

# SULZER

Flow Equipment

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## AHLSTAR

end-suction single-stage  
centrifugal pumps



# Hydraulic coverage for the most demanding applications

AHLSTAR pumps have been designed to meet the most demanding hydraulic requirements for all types of liquid, making it the ideal range for challenging pumping operations.

Since our very first designs in the mid 1980s up to the most recent state-of-the-art range, we have delivered more than 200'000 AHLSTAR pumps worldwide – all designed to exceed standard requirements and customer expectations.

The AHLSTAR range, comprised of the A, APT, NPP/T, WPP/T and EPP/T ranges, has been designed in accordance with ISO 5199 and ISO 2858 international standards, and has been even further developed to surpass market standards and ensure excellent performance and reliability.



Pulp, paper and board



Chemical process industry



Water and wastewater



Food industry



General industry



Oil and gas



Hydrocarbon processing



Power generation

Liquid	Temperature up to 210°C / 410°F	Pressure up to 16/25 bar / 230/360 psi	Gas content up to 70%	Liquid position below or above the pump	Corrosion pH from 0 to 14
Clean and slightly contaminated liquids	●	●	●	●	●
Viscous liquids	●	●	●	●	●
Fibrous slurries	●	●	●	●	●
Non-fibrous slurries	●	●	●	●	●
Large solids containing liquids	●	●	●	●	●

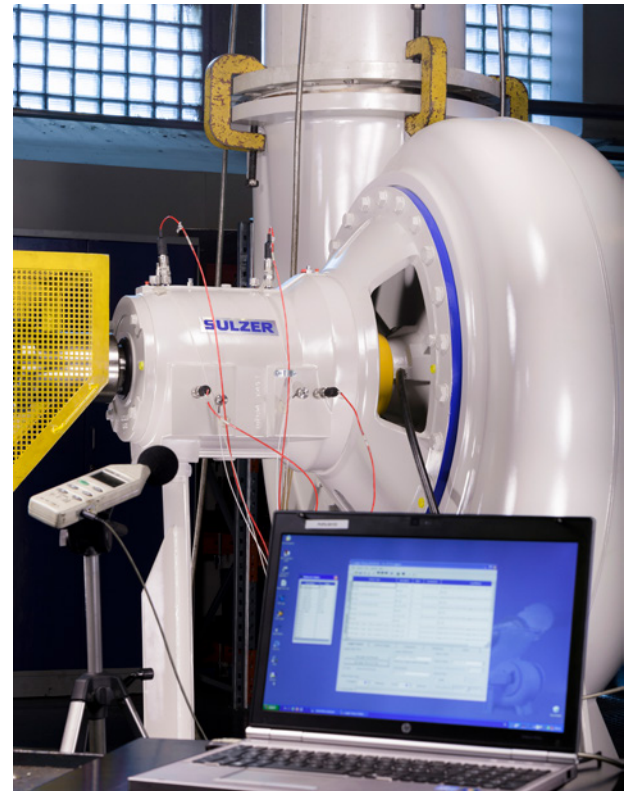


# Continuous research and development

Through revolutionary methods, we have improved the performance and reliability of our pumps. Here at Sulzer, we place great emphasis on innovation and research and development. Using our own simulation tools, we can quickly analyze various hydraulic designs and test the final design options in real operational conditions at our full-scale laboratory.

