Tech. Information Version: 25. Jan. 2019	**Unleaded Glass Colors for Borosilicate Glass** Firing Temperature 550 – 600°C	**Page:** 1/4

General Information

Glass Colors of this Range are produced without usage of Lead and Cadmium-containing frits. As unleaded colors they have a very low melting range, which makes them suitable for temperature-sensitive glass.
Colors of Range BB are recommendable for decoration of Flat Glass and hollow ware, cosmetic packaging, bottles, OPC-points, technical glasses and signature of ampoules.
The Palette consists of 30 colors, some of which like some yellow, orange, red are based on Cadmium pigments. These colors are marked with a * in the color chart.

Miscibility

The colors are only partially miscible with each other.
In general, it is recommended to carry out preliminary tests on all mixtures.

Technical Properties

The flux of this Range is based on a Alkali-Zinc-Boron-Bismuth Silicate.
The lead content of the colors is below 600 ppm.
The colors of series are Lithium-free, so there are no limitations concerning the decoration of bottles or flat qlass.

For Borosilicate Glass the colors are suitable if they are applied in 1 layer of maximum about 10 microns.

Resistance

As a consequence of their chemical composition the colors of this series have only a very weak resistance against acids and alkali. They are only suitable for decorations which don´t need to withstand acidic and alkaline solutions or dishwasher machines.
The colours have no dishwasher resistance.

Against 3 % hydrochloric acid or 4 % acetic acid the colors are not resistant. (Complete removal after 10 minutes). Immersion in 0,5% Sodium carbonate solution at 95°C causes matt surface after 1 hour.

Coefficient of thermal expansion

The coefficient of thermal expansion is in average 63 x 10^{-7}1/°K.

Particle size distribution:

The D 90-value of the colors is in average about 10 microns, so the colors can be used for screen-printing as well as for painting.

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Firing temperature

The firing range of the colours in normal firing cycles of 2 – 3 hours is between 550 ° C and 570 ° C. The optimum is 560°C with 10 min. Soak time. In fast-firing cycles 580 – 600°C with short peak time can be used.

The gloss of the colours can be increased by using an underlayer of white. An oxidizing firing atmosphere is advantageous for the development of the colour shades.

The type of used firing aggregate (box kiln, continuous furnace) in combination with the entered firing parameters have an essential influence on the burning result und should be optimized by burning tests.

In each case you have to adjust the firing temperature, object temperature and firing cycle to the items to be decorated and to the type of kiln.
In the temperature up to about 450 ° C – in which organic media and cover coats decompose – the kiln should exhaust very effective. A fast increase of temperature, short peak time and a slow cooling down is advantageous to the glasses.

For better gloss the colours can be mixed with flux– this lowers the melting point but increases the transparency.

Processing

These colours are suitable for all current decorating procedures and offer excellent processing properties because their fine particle-size.
To achieve best results either for the direct or for the indirect screen process printing, the colour pastes should be homogenized in a three-roll mill. For a high gloss the colours should be applied in a thick layer.

The thickness of layers (films) and the appearances of shades of ceramic colours depend on different factors such as the thickness of the silk-screen, technique of the screen stencil, hardness of shore, angle of setting of the squeegee, composition of colours and so on.

Therefore the stated dates can only be considered as guide values und should be checked by tests of your own.

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The following decorating auxiliaries are suitable for application:

Brush application

a) Turpentine Oil and 0000/3 Dammar lacer or 21 new Fat-oil mixed with 0405 silkscreen oil (here used as painting medium) Addition as necessary (about 20 – 30% medium)

b) Screen-printing Medium 0405:
Prepare a paste with about 20% medium, then dilute with turpentine oil to painting viscosity, addition as much as needed for painting.

Direct Screen Print Process:

a) 0405 Screen printing medium or V873 Screen printing medium or 0480 Screen printing medium

Ratio of pasting:
Colour powder: 80 – 85 weight units
Oil: 15 – 20 weight units

b) Thermoplastic medium 0492 or 0564

Pasted in wax medium ready for screen process printing

Indirect Screen Print Process (decals):

a) 0782 and 0782 thix Screen printing medium, fluid and thixotropic

Ratio of pasting:
Colour powder: 60 – 65 weight %
Oil: 35 – 40 weight %

b) 0728 Screen printing medium, fluid

Ratio of pasting:
Colour powder: 60 – 65 weight %
Oil: 35 – 40 weight %

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Recommended screens:

Polyester: 43 – 90 threads/ cm
Steel VA: 220 – 300 mesh

Depending from the type of decoration and colour

Covercoats:

0601 or 0601 thix Covercoat

Recommended screen: Polyester 30 threads/ cm

Forms of Delivery

Colours in powder form: Minimum purchase quantity per colour shade: 5 kg
Colour paste for screen printing: Minimum purchase quantity per colour shade: 5 kg

Storage

Colour powder grants the advantage of unlimited durability, if stored in dry condition.

The powders are a little bit of water-attracting (hygroscopic).
Before being processed with oily media, they should absolutely be dried at a temperature of about 120°C, because a content of little more than 0,1 % moistness leads to „cheesy" pastes. In this case they can no longer be perfectly printed, because they become thick.

Please take care to disperse the colour powder with the medium homogenously.
In mixing the powder with the medium, small colour lumps will still remain. Therefore please use a three roll mill or dissolver.

Even in closed vessels the pastes for screen process printing have only a limited shelf-life. We advise you to store the pastes under cool conditions.

Security Advices

While processing it is most important to obey the hygienic precautions such as:

- Do not eat, drink or smoke while being at work.
- Do not inhale dust.
- Keep away from food-stuff, beverage and fodder.
- In case of contact with skin: Wash off and rinse with water and soap.
- If having inhaled: Rinse mouth with cold water.

For more information please contact us or ask for a Material Safety Data Sheet.

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