Ballard Power Systems Europe A/S
Majsmarken 1
9500 Hobro
Denmark

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001	14/04/2023	First Issue
002	09/02/2024	Updated to include painting specifications from suppliers
003	16/07/2024	Updated and expanded according to comments

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Revision Record

Rev #	Description	Revised By	Date
1.0	Initial Release	RGL	April 14, 2023
2.0	Updated to include painting specifications from suppliers	EZE	February 9, 2024
3.0	Updated according to comments: -Added data sheets from paint manufacturers -Added details on the Coating Procedure Tests -Added Inspection & Test Tables -Added details on qualification testing -Added reference to NORSOK M501	EZE	July 16, 2024

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1.0 General

In terms of obtaining the required level of antirust protection of surfaces that are to be provided with such protection by painting depends greatly on the condition of the surfaces and physical elements of their design. It is therefore very important that the material and surface treatment and pre-treatment prior to the painting of the parts can be carried out in the prescribed manner. The recommendations will be found in this document.

Any and all weld spatter, slag must be removed before the item is painted. It is important that the manufacturing document clearly indicates which surfaces are to be painted and what type of treatments are to be given. If areas are not to be painted, the item document should also indicate which surfaces are NOT to be treated.

Parts or objects which, after assembly or installation, have surfaces that are not accessible for technically correct pre-treatment and painting must be finished before they are assembled or installed. If not done correctly, the antirust protection will NOT be achieved.

Painting of bolts and nuts with the intention to protect them against rust must be avoided, since painting does not provide good rust protection. If nevertheless, painting is prescribed, it is essential that the thickness of the paint applied to nuts and bolt heads does not prevent the appropriate spanners/wrenches from correctly fitting and tightening them.

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2.0 References

Table 1. Reference Documents

Document ID	Document Title	Source
ISO 2811	Paints and varnishes — Determination of density	ISO
ISO 3251	Paints, varnishes and plastics — Determination of non-volatile-matter content	ISO
ISO 4624	Paints and varnishes — Pull-off test for adhesion	ISO
ISO 4628	Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance	ISO
ISO 8501	Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness	ISO
ISO 8502	Preparation of steel substrates before application of paints and related products	ISO
ISO 8503	Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates	ISO
ISO 12944	Paints and varnishes — Corrosion protection of steel structures by protective paint systems	ISO
ISO 19840	Paints and varnishes — Corrosion protection of steel structures by protective paint systems Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces	ISO
NORSOK M501	Surface preparation and protective coating	NORSOK

3.0 Surface Preparation and Painting Specifications

The applicable corrosion environment category for the containers according to ISO 12944-9 is defined as **CX**; for Offshore areas of high salinity or industrial areas of extremely high humidity and aggressive atmosphere or subtropical and tropical areas.

The requirements of a coating system for category CX are (for a zinc-rich primer):

- Primer Dry Film Thickness: ≥ 40 µm
- Minimum Number of Coats: 3
- Total Dry Film Thickness: ≥ 280 µm

3.1 Containers

The surface preparation and painting specifications used by the supplier of the containers are detailed in the table below.

Table 2. Coating System Specification (Containers).

Manufacturer		Type of Substrate	Type of Environment
Name:	PPG Industries, Inc.	Uncoated carbon steel	CX (offshore)
Address:	One PPG Place Pittsburgh, PA 15272 USA		
Surface Preparation:	ISO 8501-3 P3 ISO 8501-1 Sa 2½ ISO 8503-1 40-70 µm ISO 8502-6 <50 mg/m^2 NaCl ISO 8502-3 Rate 2		

	Trade Name	Color Shade	Generic Type	NDFT (µm)
1st coat	SigmaZinc™ 68 GP	Grey	Zinc Epoxy	60
2nd coat	SigmaFast™ 278	Div. Ral	Epoxy	170
3rd coat	SigmaDur™ 550	Div. Ral	Acrylic PU	50
			Total NDFT (µm)	280

3.2 Cooling Platform and LT Cooler Support Structure

The surface preparation and painting specifications used by the supplier of the cooling platform and LT cooler support structure are categorized as No. 1A based on the NORSOK M501 standard, which also fulfill the requirements of ISO 12944-9 CX, and are detailed in the table below.

Table 3. Coating System Specification No. 1A (Cooling Platform and LT Cooler Support Structure).

Manufacturer		Type of Substrate	Type of Environment
Name:	Hempel A/S	Uncoated carbon steel	CX (offshore)
Address:	Lundtoftegårdsvej 91 2800 Kgs. Lyngby Denmark		
Surface Preparation:	ISO 8501-1 Sa 2½ ISO 8501-3 Grade P3 ISO 8502-3 Rate 2 ISO 8502-6 and ISO 8502-9 ≤20 mg/m^2 NaCl ISO 8503-1 Medium G (50-85 µm) ISO 2801 Surface control between layers		

	Trade Name	Color Shade	Generic Type	NDFT (µm)
1st coat	Hempadur Avantguard 750	Grey	Zinc Epoxy	60
2nd coat	Hempadur 4774D	Ral 7035	Epoxy	170
3rd coat	Hempadur 4774D	Ral 9001	Epoxy	
4th coat	Hempathane HS 5610	Ral 7035	Acrylic PU	50
			Total NDFT (µm)	280

3.3 Performance (Pre-qualification) Testing

The requirements for pre-qualification are applicable to both coating systems specified above.

Acceptance criteria in the pre-qualification testing are considered as minimum performance requirements.

Table 4. Performance tests requirements and acceptance criteria for coating systems.

Activity Description	**Environment corrosivity to ISO 12944-2**	**Verification Method**	**Acceptance Criteria**
Fingerprinting	All environments	ISO 12944-9 Annex C	ISO 12944-9 Annex C
Cyclic ageing test	CX (Offshore and coastal atmospheric zone) and CX + Im4 (splash zone and tidal zone), seawater filled compartments and Im3 (buried items)	ISO 12944-9 Clause 9	ISO 12944-9 Clause 9 Supplementary requirements: Chalking to ISO 4628-6, maximum rating 2. Pull-off test to ISO 4624, minimum 5.0 MPa and maximum 50% reduction from value measured before ageing.

3.4 Coating Procedure Test (CPT)

The Coating Procedure Test (CPT) is a systematic and controlled evaluation process used to verify the effectiveness and performance of a coating system under the defined conditions. The purpose of the CPT is to ensure that the coating procedure meets the desired quality standards and performs as expected while in service.

The table below shows the initial activities that form part of the CPT and are responsibility of the coating manufacturers.

Table 5. Coating procedure testing (partial).

Test Type	Method	Frequency	Acceptance Criteria	Consequence
Routine batch testing of painting material	a) Density ISO 2811-1 or ASTM D1475 b) Non-volatile matter (solid content) ISO 3251 or ASTM D2369	Each batch of paint	a1) For density ≤ 2.0 g/cm^3, ±0,05 g/cm^3 from fingerprint of paint used for CPT. a2) For density > 2.0 g/cm^3 , ±0,10 g/cm^3 from fingerprint of paint used for CPT. b) ±2 % wt from fingerprint of paint used for CPT.	Unused painting material shall be quarantined. Fingerprinting check shall be carried out to verify material against CPT material. If the fingerprint does not match the material used for the CPT, the entire batch shall be rejected and the areas coated with the non-compliant material shall be re-blasted and re-coated with a coating that meets the specification.
Fingerprinting	ISO 12944-9 Annex C	CPT paint material only, unless required to verify a paint batch.	ISO 12944-9 Annex C	Paint material to be rejected. Re-blast and re-coat with material compliant with CPT.

