Coating solutions for Grundfos NB/NBG and NK/NKG pumps

Effective resistance against corrosion, erosion and chemicals with highly advanced ceramic coatings, for reliable operation and long life

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Ceramic coatings protect internal at-risk areas

To ensure reliable operation and long product life, Grundfos offers the NB/NBG and NK/NKG range of multi-purpose end-suction pumps with dedicated coatings. The highly advanced ceramic coatings are strong alternatives to meet the challenges faced by common metal surfaces.

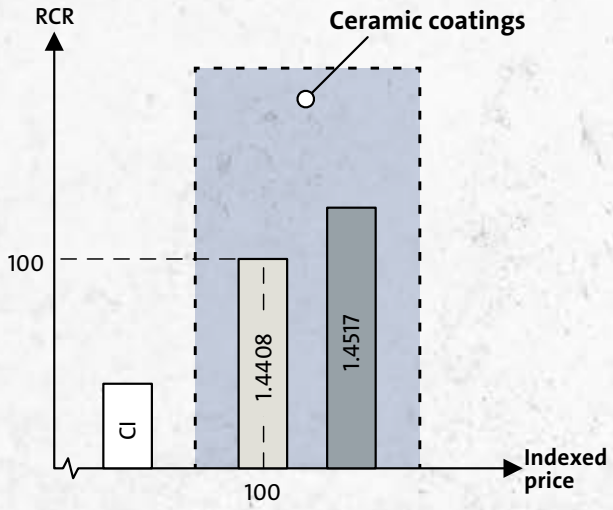
The Grundfos range of ceramic coatings provides superior performance against erosion, corrosion, chemical attack and abrasion, where metal surfaces would normally be degraded. This offers protection in industrial applications, where components and structures are often under attack, which can result in compromised plant reliability and safety, and lost profits.

A Grundfos coating solution protects the internal, wetted parts of your pump in your industrial environment. The ceramic coatings can be applied to all material versions of NB, NBG, NK and NKG pumps, such as cast iron and 1.4408 and 1.4517 stainless steel types. If a pump is worn out, it may also be possible to rebuild the pump internals.

In addition to the internal coating on wetted parts, all coated pumps have two layers of external paint, providing a corrosion category of C4-M.

Coating extends the area of liquid resistance and is price-attractive

Ceramic coatings add to the already very extensive NB/NK product range and fill a gap between cast iron and stainless steel when comparing price and resistance against the pumped liquid/media. Ceramic coatings provide resistance where even the highest stainless steel grade must give up.



***RCR** = Relative corrosion resistance*

***CI** = Cast Iron*
***1.4408** = Standard stainless steel*
***1.4517** = Duplex stainless steel*

COATING PROPERTIES

- 100 % surface preparation before coating
- Special advanced coating polymers
- Smoothness inside pump during pump lifetime
- Reinforcement with silicon carbide and aluminium oxide
- Very low permeability through coating film
- High temperature resistance towards liquid/media
- High wear resistance towards liquid/media
- High chemical resistance towards liquid/media
- Extensive Quality Control during coating process
- Long-term references from the industry
- Experienced and skilled coating applicator

=>

YOUR BENEFITS

- Application resistance to the pumped liquid/media
- Long lasting reliable solution
- No corrosion or erosion inside pump
- Better efficiency and performance of the pump
- No downtime in application
- Lower service costs for pump application
- Resistant to pitting corrosion
- No flange corrosion
- No corrosion products in pumped liquid/media

What you get when you buy a coated pump

When you invest in a coated pump, you get a pump surface that is matched to withstand the pumped liquid/media in combination with the operating conditions.

Correctly matched, you get a coating that can:

- Eliminate the cause of the normal corrosion/erosion cycle
- Extend the lifetime of your pump
- Reduce downtime compared to a non-coated pump
- Minimise the need for having inventories of spare parts

This will provide you with better overall economics for your operation, and ensure a better return on investment (ROI).

Note: There is no 'one-size-fits-all' coating, as each solution needs to match the pumped liquid/media and its operating conditions.

Coating's effect on performance

For coated pumps with the impeller in stainless steel or bronze, the coating layer has an insignificant positive effect on the pump performance. Flow and pressure is the same as for the similar uncoated pump. This also means that you can select and size a coated pump using Grundfos Product centre (GPC), which is based on non-coated pumps.

For fully coated pumps where the impeller is coated, - especially smaller pump sizes with narrow impeller geometries, a drop in head and flow can be expected when compared to the performance in GPC.