## Sulzer offers

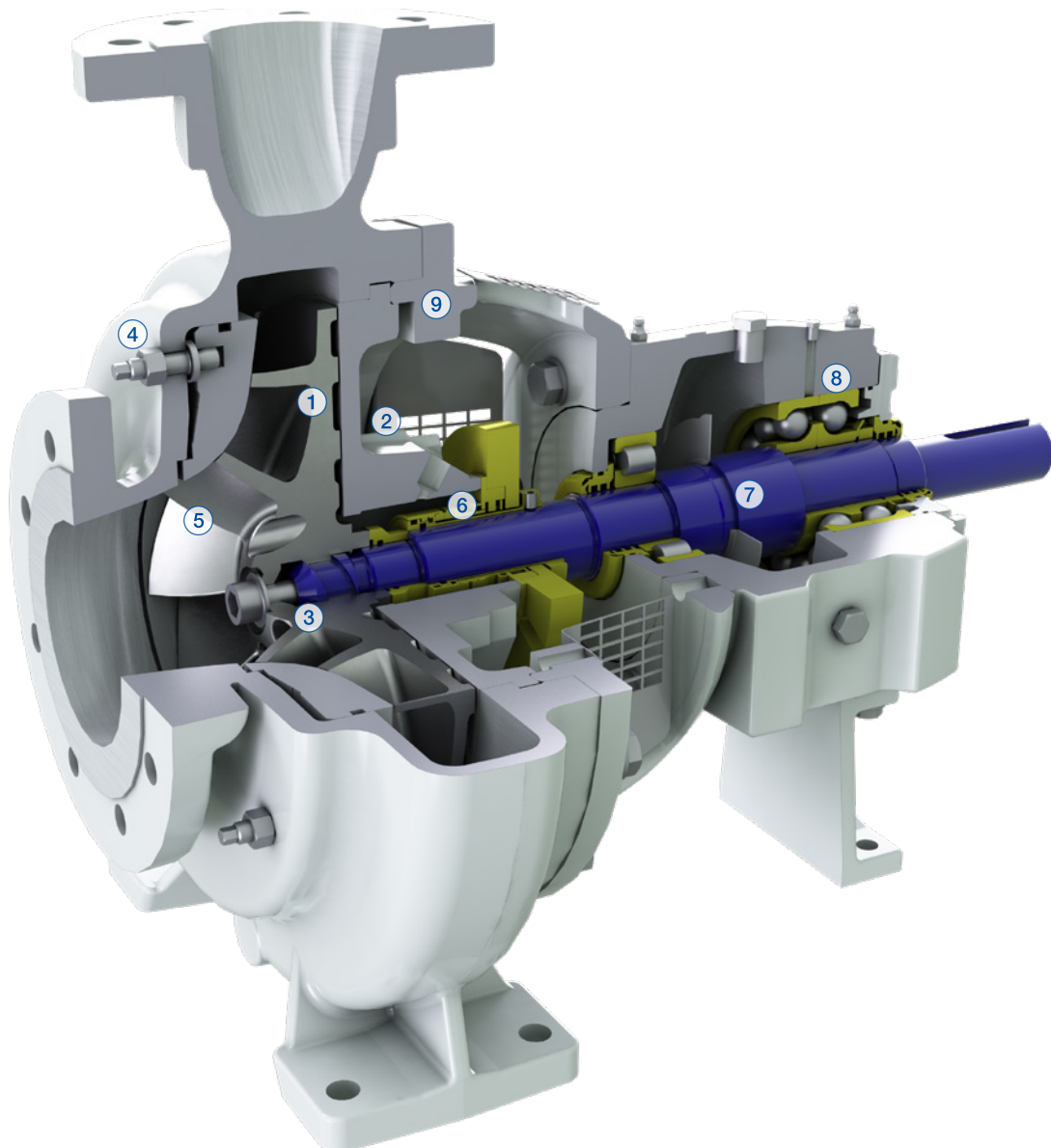
- Process knowhow and proven equipment knowledge
- Wide process and application coverage
- Excellent equipment performance through continuous equipment development
- Wide range of installations in different processes carried out by many process suppliers
- Large reference list of installed base
- Optimized selections and guidelines
- Superior reliability due to high number of test runs in laboratory and various industries



# Superior design minimizes life cycle costs

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- ① Versatile range of reliable and efficient impellers
- ② Innovative and reliable integrated degassing and self-priming units
- ③ Robust, reliable and patented Rotokey impeller mounting
- ④ Externally adjustable patented side plate
- ⑤ Patented balancing holes
- ⑥ Wide variety of shaft seal options
- ⑦ Heavy-duty shaft
- ⑧ Reliable bearing unit
- ⑨ Back pull-out design



# Features and benefits

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## Versatile range of reliable and efficient impellers

