# STEEL PAINT FR-1
# TECHNICAL DATA SHEET

Protecta®

## Content



## General Product Description

Protecta® Steel Paint FR-1 is a single component acrylic paint, used for up to 60 minutes fire protection of loadbearing structural steel that normally requires no primer, no top coat, is easy to use and very easy to clean up.

The paint is formulated with fire and heat resistant chemicals, combined with high intumescent (expanding) pigments and fillers, which gives optimal resistance against fire. The paint is formulated to provide the lowest emissions possible protecting both people's health and the environment against harmful chemicals.

It is a hard-wearing interior acrylic paint, formulated to the highest specification and offering unsurpassed intensity of colour. All colours are water-based and provide a smooth, rich and non-reflective finish. It is perfect for a contemporary look and to hide surface imperfections.

## Properties & Precautions

- Can be supplied either in a white base or in a colour of your choice mixed using our in-house colour tinting machine (pending ETA upgrade). Tinted paint has been fire tested and is part of the certified product. For available in-house colours please refer to our Colour Chart.
- Non-toxic and emission free with near zero VOC and best possible emission classifications makes the paint perfect for anyone not wanting to breathe toxic chemicals and especially people suffering from asthma, allergies or any other breathing related diseases.
- Durable, robust and designed to last, can be cleaned with a damp cloth without the risk of washing off the paint. Durability is especially important on surfaces where abrasion occurs, for instance steel in hallways and staircases.
- Excellent coverage with a spray applied system which is cost effective saving paint and especially application time. Brush and roller applications can also be performed. No topcoat needed.
- Halogen free with added preservatives that resist bacterial and fungal growth providing extra protection to health in addition to the non-harmful emissions, and it also protects the underlying substrates.
- The paint is not intended for application on bituminous substrates or substrates that can exude certain oils and plasticizers or solvents, and is not recommended for use in constant humid areas without a top coat.
- The paint's durability is expected to be at least 12 years making it a cost effective option when compared with normal paints with limited durability.
- Do not apply in very damp or humid conditions or extremes of temperature.
- Tested according to EN 13381-8:2013.


## Emission Data (indoor air quality)

| Compound | Emission rate after 3 days | Emission rate after 4 weeks |
|---|---|---|
| TVOC | 0.36 mg/m³ | < 0.005 mg/m³ |
| TSVOC | < 0.005 mg/m³ | < 0.005 mg/m³ |
| R-value (dimensionless) | 0.46 | 0 |
| Sum w/o NIK | < 0.005 mg/m³ | < 0.005 mg/m³ |
| Formaldehyde | < 0.003 mg/m³ | < 0.003 mg/m³ |
| Total carcinogens | < 0.001 mg/m³ | < 0.001 mg/m³ |
| Acetaldehyde | < 0.003 mg/m³ | < 0.003 mg/m³ |
| Propionaldehyde | < 0.003 mg/m³ | < 0.003 mg/m³ |
| Butyraldehyde | < 0.003 mg/m³ | < 0.003 mg/m³ |

| Regulation or Protocol | Conclusion |
|---|---|
| French VOC Regulation | A+ |
| French CMR components | Pass |
| AgBB/ABG | Pass |
| Belgian Regulation | Pass |
| Indoor Air Comfort® | Pass |
| Indoor Air Comfort GOLD® | Pass |
| SCAQMD Rule 1113 | Pass |
| M1 | Pass |
| BREEAM-NOR | Compliant |
| LEED v4 (VOC content) | Pass |

Tested by Eurofins Product Testing; test reports available upon request.

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## Preparation of the Surface

Ensure that the steel surfaces to be coated are clean, dry and free from all contaminants. A suitable primer must be immediately applied to any bare steel to secure long term corrosion protection.

Application should be in accordance with the manufacturer's technical data sheet. Primed surfaces must be kept clean, dry and free from all contaminants.

