Product Data

HEMPADUR® 15400

BASE 15409 with CURING AGENT 95100

Description:
HEMPADUR 15400 is a two-component, amine adduct cured epoxy paint, which cures to a coating with excellent resistance to a wide range of chemicals as tabulated in separate CARGO PROTECTION GUIDE.

Recommended use:
As a tank lining.

Service temperatures:

	Dry exposure only:	In water (no temperature gradient):
Maximum:	140°C/284°F	50°C/122°F

Wet service temperatures, other liquids:
Consult the corresponding CARGO PROTECTION GUIDE.

Certificates/Approvals:
Complies with Section 175.300 of U.S. Federal Regulations in respect of carriage of dry and wet foodstuffs.
Approved by Lloyd's Register of Shipping as a recognized corrosion control coating.
Tested for non-contamination of grain cargo at the Newcastle Occupational Health, Great Britain.
Tested for non-toxicity of welding fumes by the Danish Welding Institute.

Availability:
Part of Group Assortment. Local availability subject to confirmation.

PHYSICAL CONSTANTS:

Colours/Shade nos:	White/10000 - Light red/50900
Finish:	Semi-flat
Volume solids, %:	48 ± 1
Theoretical spreading rate:	6.0 m^2/litre - 80 micron 241 sq.ft./US gallon - 3.2 mils
Flash point:	26°C/79°F
Specific gravity:	1.4 kg/litre - 11.7 lbs/US gallon
Surface dry:	3 (approx.) hrs at 20°C/68°F (ISO 1517)
Dry to touch:	8-10 hours at 20°C/68°F
Fully cured:	7 days at 20°C/68°F
V.O.C.:	465 g/litre - 3.9 lbs/US gallon

Shelf life:
1 year (25°C/77°F) from time of production. Depending on storage conditions, mechanical stirring may be necessary before usage.

The physical constants stated are nominal data according to the HEMPEL Group's approved formulas. They are subject to normal manufacturing tolerances and where stated, being standard deviation according to ISO 3534-1.

APPLICATION DETAILS:

Mixing ratio for 15400:	Base 15409 : Curing agent 95100 4 : 1 by volume	
Application method:	Airless spray	Brush (touch-up)
Thinner (max.vol.):	08450 (5%) *(See APPLICATION INSTRUCTIONS)*	08450 (5%)
Pot life:	2 hours (20°C/68°F)	4 hours (20°C/68°F)
Nozzle orifice:	.021"	
Nozzle pressure:	200 bar/2900 psi *(Airless spray data are indicative and subject to adjustment)*	
Cleaning of tools:	HEMPEL'S TOOL CLEANER 99610	
Indicated film thickness, dry:	80 micron/3.2 mils *(See REMARKS overleaf)*	
Indicated film thickness, wet:	175 micron/7 mils	
Recoat interval, min:	10 hours (20°C/68°F)	
Recoat interval, max:	21 days (20°C/68°F)	

Safety:
Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult HEMPEL Material Safety Data Sheets and follow all local or national safety regulations. Avoid inhalation, avoid contact with skin and eyes, and do not swallow. Take precautions against possible risks of fire or explosions as well as protection of the environment. Apply only in well ventilated areas.