The CPT then follows all activities listed in the Inspection and Testing section below, which are responsibility of the coating applicators.

3.5 Inspection and Testing

Testing and inspection is carried out in accordance with the table below.

Table 6. Inspection and testing.

Test Type	Method	Frequency	Acceptance Criteria	Consequence
Environmental conditions	Ambient and metal temperature, relative humidity, and dew point.	At the start of each shift and minimum of twice per shift	In accordance with specified requirements (see data sheets)	No blasting or coating
Visual examination	Visual for sharp edges, weld spatter slivers, rustgrade, etc.	100% of all surfaces	No defects	Defects to be removed or repaired
Cleanliness	a) ISO 8501-1 b) ISO 8502-3	a) 100% visual of all surfaces b) Spot checks	a) In accordance with specified requirements b) Maximum quantity and size rating 2	a) Re-blasting b) Re-cleaning and retesting of non-conforming area until acceptable
Salt test	ISO 8502-6 and ISO 8502-9	Spot checks	Maximum conductivity corresponding to specification	Repeated washing of non-conforming area with potable water and retesting until acceptable followed by re-blasting
Roughness	ISO 8503-5	Each component or once per 10 m^2	As specified	Re-blasting non-conforming area with abrasive of suitable grade to achieve desired surface profile
Visual examination of coating	Visual to determine curing, contamination, solvent retention, pinholes/popping, sagging and surface defects	100% of surface after each coat	According to specified requirements	Repair of defects

Film thickness	ISO 19840. Calibration on a smooth surface	ISO 19840	ISO 19840, and coating system data sheet	Repair, additional coats or re-coating as appropriate
Adhesion	ISO 4624 (method A or B) using equipment with an automatic centred pulling force, and carried out when coating system are fully cured.	Spot checks	See notes below	Coating to be rejected. Re-blast and re-coat.
Notes: 1. 50 % reduction of average adhesion value from the CPT is acceptable as minimum adhesion during production coating. Absolute minimum value is 5 MPa.				

3.6 Field Painting Procedure / Repairs to Damaged Finishes

During handling, turning and assembly, damage to edges and to surfaces by the use of sharp-toothed clamps must be avoided by taking precautionary measures, such as the use of lifting devices with soft renewable contact surfaces or properly designed lifting cleats. If damage does occur, it must be carefully blended out by grinding (and the full protective treatment restored, with specified overlaps between coats).

Just as surface cleanliness before first coating is fundamental to performance of the system, so is the cleanliness of painted surfaces prior to the application of subsequent coats. On site, thorough cleaning shortly before painting is always necessary to remove contamination accumulated over time and from construction activities including dust, grout leaks from concreting, and the products of blast cleaning, bolting and welding.

3.7 Data Sheets

3.7.1 PPG Sigmazinc 68 GP

PRODUCT DATA SHEET

March 2, 2023 (Revision of January 4, 2023)

SIGMAZINC™ 68 GP

DESCRIPTION

Two-component, high solids polyamine adduct cured zinc rich epoxy primer

PRINCIPAL CHARACTERISTICS

- Designed as a system primer in various paint systems for aggressive environments
- Suitable for use in offshore and onshore environments with ISO 12944-2 corrosivity categories of C5 and CX (offshore)
- Meets the requirements of Norsok M-501 rev. 6, System 1
- Quick-drying, can be overcoated after a short interval
- Complies with the compositional requirements of ISO 12944–5
- Complies with the compositional requirements of SSPC-Paint 20, Level 2
- The zinc dust used in this product complies with minimum ASTM D520 Type II

COLOR AND GLOSS LEVEL

- Gray, reddish gray
- Flat

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	2.4 kg/l (20.0 lb/US gal)
Volume solids	68 ± 2%
VOC (Supplied)	Directive 2010/75/EU, SED: max. 130.0 g/kg max. 310.0 g/l (approx. 2.6 lb/US gal)
Recommended dry film thickness	50 - 150 µm (2.0 - 6.0 mils) depending on system
Theoretical spreading rate	13.6 m^2/l for 50 µm (545 ft^2/US gal for 2.0 mils) See spreading rate tables
Dry to touch	20 minutes
Overcoating Interval	Minimum: 1.5 hours See overcoating tables
Full cure after	7 days
Shelf life	Base: at least 24 months when stored cool and dry Hardener: at least 24 months when stored cool and dry

Note: See ADDITIONAL DATA – Curing time

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Substrate conditions

- Steel; blast cleaned to ISO-Sa2½ (SSPC SP-10), blasting profile 40 – 70 µm (1.6 – 2.8 mils)

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PRODUCT DATA SHEET

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SIGMAZINC™ 68 GP

Substrate temperature

- Substrate temperature during application should be at least 0°C (32°F)
- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point

INSTRUCTIONS FOR USE

Mixing ratio by volume: base to hardener 90:10 (9:1)

- The temperature of the paint should preferably be above 15°C (59°F), otherwise extra thinner may be required to obtain application viscosity
- Adding too much thinner results in reduced sag resistance
- Thinner should be added after mixing the components

Induction time

None

Pot life

6 hours at 20°C (68°F)

Air spray

Recommended thinner
THINNER 91-92 or THINNER 91-82 (AMERCOAT T-10)

Volume of thinner
0 - 5%, depending on required thickness and application conditions

Nozzle orifice
1.5 – 2.5 mm (approx. 0.060 – 0.100 in)

Nozzle pressure
0.3 - 0.6 MPa (approx. 3 - 6 bar; 44 - 87 p.s.i.)

Airless spray

Recommended thinner
THINNER 91-92 or THINNER 91-82 (AMERCOAT T-10)

Volume of thinner
0 - 5%, depending on required thickness and application conditions

Nozzle orifice
Approx. 0.43 – 0.53 mm (0.017 – 0.021 in)

Nozzle pressure
15.0 MPa (approx. 150 bar; 2176 p.s.i.)