IMPORTANT: A transport primer is often not a satisfactory corrosion protection primer. It is recommended, as a minimum, to use a corrosion protection primer at 25µ DFT (microns dry film thickness). Steel Paint FR-1 cannot be applied directly upon galvanized steel or a primer rich with zinc.

Pre-approved corrosion protection primers:

| Product name | Generic type |
|---|---|
| Tikkurila Temaprime EUR | Single component Alkyd, solvent based |
| AkzoNobel Intercryl 525 | Single component Acrylic, water based |
| Sherwin Williams C69 | Two-component Epoxy, solvent based |
| Sherwin Williams J984/M330 | Two-component Epoxy primer with sealer |

Pre-approved primers can be swapped with a compatible generic primer.

## Mixing

Protecta® Steel Paint FR-1 should be mixed well before application. However, it is important to use a low-speed mixing drill, to avoid air being mixed into the paint. In most cases, mixing for one minute is sufficient.

IMPORTANT: If air is mixed into the paint, bubbles can occur in the finished surface, especially when the paint is applied as a thick coating.

## Application

Temperature and climate is important for the end result. Ensure the area and the steel is heated to minimum 10 °C and preferably approx. 20 °C, but it should be possible to paint at temperatures approaching 5 °C. The paint should be at minimum the same temperature as the ambient temperature in the area of which it is applied. If the pails, when stored, have become cold, place them in a heated area over night before application proceeds.

The relative air moisture should not exceed 80 % to secure a proper curing of the film. Within climates with high relative air moisture it is important to ensure that there is proper ventilation. The surface application temperature must be at least 3 °C above the dew point and always minimum 0 °C.

At lower temperatures down towards 10 °C, it is important to apply the paint in thin layers. Especially the first layer which should be less than 500µ WFT (microns wet film thickness). The second layer can often be applied thicker.

In ideal conditions (stable temperature around 20 °C in air, on steel and in the paint combined with low air moisture), the paint can be spray applied at 1,500µ WFT and brush applied at 500µ WFT. Maximum thickness possible without sag is 1,800µ WFT. A roller can also be used.

## Paint Sprayer Equipment

Suggested paint sprayer is a Graco Mark V or similar heavy duty airless sprayers. It is common to remove filters in the pump and gun, but our experience is that using a filter with a larger mesh size gives an improved result. The paint should not be diluted.

Past experience should determine the tip size selection, but a nozzle opening of 17-21 thousand at 20-30 degrees has historically given good results.

The hoses should not be longer than 15 metres and size 3/8". The pump pressure should not be set too high, as this can cause air to be mixed into the paint, and formation of bubbles under curing. The recommended pressure is approx. 175 bar without a heated hose, and 120 bar with a heated hose and with 40 °C paint temperature. The latter will ease spraying of the paint.

## Drying Process

Low temperatures delays the drying process significantly, and one must wait until the paint is completely dry before applying the next layer. Under poor conditions this requires a minimum of 24 hours drying time.

IMPORTANT: If the underlying layer is not completely dry before the next layer is applied, this will cause cracks in the finished painted surface.

| **Average drying times are:** | **At 15 °C** | **At 23 °C** |
|---|---|---|
| Touch dry | 3 hours | 1.5 hours |
| For the next layer | 6 hours | 4 hours |

These times are guidelines for typical wet film thicknesses 400-750µ. Air movement, temperature and moisture will have a significant influence. A maximum of 2 layers spray applied per 24 hours should not be exceeded.

Cracking of the paint can in many cases be caused by incorrect drying of the paint. Drying of the paint must occur from the inside out. If the paint dries on the outside first, drying of the inner paint against the steel may cause the already dried outer paint to crack, due to movement during cure. This can be avoided by not accelerating the curing process with heaters or fans, but rather letting the paint dry under normal conditions. After heating the area that the paint is to be applied in, the heaters should be placed at some distance away from where the painting is to commence.

## Top Coat

If the painted steelwork is in an interior area with condition C1 or C2 according to BS-EN ISO 12944-2, a top-coat is not necessary, and the paint can be supplied tinted to the colour of your choice. For other conditions, a top-coat should be applied.

