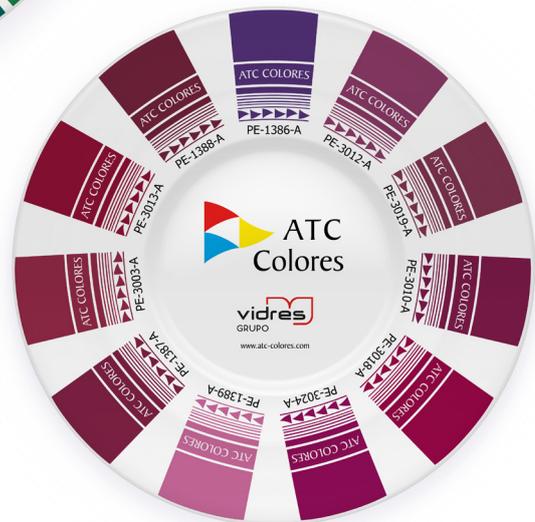


**PE SERIES - LOW METAL RELEASE ONGLAZE ENAMEL COLOURS FOR TABLEWARE, EARTHENWARE, STONEWARE, PORCELAIN, BONE CHINA & TILE**

The Colour Chart shows an approximate impression of the basic colours for a first selection of colours. For exact reproduction of a colour tone it is absolutely necessary to test a sample under original conditions.



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### TECHNICAL DATA SHEET AND USAGE

The PE Series are manufactured to provide a range of Low Metal release colours for Onglaze or Third Fire application. The colours can also be used on Lead Free substrates and glazes providing a comprehensive range of colours designed for maximum miscibility and optimal metal release.

#### MAIN PROPERTIES

##### High color intensity

The highest intensity is obtained by printing the colors without flux addition. Gloss and intensity can be fine-tuned by adding a higher or lower amount of fluxes.

##### Excellent particle size powder distribution

The particle size of the colors will vary depending on the composition, in this series the Typical Diameter particle D50=3-5 microns and D90=15-20 microns with trace residue on a 120 s sieve.

##### Very good resistance

Mechanical durability is widely resistant showing good resistance, however, it is necessary for users to determine metal release and durability, according to their own production conditions.

##### Low thermal expansion coefficient

The Coefficient of thermal expansion is  $75-85 \times 10^{-7} \cdot 1/K$  (20 to 400°C) and it is suitable for different materials.

#### MISCIBILITY AND COMPATIBILITY

All colours are designed for maximum intermixing. The Main Group & Gold Group can be intermixed together and the use of Mixing White PE-1097-T can be used to create pleasing pastel shades and PE-1114-C Mixing/Diluent Flux for dilution of shade is detailed below.

With the exception of Cadmium Group based colours which are intermixable fully with each other within the Cadmium Group or can be mixed with limitations up to a maximum of 5% with other colours and Flux PE-2423-C is recommended.

PE-1097-T - Universal Mixing White to achieve pastel colours between 10% -90%

PE-1114-C - Mixing Flux/Diluent suitable for dilution of colours up to 10%-20% maximum is recommended

PE-2423-C - Coverprint/Overprint Flux suitable for overprinting decal schemes to reduce Cadmium metal release and improve mechanical and chemical resistance, is also recommended for use with Cadmium Colours

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### APPLICATION

#### DIRECT SCREEN PRINTING AND DECALS

For screen printing directly or for decal transfers a 120T - 73T polyester mesh can be used for most colours with 120T used to achieve a halftone effect however we recommend 90T Mesh or 230/200/300 GP Stainless Steel Mesh especially for Cadmium based colours as these colours require an optimal deposit to ensure stability and we recommend customers trial these under their own conditions.

On substrate such as hard and soft paste porcelain with a lower co-efficient of thermal expansion the recommended permitted layer thickness should not exceed 20 microns in order to avoid cracking or flaking of the enamels and must be observed where several layers are built up or applied or one thick layer, customers must assess suitability including re-fired pieces, thicker layers are possible on vitreous bodies, Bone China etc

PE Colours can be used on Lead Free Glazes but this dynamic might increase metal release so it is necessary for customers to determine the outcome under their own conditions.

As a guide, recommended mixing ratios and mediums below:

Reference	Description	Parts medium per 10 parts of colour	Water Media	Oil-based Media
L427	WATER MISCIBLE MEDIUM	3,5	✓	
W172	WATERBASED PRINT MEDIUM	3,5	✓	
M286D	SEMI-THIXO S/PRINT MEDIUM	6		✓
M286T	THIXOTROPIC S/P MEDIUM	8		✓
M51D	SCREEN TRANSFER MEDIUM	5		✓
M6	DIRECT PRINT MEDIUM	3,5		✓

#### HANDPAINTING-MACHINE BANDING AND LINING & SPRAYING OR AEROGRAPHING

The colors can be supplied as dry powder for painting directly onto glazed ware and also in the following mediums:

Reference	Description	Parts medium per 10 parts of colour	Water Media	Oil-based Media
W108	WATERBASED HAND PAINT MEDIUM	6	✓	
M162N	GELLED BANDING MEDIUM	5		✓
M9	HAND PAINTING MEDIUM	3,5		✓

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### FIRING RECOMMENDATIONS

For cycles of 4 hours or more the following temperatures are recommended:

Hard Paste Porcelain	800 - 850 degrees
Soft Paste Porcelain	790 - 840 degrees
Vitreous Tableware	780 - 820 degrees
Bone China	780 - 820 degrees
Earthenware/Tiles	760 - 850 degrees

Fast firing and shorter cycles are possible:

850-880 degrees/60-90 min

Firing affect metal release and durability so it is best determined depending on cycle profile.

