

# Lead-Free System Technical Data



## VNR System

### Main Market Use

These lead-free enamels are recommended for decoration of soda-lime glass packaging, more particularly multi-trip bottles. They are the most durable of the lead-free systems for packaging glass on the market.

### Chemical Composition

Colors in this System do not contain voluntary additions of heavy metals – Pb, Cd, Hg and Cr<sup>6+</sup>. Exceptions are the cadmium-containing green, yellow, reds and oranges (marked \* below) which need to use cadmium pigments, to provide the color tones required by the market.

COLOR	REFERENCE	Pantone	Coca Cola/ Pepsi Cola	REFERENCE	Pantone
GREEN	VNR 1440	336 C	White	VNR 9407	
BLUE	VNR 2414	2985 C	Coke Red 2000	VNR 7418 *	186 C
BLUE	VNR 2419	640 C	Sprite Blue	VNR 2416	293 C
YELLOW	VNR 3414 *	102 C	Sprite Yellow	VNR 3417	107 C
RED	VNR 7424 *	485 C	Fanta Blue	VNR 2439	661 C
ORANGE	VNR 7408 *	021 C	Fanta Green	VNR 1412	360 C
BROWN	VNR 6407	490 C	Pepsi Red	VNR 7452	174 C
WHITE	VNR 9407		Pepsi Blue	VNR 2417	293 C
BLACK	VNR 4403		Mountain Dew Red	VNR 7452	174 C
FLUX	VNR 401		Mountain Dew Green	VNR 1427	380 C
ETCH	VNR 9421		Teem Yellow	VNR 3434	107 C
			Coke Zero Black	VNR 4403	
			Mirinda Green	VNR 1415	347 C

*The Pantone references and color prints are provided as an indication of the shade only.*

*The above mentioned references are randomly selected color shades, please contact your respective Ferro Technical Service to get more information on further available colors.*

*The above mentioned references refer to the powder form only. If you want the thermoplastic paste, liquid paste or spraying form, make sure to add the suitable name of the medium – mentioned on page 5 – at the end of the reference.*

The proprietary colors listed are fully approved for use by the Coca-Cola Company and Pepsi-Cola International

These colors are intermixable. We recommend performing preliminary tests before launching production with color mixtures from this System, especially for combinations of red or yellow cadmium-containing colors (marked \*) with any other colors.

Additional colours are available on demand.

Our technical service teams also offer a full custom-color matching service.

### Expansion Coefficient (C.o.E.)

This system is suitable for most chemical compositions used in the production of soda-lime glass bottles.

### Recommended Firing Conditions

From 630°C to 650°C in a cycle of 1 h -1.5 h or more with a soaking period of 1xidizi. 10 min, dependent on both the type of furnace and the volume of ware fired. We recommend an 1xidizing 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.

### Chemical resistance

Acid resistance 4  
Alkali resistance 5

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