



SEAWATER-RESISTANT PUMPS



Submersible Seawater-Resistant Dewatering Pumps

Seawater pumps are indispensable to waterfront development projects and aquaculture facilities. Japan is a maritime nation with the sixth longest coastline in the world. Tsurumi has performed field tests in various marine construction projects under severe conditions over many years, in collaboration with general contractors, and applied the obtained know-how to developing submersible seawater-resistant pumps. Tsurumi also considers economic efficiency important and, therefore, designs pumps with “as many standardized materials as possible.”

Tsurumi’s standard pumps can be combined with a seawater-resistant kit (optional) that adds a “galvanic anode” and “seawater-resistant special cast iron impeller,” to solve both problems of long service life and cost efficiency.



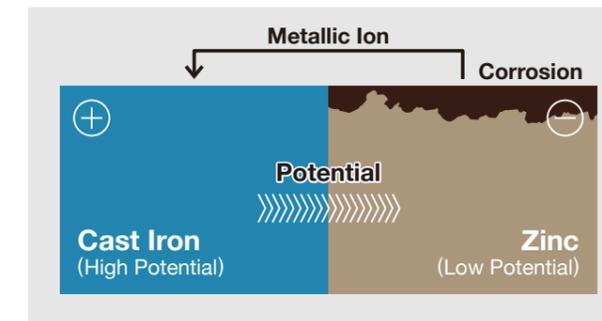
Mechanism of Metal Corrosion

If seawater-resistant measures are not taken in seawater applications, metal parts corrode, which causes performance drop that can result in pump failure. One suspected cause of corrosion in metallic parts by seawater is the “metal corrosion potential.”

In seawater, a metal’s resistance to corrosion can be seen clearly. As shown in the illustration of <Bimetallic Corrosion in Seawater>, when metals of different potential contact one another, only the metal of lower potential will corrode while the metal of higher potential is protected from corrosion. The table of <Potentials of Various Metals in Seawater> shows the corrosion strength/weakness of various metals.

As the potential difference increases, the metal of lower potential corrodes faster. For example, with a cast iron impeller and stainless steel shaft, only the impeller will corrode. With a 316 stainless steel impeller and 420 stainless steel shaft, corrosion attacks the shaft first. This is the most important point to be considered in handling seawater. Based on this principle, a galvanic anode is provided for Tsurumi’s submersible seawater-resistant dewatering pumps to protect the pump body against corrosion. To prevent corrosion of the motor shaft, which may not be fully protected by only the galvanic anode, a seawater-resistant special cast iron impeller was developed exclusively by Tsurumi.

<Bimetallic Corrosion in Seawater>



<Potentials of Various Metals in Seawater>

Metal	Potential
Titanium	High (Corrosion-Resistant)
316 Stainless Steel	
304 Stainless Steel	
420 Stainless Steel	
Cast Iron	Low (Corrosive)
Aluminium Alloy	
Aluminium	
Zinc	
Magnesium	

Corrosion of Stainless Steel

Stainless steel pumps are not absolutely resistant to seawater. After test-running a Tsurumi VANCS-series pump made of stainless steel and resin in seawater for one month, remarkable corrosion occurred in isolated areas of the pump. Stainless steel provides high corrosion resistance when a protective film of chromium oxide is formed on the surface. However, if the protective film is not formed due to an oxygen shortage, that corrosion resistance is considerably

reduced. Crevice corrosion is a phenomenon whereby corrosion concentrates in a crevice that oxygen cannot readily reach, as shown in the pictures of <Example of Crevice Corrosion>. Pitting corrosion looks like a hole and occurs only in areas where marine organisms (barnacles, etc.) attach and consequently deprive the spot of oxygen. Even with stainless steel, localized corrosion will occur, so great caution is required.

