Base Load Power Hub (BLPH)

Painting Procedure (including surface preparation)

Hydrogen Vent KO Drum, TAG V-43001

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C.A.M.P.I. Srl

Ferrara - Italy

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DOCUMENT TITLE:

SURFACE PREPARATION and PAINTING PROCEDURE

KO DRUM – ITEM V-43001

RISERVATO AL CLIENTE:
Customer Reserved:

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INDEX

PAGE

1.0 SCOPE AND APPLICATION 3
2.0 REFERENCE DOCUMENTS 3
3.0 RESPONSABILITY 4
4.0 PROCEDURE 4
5.0 REPAIRS 6
6.0 CONTROLS DURING WORK PERFORMANCE 6
7.0 CERTIFICATION 7
8.0 STORAGE 7
Enclosure. ..... 8÷

1.0 SCOPE AND APPLICATION

The present Operative Instruction describes surface preparation, primer and painting preparation and application modalities for N°1 Hydrogen Vent to K.O. Drum Item V-43001

Coating systems and Test are listed in the enclosure n. 1 and n. 2

2.0 REFERENCE DOCUMENTS

- Client specification 123A90-DDL-MAT-SP-60006
- Construction Drawings
- Paint Product Data Sheet (PDS) and Specific Paint Schedules

-ISO 8501-1:2021 - Preparation of steel substrate before application of paints and related products – Visual assessment of surface cleanliness; rust grades and preparation grades.

-ISO 8501-2:2021 - Preparation grades of previously coated steel substrate after localized removal of previous coatings

-ISO 8501-3:2021 - Preparation of steel substrate before application of paints and related products – Visual assessment of surface cleanliness; preparation grades of welds, edges and other areas with surface imperfections.

-ISO 8502-3:2017: Preparation of steel substrate before application of paints and related products – Test for the assessment of surface cleanliness; assessment of dust on steel surface prepared for painting.

-ISO 8503-1÷4:2012 - Preparation of steel substrates before application of paints and related products – Surface roughness characteristics of blast-cleaned steel substrates

-EN ISO 12944:2020 - Corrosion protection of steel structures by protective paint system

-ASTM D4285:2018 - Standard test methods for Indicating Oil or Water in Compressed Air

-ASTM D4417:2003 - Standard test methods for Field Measurement of Surface Profile of Blast Cleaned Steel.

-SSPC-SP1:2016 - Solvent Cleaning

-EN ISO 2808:2019 - Coating materials – determination of the layer thickness.

-EN ISO 19840:2012 - Paint and varnishes – Measurements of, and acceptance criteria for, the thickness of dry films on rough surfaces

-SSPC-PA:2012 Guide 3 – Guideline for safety in paint application

3.0 RESPONSABILITY

The Contractor shall carry out the necessary controls to ensure that the referenced specifications and contractual documents are followed. The Contractor shall appoint the man in charge of the Quality Control who shall perform the test and shell keep contacts with the man in charge of the Quality Control at **C.A.M.P.I. Srl**. It is responsibility of **C.A.M.P.I. Srl** inspectors to attend the tests performed by the Contractor and to approve the Quality Control Report.

4.0 PROCEDURE

4.1 **Surface preparation – Prior to paint application**

Before starting any de-rusting operation or painting application, metal surface shall be free from grease, oil and salt. SSPC-SP1 is the standard for removing the exogenous compounds.

The metallic surface to be protected by paint shall comply with ISO 8501-3 grade P2. In particular, the following shall be satisfied:

- Free from weld spatter with under cutting
- Sharp edges rounding off or chamfered to produce a radius (R>2mm)
- Weld seams continuous with regular wave and smooth

All water shall be removed from the surface prior to beginning blast cleaning. The steel surface temperature shall be at least 3°C above the dew point, min.5°C and not above 40°C When the humidity grade is acceptable, compressed air shall be blown on the material to remove all residual humidity (if any); after that abrasive blasting is performed according to base material (Carbon Steel, Stainless Steel etc..) and painting cycle requirements. This operation is performed using Almandine Garnet according to the specifications and compressors with condensate traps.

4.1.1 Before using compressed air for surface preparation, the quality of the air at trap outlet shall be checked by blowing it on a clean, white paper sheet (minimum dimensions 220 x 300 mm) for two minutes to check any oil or humidity contamination. The test by paper sheet shall be performed at the beginning of each shift and anyway at intervals not shorter than five hours. The test shall be performed after every stop of the air compressor as well or when required by the Client. The air shall be used only if the paper sheet test does not reveal visible oil or humidity contaminations. In case of contamination, the blowing equipment shall be adjusted and the air tested once again. The traps shall be constantly cleaned. All lines shall be tested one by one before use. Surfaces abrasive blasting with contaminated air shall be abrasive blasting again using clean air and new abrasive.

4.1.2 Only few surfaces shall be abrasive blasting each time in order to avoid visible new oxidations before priming. The abrasive blasting surfaces shall be primed within 4 hours or as per Paint Technical recommendations (❶if shorter times are expected)

❶If the coating application is not performed within 4 hours after sand-blasting activities, the surfaces will be re-submitted to full sandblasting process (flash blasting)

4.1.3 If no particular indication is indicated on the contractual document the minimum surface preparation grade shall be SA 2½ (SSPC-SP10) with blasting profile in ❶compliance with ISO 8502-3 Medium G, between 55 and 85 micron for C.S. components

4.2 **Primer preparation and application**

4.2.1 Paint application shall be carried out only if the following condition are verified:

-Air temperature range: 5÷40°C. Minimum value of 10°C for two components catalyses paints

-Air relative humidity: ≤85%. Minimum value of 50% for zinc primer application

-Steel temperature: in the range 10÷40°C. and at least 3°C above the dew point of surrounding air.

