

Jotaguard 660

Product description

This is a two component polyamine cured pure epoxy coating. It is a fast drying, surface tolerant, very abrasion and impact resistant, high solids, high build product. Specially designed as a high performance coating for cargo holds. Can be used as primer or finish coat in atmospheric and immersed environments. Suitable for properly prepared carbon steel and shop primed steel substrates. It can be applied at sub zero surface temperatures. Discoloration may be observed after deballasting. This will however not affect the protective properties.

Scope

The Application Guide offers product details and recommended practices for the use of the product.

The data and information provided are not definite requirements. They are guidelines to assist in smooth and safe use, and optimum service of the product. Adherence to the guidelines does not relieve the applicator of responsibility for ensuring that the work meets specification requirements. Jotun's liability is in accordance with general product liability rules.

The Application Guide (AG) must be read in conjunction with the relevant specification, Technical Data Sheet (TDS) and Safety Data Sheet (SDS) for all the products used as part of the coating system.

Referred standards

Reference is generally made to ISO Standards. When using standards from other regions it is recommended to reference only one corresponding standard for the substrate being treated.

Surface preparation

The required quality of surface preparation can vary depending on the area of use, expected durability and if applicable, project specification.

When preparing new surfaces, maintaining already coated surfaces or aged coatings it is necessary to remove all contamination that can interfere with coating adhesion, and prepare a sound substrate for the subsequent product. Inspect the surface for hydrocarbon and other contamination and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area using fresh water.

Paint solvents (thinners) shall not be used for general degreasing or preparation of the surface for painting due to the risk of spreading dissolved hydrocarbon contamination. Paint thinners can be used to treat small localized areas of contamination such as marks from marker pens. Use clean, white cotton cloths that are turned and replaced often. Do not bundle used solvent saturated cloths. Place used cloths into water.

When preparing aged coating in dry-docking situations, the entire surface is to be carefully high pressure fresh water washed with minimum 220 bar pressure. Any contamination like oil or/and grease is to be carefully removed with suitable detergent, and hosed down with fresh water. Damaged and corroded areas to be prepared to minimum St 2 (ISO 8501-1), but preferably abrasive blasted to Sa 2. If spot blasting is carried out, feathering of the existing coating is necessary to ensure good adhesion.

Process sequence

Surface preparation and coating should normally be commenced only after all welding, degreasing, removal of sharp edges, weld spatter and treatment of welds is complete. It is important that all hot work is completed before coating commences.

Soluble salts removal

Soluble salts have a negative impact on the coating systems performance, especially when immersed. Jotun's general recommendations for maximum soluble salts (sampled and measured as per ISO 8502-6 and -9) content on a surface are:

For areas exposed to (ISO 12944-2):

C1-C4: 200 mg/m²

C5M or C5I: 100 mg/m²

Im1-Im3: 80 mg/m²

Carbon steel

Initial rust grade

The steel shall preferably be Rust Grade A or B (ISO 8501-1). It is technically possible to apply the coating to rust grades C and D, but it is practically challenging to ensure specified film thickness on such a rough surface, hence risk of reduced lifetime of the coating system. When steel of Rust Grade C or D is coated, the frequency of inspection and testing should be increased. For steel with Rust Grades C or D, contact your nearest Jotun office for advice.

Metal finishing

For areas in corrosivity category C1 to C4 (ISO 12944-2) all irregularities, burrs, slivers, slag and spatter on welds, sharp edges and corners shall conform to minimum grade P2 (ISO 8501-3) Table 1, or as specified. All edges shall have a rounded radius of minimum 2 mm subjected to three pass grinding or equally effective method.

For areas in corrosivity category C5 the requirement is conformance to grade P3 (ISO 8501-3) Table 1. Defective welds shall be replaced and treated to an acceptable finish before painting. Temporary welds and brackets shall be ground to a flat finish after removal from the parent metal.

Pitting repair

Pittings in steel can be difficult to cover fully with most coatings. In some areas it is practically feasible to use filler to fill pittings. This should then be done either after the initial surface preparation or after application of first coat.

