



<b>Version: 20.03.2015</b>	<b>Resistant Onglaze Colours Range "S"</b> for Porcelain, Stoneware, Bone China, Vitreous China, Tiles, Enamelled Steel Firing Range: 800 – 1050°C	<b>Page:</b>  1/5
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### General information

One of the remarkable features of the colours of palette „S“ is the special stability during the firing process.

The palette is suitable for normal firing (800 – 850 ° C / 3 h and more) and for the conditions of fast - firing.

Fast-firing is performed in a total firing cycle of 60 – 120 minutes at temperatures of 850 – 920 ° C and up to 1050 ° C respectively.

Firing these colours at normal conditions will produce decorations with good chemical resistance. Nevertheless it can still be essentially improved by firing with higher temperatures up to 1050 (fast-firing) and definitely to be comparable to the resistance of high temperature fast-fire colours (1200 – 1250 ° C).

Cadmium-containing colours can be fired only at temperatures up to about 850°C maximum.

### Resistance

The decorations produced with colours of series „S“ are resistant to fruit acids. In touch with food stuff, they can be hardly attacked and release very low lead and cadmium.

According to DIN 51031/32 (4 % acetic acid 24 hours at 22 + 2° C) the values of lead and cadmium release are generally far below the standard being in force in Germany and in many European countries.

However it is necessary that each manufacturer controls the release of heavy metals according to his own production conditions and to the appropriate standards.

### Dishwasher-Resistance

The usability of decorations in dishwashers is just as important as low release of heavy metals. However, up till today an obliging standard for durability tests in dishwasher machines does not exist. As accelerated test EN 12875-4 can be used.

The resistance in dishwasher machines is good, as far as the decorations have been produced under best conditions. Under normal firing conditions the colours have a moderate dishwasher resistance.

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### Miscibility

The colours of the palette „S“ – except those which contain cadmium – are intermixable among each other.

Additions up to about 5 % of a non-cadmium colour to a cadmium colour are possible, but not ideal. The use of higher mixing percentages may destroy the cadmium red colours.

Pastel tones can be reached by mixing with Mixing-White F 9080/ S. For very strong whitening effects White F 9163/ S is suitable.

By diluting with flux FL 9150 brighter and paler colour tints will result. This flux can also be used as covering flux for top printing the colours (improving the resistance).

The precious metal containing Purple Colours (Marking „PR“ or „P“) should only be mixed among each other but not with other colours. Mixtures with White and/or Blue are possible.

Processing the „S“ colours according to the recommendations, they normally fire with a glossy surface.

Matt decorations can be achieved by adding Matt Additive RG 24. Depending on the desired matt effect, the addition of 10 – 30 % Matt Additive is needed, for example:

Colour powder:	80 weight %
Matt Additive RG 24:	20 weight %

By mixing with Matt Additive the colours will appear lighter proportional to the percentage of the mixing.

The addition of Matt Additive does not affect the resistance of the colours, if processed optimally

### Processing

„S“ colours are generally suitable for nearly all kinds of applications, such as:

- direct screen printing
- indirect screen printing
- application by brush
- spraying
- lining

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For the offset- or flat-printing, which produces only very thin colour layers, these colours are not optimally suitable.

Porcelain has got a lower expansion coefficient than the colours used for decoration; thus this difference can cause tensions between glaze and colour.

Consequently very thick colour layers may crack or exfoliate after the firing process. On the other side colour layers being too thin, lead to matt colour surfaces.

The layer thickness maximally permitted for each colour results from:

- the processing conditions of the colour (mixing rate, screen type)
- the object to be decorated
- the firing conditions (peak temperature and firing time).

In the case that several colours will be applied one above another, the total layer should not be thicker than about 20 microns.

On ceramic bodies as per earthenware, Vitreous China or Bone China with a high coefficient of thermal expansion than porcelain the given maximal value can be exceeded.

### **Brush Application and Lining**

The colour suspensions are suitable for brush and steel wheel applications. Suitable solvent based media are 0405 and turpentine oil or water mixable medium 0509.

### **Spraying:**

Colour suspensions for spraying are prepared with solvent based media or with water based media.

Suitable solvent based media are 0405 and turpentine oil or water mixable medium 0509.

For the preparation of oily suspensions the colour powder must be completely dry. It is recommended to dry the powder before usage at 120°C.

### **Screenprinting:**

For direct and indirect screenprinting Polyester screens with 77-140 mesh/cm (195 – 355 mesh/inch) or 270 – 400 mesh/inch steel screens are recommended.

Direct printing: Medium 0405 or water mixable Medium 0509

Decals: Medium 0782 and 0782 thix or 0721 und 0721 thix

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Pasting ratio:

Colour powder: 60 – 70 weight-%

Medium: 40 – 30 weight-%

Screenprinting covercoat for Decals:

0601 liquid and thixotropic available in different colours

### Firing

„S“ colours – like all enamels – require a certain minimum temperature, in order to melt to a homogenous glossy layer.

The optimum firing temperature depends on the following factors:

- objects to be decorated (softening point of the glaze),
- thickness of applied layer of colour
- type of kiln

The softer the glazes, the lower the temperature can be adjusted.

A higher temperature is required for the flowing of the enamels at shorter peak times.

A short peak time is optimal, because in this case the flux will not dissolve the colour particles too much. Decisive are the temperature of the fired goods and not the measured temperature in the kiln chamber.

If the firing temperature is too low, it will affect the release of lead negatively.

Cadmium colours are sensitive to high temperatures and to a bad atmosphere inside the kiln (depending on the layer thickness).

When fast-fired on porcelain at 850 – 920 ° C, Firing Time 60 – 120 minutes, the release of heavy metals and the resistance in the dishwasher machine will be improved.

When fast-fired on Porcelain at 920 – 1 050 ° C, Firing Time 60 – 120 minutes, the release of lead and cadmium can nearly not be measured according to DIN 51 031/32. In this range of temperature red and yellow cadmium colours are no longer stable. The resistance to dishwasher machines is comparable to the resistance of Inglaze fast-firing colours.

Enamelled Steel: Firing cycle 820 ° C / 2 – 3 minutes

The suitability for use has to be examined by test runs under factory conditions.

In the temperature up to about 450 ° C – in which organic media and covercoats decompose – the kiln should exhaust very effectively. A fast increase of temperature, short peak time and a slow cooling down is advantageous for a good result.

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### Security Advices

Ceramic colours are chemical products.

While processing it is important to follow 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. (MSDS).

### Storage

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

The powders are a little bit hygroscopic. Before being processed with oily media they should be dried at a temperature of about 120°C, because a content of little more than 0,1 % water 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 use a three roll mill or dissolver.

Even in closed containers the colours pasted with screen printing oil have only a limited shelf-life. We advice you to store the pastes under cool conditions.

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