For the preparation, the base and its catalysts shall be mixed in the fixed doses with addition of the proper solvent in a quantity according to Paint Data Sheet. The components shall be mixed by means of a pneumatic mixer.

4.2.2 Primer application is performed by means of AIRLESS SPRAY machines. Thickness and type of used primer shall be in accordance with relevant specifications and Paint Data Sheet. Non-interested parts shall not be sprayed during the application. The surfaces shall be blown, dried or sucked, free of sand or abrasive and cleaned before priming.

4.2.3 When ready for primer application, metallic surfaces shall have a minimum SA 2½ finishing grade. Finishing grades other than the above shall be agreed upon with the Client.

4.2.4 Stripe coating method (by brush or roller) shall be applied on all areas that are difficult to be reached such as: welds, corners, edges, etc…. Stripe coats shall be applied before paint layer.

4.2.5 Surfaces that will be inaccessible after assembly, including the surfaces of lap joint flanges, nozzle necks, lap joint stub end, lap ring, bolt holes and some welded joints, shall receive the complete painting system before being assembled.

4.3 **Paint preparation and application**

4.3.1 Paint application shall be carried out only if the following condition are verified:
-Air temperature range: 5÷40°C.
-Air relative humidity: ≤85%. Minimum value of 50% for zinc primer application
-Steel temperature: in the range 10÷40°C. and at least 3°C above the dew point of surrounding air.
Paints with two components shall be prepared mixing the base and its catalyst in the fixed doses with addition of the proper solvent in a quantity according to Paint Data Sheet. The components shall be mixed by means of a pneumatic mixer. Paints with one component shall be mixed with proper solvent according to Paint Data Sheet by means of a pneumatic mixer.

4.3.2 Paint application is performed by means of AIRLESS SPRAY machines; paints and thicknesses shall be in accordance with the applicable specifications. Non-interested parts shall not be sprayed during the application. Only in very few cases when paint cannot be sprayed (points difficult to be reached, finishing, small repairs, etc.) rollers and/or brushes shall be used. When more than a single coat of paint is applied (either by spraying of by other methods), it shall be necessary to wait some time after each application; the waiting time shall depend on application conditions, according to instructions of the paint manufacturer.

4.3.3 All abrasive blasting operations and further painting cycles shall be performed indoor.

5.0 REPAIRS

5.1 Primer repairs

5.1.1 Small repairs not larger than 5÷10 centimeters shall be shot blast at SA 2½ grade or cleaned by means of an electric tool. For cleaning operations, electric tool, electric wire brush, electric grinding wheel, electric chisel or other electric rotating tool shall be used to remove all fouling, all rust, all primer and welding sprays. The cleaning electric tool shall be used in such a way as to prevent featheredges, sharp edges, crests and digging formations.

The favorite cleaning method is by abrasive wheels.
Not acceptable cleaning methods are:
1) hand brushing
2) grinding by means of abrasive rotating disks
After cleaning, the paint edge shall be polished so that the repaired surface is smooth and the repaired area shall be brush primed.

5.1.2 Larger repairs shall be treated with SA 2½ abrasive blasting followed by primer spray application; parts next to areas to be repaired shall be blended with a light brushing.

5.2 Painting repairs

The paint area to be repaired shall be smoothed by abrasive paper and then covered with a spray finishing coat.

6.0 CONTROLS DURING WORK PERFORMANCE

6.1 **Necessary conditions for work performance**

For performance of shot blasting, priming and painting works, the following conditions shall be true:
-Relative humidity less than 85%
-Air temperature range 5°C÷40°C (10°C for two components catalyses paints)
-Metal temperature in the range 10÷40°C
-Surface temperature over 3°C above dew point.
-Temperature and humidity shall be continuously monitored, before the beginning and at the end of shift.
Weather conditions shall be in accordance with the primer and paint application recommendations when they are more restrictive.

6.2 **Controls during grit blasting**

Before abrasive blasting a visual check is performed to detect humidity traces (if any) and other check as follow:
-visual check for defects, 100% of the surface (ISO 8501-3, grade P2/ NACE SP0178 grade C)
-visual check for oil/grease, 100% of the surface
After abrasive blasting a second visual check is performed to verify cleaning grade and surface roughness as follow:
-visual check for cleanliness, 100% of the surface (ISO 8501-1, grade Sa2½)
-residual dust/abrasive as per ISO 8502-3, spot check, max rating 2 with normal vision.
-Blast cleaned surface assessment check by comparison with ISO comparator according to ISO 8503-1.
-roughness check as per ASTM D4417, method C.

6.3 **Controls during primer application**

6.3.1 A wet control of the thickness is performed by means of proper instruments: after film application a visual check is performed to verify the application uniformity.

6.3.2 A control of the dry film is performed by magnetic micro test to verify its thickness.

6.4 **Controls during paint application**

6.4.1 A wet control of the thickness is performed by means of proper instruments; after film application a visual check is performed to verify the application uniformity.

6.4.2 A control of the dry film is performed by magnetic micro test to verify that the thickness is in accordance with specifications as per ISO 2808 Method 7C.
As per ISO 19840 arithmetic mean of all the individual dry-film thickness (DFTs) not less than specified (NDFT); no single DFT less than 80% of NDFT and maximum 20% of total reading with value form 80% and 100% of the nominal required; Max DFT as per PDS. For sake of clarity: if dry film thickness gauge is calibrated on a smooth surface, readings shall be corrected subtracting correction factor as per ISO 19840 Table 2.