Abrasive blast cleaning

Cleanliness

After pre-treatment is complete, the surface shall be dry abrasive blast cleaned to Sa 1 (ISO 8501-1) using abrasive media suitable to achieve a sharp and angular surface profile.

Surface profile

Recommended surface profile 30-85 µm, grade Fine to Medium G; Ry5 (ISO 8503-2).

Abrasive media quality

The selected abrasive must be compatible with both the surface to be blast cleaned and the specified coating system. The abrasive shall meet specifications as per relevant parts of ISO 11124 (Specification for metallic blast-cleaning abrasives), or ISO 11126 (Specification for non-metallic blast-cleaning abrasives). It should be sampled and tested as per relevant parts of ISO 11125 (metallic abrasives) or ISO 11127 (non-metallic abrasives). Dry storage of abrasive and shelter for blasting pots is necessary to prevent equipment becoming clogged with damp abrasive.

All abrasive blast media used should be new and not recirculated, with the exception of Steel Grit. If this is utilized the circulation process must include a cleaning process.

Compressed air quality

The supply of clean air to blasting pots must be secured to avoid contamination of abrasive and thereby of blast cleaned surfaces. Compressors must be fitted with sufficient traps for oil and water. It is also recommended to fit two water separators at the blasting machine to ensure a supply of moisture-free air to the abrasive chamber.

Dust contamination

At the completion of abrasive blasting the prepared surface shall be cleaned to remove residues of corrosion product and abrasive media and inspected for surface particulate contamination. Maximum contamination level is rating 2 (ISO 8502-3) as per Figure 1. Dust size no greater than class 2.

Hand and Power Tool Cleaning

Power tool cleaning

Surfaces to be coated shall be prepared by mechanical preparation methods to minimum St 2 (ISO 8501-1). Suitable methods are disc grinding, hand sanding or hand wire brushing. Ensure the surface is free from mill scale, residual corrosion, failed coating and is suitable for painting. Do not use power wire brushing due to the risk of polishing the surface. The surface should appear rough and mat. Overlapping zones to intact coating shall have all leading edges feathered back by sanding methods to remove all sharp leading edges and establish a smooth transition from the exposed substrate to the surrounding coating. Consecutive layers of coating shall be feathered to expose each layer and new coating shall always overlap to an abraded existing layer. Abrade intact coatings around the damaged areas for a minimum 100 mm to ensure a mat, rough surface profile, suitable for over coating.

Water jetting

High pressure water jetting surface preparation refers to ISO 8501-4, for substrates previously coated either with a full coating system (surface DC A, DC B, DC C) or shop primer (surface DP I and DP Z). The surface definition for existing coating (DC) refers to the degree of coating breakdown according to ISO 4628. It is important before considering hydro jetting, to ensure that the specified coating system is compatible with the existing coating system. High pressure water jetting does not remove mill scale or create surface roughness, and is only useful for surfaces with an initial roughness suitable for the subsequent coat. Optimum performance is achieved with preparation grade Wa 2½ (ISO 8501-4). Minimum preparation grade is Wa 2. For DP I and DP Z surface Wa1 is accepted. Maximum accepted grade of flash rust for any preparation is FR L (ISO 8501-4). Alternatively minimum approved preparation grade is SSPC-SP WJ-2/ NACE WJ-2, Very thorough cleaning. Maximum accepted flash rust grade is Light (L).

Galvanised steel

Abrasive blast cleaning

The galvanised finish shall be smooth as is consistent for a protective coating and shall have no sharp fins, sharp edges, dross or zinc ash on the surface. If present, remove by mechanical cleaning methods. After removal of excess zinc and surface defects the area to be coated shall be degreased to ISO 12944-5, Part 6.1.4 Alkaline Cleaning. The galvanised surface shall be dry abrasive brush off blast cleaned with the nozzle angle at 45-60° from perpendicular at reduced nozzle pressure to create a sharp and angular surface profile using approved non-metallic abrasive media. As a guide, a surface profile 25-55 µm, grade Fine G; Ry5 (ISO 8503-2) should be achieved.