- Reduces life cycle costs, energy consumption, operation time and downtime

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## Externally adjustable patented side plate

- Allows fast and simple impeller clearance setting, thereby minimizing life cycle costs and ensuring continued high efficiency

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## Heavy-duty shaft

- Reduces deflection at stuffing box to <math><0.05\text{ mm} / 0.002\text{ in}</math>
- Helps extend shaft seal lifecycle, reduces unexpected shutdowns and maintenance costs

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## Innovative and reliable integrated degassing and self-priming units

- For a variety of applications with difficult liquids
- Designed to help the centrifugal pump start quickly when the liquid level is below the pump in self-priming applications

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## Patented balancing holes

- Ensure efficient liquid circulation behind the impeller and in the seal chamber
- Guarantee optimum shaft seal performance by reducing unexpected shutdowns and minimizing operation and maintenance costs

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## Reliable bearing unit

- Reliable, heavy-duty bearing unit minimizes maintenance costs
- Includes oil and grease lubrication for all performance needs: grease lubrication for applications up to

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## Robust, reliable and patented Rotokey impeller mounting

- Enables fast and simple dismantling and reassembly
- Helps minimize maintenance costs

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## Wide variety of shaft seal options

- Effective dynamic, single and double mechanical seals and gland packing
- Fast and simple installation
- No measurement required

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## Back pull-out design

- Facilitates quick access for servicing





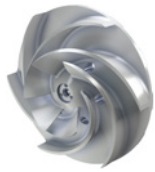
# A range Peak performance process pumps for demanding applications

AHLSTAR A end-suction single-stage centrifugal process pumps are used for demanding industrial applications to ensure process reliability, high efficiency and low operating costs.

## Impeller options



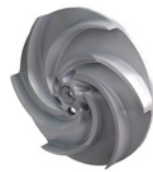
Low-flow impeller



Open impeller



Special open impeller



Vortex impeller



Low-pulse impeller

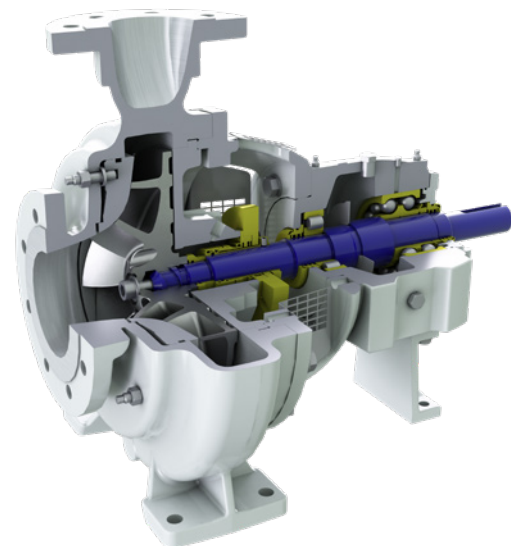
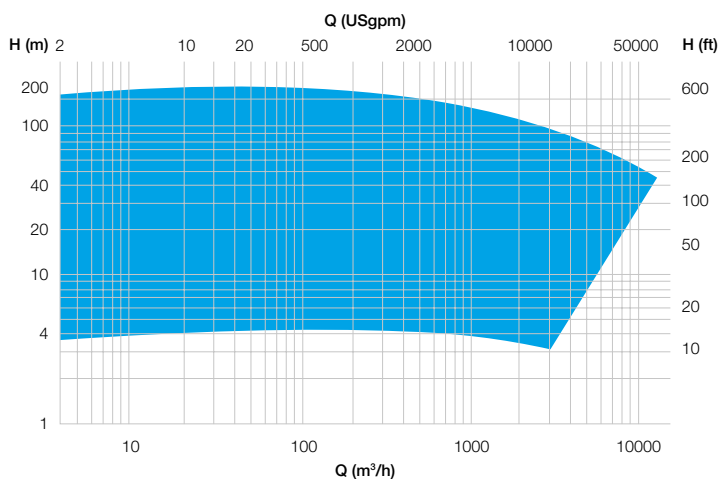