6.4.3 The instrument to measure the dry film thickness shall be newly calibrated every working day.

6.4.4 Visual check on 100% of the surface; no solvent retention, surface contamination, pinholes, popping, runs, sagging, etc..

6.4.5 The Adhesion Testing shall be performed on test panels prepared one per system and for day of production and tested by Cross Cut according to ISO2409 or ASTM D3359 with method A, Min. result required of 4A and Pull-Off according to ISO 4624 or ASTM D4541 with Min. value required of 5MPa).

7.0 CERTIFICATION

7.1 All checks shall be verified by **C.A.M.P.I. Srl** and shall be certified by reports and by a supervisor.

7.2 Equipment certification shall be performed for groups of wholly assembled equipment with proper description to enable the identification of the certified pieces.

7.3 Pipe certification shall be performed for spool and lines. When line identification numbers are used, a proper description shall be given to enable the identification of the certified pieces.

8.0 STORAGE

Paints and primers shall be stored under cover according to suppliers and Paint Manufacture prescriptions and according to the requirements of Italian law.

Enclosure 1: Applicable painting System / Elenco cicli applicabili

Item	Surface	Max oper. Temp (°C)	Painting System
CarbonSteel External surface / superfici esterne parti in acciaio carbonio	Insulated / Coibentata	25°C	**Coating System: ISO 12944-5 C3.07 (vh)** -Abrasive Blasting SA 2½ (SSPC SP-10) -Primer: Zinc Rich Epoxy coating 1x80μm – Color mfr. STD **(Barrier 80 Jotun)** -Intermediate: High build polyamide epoxy coating 1x150μm – Color mfr. STD **(Penguard Express Mio Jotun)** -Finish Coat: Modified aliphatic polyurethane 1x50μm – Color White RAL 9002 **(Hardtop XP Jotun)** Total DFT=280μm, Max as per PDS

NOTE:
- Environment aggressiveness as per EN ISO 12994-2 C3_medium

Enclosure 2: List of the test during external painting activity / Elenco controlli da fare durante la verniciatura esterna

Test / Prova	Reference Rules / Norma di riferimento	Frequency / Estensione test	Acceptance / Accettabilità	Required / Richiesto
Environmental condition / Condizioni ambientali	Ambient (air) temperature	Two times per shift / Due volte per turno	10÷40°C	Yes / Si
	Steel temperature		Min 3°C above dew point / Almeno 3°C sopra il dew point	Yes / Si
	Relative humidity		Max 85% (Min.50% for zinc primer application)	Yes / Si
Mechanical defects / Difetti meccanici	ISO 8501-3	100% of all surfaces / 100% di tutta la superficie	Grade P2 / Grado P2	Yes / Si
Contaminants / Contaminanti	Visual Check / Controllo Visivo	100% of all surfaces / 100% di tutta la superficie	No grease, oil and contaminants shall be present / Assenza di grassi, olii e contaminanti	Yes / Si
Cleanliness / Pulizia	ISO 8501-1	100% visual of all surfaces / 100% visivo di tutta la superficie	❶Sa 2½ as per paint system Sa 2½ in accordo al sistema di verniciatura	Yes / Si
Residual dust / Polvere residua	ISO 8502-3	Spot check	Max rating 2	Yes / Si
Roughness (Rz) / Rugosità	ISO 8503-1 ❶ISO 8503-3 Medium G	Each component or once per 10m^2 / Ogni componente o ogni 10m^2	❶55÷85 μm (or as per data sheet) for Carbon Steel / per acciaio carbonio	Yes / Si
Salt test / Controllo Sali	ISO 8502-6 and ISO 8502-9	One per Item or per day of production / Uno per Item o per giorno di produzione	Max conductivity corresponding to 20 mg/m^2 (20μS/cm) as Chloride / Massima conduttività corrispondente a 20 mg/m^2 (20μS/cm) per Cloruri	Yes / Si
Wet film thickness check / Controllo film bagnato	ISO 2808	Spot check / Controllo a Spot	According to PDS / In accord a data sheet prodotto	Yes / Si
Visual examination of coating (each layer) / Controllo visivo verniciatura (ogni strato)	Coating defects, such as contamination, pinholes, popping, sagging etc. / Difetti di rivestimento, come contaminazione, fori, bolle, striature, colature etc.	100% visual of all surfaces / 100% visivo di tutta la superficie	No defect / Nessun difetto	Yes / Si
MEK Test (ESI-Ethyl Silicate Inorganic Zinc only) – MEK test solo su zinco inorganico	ASTM D4752	Each component or once per 100m^2 / Ogni componente o ogni 100m^2	Rating 4 to 5	N.A.
Dry Film Thickness chek / Controllo spessore a secco	ISO 19840 (Gauge correction factors as per Table 2) / ISO 19840 (Fattore di correzione spessimetrico secondo la Tabell 2)	ISO 19840	Level 4 - Arithmetic average of DFTs not less then specifice (NDFT) / Livello 4 - media aritmetica delle misure non inferiore al minimo spessore nominale richiesto	Yes / Si
			No single DFT less than 80% of NDFT / nessuna singola misura inferiore al 80% del minimo spessore nominale richiesto	
			Max DFT as per PDS / Spessore massimo accettato secondo scheda prodotto	
Holiday test for Epoxy Phenolic only / Holyday test su Epossifenoliche	ISO 29601	100% of all surfaces / 100% di tutta la superficie	Low-Voltage Wet Sponge Test for thickness ≤ 500μm - No Pinholes / Test con spugna bagnata a bassa tensione per spessori fino a 500μm – Nessuna porosità	N.A.
Adhesion Test (pull-off) N.A. for Silicone Aluminum	ISO 4624 with hydraulic devices only / con solo dispositivo idraulico	One per system, per day (or lot) of production / Uno per ogni sistema, per giorno (o lotto) di produzione	Min. 5 MPa, unless otherwise declared by Product Data Sheet / Minimo 5 MPa se non diversamente dichiarato dal produttore	Yes / Si
Adhesion Test (X cross test) N.A. for Silicone Aluminum	ISO 2409	One per system, per day (or lot) of production / Uno per ogni sistema, per giorno (o lotto) di produzione	Class 2 Max is Required	N.A.