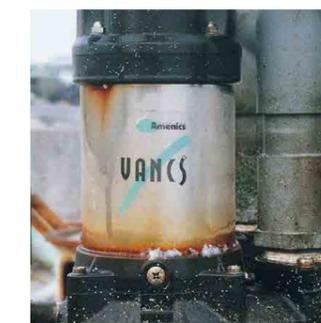
<Example of Crevice Corrosion>



304 Stainless Steel Motor Frame



Corrosion Test
(in seawater / 1 month)



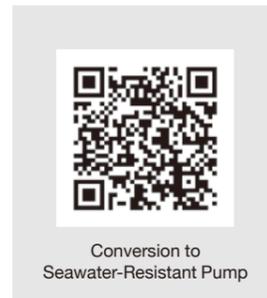
TSURUMI Seawater-Resistant Pumps



Seawater-Resistant Kit

Tsurumi's standard pumps can be combined with a seawater-resistant kit (optional) that adds a "galvanic anode" and "seawater-resistant special cast iron impeller," and enables about two years of service. (The service period depends on operating conditions.) If your pump is to be used for a longer period, contact your dealer.

- Galvanic Anodes (with Fittings, Seal Putty)
 - Seawater-Resistant Special Cast Iron Impeller
 - 304 Stainless Steel Eye Bolts*
- * Applicable only with models having steel eye bolts



Galvanic Anode

The galvanic anode is an electrolytic protective measure used with metals of differing corrosive potentials. Metals of a potential lower (aluminium and zinc) than the pump body (cast iron and steel) are brought into contact with the body via the galvanic anodes and allowed to corrode in order to protect the body. However, the full effect cannot be obtained unless the anodes are installed in the proper positions.

Tsurumi mainly utilizes aluminium because of its superior anticorrosive performance per unit weight, while utilizing zinc for only the strainer stand that is liable to be worn by water current. Since the galvanic anodes are worn by corrosion, they need to be replaced every two years. They can be replaced easily and used immediately after replacement.



Corrosion Test (in seawater / 1 year)



without galvanic anode

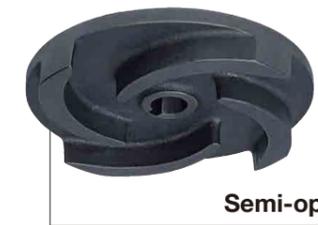
with galvanic anode installed



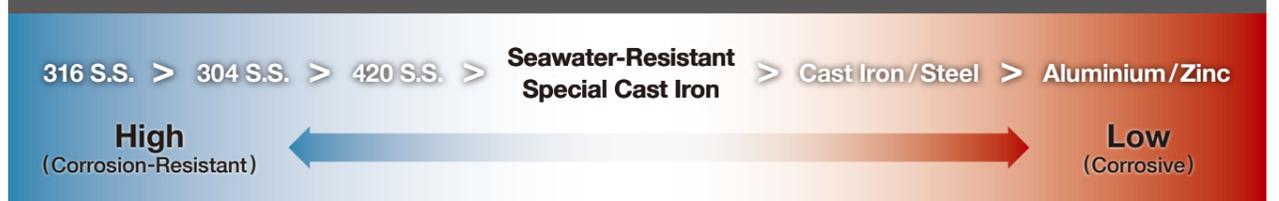
Seawater-Resistant Special Cast Iron Impeller

While the pump is running, the galvanic anode does not protect rotating parts. In seawater applications, the materials of the shaft and impeller must be carefully matched to avoid shaft corrosion and expensive repairs. After long years of research, Tsurumi developed an exclusive "seawater-resistant special cast iron impeller" suited to protect the shaft against corrosion by seawater.

This material is made by specially treating chromium cast iron. Because its electric potential is slightly lower than that of the shaft, the impeller corrodes gradually, which helps to prevent the shaft from corroding. The impeller needs to be replaced every few years to 10 years, depending on operating conditions. However, the impeller costs far less than the shaft to replace.