Coating's effect on efficiency

As for pump performance, flow and head, the effect on the efficiency is insignificant. What makes a real difference is that original efficiency is generally maintained throughout the pump lifetime. Dirt and bio-film can change the efficiency. A non-coated pump will additionally experience a drop on efficiency over time due to lost material and larger internal passages between the pressure side and inlet side of pump.

Abrasion resistance

All coating solutions have an improved resistance to wear/abrasion compared to cast iron, yet real abrasive resistant coatings are quite different from some of the coating solutions we supply as standard. Refer to the coating solutions table on page 4 as to abrasion resistance properties.

Inspection of your coating's condition

Your coated pump also requires inspection, just as for any other equipment. For non-abrasive types, we recommend that you do this with an interval of 1 to 2 years. The coatings are applied in several layers in different colours, and if you find the top coat has been partially worn away, it is time to consider an onsite refurbishment. If the wear is severe and metal is exposed to corrosion, consider a complete recoat of the pump.

The abrasion-resistant types may need inspection every half to one year, until you learn how your pumped liquid/media impacts your coating.

Coating solutions

Grundfos has several standard coating solutions that provide protection for most applications involving corrosion, erosion, chemical attack, and abrasion. The table below also indicates whether the standard coating solutions do not cover your actual needs, and Grundfos may be able to tailor a special coating type to match your requirements. As indicated, this requires more information about the liquid and the operating conditions.

For this, please use the "Guide to selecting the right coating" on page 15.

Liquid/media challenge

Corrosion and erosion			Corrosion and chemical attack					Abrasion			
Aqueous solution	Mild chemical	Elevated temperature	Corrosion/Moderate chemical	Corrosion/harsh chemical *(Acid - inorganic)*	Corrosion/harsh chemical *(Acid - organic and bleaching chemicals)*	Corrosion/harsh chemical *(Alkalines)*	Potable/drinking water	Mild abrasion	Moderate abrasion	Severe abrasion	Severe abrasion – harsh chemical
			M.I.N.								
			M.I.N.								
										O.R.	O.R.
			M.I.N.	M.I.N.	O.R.	M.I.N.		O.R	O.R	O.R	

NB, NBG/NK, NKG standard coating solutions	NOTE	Pump range covered	Top coat colour
Chlorinated water		Complete range	Grey
Sea water < 25 °C		Complete range	Black
25 °C < Sea water < 65 °C	(1)	Part of range	Black
Liquid with abrasives	(2)	Complete range	Black
Chemical liquids < 60 °C	(3)	Part of range	Red

Light blue fields indicate suitability to the liquid/media.

(1) = A special coating version can handle a operating temperature of max. 85 °C.
(2) = Max. operating temp is 110 °C, but may be lowered depending on the pumped liquid/media.
(3) = A special coating version can handle a operating temperature of max. 95 °C.

M.I.N. = A standard coating may be ok, but **More Information Needed** on the pumped liquid/media.
O.R. = **On request**, a coating variant may be applicable.

Complete range

The complete range of pumps is available with this coating solution. The impellers are not coated.

Part of range

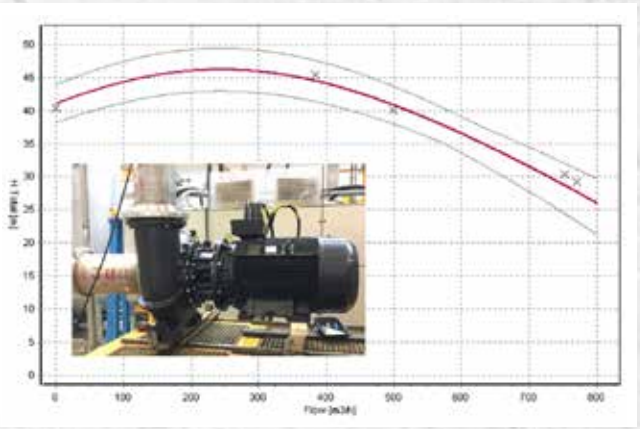
Some liquids are so difficult to handle that they require a fully-coated pump to be resistant against the pumped liquid/media. When only "part of range" is mentioned, it means that some impeller sizes cannot be coated due to narrow geometries. A larger pump at a lower speed might be the solution here, still as a coated solution.

Your coating supplier and quality control

Years of internal tests in Grundfos Research & Development and proven performance from the market is the basis for our choice of coating type, coating process, and coating supplier.

The Grundfos coating supplier has many years of proven experience in coating pumps, and with every coated pump you buy from Grundfos, you also buy a product with a track record on its coating quality. All coated pump parts are qualified by means of several tests and undergo a comprehensive inspection cycle. Results are monitored in a Quality Report (QC report).