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SIGMAZINC™ 68 GP

Brush/roller

Recommended thinner
THINNER 91-92 or THINNER 91-82 (AMERCOAT T-10)

Volume of thinner
0 – 5%

Cleaning solvent
THNNER 90-53, THINNER 90-58 (AMERCOAT 12) OR THINNER 21-06 (AMERCOAT 65)

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
50 µm (2.0 mils)	13.6 m^2/l (545 ft^2/US gal)
60 µm (2.4 mils)	11.3 m^2/l (454 ft^2/US gal)
75 µm (3.0 mils)	9.1 m^2/l (364 ft^2/US gal)
100 µm (4.0 mils)	6.8 m^2/l (273 ft^2/US gal)

Overcoating interval for DFT up to 100 µm (4.0 mils)						
Overcoating with...	**Interval**	**0°C (32°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
subsequent coating	Minimum	6 hours	3 hours	1.5 hours	1 hour	30 minutes
	Maximum	3 months	3 months	3 months	3 months	3 months

Notes:
- Zinc rich primers can form zinc salts on the surface; preferably they should not be weathered for long periods before overcoating
- Before overcoating visible surface contamination must be removed by high-pressure water cleaning, sweep blasting or mechanical cleaning

Curing time for DFT up to 100 µm (4.0 mils)			
Substrate temperature	**Dry to touch**	**Dry to handle**	**Full cure**
0°C (32°F)	1.5 hours	6 hours	20 days
10°C (50°F)	1 hour	3 hours	15 days
15°C (59°F)	40 minutes	2 hours	10 days
20°C (68°F)	20 minutes	1.5 hours	7 days
30°C (86°F)	10 minutes	1 hour	5 days

Notes:
- Adequate ventilation must be maintained during application and curing
- In case of application at air or surface temperature below 5°C (41°F), the temperature of the mixed paint is recommended to be higher than 10°C (50°F)

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PRODUCT DATA SHEET

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SIGMAZINC™ 68 GP

SAFETY PRECAUTIONS

- See Safety Data Sheet and product label for complete safety and precaution requirements
- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes

WORLDWIDE AVAILABILITY

It is always the aim of PPG Protective and Marine Coatings to supply the same product on a worldwide basis. However, slight modification of the product is sometimes necessary to comply with local or national rules/circumstances. Under these circumstances an alternative product data sheet is used.

REFERENCES

• EXPLANATION TO PRODUCT DATA SHEETS	INFORMATION SHEET	1411

WARRANTY

PPG warrants (i) its title to the product, (ii) that the quality of the product conforms to PPG's specifications for such product in effect at the time of manufacture and (iii) that the product shall be delivered free of the rightful claim of any third person for infringement of any U.S. patent covering the product. THESE ARE THE ONLY WARRANTIES THAT PPG MAKES AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, UNDER STATUTE OR ARISING OTHERWISE IN LAW, FROM A COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION, ANY OTHER WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE DISCLAIMED BY PPG. Any claim under this warranty must be made by Buyer to PPG in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life of the product, or one year from the date of the delivery of the product to the Buyer, whichever is earlier. Buyer's failure to notify PPG of such non-conformance as required herein shall bar Buyer from recovery under this warranty.

LIMITATIONS OF LIABILITY

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3.7.2 PPG Sigmafast 278

PRODUCT DATA SHEET

March 2, 2023 (Revision of November 16, 2022)

SIGMAFAST™ 278

DESCRIPTION

Two-component, high solids, zinc phosphate epoxy primer and buildcoat

PRINCIPAL CHARACTERISTICS

- Epoxy primer or buildcoat in protective coating systems
- Excellent corrosion resistance in atmospheric exposure
- Cures at temperatures down to -5°C (23°F)
- Speed curing in steel fabrication
- Easy application by airless spray
- Wide application range
- ACQPA 27752-certified

COLOR AND GLOSS LEVEL

- Redbrown, gray and a selected range of (MIO) colors
- Semi-gloss

Notes:
- Epoxy coatings will chalk and fade upon exposure to sunlight, elevated temperatures, or chemical exposure. Discoloration and normal chalking do not impact performance. Light colors will darken over time. Some batch-to-batch variation in color is to be expected. Color matches are approximate.
- The addition of a UV stable topcoat should be considered when using epoxy coatings in cosmetic areas

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	1.5 kg/l (12.5 lb/US gal)
Volume solids	80 ± 2%
VOC (Supplied)	Directive 2010/75/EU, SED: max. 153.0 g/kg UK PG 6/23(92) Appendix 3: max. 230.0 g/l (approx. 1.9 lb/US gal) EPA Method 24: 220.0 g/ltr (1.8 lb/USgal) China GB 30981-2020 (tested) 198.0 g/l (approx. 1.7 lb/gal)
Recommended dry film thickness	75 - 250 µm (3.0 - 10.0 mils)
Theoretical spreading rate	6.4 m^2/l for 125 µm (257 ft^2/US gal for 5.0 mils)
Dry to touch	2 hours
Overcoating Interval	Minimum: 2 hours Maximum: Extended
Full cure after	4 days

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Data for mixed product	
Shelf life	Base: at least 24 months when stored cool and dry Hardener: at least 24 months when stored cool and dry

Notes:
- See ADDITIONAL DATA – Spreading rate and film thickness
- See ADDITIONAL DATA – Overcoating intervals
- See ADDITIONAL DATA – Curing time

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

- Apply this product to the specified thickness as soon as possible after the surface is prepared

Substrate conditions

- Steel; blast cleaned to ISO-Sa2½ or minimum SSPC SP-6, blasting profile 40 – 70 µm (1.6 – 2.8 mils) or power tool cleaned to minimum ISO-St3 / SSPC SP3

Primed steel or previous coat

- Previous suitable coat must be dry and free from any contamination
- Surface of previous coat should be sufficiently roughened if necessary
- When applied to zinc silicate, a mist coat and full coat technique is required

Galvanized steel

- The surface must be properly prepared, dry, clean and free of any contamination
- The surface should be sufficiently roughened by sweep blasting to achieve a uniform matt appearance
- Sweep blast in accordance with the SSPC SP-16 guidelines

Stainless steel

- The surface must be properly prepared, dry, clean and free of any contamination
- The surface should be sufficiently roughened by sweep blasting with inert non-metallic abrasives
- Sweep blast in accordance with the SSPC SP-16 guidelines

Thermal Sprayed Metallization (TSM)

- Surface must be dry and free from any contamination
- The mist coat / full coat technique is required. See mist coat thinning recommendation in the Instructions For Use part below

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Substrate temperature and application conditions

- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point
- Substrate temperature during application and curing down to -5°C (23°F) is acceptable; provided the substrate is free from ice and dry

INSTRUCTIONS FOR USE

Mixing ratio by volume: base to hardener 75:25 (3:1)

- The temperature of the paint should preferably be above 15°C (59°F), otherwise extra thinner may be required to obtain application viscosity
- Adding too much thinner results in reduced sag resistance and slower cure
- Thinner should be added after mixing the components

Induction time
None

Pot life
1 hour at 20°C (68°F)

Air spray

Recommended thinner
THINNER 91-92

Volume of thinner
0 - 10%, depending on required thickness and application conditions

Nozzle orifice
1.7 – 2.0 mm (approx. 0.070 – 0.079 in)

Nozzle pressure
0.3 - 0.4 MPa (approx. 3 - 4 bar; 44 - 58 p.s.i.)

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SIGMAFAST™ 278

Airless spray

Recommended thinner
THINNER 91-92

Volume of thinner
0 - 10%, 30 - 50% when mist coat applied

Nozzle orifice
Approx. 0.46 – 0.53 mm (0.018 – 0.021 in)

Nozzle pressure
20.0 - 25.0 MPa (approx. 200 - 250 bar; 2901 - 3626 p.s.i.)