	CERTIFICATO CONTROLLO VERNICIATURA Painting Test Report	**QA 7.5 ALL. 6 REV. 00**

C.A.M.P.I. S.r.l. – CERTIFICATE N°24003/xx

PROCEDURA APPLICATA / *Applied Procedure:* Procedure ITP n° _____ step __ **PAINTING DATE:** Sandblasting: 1° coat: 2° coat: Final coat: Example	**DESCRIZIONE**/*Description:* Steam Condenser **N° DI Commessa** /*Job n°* : **N° PEZZI:** No. Of PCS: **N° MATRICOLA** /*Serial No.:*

-Visual check for defects as per ISO 8501-3, grade P2: -Contamination visual check: -Blotter test as per ASTM D4285: Sabbiatura : (ISO 8503-1) *Sandblasting:* (ASTM D4417 Method C) Date _____ Start _____ Finish _____	**Valori richiesti** **Requested values** **SA 2½** **Rz. 40÷75 µm**	**Valori rilevato** **Results** **AVR= ___ µm** **Satisfactory**
Cleanliness (ISO 8501-1):	**SA 2½**	
Dust Level Test (ISO 8502-3):	**Max Rating 2**	
primer (Asciutto/Dry): ( ) Batch: "A" _____; "B" _____ Date:_____ *Start:* ____ **T.** ____°C; **RH** ___%; **Dp.** ____°C; **Ts.** ____°C; *Finish:* ____ **T.** ____°C; **RH** ___%; **Dp.** ____°C; **Ts.** ____°C;	**NDFT Thickness as per ISO 19840** **____ µm** **Visual check**	**AVR= ____ µm** **Minimum DFT value** **____ µm** **Satisfactory**
MEK test (ASTM D4752), only for Etil Silicate Inorganic Zinc:	**Rating 5**	**N.A.**
Intermedio/Intermediate (Asciutto/Dry): ( ) Batch: "A" _____; "B" _____ Date:_____ *Start:* ____ **T.** ____°C; **RH** ___%; **Dp.** ____°C; **Ts.** ____°C; *Finish:* ____ **T.** ____°C; **RH** ___%; **Dp.** ____°C; **Ts.** ____°C;	**NDFT Thickness as per ISO 19840** **____ µm** **Visual check**	**AVR= ____ µm** **Minimum DFT value** **____ µm** **Satisfactory**
Finale / Final Layer (Asciutto/Dry): ( ) Batch: "A" _____; "B" _____ Date:_____ *Start:* ____ **T.** ____°C; **RH** ___%; **Dp.** ____°C; **Ts.** ____°C; *Finish:* ____ **T.** ____°C; **RH** ___%; **Dp.** ____°C; **Ts.** ____°C;	**NDFT Thickness as per ISO 19840** **____ µm** **Visual check**	**AVR= ____ µm** **Minimum DFT value** **____ µm** **Satisfactory**
Spessore Totale: *Total Thickness:*	**____ µm**	**AVR=____ µm**
Thickness Gauge used:		

CONFORME/CONFORMING **NON CONFORME**/NOT CONFORMING
SATISFACTORY

NOTE: Pull-Off Adhesion test according to:

DATE:		**C.A.M.P.I.**	**INSPECTOR**	**CUSTOMER**

SABBIE INDUSTRIALI S.R.L.
MINERALI PER INDUSTRIA, EDILIZIA, SPORT & TEMPO LIBERO

TECHINCAL DATA SHEET

GARNET

Specific minerals belonging to the group of garnets compose it.
They are mainly orthosilicates of which Almandine (97÷ 98%) is the variety most appreciate for abrasiveness.

THE PRODUCT DOES NOT CONTAIN SILICA FREE.

Applications:
This mineral is especially suitable for product cutting with water jet.
It is also widely used in metal and product sandblasting, when it is not possible the application of steel abrasive and where it is necessary to guarantee any kind of dust and/or damaging elements for health.
An additional use is also in water purification and in abrasives in general.

Extraction and production: The most modern methods of extraction, washing and selection guarantee the absence of impertinent and/or damaging elements for the specific use of this product.

Chemical elements:
Al2O3: 21%; Fe2O3: 31%; SiO2: 35%; MgO: 8%; CaO: 1,5%; MnO 1%; TiO2: 1%;
Fe2O3 and SiO2 are combined chemically and they do not release any kind of substance.

Common physical features: Crushed grain, red-brown with a high abrasive power.
Mosh hardness: 8 Absolute specific weight: 4, 1 Ton/mc Partial specific weight: 2,4 Ton/mc.
Solubility in HCL < 1% Conductivity: < 100 M/cm Sol. CL < 25 ppm

Packaging:
25 Kg Bags in 1.000 Kg bags
1.000 Kg big bags

Grain sizes available

Classification	Size range	Main applications
12 ÷ 24	**mm 0.40 ÷ 1.40**	**Sandblasting, water purification, abrasives**
20 ÷ 40	**mm 0.30 ÷ 0.85**	**Sandblasting, water purification, abrasives**
30 ÷ 60	**mm 0.15 ÷ 0.60**	**Sandblasting, abrasives**
60	**mm 0.18 ÷ 0.50**	**Water jet, abrasives, sandblasting**
80	**mm 0.18 ÷ 0.40**	**Water jet, abrasives, sandblasting**
120	**mm 0.10 ÷ 0.20**	**Faint sandblasting, abrasives**

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Barrier 80 S

Product description

This is a two component ceramically reinforced polyamide cured zinc rich epoxy coating. It is a fast drying, high solids, high zinc dust containing product. It conforms to the compositional requirements of SSPC paint 20, level 2 and ISO 12944-5. It provides very good corrosion protection as part of a complete coating system. To be used as primer in atmospheric environments. Suitable for carbon steel, repair of inorganic zinc silicate coating and damaged galvanized steel substrates. This product complies with ASTM D520 type II zinc dust.

