

36220 Underlay white 760–860°C

Lead–and cadmium–free onglaze color

1. General Information

Features!

- Lead and cadmium free
- Low C.O.E.
- Very intensive and opaque
- Less color changing with other colors
- Can mix with other colors

36220 is lead– and cadmium–free onglaze white for porcelain, bone china, earthenware, vitreous china and enamel ware. It is specially developed as low C.O.E. and intensive underlay white, which can hide the colored glaze.



2. Firing Conditions

| Type of ware | Firing range |
|----------------|--------------|
| Porcelain | 780–860°C |
| Bone china | 780–860°C |
| Earthenware | 760–840°C |
| Vitreous china | 760–840°C |
| Enamel ware | 780–820°C |

36220 is suitable for fast-firing for 60–150 minutes, cold-to-cold conditions and it becomes a yellowish-white tone under longer and over-firing conditions. They should also be only used with lead-free colors and glazes. They must be fired only under lead-free conditions to avoid heavy lead release.

Over-firing and longer-firing conditions make 36220 underlay white-yellowish and change the overprinted colors more. In this case we recommend to fire as low as possible.

3. Application

36220 is 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.) |
|----------------------|---------------------------------------|
| 36220 underlay white | $6.1 \times 10^{-6}/^{\circ}\text{C}$ |

36220 is carefully developed and tested under optimum conditions to minimize cracking or chipping problems. The maximum thickness of a color layer, including additional over-printed colors, should be below $30 \mu\text{m}$ (approx. by 200 mesh/80T, triple printing) for porcelain glaze (C.O.E. $4.5\text{--}5.5 \times 10^{-6}/^{\circ}\text{C}$). Thicker printing of more than $30 \mu\text{m}$ could be allowed for bone china, earthen ware and vitreous china (C.O.E. $5.5\text{--}8.5 \times 10^{-6}/^{\circ}\text{C}$). However, it is necessary to consider the total thickness of the color layer with other colors. Therefore, we recommend testing the cracking or chipping before mass production. The results will depend on the end-user's conditions.

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

| Product | D ₅₀ average | D ₁₀₀ biggest |
|----------------------|-------------------------|-----------------------------|
| 36220 underlay white | $3 \mu\text{m}$ | $15\text{--}20 \mu\text{m}$ |

6. Printing

【6.1 Mesh size】

We recommend mesh sizes that are 200–250 mesh (80–100T) polyester for all screen applications. We recommend printing 1–2 times as an underlay white.

36220 can be printed by finer mesh up to 350 mesh (140T) polyester.

【6.2 Medium ratio】

| | |
|-----------------------------------|----------|
| 36220 underlay white : Medium PM2 | 10 : 6–7 |
|-----------------------------------|----------|

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

7. Color and Mixability

36220 can be under-printed and mixed with **SELECTION 34, 35 and 36** colors in any proportions. However, it is mainly developed as an underlay white. Therefore, we recommend testing the stability of colors under end-user's firing conditions before mass production. **If you find unstable or color changing problems, please refer to the following guidelines.**

【7.1 Sensitive colors for color changing】

Cobalt-containing colors: such as 35803, 36803, 35804, 36804, 35901, 36901 can be greenish.

Chrome-containing colors: such as 35402, 36402 can be yellowish and 36220 becomes yellowish tone.

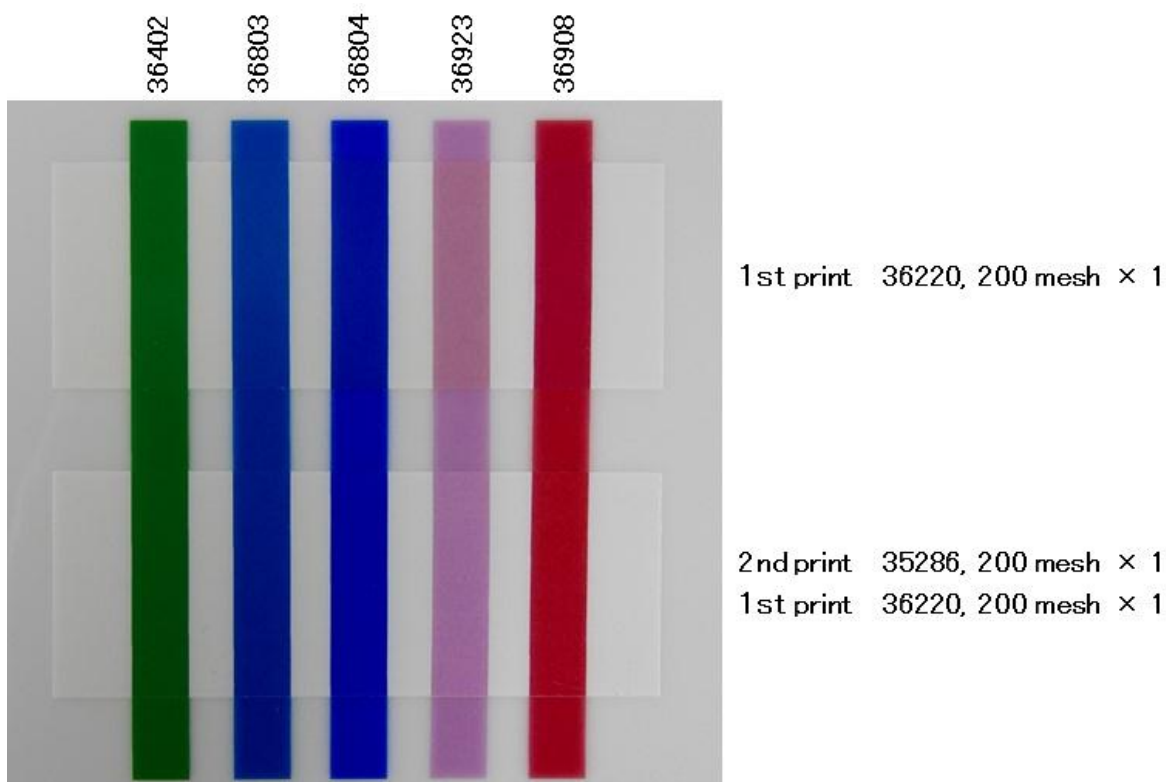
Chrome-tin violet: such as 35923, 36923 can be yellowish.

Gold-containing colors: they become bluish tone.

【7.2 Printing recommendations】

Printing 35286 white on 36220 underlay white: 35286 is a relief white but it helps a no color-changing effect if it is printed between 36220 underlay white and above sensitive colors. 35286 white does not change other colors too. In this case, we recommend printing 1st 36220 by 200 mesh (80T) and 2nd 35286 by the same 200 mesh (80T) polyester.

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8. Chemical durability

Chemical durability of 36220 depends on type of ware, glaze, kiln, color deposit and firing conditions. The following are the results of tests on porcelain, 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】

36220 contains less than 300 ppm residual lead and less than 100 ppm residual cadmium and is 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, 36220 shows lead and cadmium release is below AAS limits.

【8.3 Acid resistance】

According to the DI EN 1388-1-2 test, 36220 does not show any visible attack after immersion in a 4% acetic acid solution for 24 hours at a room temperature $22\pm 2^{\circ}\text{C}$.

【8.4 Alkali resistance】

According to the ASTM C556-88 test, 36220 colors do not show visible attack for up to 4 hours.

9. Material Safety Data Sheet (MSDS)

Material safety data sheet (MSDS) of 36220 is available on request.

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