MetaLine®.com

surface protection

Elastomeric repair coatings

spiral pumps, positive displacement pumps, axially split pumps, submersible pumps, inline pumps, rotary valves, mixers

MetaLine® Series 700

fighting against erosion, corrosion, cavitation, wear & tear

Featured as initial OEM equipment by prominent pump producers!

MADE IN GERMANY

60 YEARS OF EXPERIENCE

Process Description

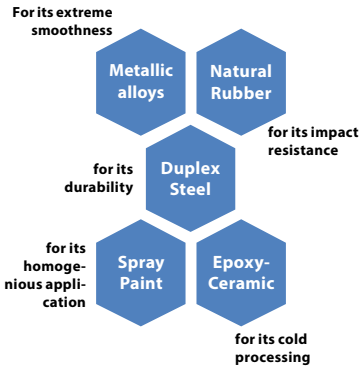
Changing surfaces to the better ...

Absorbing destructive energy instead of deflecting it! Sprayable elastomeric high performance coatings to solve erosion, corrosion, cavitation and abrasion problems in fluid flow systems!

MetaLine® Series 700 incorporates the primary technical characteristics of completeley different materials: The polymeric application process is as straight-forward as with an epoxy-ceramic repair product. But the compound itself functions like rubber, and finally possesses erosion resistant qualities equal or **greater than Duplex Steel!**

NOT rubber, NOT steel, NOT epoxy and **by far NOT paint** – but an ingenious mix out of all four of them!

MetaLine® Series 700 extends the service life of metallic substrates by initially storing the destructive kinetic energy (like rubber) and returning it with a time delay – but reduced bounce. The process is based on a duroplastic **polymer design** instead of a traditional vulcanization. No seams, no tension-induced delamination and no massive equipment requirements.



The result is a hydrodynamically resistant protective coating that exhibits unmatched erosion & cavitation resistance. Ceramic composites and conventional protective coatings are FAR inferior in terms of wear resistance and service life!

The efficiency of surfaces exposed to fluid flow is decisively influenced by 3 factors:

- **Smoothness**
- **Static friction**
- **Hydrophobic properties**

Do Coatings Protect against Corrosion and Wear?

The industry has myriad spray-on, brush-on and scraper-on products to offer, the producers of which claim them to have corrosion- and wear-reducing effects. Until now, pump users have had to take a trial-&-error approach to finding out which, if any, such products actually do help. Now, in order to shed some light in the dark, one of coating technology, KSB has conducted a voluminous series of pertinent tests at its materials laboratory in Pegnitz.

Bernd Schramm
Anja Steers
Andreas Kühl

Pump materials are subject to very complex loads & stresses. The structural and hydraulic design of pumps involves thermal and mechanical stresses exposure. Additionally, all wetted surfaces are exposed to the effects of the fluid itself. Depending on the nature of the fluid, such cavitities can cause corrosive, abrasive and cavitation damage to pump components. Grey cast iron and low-alloy steel are standard materials for drinking water pumps, wastewater disposal pumps and cooling water pumps – the main determining factors being price, workability and availability. However, due to their limited resistance and ductility, such materials soon come up against their duty limits when they are exposed to soiled, laden or corrosive pumped fluids – as evidenced by damaged hydraulic components, e.g., impellers and volute casings. To avoid the need for oxygen rich stainless materials in such cases, the industry makes and sells a wide range of coatings as alternative solutions. However, it is usually difficult to locate a really suitable kind of coating because there are any number of boundary conditions to be satisfied.

Hard phases carry hard particles of ceramic material.

Fundamental criteria:

- chemical resistance with respect to the fluid at service temperature
- geometrical accessibility of the component for the application of a coating
- potable water approval for the coating
- machinability of the coating on sealing surfaces and in gap areas

For users, the problem is to locate among all the various makers and types a coating to fit the case at hand. The producers' advertising vocabulary is full of terms like "extremely wear-resistant", "outstandingly resistant to corrosion", "hard-wearing", "resistant to cavitation", and so on, but all that is of little help. In order to realistically assess such products' fitness for use in and on pumps, KSB subjected a large number of products to wear and cavitation tests.