Potentials of Various Metals in Seawater



The amount of corrosive wear in the special cast iron impeller is approx. one tenth of that of conventional cast iron impeller.

Motor Shaft Corrosion Test (in seawater / 1 year)



A cast 304 stainless steel impeller was mounted on 403 stainless steel shaft. (The shaft was heavily corroded.)



A seawater-resistant special cast iron impeller was mounted on 403 stainless steel shaft. (The shaft was protected against corrosion.)

Impeller Corrosion Test (in seawater / 11 months)

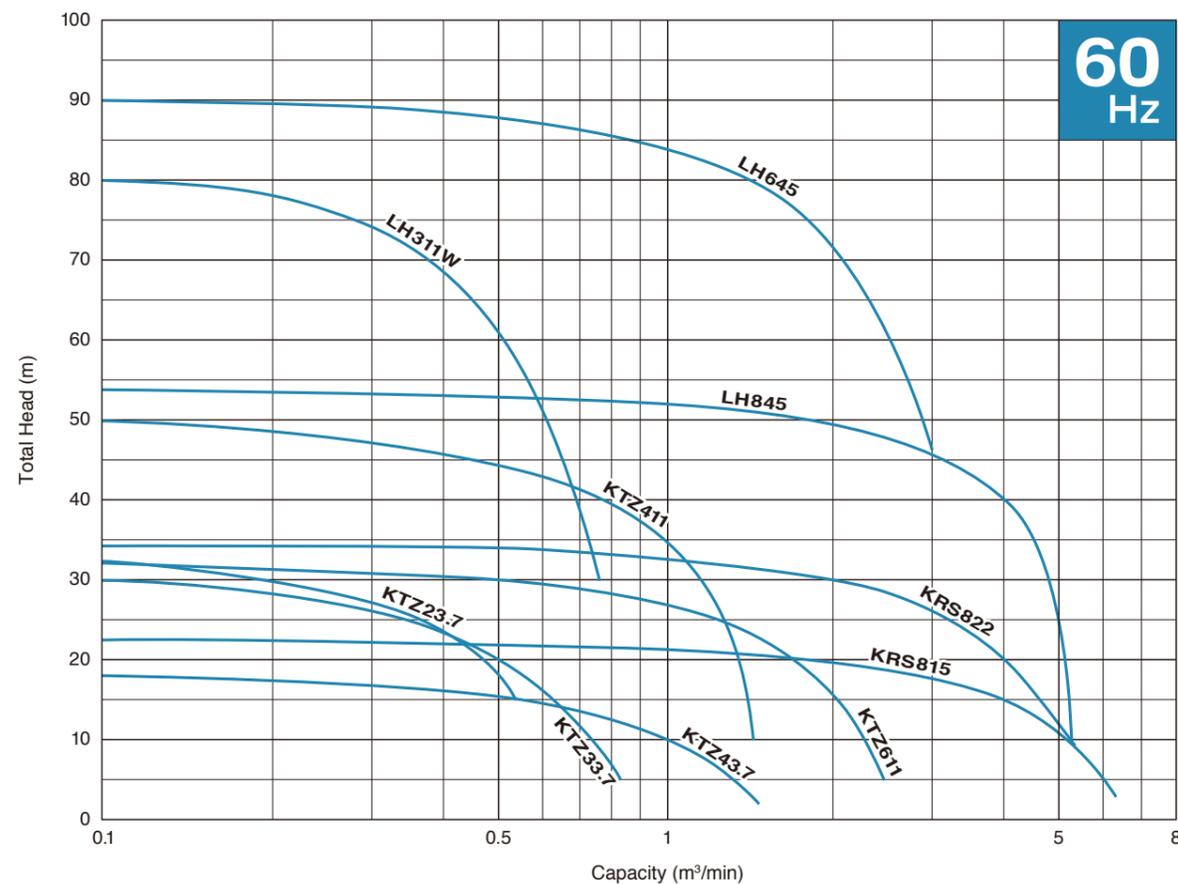
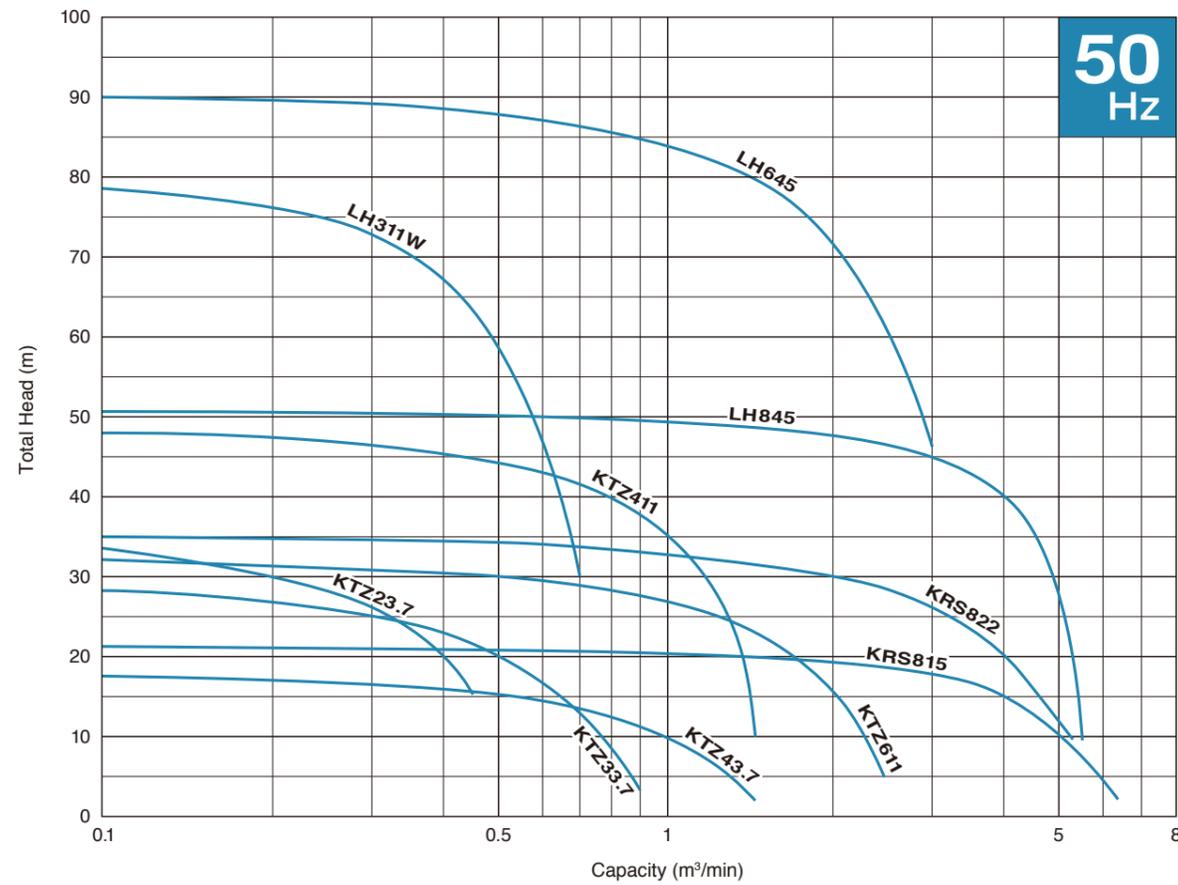


