

EXPLANATORY NOTES TO THE PRODUCT DATA SHEETS

The product data sheets comprise descriptions of the products, product data, and guidelines/recommendations for their use. The purpose is to contribute to the best possible results when using the products.

PRODUCT NAMES, QUALITY NUMBERS, AND SHADE NUMBERS.

PRODUCT NAMES:

Generally the proprietary name of a Hempel paint is a collective name denoting the group and the generic type to which it belongs, thus:

Physically drying:

HEMPATEX*	:	Chlorinated rubber, acrylic (solvent-borne)
HEMPANYL*	:	Vinyl, vinyl copolymer
HEMUCRYL*	:	Acrylic (water-borne)

Chemically curing:

HEMPALIN*	:	Alkyd, modified alkyd (oxidatively drying)
HEMPADUR*	:	Epoxy, modified epoxy (solvent-borne)
HEMUDUR*	:	Epoxy (water-borne)
HEMPATHANE*	:	Iso-cyanate, (polyurethane)
GALVOSIL*	:	Zinc silicate, modified zinc silicate

Note: Where a proprietary name is not used the product name is preceded by HEMPEL'S.

QUALITY NUMBERS:

Each Hempel product is identified by a 5-digit quality number. The first two digits relate to the principal function and the generic type. The third and fourth digits are serial numbers. The fifth digit identifies specific formulas with the same product, e.g. high temperature curing/low, medium temperature curing, conformity to local legislation. Usually an 0 indicates a corporate standard formula. Therefore, the first four digits define the end-user performance, ie the dried, cured paint material. The fifth digit usually relates to the conditions of application.

First digit	Function
0 - - - -	Clear varnish, thinner
1 - - - -	Primer for steel and other metals
2 - - - -	Primer for non-metallic substrates
3 - - - -	Paste product, high-solids material
4 - - - -	Intermediate coating, high-build coating used with/without primer and finishing coat
5 - - - -	Finishing coat
6 - - - -	Miscellaneous
7 - - - -	Antifouling paint
8 - - - -	Miscellaneous
9 - - - -	Miscellaneous

This Product Data Sheet supersedes those previously issued. For definition and scope, see explanatory notes to applicable Product Data Sheets.

Data, specifications, directions and recommendations given in this data sheet represent only test results or experience obtained under controlled or specially defined circumstances. Their accuracy, completeness or appropriateness under the actual conditions of any intended use of the Products herein must be determined exclusively by the Buyer and/or User. The Products are supplied and all technical assistance is given subject to HEMPEL'S GENERAL CONDITIONS OF SALES, DELIVERY AND SERVICE, unless otherwise expressly agreed in writing. The Manufacturer and Seller disclaim, and Buyer and/or User waive all claims involving, any liability, including but not limited to negligence, except as expressed in said GENERAL CONDITIONS for all results, injury or direct or consequential losses or damages arising from the use of the Products as recommended above, on the overleaf or otherwise. Product data are subject to change without notice and become void five years from the date of issue.

Issued by HEMPEL'S MARINE PAINTS A/S.

*This is a corporate trademark of the Hempel Group.

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Example:	HEMPATEX ALUMINIUM 16300:	1 - - -	Primer for steel
		- 6 - -	Physically drying
		- - 30 -	Serial number
		- - - 0	Standard formula

White	:	10000
Grey	:	10010-19980
Black	:	19990
Yellow, cream, buff	:	20010-29990
Blue, violet	:	30010-39990
Green	:	40010-49990
Red, orange, pink	:	50010-59990
Brown	:	60010-69990

A service temperature constantly near the maximum will result in a shorter lifetime of the specified paint system compared to the lifetime anticipated when operating at normal temperatures. If service temperatures are often fluctuating between normal temperatures and near maximum temperatures this will result in an additional decrease in the anticipated lifetime of the paint system ("accelerated ageing").

Most paints will change appearance when exposed to high temperatures, either by a direct change of colour or by losing gloss.

Approvals, certificates:

A list of official and semi-official certificates and approvals.

Other certificates and approvals than listed may be available from the nearest HEMPEL office.

Availability:

Delivery of certain products require notice in advance for logistic reasons. This is indicated by the expression "Subject to confirmation".

PHYSICAL CONSTANTS

Finish:

The appearance of the paint film after drying under optimum conditions, - given as high gloss (>90), glossy (60-90), semi-gloss (30-60), semi-flat (15-30), or flat (<15). All figures are in gloss units and according to ASTM D 523-67 (specular gloss, 60 degree geometry). The actual appearance will depend on the conditions during application and drying/curing.

Colours/shade nos:

See SHADE NUMBERS. Certain physical constants may vary from one colour to another.

