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GRUNDFOS SL, SE, S PUMP VARIANTS

Q, R, S AND D

1.1 - 520 kW



**SUBMERSIBLE AND  
DRY-INSTALLED PUMPS  
FOR AGGRESSIVE ENVIRONMENTS**

BE > THINK > INNOVATE >

GRUNDFOS 

# THE RIGHT PUMPS FOR THE RIGHT MEDIA

The extremely reliable and durable Grundfos SL, SE and S wastewater pumps are made partly or entirely of high-grade stainless steel. These powerful pumps are built for handling wastewater, process water, seawater and unscreened raw sewage in aggressive environments that expose the pump to corrosive or abrasive liquids and fluctuating pH levels.

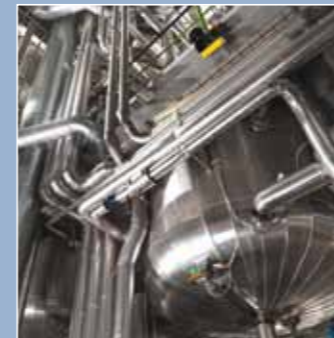
#### Recognised Grundfos quality means you get

- Correct choice of material for your application
- Trouble-free operation in aggressive media
- Reliable operation with less downtime.

In addition to a durable pump, you gain reliability and trouble-free, continuous operation. The stainless steel construction is tailored to allow the pumps to work in environments typical to the application in question, giving optimal protection against corrosion, erosion, or a combined effect.



Water intake – seawater, brackish water, surface water



Industrial wastewater with fluctuating pH and aggressive media



Pumping near coastal areas



Wastewater

## Less downtime when pumping in aggressive environments

Grundfos can help you match pump materials to the media to be pumped. The combination of stainless steel build quality and our proven abilities with hydraulics ensures reliable operation without pump failure because of corrosion, erosion, or a combined effect. The pump hydraulics can handle solids and fibres effectively to resist clogging. The impeller clearance is adjustable with SmartTrim, or exchangeable wear rings which maintain a high efficiency over time.

## Reliable pumps for submerged or dry installation

Typical applications for variant SL, SE and S pumps ranges cover aggressive environments where the pump is at risk from corrosion, erosion, or a combined effect.

#### Water intake and seawater, brackish water, surface water applications

- Surface water intake
- Desalination plants
- Cooling of power plants and industries
- Process water for fish farming
- Marine and off-shore sector.

#### Industrial wastewater

- Wastewater with fluctuating pH values, chemical constituents, temperature, and abrasive particles from, for example, the textile and chemical industry
- Process water from CIP and SIP cleaning processes in, for example, the pharmaceutical or food and beverage industries.

#### Pumping near coastal areas

- Seawater infiltration into wastewater systems, resulting in increased chloride levels
- Dewatering of farming areas near coastal zones resulting in salt water infiltration.

#### Wastewater

- Wastewater environments with high levels of hydrogen sulphide
- Highly oxygenated wastewater and effluents
- Wastewater dosed with aggressive chemicals
- Wastewater with a high content of abrasive particles, such as sand and grit
- Sludge, drain and percolate water containing aggressive elements.

## Select from four basic variants (1.1 kW – 520 kW)

In addition to cast iron, you can choose between the following four variants of the S, SL, and SE pumps in stainless steel.



### Variant Q

Stainless steel impeller in EN 1.4408. Volute is cast iron and motor housing either cast iron (SL, S) or with a stainless steel motor jacket (SE).



SL pump



SE pump



S pump



### Variant S

Stainless steel hydraulic parts are in EN 1.4408 with the shaft upgraded to EN 1.4462. Motor housing is either cast iron (S) or with a stainless steel motor jacket (SE).



SE pump



S pump



### Variant R

All parts in contact with media are entirely of stainless steel EN 1.4408 with the shaft upgraded to EN 1.4462.



SE pump



S pump



### Variant D

All parts in contact with media are entirely of stainless steel with the critical parts upgraded to EN 1.4517 for casted parts and EN 1.4539 for plate material.



SE pump



S pump

## Typical applications

The Grundfos ranges of stainless steel SL, SE and S wastewater pumps with large free passage ensure that you always have the correct pump built with the right materials for the application. All pumps can be further customised, depending on your requirements and the media to be pumped.



One of two SE pumps for pumping wastewater containing chemicals with large variations in pH from the CIP process at a dairy producing cheese.



One of two S pumps used at a glass wool manufacturing plant for pumping process water with a high content of abrasive particles.