Typical use

Protective:
Suitable for structural steel and piping exposed in corrosivity categories up to C5VH (ISO 12944-2). Recommended for offshore environments, refineries, power plants, bridges, buildings, mining equipment and general structural steel. Specially designed as a primer for coating systems where extended durability is required.

Approvals and certificates

Tested in accordance with ISO 12944-6, high expected durability in corrosivity category C5H and C5VH

Additional certificates and approvals may be available on request.

Colors

grey

Product data

Property	Test/Standard	Description
Solids by volume	ISO 3233	67 ± 2 %
Gloss level (GU 60 °)	ISO 2813	matt (0-35)
Flash point	ISO 3679 Method 1	77 °F (25 °C)
Density	calculated	2.3 kg/l

The provided data is typical for factory produced products, subject to slight variation depending on color.
All data is valid for mixed paint.
Gloss description: According to Jotun Performance Coatings' definition.

Film thickness per coat

Typical recommended specification range

Dry film thickness	2.4 mils (60 µm)	- 4 mils (100 µm)
Wet film thickness	4 mils (90 µm)	- 6 mils (150 µm)

This technical data sheet supersedes those previously issued.
The Technical Data Sheet (TDS) is recommended to be read in conjunction with the Safety Data Sheet (SDS) and the Application Guide (AG) for this product. For your nearest local Jotun office, please visit our website at www.jotun.com

Theoretical spreading rate 450 ft²/gal (11.1 m²/l) - 270 ft²/gal (6.7 m²/l)

This product can be applied up to 50 % higher than maximum specified film thickness without loss of technical properties.

Surface preparation

To secure lasting adhesion to the subsequent product all surfaces shall be clean, dry and free from any contamination.

Surface preparation summary table

Substrate	Surface preparation	
	Minimum	Recommended
Carbon steel	St 3 (ISO 8501-1) or SSPC SP-3	Sa 2½ (ISO 8501-1) or NACE No. 2 / SSPC SP-10
Shop primed steel	Clean, dry and undamaged approved shop primer (ISO 12944-4 5.4)	Sweep blasted or alternatively blasted to Sa 2 (ISO 8501-1) or SP 6 / NACE No. 3 (SSPC-VIS 1) of at least 70 % of the surface.

Application

Application methods

The product can be applied by

Spray: Use airless spray.

Brush: Recommended for stripe coating and small areas. Care must be taken to achieve the specified dry film thickness.

Product mixing ratio (by volume)

Barrier 80 S Comp A	6 part(s)
Barrier 80 S Comp B	1 part(s)

Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 17 / Jotun Thinner No. 69

Jotun Thinner No. 17: for fast evaporation
Jotun Thinner No. 69: for slow evaporation, max 10%

It is recommended to use Jotun Thinner No. 69 when the ari temperature is >30ºC.
If the relative humidity is <30%, it is recommended to use Jotun Thinner No. 69 when the air temperature >25ºC.

Guiding data for airless spray

This technical data sheet supersedes those previously issued.
The Technical Data Sheet (TDS) is recommended to be read in conjunction with the Safety Data Sheet (SDS) and the Application Guide (AG) for this product. For your nearest local Jotun office, please visit our website at www.jotun.com

Nozzle tip (inch/1000):	15-21
Pressure at nozzle (minimum):	150 bar/2100 psi

Drying and Curing time

Temperatures:
-10°C = 14°F / -5°C = 23°F / 0°C = 32°F / 5°C = 41°F / 10°C = 50°F / 15°C = 59°F / 23°C = 73°F / 35°C = 95°F / 40°C = 104°F / 100°C = 212°F

Substrate temperature	-5 °C	0 °C	5 °C	10 °C	23 °C	40 °C
Surface (touch) dry	1 h	45 min	30 min	20 min	8 min	4 min
Walk-on-dry	16 h	8 h	4 h	3 h	2 h	40 min
Dried to over coat, minimum	16 h	8 h	4 h	3 h	2 h	40 min
Dried/cured for service	21 d	14 d	10 d	7 d	5 d	3 d

For maximum overcoating intervals, refer to the Application Guide (AG) for this product.

Drying and curing times are determined under controlled temperatures and relative humidity below 85 %, and at average of the DFT range for the product.

Surface (touch) dry: The state of drying when slight pressure with a finger does not leave an imprint or reveal tackiness.

Walk-on-dry: Minimum time before the coating can tolerate normal foot traffic without permanent marks, imprints or other physical damage.

Dry to over coat, minimum: The recommended shortest time before the next coat can be applied.

Dried/cured for service: Minimum time before the coating can be permanently exposed to the intended environment/medium.

Induction time and Pot life

Temperatures: 15°C = 59°F / 23°C = 73°F

Paint temperature	23 °C
Pot life	6 h

Heat resistance

	Temperature	
	Continuous	Peak
Dry, atmospheric	120 °C	140 °C

Peak temperature duration max. 1 hour.

The temperatures listed relate to retention of protective properties. Aesthetic properties may suffer at these temperatures.