Brush/roller

Recommended thinner
THINNER 91-92

Volume of thinner
0 – 5%

Notes:
- Application by roller will leave roller marking and is suitable for minimum DFT requirements only
- A roller suitable for epoxy application must be used
- Application by brush may show brush marking, due to the thixatropic nature of the paint and is most suitable to small areas, tight angle areas or for stripe coating or touch-up

Cleaning solvent
THINNER 90-53

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
75 µm (3.0 mils)	10.7 m^2/l (428 ft^2/US gal)
125 µm (5.0 mils)	6.4 m^2/l (257 ft^2/US gal)
250 µm (10.0 mils)	3.2 m^2/l (128 ft^2/US gal)

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Overcoating interval for DFT up to 125 µm (5.0 mils)						
Overcoating with...	**Interval**	**-5°C (23°F)**	**0°C (32°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**
various epoxy coatings, polyurethane coatings, and PSX	Minimum Maximum	24 hours Extended	14 hours Extended	4 hours Extended	2 hours Extended	1 hour Extended

Notes:
- Actual maximum overcoating times will be influenced by local conditions
- A detergent wash with PREP 88 or equivalent is recommended prior to application of topcoats after 30 days of exposure if chalking or contamination is present
- To ensure optimal adhesion of the next coat, the surface must be dry and free from all contaminations (oil, grease, chalking, etc...) which would require cleaning and/or abrading

Curing time for DFT up to 125 µm (5.0 mils)			
Substrate temperature	**Dry to touch**	**Dry to handle**	**Full cure**
-5°C (23°F)	16 hours	38 hours	N/A
0°C (32°F)	11 hours	24 hours	21 days
10°C (50°F)	4 hours	8 hours	8 days
20°C (68°F)	2 hours	4 hours	4 days
30°C (86°F)	1 hour	2 hours	3 days

Note: Adequate ventilation must be maintained during application and curing

Pot life (at application viscosity)	
Mixed product temperature	**Pot life**
0°C (32°F)	10 hours
10°C (50°F)	3 hours
20°C (68°F)	1 hour
30°C (86°F)	30 minutes

SAFETY PRECAUTIONS

- See Safety Data Sheet and product label for complete safety and precaution requirements
- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes

WORLDWIDE AVAILABILITY

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Ref. 6829

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PRODUCT DATA SHEET

March 2, 2023 (Revision of November 16, 2022)

SIGMAFAST™ 278

REFERENCES

- EXPLANATION TO PRODUCT DATA SHEETS — INFORMATION SHEET 1411

WARRANTY

PPG warrants (i) its title to the product, (ii) that the quality of the product conforms to PPG's specifications for such product in effect at the time of manufacture and (iii) that the product shall be delivered free of the rightful claim of any third person for infringement of any U.S. patent covering the product. THESE ARE THE ONLY WARRANTIES THAT PPG MAKES AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, UNDER STATUTE OR ARISING OTHERWISE IN LAW, FROM A COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION, ANY OTHER WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE DISCLAIMED BY PPG. Any claim under this warranty must be made by Buyer to PPG in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life of the product, or one year from the date of the delivery of the product to the Buyer, whichever is earlier. Buyer's failure to notify PPG of such non-conformance as required herein shall bar Buyer from recovery under this warranty.

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3.7.3 PPG Sigmadur 550

PRODUCT DATA SHEET

August 8, 2022 (Revision of November 3, 2021)

SIGMADUR™ 550

DESCRIPTION

Two-component, aliphatic acrylic polyurethane finish

PRINCIPAL CHARACTERISTICS

- Unlimited recoatable
- Excellent resistance to atmospheric exposure conditions
- Good color and gloss retention
- Cures at temperatures down to -5°C (23°F)
- Resistant to splash of mineral and vegetable oils, paraffins, aliphatic petroleum products and mild chemicals
- Can be recoated even after long atmospheric exposure
- Good application properties

COLOR AND GLOSS LEVEL

- White and various other colors (see also SIGMACARE shade card)
- Gloss

Note: Certain colors, especially red, orange, and yellow may require additional coats for adequate hiding, especially if applied over primers with a significant color contrast

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	1.3 kg/l (10.8 lb/US gal)
Volume solids	55 ± 2%
VOC (Supplied)	Directive 2010/75/EU, SED: max. 334.0 g/kg EUR Directive: 2004/42/IIA(i)(500) 459 g/l max. 430.0 g/l (approx. 3.6 lb/US gal) China GB 38469-2019 (tested) 409.0 g/l (approx. 3.4 lb/gal)
Recommended dry film thickness	50 - 60 µm (2.0 - 2.4 mils) depending on system
Theoretical spreading rate	11.0 m^2/l for 50 µm (441 ft^2/US gal for 2.0 mils)
Dry to touch	1 hour
Overcoating Interval	Maximum: 6 hours Maximum: Unlimited
Full cure after	4 days
Shelf life	Base: at least 36 months when stored cool and dry Hardener: at least 24 months when stored cool and dry

Ref. 7537

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PRODUCT DATA SHEET

August 8, 2022 (Revision of November 3, 2021)

SIGMADUR™ 550

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Substrate conditions

- Previous coat (epoxy or polyurethane) must be dry and free from any contamination
- Previous coat: surface should be sufficiently roughened if necessary

Substrate temperature and application conditions

- Substrate temperature during application at -5°C (23°F) is acceptable; provided the substrate is free from ice and dry
- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point
- Relative humidity during application and curing should not exceed 85%
- Should condensation on the surface occur during, or soon after application, this could result in color and gloss change

INSTRUCTIONS FOR USE

Mixing ratio by volume: base to hardener 88:12

- The temperature of the mixed base and hardener should be above 10°C (50°F), otherwise extra thinner may be required to obtain application viscosity
- Thinner should be added after mixing the components
- Adding too much thinner results in reduced sag resistance

Induction time

None

Pot life

5 hours at 20°C (68°F)

Note: See ADDITIONAL DATA – Pot life

Air spray

Recommended thinner
THINNER 21-06

Volume of thinner
3 - 5%, depending on required thickness and application conditions

Nozzle orifice
1.0 - 1.5 mm (approx. 0.040 - 0.060 in)

Nozzle pressure
0.3 - 0.4 MPa (approx. 3 - 4 bar; 44 - 58 p.s.i.)

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PRODUCT DATA SHEET

August 8, 2022 (Revision of November 3, 2021)

SIGMADUR™ 550

Airless spray

Recommended thinner
THINNER 21-06

Volume of thinner
3 - 5%, depending on required thickness and application conditions

Nozzle orifice
Approx. 0.43 – 0.48 mm (0.017 – 0.019 in)

Nozzle pressure
20.0 MPa (approx. 200 bar; 2901 p.s.i.)