High-chromium cast iron



Seawater-resistant special cast iron

Performance Curves

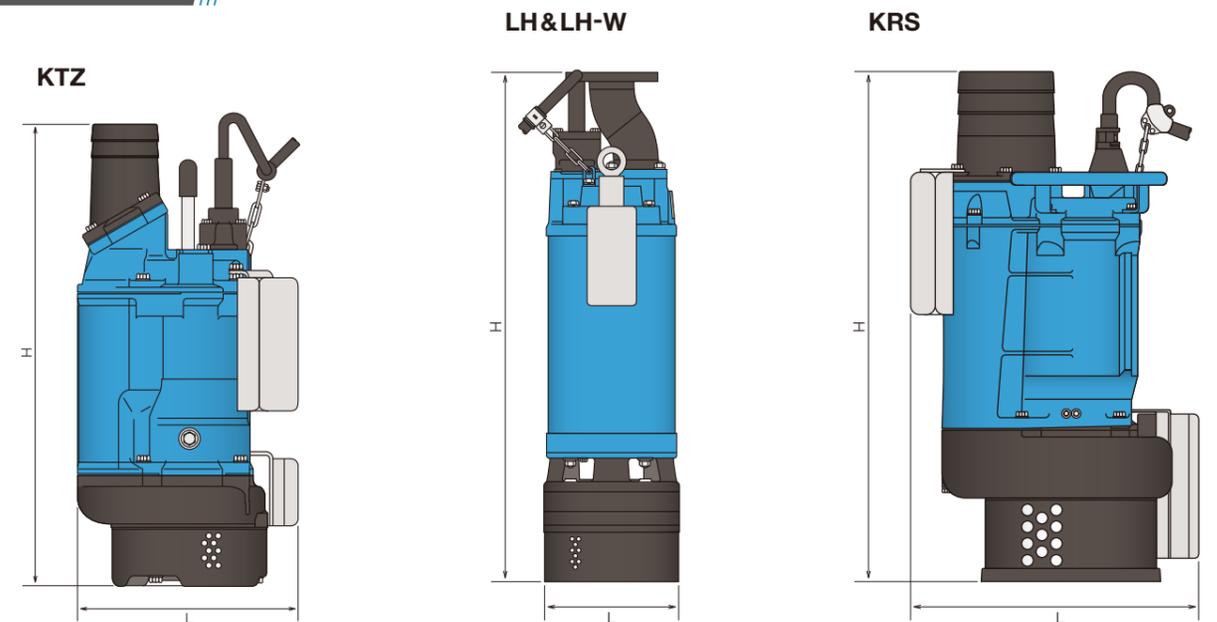


Model Selection

Discharge Bore mm	Model	Motor Output kW	Phase	Pole	Starting Method	Solids Passage mm	Dimensions L x H mm	Dry Weight kg	Cable Length m
50	KTZ23.7	3.7	Three	2	D.O.L.	8.5	345 x 675	60	8
80	KTZ33.7	3.7	Three	2	D.O.L.	8.5	345 x 675	60	8
100	KTZ43.7	3.7	Three	2	D.O.L.	8.5	345 x 690	60	8
100	KTZ411	11	Three	2	D.O.L.	12	415 x 884	133	8
150	KTZ611	11	Three	2	D.O.L.	20	415 x 884	133	8
150	LH645	45	Three	2	Star-Delta	6	620 x 1448	510	10
200	LH845	45	Three	2	Star-Delta	6	620 x 1488	510	10
80	LH311W	11	Three	2	D.O.L.	8.5	440 x 1024	130	20
200	KRS815	15	Three	4	D.O.L.	25	635 x 1069	240	8
200	KRS822	22	Three	4	Star-Delta	25	705 x 1241	380	10

* Dry weight excluding galvanic anodes and cable

Dimensions



Seawater Pumps

TM-series

Tsurumi also offers submersible seawater pumps, the TM-series.

All the wetted parts of this pump are made of titanium and resin, which provides the highest corrosion resistance to seawater. The TM-series is available in 0.25 to 3.7kW motor output, and both single-phase and three-phase models. For details, refer to the VANCS-series catalog [IA114].



We reserve the right to change the specifications and designs for improvement without prior notice.

**TSURUMI
MANUFACTURING CO., LTD.**

Your Dealer