

## Information on the Hybrid technology

The Hybrid product-family is a hybrid inorganic-organic coating technology for indoor and outdoor decorative and protective applications. It cures to form a hard, decorative and mar resistant coating with easy-to-clean properties, excellent weathering fastness, UV-light degradation resistance, water resistance, and good colour and gloss retention. The family includes the HybridRED product range with outstanding fire protection properties.

### General characteristics

- solvent-based, high-solids system
- protection for thermoset and thermoplastic composites, also may be applied to steel & aluminium
- range of gloss levels available, may also be textured finish
- RAL colour standards, translucent versions also available (excluding ESD)
- fast tack-free time
- no need for stoved post-curing
- wide application window

### Specific information on the HybridRED products

Due to ceramification, HybridRED has outstanding fire protection properties, i.e. very low smoke generation, prolonged ignition times and low heat release rates when compared with standard organic coatings. There are several members of the HybridRED product range:

HybridRED 100	standard version, good overall fire performance and protection
HybridRED 100 ESD	anti-static version of HybridRED 100 with limited colour option
HybridRED 200	maximized inorganic content, giving higher fire resistance and minimal heat of combustion. Designed for more demanding applications.
HybridRED 295	1-component version for easy application (interiors only)
HybridRED 900	clear topcoat, for maximum gloss (automotive finish)

## Applications

- fire proofing of composites in various applications in energy, railway, marine and transport sectors
- decorative and industrial applications
- resurfacing damaged Fire-Retardant gelcoats

- indoor and outdoor environments
- train and marine interiors

## Key properties

- EN 45545-2 HL3 R7, R1 compliant
- smooth finish
- anti-graffiti properties
- weather and UV-light resistant
- does not contain halogens or antimony trioxide
- little or no change in fire retardant properties over time in outdoor conditions

No change in fire retardant properties after accelerated outdoor exposure (tested according to ISO 4892-2 / 5500 hours in 40°C, RH50%, 0.5 W/m<sup>2</sup> (340 nm) weather cabinet: Atlas Ci3000+).

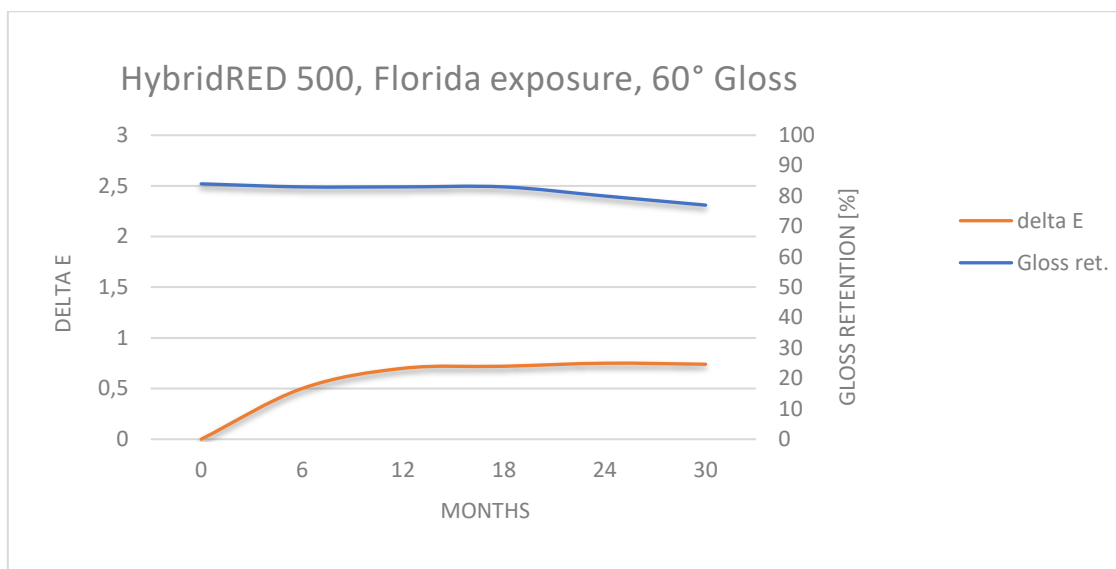
**See separate information regarding HybridRED fire protection performance by industry sector.**

## Other information

<b>Impact-Test (ISO 6272)</b>	
Front [cm]	15,0
Back [cm]	< 2,5
<b>Pendulum-Hardness (König) (ISO 1522) [seconds]</b>	
	128
<b>Buchholz-Hardness (ISO 2815)</b>	
Mark Length [mm]	11,7
Depth of Impression [µm]	11
Indentation Resistance of Buchholz	87

Taber abraser test procedure was implemented according to ASTM D 1044. One cycle equals 1000 revolutions with a weight of 250g.

<i>mass lost</i>	<i>HybridRED 100</i>		<i>2-component, solvent borne polyurethane coating</i>	
	mg	%	mg	%
<i>cycle 1</i>	0,25	0,04	6,9	0,76
<i>cycle 2</i>	2,9	0,47	12,1	1,3
<i>cycle 3</i>	9,2	1,55	51,4	5,6



Following chemicals were tested and the appearance was checked visually.

