FERRO PIGMENTS FOR COATINGS
Ferro Corporation (NYSE: FOE) is a leading global supplier of technology-based performance materials, including glass-based coatings, pigments and colors, and polishing materials. Ferro products are sold into the building and construction, automotive, appliances, electronics, household furnishings, and industrial products markets. The Company is headquartered in Mayfield Heights, Ohio, USA.

Our Values and behaviors:

- **CUSTOMER FOCUS**
  Our customers are why we exist. We build relationships with internal and external customers that are built on trust, a desire to understand their needs and challenges, and a genuine interest in making them more successful.

- **ACCOUNTABILITY FOR PERFORMANCE**
  As individuals and teams, we work to achieve the highest performance standards. We prioritize safety and environmental stewardship; providing high-value solutions for our customers; and creating value for Ferro’s shareholders.

- **INNOVATIVE THINKING**
  We encourage our associates to seek out new ideas for technologies and business processes, and to always look for ways to improve and to better serve our customers.

- **TEAMWORK AND COLLABORATION**
  We are committed to a work environment that promotes trust, mutual respect, teamwork and collaboration, and that focuses on consistently delivering value to our customers and shareholders.
**BLUE**
- PB15: X: Phthalocyanine Blue (Organic pigments)
- PB28: Cobalt Aluminate Blue Spinel (Inorganic pigments)
- PB29: Ultramarine Blue (Inorganic pigments)
- PB36: Cobalt Chromite Blue-Green Spinel (Inorganic pigments)

**VIOLET**
- PV15: Ultramarine Violet (Inorganic pigments)
- PV19: Quinacridone Violet (Organic pigments)
- PV23: Dioxazin Violet (Organic pigments)
- PV62: Strontium Phosphate Violet (Inorganic pigments)

**GREEN**
- PG7: Phthalocyanine Green (Organic pigments)
- PG17: Chrome Oxide Green (Inorganic pigments)
- PG26: Cobalt Chromite Green Spinel (Inorganic pigments)
- PG50: Cobalt Titanate Green Spinel (Inorganic pigments)

**YELLOW**
- PY3: Monoazo Yellow (Organic pigments)
- PY34: Chrome Yellow (Inorganic pigments)
- PY42: Iron Oxide Yellow-Opaque (Inorganic pigments)
- PY42: Iron Oxide Yellow-Transparent (Inorganic pigments)
- PY53: Nickel Antimony Titanium Yellow Rutile (Inorganic pigments)
- PY65: Monoazo Yellow (Organic pigments)
- PY74: Monoazo Yellow (Organic pigments)
- PY83: Diarylide Yellow (Organic pigments)
- PY110: Isoindolinone Yellow (Organic pigments)
- PY138: Quinophthalone Yellow (Organic pigments)
- PY139: Isoindoline Yellow (Organic pigments)
- PY151: Benzimidazolone Yellow (Organic pigments)
- PY154: Benzimidazolone Yellow (Organic pigments)
- PY170: Diarylide Yellow (Organic pigments)
- PY184: Bismuth Vanadate (Inorganic pigments)
- PY194: Benzimidazolone Yellow (Organic pigments)

**BUFF**
- PBr24: Chrome Antimony Titanium Buff Rutile (Inorganic pigments)
- PY119: Zinc Ferrite Brown Spinel (Inorganic pigments)
- PY164: Manganese Antimony Titanium Buff Rutile (Inorganic pigments)

**ORANGE**
- PO34: Disazopyrazolone Orange (Organic pigments)
- PO36: Benzimidazolone Orange (Organic pigments)
- PO85: Bismuth Oxyhalide (Inorganic pigments)

**RED**
- PR3: Beta-Napthol Red (Organic pigments)
- PR48:4: Bona Lake Red (Organic pigments)
- PR101: Iron Oxide Red-Opaque (Inorganic pigments)
- PR101: Iron Oxide Red-Transparent (Inorganic pigments)
- PR104: Molybdate Orange (Inorganic pigments)
- PR122: Quinacridone Red (Organic pigments)
- PR170: Naphthol AS Red (Organic pigments)
- PR177: Anthraquinone Red (Organic pigments)

**BLACK**
- PBk11: Black Iron Oxide (Inorganic pigments)
- PBk26: Manganese Ferrite Black Spinel (Inorganic pigments)
- PBk28: Copper Chromite Black Spinel (Inorganic pigments)
- PBk33: Iron Manganese Black Oxide (Inorganic pigments)
- PB29: Chrome Iron Brown Hematite (Inorganic pigments)
- PG17: Chromium Green-Black Hematite (Inorganic pigments)

**ECO-LYSOPAC**

**COOL PIGMENTS**

**CORROSION INHIBITORS**

**APPLICATION GUIDE**
### INORGANICS

<table>
<thead>
<tr>
<th>Pigment Code</th>
<th>Name</th>
<th>Color</th>
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<tbody>
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<tr>
<td>PB29</td>
<td>Ultramarine Blue</td>
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<td>Chrome Oxide Green</td>
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<td>PBk33</td>
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</tr>
</tbody>
</table>

### ECO-LYSOPAC

**APPLICATION GUIDE**
PB15:X  PHTHALOCYANINE BLUE

MAIN CHARACTERISTICS

- Pigment Blue-crystal 15:X (C.I. 74160)
- Good overall fastness properties
- High tinting strength
- Wide range of coating applications

<table>
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<td>Weather fastness</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

RECOMMENDED PRODUCTS

- Phthalocyanine Blue 1511C
  Reddish blue α-crystal modification (PB15:1)
- Phthalocyanine Blue 1531C
  Greenish blue β-crystal modification (PB15:3)
- Phthalocyanine Blue 1541C
  Greenish blue β-crystal modification (PB15:4)

* Paint
PB28 COBALT ALUMINATE BLUE SPINEL

MAIN CHARACTERISTICS

- CoAl₂O₄
- Pigment Blue 28 (C.I. 77346)
- Spinel structure
- Reddish blue shade
- Ease of dispersion
- UV transparent, opaque to visible light, with moderate NIR reflectance ("cool" pigment)

<table>
<thead>
<tr>
<th>Characteristic</th>
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<tbody>
<tr>
<td>Heat fastness</td>
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<tr>
<td>Cement compatibility</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

