

# STEEL PAINT FR-1

## TECHNICAL DATA SHEET



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### 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. 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 BS-EN 13381-8:2013.



### Emission Data (indoor air quality)

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

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
BREEM-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.

<b>Average drying times are:</b>	<b>At 15 °C</b>	<b>At 23 °C</b>
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 200m<sup>-1</sup> 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

<b>Condition</b>	Single component acrylic intumescent paint. Ready for use
<b>Colour</b>	White base plus 28 decorative, water-based colours. See separate Colour Chart.
<b>Density</b>	Approx. 1.43 kg/ltr
<b>Durability</b>	Z <sub>2</sub> ; intended for use in internal conditions with humidity classes other than Z <sub>1</sub> , excluding temperatures below 0 °C (C1 or C2 according to EN ISO 12944-2). Higher classes achievable with top-coat.
<b>Volume solids</b>	72.6 % (ASTM D2369)
<b>V.O.C.</b>	< 1 g/L (below limit of detection) (ASTM D2369)
<b>Application method</b>	Spray, brush, roller
<b>Dilution</b>	Preferably not. Max 10% water.
<b>Storage</b>	6 months stored in unopened containers. To be stored in temperatures between 5 °C and 25 °C protected against frost and direct sunlight.
<b>Temperature range</b>	-30°C to +80°C (when fully cured, up to 4 weeks)
<b>Installation temp.</b>	+5°C to +50°C
<b>Working life</b>	Minimum 12 years if conditions are met
<b>Test standard</b>	Loadbearing structural steel: EN 13381-8:2013. Compliance; primers & colours: EAD 350402-0001106.
<b>Packaging</b>	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 **550 °C** for columns and **620 °C** for beams, 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 certification document. 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 <sup>-1</sup> )	Classification R 30		Classification R 60	
			DFT (µ)	Ltr/m <sup>2</sup> (approx)	DFT (µ)	Ltr/m <sup>2</sup> (approx)
HE 100 A	3-beam	217	130	0.18	982	1.35
	4-column	264	350	0.48	1,332	1.83
HE 120 A	3-beam	220	130	0.18	982	1.35
	4-column	267	358	0.49	1,365	1.88
HE 140 A	3-beam	208	130	0.18	916	1.26
	4-column	253	334	0.46	1,273	1.75
HE 160 A	3-beam	192	130	0.18	817	1.13
	4-column	234	302	0.42	1,156	1.59
HE 180 A	3-beam	187	130	0.18	784	1.08
	4-column	226	293	0.40	1,126	1.55
HE 200 A	3-beam	174	130	0.18	706	0.97
	4-column	211	269	0.37	1,058	1.46
HE 220 A	3-beam	161	130	0.18	679	0.94
	4-column	195	237	0.33	920	1.27
HE 240 A	3-beam	147	130	0.18	638	0.88
	4-column	178	212	0.29	832	1.15
HE 260 A	3-beam	141	130	0.18	624	0.86
	4-column	171	204	0.28	803	1.11
HE 280 A	3-beam	136	130	0.18	610	0.84
	4-column	165	188	0.26	744	1.02
HE 300 A	3-beam	126	130	0.18	583	0.80
	4-column	153	172	0.24	706	0.97
HE 320 A	3-beam	117	130	0.18	555	0.76
	4-column	141	155	0.21	680	0.94
HE 340 A	3-beam	112	130	0.18	541	0.75
	4-column	134	142	0.20	654	0.90
HE 360 A	3-beam	107	130	0.18	528	0.73
	4-column	128	142	0.20	641	0.88
HE 400 A	3-beam	101	130	0.18	514	0.71
	4-column	120	142	0.20	615	0.85
HE 450 A	3-beam	96	130	0.18	500	0.69
	4-column	113	142	0.20	602	0.83
HE 500 A	3-beam	92	130	0.18	486	0.67
	4-column	107	142	0.20	589	0.81
HE 550 A	3-beam	90	130	0.18	472	0.65
	4-column	104	142	0.20	576	0.79
HE 100 B	3-beam	179	130	0.18	720	0.99
	4-column	218	277	0.38	1,067	1.47
HE 120 B	3-beam	166	130	0.18	693	0.95
	4-column	202	253	0.35	979	1.35
HE 140 B	3-beam	155	130	0.18	651	0.90
	4-column	187	228	0.31	891	1.23
HE 160 B	3-beam	140	130	0.18	610	0.84
	4-column	169	196	0.27	773	1.06
HE 180 B	3-beam	131	130	0.18	596	0.82
	4-column	159	180	0.25	719	0.99
HE 200 B	3-beam	122	130	0.18	569	0.78
	4-column	147	163	0.22	693	0.95
HE 220 B	3-beam	115	130	0.18	541	0.75
	4-column	139	147	0.20	667	0.92
HE 240 B	3-beam	108	130	0.18	528	0.73
	4-column	131	142	0.20	654	0.90