Brush/roller

Recommended thinner
THINNER 21-06

Volume of thinner
0 – 5%

Cleaning solvent
THINNER 90-53

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
50 µm (2.0 mils)	11.0 m^2/l (441 ft^2/US gal)
60 µm (2.4 mils)	9.2 m^2/l (368 ft^2/US gal)

Overcoating interval for DFT up to 50 µm (2.0 mils)							
Overcoating with...	**Interval**	**-5°C (23°F)**	**0°C (32°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
itself	Minimum	24 hours	16 hours	8 hours	6 hours	5 hours	3 hours
	Maximum	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited

Note: Surface should be dry and free from any contamination

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PRODUCT DATA SHEET

August 8, 2022 (Revision of November 3, 2021)

SIGMADUR™ 550

Curing time for DFT up to 60 µm (2.4 mils)		
Substrate temperature	**Dry to handle**	**Full cure**
-5°C (23°F)	24 hours	15 days
0°C (32°F)	16 hours	11 days
10°C (50°F)	8 hours	6 days
20°C (68°F)	6 hours	4 days
30°C (86°F)	5 hours	3 days
40°C (104°F)	3 hours	48 hours

Notes:
- Adequate ventilation must be maintained during application and curing
- Premature exposure to early condensation and rain may cause color and gloss change

Pot life (at application viscosity)	
Mixed product temperature	**Pot life**
10°C (50°F)	7 hours
20°C (68°F)	5 hours
30°C (86°F)	3 hours
40°C (104°F)	2 hours

SAFETY PRECAUTIONS

- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes
- Contains a toxic polyisocyanate curing agent
- Avoid at all times inhalation of aerosol spray mist

WORLDWIDE AVAILABILITY

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REFERENCES

- EXPLANATION TO PRODUCT DATA SHEETS — INFORMATION SHEET — 1411

Ref. 7537

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PRODUCT DATA SHEET

August 8, 2022 (Revision of November 3, 2021)

SIGMADUR™ 550

WARRANTY

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3.7.4 Hempel Hempadur Avantguard 750

Product Data Sheet

Hempadur Avantguard 750

Product characteristics

Description
Hempadur Avantguard 750 is an activated zinc-rich epoxy primer in compliance with the requirements of Level 2, type II in SSPC Paint-20, 2019 and ISO 12944 Part 5, 2018. The product is in full compliance with ASTM D520 type II and EU Directive 2004/42/EC, the Paints Directive on the limitation of volatile organic compounds: subcategory j.

Recommended use
Hempadur Avantguard 750 is recommended as a versatile primer for long-term protection of steel in severely corrosive environments including offshore.

Service temperature:
- Maximum, dry exposure only: 160°C [320°F].

Certificates / Approvals
- Meets requirements to NORSOK M-501 when used as part of a predefined paint system. Edition 6, System 1. Edition 7, System 1B
- Reaction to fire tested (as part of a coating system with approved primer and topcoat) according to EN13501-1 B-s1, d0.

Features
- Reduces the effect of corrosion and provides excellent galvanic protection.
- Fast drying primer with short minimum overcoating intervals.
- Excellent mechanical strength, also in cyclic temperatures, with improved tolerance to high film thickness through high flexibility and self-healing effect.
- Superior tolerance to high relative humidity during application.
- Cures down to -10°C [14°F].

Product safety

Flash point 25°C [77°F]

VOC content mixed product

Legislation	Value	5% thinning, by volume	Limit value, phase II (2010)[a]
EU	330 g/L [2.75 lb/US gal]	356	500
US (coatings)	330 g/L [2.75 lb/US gal]		
US (regulatory)	330 g/L [2.75 lb/US gal]		
China	330 g/L [2.75 lb/US gal]		

VOC values may vary with shade, please consult the Safety Data Sheet, section 9. According to specific legislation, see details in the Explanatory Notes available at Hempel website, hempel.com or at your local Hempel website. [a]EU Directive 2004/42/CE.

Handling
Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel's Safety Data Sheet for this product along with the Product Data Sheet.

For professional use only.

Product data

Product code
1736G

Product components
Base 1736U
Curing Agent 97043

Standard shade / code
Grey 19840

Gloss
Flat

Volume solids
65 ± 2%

Issued by Hempel A/S - June 2024
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Product Data Sheet

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Hempadur Avantguard 750

Specific gravity
2.3 kg/L [19 lb/US gal]

Reference dry film thickness
60 micron [2.4 mils]

Surface preparation

Cleanliness
- Remove oil, grease and other contaminants by suitable detergent cleaning.
- Remove salts, detergents and other contaminants by high pressure fresh water cleaning.

New build:
- Abrasive blasting to min. Sa 2½ (ISO 8501-1) / SP 10 (SSPC).
- Remove dust, blast media and loose materials.

Roughness
- Surface profile Medium (G) (ISO 8503-2).

Consult Hempel's separate Surface Preparation Guidelines for more details.

Application

Mixing ratio
Base 1736U : Curing Agent 97043
(8.5 : 1.5 by volume)

Products containing floating or settling particles/pigments need to be continuosly stirred during application. This is especially important in case of heavy thinning.

Thinner
Above 20°C [68°F] Hempel's Thinner 08450
Below 20°C [68°F] Hempel's Thinner 08510

Cleaner
Hempel's Tool Cleaner 99610

Pot life

Product temperature	0°C [32°F]	20°C [68°F]	40°C [104°F]
Pot life	5 hours	4 hours	1½ hours

Application method

Tool	Thinning max vol.	Application parameters
Airless spray	5%	Nozzle pressure: 220 bar [3200 psi] Nozzle orifice: 0.017-0.021"

If brush or roller application is used, more coats will be necessary to achieve the specified dry film thickness. Spray data are indicative and subject to adjustment. Pressure is for a material temperature of 20°C [68°F].

Film thickness

Specification range	Low	High	Recommended
Dry film thickness	40 micron [1.6 mils]	100 micron [4.0 mils]	60 micron [2.4 mils]
Wet film thickness	60 micron [2.4 mils]	150 micron [6.0 mils]	90 micron [3.6 mils]
Theoretical spreading rate	16 m²/L [652 sq ft/US gal]	6.5 m²/L [265 sq ft/US gal]	11 m²/L [448 sq ft/US gal]

Overthickness must be closely controlled and never locally exceed 200 micron [8.0 mils] DFT. On irregular surfaces it is recommended to employ special care in avoiding over application.

Application conditions
- Temperature of product must be above 15°C [59°F] during application.
- To avoid condensation, apply on a clean and dry surface with a temperature that is at least 3°C [5°F] above the dew point.
- Surface temperature must be above -10°C [14°F] during application and curing.
- Surface temperature must be below 40°C [104°F] during application and curing.

Relative Humidity:
- Relative humidity must be below 95% during curing.
- Relative humidity must be below 95% during application.

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Product Data Sheet

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Hempadur Avantguard 750

Drying and overcoating

Product compatibility
- Previous coat: None.
- Subsequent coat: According to Hempel's Specification.

Drying time

Surface temperature		-10°C [14°F]	0°C [32°F]	20°C [68°F]	40°C [104°F]
Touch dry	min	50	30	10	5
Hard dry	hours	4½	3	1½	½

Determined for dry film thickness 60 micron [2.4 mils] at standard conditions, see Hempel's Explanatory Notes for details.