Be aware that Cadmium Colours are more susceptible to higher temperatures above 820-850 degrees centigrade.

### ACID AND ALKALI RESISTANCE

The chemical resistance of the fired color layers is influenced by the color deposit, the firing conditions and the glaze. The colors could show a very slight visible attack with 4% acetic acid solution ( $22\pm 2^{\circ}\text{C}$ , 24h) as well as with 5% sodium carbonate solution ( $60\pm 2^{\circ}\text{C}$ , 32h). We recommend carrying out tests under industrial conditions.

### METAL RELEASE CHARACTERISTICS

Every effort is made to manufactured these colors with the lowest metal release possible, there are in the order of typically less than 0.3% Lead and 0.03% Cadmium respectively under normal application conditions and optimal firing and experience show results well below current permissible limits for tableware.

Metal release conditions can be influenced by deposit weight, glaze composition, firing conditions (firing cycle and kiln atmosphere), etc. and, in general, the higher the cycle temperatures, the better metal release and greater durability will be obtained. Under some conditions, note that the lining of kilns previously used to fire Low-Solubility or Lead products is known to release volatile metals detectable in the test.

The solubility of some particular colors can affect the mechanical strength and metal release in the case of cobalt and cadmium colors, in particular PE-1198-L, or Cadmium Group Colours.

It is possible to improve mechanical resistance and metal release using Cover Flux PE-2423-C or by firing and applying in optimal conditions.

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### REFERENCES

	Colour	Reference		Colour Composition	Pantone
<b>Main Group:</b>		PE-1093-T	White	Ce	-
		PE-1097-T	Mixing White	Ce	-
		PE-1208-T	Super White	Ce	-
		PE-1098-E	Black	Cr-Fe-Co	Black C
		PE-1099-K	Chrome Green	Cr	7742 C
		PE-1100-K	Bright Green	Co-Ti	7731 C
		PE-1106-H	Orange	Cr-Ti-Sb	2011 C
		PE-1122-T	Grey	Sn-Sb	7543 C
		PE-1124-H	Bright Yellow	Pb-Sb	106 C
		PE-1145-R	Golden Brown	Cr-Fe-Zn-Al	2429 C
		PE-1154-N	Blue Green	Cr-Co-Al-Zn	7470 C
		PE-1155-R	Red Brown	Cr-Fe-Zn	188 C
		PE-1167-K	Green Blue	Cr-Co-Al	329 C
		PE-1184-N	Turquoise	V-Zr-Si	2905 C
		PE-1198-L	Royal Blue	Co-Si-Zn	293 C
		PE-1385-L	Bright Blue	Cr-Ca-Sn-Si	2144 C
		PE-1517-M	Non Gold Pink	Cr-Ca-Sn-Si	3519 C
		PE-1651-L	Cyan	Co-Al-Zn	7704 C
		PE-1114-C	Mixing/Diluent Flux	-	-
		PE-1240-C	Transparent Flux	-	-
<b>Cadmium Group:</b>		PE-1103-H	Cd. Yellow	Cd-S-Zn	7406 C
		PE-1104-H	Cd. Orange	Cd-S-Se	1665 C
		PE-1105-M	Cd. Bright Red	Cd-S-Se	187 C
		PE-1121-M	Cd. Dark Red	Cd-S-Se	7427 C
		PE-2576-K	Cd. Green	Cd-S-Zn-Cr-Co-Al	3539 C
			PE-2423-C	Cd. Cover Flux	-

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### REFERENCES

	Colour	Reference		Colour Composition	Pantone
Gold Group:		PE-1386-A	Purple	Sn-Al-Au-Ag-Co-Si-Zn	7680 C
		PE-1387-A	Magenta	Sn-Al-Au-Ag	216 C
		PE-1388-A	Maroon	Sn-Al-Au-Ag	209 C
		PE-1389-A	Pink	Sn-Al-Au	3582 C
		PE-3003-A	Wine	Sn-Al-Au-Ag	7641 C
		PE-3010-A	Medium Purple	Sn-Al-Au-Ag	4074 C
		PE-3013-A	Dark Purple	Sn-Al-Au-Ag	1955 C
		PE-3018-A	Strong Maroon	Sn-Al-Au-Ag	221 C
		PE-3019-A	Intensive Purple	Sn-Al-Au-Ag	4075 C
		PE-3021-A	Magenta Purple	Sn-Al-Au-Ag-Co-Si-Zn	689 C
		PE-3024-A	Rosewood	Sn-Al-Au-Ag	228 C

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