RECOMMENDED PRODUCTS

- 22-5091: Standard grade
- 10336: High tinting strength, reddish shade
- 10446: High tinting strength, reddish shade
- 22-5500: Turquoise Blue
- 22-5600: Turquoise Blue, high tinting strength
- 22-5700: Turquoise Blue, greenish shade
- 22-5475: Modified cobalt blue with most reddish shade in the range

* Paint
# MAIN CHARACTERISTICS

- Sodium Aluminum Sulfosilicate \( \text{Na}_8[(\text{Al},\text{Si})_{12}]\text{O}_{24}(\text{S}_2)_{\frac{1}{2}} \)
- Pigment Blue 29 (C.I. 77007)
- Unique reddish blue shade
- Excellent ability to make whites “whiter”, greys bluer and blacks “jetter/deeper”
- Ease of dispersion
- Semitransparent to visible light, transparent to NIR (“cool pigment”, but its cool performance will be highly dependent on substrate and formulation)

<table>
<thead>
<tr>
<th>Characteristic</th>
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<td>Excellent (8 on blue wool scale)</td>
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<tr>
<td>Weather fastness</td>
<td>Excellent (4-5 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Low, except acid resistant series</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Cement compatibility</td>
<td>Low, except Nubicem Series</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
PB29  ULTRAMARINE BLUE

RECOMMENDED PRODUCTS

**Nubicoat SERIES**

Ultramarine Blues specifically designed and quality controlled for coatings

**Nubicoat HWR** (High Weather Resistance)
New generation, encapsulated Ultramarine Blue to enhance acid and weather fastness, suitable for indoor and outdoor applications

**Nubicoat HTS** (High Tinting Strength) and **Nubicoat HRD** (Highly Reddish)
For indoor and outdoor applications (the latter, only with highly cross-linked resins and/or highly stabilized-to-UV systems and/or high resistance to industrial/acid environment systems)

**Nubicem SERIES**

Ultramarine Blues specifically designed to be compatible with cementitious formulations, highly alkaline coatings, paints over highly alkaline substrates and lime paints; quality control in cement

**Nubicem B-101**
Cement compatible Ultramarine Blue, for indoor and outdoor applications (the latter, only when the contact with water or high humidity is not severe i.e. in dry areas or when the formulation is highly hydrophobic)

**Nubicem B-201**
Cement compatible Ultramarine Blue modified with Cobalt Blue, for the most demanding applications

BLUE / inorganic pigments
**PB36**
**COBALT CHROMITE BLUE-GREEN SPINEL**

### MAIN CHARACTERISTICS
- Co(Al,Cr)₂O₄
- Pigment Blue 36 (C.I. 77343)
- Spinel structure
- Greenish blue shade
- Ease of dispersion
- UV transparent, opaque to visible light, with moderate NIR reflectance (*“cool”* pigment)

### RECOMMENDED PRODUCTS

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>22-5070</td>
<td>Standard grade</td>
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<tr>
<td>22-5096B</td>
<td>The highest tinting strength</td>
</tr>
<tr>
<td>22-5096</td>
<td>High tinting strength</td>
</tr>
<tr>
<td>22-4400</td>
<td>Turquoise Blue, greenish shade</td>
</tr>
</tbody>
</table>

* Paint
PV15  ULTRAMARINE VIOLET

MAIN CHARACTERISTICS

- Sodium Aluminum Sulfosilicate Na_{8-x}[(Al, Si)_{12}O_{24}(S_{2})_{x}]
- Pigment Violet 15 (C.I. 77007)
- Unique violet shades
- Excellent ability to make whites “whiter”
- Ease of dispersion
- Semitransparent to visible light, transparent to NIR (“cool” pigment”, but its cool performance will be highly dependent on substrate and formulation)

**Heat fastness** 300°C*, 5 min
**Light fastness** Excellent (8 on blue wool scale)
**Weather fastness** Excellent (4-5 on grey scale)
**Acid fastness** Low
**Alkali fastness** High
**Cement compatibility** Low
**Solvent fastness** Excellent

RECOMMENDED PRODUCTS

**Nubix SERIES**

**Nubix V-5**  Bluish shade
**Nubix V-9**  High tinting strength, unique blue shade
**Nubix V-40**  High tinting strength, unique reddish shade
**Nubix V-60**  Reddish/pink shade

* Paint
PV19 QUINACRIDONE VIOLET

MAIN CHARACTERISTICS

- Pigment Violet 19 (C.I. 73900)
- Clean reddish Violet shade (ß-modification)
- High tinting strength
- Good transparency
- Useable as shading component in both solid and metallic shades

Heat fastness: 200°C*, 30 min
Light fastness: Good (7-8 on blue wool scale)
Weather fastness: Good (4 on grey scale)
Acid fastness: Excellent
Alkali fastness: Excellent
Solvent fastness: Good

RECOMMENDED PRODUCTS

- Lysopac Red Violet 1940C
  Standard grade
**PV23** | DIOXAZINE VIOLET

**MAIN CHARACTERISTICS**

- Pigment Violet 23 (C.I. 51319)
- Bluish Violet shade
- Very high tinting strength
- Much used as shading component

### Heat fastness

180°C*, 30 min

### Light fastness

Excellent (8 on blue wool scale)

### Weather fastness

Excellent (5 on grey scale)

### Acid fastness

Excellent

### Alkali fastness

Excellent

### Solvent fastness

Good

---

**RECOMMENDED PRODUCTS**

- **Lysopac Violet 2341C**
  - More reddish grade
- **Lysopac Violet 2342C**
  - More bluish grade

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* Paint
VIOLET/organic pigments

PV62 • STRONTIUM PHOSPHATE VIOLET

MAIN CHARACTERISTICS

- Strontium Phosphate Violet Sr₅(PO₄)₂Cu₀.₃O
- Apatite structure
- Unique violet shade
- Suitable for replacing PV23
- Excellent ability to make whites “whiter”
- Ease of dispersion
- Semitransparent to visible light, NIR absorbent

<table>
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<tr>
<td>Cement compatibility</td>
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</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
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</tbody>
</table>

RECOMMENDED PRODUCTS

28-5333 Standard grade

* Paint
MAIN CHARACTERISTICS

- Pigment Green 7 (C.I. 74260)
- Good overall fastness properties
- High tinting strength
- Wide range of coatings applications