Two groups of coatings

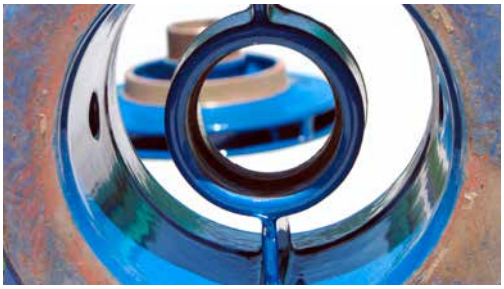
On the basis of their respective organic binder phases, the coatings in question can be roughly assigned to one of two categories: epoxy resins and polyurethane.

Fig.: Upper casing half of a big water pump, with epoxy resin base coating for sea water.

MetaLine® 795 achieves best values in all 3 characters: However, application requires expert knowledge and precision down to the last detail – **MetaLine® Series 700** is NOT a simple do-it-yourself solution!

And what is the response of the international markets?
To consider MetaLine® not only as a repair solution but more and more as a novel product concept for the engineering design of new equipment as well. Tested & approved by key **OEM manufacturers**, R&D laboratories & multiple public authorities!

Disappointing repair reality – brushed-on epoxy ceramic. No engineer wants to see such turbulence-generating results anymore. Today, "good" looks fully different ...



... and that's how it should be! The MetaLine® surface regeneration is significantly smoother than casted steel and up to 500 % more wear-resistant. Repairs at least as durable as an original spare part – but lower in costs ...

More than 60 years of experience

In 1960 MetaLine® started its global surface protection activities and developed itself into the **oldest German** manufacturer of synthetic repair compounds and maintenance coating solutions.

Our Series 700 technology has become **OEM (Original Equipment Manufacturer)** Standard in different industries.

When handling our products, we place great importance on professional instruction! Training courses are an obligatory part of our sales.

MetaLine® has its headquarter located near Stuttgart (Germany) and through our partners we are represented not too far from you.

MetaLine's time zone is UTC+1

Phone: +49 (0) 7034 31000
E-Mail: info@metaline.de

Only facts count:

Solvent-free elastomer
Sprayable, castable or injectable
Low pressure atomization for convex/concave surfaces
Start of solidification after only 1 minute
Touch dry after 5 minutes
Machinable after 30 minutes
Entry into service after 24 hours (at 20 °C / 70 °F)
Coating thickness between 1 and 20 mm (40-8000 mils)
Adheres to all metallic substrates
No component heating required
Tension-free curing
Temperature resistant +60 °C (140°F) **(immersed)**
Up to 40 % slurry content in the conveyed medium
Can be repaired and overcoated at any time
Optical wear indicator can be implemented
Efficiency increase up to 3.5 %
Hydrophobic properties have a flow-accelerating effect
25 % more erosion resistant than AISI 316
Surface smoothness comparable to polished steel
Pharmaceutical grade complying to FDA standards
Decontaminable in case of radioactive radiation
Recommended up to 1,900 rpm
Minimum impleller clearance 2 mm (80 mils)

MetaLine® Series 700 is available in three different degrees of hardness

- **MetaLine® 760 (60 Shore A)** for the repair of existing pump rubber linings
- **MetaLine® 785 (85 Shore A)** for the coating of erosion and cavitation impacted impeller/volutes
- **MetaLine® 795 (95 Shore A)** if hydrophobic properties are required to increase the flow speed

The strength of MetaLine® Series 700 lies in its erosion and wear resistance, which is comparable to high-alloy steels and armors. With a density of just 1.05 g/cm³ (0.038 lb/in³), MetaLine® represents the **most lightweight duroplastic wear protection concept**. The weight-related advantage, e.g. on pump-impellers or rotors, compared to heavy metallic armoring or welding overlay is considerable.