This technical data sheet supersedes those previously issued.
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Product compatibility

Depending on the actual exposure of the coating system, various primers and topcoats can be used in combination with this product. Some examples are shown below. Contact Jotun for specific system recommendation.

Previous coat:	inorganic zinc shop primer
Subsequent coat:	epoxy, epoxy mastic, polyurethane

Packaging (typical)

	Volume (liters)	Size of containers (liters)
Barrier 80 S Comp A	7.5	10
Barrier 80 S Comp B	1.25	3

1 l = 0.26 gal
3 l = 0.79 gal
2.25 l = 0.59 gal
6.75 l = 1.78 gal

The volume stated is for factory made colors. Note that local variants in pack size and filled volumes can vary due to local regulations.

Storage

The product must be stored in accordance with national regulations. Keep the containers in a dry, cool, well ventilated space and away from sources of heat and ignition. Containers must be kept tightly closed. Handle with care.

Shelf life at 73°F (23 °C)

Barrier 80 S Comp A	24 month(s)
Barrier 80 S Comp B	24 month(s)

In some markets commercial shelf life can be dictated shorter by local legislation. The above is minimum shelf life, thereafter the paint quality is subject to re-inspection.

Note

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Health and safety

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Please observe the precautionary notices displayed on the container. Use under well ventilated conditions. Do not inhale spray mist. Avoid skin contact. Spillage on the skin should immediately be removed with suitable cleanser, soap and water. Eyes should be well flushed with water and medical attention sought immediately.

Color variation

When applicable, products primarily meant for use as primers or antifoulings may have slight color variations from batch to batch. Such products and epoxy based products used as a finish coat may chalk when exposed to sunlight and weathering.

Color and gloss retention on topcoats/finish coats may vary depending on type of color, exposure environment such as temperature, UV intensity etc., application quality and generic type of paint. Contact your local Jotun office for further information.

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Penguard Express MIO

Product description

This is a two component amine cured epoxy coating. It is a fast drying, micaceous iron oxide (MIO) pigmented, high solids, high build product. Specially designed for new construction where short dry to handle and over coating times are required. Can be used as primer, mid coat, finish coat or as single coat system in atmospheric environments. Suitable for properly prepared carbon steel, stainless steel, aluminum and concrete substrates. It can be applied at sub zero surface temperatures.

Typical use

Suitable for structural steel and piping to be exposed to highly corrosive environments, C5I or C5M (ISO 12944-2). Recommended for offshore environments, refineries, power plants, bridges, buildings and mining equipment.

Other variants available

Penguard Express
Penguard Express ZP
Penguard Express CF

Refer to separate TDS for each variant.

Colors

grey, red

Product data

Property	Test/Standard	Description
Solids by volume	ISO 3233	74 ± 2 %
Gloss level (GU 60 °)	ISO 2813	matt (0-35)
Flash point	ISO 3679 Method 1	90 °F (32 °C)
Density	calculated	1.6 kg/l
VOC-US/Hong Kong	US EPA method 24 (tested) (CARB(SCM)2007, SCAQMD rule 1113, Hong Kong)	2.14 lbs/gal

The provided data is typical for factory produced products, subject to slight variation depending on color.
All data is valid for mixed paint.
Gloss description: According to Jotun Performance Coatings' definition.

Film thickness per coat

Typical recommended specification range

Dry film thickness	3 mils (75 µm)	- 10 mils (250 µm)
Wet film thickness	4 mils (100 µm)	- 13 mils (340 µm)
Theoretical spreading rate	400 ft²/gal (9.9 m²/l)	- 120 ft²/gal (3 m²/l)

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Surface preparation

To secure lasting adhesion to the subsequent product all surfaces shall be clean, dry and free from any contamination.

Surface preparation summary table

Substrate	Surface preparation	
	Minimum	Recommended
Carbon steel	St 2 (ISO 8501-1) or SSPC SP-2	Sa 2½ (ISO 8501-1) or NACE No. 2 / SSPC SP-10
Galvanized steel	Cleanliness corresponding to description of Sa 1 (ISO 8501-1) or NACE No. 4 / SSPC SP-7	Cleanliness corresponding to description of Sa 1 (ISO 8501-1) or NACE No. 4 / SSPC SP-7
Aluminum	Cleanliness corresponding to description of Sa 1 (ISO 8501-1) or NACE No. 4 / SSPC SP-7	Cleanliness corresponding to description of Sa 1 (ISO 8501-1) or NACE No. 4 / SSPC SP-7
Shop primed steel	Clean, dry and undamaged approved shop primer (ISO 12944-4 5.4)	Clean, dry and undamaged approved shop primer (ISO 12944-4 5.4)
Coated surfaces	Clean, dry and undamaged compatible coating	Clean, dry and undamaged compatible coating
Concrete	Low pressure water washing to a rough, clean, dry and laitance free surface.	Minimum 4 weeks curing. Moisture content maximum 5 %. Low pressure water washing to a rough, clean, dry and laitance free surface.

Optimum performance, including adhesion, corrosion protection, heat resistance and chemical resistance is achieved with recommended surface preparation.

Application

Application methods

The product can be applied by

Spray:	Use airless spray.
Brush:	Recommended for stripe coating and small areas. Care must be taken to achieve the specified dry film thickness.