RECOMMENDED PRODUCTS

Phthalocyanine Green 0762C
Bluish green standard grade

<table>
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</tr>
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</tr>
</tbody>
</table>

* Paint
**PG17  CHROME OXIDE GREEN**

**MAIN CHARACTERISTICS**

- \( \text{Cr}_2\text{O}_3 \)
- Pigment Green 17 (C.I. 77288)
- Prismatic/Rhombohedral structure
- Olive green shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance ("cool" pigment)

<table>
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* Paint

**RECOMMENDED PRODUCTS**

**SMM SERIES**
- SMM-4  Bluish shade
- SMM-6  Yellowish shade
- SMM-7  Yellowish shade

**Nubicrom SERIES**
- Nubicrom 02  Yellowish shade
PG26  COBALT CHROMITE GREEN SPINEL

MAIN CHARACTERISTICS

- CoCr₂O₄
- Pigment Green 26 (C.I. 77344)
- Spinel structure
- Dark bluish green shade
- Ease of dispersion
- Opaque to visible light, with moderate NIR reflectance ("cool" pigment)

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RECOMMENDED PRODUCTS

21-4700  Standard grade
**MAIN CHARACTERISTICS**

- \( \text{Co}_2\text{TiO}_4 \)
- Pigment Green 50 (C.I. 77377)
- Spinel structure
- Bright green shade
- Ease of dispersion
- Opaque to visible light, with moderate NIR reflectance ("cool" pigment")
- Ni free products available

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</tr>
<tr>
<td>Cement compatibility</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

**RECOMMENDED PRODUCTS**

- **21-4045** Standard grade
- **21-4030** High tinting strength, bluish shade
- **21-5801** Ni free (CMR classification free), bluish shade
- **21-5901** Ni free (CMR classification free), yellowish shade
- **21-4345** Ni free (CMR classification free), color like 21-4045

* Paint
PY3 • MONOAZO YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 3 (C.I. 11710)
- Clean greenish yellow
- Semi-transparent version
- Coloristic suitable to replace greenish Chrome Yellow grades
- Less stable to strong organic solvents

Heat fastness: 140°C*, 30 min
Light fastness: Good (6-7 on blue wool scale)
Weather fastness: Good (4 on grey scale)
Acid fastness: Good
Alkali fastness: Excellent
Solvent fastness: Moderate

RECOMMENDED PRODUCTS

Acetanil Yellow 10 GH 0314C
Standard grade

* Paint
PY34  CHROME YELLOW

MAIN CHARACTERISTICS

• PbCrO₄·PbSO₄
• Pigment Yellow 34 (C.I. 77603)
• Monoclinic to Rhombic structure, depending on shade
• Bright yellow shade (middle, lemon and primrose)
• Ease of dispersion
• Opaque to visible light

CONVENTIONAL (L/D) SERIES

Heat fastness 180°C*, 5 min
Light fastness Middle/Lemon = Fair • Primrose = Low
Weather fastness Middle/Lemon = Medium • Primrose = Low
Acid fastness Fair
Alkali fastness Low
Cement compatibility Incompatible
Solvent fastness Excellent

RESISTANT (R/S) SERIES

Heat fastness 220-260°C, 5 min
Light fastness Middle/Lemon = High • Primrose = Fair
Weather fastness Middle/Lemon = High • Primrose = Fair
Acid fastness High
Alkali fastness Low
Cement compatibility Incompatible
Solvent fastness Excellent

Nubiterm K SERIES

Heat fastness 300°C*, 5 min
Light fastness High
Weather fastness High
Acid fastness High
Alkali fastness Low
Cement compatibility Incompatible
Solvent fastness Excellent

N.B. Ferro has not requested the REACH authorization for the use of Chrome Yellows in the European Union.
PY42 • IRON OXIDE YELLOW-OPAQUE

MAIN CHARACTERISTICS

- FeOOH
- Pigment Yellow 42 (C.I. 77492)
- Goethite structure
- Dull, buff shade
- Ease of dispersion
- Opaque to visible light, with low NIR reflectance
- Possible replacement of Chrome Yellows in combination with Organics
- Good coloristics to combine with Organics and Inorganics to reach specific colors at very competitive cost e.g. natural greens, bright reds, chocolate browns, light beiges

Heat fastness
- 160°C, 5 min except Nubifer Y-7050 (260°C, 5 min)

Light fastness
- Excellent (8 on blue wool scale)

Weather fastness
- Excellent (5 on grey scale)

Acid fastness
- Excellent

Alkali fastness
- Excellent

Cement compatibility
- Excellent

Solvent fastness
- Excellent

RECOMMENDED PRODUCTS

**Nubifer Y-5000 SERIES**
The micronized/high dispersibility/narrow colorimetric tolerances Yellow Iron Oxides

<table>
<thead>
<tr>
<th>Product</th>
<th>Color Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nubifer Y-5010</td>
<td>Light shade</td>
<td></td>
</tr>
<tr>
<td>Nubifer Y-5020</td>
<td>Reddish shade</td>
<td></td>
</tr>
<tr>
<td>Nubifer Y-5028LV</td>
<td>Reddish shade, enhanced rheological performance</td>
<td></td>
</tr>
</tbody>
</table>

**Nubifer Y-7000 SERIES**
The micronized, high heat fastness Yellow Iron Oxides

<table>
<thead>
<tr>
<th>Product</th>
<th>Color Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nubifer Y-7050</td>
<td>Encapsulated grade for high temperature curing coatings (heat fastness = 260°C, 5 min)</td>
<td></td>
</tr>
</tbody>
</table>
**PY42**

IRON OXIDE YELLOW-TRANSPARENT

**MAIN CHARACTERISTICS**

- FeOOH
- Pigment Yellow 42 (C.I. 77492)
- Highly transparent
- Clean shade
- Absorb strongly UV-Light providing a natural and continuous UV protection
- Suitable to produce effect shades