MetaLine® Series 700 is no longer a temporary repair idea, but a general design improvement in efficiency and service life!

MetaLine® APPLICATOR S-700
with Series 700 Double Cartridges

Experts talk about limits:

1. Professional **surface preparation** is mandatory! The substrates to be coated must be dry, clean, free of oil, desalted and gritblasted to a **specification** of R(t) = minimum 125 my (5 mil). Manually prepared surfaces are not permitted.
2. For a proper processing, surface temperatures of at least +15 °C (+60 °F) are absolutely mandatory. The use at fluid temperatures above 60 °C (+140 °F) is not authorized.
3. The application is possible in fresh water as well as in **salt water.**
4. Rotational speeds above 1,900 rpm are not recommended, nor are clearances of less than 2 mm (80 mils). Flow velocities higher than 50 m/s (165 f/s) shall be avoided.
5. Within the coating area no **solid anodes** are advisable and are not permitted.
6. The average coating thickness shall be at least 2 mm (80 mils) in the most impacted areas. Partial coatings must be kept to a minimum in order to minimize the formation of elastomeric edges.
7. Elastomeric pump coatings basically require a functioning **debris filtration**. Unprotected operation (e.g. for submersible pumps) is not recommended.
8. Spray processing is by far the most professional, smooth, uniform and **flow-optimized** form to apply a coating. No – we do not feature “brushes” – because a perfect hydrodynamic surface requires more: it is not about easy processing but only about maximum performance!

Special Pump Impeller Design

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Seamlessly sprayed-on elastomeric coatings for the surface protection of hydro-dynamically impacted components. Changeable film thicknesses. FDA-compliant (conforms to pharmaceutical and some food grade specifications by US and EU regulations).

Applications

- steel / stainless steel impellers
- brass impellers
- polyurethane impellers
- rubber impellers
- FRP impellers

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Reference

- up to 3.5 % **increase in efficiency** compared to casted steel surfaces
- higher erosion / cavitation resistance than stainless steel
- resists wastewater / gray water as well as sewage

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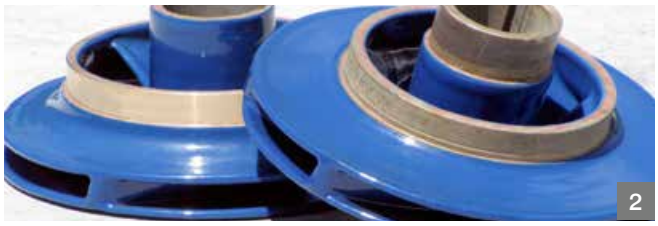
Closed Pump Impellers

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Seamlessly sprayable elastomeric coatings to increase pump service life. Exceptionally resistant against erosion & cavitation. Low structural weight. Hydrodynamically optimized due to an impressive surface smoothness. Not affected by pulsation forces.

Applications

- steel / stainless steel impellers
- brass impellers
- polyurethane impellers
- rubber impellers
- FRP impellers



Reference

- hydrophobic properties increase the water flow velocity
- generally recommended for rotational speeds up to 1,900 rpm
- **decontaminable** in case of the presence of radioactive radiation

Open Pump Impellers

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Extremely smooth surface characteristics, which can aditionally be equipped with non-stick properties. This results in a hydrodynamically optimized surface structure which leads to energy savings and a distinct increase in efficiency.

Applications

- steel / stainless steel impellers
- brass impellers
- polyurethane impellers
- rubber impellers
- FRP impellers

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Reference

- extremely high bond strength of up to 15 N/mm² (2175 psi) on steel
- vibration-resistant and a non-magnetic film configuration
- hydrodynamically optimized, extremely smooth surface structure – **reduces turbulences**

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Spiral Pump Casings

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

1

Up to 50 times more wear-resistant compared to famous epoxy ceramic brands (laboratory testing performed by KSB® / Andritz Hydro® / others).