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SURFACE PREPARATION:	Abrasive blasting to near white metal Sa 2½ with a surface profile corresponding to Rugotest No. 3, BN10, Keane-Tator Comparator, 3.0 G/S, or ISO Comparator, Rough Medium (G). (Please do also see Notes under REMARKS).
APPLICATION CONDITIONS:	Use only where application and curing can proceed at temperatures above 10°C/50°F. A special curing agent 95990 may be available for curing between 5°C/41°F and 10°C/50°F if required, see Application Instructions. The temperature of the surface and that of the paint itself must also be above this limit. Optimal spraying properties are obtained at paint temperatures of 15-25°C/59-76°F. Apply only on a dry and clean surface with a temperature above the dew point to avoid condensation. Relative humidity max. 80%, preferably 40-60%. In confined spaces provide adequate ventilation during application and drying.
PRECEDING COAT:	None, or as per specification.
SUBSEQUENT COAT:	None, or as per specification.
REMARKS:	**Certificates** are issued under the former quality number 1540.
Film thicknesses:	May be specified in another film thickness than indicated depending on purpose and area of use. This will alter spreading rate and may influence drying time and recoating interval. Normal range is 80-125 micron/3.2-5 mils.
Recoating:	If the maximum recoating interval is exceeded, roughening of the surface is necessary to ensure intercoat adhesion.
Curing:	Do not put tanks into service until the paint system is completely cured - consult the corresponding CARGO PROTECTION GUIDE and APPLICATION INSTRUCTIONS.
Notes:	This datasheet outlines the main guidelines and recommendations. For details the corresponding PAINTING SPECIFICATION must be consulted and strictly adhered to during execution of the work. The CARGO PROTECTION GUIDE and the corresponding PAINTING SPECIFICATION may be tailored to meet other conditions than stipulated above. Such adjustments may include the degree of surface preparation, conditions of application, dry film thickness, and recoating interval. **HEMPADUR 15400 is for professional use only.**
ISSUED BY:	HEMPEL A/S - 1540010000CO014

For product description refer to product data sheet

HEMPADUR® 15400

15400: BASE 15409 with CURING AGENT 95100
15402: BASE 15409 with CURING AGENT 95990

Scope:

These application instructions cover surface preparation, application equipment, and application of HEMPADUR 15400 as a tank coating.

The following are general rules, which may be supplemented with more detailed descriptions when needed, for instance for major newbuildings/new constructions or extensive repair jobs.

Steel work:

All welding seams must have a surface finish which ensures that the quality of the paint system will be maintained in all respects. Holes in weldings seams, undercuts, cracks, etc. should be avoided. If found, they must be remedied by welding and/or grinding.

All weld spatters must be removed.

All sharp edges must be removed or rounded off in such a way that the specified film thickness can be build-up on all surfaces. The radius of the rounding should be approximately 1-2 mm.

The steel must be of first class quality and should not have been allowed to rust more than corresponding to grade B of ISO 8501-1:2007. Any laminations must be removed.

All steel work (including welding, flame cutting, grinding) must be finished before the surface preparation starts.

Surface preparation:

Prior to abrasive blast cleaning of the steel, remove oil, grease, salts and other contamination with a suitable detergent followed by (high pressure) fresh water hosing. Alkali deposits on new welding seams as well as soap traces from pressure testing of tanks to be removed by fresh water and scrubbing with stiff brushes. Control for absence of contamination according to separate guidelines.

On repair jobs, a rough blasting to remove all loosely adhering materials may be required before degreasing/washing is carried out.

Old steel: Even after a very thorough tank cleanings, pits may typically contain contamination in the form of remnants of old cargoes as well as water soluble salts. For this reason, repeated detergent washing plus abrasive blasting may be necessary:

After the first blasting, a very thorough vacuum cleaning is carried out in order to see if any "cargo bleeding" occurs as well as controls for water soluble salts are made. Reference is made to separate instructions. Special care should be taken in evaluating pitted areas.

To obtain full chemical resistance according to the CARGO PROTECTION GUIDE, the steel surface must be abrasive blast cleaned according to ISO 8501-1: 2007, Sa 2½.

The resulting surface profile must be equivalent to Rugotest No. 3, min. BN 10, Keane-Tator Surface Comparator, G/S min. 3.0 or ISO 8503/1 rough MEDIUM (G).

Use steel grit, aluminium silicate or similar sharp-edged abrasives of a good quality free of foreign matters, soft particles, and the like. Control for possible contamination according to separate guidelines.

Steel grit with particle sizes of 0.2 - 1.2 mm or aluminium silicate of 0.4 - 1.8 mm will usually create the desired surface profile when the air pressure measured at the nozzle is 6 - 7 bar/85 -100 psi.

The compressed air must be dry and clean. The compressor must be fitted with suitable oil and water traps.

When the abrasive blasting is completed, remove residual grit and dust by vacuum cleaning. Abrasive particles not removed by vacuum cleaning are to be removed by brushing with clean brushes followed by vacuum cleaning.

The importance of systematic working must be stressed when blasting. Poorly blasted areas covered with dust are very difficult to locate during the blast inspection made after the rough cleaning.