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Polyseam Ltd tel. +44(0)1484421036

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Profile	Exposed sides	Hp/A (m <sup>-1</sup> )	Classification R 30		Classification R 60	
			DFT (μ)	Ltr/m <sup>2</sup> (approx)	DFT (μ)	Ltr/m <sup>2</sup> (approx)
HE 260 B	3-beam	105	130	0.18	514	0.71
	4-column	127	142	0.20	641	0.88
HE 280 B	3-beam	102	130	0.18	514	0.71
	4-column	123	142	0.20	628	0.87
HE 300 B	3-beam	96	130	0.18	500	0.69
	4-column	116	142	0.20	615	0.85
HE 320 B	3-beam	91	130	0.18	486	0.67
	4-column	110	142	0.20	589	0.81
HE 340 B	3-beam	88	130	0.18	472	0.65
	4-column	106	142	0.20	589	0.81
HE 360 B	3-beam	86	130	0.18	472	0.65
	4-column	102	142	0.20	576	0.79
HE 400 B	3-beam	82	130	0.18	459	0.63
	4-column	97	142	0.20	563	0.78
HE 450 B	3-beam	79	130	0.18	445	0.61
	4-column	93	142	0.20	551	0.76
IPE 80	3-beam	369	379	0.52	1,992	2.74
	4-column	429	-	-	-	-
IPE 100	3-beam	334	317	0.44	1,754	2.42
	4-column	387	-	-	-	-
IPE 120	3-beam	311	282	0.39	1,618	2.23
	4-column	360	505	0.70	1,968	2.71
IPE 140	3-beam	291	247	0.34	1,482	2.04
	4-column	335	464	0.64	1,801	2.48
IPE 160	3-beam	269	208	0.29	1,312	1.81
	4-column	310	423	0.58	1,633	2.25
IPE 180	3-beam	253	177	0.24	1,213	1.67
	4-column	291	399	0.55	1,532	2.11
IPE 200	3-beam	235	141	0.19	1,081	1.49
	4-column	270	358	0.49	1,365	1.88
IPE 220	3-beam	221	130	0.18	1,015	1.40
	4-column	254	334	0.46	1,273	1.75
IPE 240	3-beam	205	130	0.18	883	1.22
	4-column	236	310	0.43	1,185	1.63
IPE 270	3-beam	197	130	0.18	850	1.17
	4-column	227	293	0.40	1,126	1.55
IPE 300	3-beam	188	130	0.18	784	1.08
	4-column	216	277	0.38	1,067	1.47
IPE 330	3-beam	175	130	0.18	706	0.97
	4-column	200	245	0.34	950	1.31
IPE 360	3-beam	163	130	0.18	679	0.94
	4-column	186	228	0.31	891	1.23
IPE 400	3-beam	152	130	0.18	651	0.90
	4-column	174	204	0.28	803	1.11
IPE 450	3-beam	143	130	0.18	624	0.86
	4-column	162	188	0.26	744	1.02
IPE 500	3-beam	134	130	0.18	596	0.82
	4-column	151	172	0.24	706	0.97
IPE 550	3-beam	124	130	0.18	569	0.78
	4-column	140	147	0.20	667	0.92
IPE 600	3-beam	115	130	0.18	541	0.75
	4-column	129	142	0.20	641	0.88

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Profile	Exposed sides	Hp/A (m <sup>-1</sup> )	Classification R 30		Classification R 60	
			DFT (μ)	Ltr/m <sup>2</sup> (approx)	DFT (μ)	Ltr/m <sup>2</sup> (approx)
Hollow 4.4mm w/t	4-column	227	653	0.90	2,234	3.08
Hollow 5.0mm w/t	4-column	200	557	0.77	1,813	2.50
Hollow 6.0mm w/t	4-column	167	461	0.63	1,392	1.92
Hollow 6.3mm w/t	4-column	159	429	0.59	1,277	1.76
Hollow 8.0mm w/t	4-column	125	317	0.44	1,036	1.43
Hollow 10.0mm w/t	4-column	100	237	0.33	864	1.19
Hollow 12.0mm w/t	4-column	84	188	0.26	761	1.05
Hollow 14.0mm w/t	4-column	72	156	0.21	689	0.95
Hollow 16.0mm w/t	4-column	63	129	0.18	582	0.80
Hollow 18.0mm w/t	4-column	56	129	0.18	529	0.73
Hollow 20.0mm w/t	4-column	50	129	0.18	475	0.65