Volume solids:

The Volume Solids (VS) figure expresses in percentage the ratio:

The stated figure has been determined as the ratio between dry and wet film thickness of the coating applied in the indicated thickness under laboratory conditions, where no paint loss has been encountered.

The method of determination follows the rules of ISO 3233/ASTM D 2697, yet by drying at 20°C/68°F and 60% relative humidity for 7 days instead of drying at higher temperatures.

Volume solids are usually slightly higher than the theoretical value, which is found by a calculation based on the paint composition taking specific gravity and solid content of each individual raw material into consideration.

Volume solids take into account that small amounts of solvents are usually retained, and that air may be entrapped in the dry paint film either in the form of vacuoles or as interstices in zinc silicates.

Volume solids are in better agreement with practical measurements of dry film thickness than the theoretical value.

Theoretical spreading rate:

The theoretical spreading rate of the paint in a given dry film thickness on a completely smooth surface is calculated as follows:

or

1mil is rounded off to 25 micron - the exact value is 25.4 micron

In the product data sheet the Theoretical spreading rate is stated for an indicated dry film thickness (dft) that is usually specified for the product. Some products may be specified in different dry film thicknesses for different purposes affecting the spreading rate accordingly. Theoretical spreading rate cannot be given for paint materials used for saturation of an absorbing substrate, wood, concrete, etc.

The Practical spreading rate is not given in the product data sheet as the variation is too great to be represented by one single figure.

The practical consumption is estimated by multiplying the theoretical consumption with a relevant Consumption Factor (CF).

The Consumption Factor cannot be stated in the product data sheet as the variation is too great to be represented by one single figure.

The variation in the Consumption Factor is largely attributed to the following:

- 1) Waviness of the surface to be coated and especially of the paint surface itself leads to a higher consumption in order to reach the specified minimum total thickness of the system.
- 2) Roughness of the substrate to be painted gives a "dead volume" to be filled up - or for shopprimers a "surface area ratio" greater than one.
- 3) Physical losses, such as left-overs in cans, pot-life exceedings, wind loss, loss during cleaning of equipment, etc.

The Practical spreading rate thus varies with method of application, skill of the painter, shape of the object to be painted, texture of the substrate, film thickness applied, and working conditions. It is therefore not possible to give a universally valid figure.

In any case it is not beneficial to stretch the paint as much as possible, but rather to try to obtain the specified thickness of the applied paint on the entire area.

Flash point:

The lowest temperature at which a liquid liberates sufficient vapour to form a mixture with the air near its surface which, if ignited, will make a small flash, but not catch fire.

The flash points of HEMPEL'S paints are measured according to the Setaflash method (closed cup). For two-component products flash points are normally given for the mixed products. The figures are given as a guidance with a view to local regulations for precautions against fire during use. Substantial changes owing to reformulation will be followed by the issue of a revised product data sheet.

Adding THINNER to a paint may change the flash point of the diluted material.

Specific gravity:

The weight in kilogramme per litre at 25°C/77°F. An equivalent figure is given in lbs per US gallon.

For two-component products the specific gravity is given for the mixed product.

Surface dry:

Drying time tested according to ISO 1517. Records the time to elapse before dust will not stick onto the painted surface.

Dry to touch:

The drying time in the product data sheet is "dry to touch" unless otherwise indicated.

For shopprimers the more relevant figure for "dry to handle" is given.

The drying times refer to a temperature of 20°C/68°F with adequate ventilation.

"Dry to touch": A slight pressure with a finger does not leave a mark or feel sticky.

"Dry to handle": The paint surface is sufficiently hardened to be handled with care without coming off/being damaged.

The drying process until "dry to touch" is - for solvent (or water) containing paints - first and foremost dependent on ventilation. Furthermore it depends on the temperature and on the film thickness of each coat applied.

For physically drying paints the drying time is also influenced by the number of coats and the total film thickness of the system.

Fully cured:

The curing time is given for two-component products at 20°C/68°F. The curing is accelerated at higher temperatures and retarded at lower temperatures. For some products the curing times at different temperatures are given as a table in the product data sheet. For products where the curing time is given at 20°C/68°F only, the following rough rule of thumb can be utilized:

The curing time is halved at an increase in temperature of 10°C/18°F, and doubled at a decrease in temperature of 10°C/18°F.

Curing will stop almost completely below the temperature stated under application conditions as the lowest temperature at which the paint should be applied.

V.O.C.:

The calculated weight of volatile organic content in gramme per litre. An equivalent figure is given in lbs per US gallon.

Alternatively, VOC can be indicated by a measured value.