**RECOMMENDED PRODUCTS**

**Heat fastness**
- 160°C*, 30 min

**Light fastness**
- Excellent (8 on blue wool scale)

**Weather fastness**
- Excellent (5 on grey scale)

**Acid fastness**
- Excellent

**Alkali fastness**
- Excellent

**Solvent fastness**
- Excellent

*C Paint

**Cappoxyt Yellow 4212X**
- Standard grade

**Cappoxyt Yellow 4214X**
- Grade also suitable for OEM applications
PY53
NICKEL ANTIMONY TITANIUM YELLOW RUTILE

MAIN CHARACTERISTICS

- \((\text{Ti},\text{Ni},\text{Sb})\) \(\text{O}_2\)
- Pigment Yellow 53 (C.I. 77788)
- Rutile structure
- Light yellow shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance ("cool" pigment)
- Possible replacement of Chrome Yellows in combination with Organics
- Cement compatibility: excellent

RECOMMENDED PRODUCTS

| 10401 | Standard grade |

**Heat fastness** 500°C, 5 min
**Light fastness** Excellent (8 on blue wool scale)
**Weather fastness** Excellent (5 on grey scale)
**Acid fastness** Excellent
**Alkali fastness** Excellent
**Cement compatibility** Excellent
**Solvent fastness** Excellent

* Paint
PY65  MONOAZO YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 65 (C.I. 11740)
- Reddish Yellow shade
- Semi-transparent version
- Coloristic suitable to replace reddish Chrome Yellow grades
- Less stable to strong organic solvents

Heat fastness: 140°C*, 30 min
Light fastness: Good (7 on blue wool scale)
Weather fastness: Good (4 on grey scale)
Acid fastness: Excellent
Alkali fastness: Excellent
Solvent fastness: Moderate

* Paint

RECOMMENDED PRODUCTS

Acetanil Yellow R 6514C
Standard grade
PY74  MONOAZO YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 74 (C.I. 11741)
- Greenish to medium Yellow shade
- Good hiding power
- Coloristic suitable to replace medium Chrome Yellow grades
- Favorable pigment rheology to improve the pigment loading
- Less stable to strong organic solvents

Heat fastness  140°C*, 30 min
Light fastness  Good (7 on blue wool scale)
Weather fastness  Good (4 on grey scale)
Acid fastness  Good
Alkali fastness  Good
Solvent fastness  Moderate

RECOMMENDED PRODUCTS

- Acetanil Yellow 2GO 7415C
  Standard grade
- Acetanil Yellow 2GO 9116C
  More economical grade
- Acetanil Yellow 7416C
  Grade with improved solvent resistance

* Paint
### MAIN CHARACTERISTICS

- Pigment Yellow 83 (C.I. 21108)
- Reddish Yellow shade
- Good tinting strength
- Both transparent and opaque grades available

### RECOMMENDED PRODUCTS

**Diacetanil Yellow 3RH 8315C**  
Standard transparent grade  
**Lysopac Yellow 83125**  
Cleaner and greener opaque grade  
**Lysopac Yellow 8313S**  
Standard opaque grade

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>200°C*, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Good (7-8 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Good (3-4 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

* Paint
PY110  ISOINDOLINONE YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 110 (C.I. 56280)
- Very reddish yellow
- The transparency is an asset in metallic finishes
- Overall good fastness properties

Heat fastness 220°C*, 30 min
Light fastness Good (7-8 on blue wool scale)
Weather fastness Good (4-5 on grey scale)
Acid fastness Excellent
Alkali fastness Excellent
Solvent fastness Excellent

RECOMMENDED PRODUCTS

Lysopac Yellow 1010C
Standard grade

* Paint
**PY138**  
**QUINOPHTHALONE YELLOW**

**MAIN CHARACTERISTICS**

- Pigment Yellow 138 (C.I. 56300)  
- Greenish yellow shade  
- Good hiding power  
- Overall good fastness properties

**Heat fastness**  
220°C*, 30 min

**Light fastness**  
Good (7-8 on blue wool scale)

**Weather fastness**  
Good (4-5 on grey scale)

**Acid fastness**  
Excellent

**Alkali fastness**  
Excellent

**Solvent fastness**  
Good

**RECOMMENDED PRODUCTS**

**Lysopac Yellow 3810C**  
Standard grade
## MAIN CHARACTERISTICS

- Pigment Yellow 139 (C.I. 56298)
- Reddish Yellow
- Good opacity
- Behaves poorly in contact with alkaline substrate

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>220°C*, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Good (7-8 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Good (4-5 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

## RECOMMENDED PRODUCTS

Lysopac Yellow 3912C
Standard grade
PY151  BENZIMIDAZOLONE YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 151 (C.I. 13980)
- Clean greenish Yellow
- Good opacity
- Good rheological behavior
- Coloristic suitable to replace greenish Chrome Yellow grades
- Limited alkali resistance

**MAIN CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>200°C*, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Good (7-8 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Good (4-5 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Moderate</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Good</td>
</tr>
</tbody>
</table>

**RECOMMENDED PRODUCTS**

<table>
<thead>
<tr>
<th></th>
<th>Lysopac Yellow 5110C</th>
<th>Lysopac Yellow 5110P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard grade</td>
<td>Improved dispersibility</td>
</tr>
</tbody>
</table>

* Paint
PY154  BENZIMIDAZOLONE YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 154 (C.I. 11781)
- Greenish to medium Yellow
- Good rheological behavior
- One of the most weather fast organic yellows
- Coloristic suitable to replace medium Chrome Yellow grades

Heat fastness 160°C*, 30 min
Light fastness Excellent (8 on blue wool scale)
Weather fastness Excellent (5 on grey scale)
Acid fastness Excellent
Alkali fastness Excellent
Solvent fastness Good

SYNTHETIC YELLOW / organic pigments

RECOMMENDED PRODUCTS

Lysopac Yellow 5410C
Standard grade
Lysopac Yellow 5410P
Improved dispersibility

Lysopac Yellow 5412C
Improved behavior in water based applications
PY170  DIARYLIDE YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 170 (C.I. 21104)
- Very reddish Yellow offering high gloss
- Unique shade developed by Ferro
- Good dispersibility
- Good hiding power

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>200°C*, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Good (6-7 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Good (3-4 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Good</td>
</tr>
</tbody>
</table>

ReCOMMENDED PRODUCTS

Lysopac Yellow 7010C
Standard grade

Lysopac Yellow 7011C
Grade suitable for universal tinting systems
PY184  BISMUTH VANADATE

