Tech. Information Version: 1.Feb. 2009	**Unleaded Glass Colors - Serie BU** Firing Temperature 550 – 600°C	**Page:** 1/5

General Information

Glass Colors of Serie BU are produced without usage of Lead and Cadmium – except the yellow and red Color shades which contain Cadmium pigments.
As unleaded colors they have a very low melting range, which makes them suitable for temperature-sensitive glass.
Colors of serie BU are recommendable for decoration of Flat Glass and hollow ware (decorative glasses, cosmetic packaging, bottles, OPC-points and signature of ampoules.
The Palette consists of 21 colors, 6 of them contain Cadmium (marked with *). The Cadmium content of these is up to 10% (Cd).

Color Chart and Product numbers:

White BU 9826 Pant. white	Flux BU 9827 transparent	Light Yellow BU 3831 Pant. 386C	* Cd-yellow BU 3832 Pant. YellowC	Yelloworange BU 7833 Pant. 143C	* Yellowbrown BU 6883 Pant. 1395C
Deer Brown BU 6884 Pant. 1615C	Dark Brown BU 6885 Pant. 476C	Red Brown BU 6886 Pant. 174C	* Cd-Orange BU 7834 Pant. 165C	* Cd-Red BU 7835 Pant. 179C	* Cd-Dark Red BU 7837 Pant. 180C
* Cd-Wine Red BU 7836 Pant. 188C	Green BU 1835 Pant. 364C	Blue Green BU 2830 Pant. 329C	Leaf Green BU 1834 Pant. 355C	Blue BU 2831 Pant. 3015C	Medium Blue BU 2832 Pant. 300C
Gentian Blue BU 2833 Pant. 2728C	Black BU 4845 Pant. BlackC	Grey BU 5824 Pant. 422C	Dark Grey BU 5825 Pant. 431C		

The color chart shows an approximate impression of the shades for a first selection.
For exact selection of a color shade it is absolutely necessary to test a sample under original conditions.

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Miscibility

The colors are intermixable and can be mixed with flux BU 9827.
When Cadmium-containing and Cadmium-free colors are mixed it is necessary to do own tests under the specific customer conditions.

Technical Properties

The flux of Serie BU is based on a Alcali-Zinc-Boron-Silicate.
The lead content of the colors is below 100 ppm.

The colors of series BU are Lithium-free, so there are no limitations concerning the decoration of bottles or flat glass.

For Borosilicate Glass the colors are only suitable with limitations because they may crack or flake off after firing. If they are applied in thin layer and fired at relatively low temperature (not with high gloss) they can be used.

Resistance

As a consequence of their chemical composition the colors of serie BU 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 80 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.

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.

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The gloss of the colors can be increased by using an underlayer of white BU 9826 and flux coat BU 9827.
If the colors are fired a too high temperature they may get matt!
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 covercoats 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 BU 9827 – this lowers the melting pint but increases the transparency.

Processing

BU 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.

The following decorating auxiliaries are suitable for application:

Brush application

a)
Turpentine Oil and 0000/3 Dammarlack or 21 neu Dicköl mixed with 0405 silkscreen oil (here used as painting medium) addition as necessary

b)
Screen-printing Paste (basis 0405 screen-printing oil)
Dilute with turpentine oil to painting viscosity, addition as much as needed for painting.

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Direct Screen Print Process:

a)

0405 Screen printing medium or 0480 Screen printing medium
(for example: OPC points)

Ratio of pasting:

Colour powder:	60 – 65 weight units
Oil:	40 – 35 weight units

b)

0492 Thermoplastic medium

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:	55 – 60 weight units
Oil:	45 – 40 weight units

b)

0728 Screen printing medium, fluid

Ratio of pasting:

Colour powder:	55 – 60 weight units
Oil:	45 – 40 weight units

Recommended screens:

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

According to the decoration and colour

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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

Thermoplastic pasted colours: Minimum purchase quantity per colour shade: 25 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 inhalate dust.
- Keep it away from food-stuff, beverage and fodder.
- In case of contact with skin: Wash off and rinse with water and soap.
- If having inhalated: Rinse mouth with cold water.

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

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