Approximately 25 % higher erosion resistance compared to stainless steel (AISI 316) at a slurry impact angle > 40°.

Applications

- grey cast iron casings
- stainless steel casings
- duplex steel casings
- special alloy casings

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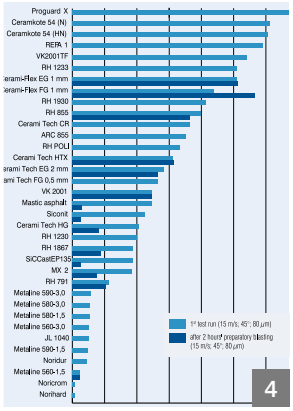

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Reference

- **very low specific density** of 1.05 g/cm³ (0.038 lb/in³)
- suitable for up to 40 % solids content in slurry conveying
- up to 550 % longer service life compared to gray cast iron / casted steel volutes (pic. 4)

Axially Split Casing Pumps

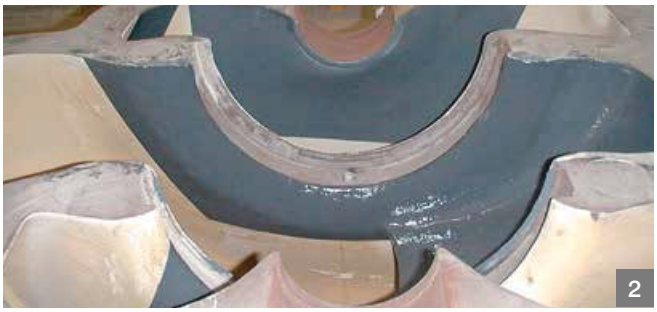
MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

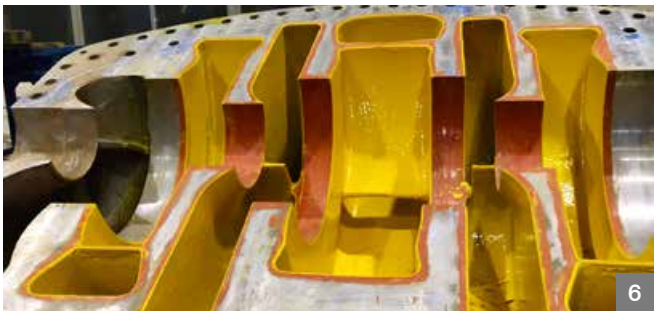
Sprayable elastomeric coatings to reconstruct or protect erosively abused surfaces. Cold & tension-free curing. Impact and vibration resistant.

According to research studies by supreme pump manufacturers, “more wear-resistant than stainless steel and epoxy ceramic coatings” (e.g. **KSB Technik kompakt**).

Applications

- double flow spiral casings
- axially split casing pumps



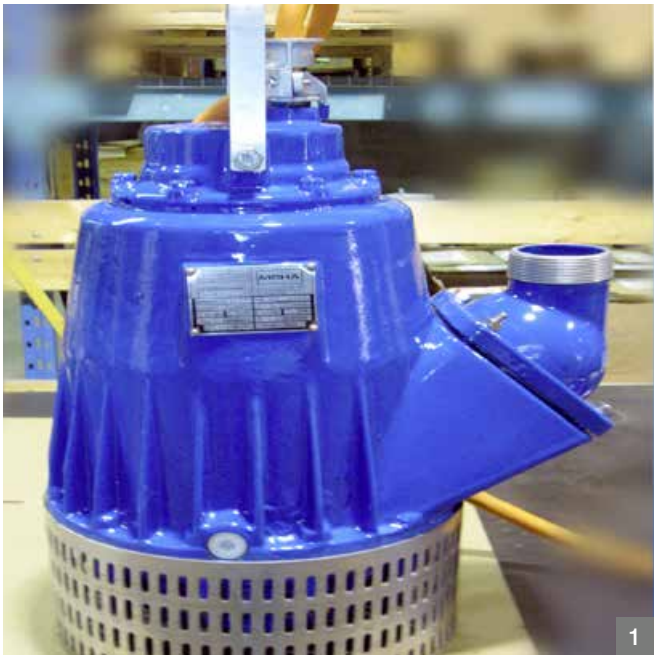


Reference

- can be repaired and partially overcoated ON SITE at any time
- does not contain any epoxy, polyurea, silicone or rubber
- active (encapsulating) and passive (anodic) **duplex corrosion protection properties**