Shopprimed and previously painted surfaces: Existing coating materials to be completely removed. Depending on the type of shopprimer and the requested chemical resistance, the shopprimer should be removed completely or partly. Reference is made to HEMPEL's CARGO PROTECTION GUIDE/tank coating specification.

Note: Degree of steelwork finish and surface preparation are more detailed described in HEMPEL's Technical Standard for Tank Coating Work.

Application equipment:

HEMPADUR 15400 is to be applied by airless spray equipment. Stripe coating and minor repairs can be carried out by brushing.

Airless spray equipment: A large pump is preferred, with a pump capacity of 8-12 litres/minute.

Pump ratio:	Min. 45:1
Nozzle orifice:	.018"-.021"
Nozzle pressure:	200 bar (2900 psi)
Hoses:	To avoid excessive loss of pressure in long hoses, hoses with an internal diameter of up to 0.5" can be used

(Spray data are indicative and subject to adjustment).

Thinning:

If required: max. 10% of THINNER 08450, possibly higher if tendency to dust-spray will require more thinning eg at higher temperatures. Thinning should only be at the required level to avoid possible risk of solvent entrapment.

Only add thinner to the mixed paint.

Cleaning of equipment:

The whole equipment to be cleaned thoroughly with HEMPEL'S TOOL CLEANER 99610 after use.

Mixing, pot life:

a. Mix the entire content of corresponding base and curing agent packings. If it is necessary to mix smaller portions, this must be done properly by either weighing base and curing agent in the prescribed weight ratio: 87 parts by weight of base and 13 parts by weight of curing agent or by volume: 4.0 parts by volume base and 1.0 parts by volume curing agent.

b. Stir the mixed paint thoroughly by means of a clean mechanical mixer until a homogeneous mixture is obtained.

c. **Allow the mixed paint to pre-react before application, see table below**.

d. Use all mixed paint before the pot life is exceeded. The pot life depends on the temperature of the paint as shown in table below (valid for a 20 litres can):

CURING AGENT 95100:

Temperature of mixed paint	(10°C/50°F[1])	15°C/59°F[1]	20°C/68°F	25°C/77°F	30°C/86°F[2]
Induction time, minutes	(30)	25	15	10	5
Pot life, hours, airless spray	(4)	3	2	1½	1
Pot life, hours, brush	6	5	4	3	2

1) At paint temperatures below 15°C/59°F the viscosity can be too high for airless spray application.

2) Temperatures at 30°C/86°F and above should be avoided due to an enhanced risk of dry-spray and poor film formation.

CURING AGENT 95990:

Temperature of mixed paint	(5°C/41°F[1])	(10°C/50°F[1])	15°C/59°F[1])
Induction time, minutes	(35)	(30)	25
Pot life, hours, airless	(3)	(2)	1½
spray	4	4	4
Pot life, hours, brush			

1) At paint temperatures below 15°C/59°F the viscosity can be too high for airless spray application.

Application procedure:

The first full coat is usually applied immediately after vacuum cleaning. The first stripe coat afterwards. The final dry film thickness of the three coat system must be between 240-500 micron.

The wet film thickness must be 175-200 micron and must be measured regularly.

Film-build/continuity: With this tank coating, it is of special importance that a continuous, pinhole-free paint film is obtained at application of each coat. An application technique must be adopted to ensure good film formation on **all** surfaces and **no** dust spray. It is very important to use nozzles of the correct size, ie not too big. Select small nozzles for spray application of complicated structures, while bigger nozzles may be used for regular surfaces. A proper, uniform distance of the spray gun to the surface, 30-50 cm, should be aimed at. To obtain good and steady atomising, the viscosity of the paint must be suitable and the spray equipment must be sufficient in output pressure and capacity. At high working temperatures, use of extra thinner may be necessary to avoid dust-spray.

The paint layer must be applied homogeneously and as close to the specification as possible. The consumption of paint must be controlled and heavy layers must be avoided because of the risk of sags and cracks and solvent retention.

Furthermore, great care must be taken to cover edges, openings, rear sides of stiffeners etc. Thus, on these areas a stripe coat will usually be necessary.