Closed impeller

## Operating data

	50 Hz	60 Hz
Capacities	11'000 m <sup>3</sup> /h	48'400 USgpm
Heads	160 m	525 ft.
Temperatures	180°C	356°F
Pressures depending on material and size	16/25 bar	230/360 psi

## Performance range



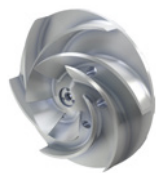
# APT range High performance process pumps for demanding applications

AHLSTAR APT end-suction single-stage centrifugal process pumps are used for demanding industrial applications to ensure process reliability, high efficiency and low operating costs.

## Impeller options



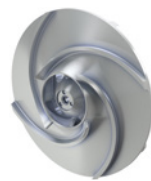
Closed impeller



Open impeller



Special open impeller

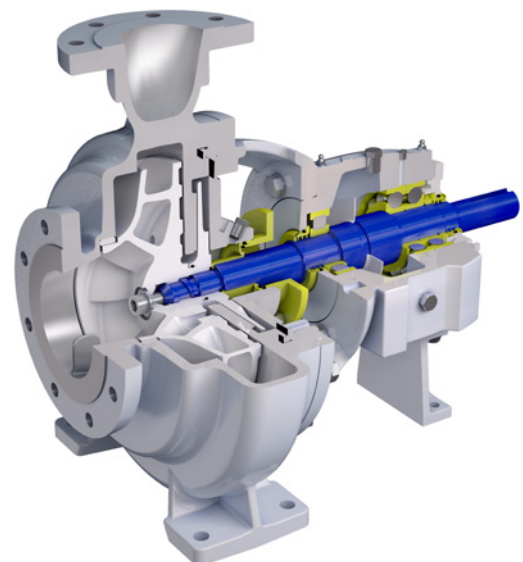
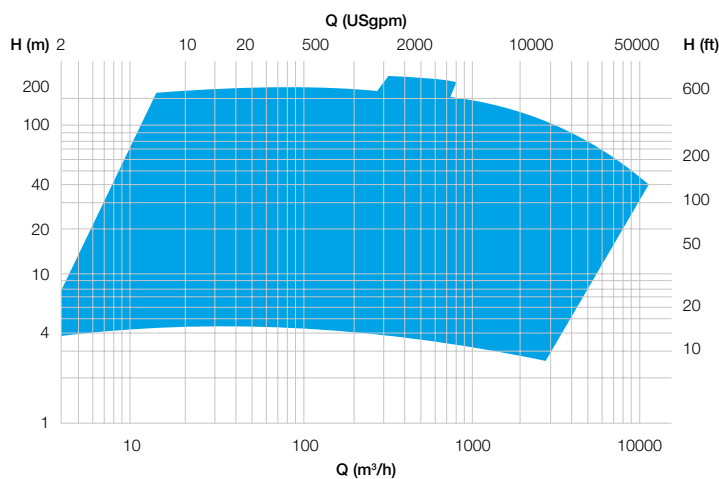


Low-pulse impeller

## Operating data

	50 Hz	60 Hz
Capacities	9'000 m <sup>3</sup> /h	39'600 USgpm
Heads	160 m	525 ft.
Temperatures	180°C	356°F
Pressures depending on material and size	16/25 bar	230/360 psi

## Performance range



# WPP/T range Tough against wear, gentle against process

AHLSTAR WPP/T wear-resistant end-suction single-stage centrifugal pumps are designed for abrasive and erosive pumping applications, such as lime milk and mud, and coating pigments.