For water-borne paints, two VOC figures are indicated:

1. VOC calculated on total wet paint.
2. VOC calculated omitting the water content in the wet paint (according to ASTM D 3960).

Shelf life:

The time the product will keep in good condition when stored under cover in original, sealed containers under normal storage conditions. Shelf life is indicated only if it is one year or less at 20°C/68°F. It will usually decrease at higher temperatures.

If no specific limitation is given, a paint should not be stored for more than one year from the date of invoice. This interval has been chosen as a practical guideline.

APPLICATION DETAILS

Mixing ratio:

Two-component, chemically curing products are supplied as BASE and CURING AGENT in the correct mixing ratio. The mixing ratio must be strictly adhered to, also when sub-dividing. Add the CURING AGENT to the BASE 30 minutes before use (at 20°C/68°F), unless the pot life is (very) short, and stir well.

It is very important for two component products that the prescribed amount of CURING AGENT is added to the BASE. In order to ensure this the indicated thinner may in most cases beneficially be used to flush the CURING AGENT can. Once the material has been mixed the curing will proceed. Therefore, only the quantity needed within the pot life of the mixture should be mixed at a time.

Application method:

Gives the possible or recommended method(s) of application. As a general rule, the first coat of a rust-preventing primer should be applied by brush or airless spray to obtain best possible wetting and penetration into the substrate.

Application by brush or roller usually demands more coats applied to achieve the specified film thickness than application by spray equipment.

Thinner (max.vol):

HEMPEL'S paints are delivered in such a way, that they are ready for application by brush or airless spray after mixing of BASE and CURING AGENT and/or stirring. If the paint is too thick, e.g. in cold weather or for special purposes, the THINNER(S) indicated under this heading may be added to give the required viscosity. The amount of thinner to be added, depends on prevailing temperature, spray method, etc. The usual maximum percentage is indicated for the respective application method. If more thinning is deemed necessary under special circumstances, consult nearest HEMPEL office.

Adding a small percentage of thinner will give no measurable difference in the film thickness. There are cases, however, when a higher degree of thinning is necessary and justified. It should then be kept in mind that adding thinner increases the quantity of liquid paint without contributing to the solids content. Consequently, a proportionally higher wet film thickness must be applied when adding any significant amount of thinner in order to obtain the specified dry film thickness.

Example: If 0.5 litre of THINNER is added to 20 litres of paint, then % THINNER added equals

VS% after thinning equals

Note: Avoid unnecessary eg habitual thinning.

Pot life:

Roughly speaking, the pot life for solvent-borne paints depends on the paint temperature as follows:

The pot life is halved at an increase in temperature of 10°C/18°F, and doubled at a decrease in temperature of 10°C/18°F.

For HEMPADUR products the pot life is usually shorter for application by airless spray than for brush application. This is due to the fact that the anti-sagging properties are gradually lost after expiration of the pot life indicated for airless application. Thus the high dry film thickness usually specified by airless spray application is only obtainable within the pot life indicated for airless application.

Note: Pot life cannot be extended by thinning.

In the case of **water-borne**, two-component epoxy products this rule of thumb will not fit. The temperature's influence on the pot life is noted in the relevant data sheets.

Nozzle orifice:

A typical nozzle orifice (or a range of nozzle orifices) is indicated.

Nozzle pressure:

A nozzle pressure generally suitable is given.

Note: Airless spray data are offered as a guidance and are subject to adjustment to suit the work at hand.

Cleaning of tools:

Normally the indicated HEMPEL THINNER or equivalent commercial solvents (given in the product data sheet for thinners) can be used for cleaning of tools after use. Where special cleaning agents are recommended it is indicated on the product data sheet.

Indicated film thickness, dry:

Dry film thickness (dft) is indicated in a thickness frequently used in specifications.

Note: Several products are **specified** in different film thicknesses for different purposes.

Checking of dry film thicknesses is, generally, done with gauges calibrated on smooth reference steel panels. Shopprimers are controlled according to a special procedure, which is available at your nearest Hempel office.

Indicated film thickness, wet: Wet film thickness (wft) is indicated in multiple of 25 micron (1 mil) in order to facilitate the practical measurements with the wet film thickness gauge (comb gauge). These values are rounded off to the multiple of 25 which is regarded most relevant in each case.

Recoat interval: The time required or allowed to pass at 20°C/ 68°F or the relevant temperature range for the product in question before the subsequent coat is applied. The intervals are related to the temperature, film thickness, number of coats, type of future (in service) exposure and will be affected correspondingly. For maximum intervals the temperature in this context is the highest surface temperature during the period. For some products the interval is more critical in regard to intercoat adhesion than others. If the maximum interval is exceeded it may be necessary to roughen the surface to ensure adhesion of the next coat. On the other hand, for some paint types the interval may not be critical in respect of adhesion, but a primer coat should not be left unprotected for too long in an aggressive environment.