Submersible Pumps

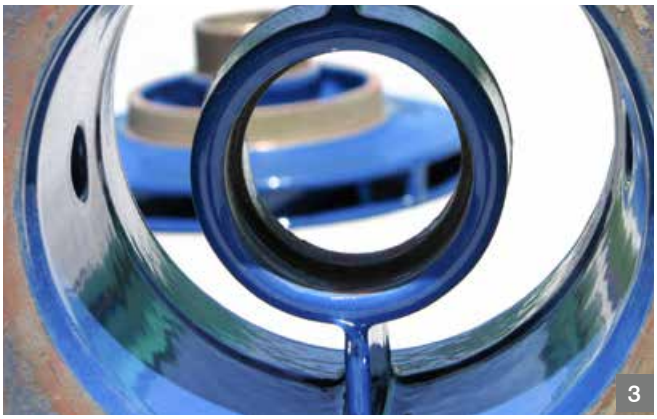
MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**



Sprayable elastomeric coatings to protect exterior and interior surfaces of submerged equipment against chemical, mechanical, abrasive and corrosive attack. Self-processable, durable and exceptionally economical.

Applications

- waste-water pumps
- sewage pumps
- lifting / bilge pumps
- submersible pumps
- submersible agitators
- flow accelerators



Reference

- hydraulically and pneumatically pressure resistant up to a maximum of 70 bars (1015 psi)
- feasible investment costs for serial production purposes
- visual **wear control** indication by a colour change within the layer build-up

Elbow Pumps

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

1

A typical recirculation pump with a constructive weak point in the shaft alignment! Substrate loss caused by turbulences and massive corrosion resulting in leakage. A combination out of 2 well approved MetaLine® Technologies solve this repair problem and protect from further surface deterioration:

MetaLine® Series XL – rebuilds worn areas
MetaLine® Series 700 – protects from erosion/cavitation

Applications

- shaft alignment
- volute coating
- wear ring replacement

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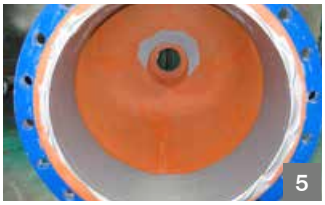
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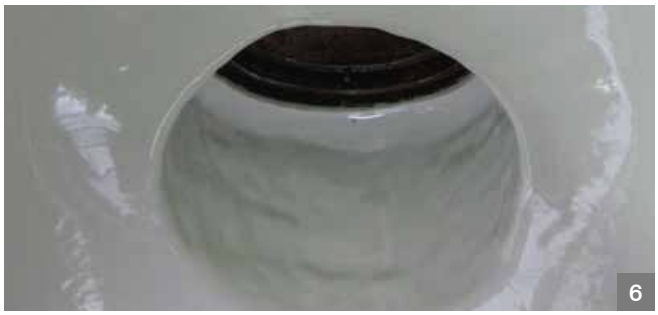
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Reference

- **electrically insulating properties** prevent galvanic corrosion and pitting corrosion
- can be locally reinforced by metallic mesh or plastic fabric
- adheres to all known (stainless) steels & metals, including brass, aluminum . . .

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Horizontal Inline-Pumps

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Single stage pump design with a complex geometry as the suction and pressure socket (at identical diameters) are located in straight plain pipe direction.

Due to the missing reachability on the pressure side, different MetaLine® technologies have to be used. Besides the sprayable MetaLine® 785, the brushable MetaLine® KXL is needed as well.