Hand and Power Tool Cleaning

After removal of excess zinc and surface defects the area to be coated shall be degreased with an alkaline detergent, washed by Low-Pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard and the surface abraded using mechanical or hand sanding methods using non-metallic abrasives or bonded fibre abrasive pads to remove all polish and to impart a scratch pattern to the surface. Do not use high speed rotational sanders.

Water jetting

Inspect the surface for process residues, hydrocarbon contamination and zinc corrosion by-products. If present, remove with an alkaline detergent. Agitate the surface to activate the detergent and before it dries, wash the treated area by Low-Pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard using fresh water. Optimum performance is achieved with preparation to a grade corresponding to the description of Wa 2½. Minimum preparation grade is Wa 1.

Aluminium

Abrasive blast cleaning

After pre-treatment of welds, sharp edges, removal of weld spatter and other surface contamination the surface shall be degreased using an alkaline detergent which is agitated with non-metallic brushes and removed by Low-pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard with fresh water. The surface shall be then dry abrasive blast cleaned with an approved non-metallic abrasive media to create a sharp and angular surface profile. As a guide, a surface profile between 25-55 µm, grade Fine G; Ry5 (ISO 8503-2) should be achieved.

Hand and Power Tool Cleaning

After pre-treatment of welds, sharp edges, removal of weld spatter and other surface contamination the surface shall be degreased using an alkaline detergent which is agitated with non-metallic brushes and then fresh water rinsed. The cleaned surface shall be then hand or machine abraded with non-metallic abrasives or bonded fibre machine or hand abrasive pads to remove all surface polish and to impart a scratch pattern to the surface. Do not use high speed rotational sanders.

Water jetting

Surfaces not contaminated with hydrocarbon deposits shall be cleaned by Low-pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard using fresh water to remove all dusts, chloride and non-visible contamination. Optimum performance is achieved with preparation to a grade corresponding to the description of Wa 2½. Minimum preparation grade is Wa 1.

Stainless steel

Abrasive blast cleaning

After pre-treatment of welds, sharp edges, removal of weld spatter and other surface contamination the surface shall be degreased with an alkaline detergent, washed by low-pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard and dry abrasive blast cleaned to create a sharp and angular surface profile using approved non-metallic abrasive media. As a guide, a surface profile between 45-75 µm, grade Fine, Ry5 (ISO 8503-2) should be achieved.

Hand and Power Tool Cleaning

After pre-treatment of welds, sharp edges, removal of weld spatter and other surface contamination the surface shall be degreased with an alkaline detergent, washed by low-pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard and hand or machine abraded with non-metallic abrasives or bonded fibre machine or hand abrasive pads to remove all polish and to impart a scratch pattern to the surface. Do not use high speed rotational sanders.

Water jetting

Inspect the surface for oil and hydrocarbon contamination and if present, remove with an alkaline detergent. Agitate the surface with non-metallic brushes to activate the detergent and before it dries, wash the treated area by low-pressure Water Cleaning (LPWC) to a grade corresponding to the description of Wa 1 (ISO 8501-4) or higher standard using fresh water to remove contamination and reduce salt concentration. Optimum performance is achieved with preparation to a grade corresponding to the description of Wa 2½. Minimum preparation grade is Wa 1. Maximum accepted grade of flash rust for any preparation is FR M (ISO 8501-4).

Chlorinated or chlorine containing solvents or detergents must not be used on stainless steel.

Concrete

Water cleaning

Low pressure water washing to a rough, clean, dry and laitance free surface.

Coated surfaces

Verification of existing coatings including primers

When the surface is an existing coating, verify with technical data sheet and application guide of the involved products, both over coatability and the given maximum over coating interval.