MAIN CHARACTERISTICS

- \(\text{BiVO}_4\)
- Pigment Yellow 184 (C.I. 771740)
- Bright, primrose yellow shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance ("cool" pigment)
- Possible replacement of Chrome Yellows in combination with Organics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>200°C*, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Excellent (8 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Excellent (5 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Cement compatibility</td>
<td>Low</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

* Paint

RECOMMENDED PRODUCTS

- Lysopac Yellow 6601B  Standard grade
- Lysopac Yellow 6602B  Standard grade (Replacement of Nubivan Y-901)
- Lysopac Yellow 6607B  Newest generation of BiVa with superior color strength
- Lysopac Yellow 6608B  Most economical grade
- Lysopac Yellow 6611B  Most greenish version in alkyd melamine systems
- Lysopac Yellow 6615B  Most reddish version
- Lysopac Yellow 6616B  Standard grade
- Lysopac Yellow 6618B  Grade with improved heat resistance for use in powder coatings
- Lysopac Yellow 6716B  Very reddish and unique shade
PY194 • BENZIMIDAZOLONE YELLOW

MAIN CHARACTERISTICS

- Pigment Yellow 194 (C.I. 11785)
- Greenish to medium Yellow shade
- Very high tinting strength
- Very good opacity

RECOMMENDED PRODUCTS

**Heat fastness**: 200°C*, 30 min

**Light fastness**: Good (7-8 on blue wool scale)

**Weather fastness**: Good (4 on grey scale)

**Acid fastness**: Excellent

**Alkali fastness**: Excellent

**Solvent fastness**: Good

Lysopac Yellow 9410C
Standard grade

* Paint
PBr24

Chrome Antimony Titanium Buff Rutile

Main Characteristics

- (Ti, Cr, Sb) O₂
- Pigment Brown 24 (C.I. 77310)
- Rutile structure
- Clean, buff shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance ("cool" pigment)
- Possible replacement of Chrome Yellows in combination

Recommended Products

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Description</th>
<th>Shade</th>
</tr>
</thead>
<tbody>
<tr>
<td>10406H</td>
<td>Standard grade, yellowish shade</td>
<td>23-6019 Yellowish</td>
</tr>
<tr>
<td>10408H</td>
<td>Standard grade, reddish shade</td>
<td>23-6070 Yellowish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23-6075 Reddish</td>
</tr>
</tbody>
</table>
**PY119 • ZINC FERRITE BROWN SPINEL**

**MAIN CHARACTERISTICS**

- ZnFe$_2$O$_4$
- Pigment Yellow 119 (C.I. 77496)
- Spinel structure
- Reddish buff shade
- Ease of dispersion
- Opaque to visible light, with moderate NIR reflectance ("cool" pigment)
- Possible replacement of Chrome Yellows in combination with Organics
- Good coloristics to combine with Organics and Inorganics to reach specific colors at very competitive cost e.g. natural greens, bright reds, chocolate browns, light beiges

<table>
<thead>
<tr>
<th>Property</th>
<th>Nubifer Y-805K (300°C, 5 min)</th>
<th>Nubifer Y-905K (260°C, 5 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Excellent (8 on blue wool scale)</td>
<td>Excellent (5 on grey scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>Cement compatibility</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
<td></td>
</tr>
</tbody>
</table>

**RECOMMENDED PRODUCTS**

- **Nubifer Y-805K**
  - Very high heat fastness
  - (300°C, 5 min), dark, reddish shade

- **Nubifer Y-905K**
  - High heat fastness
  - (260°C, 5 min), light, yellowish shade
PY164  MANGANESE ANTIMONY TITANIUM BUFF RUTILE

**MAIN CHARACTERISTICS**

- $(\text{Ti, Mn, Sb})\;\text{O}_2$
- Pigment Yellow 164 (C.I. 77899)
- Dark brown shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance (“cool” pigment)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>200°C, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Excellent (8 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Excellent (5 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Cement compatibility</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

**RECOMMENDED PRODUCTS**

- **10550  Standard grade**
MAIN CHARACTERISTICS

- Pigment Orange 34 (C.I. 21115)
- Bluish orange clean shade
- Good opacity
- Coloristic suitable to replace red lead molybdates

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>200°C*, 30 min</td>
</tr>
<tr>
<td>Light fastness</td>
<td>Good in full shade only (6-7 on blue wool scale)</td>
</tr>
<tr>
<td>Weather fastness</td>
<td>Good in full shade only (3-4 on grey scale)</td>
</tr>
<tr>
<td>Acid fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Good</td>
</tr>
</tbody>
</table>

RECOMMENDED PRODUCTS

- Lysopac Orange 3420C
  - Standard grade
- Lysopac Orange 3421C
  - A more bluish grade
PO36  
BENZIMIDAZOLONE ORANGE

MAIN CHARACTERISTICS

- Pigment Orange 36 (C.I. 11780)
- Reddish somewhat dull orange
- Good rheological behavior
- Good opacity
- Coloristic suitable to replace red lead molybdates

Heat fastness: 160°C*, 30 min
Light fastness: Good (7-8 on blue wool scale)
Weather fastness: Good (4-5 on grey scale)
Acid fastness: Excellent
Alkali fastness: Excellent
Solvent fastness: Good

RECOMMENDED PRODUCTS

Lysopac Orange 3620C
Standard grade

Lysopac Orange 3621C
A slightly more bluish grade

* Paint
**BISMUTH OXYHALIDE**

**PO85**

**MAIN CHARACTERISTICS**

- BiOX
- Pigment Orange 85
- Bright Yellowish Orange with high chroma
- Ease of dispersion
- Exceptional coloristic property allows to produce clean yellow, orange and red shades in combination with appropriate organic pigments

**Heat fastness**: 200°C*, 30 min

**Light fastness**: Good (7-8 on blue wool scale)

**Weather fastness**: Good (4-5 on grey scale)

**Acid fastness**: Moderate

**Alkali fastness**: Good

**Solvent fastness**: Excellent

**RECOMMENDED PRODUCTS**

- **Lysopac Orange 6820B**
  - Standard grade for coatings

- **Lysopac Orange 6821B**
  - Coated version with improved chemical resistance
**MAIN CHARACTERISTICS**

- Pigment Red 3 (C.I. 12120)
- Yellowish to Bluish red shade
- Yellowish version has more gloss and higher tinting strength
- Good light and weather fastness in full shade only