Applications

- pump volutes
- pump impellers
- wear plates

Reference

- suitable for fluid flow velocities of up to 50 m/s (165 ft/s)
- completely **shrink- & swell-free** during solidification
- multi-stage layer structure to reduce interfacial and galvanic corrosion

Vacuum Pumps

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Elastomeric repair and coating materials to be applied by brush, trowel or spraying. Corrosion-inhibiting. Exceptionally smooth with an active borderline penetration protection.

Resists solid particle impact and offers preservation against structural loss under high dynamical load.

Applications

- rotors
- casings
- end covers
- valve plates

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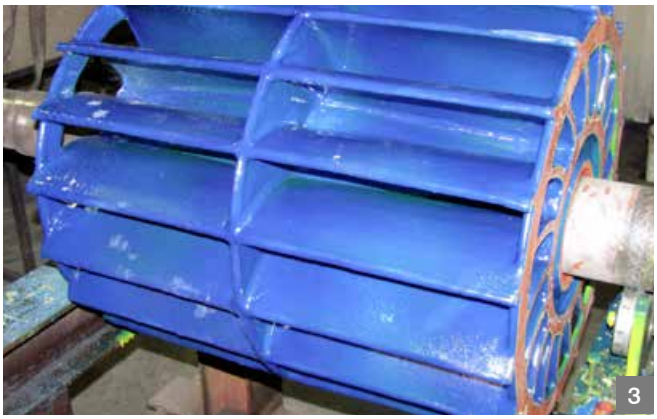
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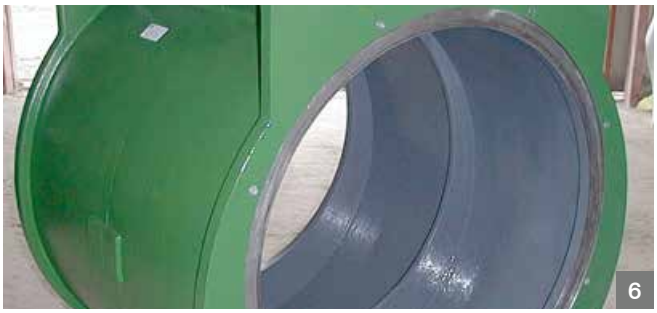
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Reference

- **overhead processing** without limitation of the layer thickness
- does not tend to germination and is free of biocides and toxic substances
- applicable on components that are exposed to high bending forces/deformations

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Fish Pumps

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

1

A very unusual pump construction! On the inside, it is necessary to secure that the fish is not harmed during pumping. On the outside, the ship shall not be damaged. To satisfy these two requirements, elastomeric surfaces are mandatory!

MetaLine® 760 fulfills the requirements on the outside due to its softness, while MetaLine® 795 guarantees a practically trouble-free, slide enhanced transport on the inside.

Applications

- pump volutes outside
- pump volutes inside
- pump impellers

FDA
Certified pharmacy quality as per CFC 177.1680 (title 21)

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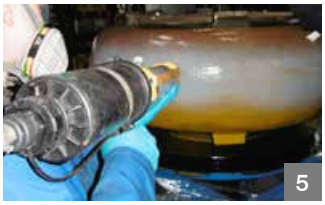

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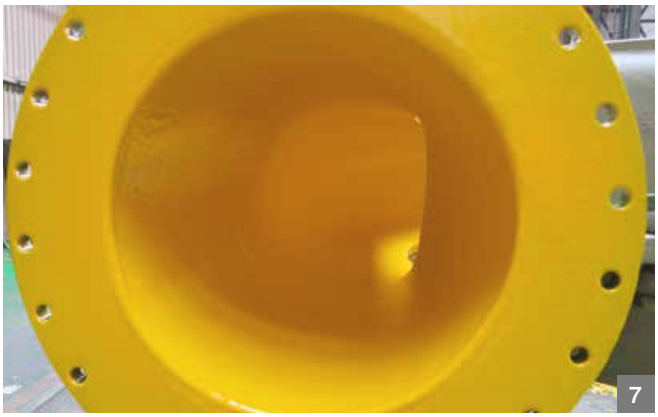