	24h @ RT	1h @ 80°C
<i>petrol</i>	no change	blisters
<i>Diesel gasoline</i>	no change	no change
<i>hydraulic oil</i>	no change	no change
<i>NaOH (10%)</i>	slightly matt	haze
<i>HCl (10%)</i>	slightly yellow	slightly matt
<i>H2SO4 (10%)</i>	slightly matt	slightly matt

Further chemical resistance tests were implemented according to DIN 68861. Evaluation after 24 hours and 7 days except for boiling water.

	after 24 h	after 7 days	evaluation marks
<i>Acetic acid (10%)</i>	2	4	0 = no change
<i>Citric acid (10%)</i>	0	1	1 = minimal change in color and gloss
<i>Lactic acid (85% w/w)</i>	2 - 3	3	2 = slight changes in color and gloss
<i>xylene</i>	1	2	3 = coating largely undamaged
<i>MEK</i>	2	2 - 3	4 = coating damaged
<i>ammonia (25%)</i>	0	1	5 = coating destroyed
<i>Crude oil</i>	0	0	
<i>boiling water (30 min)</i>		0	

**Salt Fog/Spray EN ISO 9227**, substrate: zinc phosphate steel, coated direct to metal. Exposure time: 1500 hours. No visual change in gloss or color.

## Usage

The working temperature should be 15 – 25°C. For other grades than HR295: *Curing agent is supplied with resin part. Add the curing agent accordingly. The mixing ratio is given in the label.* The product is ready to use but it can be diluted with Solvent 22 if required. Working time is 8 to 10 hours depending on the ambient temperature and moisture.

Application with conventional spray gun:

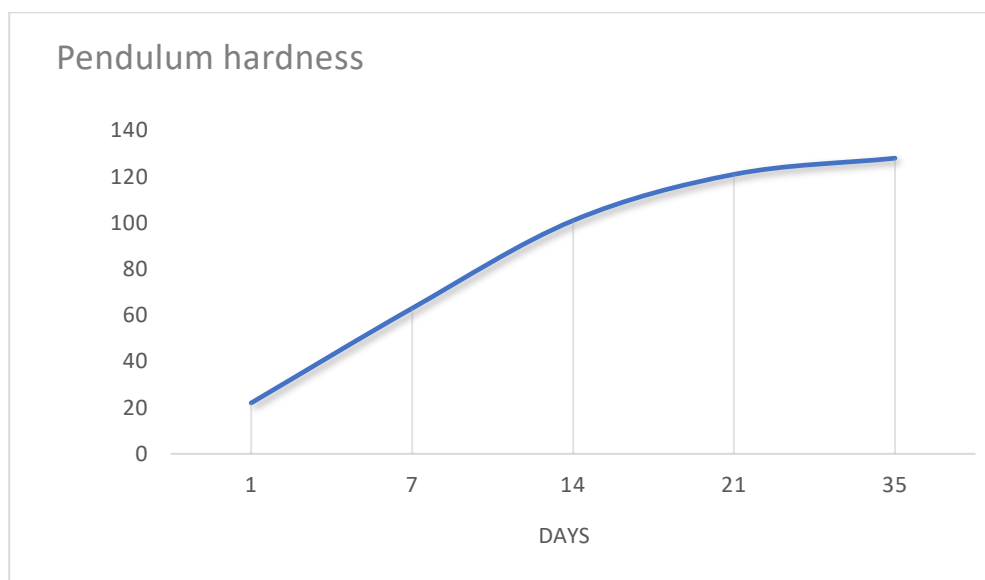
- nozzle size: 1,2 – 1,4 mm
- pressure: 2,5 bar

Application with high pressure spray gun:

- nozzle size: 413 – 617
- pressure: 140 – 180 bar

Spray the first layer as thin tack layer and let it flash-off 15 – 20 minutes. Spray 3 – 4 layers wet-on-wet to reach total wet film thickness maximum of 300 µm. The product can be applied also with brush or roller. Clean tools with acetone or equivalent.

HybridRED is double curing system where initial tack-free cure occurs with ambient moisture. This is a rather fast reaction, and a fully tack-free surface can be achieved within a few hours depending on the conditions. The second reaction is cross-linking, which is relatively slow process and highly dependable on temperature. At room temperature achieving the high cross-linking density can take two to three weeks. This needs to be taken account when testing product. The surface will go harder and harder within following weeks as shown in a below chart.



However, initial cross-linking can be accelerated with increasing ambient moisture content – while avoiding direct water contact. After tack-free surface, elevated temperature can be applied. This can range from 50°C to 140°C and from 8 hours to 1 hour and any variation between.

When using ventilation and under pressure, extra care must be taken not to exclude all the humidity from the “drying room”. If no water is present, the surface will stay tacky for days and only cross-linking happens which can lead to gloss reduction. Same happens if heat is applied too early.

If the ambient humidity is very low i.e. in the winter, a bucket of water on the floor will be enough.

## Safety and Handling

The content of an opened package is influenced by air moisture. Keep tightly capped when not in use. Handle in a well-ventilated area. Store indoors at room temperature in the original containers kept tightly closed. Protect from direct sun light. Detailed safety information is contained in a material data safety sheet.