

## Technical Information



### 767 Series Lead-Free Glass Enamels

#### Product Codes and Color Shades

Product Code	Color Shade	Pantone® Code <sup>1</sup>	Product Code	Color Shade	Pantone® Code <sup>1</sup>
117671	Green	7331C	117672	Chrome Green	364C
117673*	Green	3278C	117674*	Grass Green	361C
117675*	Yellow Green	368C	127671	Blue	2726C
127673	Cyan	3005C	127672(1)	Blue	286C
127675(1)	Blue	285C	127676(1)	Violet Blue	072C
137672*	Yellow	116C	137674	Metallic Yellow	2007U
147671(2)	Black	Black C	147673	Black	Black C
167673	Brown	498C	177672*	Red	485C
177673*	Intensive Red	1795C	197670	Etch	
197672	White		197673	Opaque White	
197674	Silver		107671	Flux	

Pantone® is a registered trade mark of Pantone Inc.

<sup>1</sup> The above mentioned Pantone® code is only a guideline for the color shade

“\*” Denotes cadmium-containing colors.

(1) The colors need to overprint flux.

(2) The colors contain Lithium, which we do not recommend to apply on pressurized containers.

#### Heavy Metal Release

Colors in the 767 Series do not contain voluntary additions of heavy metals that include lead, cadmium, mercury and hexavalent chromium (Cr<sup>6+</sup>). Ferro manages heavy metals in the 767 Series colors with controls in place to maintain the following limits:  
Lead content < 300 ppm ;  
Cadmium content (with the exception of cadmium-containing colors) < 100 ppm ;  
Lithium < 30 ppm (with the exception of product 147671)

#### Application

Colors in the 767 Series are used in the decoration of soda lime glass packaging, particularly glass tumblers

and one-way bottles where the chemical durability is not an issue. These colors have excellent processing characteristics in all conventional decorating methods like screen printing (direct and indirect), lining and banding, spraying as well as hand painting. For screen printing, we recommend following printing methods:  
For etch color, we recommend 200-300mesh/inch, color: medium (803915) =10:6-7.  
For metallic color, we recommend 100-200mesh/inch, color: medium (803915) =10:7-8.  
For other colors, we recommend 150-300mesh/inch, color: medium (803915)=10:5-6.  
For overprinting flux, we recommend 250-300 mesh/inch, color: medium (803915:803903=1:1) =10:7-8.

**Miscibility**

These colors are intermixable, we recommend performing preliminary tests before launching production with color mixtures from this system. Additional colors are available on demand.

**Firing**

We recommend firing temperature 590-610°C in a cycle of 1-1.5h, with a soaking period of approx.10 min, If overprinting the flux 107671, firing temperature of most colors can reduce to 560°C, depending on both the type of furnace and the volume of ware load. We recommend an oxidizing

atmosphere to give optimal fired appearance and brightness. It is essential to maintain good ventilation and an efficient extraction of the combustion gases and the products resulting from decomposition of the medium.

**Color Deposit**

The maximum color deposit after firing, depending on the glass and the firing temperature. Too thick color deposit may cause blistering. We recommend the customer to do the trials prior to production

**Chemical Resistance**

Acid resistance: 22±2°C, 22±2°C, 10%citric acid and 3.7% HCl,15min; Grade 7

Alkali resistance: 9.1%NaOH+0.9Na3PO4·12H2O,88°C, 4 h; Grade 7

Alcohol resistance: 45% spirit, 30 minutes, Grade 4 or better

1.	No attack apparent.
2.	Appearance of iridescence or visible stain on the exposed surface when viewed at a 45angle but not apparent at angles less than 30.
3.	A definite stain which does not blur reflected images and is visible at angles less than 30.
4.	Definite stain with a gross color change or strongly iridescent surface visible at angles less than 30 and which may blur reflected images.
5.	Surface dull or matte with chalking possible.
6.	Significant removal of enamel with pinhole evident.
7.	Complete removal of enamel in exposed area.

**Expansion Coefficient (CTE)**

The CTE of the colors from this series is about  $90\pm 5 \times 10^{-7}/^{\circ}\text{C}$  (30-300°C) . This system is suitable for the decoration of most soda-line glasses.

**Supplying Forms**

Our glass enamels from this system can be provided in Powder form and the Thermoplastic pastes (TP) form for multi-color hot screen printing.

**Storage**

The colors should be stored in a dry place. Opened containers should be closed carefully. To ensure that the colors have not absorbed any humidity, we recommend drying the color powder at approx.130°C prior to pasting.

Thermoplastic paste should be stored in cool and dry conditions, not below 5°C or above 35°C. Partly used tins must be tightly sealed after use. If stored as recommended, the shelf life is 2 years after production date.

**Limitation of Warranty and Liability**

Ferro believes that the information contained in this document is accurate at the time of its publication. Ferro makes no warranty with respect to the information contained in this document. The information in this document is not a product specification, either in whole or in part. Your use of the information contained in this document and your purchase and use of this Ferro product are at your sole discretion. Downstream users are responsible for determination of the suitability of this product and for testing in specific applications. Nothing in this document shall be construed as a license for use that infringes upon any property rights of any third party. Please refer to the Safety Data Sheet (SDS) for safe use, handling and disposal information. All sales by Ferro to you are subject to Ferro's Terms and Conditions of Sale, as amended from time to time and available at [www.ferro.com](http://www.ferro.com). In the event this document conflicts with Ferro's Terms and Conditions of Sale, Ferro's Terms and Conditions of Sale shall control.