Tech. Information Version: 1.March 2013	**Unleaded Glass Colors –Series BR** Firing Temperature 600 – 650°C	**Page:** 1/5

General Information

Glass Colors of Series BR are produced without usage of Lead and Cadmium – except the yellow and red Color shades which contain Cadmium pigments.
The colors have a good chemical resistance against acids and alkalis, which makes them suitable for decoration of glass tableware.
Colors of series BR 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 *).

Color Chart and Product numbers:

White BR 9920 Pant. white	Flux BR 9921 transparent	Light Yellow BR 3900 Pant. 386C	* Cd-yellow BR 3901 Pant. YellowC	Yelloworange BR 7960 Pant. 143C	* Yellowbrown BR 6921 Pant. 1395C
Deer Brown BR 6922 Pant. 1615C	Dark Brown BR 6923 Pant. 476C	Red Brown BR 6924 Pant. 174C	* Cd-Orange BR 7961 Pant. 165C	* Cd-Red BR 7962 Pant. 179C	* Cd-Dark Red BR 7964 Pant. 180C
* Cd-Wine Red BR 7963 Pant. 188C	Green BR 1950 Pant. 364C	Blue Green BR 2900 Pant. 329C	Leaf Green BR 1949 Pant. 355C	Blue BR 2901 Pant. 3015C	Medium Blue BR 2902 Pant. 300C
Gentian Blue BR 2903 Pant. 2728C	Black BR 4901 Pant. BlackC	Grey BR 5910 Pant. 422C	Dark Grey BR 5911 Pant. 431C	Silk Matt BR 9922	

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 BR 9921 (resistant) or BU 9827 (not resistant).
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 series BR is based on a Alkali-Zinc-Boron-Silicate.
The lead content of the colors is below 100 ppm.

The colors of series BR contain Lithium (Li-content approx. 1,5% based on Lithium oxide). They are suitable for the decoration of flat glass and bottles. For the decoration of bottles which are under pressure, suitability has to be tested.

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 series BR have a medium to good resistance against acids and alkali. They suitable for decorations which need to withstand acidic and alkaline solutions or dishwasher machines.

3 % hydrochloric acid/room temperature: After 1 hour matt
4 % acetic acid/room temperature: After 1 hour matt
0,5 % Sodium carbonate solution, 95°C: after 2 hours matt

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

The firing range of the colours is between 600 ° C and 650 ° C.
An oxidizing firing atmosphere is advantageous for the development of the colour shades.
The higher the firing temperature the more brilliant the colour surfaces will look.

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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 BR 9921 (resistant), but this will cause weaker, more transparent colour shades. Mixing with flux BU 9827 (not resistant) lowers the melting point but also reduces the chemical durability significantly.

Processing

BR 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 has 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 it 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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