## Impeller options



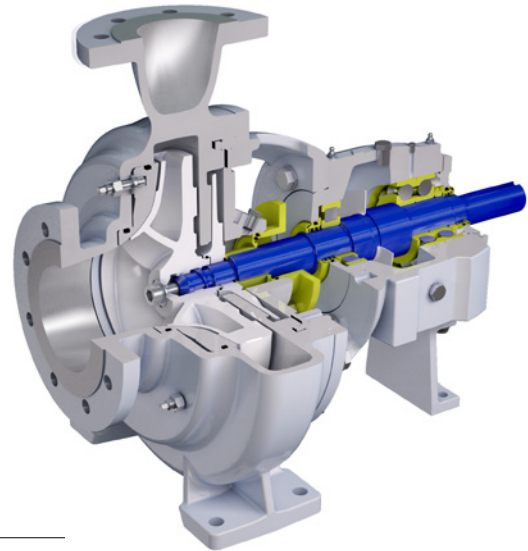
Wear-resistant closed impeller



Wear-resistant open impeller



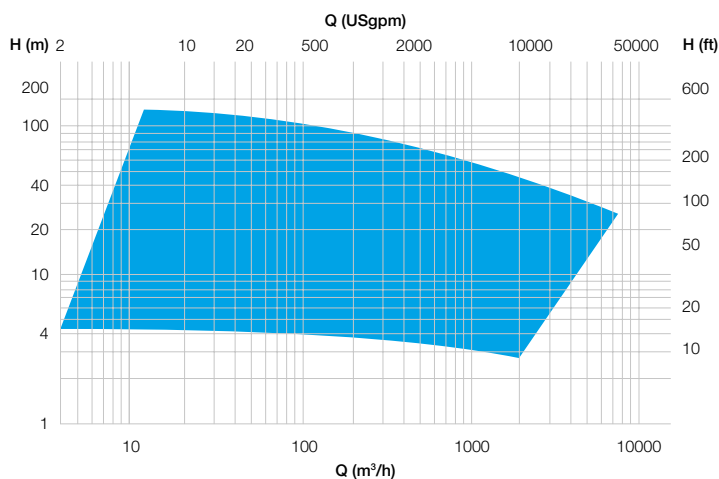
Wear-resistant vortex impeller



## Operating data

	50 Hz	60 Hz
Capacities	7'000 m <sup>3</sup> /h	31'000 USgpm
Heads	110 m	360 ft.
Temperatures	180°C	356°F
Pressures depending on material and size	16 bar	230 psi

## Performance range





# NPP/T range Smooth solution for large solid particle pumping

AHLSTAR NPP/T non-clogging end-suction single-stage centrifugal process pumps are designed for industrial large solids containing liquid or abrasive slurry applications to avoid plugging.