Over coating

High pressure water jetting surface preparation refers to ISO 8501-4, for substrates previously coated either with a full coating system (surface DC A, DC B, DC C) or shop primer (surface DP I and DP Z). The surface definition for existing coating (DC) refers to the degree of coating breakdown according to ISO 4628. It is important before considering hydro jetting, to ensure that the specified coating system is compatible with the existing coating system. High pressure water jetting does not remove mill scale or create surface roughness, and is only useful for surfaces with an initial roughness suitable for the subsequent coat.

Shop primers

Shop primers are accepted as temporary protection of steel plates and profiles. Refer to the technical data sheet for the generic types accepted. Certain standards require pre-approval of the shop primer as part of a complete system. Contact your nearest Jotun office for specific system compatibility. Before being overcoated the shop primer must be fully cured, clean, dust free, dry and undamaged. Inorganic zinc shop primers must be free of zinc salts (white rust).

Corroded and damaged areas must be blast cleaned to minimum Sa 1 (ISO 8501-1).

Application

Acceptable environmental conditions - before and during application

Before application, test the atmospheric conditions in the vicinity of the substrate for the dew formation according to ISO 8502-4.

Air temperature	-5 - 60	°C
Substrate temperature	-5 - 50	°C
Relative Humidity (RH)	10 - 85	%

The following restrictions must be observed:

- Only apply the coating when the substrate temperature is at least 3 °C (5 °F) above the dew point
- Do not apply the coating if the substrate is wet or likely to become wet
- Do not apply the coating if the weather is clearly deteriorating or unfavourable for application or curing
- Do not apply the coating in high wind conditions

Product mixing

Product mixing ratio (by volume)

Jotaguard 660 Comp A	3 part(s)
Jotaguard 660 Comp B	1 part(s)

Induction time and Pot life

Paint temperature	23 °C
Pot life	1 h

The temperature of base and curing agent is recommended to be 18 °C or higher when the paint is mixed.

Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 17

Application data

Airless Spray Equipment

Pump ratio (minimum) :	42:1
Pump output (litres/minute) :	1.9-3.1
Pressure at nozzle (minimum) :	200 bar/2900 psi
Nozzle tip (inch/1000) :	19-25
Filters (mesh) :	70

Several factors influence, and need to be observed to maintain the recommended pressure at nozzle. Among factors causing pressure drop are:

- long paint- and whip hoses
- low inner diameter hoses
- high paint viscosity
- large spray nozzle size
- inadequate air capacity from compressor
- wrong or clogged filters

Film thickness per coat

Typical recommended specification range

Dry film thickness	100 - 250	µm
Wet film thickness	140 - 345	µm
Theoretical spreading rate	7,2 - 2,9	m ² /l

Wet film thickness (WFT) measurement and calculation

To ensure correct film thickness, it is recommended to measure the wet film thickness continuously during application using a painter's wet film comb (ISO 2808 Method 1A). Use a wet-to-dry film calculation table to calculate the required wet film thickness per coat.

A wet to dry film thickness chart is available on the Jotun Web site.

Dry film thickness (DFT) measurement

When the coating has cured to hard dry state the dry film thickness can be checked to SSPC PA 2 or equivalent standard using statistical sampling to verify the actual dry film thickness. Measurement and control of the WFT and DFT on welds is done by measuring adjacent to and no further than 15 cm from the weld.

Ventilation

Sufficient ventilation is very important to ensure proper drying/curing of the film.

Stripe coating

The stripe coat sequence can be either of the following:

1. Surface preparation, stripe coat, full coat.
2. Surface preparation, full coat, stripe coat. This sequence can be used when a large substrate area has been prepared and leaving the substrate exposed for a long time while doing stripe coating could lead to surface deterioration. It is important to pay special attention to edges, openings, rear sides of stiffeners, scallops etc. and to apply a stripe coat to these areas where the spray fan may not reach or deposit an even film. When applying a stripe coat to bare metal use only a stiff, round stripe coating brush to ensure surface wetting and filling of pits in the surface. Stripe coating shall be of a different colour to the main primer coat and the topcoat colour and should be applied in an even film thickness, avoiding excessive brush marks in order to avoid entrapped air. Care should be taken to avoid excessive film thickness. Pay additional attention to pot life during application of stripe coats. Jotun recommends a minimum of one stripe coat. However, in extremely aggressive exposure conditions there may be good reason to specify two stripe coats.