Before coated pumps are supplied they are all performance tested in our production.



Coating supplier references, qualifications and approvals

Our supplier of coatings for NB/NK pumps has the following list of references:

- A.P Moeller Maersk: 30 years
- Power plants: 20 years
- Wastewater pumps: 18 years
- Offshore industry: 15 years
- Chemical industry: 10 years
- District heating plants: 5 years.

Qualifications/approvals:

- Sellicha prequalification
- Achilles prequalification
- ISO14001 Environment
- ISO 18001 Working environment
- Certified Frosio paint inspector.

Coatings are produced in accordance with Quality management system ISO 9001.

Chlorinated water

In recent years, there has been a change in the design and use of swimming pools. From plants with square pools where the bathers swam at a quiet pace, not least new swimming pools have gradually been transformed into recreational water parks, with water slides, fountains, artificial rain and hot water basins, optionally supplemented by wave machines. The temperature level in the halls has also increased from earlier to the current level near 30 °C. This change has affected the environment in the halls towards greater corrosion loading of all fluid-affected parts. This means that it is important to avoid any problems with stainless steel in the hall itself and in the technical plants for water treatment. The water in a swimming pool is usually potable water with the corresponding salts, which are roughly hardness formers (calcium, magnesium, bicarbonate) and the anions chloride and sulphate. In addition, sodium chloride is often added in an amount corresponding to 0.3-0.4 %, providing physical wellness and to support the process of chlorine generated directly in the water by electrolysis.

Disinfectant can also be dosed as sodium hypochlorite, which also forms chlorine.

The temperature is usually 26-28 °C. Thus, the corrosion environment to which all fluid-affected parts are to resist is a mild aqueous solution with a chloride content of at least 0.4 % and up to typically 0.6 % with a pH of 7.

CHLORINATION FOR LARGE, MODERN WATER AND WELLNESS CENTERS

Increased focus on energy consumption and reduction in water usage calls for new ways of treating water. This includes utilising optimally the available square meters for all equipment, and to have energy-optimised pumps that can withstand the pumped liquid/media for years of operation without affecting performance. Randers Water & Wellness center in Denmark, which treats more than 1650 m^3 of chlorinated water per hour, has chosen Grundfos as supplier of the main part of pumps for this installation.

There is at least one Grundfos NB pump in each sub-plant in the facility, and often more, and additionally TP pumps for partial flow of heat and chemistry.

Operating costs play a crucial role in such large installations. That is why it is important to select the right pump size relative to the flow and head, and the internal parts of the cast iron pumps are typically coated with a ceramic coating to avoid corrosion and contamination of the water. This also ensures pump efficiency throughout the pump lifetime. The pumps also get two extra layers of external paint to withstand the chlorine-containing environment. This provides a corrosion category of C4-M.

TYPICAL APPLICATIONS

- Swiming pools
- Spa and Wellness
- Water parks
- Fountains
- Hot water basins
- Wave machines

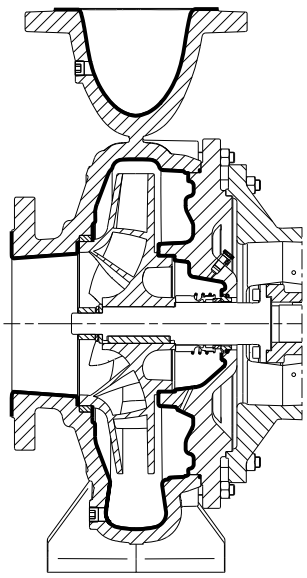
Cast-iron pumps have typically been used for these applications, but with increasing water temperatures and increased water treatment requirements, as well as requirements for energy-efficient pumps, these are no longer the right choice.

Chlorides in the water will oxidise the iron, resulting in contamination in the water in the form of rust, which stagnates and can cause discolouration in the water and over time on tiles and bottom fabrics. In addition, a cast-iron pump will lose some pump efficiency during operation, due to lost material and the subsequent larger passages between the pressure side and the and the inlet side. Wetted parts will get a rougher surface, which causes flow losses. The coated pump maintains the same efficiency throughout the pump lifetime, and the release of oxidised iron to the water is reduced to insignificance.