Overcoating

Hempel's specification supersedes any guidelines indicated in the overcoating table

Quality name		-10°C [14°F]	0°C [32°F]	20°C [68°F]	40°C [104°F]
Atmospheric medium					
Hempaprime Multi 500 Winter	Min	3 h	90 min	45 min	25 min
	Max	Ext*	Ext	Ext	Ext
Hempathane HS 55610	Min	3 h	90 min	45 min	25 min
	Max	56 d	42 d	14 d	3½ d
Atmospheric severe					
Hempaprime Multi 500 Winter	Min	3 h	90 min	45 min	25 min
	Max	90 d	90 d	30 d	7 d
Hempathane HS 55610	Min	3 h	90 min	45 min	25 min
	Max	20 d	15 d	5 d	28 h

Overcoating times are indicative for products of the same generic chemistry. Consult Hempel's specification for more information.

Drying conditions
- To obtain the drying time stated, it is important to maintain sufficient ventilation during application, drying and curing.

Overcoating details
- If the maximum overcoating interval is exceeded, roughening of the surface is necessary to ensure intercoat adhesion.
- Remove zinc salts or other contamination before overcoating.
- The surface must be dry and clean prior to application.

Other remarks
- Hempel's Specification supersedes any recommendations given in the Product Data Sheets.

Storage

Shelf life

Ambient temperature	25°C [77°F]
Base	12 months
Curing Agent	36 months

Shelf life from date of production, when stored in original, unopened containers. Thereafter, the product quality must be re-inspected. Storage at elevated temperatures may reduce shelf life. For advice, please consult Hempel.

Storage conditions
- Product must be stored according to local legislation, at maximum 40°C [104°F], without direct sunlight and protected from rain and snow.

Carbon Footprint

Dry film thickness	1 µm	1 mil
GWP (Global Warming Potential)	18.9 g CO_2e/m^2	0.098 lb CO_2e/ft^2

The carbon footprint is for 1 square meter / square foot of surface area with a dry film thickness of 1 micron / mil.

The scope includes raw materials, in-bound transport to the Hempel factory, Hempel manufacturing processes, and any Volatile Organic Compounds emitted during and after the application of the product.

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Hempadur Avantguard 750

It is calculated based on the standard shade defined in this PDS.
Values may vary with shade.

Additional documents

Additional information is available at the Hempel website
https://www.hempel.com/service-and-support/technical-guidelines
or at your local Hempel website:

- Explanatory Notes for Product Data Sheet.
- Application methods.
- Substrates.
- Surface Preparation.
- Application Instruction for this product.
- Repair & maintenance.
- Inspection & quality control.

This Product Data Sheet ("**PDS**") relates to the supplied product ("**Product**") and is subject to updating from time-to-time. Accordingly, the buyer/applicator should have regard to the PDS supplied together with the relevant batch of the Product (and not an earlier version). In addition to the PDS, the buyer/applicator may receive some or all of the following specifications, statements and/or guidelines as listed below or as are available from the Hempel website under 'Products' at www.hempel.com (the "**Additional documents**"):

No.	Document description	Location/comments
1.	Technical Statement	One-off specific advice provided on request for specific projects
2.	Specification	Only issued for specific projects
3.	PDS	This document
4.	Explanatory Notes to the PDS	Available at www.hempel.com and contain relevant information about the Product testing parameters
5.	Application Instruction	Where available, at www.hempel.com
6.	Generic technical guidelines (e.g. on application and surface preparation)	Where available, at www.hempel.com

In the event of a conflict of information between the PDS and the Additional documents, the order of priority of information shall be in the order as set out above. In such event you should also contact your representative at Hempel for clarification. Furthermore, the buyer/applicator must have full regard to the relevant Safety Data Sheet provided with each Product and which can also be downloaded from www.hempel.com.

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3.7.5 Hempel Hempadur 4774D

Product Data Sheet

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Hempadur 4774D

Product characteristics

Description
Hempadur 4774D is a self-priming, high-build, pure epoxy paint providing both abrasion and corrosion resistance.

Recommended use
Hempadur 4774D is recommended as a high-build primer, intermediate and/or self-primed finish for high performance, heavy-duty coating systems. Hempadur 4774D is fast curing and therefore suitable when high productivity is key - such as in the Wind segment.

Service temperature:
- Maximum, dry exposure only: 120°C [248°F].

Certificates / Approvals
- Meets requirements to ISO 12944 when used as part of a predefined paint system. Part 6 C5.
- Meets requirements to NORSOK M-501 when used as part of a predefined paint system. Edition 6, System 1. Edition 7, System 1B.

Features
- Heavy duty, abrasion resistant coating.
- Overcoatable by a wide range of epoxy- and polyurethane coatings.
- Low VOC.
- Applicable by standard heavy duty airless spray equipment in a wide range of film thicknesses.

Product safety

Flash point 34°C [93°F]

VOC content mixed product

Legislation	Value
EU	217 g/L [1.81 lb/US gal]
US (coatings)	217 g/L [1.81 lb/US gal]
US (regulatory)	217 g/L [1.81 lb/US gal]
China	217 g/L [1.81 lb/US gal]

According to specific legislation, see details in the Explanatory Notes available at Hempel website, hempel.com or at your local Hempel website. VOC values may vary with shade, please consult the Safety Data Sheet, section 9.

Handling
Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel's Safety Data Sheet for this product along with the Product Data Sheet.

For professional use only.

Product data

Product code
4774D

Product components
Base 4774M
Curing Agent 9874D

Standard shade* / code
Light cream 20450 **

Gloss
Semi-gloss

Volume solids
76 ± 2%

Specific gravity
1.5 kg/L [12 lb/US gal]

Reference dry film thickness
150 micron [6.0 mils]

* Other shades are available, please contact your local Hempel representative.
** Slight discolouration may occur. This does not affect the performance of the coating.

Issued by Hempel A/S - June 2024
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Product Data Sheet

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Hempadur 4774D

Surface preparation

Cleanliness
- Remove oil, grease and other contaminants by suitable detergent cleaning.
- Remove salts, detergents and other contaminants by high pressure fresh water cleaning.

New build:
- Abrasive blasting to min. Sa 2½ (ISO 8501-1) / SP 10 (SSPC).
- Remove dust, blast media and loose materials.
- All damage of shopprimer and contamination from storage and fabrication should be thoroughly mechanically/chemically cleaned prior to final painting.

Maintenance and Repair
- Abrasive blasting to min. Sa 2 (ISO 8501-1) / SP 6 (SSPC).
- Minor areas can be cleaned by power tool to St 3 provided the surface is roughened and not polished.
- Remove dust, blast media and loose materials.

Roughness
- Surface profile Medium (G) (ISO 8503-2).

Consult Hempel's separate Surface Preparation Guidelines for more details.

Application

Mixing ratio
Base 4774M : Curing Agent 9874D
(4 : 1 by volume)

Stir well before use.

Thinner
Hempel's Thinner 08450

Cleaner
Hempel's Tool Cleaner 99610

Pot life

Product temperature	15°C [59°F]	20°C [68°F]	30°C [86°F]
Pot life	60 min	45 min	20 min
Pot life (spray)	60 min	45 min	20 min
Pot life (brush)	60 min	45 min	20 min

Application method

Tool	Thinning max vol.	Application parameters
Airless spray	5%	Nozzle pressure: 250 bar [3600 psi] Nozzle orifice: 0.021-0.025"
Brush	5%	Not Applicable.