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Reference

- very low coefficient of static friction of $\mu(0) = 0.15$ (similar to PTFE)
- seamless, conclusive protection concept for simultaneous flange and internal coating
- high **flexibility** of approx. 380 % to withstand vibrations of the substrate

Pump Semi-Shells

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Elastomeric repair and coating materials to be applied by spraying or troweling. Service life is equal if not superior compared to original spare parts (OEM). Maximum ecological sustainability by avoiding waste and protecting natural resources.

Applications

- rubber semi-shells
- PUR elastomeric semi-shells
- casted steel semi-shells

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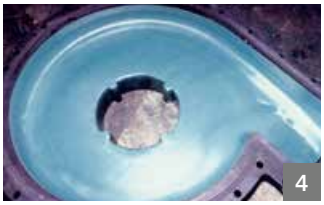

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Reference

- resistant to salt water and many chemicals in a pH range from 3 to 11
- according to DIN 53516 dynamic **abrasion index** > 55 mm³ (0.003 in³) (rubber > 120 mm³ / 0.007 in³)
- suitable for natural rubber and many synthetic rubber qualities such as EPDM or Neoprene

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Pump Volute Refurbishment

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

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Reconturing & coating in a single work step by use of the castable and sprayable MetaLine® Series 700 elastomeric coating technology. Time as well as cost intensive mechanical treatments like lathe operation or milling can often be avoided.

MetaLine® Series 700 coatings can be applied in every required thickness starting from 1 mm (40 mils) up to several cm. Amazingly effective and efficient!

Applications

- pump volutes
- flange areas
- wear plates
- suction elbows

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Reference

- free of metal particles and therefore absolutely **corrosion-free**
- different processing methods can be combined such as casting/spraying in one work step
- experience and spray application know-how is absolutely required

Pump Impeller Refurbishment

MetaLine® Series 700 – **Wear protection for pumps & fluid-flow systems**

Sprayable elastomeric coatings for refurbishing worn components or the preventive coating of new parts. Tremendously resistant to erosion, cavitation and corrosion.

Applications

- open / closed impellers
- split pump casing
- submersible pumps
- vacuum pumps
- rotary valves
- cooling water pumps
- waste water pumps

ORIGINAL EQUIPMENT MANUFACTURER
OEM PROOFED
made in Germany

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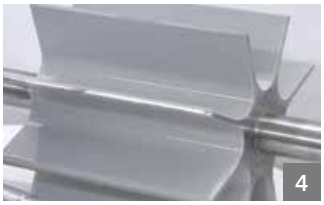
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Reference

- well selected starting from a clearance of 2 mm (80 mils) and larger
- a **spray smoothness** that is impossible to be achieved by brush or trowel application
- recommended as initial lining by prominent international pump manufacturers