Coating lifetime

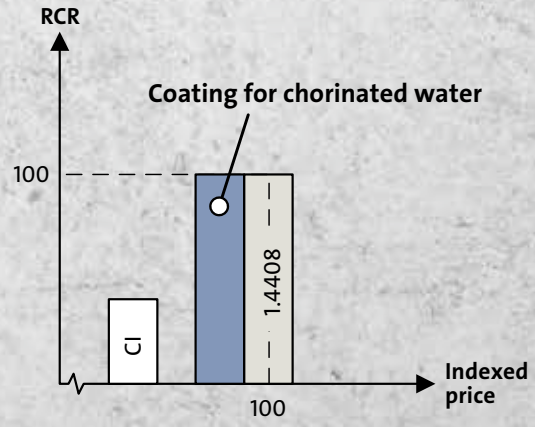
An expected coating lifetime is 10+ years. This is for clean, chlorinated water not containing hard particles. If hard particles are present, coating lifetime decreases. This coating type is only able to handle mild abrasion.

CONFIGURATION AND CUSTOMER VALUE



Pump part	Basic material	Coated
Pump housing + cover/motor stool	Cast iron	Yes
Impeller	Bronze/stainless steel 1.4408	No
Shaft	Stainless steel 1.4408	No

When you buy a pump coated for chlorinated water, you get a solution that is fully resistant to the application at an attractive cost. This solution is less expensive than a 1.4408 stainless steel pump, which seen from the resistance perspective is comparable, and you will have an RCR on at least the same level as a 1.4408 pump would provide.



RCR = Relative corrosion resistance.

Abrasion-resistant coatings

Abrasion affects metal surfaces by the wearing away of the topmost layer as particles impinge and scour the surface. The severity of attack is related to the density, hardness, and shape of the particles as well as the forces related to their flow.

The coatings for abrasive wear are formulated from chemically resistant ductile polymers, which allow for wide-ranging conditions of exposure. Extremely high packing densities of graded sizes of ceramic particles are blended into this polymer matrix for a wide range of abrasive wear environments.

Erosion/corrosion is a cyclic process which degrades metallic surfaces over time due to a weakly-bound oxidised corrosion layer being swept away by turbulent flow. As this process repeats, metal wall thicknesses can be reduced, affecting performance and impacting reliability of critical plant equipment. The coating blocks the corrosion cycle from starting and, due to its erosion-resistant ceramic reinforcement, resists turbulent flow.

EXHAUST SCRUBBER AT A DISTRICT HEATING PLANT

Some applications are very extreme for equipment, for example scrubbers, which are used to clean exhaust gasses/acetic gasses from processes or odours. Scrubbers are also known as 'washing tower', 'dish washer', 'gas washer' and scrubber. A scrubber basically cleans gas/odours by washing the gas. It can be built both horizontally and vertically. Contaminated gas/exhaust is introduced in the bottom of the scrubber and washing water typically in the top. Inside the tower, specially designed equipment ensures optimal contact between the washing water and gas. Depending on what is being cleaned, the washing water can continuously be treated by adding chemicals to optimise the cleaning effect and then circulated until it is further treated and led to the public sewer system.

The ambient environment for this appliation is often with high humidity. All pumps with abrasion-resistant coating have additionally two extra layers of external paint, which provides a corrosion category of C4-M.

If higher corrosion categories are required (marine certificates) for the external coating, this must be specified with the coating order.

Some district heating plants use wood chips as fuel for their plant, which gives some challenges to the scrubber system.

When wooden chips are burned, the residual ash product is extremely abrasive and on top of that also acetic to a certain level. For the recirculating pump in this system, it is necessary to apply an abrasive resistant coating that can also deal with the acetic level of the washing water. The picture shows an example of a coat for severe abrasion and harsh chemicals.

TYPICAL APPLICATIONS

- Mining (moderate to severe abrasion)
- Offshore fire-fighting (moderate abrasion)
- Sea water containing particles (moderate abrasion)
- Exhaust scrubbers (moderate to severe abrasion, may also be acetic/low pH).

For these applications, it is well known that any components in touch with the pumped liquid/media will wear out sooner or later. Steel types and stainless steel will not survive very long, so other solutions are needed.

Depending on the severity of the expected wear, we can find a coating that matches the operating conditions and the pumped liquid/media.

Coating lifetime

An expected coating lifetime for abrasives is hard to predict. Abrasives in a liquid can be anything from micro-sized, round and very hard particles to larger particles with sharp edges and high density. Additionally, flow plays an important role for the impact of the abrasive particles on the coat. These parameters together define the challenges to the abrasive resistant coating, and by this also to the selection of coating type.

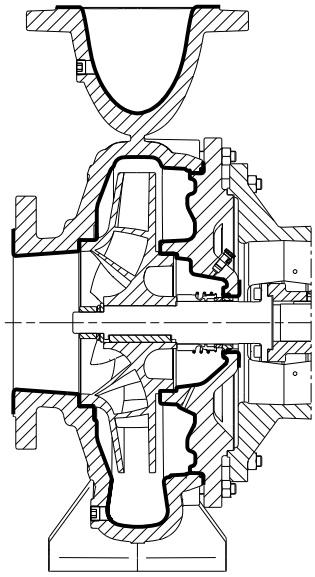
Selecting the coating

To select the coating that matches your abrasive liquid requires extra attention.