Product mixing ratio (by volume)

Penguard Express MIO Comp A	4 part(s)
Penguard Express Comp B	1 part(s)

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Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 17

Guiding data for airless spray

Nozzle tip (inch/1000): 13-23

Pressure at nozzle (minimum): 150 bar/2100 psi

Drying and Curing time

Temperatures:
-10°C = 14°F / -5°C = 23°F / 0°C = 32°F / 5°C = 41°F / 10°C = 50°F / 15°C = 59°F / 23°C = 73°F / 35°C = 95°F / 40°C = 104°F / 100°C = 212°F

Substrate temperature	-5 °C	0 °C	5 °C	10 °C	23 °C	40 °C
Surface (touch) dry	16h	11h	4h	2h	1h	30min
Walk-on-dry	38h	24h	10h	6h	3h	2h
Dried to over coat, minimum	24h	14h	8h	4h	2h	1h
Dried/cured for service		21d	13d	8d	4d	3d

For maximum overcoating intervals, refer to the Application Guide (AG) for this product.

Drying and curing times are determined under controlled temperatures and relative humidity below 85 %, and at average of the DFT range for the product.

Surface (touch) dry: The state of drying when slight pressure with a finger does not leave an imprint or reveal tackiness.

Walk-on-dry: Minimum time before the coating can tolerate normal foot traffic without permanent marks, imprints or other physical damage.

Dry to over coat, minimum: The recommended shortest time before the next coat can be applied.

Dried/cured for service: Minimum time before the coating can be permanently exposed to the intended environment/medium.

Induction time and Pot life

Temperatures: 15°C = 59°F / 23°C = 73°F

Paint temperature	23 °C
Pot life	2 h

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Heat resistance

	Temperature	
	Continuous	**Peak**
Dry, atmospheric	120 °C	140 °C

Peak temperature duration max. 1 hour.

The temperatures listed relate to retention of protective properties. Aesthetic properties may suffer at these temperatures.

Product compatibility

Depending on the actual exposure of the coating system, various primers and topcoats can be used in combination with this product. Some examples are shown below. Contact Jotun for specific system recommendation.

Previous coat:	inorganic zinc silicate shop primer, epoxy, epoxy mastic, zinc epoxy, zinc silicate, organic shop primer
Subsequent coat:	acrylic, epoxy, polyurethane, polysiloxane

Packaging (typical)

	Volume (liters)	**Size of containers (liters)**
Penguard Express MIO Comp A	4 / 16	5 / 20
Penguard Express Comp B	1 / 4	1 / 5

1 l = 0.26 gal
4 l = 1.06 gal
16 l = 4.23 gal

The volume stated is for factory made colors. Note that local variants in pack size and filled volumes can vary due to local regulations.

Storage

The product must be stored in accordance with national regulations. Keep the containers in a dry, cool, well ventilated space and away from sources of heat and ignition. Containers must be kept tightly closed. Handle with care.

Shelf life at 73°F (23 °C)

Penguard Express MIO Comp A	24 month(s)
Penguard Express Comp B	24 month(s)

In some markets commercial shelf life can be dictated shorter by local legislation. The above is minimum shelf life, thereafter the paint quality is subject to re-inspection.

This technical data sheet supersedes those previously issued.
The Technical Data Sheet (TDS) is recommended to be read in conjunction with the Safety Data Sheet (SDS) and the Application Guide (AG) for this product. For your nearest local Jotun office, please visit our website at www.jotun.com

Note

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Health and safety

Please observe the precautionary notices displayed on the container. Use under well ventilated conditions. Do not inhale spray mist. Avoid skin contact. Spillage on the skin should immediately be removed with suitable cleanser, soap and water. Eyes should be well flushed with water and medical attention sought immediately.

Color variation

When applicable, products primarily meant for use as primers or antifoulings may have slight color variations from batch to batch. Such products and epoxy based products used as a finish coat may chalk when exposed to sunlight and weathering.

Color and gloss retention on topcoats/finish coats may vary depending on type of color, exposure environment such as temperature, UV intensity etc., application quality and generic type of paint. Contact your local Jotun office for further information.

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Hardtop XP

Product description

This is a two component chemically curing aliphatic acrylic polyurethane coating. It has a glossy finish with very good gloss retention. It is a high solids product. The product has good application properties with low dry spray. To be used as topcoat in atmospheric environments.

Typical use

Marine:
Recommended for topside, deck and superstructure.

Protective:
Recommended for offshore environments, refineries, power plants, bridges and buildings. Suitable for a wide range of industrial structures. Used as a topcoat in pre-qualified NORSOK systems.

Approvals and certificates

This product contributes to the Green Buildings Standard credits. Please see section Green Building Standards.

NORSOK System 1, Rev.5
Grain, Newcastle Occupational Health
Food, Compliant with USA, FDA Title 21, Part 175.300 for dry solids

When used as part of an approved scheme, this material has the following certification:
- Low Flame Spread in accordance with EU Directive for Marine Equipment. Approved in accordance with parts 5 and 2 of Annex 1 of IMO 2010 FTP Code, or Parts 5 and 2 of Annex 1 of IMO FTPC when in compliance with IMO 2010 FTP Code Ch. 8

Consult your Jotun representative for details.

Additional certificates and approvals may be available on request.

Other variants available

Hardtop XP Alu
Hardtop XPL
Hardtop XPF (Winter grade version)

Refer to separate TDS for each variant.

Colours

according to colour card and Multicolor Industry tinting system (MCI)

Product data

Property	Test/Standard	Description
Solids by volume	ISO 3233	63 ± 2 %
Gloss level (GU 60 °)	ISO 2813	gloss (70-85)
Flash point	ISO 3679 Method 1	30 °C
Density	calculated	1.4 kg/l
VOC-US/Hong Kong	US EPA method 24 (tested) (CARB(SCM)2007, SCAQMD rule 1113, Hong Kong)	323 g/l

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VOC-EU	IED (2010/75/EU) (theoretical)	326 g/l
VOC-China	GB/T 23985-2009 (tested)	330 g/l
VOC-Korea	Korea Clean Air Conservation Act (tested) (Max. thinning ratio included)	385 g/l

The provided data is typical for factory produced products, subject to slight variation depending on colour.
All data is valid for mixed paint.
Gloss description: According to Jotun Performance Coatings' definition.