If nothing else is mentioned the indicated intervals refer to recoating with the same paint. Other paints of different types may require other (recoating) intervals.

After exposure of any painted surface in polluted environment thorough cleaning by high pressure fresh water hosing or another appropriate measure is always recommended before recoating.

Details about recoat intervals are stated in the relevant painting specification.

SURFACE PREPARATION: The recommended degree of cleaning of the surface before painting. The degrees of cleaning refer to ISO 8501-1:1988. Pictorial Surface Preparation Standards for Painting of Steel Surfaces, unless otherwise indicated.

For some products a minimum surface profile is mandatory. The profile so specified is given with reference to one or more of the roughness comparators: Rugotest No. 3, Keane-Tator Comparator, or the ISO Comparator.

For previously painted surfaces the method and degree of preparatory cleaning is generally indicated.

APPLICATION CONDITIONS: If climatic or other limits, beyond what is dictated by normal good painting practice, apply to the use of a particular quality of paint, this is indicated under this heading.

As a general rule, paint should never be applied under adverse weather conditions. Even if the weather seems fit for painting there will be condensation if the temperature of the substrate is at or below the dew point (the temperature at which the atmospheric humidity condenses, e.g. as dew). To compensate for fluctuations the temperature of the surface should be at least a few degrees above the dew point during painting and drying. 3°C/5°F is often quoted as safe.

In confined spaces it may be necessary to remove solvent vapours or water vapours by providing an adequate amount of fresh air constantly during application and drying, both for reasons of safety and health, and to assist evaporation.

PRECEDING COAT: Recommendations of some preceding coat(s) known to be compatible with the product. No limitation is implied. Other compatible products may be specified depending on the purpose. In this context, shopprimers are regarded an integral part of the surface preparation.

SUBSEQUENT COAT: Recommendations of some subsequent coat(s) known to be compatible with the product. No limitation is implied. Other compatible products may be specified depending on the purpose.

REMARKS: Under this heading other relevant data or information are included.

SAFETY:

Under this heading **general** safety precautions when handling or working with the product are given. Packings are provided with applicable safety labels which should be observed. In addition, national or local safety regulations should always be followed.

ISSUED:

Month and year of issue, current formula.

Note: The product data sheets are subject to change without notice and automatically void five years from issue.

Additional notes and definitions of some expressions used in the product data sheets:

Surface cleaning*

Low pressure water cleaning (LP WC):	up to 340 bar/5000 psi
High pressure water cleaning (HP WC):	340-680 bar/5000-10.000 psi
High pressure water jetting (HP WJ):	680-1700 bar/10.000-25.000 psi
Ultra-high pressure water jetting (UHP WJ):	above 1700 bar/25.000 psi

*As defined in "Joint Surface Preparation Standard NACE No. 5/SSPC-SP 12, 1995".

Note: Wet abrasive blasting may be performed with low or high pressure fresh water to which a relative small amount of abrasives is introduced, and in some cases inhibitors are added to prevent flash rusting (however, as a general rule it is recommended **not** to use inhibitors when cleaning areas to be immersed during service. Surplus of inhibitors may lead to osmosis).

A **blast primer** is a paint used for short term protection of a newly blast cleaned steel surface of an assembled structure in order to ease the working procedures. In this context blast primers are often regarded an integral part of the surface preparation.

A **holding primer** is a paint used to prolong (hold) the protective lifetime of a shopprimer till the specified paint system proper can be applied.

To apply a **mist coat** or **flash coat** is a two step application procedure used to minimize popping when painting on a porous substrate. At first, one or two spray passes are applied very thin to expel the air from the pores. As soon as this thin coat has flashed off, the film is built up to the specified film thickness.

A **tie coat** is a layer of paint which improves the adhesion between coatings of different generic types, eg to "bridge" between conventional and advanced coatings, or between epoxy and physically drying paints.

A **sealer coat** is a layer of paint which is used to seal off (fill the pores of) porous surfaces such as zinc silicates and empty, insoluble matrix of certain antifoulings. In this connection it prevents disturbance of the balance between binder and active pigments of the new antifouling. Furthermore, certain paints may be used as sealer coats to minimize popping of the following coat(s) when painting a porous substrate.

When a paint is mentioned to be resistant to **spillages and splashes** of certain chemicals it is understood to be limited in both area and time. The spilt chemical must be removed as soon as possible and not remain on the surface more than 1-2 days.

When stating **both metric and US figures** the US figures may be rounded off when an exact figure is of less importance.