It is vital to investigate the operating conditions and the particle properties to make the correct match with the abrasive resistant coating. You will need to contact your local Grundfos representative for this.

See the “Coating solutions” on page 4 and follow the “Guide to selecting the right coating” on page 15.

CONFIGURATION AND CUSTOMER VALUE



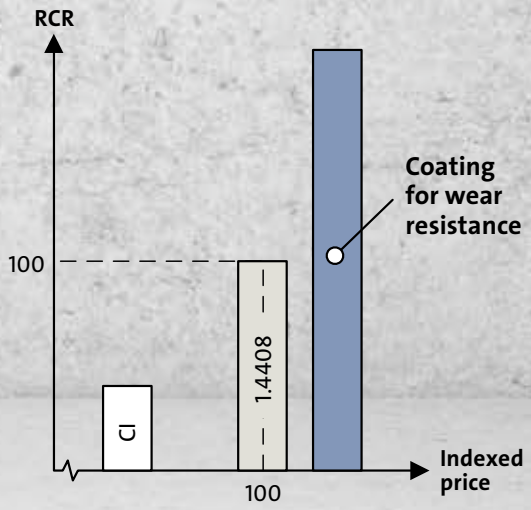
Pump part	Basic material	Coated
Pump housing + cover/motor stool	Cast iron	Yes
Impeller	Stainless steel 1.4517	No
Shaft	Stainless steel 1.4462	No

When you buy a pump with an abrasion-resistant coating, you get a pump that substantially prolongs the life of the pump at an attractive price. When the coating is close to being worn away, it is possible to make a re-coat of the pump, and you can start all over again.

This solution is on the same price level as a 1.4408 stainless pump, but less expensive than the duplex quality 1.4517.

Seen from the resistance perspective, you will have an RCR that goes far beyond anything that 1.4408 and 1.4517 stainless steel can provide.

The impeller is only slightly worn and is in the standard version stainless steel 1.4517.



RCR = Relative corrosion resistance.

Chemical-resistant coatings

A reliable coating system needs to resist permeation and chemical degradation under fluctuating temperature ranges and often under varying mechanical load conditions. The selected systems must also be able to be applied by conventional equipment to assist the applicator in a reliable application procedure. Coatings for chemical exposures are formulated with high-performance, cross-linking polymers, which are reinforced with inert mineral fillers to resist permeation and chemical attack.

The chemical resistant coating:

- Resists aggressive chemical attack
- Provides long-term barrier properties to resist corrosion
- Resists delamination due to permeation and blister formation

It is reliable and safe:

- Non-shrinking on cure eliminates stress
- Able to be high-voltage spark tested for pinhole-free film verification
- 100 % solids
- Non-flammable

HANDLING AGGRESSIVE LIQUIDS/MEDIA

Most chemical processes are extreme in their effect on equipment and challenging to any steel and most stainless steel materials. Composites or coatings are often the only materials that can resist the pumped liquid/media. All wetted pump parts or their surfaces must be compatible with the pumped liquid/media and its operating conditions, for example temperature and concentration.

The chemical-resistant coating is designed specifically to handle aggressive and corrosive liquids and offers distinct advantages for handling such liquids. Tests on pumps have shown resistance to even the most aggressive liquids, such as hydrochloric acid.

All pumps with chemical-resistant coating have additionally two extra layers of external paint, which provides a corrosion category of C4-M.

An example of a pump solution where the pumped liquid/media must be kept inside the pump – the pumped liquid might be toxic or react with air. The intensifier mounted on the pump and providing the barrier liquid with an over-pressure compared to the pump pressure is made in stainless steel grade 1.4408.

TYPICAL APPLICATIONS

Chemical processes are numerous, and pumps with a chemical-resistant coating could be for these typically-used and aggressive liquids:

- Hydrochloric acid (30 %)
- Phosphoric acid (50 %)
- Sodium hypochlorite (6 %)
- Sulfuric acid (98 %)
- Deionised water

Application examples for these liquids could be;

- Process industry
- Scrubbers
- Bleaching
- Oil industry, additives in the liquid, H_2S
- Biogas or waste water with organic acids

Note: This solution is not available on the complete pump range. It requires a pump where the impeller is coated and some internal geometries cannot be coated for certain pump sizes. You will need to contact your local Grundfos representative to clarify this.