DIN/EN	AISI/ASTM
1.4408	AISI 316/A351 CF8M
1.4462	UNS S32205
1.4517	ASTM A890 1B
1.4539	AISI 904L

**Material declaration:**  
 Grey cast iron are manufactured according to EN 1561:1997  
 Cast stainless steel are manufactured according to EN 10283:2010.  
 Conversion to other standards as AISI/ASTM are normative and products are not manufactured according to these.

## Why corrosion and erosion is an issue

There are a number of environmental variables that affect the corrosion resistance of metals and alloys, not least that all types of materials and coatings inevitably deteriorate at a given rate of corrosion or erosion. Furthermore, in a corrosive environment, erosion can further accelerate corrosion of the pump. This deterioration must be considered and calculated into the expected lifetime for the pump.

### The causes of corrosion

Corrosion is the deterioration of a metal caused by a reaction with its environment. Corrosion of a pump involves the loss of metal and occurs in various forms ranging from a generalised attack over the entire surface to a severe concentrated attack, which eventually can cause the pump to fail.

A variety of different media and the specific environment can induce corrosion of a pump. These include:

- pH
- Oxidising agents (such as oxygen)
- Temperature
- Concentration of solution constituents (such as chlorides)
- Biological activity
- Operating conditions (such as velocity, cleaning procedures and shutdowns)
- Chemicals.

In situations where metallic parts are exposed to these environmental variables, stainless steel is considered more corrosion-resistant than cast iron. This is due to the fact that stainless steel contains a defined minimum content of chromium, and this chromium content promotes the formation of passive, invisible oxide film on the surface that prevents surface corrosion and protects the metal beneath.

### How erosion happens

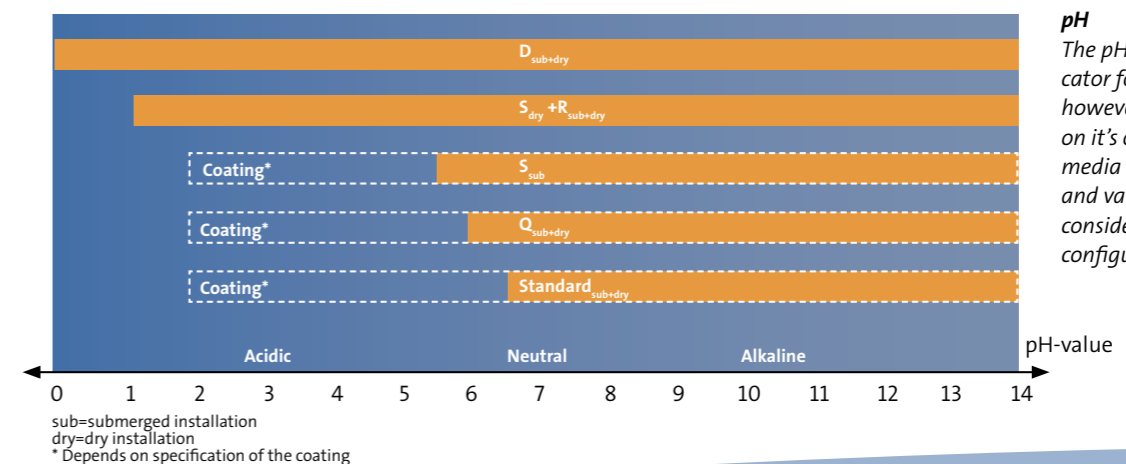
Erosion by particle impingement can be damaging to pump parts by itself and it can furthermore accelerate corrosion in aggressive environments. Erosion is a localised process that constantly removes material from the pump parts.

Erosion occurs primarily in areas with high velocity and turbulent flow, and it is thus typically seen on impellers and volutes. Stainless steel has an erosion-resistant oxide film on the surface, which makes it more resistant towards media with a high content of abrasive particles, compared to standard cast iron pump parts.

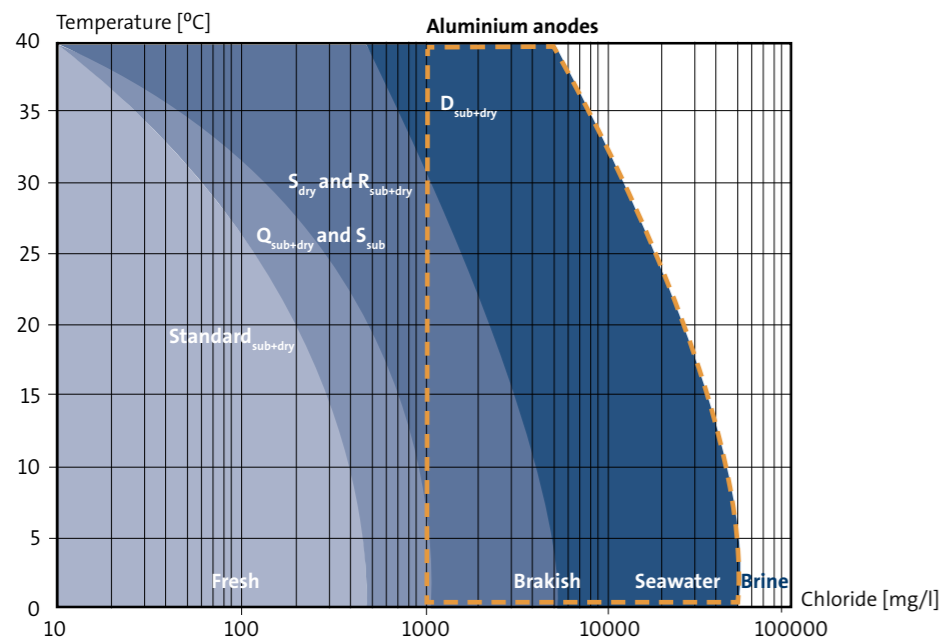
## The right material for optimum resistance