**Heat fastness** 180°C*, 30 min

**Light fastness** Good in full shade only
(7-8 on blue wool scale)

**Weather fastness** Good in full shade only
(4-5 on grey scale)

**Acid fastness** Good

**Alkali fastness** Good

**Solvent fastness** Moderate

* Paint

---

**RECOMMENDED PRODUCTS**

**Toluidine Red RN 0333C**
Yellowish grade

**Toluidine Red RB 0336C**
Bluish grade
PR48:4  BONA LAKE RED

MAIN CHARACTERISTICS

- Pigment Red 48:4 (C.I. 15865:4)
- Yellowish to bluish (maroon) red shade
- The more bluish the shade, the more transparent
- Can be combined with molybdate oranges to get solid red shades

- Heat fastness: 150°C*, 30 min
- Light fastness: Good (6-7 on blue wool scale)
- Weather fastness: Good in full shade only (4 on grey scale)
- Acid fastness: Moderate
- Alkali fastness: Moderate
- Solvent fastness: Moderate

* Paint

RECOMMENDED PRODUCTS

<table>
<thead>
<tr>
<th>Bonithol Red M 4844C</th>
<th>Bonithol Red BM 4846C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowish grade</td>
<td>Most bluish grade</td>
</tr>
<tr>
<td>Bonithol Red 4845C</td>
<td></td>
</tr>
<tr>
<td>More bluish grade</td>
<td></td>
</tr>
</tbody>
</table>

RED / organic pigments
PR101  IRON OXIDE RED-OPAQUE

MAIN CHARACTERISTICS

- $\text{Fe}_2\text{O}_3$
- Pigment Red 101 (C.I. 77491)
- Hematite structure
- Dull red shade
- Ease of dispersion
- Opaque to visible light, with moderate NIR reflectance

Heat fastness 800ºC, 5 min
Light fastness Excellent (8 on blue wool scale)
Weather fastness Excellent (5 on grey scale)
Acid fastness Excellent
Alkali fastness Excellent
Cement compatibility Excellent
Solvent fastness Excellent

RECOMMENDED PRODUCTS

Nubifer R-5500 SERIES
The micronized/high dispersibility/narrow colorimetric tolerances Red Iron Oxides

Nubifer R-5501  The most yellowish/lightest shade
Nubifer R-5510  Yellowish shade
Nubifer R-5520  Yellowish-medium shade
Nubifer R-5530  Yellowish-medium shade
Nubifer R-5540  Bluish-medium shade
Nubifer R-5560  Bluish-medium shade
Nubifer R-5580  The most bluish/darkest shade
PR101  IRON OXIDE RED-TRANSPARENT

MAIN CHARACTERISTICS

- \( \text{Fe}_2\text{O}_3 \)
- Pigment Red 101 (C.I. 77491)
- Highly transparent
- Clean shade
- Absorb strongly UV-Light providing a natural and continuous UV protection
- Suitable to produce effect shades

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat fastness</td>
<td>&gt;300(^\circ)C*, 30 min</td>
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<tr>
<td>Light fastness</td>
<td>Excellent (8 on blue wool scale)</td>
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<tr>
<td>Weather fastness</td>
<td>Excellent (5 on grey scale)</td>
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<tr>
<td>Acid fastness</td>
<td>Excellent</td>
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<tr>
<td>Alkali fastness</td>
<td>Excellent</td>
</tr>
<tr>
<td>Solvent fastness</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

RECOMMENDED PRODUCTS

- Cappoxyt Red 4435B
  - Standard grade
- Cappoxyt Red 4437B
  - Higher transparency
- Cappoxyt Red 4438B
  - Bluer shade and higher tinting strength
PR104  MOLYBDATE ORANGE

MAIN CHARACTERISTICS

- PbCrO₄, PbSO₄, PbMoO₄
- Pigment Red 104 (C.I. 77605)
- Tetragonal structure
- Bright red shade (orange, scarlet and red)
- Ease of dispersion
- Opaque to visible light

RECOMMENDED PRODUCTS

- NRC-36  Resistant, scarlet shade
- NRC-38  Resistant, orange shade

CONVENTIONAL (L) SERIES

- Heat fastness 180°C-200°C, 5 min
- Light fastness Fair
- Weather fastness Fair
- Acid fastness Fair
- Alkali fastness Low
- Cement compatibility Incompatible
- Solvent fastness Excellent

RESISTANT (R/S) SERIES

- Heat fastness 240°C-260°C, 5 min
- Light fastness High
- Weather fastness High
- Acid fastness High
- Alkali fastness Low
- Cement compatibility Incompatible
- Solvent fastness Excellent

NUBITERM (K) SERIES

- Heat fastness 300°C, 5 min
- Light fastness High
- Weather fastness High
- Acid fastness High
- Alkali fastness Low
- Cement compatibility Incompatible
- Solvent fastness Excellent

N.B. Ferro has not requested the REACH authorization for the use of Molybdate Oranges in the European Union.
PR122  QUINACRIDONE RED

MAIN CHARACTERISTICS

- Pigment Red 122 (C.I. 73915)
- Very clean bluish red referred to as pink or magenta
- High tinting strength
- Good transparency
- Useable as shading component in both solid and metallic shades

Heat fastness: 200°C*, 30 min
Light fastness: Good (7-8 on blue wool scale)
Weather fastness: Good (4-5 on grey scale)
Acid fastness: Excellent
Alkali fastness: Excellent
Solvent fastness: Good

RECOMMENDED PRODUCTS

<table>
<thead>
<tr>
<th></th>
<th>Lysopac Red 2230C</th>
<th>Lysopac Red 2231C</th>
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<tbody>
<tr>
<td></td>
<td>Standard grade</td>
<td>More bluish grade</td>
</tr>
</tbody>
</table>

* Paint
PR170  NAPHTHOL AS RED

MAIN CHARACTERISTICS

- Pigment Red 170 (C.I. 12475)
- Medium Red shade
- Semi-transparent to opaque
- Opaque grades are more Yellowish
- Opaque grades have better overall performance

Heat fastness: 160°C*, 30 min
Light fastness: Good in full shade only (6-7 on blue wool scale)
Weather fastness: Good in full shade only (3-4 on grey scale)
Acid fastness: Excellent
Alkali fastness: Excellent
Solvent fastness: Good