Coating lifetime

We cannot state an expected lifetime for a chemical-resistant coating, as this will heavily depend on the liquid to be pumped, its concentration and temperature.

The expected lifetime is evaluated case-by-case based on the liquid to be pumped and will be discussed during the quotation process.

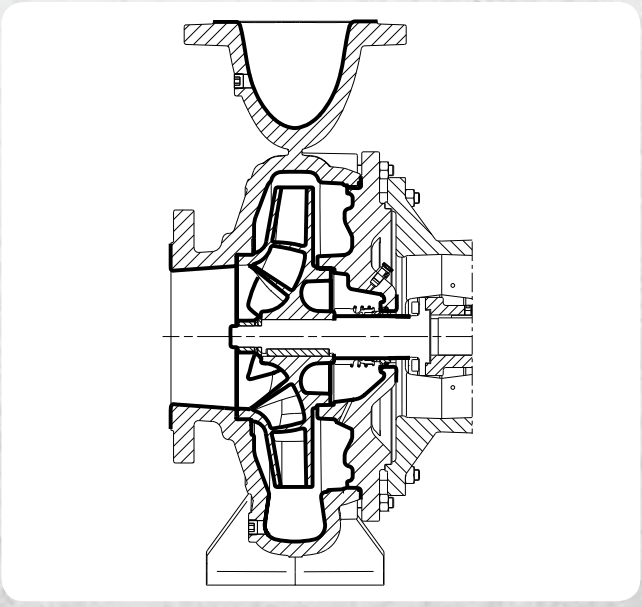
Selecting the coating

To select the coating that matches your chemical liquid requires extra attention.

It is vital to have precise data on the operating conditions and the chemical liquid properties to make the correct match with the chemical coating. You will need to contact your local Grundfos representative for this.

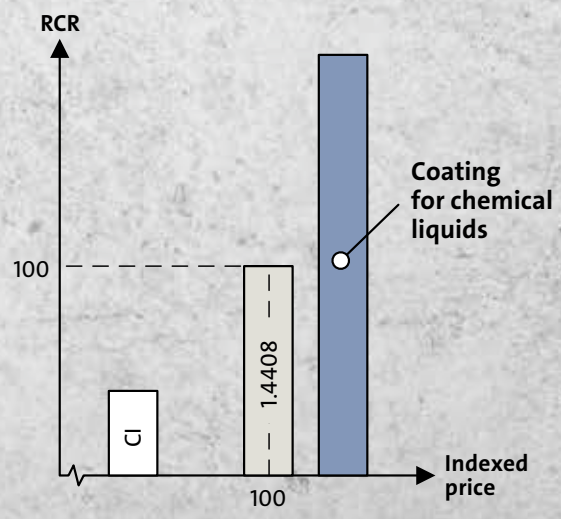
See the “Coating solutions” on page 4 and follow the “Guide to selecting the right coating” on page 15.

CONFIGURATION AND CUSTOMER VALUE



Pump part	Basic material	Coated
Pump housing + cover/motor stool	Cast iron	Yes
Impeller	Cast iron	Yes
Shaft	Stainless steel 1.4401	Yes

The illustration with the indexed price and RCR gives an indication of what you get with this coating solution. The RCR will of course depend on the liquid, as previously mentioned.



RCR = Relative corrosion resistance.

Sea water coating

Sea water and the environments that are normally related to this installation impact extremely on any pump and surrounding equipment. Every factor that can make pump materials corrode are present, such as humidity, air and salt.

Sea water in general contains between 30 g to 40 g salt/l water (30,000-40,000 ppm salinity) and the temperature normally varies between 0 to 40 °C. For sea water treatment plants, temperatures and salinity can be considerably higher.

Brackish water contains on an overall level 0.5-30 g salt/l water. Salt contents less than 0.5 g salt/l water is considered potable water.

NB/NK pumps in stainless steel grades can to a certain extent handle sea water, but this is basically at lower temperatures, up to 25 °C and with salinities of max. 35,000 ppm, and even then pump life can still be unpredictable. Other factors such as bio-film activity and prolonged stand-still duty significantly increase the risk of corrosion. Such cases call for a coated pump solution.

Any salinity - including brine/reject water from desalination - and temperatures up to 65 °C (optionally 85 °C) can be handled by our coating solutions.

Similarly, bio-film activity and stand-still duty are no longer a consideration.

All coated pumps have additionally two extra layers of external paint, which provides a corrosion category of C4-M. If higher corrosion categories are required (marine certificates) for the external coating, this must be specified with the coating order.