The following graphs are intended as a general guide for selecting the suitable pump materials for your specific application, evaluated according to pH value, chloride concentration and wear. The suitable pump variant should be selected from a cross-reading between several of the graphs.

For final specification and selection of your pump, exact media data and variations should be obtained. Grundfos can give you further support to match pump materials to the media to be pumped.



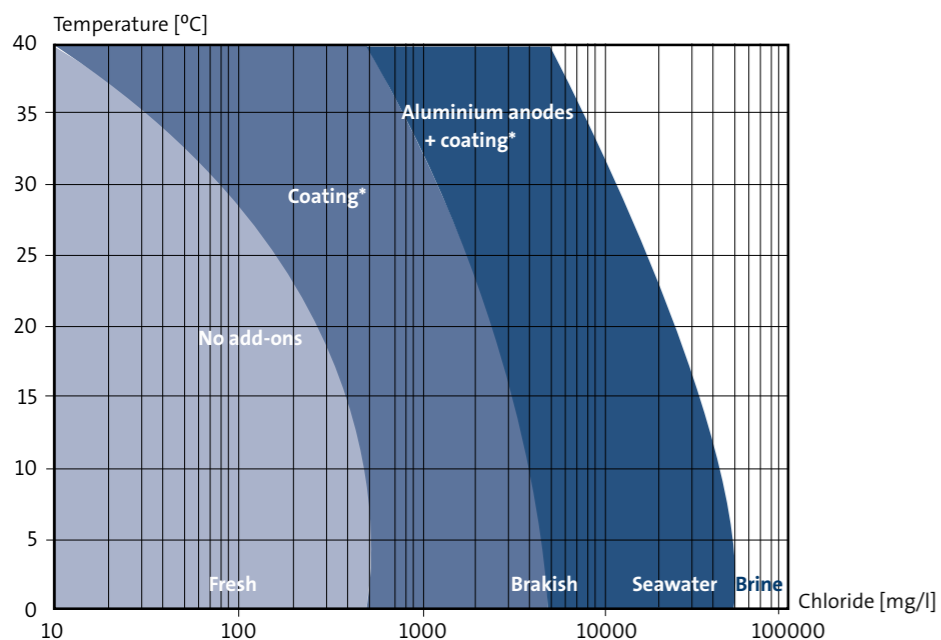
**pH**  
 The pH value is a good indicator for corrosive behaviour, however pH is insufficient on its own to evaluate a media as its composition and variations must be considered before final pump configuration.



**Stainless steel pumps used for brackish and seawater**  
 To minimise the risk of corrosion, the pump must be running continuously, meaning that standstills must not exceed six to eight hours. Resistance in these aggressive environments may be limited. Contact Grundfos for an evaluation of your conditions.

Sacrificial aluminium anodes can be used for corrosion protection of both cast iron and stainless steel parts. Aluminium anodes perform optimally in seawater, but some protection will also be achieved in brackish water. Aluminium anodes have no effect in acidic or alkaline environments.