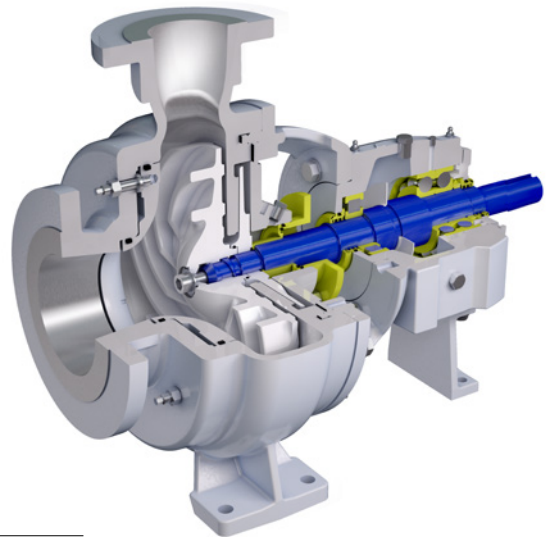
## Impeller options



Non-clogging closed (channel type) impeller



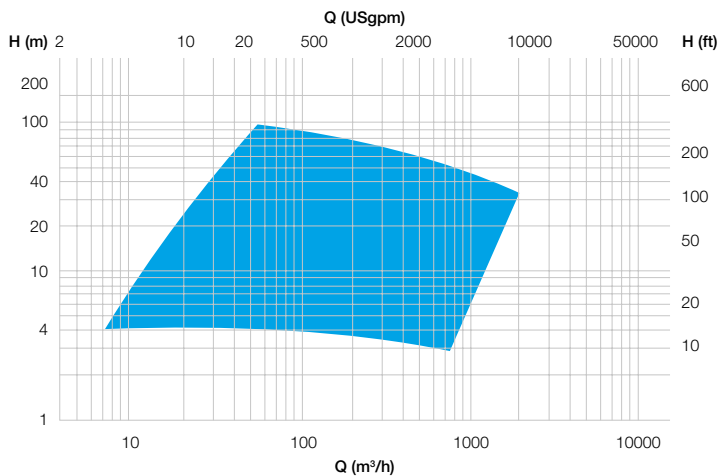
Non-clogging vortex impeller



## Operating data

	50 Hz	60 Hz
Capacities	2'000 m <sup>3</sup> /h	8'800 USgpm
Heads	90 m	295 ft.
Temperatures	180°C	356°F
Pressures depending on material and size	16 bar	230 psi

## Performance range



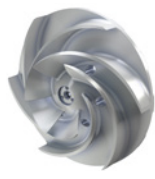
# EPP/T range Cool selection for hot liquid pumping needs

AHLSTAR EPP/T centerline supported end-suction single-stage centrifugal process pumps are designed to stand high temperature especially in demanding industrial hot liquid pumping applications.

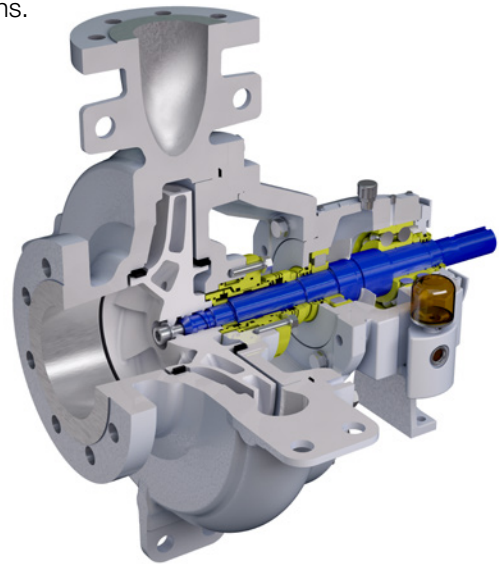
## Impeller options



Closed impeller



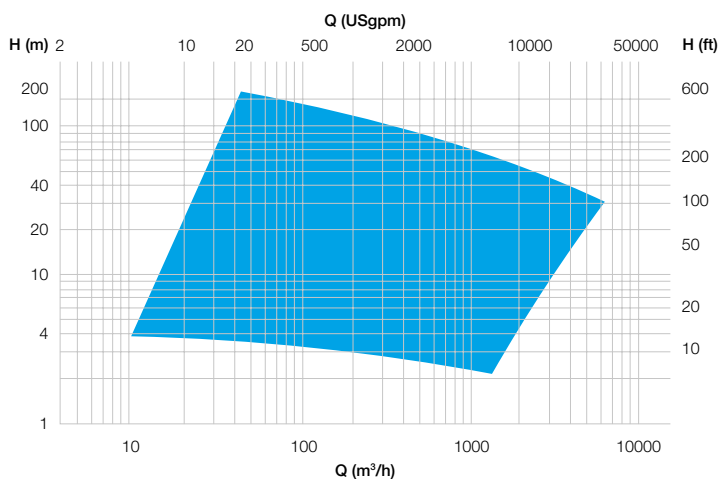
Open impeller



## Operating data

	50 Hz	60 Hz
Capacities	6'100 m <sup>3</sup> /h	26'860 USgpm
Heads	160 m	525 ft.
Temperatures	210°C	410°F
Pressures depending on material and size	25 bar	360 psi