Drying process

Do not attempt to speed up the curing process by blowing hot air on to the wet coating film as this may lead to skin drying/curing, entrapped solvents and consequently solvent blistering and inferior corrosion protection.

Coating loss

The consumption of paint should be controlled carefully, with thorough planning and a practical approach to reducing loss. Application of liquid coatings will result in some material loss. Understanding the ways that coating can be lost during the application process, and making appropriate changes, can help reducing material loss.

Some of the factors that can influence the loss of coating material are:

- type of spray gun/unit used
- air pressure used for airless pump or for atomization
- orifice size of the spray tip or nozzle
- fan width of the spray tip or nozzle
- the amount of thinner added
- the distance between spray gun and substrate
- the profile or surface roughness of the substrate. Higher profiles will lead to a higher "dead volume"
- the shape of the substrate target
- environmental conditions such as wind and air temperature

Drying and Curing time

Substrate temperature	-5 °C	0 °C	10 °C	23 °C	40 °C
Surface (touch) dry	22 h	14 h	5 h	2.5 h	1 h
Walk-on-dry	48 h	24 h	10 h	5 h	2 h
Dry to over coat, minimum	48 h	24 h	10 h	5 h	2 h
Dried/cured for service		32 d	14 d	7 d	4 d

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

NB: For this product the times for dried/cured for service is the minimum time before loading of the first cargo. For further advice please contact your local Jotun office.

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 shortest time allowed 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.

Maximum over coating intervals

Maximum time before thorough surface preparation is required. The surface must be clean and dry and suitable for over coating. Inspect the surface for chalking and other contamination and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area by low-pressure water jetting to Wa 1 (ISO 8501-4) using fresh water.

If maximum over coating interval is exceeded the surface should in addition be carefully roughened to ensure good inter coat adhesion.

Areas for atmospheric exposure

Average temperature during drying/curing	-5 °C	0 °C	10 °C	23 °C	40 °C
Itself	14 d	14 d	9 d	7 d	3 d
epoxy	14 d	14 d	9 d	7 d	3 d

Areas for immersed exposure

Average temperature during drying/curing	-5 °C	0 °C	10 °C	23 °C	40 °C
Itself	14 d	14 d	9 d	7 d	3 d
epoxy	14 d	14 d	9 d	7 d	3 d

Other conditions that can affect drying / curing / over coating

Repair of coating system

Spot blasting to minimum Sa 2 (ISO 8501-1) on corroded or damaged areas. Feather edges and roughen the overlap zone of surrounding intact coating. Careful sweep blasting of intact areas to roughen the surface.

Coating application, area:

1st coat: Jotaguard 660, as required

2nd coat: Jotaguard 660, full coat

Repair of damaged areas

Sags and runs can be caused by too high wet film thickness, too much thinner added or the spray gun used too close to the surface.

Repair by using a paint brush to smooth the film when still wet.

Sand down to a rough, even surface and re-coat if the coating is cured.

Orange peel can be caused by poor flow/levelling properties of the paint, poor atomization of the paint, thinner evaporating too fast or the spray gun held too close to the surface.

This can be rectified by abrading the surface and applying an additional coat after having adjusted the application properties or the application technique.

Dry spray can be caused by poor atomization of the paint, spray gun held too far from the surface, high air temperature, thinner evaporating too fast or coating applied in windy conditions.

Sand down to a rough even surface and re-coat.

Pinholes can be caused by entrapped solvents in the film or by incorrect application technique. Pinholes can be repaired as per procedure for damages to the coating layer or to the substrate, ref. above.

Coating film continuity

When required by the specification, the coating shall be tested for film discontinuity according to ASTM D 5162, test method A or B as appropriate for the actual dry film thickness.

All recorded defects shall be repaired by best practical means.

Quality assurance

The following information is the minimum required. The specification may have additional requirements.