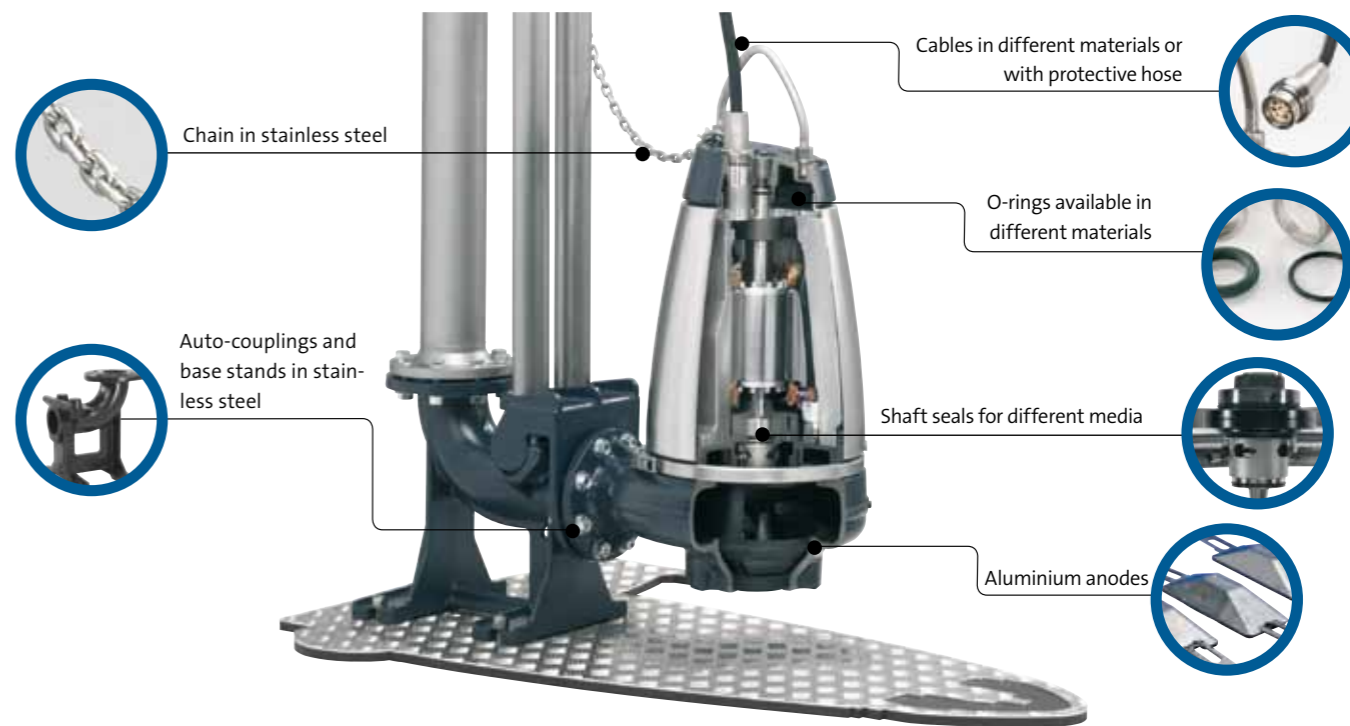
sub=submerged installation  
 dry=dry installation  
 \* Depends on specification of the coating



**Erosion resistance**  
 Erosive wear is determined by many parameters, such as the geometry, size, sharpness, composition and content of the abrasive particles. This means the pump materials may in some applications behave differently from what is shown in the graph. If combined with a corrosive liquid, erosion rates can be further accelerated.

**Important information about these graphs**  
 Grundfos provides these graphs as a service, as a guide for preliminary pump specifications and pre-selection. The information shown in the graphs is based on experience and available literature, which we have reported as accurately as possible.  
 Deviations due to specific media composition may impose erroneous results from the graphs for which Grundfos disclaims any and all liability.

# Upgrade standard pumps for aggressive environments



In environments where stainless steel is at risk from corrosion, erosion or a combined effect of the two, coating the standard pump casing, volute and impeller can be a good alternative. Brackish or seawater environments that contain high chloride levels are typical examples of applications where pumps may be at risk. Coatings of pump parts can be tailored to fit to specific applications and customer requests.

**Reducing the risk of corrosion**  
 Where erosion is a minor issue for the external parts of the pump, a coating that offers protection against corrosion for surfaces immersed in saline liquids and aggressive chemicals may be sufficient.

**Reducing the risk of erosion corrosion**  
 Where erosion corrosion with abrasive and/or saline liquids puts the impeller and volute casing at risk, a ceramic-filled coating offers superb resistance to erosion and outstanding resistance to a broad range of chemicals.

Even with a flawless coating, cracks and perforation resulting from operational wear will expose the underlying material to the aggressive media, with corrosion as an effect. This means that coatings should be inspected regularly to ensure sufficient protection and product lifetime.

**Aluminium anodes for high chloride levels**  
 Sacrificial aluminium anodes can be used for corrosion protection of both cast iron and stainless steel parts, where the anodes will be corroded, instead of the pump parts. Therefore aluminium anodes should be inspected regularly to maintain protection. To increase lifetime of the sacrificial aluminium anodes, it is recommended that cast iron or stainless steel components are painted or coated.

In some cases a coating used together with sacrificial aluminium anodes may offer sufficient protection to a cast iron pump in chloride-containing water.

