



# TECHNICAL DATA SHEET

## PERMA FILM

01/2006

<b>1. Description</b>	One component surface tolerant high build protective coating for maintenance of ballast water tanks and for industrial use in severe corrosive environments
<b>2. Colour</b>	aluminum grey, aluminum buff, transparent, black
<b>3. General use</b>	Single pack multi purpose, surface tolerant coating recommended for ballast water tanks, voids in ships, offshore and marine structures. Can also be used for protection of machine parts, tools and equipment during sea transport and outside storage
<b>4. Features</b>	<ul style="list-style-type: none"><li>• Although it can be applied in a thick layer of 250 µm dft in one working step it is recommended to apply a system of two or more coats.</li><li>• Excellent penetration and adhesion properties;</li><li>• The flat platelet structure of the film forming agents provide mechanical integrity and physical barrier to the ingress of water and oxygen into the film;</li><li>• neutralized corrosion stimulators;</li><li>• Can be used on hand cleaned surfaces (St2/St3), old coatings, and surfaces cleaned by high-pressure water jetting;</li><li>• High tolerance against relative humidity during application (possible near the dew point), and salt water resistance;</li><li>• Has high- volume solid content and mild solvent in the formulation;</li><li>• Contains lamellar fillers (aluminum flakes)</li><li>• Application and curing possible at low temperatures (0 °C);</li><li>• Slow release of solvents that prolongs the wetting and penetration processes.</li></ul>
<b>5. Approvals</b>	Germanischer Lloyd Det Norske Veritas - 2,5 years inspection intervals
<b>6. Storage</b>	Shelf life in 20 ltr pails unlimited in original package. In 200 ltr. drums also unlimited but a possible slight skin on top of the paint should be before using removed.
<b>7. Package</b>	200 ltr drums or 20 ltr pails – non returnable

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**8. Technical data for use**

Applied by	Amount of coats	Average thickness in $\mu\text{m}$		non volatile by	Theoretical consumption	Nozzle / pressure	
		wet	dry	Vol %	$\text{m}^2/\text{l}$	mm/inch	Bar
Brush	4	400	250	62	2,5	-	-
Roller	3	400	250	62	2,5	-	-
Airless	2	400	250	62	2,5	0,48÷0,02	180

The durability of a coating system depends among other things on the film thickness. The film thickness should be selected according to the required durability and the corrosive environment. For ballast water tanks a dry film thickness (dft) minimum 250  $\mu\text{m}$  is recommended by Germanischer Lloyd and DNV.

**9. Recommended substrate condition**

Recommended cleaning standard is St 2/St 3 acc. ISO 8501-5 referring to hand or hand tool methods, (needle hammering, chipping, grinding) and Wa 2 acc. to ISO 9501-4 or WJ-2/WJ-3 acc. to SSPC-SP/NACE No 5 referring to water-jetting at a water pressure of at least 340 – 700 bar.

While the vessel is in service and the cleaning standard can't reach St 2, because of insufficient equipment, Active Rust Pre-Primer can be used as a first coat. Surfaces cleaned to St 2 and St 3 means that a certain amount of rust can remain on the substrate after surface preparation. Just like rust must not detach from the cleaned substrate, the old coating must also adhere to the substrate when overcoated. Old coatings to be overcoated have to be evaluated on at least two points: their actual adhesion values and their characterization (composition, unusual features, etc). Manual and power tool cleaning normally cannot remove the contaminants in the rust. Therefore, intensive pressure water washing is highly recommended as a method of desalination supporting manual cleaning. As Perma Film is applied over the transition zone of rust and intact old coating it should be determined if the substrate is dry under the edge of the old coating. Too thick rust left on the substrate after cleaning penetrated later by applying Perma Film can be weakened and delaminate with the coating in consequence.

**9.1 Use of Active Rust Pre-Primer (ARP-P) – FLUID FILM LIQUID A.**

As advised above when the coating has to be done, while the vessel is in service it is difficult to meet surface demands. To create an effective barrier film on steel structure under difficult conditions with high humidity or when the surface is cleaned from the remaining rust to a lower standard than St2 (this standard is even in many shipyards not yet attainable) it is recommended to apply the thinnest possible layer of Active Rust Pre-Primer. ARP-P penetrates excellently micro-porous, micro-cracked surfaces, and raised edges of old coatings under which moisture can be trapped.