RECOMMENDED PRODUCTS

Lysopac Red 7030C  
Standard opaque grade
Lysopac Red 7031C  
More bluish opaque grade

Naphthol Red B 7032C  
Standard semi-transparent grade
Naphthol Red 7034C  
More yellowish semi-transparent grade

* Paint
PR177  ANTHEIRAQUINONE RED

MAIN CHARACTERISTICS

- Pigment Red 177 (C.I. 65300)
- Yellowish red shade
- Highly transparent
- Useable as shading component in both solid and metallic shades
- Good overall fastness properties

<table>
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<td>Alkali fastness</td>
<td>Excellent</td>
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<tr>
<td>Solvent fastness</td>
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</table>

RECOMMENDED PRODUCTS

- Lysopac Red 7731C
  - Standard grade

* Paint
PBk11  IRON OXIDE BLACK

MAIN CHARACTERISTICS

- Fe3O4
- Pigment Black 11 (C.I. 77499)
- Magnetite structure
- Bluish black shade
- Ease of dispersion
- Opaque to visible light, NIR absorbent

<table>
<thead>
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<th>Value</th>
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<td>Cement compatibility</td>
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<td>Solvent fastness</td>
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</table>

* Paint

RECOMMENDED PRODUCTS

Nubifer NB-5970
Micronized, high tinting strength, very bluish shade
PBk26  MANGANESE FERRITE BLACK SPINEL

MAIN CHARACTERISTICS

- \( \text{MnFe}_2\text{O}_4 \)
- Pigment Black 26 (C.I. 77494)
- Spinel structure
- Very bluish/deep shade, the strongest black CICP
- Ease of dispersion
- Opaque to visible light, UV/NIR absorbent
- The black CICP with the highest heat fastness, very suitable for high temperature resistant coatings

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<td>Solvent fastness</td>
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</table>

* Paint

RECOMMENDED PRODUCTS

24-3060 High tinting strength, very bluish shade
PBk28 COPPER CHROMITE BLACK SPINEL

MAIN CHARACTERISTICS

- CuCr₂O₄
- Pigment Black 28 (C.I. 77428)
- Spinel Structure
- Bluish, deep shade
- Opaque to visible light, NIR absorbent

RECOMMENDED PRODUCTS

<table>
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<th>Property</th>
<th>Performance</th>
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</table>

* Paint

24-3095 Standard grade
PBk33  MANGANESE FERRITE BLACK OXIDE

MAIN CHARACTERISTICS

- MnFe₂O₄
- Pigment Black 33 (C.I. 77537)
- Hematite structure
- Brownish to bluish black shade
- Ease of dispersion
- Opaque to visible light, with moderate NIR reflectance (*“cool” pigment*)
- Used when neither Carbon Black nor Black Iron Oxide can be used for technical reasons

<table>
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<td>Solvent fastness</td>
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</tbody>
</table>

* Paint

RECOMMENDED PRODUCTS

- 24-3303  Reddish shade
- Nubifer NB-803K  Bluish shade
PBr29  CHROME IRON BROWN HEMATITE

MAIN CHARACTERISTICS

- $(Cr,Fe)_2O_3$
- Pigment Brown 29 (C.I. 77500)
- Hematite structure
- Brownish to bluish black shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance ("cool" pigment)

**RECOMMENDED PRODUCTS**

- 10466  Reddish shade
- 785    The most bluish shade
- V-10121 Dark brown
- 24-3950 Bluish shade

**Heat fastness**  >500°C, 5 min
**Light fastness**  Excellent (8 on blue wool scale)
**Weather fastness**  Excellent (5 on grey scale)
**Acid fastness**  Excellent
**Alkali fastness**  Excellent
**Cement compatibility**  Excellent
**Solvent fastness**  Excellent

*Paint*
**PG17  CHROMIUM GREEN-BLACK HEMATITE**

### MAIN CHARACTERISTICS

- $\text{Cr}_2\text{O}_3$
- Pigment Green 17 (C.I. 77288)
- Hematite structure
- Brownish to bluish black shade
- Ease of dispersion
- Opaque to visible light, with high NIR reflectance ("cool" pigment)

### RECOMMENDED PRODUCTS

<table>
<thead>
<tr>
<th>V-774</th>
<th>High tinting strength, bluish shade</th>
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</thead>
<tbody>
<tr>
<td>V-775</td>
<td>The most bluish shade</td>
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### Properties

<table>
<thead>
<tr>
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</table>

* Paint
ECO-LYSOPAC

MAIN CHARACTERISTICS

There have always been customized shades, but nowadays they are becoming more and more important for many different reasons, such as lead chrome replacement, matching RAL shades, brand owners and customers asking for specific shades.

Hybrid pigments are the most suitable solution to respond to these kinds of demands, thanks to the possibility of having a single product color solution for a given application.

Ferro has a very broad pigment offering and has built up a lot of knowledge in color matching and shade development. Therefore, Ferro is well placed to guide its customers to the right color solution for any of their applications (from decorative to the most demanding industrial coatings).

A number of standardized hybrid pigments are already available and new developments are always on the way based on new market demands.

MAIN APPLICATIONS AND BENEFITS

APPLICATIONS

A broad range of applications is reachable depending on the targeted market. The right hybrid pigment can be produced to meet customers’ expectations on shade and quality specifications for a given application while keeping the most economical solution in view.

BENEFITS

- One per single product color solution
- Applications based color solutions
- Sustainable solutions for lead chrome replacement
- Saving lab time on color matching

MAIN PRODUCTS

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>6623B</td>
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<tr>
<td>6624B</td>
</tr>
<tr>
<td>6625B</td>
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<tr>
<td>6626B</td>
</tr>
</tbody>
</table>
MAIN CHARACTERISTICS

It is well known that under the sun, dark surfaces become hot and white surfaces remain cooler. When comparing a white coating containing TiO$_2$ (Near Infrared-NIR-reflecting pigment) with a black coating containing Carbon Black (Near Infrared-NIR-absorbent pigment) the surface temperature difference can reach more than 30°C on a hot, sunny day.

This common effect is not only related to color but also to NIR absorption of the pigments used in a particular application. By using the appropriate pigments, even dark surfaces can stay cool under the sun.