The finished coating must appear as a homogeneous film with a smooth surface and irregularities such as dust, dry spray, abrasives, must be remedied.

Note: In the case of old, pit-corroded steel, application of a diluted, extra first coat is recommended to obtain better "penetration" in the fine pits. For this purpose, it is relevant to dilute approximately 10%. Application by brush is recommended and film thickness so low that the surface is "saturated" only.

Stripe coating:

All places difficult to cover properly by spray application should be stripe coated twice by brushing. The first stripe coat is applied either before or after the first full coat. The second stripe coat is most typically applied after the second full coat. Which procedure to follow depends on the actual working conditions. A sprayed coat using small spray nozzles with a narrow angle may substitute the second brush-applied stripe coat, however, lightening holes and similar, plus possible undercuts and similar will still demand brush- applied stripe coating.

Micro climate:

The actual climate conditions at the substrate during application:

The minimum surface temperature is 10°C/50°F when using CURING AGENT 95100, 5°C/41°F when using CURING AGENT 95990.

The maximum surface temperature should preferably be below approximately 30°C/86°F. In a warm climate it is recommended to carry out application during night-time. Application at high temperatures, up to approximately 40°C/104°F, is possible, but extra care must be taken to avoid poor film formation and excessive spray dust. Extra thinning may also be necessary.

The steel temperature must be above the dew point. As a rule of thumb, a steel temperature which is 3°C/5°F above the dew point can be considered safe.

In confined spaces, supply an adequate amount of fresh air during application and drying to assist the evaporation of solvent.

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Drying and curing, ventilation:

In a dry film thickness of 80 micron, with a steel temperature of 20°C/68°F, a relative air humidity of maximum 80% and adequate ventilation, HEMPADUR 15400 will be dry to touch after 8-10 hours. For similar drying conditions, the paint film will accept light traffic after approximately 24 hours.

Correct film formation depends on an adequate ventilation during drying.

A good guideline for tank coating work is to ventilate to a calculated 10% of LEL during application and until the coating is dry.

One litre undiluted HEMPADUR 15400 gives off in total 123 litres solvent **vapour** until it is completely dry.

The lower explosive limit, LEL, is 0.5%.

To reach a common safety requirement of 10% LEL, the theoretical ventilation requirement is 250 m^3 per litre paint.

Because solvent vapours are heavier than atmospheric air, effective ventilation requires forced ventilation with exhaust from the lowest part of the tank.

During the following period until full curing a few air shifts per hour will suffice. Take actions to avoid "pockets" of stagnant air.

Please contact HEMPEL for further advice.

Actual safety precautions may require stronger ventilation.

Curing time:

Provided that adequate ventilation, recommended relative humidity, specified film thickness, and recommended minimum recoating interval are kept, the following curing times are valid:

CURING AGENT 95100:

Steel temperature	10°C/50°F	15°C/59°F	20°C/68°F	25°C/77°F	30°C/86°F	(35°C/95°F)*
Curing time	18 days	11 days	7 days	5 days	4 days	(3 days)

*Avoid application at elevated temperatures to avoid dry-spray and poor film formation.

CURING AGENT 95990:

Steel temperature	5°C/41°F	10°C/50°F	15°C/59°F
Curing time	25 days	18 days	11 days

Recoating intervals:

Provided observance of the above stated ventilation and relative humidity the following recoating intervals in relation to the (steel) temperature are valid:

CURING AGENT 95100:

Steel temperature	10°C/50°F	15°C/59°F	20°C/68°F	25°C/77°F	30°C/86°F	35°C/95°F
Minimum	30 hours	14 hours	10 hours	7 hours	5 hours	4 hours
Maximum	28 days	25 days	21 days	18 days	14 days	10 days

CURING AGENT 95990:

Steel temperature	5°C/41°F	10°C/50°F	15°C/59°F
Minimum	45 hours	30 hours	14 hours
Maximum	35 days	28 days	25 days

The maximum relative humidity before and between the coats should not exceed 80% and the steel temperature should always be above the dew point, in practice minimum 3°C/5°F above the dew point.