Topcoats with a type X durability (intended for all conditions) are recommended, but as a minimum, coatings for C3 environments (humidity) can be used. In general polyurethane topcoats offer the greater durability. Topcoats that are compatible include (but not limited to) Jotun Hardtop XP, Temador 50 and Acrolon 7300.

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## Necessary Paint Thickness

The following information is a guide on how to choose the correct film thickness of Protecta® Steel Paint FR-1 to achieve the different fire classifications for loadbearing structural steelwork.

To make sure the correct DFT (dry film thickness) is used, the accepted concept of Hp/A values is used. This concept is related to the fact that steelwork will begin to lose its loadbearing capabilities when the temperature increases in a fire situation.

The intention with passive fire protection is to prevent steel from reaching its critical temperature within a selected time period. This is generally referred to as fire resistance, and as Eurocode, the letter R followed by the time period in minutes.

The time it takes for the temperature in the steel to increase, is directly related to the section of the steel exposed to fire, the so called Heated Perimeter (Hp), and the volume of the steel to be heated, the cross-sectional Area (A). The higher the exposure to fire in proportion to its volume, the faster the temperature will rise, and the more fire protection material is needed to avoid reaching its critical temperature; when it can no longer sustain loadbearing in a building.

The section factor Hp/A can simply be calculated for all steel sections. Generally, the higher Hp/A factor of a steel section, the more fire protection is needed. This is achieved by increasing the film thickness of applied Protecta® Steel Paint FR-1. The film thickness can simply be selected through the tables on the following pages in this data sheet, or, from the tables in the product's certification.

Where non-loadbearing steel is used connected to load-bearing steel, (subject to authority approval), e.g. wind supports, a Hp/A at maximum 200$m^{-1}$ can be used for the section factor.

When a steel truss is to be protected, the thickness of Protecta® Steel Paint FR-1 should be calculated for each individual steel element which is part of the structure. It is therefore possible to have different film thicknesses on different sections of a steel truss to achieve one given fire resistance.

## Usage

To achieve the necessary DFT (dry film thickness), the following calculation can be used, to ensure that the necessary amount of paint is applied:

$$\frac{\text{Dry film thickness } (\mu)}{726} = \text{Theoretical Litres per } m^2$$

This calculation gives a theoretical usage and the result in litre per square metre allows for no waste at application. A waste-factor should therefore be added to find the consumption of paint when used, depending on, but not limited to overspray.

## Technical Data

| | |
|---|---|
| **Condition** | Single component acrylic intumescent paint.<br>Ready for use |
| **Colour** | White base plus 28 decorative, water-based colours.<br>See separate Colour Chart. |
| **Density** | Approx. 1.43 kg/ltr |
| **Durability** | $Z_2$; intended for use in internal conditions with humidity classes other than $Z_1$, excluding temperatures below 0 °C (C1 or C2 according to EN ISO 12944-2).<br>Higher classes achievable with top-coat. |
| **Volume solids** | 72.6 % (ASTM D2369) |
| **V.O.C.** | < 1 g/L (below limit of detection) (ASTM D2369) |
| **Application method** | Spray, brush, roller |
| **Dillution** | Preferably not. Max 10% water. |
| **Storage** | 12 months stored in unopened containers.<br>To be stored in temperatures between 5 °C and 25 °C protected against frost and direct sunlight. |
| **Temperature range** | -30°C to +80°C (when fully cured, up to 4 weeks) |
| **Installation temp.** | +5°C to +50°C |
| **Working life** | Minimum 12 years if conditions are met |
| **Test standard** | Loadbearing structural steel: EN 13381-8:2013.<br>Compliance; primers & colours: EAD 350402-0001106. |
| **Packaging** | 20 litre / approx. 29 kg pails: 36 pcs per pallet |

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## Steel Profiles, Hp/A Factors and Paint Thicknesses