DELIVERING TO LARGE RECIRCULATING AQUACULTURE SYSTEMS (RAS)

A recirculating aquaculture system (RAS) is a type of fish farm where water is circulated and recycled in a closed system. This is quickly becoming one of the most environmentally-friendly and low-emission ways of producing animal protein, and RAS installations are growing rapidly – about 8 % annually – around the world.

For all pumps in a RAS installation reliability is critical for the operation; pump failure can result in the death of hundreds of thousands of fish. Many different pumps are used in the recirculating process, and the extreme conditions either require specialised material variants or ceramic coatings on wetted parts.

Grundfos has worked with Aquatec Solutions, a global supplier of aquaculture systems based in Denmark, to supply quality, reliable pumps for recirculating systems, tailored for the specific requirements of each fish farm. Working with the customer on the system design and on delivering a complete pump solution is essential for the success of the RAS.

Coating for sea water less than 25 °C

TYPICAL APPLICATIONS

- Land-based fish farms (RAS)
- Process liquids/media containing light chemicals
- Cooling circuits using sea water as coolant
- RO (reverse osmosis) with high salinity

In a Recirculating Aquaculture System (RAS), pumps make up only a small part of the total costs at the fish farm, but are of vital importance for successful operation, as downtime is critical.

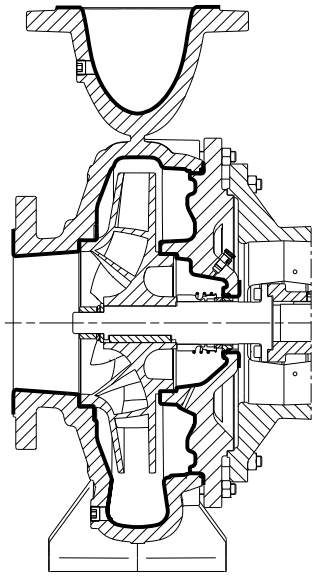
A RAS installation often includes up to 50 pumps, and they run constantly, 24/7, all year. Grundfos delivers specially-built pumps in stainless steel up to duplex quality or with a ceramic coating able to withstand the extreme conditions in constant operation.

Contact Grundfos to ensure correct pump sizing and wetted part coating for the water conditions, and that the pumps are designed for the complete solution, ensuring long pump lifetime.

Coating lifetime

An expected life of the coating is 10-15 years. This is for clean water not containing hard particles. Biological film activity does not affect the coating.

CONFIGURATION AND CUSTOMER VALUE

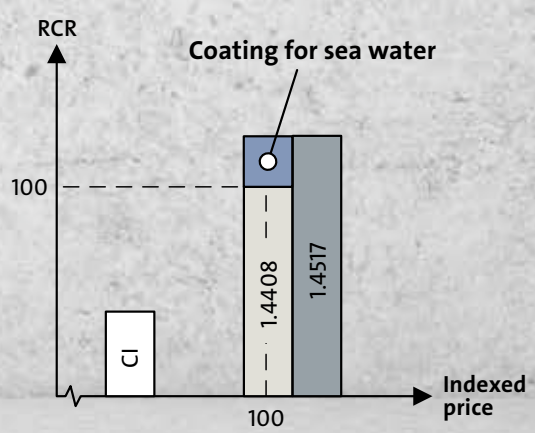


Pump part	Basic material	Coated
Pump housing + cover/motor stool	Cast iron	Yes
Impeller	Stainless steel 1.4517	No
Shaft	Stainless steel 1.4462	No

Sea water < 25 °C

When you buy a pump coated for sea water with a temperature less than 25 °C, you get a solution that is fully resistant to the application at an attractive cost. This solution is about the same price level as a 1.4408 stainless pump but less expensive than the duplex quality 1.4517.

Seen from the resistance perspective, you will have an RCR on at least the same level as a 1.4517 pump would provide.



RCR = Relative corrosion resistance.

Coating for sea water between 25 °C and 65 °C

TYPICAL APPLICATIONS

- Desalination/water treatment
- Mining
- Offshore fire-fighting.

Desalination of seawater is rapidly becoming an additional and necessary source of potable water in many parts of the world, and Grundfos is a market leader supplying solutions for desalination.