- Confirm that all welding and other metal work has been completed before commencing pre-treatment and surface preparation
- Confirm that installed ventilation is balanced and has the capacity to deliver and maintain the RAQ
- Confirm that the required surface preparation standard has been achieved and is held prior to coating application
- Confirm that the climatic conditions are within recommendations in the AG, and are held during the application
- Confirm that the required number of stripe coats have been applied
- Confirm that each coat meets the DFT requirements in the specification
- Confirm that the coating has not been adversely affected by rain or other factors during curing

- Observe that adequate coverage has been achieved on corners, crevices, edges and surfaces where the spray gun cannot be positioned so that its spray impinges on the surface at 90° angle
- Observe that the coating is free from defects, discontinuities, insects, abrasive media and other contamination
- Observe that the coating is free from misses, sags, runs, wrinkles, fat edges, mud cracking, blistering, obvious pinholes, excessive dry spray, heavy brush marks and excessive film build
- Observe that the uniformity and colour are satisfactory

All noted defects shall be fully repaired to conform to the coating specification.

Caution

This product is for professional use only. The applicators and operators shall be trained, experienced and have the capability and equipment to mix/stir and apply the coatings correctly and according to Jotun's technical documentation. Applicators and operators shall use appropriate personal protection equipment when using this product. This guideline is given based on the current knowledge of the product. Any suggested deviation to suit the site conditions shall be forwarded to the responsible Jotun representative for approval before commencing the work.

For further advice please contact your local Jotun office.

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.

Accuracy of information

Always refer to and use the current (last issued) version of the TDS, SDS and if available, the AG for this product. Always refer to and use the current (last issued) version of all International and Local Authority Standards referred to in the TDS, AG & SDS for this product.

Colour variation

Some coatings used as the final coat may fade and chalk in time when exposed to sunlight and weathering effects. Coatings designed for high temperature service can undergo colour changes without affecting performance. Some slight colour variation can occur from batch to batch. When long term colour and gloss retention is required, please seek advice from your local Jotun office for assistance in selection of the most suitable top coat for the exposure conditions and durability requirements.

Reference to related documents

The Application Guide (AG) must be read in conjunction with the relevant specification, Technical Data Sheet (TDS) and Safety Data Sheet (SDS) for all the products used as part of the coating system.

When applicable, refer to the separate application procedure for Jotun products that are approved to classification societies such as PSPC, IMO etc.

Symbols and abbreviations

min = minutes

h = hours

d = days

°C = degree Celsius

° = unit of angle

µm = microns = micrometres

g/l = grams per litre

g/kg = grams per kilogram

m²/l = square metres per litre

mg/m² = milligrams per square metre

psi = unit of pressure, pounds/inch²

Bar = unit of pressure

RH = Relative humidity (% RH)

UV = Ultraviolet

TDS = Technical Data Sheet

AG = Application Guide

SDS = Safety Data Sheet

VOC = Volatile Organic Compound

MCI = Jotun Multi Colour Industry (tinted colour)

RAQ = Required air quantity

PPE = Personal Protective Equipment

EU = European Union

UK = United Kingdom

EPA = Environmental Protection Agency

ISO = International Standards Organisation

ASTM = American Society of Testing and Materials

AS/NZS = Australian/New Zealand Standards

NACE = National Association of Corrosion Engineers

DFT = dry film thickness
WFT = wet film thickness

SSPC = The Society for Protective Coatings
PSPC = Performance Standard for Protective Coatings
IMO = International Maritime Organization

Disclaimer

The information in this document is given to the best of Jotun's knowledge, based on laboratory testing and practical experience. Jotun's products are considered as semi-finished goods and as such, products are often used under conditions beyond Jotun's control. Jotun cannot guarantee anything but the quality of the product itself. Minor product variations may be implemented in order to comply with local requirements. Jotun reserves the right to change the given data without further notice.

Users should always consult Jotun for specific guidance on the general suitability of this product for their needs and specific application practices.

If there is any inconsistency between different language issues of this document, the English (United Kingdom) version will prevail.