The necessary paint thickness to achieve a given fire resistance classification is dependent on three factors; critical temperature for the actual profile, its Hp/A factor and the fire classification needed, in minutes. With a simplified calculation with critical temperatures of **500 ˚C**, the following tables in this data sheet can be used. If there are special circumstances, such as a different critical temperature or steel profile, the Hp/A can be calculated manually and the necessary paint thickness can then be found in the product's European Technical Assessment. The dry film thickness in the following tables indicate what is needed to achieve the different fire classifications. The given usage in litres per square metres of steel surfaces is only theoretical and without waste, and no warranties, expressed or implied, are intended to be given as to the actual amount of paint needed, and no liability whatsoever will be accepted for any loss from the use of the information given.

| Profile | Exposed sides | Hp/A ($m^{-1}$) | Classification R 30 | | Classification R 60 | |
|---|---|---|---|---|---|---|
| | | | DFT (µ) | Ltr/$m^2$ (approx) | DFT (µ) | Ltr/$m^2$ (approx) |
| HE 100 A | 3-beam | 217 | 465 | 0.64 | 1890 | 2.61 |
| | 4-column | 264 | 558 | 0.77 | - | - |
| HE 120 A | 3-beam | 220 | 465 | 0.64 | 1890 | 2.61 |
| | 4-column | 267 | 569 | 0.78 | - | - |
| HE 140 A | 3-beam | 208 | 444 | 0.61 | 1794 | 2.48 |
| | 4-column | 253 | 537 | 0.74 | - | - |
| HE 160 A | 3-beam | 192 | 413 | 0.57 | 1649 | 2.27 |
| | 4-column | 234 | 496 | 0.68 | 2034 | 2.80 |
| HE 180 A | 3-beam | 187 | 402 | 0.55 | 1601 | 2.21 |
| | 4-column | 226 | 485 | 0.67 | 1986 | 2.74 |
| HE 200 A | 3-beam | 174 | 371 | 0.51 | 1457 | 2.01 |
| | 4-column | 211 | 454 | 0.63 | 1842 | 2.54 |
| HE 220 A | 3-beam | 161 | 350 | 0.48 | 1361 | 1.87 |
| | 4-column | 195 | 413 | 0.57 | 1649 | 2.27 |
| HE 240 A | 3-beam | 147 | 319 | 0.44 | 1260 | 1.74 |
| | 4-column | 178 | 381 | 0.52 | 1505 | 2.07 |
| HE 260 A | 3-beam | 141 | 309 | 0.43 | 1228 | 1.69 |
| | 4-column | 171 | 371 | 0.51 | 1457 | 2.01 |
| HE 280 A | 3-beam | 136 | 298 | 0.41 | 1197 | 1.65 |
| | 4-column | 165 | 350 | 0.48 | 1361 | 1.87 |
| HE 300 A | 3-beam | 126 | 277 | 0.38 | 1134 | 1.56 |
| | 4-column | 153 | 329 | 0.45 | 1291 | 1.78 |
| HE 320 A | 3-beam | 117 | 257 | 0.35 | 1072 | 1.48 |
| | 4-column | 141 | 309 | 0.43 | 1228 | 1.69 |
| HE 340 A | 3-beam | 112 | 246 | 0.34 | 1040 | 1.43 |
| | 4-column | 134 | 288 | 0.40 | 1166 | 1.61 |
| HE 360 A | 3-beam | 107 | 236 | 0.33 | 1009 | 1.39 |
| | 4-column | 128 | 277 | 0.38 | 1134 | 1.56 |
| HE 400 A | 3-beam | 101 | 225 | 0.31 | 978 | 1.35 |
| | 4-column | 120 | 257 | 0.35 | 1072 | 1.48 |
| HE 450 A | 3-beam | 96 | 215 | 0.30 | 946 | 1.30 |
| | 4-column | 113 | 246 | 0.34 | 1040 | 1.43 |
| HE 500 A | 3-beam | 92 | 205 | 0.28 | 915 | 1.26 |
| | 4-column | 107 | 236 | 0.33 | 1009 | 1.39 |
| HE 550 A | 3-beam | 90 | 194 | 0.27 | 884 | 1.22 |
| | 4-column | 104 | 225 | 0.31 | 978 | 1.35 |
| HE 100 B | 3-beam | 179 | 381 | 0.52 | 1505 | 2.07 |
| | 4-column | 218 | 465 | 0.64 | 1890 | 2.60 |
| HE 120 B | 3-beam | 166 | 361 | 0.50 | 1409 | 1.94 |
| | 4-column | 202 | 433 | 0.60 | 1745 | 2.40 |
| HE 140 B | 3-beam | 155 | 329 | 0.45 | 1291 | 1.78 |
| | 4-column | 187 | 190 | 0.26 | 1601 | 2.21 |
| HE 160 B | 3-beam | 140 | 298 | 0.41 | 1197 | 1.65 |
| | 4-column | 169 | 361 | 0.50 | 1409 | 1.94 |
| HE 180 B | 3-beam | 131 | 288 | 0.40 | 1166 | 1.61 |
| | 4-column | 159 | 340 | 0.47 | 1322 | 1.82 |
| HE 200 B | 3-beam | 122 | 367 | 0.51 | 1103 | 1.52 |
| | 4-column | 147 | 319 | 0.44 | 1260 | 1.74 |
| HE 220 B | 3-beam | 115 | 246 | 0.34 | 1040 | 1.43 |
| | 4-column | 139 | 298 | 0.41 | 1197 | 1.65 |
| HE 240 B | 3-beam | 108 | 236 | 0.33 | 1009 | 1.39 |
| | 4-column | 131 | 288 | 0.40 | 1166 | 1.61 |