The VOC values refer to white colour.

Film thickness per coat

Typical recommended specification range

Dry film thickness	50	-	100	µm
Wet film thickness	80	-	160	µm
Theoretical spreading rate	12.6	-	6.3	m²/l

Bright colours may need film thickness in the high end of the recommended specification range to achieve opacity.

Special effect colours may have diverging specification range. Refer to the Application Guide (AG) for additional information or contact your nearest Jotun office.

Surface preparation

To secure lasting adhesion to the subsequent product all surfaces shall be clean, dry and free from any contamination.

Surface preparation summary table

	Surface preparation	
Substrate	**Minimum**	**Recommended**
Coated surfaces	Clean, dry and undamaged compatible coating	Clean, dry and undamaged compatible coating

Application

Application methods

The product can be applied by

Spray:	Use air spray or airless spray.
Brush:	Recommended for stripe coating and small areas. Care must be taken to achieve the specified dry film thickness.
Roller:	May be used. Care must be taken to achieve the specified dry film thickness.

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The Technical Data Sheet (TDS) is recommended to be read in conjunction with the Safety Data Sheet (SDS) and the Application Guide (AG) for this product. For your nearest local Jotun office, please visit our website at www.jotun.com

Product mixing ratio (by volume)

Hardtop XP Comp A	10 part(s)
Hardtop XP Comp B	1 part(s)

Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 10 / Jotun Thinner No. 26

Jotun Thinner No. 26 is supplied and used in USA due to legislation.

Thinning is not normally required. Consult the local representative for advice during application in extreme conditions. Do not thin more than allowed by local environmental legislation.

Guiding data for airless spray

Nozzle tip (inch/1000):	13-19
Pressure at nozzle (minimum):	150 bar/2100 psi

Guiding data for air spray

Nozzle tip:	HVLP: 11-19 (inch/1000) / Pressure pot: 1.1-1.9 (mm)
Pressure at nozzle (minimum):	HVLP: 2.1 bar/30 psi / Pressure pot: 2.1 bar/30 psi

Drying and Curing time

Substrate temperature	5 °C	10 °C	23 °C	40 °C
Surface (touch) dry	16 h	6 h	3.5 h	2 h
Walk-on-dry	24 h	14 h	7 h	4 h
Dry to over coat, minimum	24 h	14 h	7 h	4 h
Dried/cured for service	21 d	14 d	7 d	3 d

For maximum overcoating intervals, refer to the Application Guide (AG) for this product.

Drying and curing times are determined under controlled temperatures and relative humidity below 85 %, and at average of the DFT range for the product.

Surface (touch) dry: The state of drying when slight pressure with a finger does not leave an imprint or reveal tackiness.

Walk-on-dry: Minimum time before the coating can tolerate normal foot traffic without permanent marks, imprints or other physical damage.

Dry to over coat, minimum: The recommended shortest time before the next coat can be applied.

Dried/cured for service: Minimum time before the coating can be permanently exposed to the intended environment/medium.

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Induction time and Pot life

Paint temperature	23 °C	40 °C
Pot life	1.5 h	50 min

Heat resistance

	Temperature	
	Continuous	Peak
Dry, atmospheric	120 °C	140 °C

Peak temperature duration max. 1 hour.

The temperatures listed relate to retention of protective properties. Aesthetic properties may suffer at these temperatures.

Product compatibility

Depending on the actual exposure of the coating system, various primers and topcoats can be used in combination with this product. Some examples are shown below. Contact Jotun for specific system recommendation.

Previous coat: epoxy, zinc epoxy, epoxy mastic, polyurethane

Packaging (typical)

	Volume (litres)	Size of containers (litres)
Hardtop XP Comp A	4.55 / 18.2	5 / 20
Hardtop XP Comp B	0.45 / 1.8	1 / 3

The volume stated is for factory made colours. Note that local variants in pack size and filled volumes can vary due to local regulations.

Storage

The product must be stored in accordance with national regulations. Keep the containers in a dry, cool, well ventilated space and away from sources of heat and ignition. Containers must be kept tightly closed. Handle with care.

Shelf life at 23 °C

Hardtop XP Comp A	48 month(s)
Hardtop XP Comp B	48 month(s)

In some markets commercial shelf life can be dictated shorter by local legislation. The above is minimum shelf life, thereafter the paint quality is subject to re-inspection.

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Green Building Standards

This product contributes to Green Building Standard credits by meeting the following specific requirements:

LEED®v4 (2013)
MR credit: Building product disclosure and optimization
- Material Ingredients, Option 2: Material Ingredient Optimization, International Alternative Compliance Path - REACH optimization: Fully inventoried chemical ingredients to 100 ppm and not containing substances on the REACH Authorization list – Annex XIV, the Restriction list – Annex XVII and the SVHC candidate list.
- Environmental Product Declarations. Product-specific Type III EPD (ISO 14025;21930, EN 15804).

BREEAM® International (2016)
- Mat 01: Product-specific Type III EPD (ISO 14025;21930, EN 15804).

BREEAM® International (2013)
- Hea 02: VOC content for Two-pack performance Coatings SB (500 g/l) (EU Directive 2004/42/CE).

The EPDs are available at www.epd-norge.no

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Colour variation

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Colour and gloss retention on topcoats/finish coats may vary depending on type of colour, exposure environment such as temperature, UV intensity etc., application quality and generic type of paint. Contact your local Jotun office for further information.

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