If brush or roller application is used, more coats will be necessary to achieve the specified dry film thickness. Spray data are indicative and subject to adjustment. Pressure is for a material temperature of 20°C [68°F].

Film thickness

Specification range	Low	High	Recommended
Dry film thickness	100 micron [4.0 mils]	250 micron [10 mils]	150 micron [6.0 mils]
Wet film thickness	130 micron [5.2 mils]	330 micron [13 mils]	200 micron [8.0 mils]
Theoretical spreading rate	7.6 m²/L [310 sq ft/US gal]	3 m²/L [122 sq ft/US gal]	5.1 m²/L [208 sq ft/US gal]

For best performance, avoid excessive film thickness. Product may be specified in another film thickness than indicated depending on purpose and area of use. This will alter spreading rate, drying and curing time and overcoating interval.

Application conditions
- Temperature of product must be above 15°C [59°F] during application.
- To avoid condensation, apply on a clean and dry surface with a temperature that is at least 3°C [5°F] above the dew point.
- Surface temperature must be above 5°C [41°F] during application and curing.
- Surface temperature must be below 60°C [140°F] during application and curing.

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Product Data Sheet

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Hempadur 4774D

Relative Humidity:
- Relative humidity must be below 85% during application.
- Relative humidity must be below 85% during curing.

Application remarks
- Product requires heavy duty spray equipment; spray hoses shall be as short as possible.
- The practical consumption factor may vary depending on application conditions, equipment and workmanship.

Drying and overcoating

Product compatibility
- Previous coat: None or according to Hempel's specification.
- Subsequent coat: None or according to Hempel's specification. Recommended products are: Hempadur, Hempathane

Drying time

Surface temperature		10°C [50°F]	20°C [68°F]	30°C [86°F]	40°C [104°F]
Touch dry	min	30	15	15	15
Hard dry	hours	5	2½	2	1½
Fully cured	days	-	7	-	-

Determined for dry film thickness 150 micron [6.0 mils] at standard conditions, see Hempel's Explanatory Notes for details.

Overcoating

Hempel's specification supersedes any guidelines indicated in the overcoating table

Quality name		10°C [50°F]	20°C [68°F]	30°C [86°F]	40°C [104°F]
Atmospheric medium					
Hempadur 4774D	Min	4 h	2 h	90 min	60 min
	Max	60 d	30 d	22 d	15 d
Hempathane HS 55610	Min	4 h	2 h	90 min	60 min
	Max	14 d	7 d	5½ d	3½ d
Atmospheric severe					
Hempadur 4774D	Min	4 h	2 h	90 min	60 min
	Max	60 d	30 d	22 d	15 d
Hempathane HS 55610	Min	4 h	2 h	90 min	60 min
	Max	14 d	7 d	5½ d	3½ d

Overcoating times are indicative for products of the same generic chemistry. Consult Hempel's specification for more information.

Drying conditions
- To obtain the drying time stated, it is important to maintain sufficient ventilation during application, drying and curing.

Overcoating details
- If the maximum overcoating interval is exceeded, roughening of the surface is necessary to ensure intercoat adhesion.
- The surface must be clean before overcoating.
- The surface must be dry and clean prior to application.

Other remarks
- Epoxy coats have an inherent tendency of chalking in outdoor exposure. This does not affect the performance of the coating.
- Hempel's Specification supersedes any recommendations given in the Product Data Sheets.

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Product Data Sheet

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Hempadur 4774D

Storage

Shelf life

Ambient temperature	25°C [77°F]
Base	36 months
Curing Agent	36 months

Shelf life from date of production, when stored in original, unopened containers. Thereafter, the product quality must be re-inspected. Storage at elevated temperatures may reduce shelf life. For advice, please consult Hempel.

Storage conditions

- Product must be stored according to local legislation, at maximum 40°C [104°F], without direct sunlight and protected from rain and snow.

Carbon Footprint

Dry film thickness	1 µm	1 mil
GWP (Global Warming Potential)	7 g CO_2e/m^2	0.036 lb CO_2e/ft^2

The carbon footprint is for 1 square meter / square foot of surface area with a dry film thickness of 1 micron / mil.

The scope includes raw materials, in-bound transport to the Hempel factory, Hempel manufacturing processes, and any Volatile Organic Compounds emitted during and after the application of the product.

It is calculated based on the standard shade defined in this PDS. Values may vary with shade.

Additional documents

Additional information is available at the Hempel website https://www.hempel.com/service-and-support/technical-guidelines or at your local Hempel website:

- Explanatory Notes for Product Data Sheet.
- Application methods.
- Substrates.
- Surface Preparation.
- Application Instruction for this product.
- Repair & maintenance.
- Inspection & quality control.

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No.	Document description	Location/comments
1.	Technical Statement	One-off specific advice provided on request for specific projects
2.	Specification	Only issued for specific projects
3.	PDS	This document
4.	Explanatory Notes to the PDS	Available at www.hempel.com and contain relevant information about the Product testing parameters
5.	Application Instruction	Where available, at www.hempel.com
6.	Generic technical guidelines (e.g. on application and surface preparation)	Where available, at www.hempel.com

In the event of a conflict of information between the PDS and the Additional documents, the order of priority of information shall be in the order as set out above. In such event you should also contact your representative at Hempel for clarification. Furthermore, the buyer/applicator must have full regard to the relevant Safety Data Sheet provided with each Product and which can also be downloaded from www.hempel.com.

Hempel shall not be liable for defects where the application of the Product has not been made fully in accordance with the recommendations and requirements set out in the relevant PDS and the Additional Documents. The information and terms of this disclaimer apply to this PDS, the Additional documents and any other documents supplied by Hempel in respect of the Product. In addition, the Product is supplied and all technical assistance is given subject to Hempel's General Conditions of Sale, Delivery and Service, unless otherwise expressly agreed in writing.

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3.7.6 Hempel Hempathane HS 55610

Product Data Sheet

Hempathane HS 55610

Product characteristics

Description
Hempathane HS 55610 is a glossy polyurethane topcoat, cured with aliphatic isocyanate. The product has very good gloss and colour retention and contains zinc phosphate.
Complies with EU Directive 2004/42/EC, The Paints Directive on the limitation of volatile organic compounds: subcategory j.

Recommended use
Hempathane HS 55610 is recommended as VOC compliant, high-build finishing coat for protection of structural steel in severely corrosive environment. The product may be specified as a one coat "direct to metal" system in environments classified as C2 and C3. It may also be applied directly on galvanised steel.

Service temperature:
- Maximum, dry exposure only: 120°C [248°F].

Certificates / Approvals
- EC-type examined as a low flame spread material when used as part of a predefined paint system. Please refer to “Declaration of Conformity” on hempel.com for further details.
- The following shades are formulated with special electrical conductive pigments that makes it possible to design paint systems that meet the requirements in ISO 80079-36:2016 Explosive atmospheres (ATEX): 95000
- Meets requirements to NORSOK M-501 when used as part of a predefined paint system. Edition 6, System 1. Edition 7, System 1A, 1B.