To ensure the best possible application results of ARP-P, the use of airless or pneumatic spray equipment with the smallest possible nozzle is recommended producing an oily mist layer only. The film thickness should not be higher than 25 $\mu\text{m}$ , equal to coverage of 25 – 40  $\text{m}^2/\text{l}$  depending on the surface roughness.

The ARP-P film should be allowed to penetrate into the substrate abt. 6 h before the 1-st coat of Perma Film is applied.

## 10.Application details

PERMA FILM, the surface tolerant painting needs no field mixing and is suitable for easy application with a minimal dripping and running even when applied at very high film thickness.

Perma Film can be applied at low temperatures but it is not recommended to apply the coating when the substrate has a temperature below zero and white frost is forming under high humidity. Also the curing time of the coating before exposure to water will be very long.

Perma Film can be applied in a single coat but the risk of pinholing will be high. These holes are so small that they are very difficult to see without special equipment. They are caused by application properties of the coatings, i.e. discharge of air and solvent vapors from the coating and the method of application. Multiple coats are applied to minimize pinholing from one coat being in the same spot as pinholes from another coat by overlapping eventual holes in the previous coat, and thus exposing the substrate to water, moisture, contaminants, etc

We recommend the use of two coats Perma Film. The wet wet film thickness for the first coat should be 150  $\mu\text{m}$  (dft 100  $\mu\text{m}$ ) and the wet film thickness for the second coat 250  $\mu\text{m}$  (dft 150  $\mu\text{m}$ ), plus a stripe coat over sharp edges, cut-outs and welds, and when necessary as described in section 9.1 with an additional coat of the Pre-Primer Fluid Film Liquid A. Use contrasting colours (grey and buff) of Perma Film AI for each coat and stripe coat.

Special care has to be taken on the backside of bars, edges, openings etc.

It is recommended to apply a stripe coat by **brush (!)** on these elements.

During application the wet coat thickness must be controlled to prevent under- or overcoating

The applicator should be equipped with a proper respiratory mask.

When applying Perma Film from 200 ltr. drums it is recommended to use rampress equipment with an airless unit (above a ratio 45:1) fitted into the follow plate for ease of application.

Thinning with white spirit is normally not required above +15 °C, however, at lower temperature small amounts (5 % or less) should be added. To reduce the viscosity before application at low temperatures the material also can be warmed up to 20 – 25 °C (e.g. overnight storage at ambient temperatures).

Perma Film is a physically drying paint, i.e. no chemical reaction takes place during film formation, only solvent evaporation. This paint can be applied and will dry to satisfaction regardless of temperature condition, as long as these are not extreme. The only thing that will vary with the temperature is the rate of evaporation of the solvent (see the below table). Sufficient air movement i.e. ventilation to remove the evaporating solvent away from the surface is even more important for the drying rate than the temperatures. Therefore the ventilation system and trunking should be so arranged that “dead spaces” do not exist. To increase in the winter time the drying rate we recommend for ventilation, and at the same time also for getting warm air, the use of dehumidifiers.

Perma Film is easily applied by airless spray equipment or can be brushed or rolled on the surface prepared as above described. However, to achieve the recommended thickness brush applied (dft.250  $\mu\text{m}$  equal to 400  $\mu\text{m}$  wet film thickness for maintenance of ballast tanks), several coats will be necessary.

**11. Curing table  
for dft at  
125 µm**

Substrate temperature	Initial cure before applying the second coat and exposure to seawater
5°C	96 hours
10°C	48 hours
15°C	40 hours
20°C	30 hours
30°C	24 hours
35°C	20 hours

- exposure to seawater is permitted after the initial curing time;
- the mechanical strength, when cured in low temperatures is low initially, but will increase after a time;
- ventilation must be maintained during application and continue whilst solvent is released from the paint film during drying

**12. Safety  
information**

The drying process can be accelerated by applying dry and warm ventilation to increase the surface temperature.  
 Low temperature as well as high humidity conditions will generally increase the time to cure  
 Flash point (acc. DIN 52213) > 40 °C  
 It is very important for the safety of the applicator and proper performance of Perma Film coating that good ventilation is provided to all portions of the enclosed area. It is equally important to bring dry, fresh air into the closed area to remove all solvent vapours. Since all solvent vapours are heavier than air, ventilation ducts should reach to the lowest position of the enclosed areas as well as into any structural pockets.  
 Ventilation should be provided throughout the cure period to ensure all the solvents are removed from the coating.  
 For welding and cutting in the coated area the tank should be “gas-free”, provided by measurement.