The maximum intervals assume that the film formation is of good quality and without dry spray and that no kind of surface contamination exists except contamination which can be removed completely by vacuum cleaning. Furthermore, the coating must not have been exposed to direct sunlight for more than maximum 2 days.

Conditions for paint application work:

Dry spray is not acceptable as this will reduce the protective characteristics of the paint and make later tank cleaning difficult. Dry spray can be avoided by using adequate staging, spraying equipment and methods.

Hold the spray gun at a right angle to and about 30-50 cm/1-1½ foot from the surface making even parallel passes at a rate to produce the specified wet film thickness as per specification.

Avoid dry spray (overspray creating excessive paint mist), e.g. by using a smaller fan angle, and the lowest possible pressure. A small fan angle should also be used, if spray application is used, for "stripe coating" of for instance reverse sides of stiffeners.
Each layer must be applied homogeneously and as near above the specification of 80 micron dry film thickness as possible. The consumption of paint must be controlled, and heavy layers must be avoided because of the risk of sagging, cracks and solvent retention.

Surface irregularities such as dry spray, sagging, exaggerated thickness or embedded dust or abrasives will have to be remedied.

If sandpapering between layers, for instance on the bottom, is needed, great care must be taken to avoid damage of otherwise intact surfaces. When using mechanical means only lightweight equipment should be used, orbital sander is recommended. Yet, avoid sandpapering on top of welds or irregularities or near to vertical surfaces.

The finished coating must appear as a homogeneous surface without pores, runners or contamination of any kind.

For the standard specification following applies to the dry film thickness:

The minimum dry film thickness is 240 micron; the maximum thickness to be aimed at is approximately 500 micron. The minimum dry film thickness is evaluated according to the "80-20" rule, i.e. no more than 20% of the total number of individual measurements must be lower than the minimum dry film thickness, and the lowest individual measurement must be at least 80% of the minimum dry film thickness, ie 192 micron. Dry film thickness control is not to be carried out within the first 24 hours after application of final coat (20°C, sufficient ventilation). The measurement must be carried out using an electromagnetic dry film thickness gauge calibrated with shims placed on a smooth steel substrate. The maximum dry film thickness can be evaluated according to the "80-20" rule.

Repairs:

It is of great importance that all damage to the coating is repaired.

Repair shall be started up as soon as possible. Repair of mountings for staging, etc. must take place in connection with the dismantling of the staging, the tempo of which shall be adjusted to the touch-up procedure.

It is important that the repaired areas, as well as the rest of the coated areas, are fully cured before the tank is taken into use or washed by the tank cleaning system.

The extent of damage to the coating can be evaluated by a sea water test. Wash the tanks with clean sea water by means of the tank cleaning machines until profiles and/or heating coils on tanktop is covered. Allow the water to stay for minimum 3 days, after which period the tank is emptied and cleaned with clean fresh water to remove salts.

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The repair process:

General: Before mechanical treatment is started, surfaces to be repaired have to be cleaned for any salts and other contamination.

Areas less than 5 x 5 cm.
The surface preparation can be executed by grinding to a clean rough metal surface, feathering edges of intact coating and slightly sanding the adjacent surface.

Clean and wash with HEMPEL'S THINNER 08450.

Touch-up by brush to full film thickness with minimum 4 coats of HEMPADUR 15400.

Areas up to 1 square metre
The surface preparation must be executed by vacuum blasting or open nozzle blasting so that the steel has a proper roughness and a cleanliness to Sa 2½-3 according to ISO 8501-1:2007. The overlapping zone must be sanded or sweep blasted to ensure a good adhesion of the new paint.

Clean and wash with HEMPEL'S THINNER 08450.

Touch-up by brush to full film thickness with minimum 4 coats or by spray 3 coats HEMPADUR 15400.

Areas more than 1 square metre or areas where several damaged spots are concentrated.
Treatment: Repeat the original specification.

Safety:

Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult HEMPEL Material Safety Data Sheets and follow all local or national safety regulations. Avoid inhalation, avoid contact with skin and eyes, and do not swallow. Take precautions against possible risks of fire or explosions as well as protection of the environment. Apply only in well ventilated areas.

ISSUED BY**:**

HEMPEL A/S - 15400100000CO014