Features
- For severely corrosive atmospheric environment.
- Direct-to-metal in C2 and C3 environments.
- Glossy with very good gloss and colour retention.
- High volume solids and VOC-compliant.
- The minimum temperature for curing is -10°C [14°F].

Product safety

Flash point 31°C [88°F]

VOC content mixed product

Legislation	Value	5% thinning, by volume	Limit value, phase II (2010)[a]
EU	343 g/L [2.86 lb/US gal]	366 g/L [3.05 lb/US gal]	500 g/L [4.17 lb/US gal]
US (coatings)	320 g/L [2.67 lb/US gal]	-	-
US (regulatory)	343 g/L [2.86 lb/US gal]		
China	343 g/L [2.86 lb/US gal]		
Hong Kong	320 g/L [2.67 lb/US gal]		

According to specific legislation, see details in the Explanatory Notes available at Hempel website, hempel.com or at your local Hempel website. VOC values may vary with shade, please consult the Safety Data Sheet, section 9. [a]EU Directive 2004/42/CE. According to EPA Method 24.

Handling
Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel’s Safety Data Sheet for this product along with the Product Data Sheet.

For professional use only.

Product data

Product code
55610

Product components
Base 55619
Curing Agent 97050

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Product Data Sheet

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Hempathane HS 55610

Standard shade / code
White 10000 *

Wide range of colours is available via Hempel's tinting system.

Gloss
Glossy

Volume solids
67 ± 2%

Specific gravity
1.4 kg/L [12 lb/US gal]

Reference dry film thickness
80 micron [3.2 mils]

Aluminium shade / code
Aluminium grey 19002

Gloss
Please consult Hempel's Guideline on aluminium pigmented coatings.

Volume solids
58 ± 2%

Specific gravity
1.1 kg/L [10 lb/US gal]

Reference dry film thickness
80 micron [3.2 mils]

Surface preparation

Cleanliness
- Remove oil, grease and other contaminants by suitable detergent cleaning.
- Remove salts, detergents and other contaminants by high pressure fresh water cleaning.

New build:
- Abrasive blasting to min. Sa 2½ (ISO 8501-1) / SP 10 (SSPC).
- Remove dust, blast media and loose materials.

Maintenance and Repair
- Abrasive blasting to min. Sa 2 (ISO 8501-1) / SP 6 (SSPC).
- Minor areas may be hand or power tool cleaned instead of abrasive blasting.
- Water jetting to Wa 2½ (ISO 8501-4).
- Flash rust degree of maximum FR M (ISO 8501-4).
- Remove dust, blast media and loose materials.

Roughness
- Surface profile Medium (S) (ISO 8503-2).

Consult Hempel's separate Surface Preparation Guidelines for more details.

Application

Mixing ratio
Base 55619 : Curing Agent 97050
(7 : 1 by volume)

Stir well before use.

Thinner
Hempel's Thinner 08080

Cleaner
Hempel's Thinner 08080

* Colour stability may be affected by exposure to harsh chemical and/or high temperatures.

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Hempathane HS 55610

Pot life

Product temperature	10°C [50°F]	20°C [68°F]	30°C [86°F]
Pot life	3½ hours	2 hours	1 hour

Application method

Tool	Thinning max vol.	Application parameters
Airless spray	5%	Nozzle pressure: 175 bar [2500 psi] Nozzle orifice: 0.017-0.021"

If brush or roller application is used, more coats will be necessary to achieve the specified dry film thickness. Never thin more than allowed according to local environmental legislation. Spray data are indicative and subject to adjustment. Pressure is for a material temperature of 20°C [68°F].

Film thickness

Specification range	Low	High	Recommended
Dry film thickness	50 micron [2.0 mils]	125 micron [5.0 mils]	80 micron [3.2 mils]
Wet film thickness	75 micron [3.0 mils]	187 micron [7.5 mils]	120 micron [4.8 mils]
Theoretical spreading rate	13 m²/L [530 sq ft/US gal]	5.3 m²/L [216 sq ft/US gal]	8.3 m²/L [338 sq ft/US gal]

For best performance, avoid excessive film thickness.

Application conditions

- To avoid condensation, apply on a clean and dry surface with a temperature that is at least 3°C [5°F] above the dew point.
- Surface temperature must be above -10°C [14°F] during application and curing.
- Beware of ice on the surface at low temperatures.
- The film formation may be adversely affected by light rain, high humidity and/or condensation during application and the following interval after application: “8 hours, 20°C/68°F”.
- Optimal spraying properties are obtained at paint temperatures of 15-30°C [59-86°F]. Beyond these temperatures additional thinning may be necessary.

Relative Humidity:

- Relative humidity must be below 85% during curing.
- Relative humidity must be below 85% during application.

Drying and overcoating

Product compatibility

- Previous coat: According to Hempel’s Specification. Recommended products are: Hempaprime Multi 500, Hempadur
- Subsequent coat: None.

Drying time

Surface temperature		10°C [50°F]	20°C [68°F]	30°C [86°F]
Touch dry	min	120	90	60
Surface dry	hours	11	3½	2
Hard dry	hours	12	5	3
Fully cured	days	-	7	-

Determined for dry film thickness 80 micron [3.2 mils] at standard conditions, see Hempel’s Explanatory Notes for details.

Overcoating

Hempel’s specification supersedes any guidelines indicated in the overcoating table

Quality name		-10°C [14°F]	10°C [50°F]	20°C [68°F]	30°C [86°F]
Atmospheric medium					
Hempathane HS 55610	Min	30 h	9 h	6 h	3 h
	Max	Ext*	Ext	Ext	Ext

Overcoating times are indicative for products of the same generic chemistry. Consult Hempel’s specification for more information.

Drying conditions

- To obtain the drying time stated, it is important to maintain sufficient ventilation during application, drying and curing.
- Condensation on the freshly applied coating should be avoided.

Overcoating details

- The surface must be dry and clean prior to application.

Other remarks

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Product Data Sheet

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Hempathane HS 55610

Storage

Shelf life

Ambient temperature	25°C [77°F]
Base	36 months
Curing Agent	24 months

Shelf life from date of production, when stored in original, unopened containers. Thereafter, the product quality must be re-inspected. Storage at elevated temperatures may reduce shelf life. For advice, please consult Hempel.

Storage conditions

- Product must be stored according to local legislation, at maximum 40°C [104°F], without direct sunlight and protected from rain and snow.
- The curing agent is sensitive to moisture. Store in a dry place and keep the can tightly closed until use.

Carbon Footprint

Dry film thickness	1 µm	1 mil
GWP (Global Warming Potential)	8.7 g CO_2e/m^2	0.045 lb CO_2e/ft^2

The carbon footprint is for 1 square meter / square foot of surface area with a dry film thickness of 1 micron / mil.

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It is calculated based on the standard shade defined in this PDS. Values may vary with shade.

Additional documents

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- Explanatory Notes for Product Data Sheet.
- Application methods.
- Surface Preparation.
- Application Instruction for this product.
- Aluminium pigmented topcoats.

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