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| Profile | Exposed sides | Hp/A ($m^{-1}$) | Classification R 30 | | Classification R 60 | |
|---|---|---|---|---|---|---|
| | | | DFT (µ) | Ltr/$m^2$ (approx) | DFT (µ) | Ltr/$m^2$ (approx) |
| HE 260 B | 3-beam | 105 | 225 | 0.31 | 978 | 1.35 |
| | 4-column | 127 | 277 | 0.38 | 1134 | 1.56 |
| HE 280 B | 3-beam | 102 | 225 | 0.31 | 978 | 1.35 |
| | 4-column | 123 | 267 | 0.37 | 1103 | 1.52 |
| HE 300 B | 3-beam | 96 | 215 | 0.30 | 946 | 1.30 |
| | 4-column | 116 | 257 | 0.35 | 1072 | 1.48 |
| HE 320 B | 3-beam | 91 | 205 | 0.28 | 915 | 1.26 |
| | 4-column | 110 | 236 | 0.33 | 1009 | 1.39 |
| HE 340 B | 3-beam | 88 | 194 | 0.27 | 884 | 1.22 |
| | 4-column | 106 | 236 | 0.33 | 1009 | 1.39 |
| HE 360 B | 3-beam | 86 | 194 | 0.27 | 884 | 1.22 |
| | 4-column | 102 | 225 | 0.31 | 978 | 1.35 |
| HE 400 B | 3-beam | 82 | 184 | 0.25 | 852 | 1.17 |
| | 4-column | 97 | 215 | 0.30 | 946 | 1.30 |
| HE 450 B | 3-beam | 79 | 173 | 0.24 | 821 | 1.13 |
| | 4-column | 93 | 205 | 0.28 | 915 | 1.26 |
| IPE 80 | 3-beam | 369 | 841 | 1.16 | - | - |
| | 4-column | 429 | - | - | - | - |
| IPE 100 | 3-beam | 334 | 704 | 0.97 | - | - |
| | 4-column | 387 | - | - | - | - |
| IPE 120 | 3-beam | 311 | 662 | 0.91 | - | - |
| | 4-column | 360 | 796 | 1.10 | - | - |
| IPE 140 | 3-beam | 291 | 621 | 0.86 | - | - |
| | 4-column | 335 | 704 | 0.97 | - | - |
| IPE 160 | 3-beam | 269 | 569 | 0.78 | - | - |
| | 4-column | 310 | 652 | 0.90 | - | - |
| IPE 180 | 3-beam | 253 | 537 | 0.74 | - | - |
| | 4-column | 291 | 621 | 0.86 | - | - |
| IPE 200 | 3-beam | 235 | 496 | 0.68 | 2034 | 2.81 |
| | 4-column | 270 | 569 | 0.78 | - | - |
| IPE 220 | 3-beam | 221 | 475 | 0.65 | 1938 | 2.67 |
| | 4-column | 254 | 537 | 0.74 | - | - |
| IPE 240 | 3-beam | 205 | 433 | 0.60 | 1748 | 2.41 |
| | 4-column | 236 | 506 | 0.70 | 2082 | 2.87 |
| IPE 270 | 3-beam | 197 | 423 | 0.58 | 1697 | 2.34 |
| | 4-column | 227 | 485 | 0.67 | 1986 | 2.74 |
| IPE 300 | 3-beam | 188 | 406 | 0.56 | 1601 | 2.21 |
| | 4-column | 216 | 465 | 0.64 | 1890 | 2.60 |
| IPE 330 | 3-beam | 175 | 371 | 0.51 | 1457 | 2.01 |
| | 4-column | 200 | 423 | 0.58 | 1697 | 2.34 |
| IPE 360 | 3-beam | 163 | 350 | 0.48 | 1361 | 1.87 |
| | 4-column | 186 | 402 | 0.55 | 1601 | 2.21 |
| IPE 400 | 3-beam | 152 | 329 | 0.45 | 1291 | 1.78 |
| | 4-column | 174 | 371 | 0.51 | 1457 | 2.01 |
| IPE 450 | 3-beam | 143 | 309 | 0.43 | 1228 | 1.69 |
| | 4-column | 162 | 350 | 0.48 | 1361 | 1.87 |
| IPE 500 | 3-beam | 134 | 288 | 0.40 | 1166 | 1.61 |
| | 4-column | 151 | 329 | 0.45 | 1291 | 1.78 |
| IPE 550 | 3-beam | 124 | 267 | 0.37 | 1103 | 1.52 |
| | 4-column | 140 | 298 | 0.41 | 1197 | 1.65 |
| IPE 600 | 3-beam | 115 | 246 | 0.34 | 1040 | 1.43 |
| | 4-column | 129 | 277 | 0.38 | 1134 | 1.56 |