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Technical Data

MetaLine® Series 700 – ultra dynamic responding spray-applied elastomers

	MetaLine® 760	MetaLine® 785	MetaLine® 795
Prefered usage (multi-purpose use is possible)	shock absorption rubber repairs noise deadening slip resistance	wear protection erosion protection cavitation protection electrical insulation	fouling release non-stick character corrosion protection fluid flow efficiency increase
Processing spraying / casting / injecting	APPLICATOR S-700 high pressure / low pressure	APPLICATOR S-700 high pressure / low pressure	APPLICATOR S-700 high pressure / low pressure
Solids content DIN EN ISO 3251	100 % by weight / volume no solvent / zero VOC	100 % by weight / volume no solvent / zero VOC	100 % by weight / volume no solvent / zero VOC
Mixing ratio cartridge based application process	2 : 1 by volume	2 : 1 by volume	2 : 1 by volume
Consumption theoretically per mm (40 mils) film thickness	1.25 kg/m² 0.25 lbs/ft²	1.20 kg/m² 0.24 lbs/ft²	1.20 kg/m² 0.24 lbs/ft²
Processing time at 60 °C (140 °F) material temperature	7 minutes	1 minute	1 minute
Solidification at 20 °C (68 °F) – dependent on stress	> 1.5 days	> 1 day	> 1 day
Hardness A.S.T.M. D2240-68	60 Shore A sprayed 65 Shore A casted	82 Shore A sprayed 85 Shore A casted	95 Shore A sprayed 98 Shore A casted
Density DIN EN ISO 1183-2	1.10 g/cm³ 0.039 lb/in³	1.05 g/cm³ 0.038 lb/in³	1.05 g/cm³ 0.038 lb/in³
Pull-off adhesion strength A.S.T.M. D4541	> 15 N/mm² (Steel S235JR) > 2,175 psi (Steel ASTM A36)	> 15 N/mm² (Steel S235JR) > 2,175 psi (Steel ASTM A36)	> 15 N/mm² (Steel S235JR) > 2,175 psi (Steel ASTM A36)
Tensile strength A.S.T.M. D412-16	20 N/mm² 2,900 psi	20 N/mm² 2,900 psi	24 N/mm² 3,480 psi
Tensile modulus at 100 % elongation A.S.T.M. D412-16	6 N/mm² 870 psi	7 N/mm² 1,015 psi	13 N/mm² 1,885 psi
Tear resistance DIN 53 515	68 N/mm 388 pound/inch	55 N/mm 314 pound/inch	68 N/mm 388 pound/inch
Elongation at break A.S.T.M. D412-16	650 %	380 %	275 %
Bashore resilience DIN 53 512	63 %	45 %	27 %
Coefficient of thermal conductivity ISO 8302	0.2 W/K · m 0.11 BTU/h · ft · °F	0.2 W/K · m 0.11 BTU/h · ft · °F	0.2 W/K · m 0.11 BTU/h · ft · °F
Dielectric surface resistivity DIN EN 62631	> 7 x 10^{10} Ohm	> 7 x 10^{10} Ohm	> 7 x 10^{10} Ohm
Dielectric breakdown voltage DIN EN 60243	> 5,000 Volts/mm	> 5,000 Volts/mm	> 5,000 Volts/mm
High temperature resistance above water / under water	+ 100 °C / 212 °F dry + 60 °C / 140 °F wet	+ 120 °C / 248 °F dry + 60 °C / 140 °F wet	+ 120 °C / 248 °F dry + 60 °C / 140 °F wet
Low temperature resistance dry	- 50 °C - 58 °F	- 50 °C - 58 °F	- 50 °C - 58 °F
Linear abrasion (Taber®) A.S.T.M. D4060, H-22, dry, 1 kg, 1,000 revolutions	n.a. n.a.	8.2 mg 0.12 grain	10.5 mg 0.16 grain
Dynamic abrasion DIN ISO 4649	85 mm³ 0.005 in³	55 mm³ 0.003 in³	65 mm³ 0.004 in³
Coefficient of static friction DIN EN ISO 8295	$\mu(0)$ = approx. 0.7	$\mu(0)$ = approx. 0.6	$\mu(0)$ = approx. 0.15
Approvals (dry) pharma & food conformity	FDA 177.1680 (21) EU 1935/2004	FDA 177.1680 (21) EU 1935/2004	FDA 177.1680 (21) EU 1935/2004
Approvals (wet) drinking (potable) water conformity		BS 6920 Part 2.6 AS/NZS 4020:2005	
Purity formulation being free off	no free isocyanate no polyurea, no silicone	no free isocyanate no polyurea, no silicone	no free isocyanate no polyurea, no silicone

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surface protection

cavitation protection
permanently **elastic**
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erosion-reducing
slip **enhancing**
shock absorbing
vibration-damping

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K-700 Pumps (EN), May 2023

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