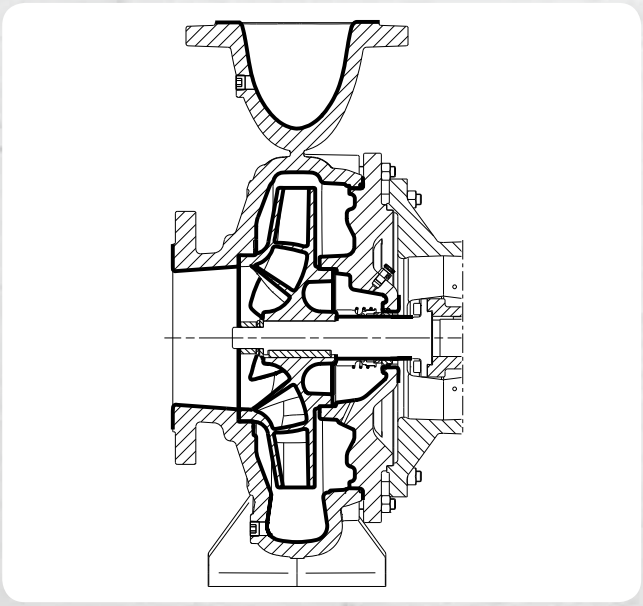
For applications with high salinity and a water temperature greater than 25 °C, Reverse Osmosis (RO) is a process used to draw water with a low concentration of total dissolved solids (TDS) through a semi-permeable membrane into a solution of higher TDS, to balance the solute levels on both sides of the membrane.

RO is broadly applicable for high TDS solutions such as seawater, brackish water, industrial effluent and other sources.

Coating lifetime

An expected life of the coating is 10-15 years. This is for clean water not containing hard particles. Biological film activity does not affect the coating.

CONFIGURATION AND CUSTOMER VALUE

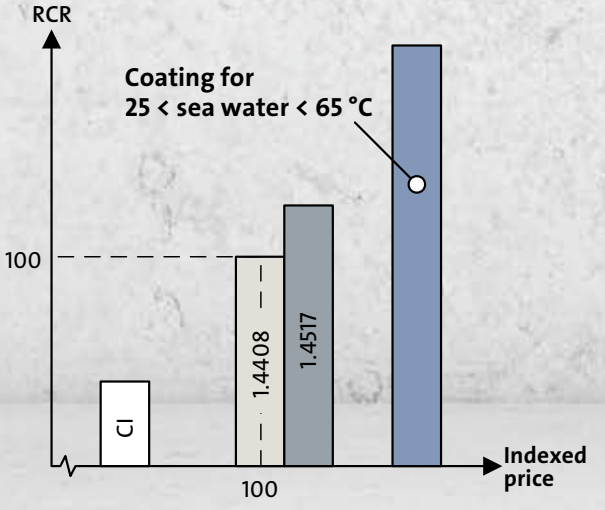


Pump part	Basic material	Coated
Pump housing + cover/motor stool	Stainless steel 1.4517	Yes
Impeller	Stainless steel 1.4517	Yes
Shaft	Stainless steel 1.4462	Yes

25 °C < sea water < 65 °C (optionally 85 °C)

When you buy a pump coated for sea water with a temperature greater than 25 °C and less than 65 °C (optionally 85 °C), you get a solution that is fully resistant to the application at an attractive cost. This solution is more expensive as a duplex pump 1.4517 as the base pump is a 1.4517 pump.

The reason for using duplex steel 1.4517 as the basic material lies in the need for safety for this type of application. If the coating is damaged, this pump will still be able to survive for some time. And if this should happen, any damaged pump parts can most likely be refurbished.



RCR = Relative corrosion resistance.

Selecting the right coating

Special operating conditions

If the operating conditions differ from the ones listed in the table “Grundfos standard coating solutions” on page 4, an alternative coating might be possible.

To determine this, Grundfos will need information on the operating conditions from the customer. Follow the “Guide to selecting the right coating” below.

Guide to selecting the right coating

In order to select the correct coating for the application, the operating conditions must be known. Grundfos Customer Service Units (CSU) will always need the following information:

Drinking water approvals

Some coatings used for the NB/NK pumps have a drinking water approval.

The table below shows which coating solutions that use a coating which has a drinking water approval and the type of approval.

Coating solution for	Drinking water approval
Chlorinated water	WRAS
Sea water < 25 °C	WRAS
25 °C < Sea water < 65 °C	WRAS
Liquid with abrasives	-
Chemical liquid < 60 °C	-

GUIDE TO SELECTING THE RIGHT COATING

- **Type of liquid**
- **Composition of liquid: - liquid + particles etc**
- **Operating temperature, Min. - Max.** **°C**
- **Sizes of particles (in mm)** **mm**
- **Weight-percentage of particles (percentage of the pumped liquid/media)**
- **Density of particles (in kg/m³)** **kg/m³**
- **Speed of particles (duty point of pump)** **m³/h**

Further information about coating

Please see the NB, NBG, NK, NKG Custom-built data booklet.

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