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| Profile | Exposed sides | Hp/A ($m^{-1}$) | Classification R 30 | | Classification R 60 | |
|---|---|---|---|---|---|---|
| | | | DFT (µ) | Ltr/$m^2$ (approx) | DFT (µ) | Ltr/$m^2$ (approx) |
| Hollow 4.4mm w/t | 4-column | 227 | 1013 | 1.40 | - | - |
| Hollow 5.0mm w/t | 4-column | 200 | 896 | 1.23 | - | - |
| Hollow 6.0mm w/t | 4-column | 167 | 779 | 1.07 | - | - |
| Hollow 6.3mm w/t | 4-column | 159 | 740 | 1.02 | - | - |
| Hollow 8.0mm w/t | 4-column | 125 | 569 | 0.78 | 2110 | 2.91 |
| Hollow 10.0mm w/t | 4-column | 100 | 437 | 0.60 | 1378 | 1.90 |
| Hollow 12.0mm w/t | 4-column | 84 | 357 | 0.49 | 1123 | 1.55 |
| Hollow 14.0mm w/t | 4-column | 72 | 304 | 0.42 | 979 | 1.35 |
| Hollow 16.0mm w/t | 4-column | 63 | 251 | 0.35 | 835 | 1.15 |
| Hollow 18.0mm w/t | 4-column | 56 | 225 | 0.31 | 763 | 1.05 |
| Hollow 20.0mm w/t | 4-column | 50 | 198 | 0.27 | 691 | 0.95 |