This type of pigments, also referred to as Cool Pigments, do not absorb the NIR portion of wavelengths coming from sunlight. There are 2 types of Cool Pigments: NIR reflecting pigments and NIR transparent pigments. The final behavior of the latter will be influenced by the entire system; therefore, when using NIR transparent pigments it is recommended to apply the coating over a NIR reflecting substrate or use such pigments in combination with NIR reflecting pigments in the coatings formula.

Ferro Pigments has a full range of Cool Pigments and many years of experience developing projects in this field, so we are the ideal partner to support you in your cool projects.

MAIN APPLICATIONS AND BENEFITS

APPLICATIONS
- Coil Coatings for roofs
- Exterior paints for roofs and façades
- Roof shingles
- Sport fields
- Automotive coatings

BENEFITS
- Reduced air conditioning and energy consumption
- Increased building comfort
- Increased service life of the roof, EIFS (External Insulation Finishing System)

MAIN PRODUCTS

Ferro offers a full range of Cool Pigments in the whole color spectra.
COOL PIGMENTS

FERRO COOL PIGMENTS COLOR SPACE

COOL PIGMENTS  (High NIR Reflectance)

PY53  Nickel Antimony Titanium Yellow Rutile
PBr24  Chrome Antimony Titanium Buff Rutile
PY184  Bismuth Vanadete
PG17  Chromium Green-Black Hematite
PG17  Chrome Oxide Green
PBr29  Chrome Iron Brown Hematite
PY164  Manganese Antimony Titanium Buff Rutile

COOL PIGMENTS  (Moderate NIR Reflectance or NIR transparency)

○ Transparent to NIR

PBk12  Iron Titanium Brown Spinel
PB28  Cobalt Aluminate Blue Spinel
PB36  Cobalt Chromite Blue-Green Spinel
PBk33  Manganese Ferrite Black Oxide
PG26  Cobalt Chromite Green Spinel
PG50  Cobalt Titanate Green Spinel
PR101  Iron Oxide Red
PY119  Zinc Ferrite Brown Spinel
PB29  Ultramarine Blue
PV15  Ultramarine Violet
CORROSION INHIBITORS

ANTICORROSIVE PIGMENTS
ZINC-BASED ANTICORROSIVE PIGMENTS

NUBIROX ANTICORROSIVE PIGMENTS

Zinc Phosphate (Zn₃(PO₄)₂·2H₂O)

NUBIROX N2
Standard Zinc Phosphate

NUBIROX SP
Special particle Zinc Phosphate
• Nubirox Technology
Special particle Zinc Phosphate with higher specific surface area than standard Zinc Phosphate
• Efficiency at low concentration

High performance anticorrosive pigments for long term corrosion protection
Suitable for solvent and water based protective coatings
CORROSION INHIBITORS

ANTICORROSIVE PIGMENTS
ZINC-BASED ANTICORROSIVE PIGMENTS

Nubirox 100 series & Nubirox 200 series
Modified Zinc Phosphates of enhanced performance
due to specific combinations of active compounds

Nubirox 102
Organophilized Zinc Phosphate and Zinc Molybdate
- Direct replacement of Zinc Phosphate with improved activity
- Suitable for high film thickness & medium-gloss DTM coatings

Nubirox 106
Organophilized Zinc Phosphate and Zinc Molybdate
- High anticorrosive activity at low concentrations
- Excellent performance in many water/solvent based systems and
  thin film application

Nubirox 213
Iron Phosphate and Zinc Phosphate
- Anticorrosive activity at low concentrations
- Specially suitable for alkyd and epoxy primers
CORROSION INHIBITORS

ANTICORROSIVE PIGMENTS
NON ZINC-BASED ANTICORROSIVE PIGMENTS

NUBIROX ANTICORROSIVE PIGMENTS

High performance anticorrosive pigments for long term corrosion protection

Suitable for solvent and water based protective coatings

NUBIROX 300 series

Alternative to Zinc-based pigments with excellent performance in many applications, and suitability in systems where Zinc-based anticorrosive pigments are reactive

NUBIROX 301
Calcium Strontium Phosphosilicate
- Protection of different metal substrates, specially galvanized
- Good performance in etch/wash primers and DTM coatings

NUBIROX 302
Organophilized Calcium Strontium Phosphosilicate
- Wider compatibility and enhanced performance
- Suitable for glossy DTM coatings thanks to low impact on gloss
CORROSION INHIBITORS

ANTICORROSIVE PIGMENTS

NUBIROX APPLICATIONS MAP

<table>
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<th>Highly recommended</th>
<th>Recommended</th>
<th>Limited suitability</th>
<th>Not recommended</th>
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<td>Solvent Based Alkyds</td>
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<td>Water Based Alkyds</td>
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<td>Application Wash &amp; Shop Primers</td>
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</table>
CORROSION INHIBITORS

ANTICORROSIVE PIGMENTS
CHROMATE BASED PIGMENTS

Z-952
Zinc Chromate
Yellow anticorrosive pigment used in solvent based paint systems (alkyds, epoxy-polyamides…)

T-902
Zinc Tetraoxochromate
Yellow anticorrosive pigment commonly used in Wash and Shop Primers

FLASH RUST INHIBITORS

Liquid inhibitors to prevent flash rust and in-can rust in water based paint systems without detracting from the long-term performance properties

NUBIROX FR-11
Nitrite based liquid Flash Rust Inhibitor
• Effective at low loading

N.B. For classification and safety please refer to SDS
N.B. Ferro has not requested the REACH authorization for the use of Zinc Chromates and Zinc Tetraoxochromates in the European Union.
# APPLICATIONS GUIDE

## BLUE PIGMENTS

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<thead>
<tr>
<th></th>
<th>Liquid decorative / architectural coatings</th>
<th>Liquid industrial coatings</th>
<th>High temperature curing coatings</th>
<th>Automotive</th>
<th>High temperature resistant coatings</th>
<th>Cool coatings</th>
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<tr>
<td>PB28 Cobalt Aluminate Blue Spinel</td>
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<td>PB36 Cobalt Chromite Blue-Green Spinel</td>
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<td>PB29 Ultramarine Blue Nubicoat series</td>
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<td>PB15:4 Phthalocyanine Blue</td>
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## VIOLET PIGMENTS

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### Notes:
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- ** Recommended
- * Limited suitability
- x Not recommended
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<th>PIGMENT</th>
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# APPLICATIONS GUIDE

## RED PIGMENTS

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