## Performance range



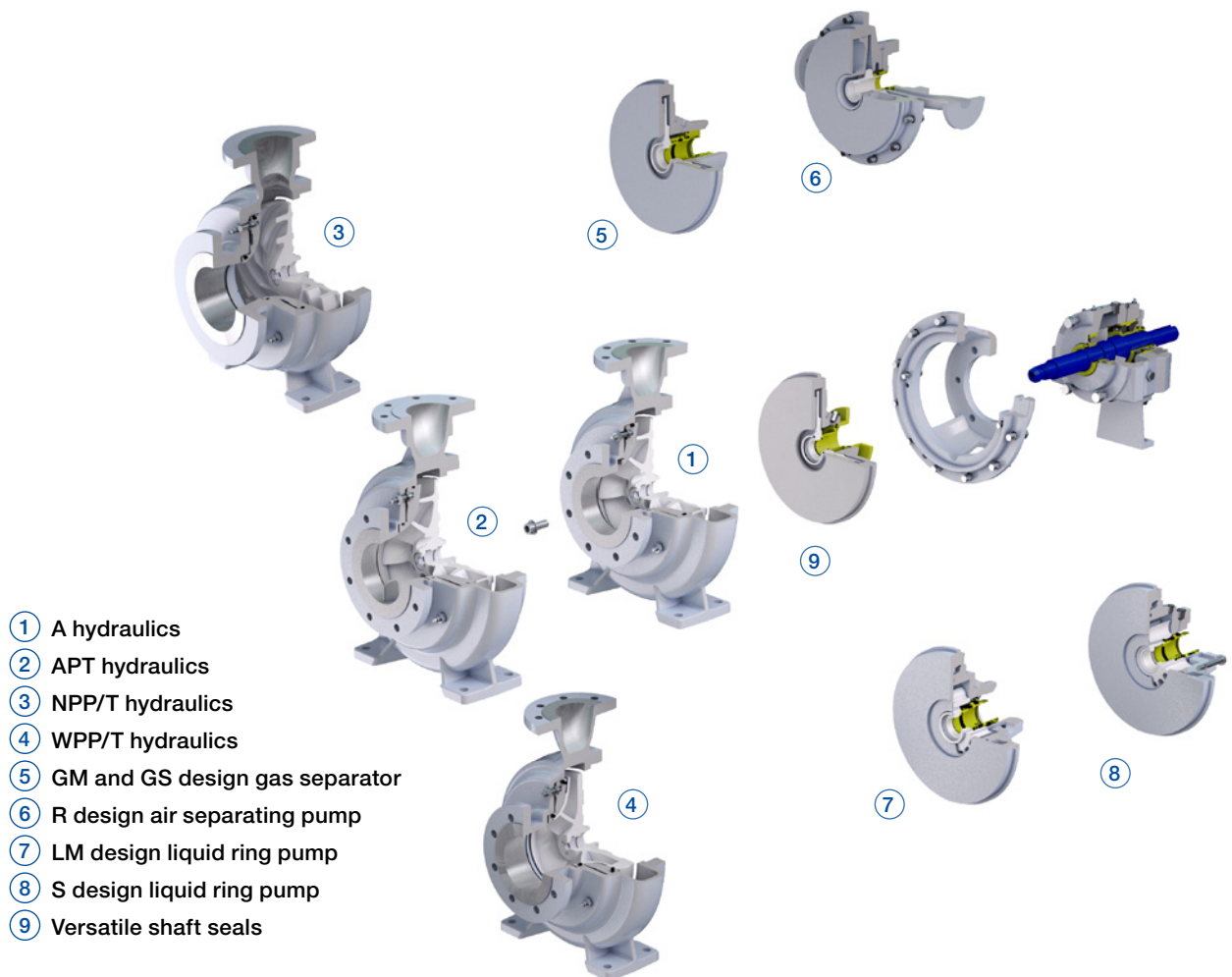
# Interchangeability

All pumps in our AHLSTAR range have been standardized, using common modules and components, for maximum interchangeability and easy installation and maintenance. Fewer parts means lower inventory costs and greater process reliability.

Common components and modules in AHLSTAR range types A, APT, EPP/T, NPP/T and WPP/T, with all options of gas separator GM, GS, R, self-priming LM and S are:

- 173 wet end sizes
- 24 sealing unit sizes with 7 common shaft seal sizes
- 7 common bearing units
- Common sealing water equipment
- Common couplings and coupling guards
- Common baseplates

Lower spare part inventory and higher process reliability with high interchangeability of wet ends, sealing units and bearing units



# Materials

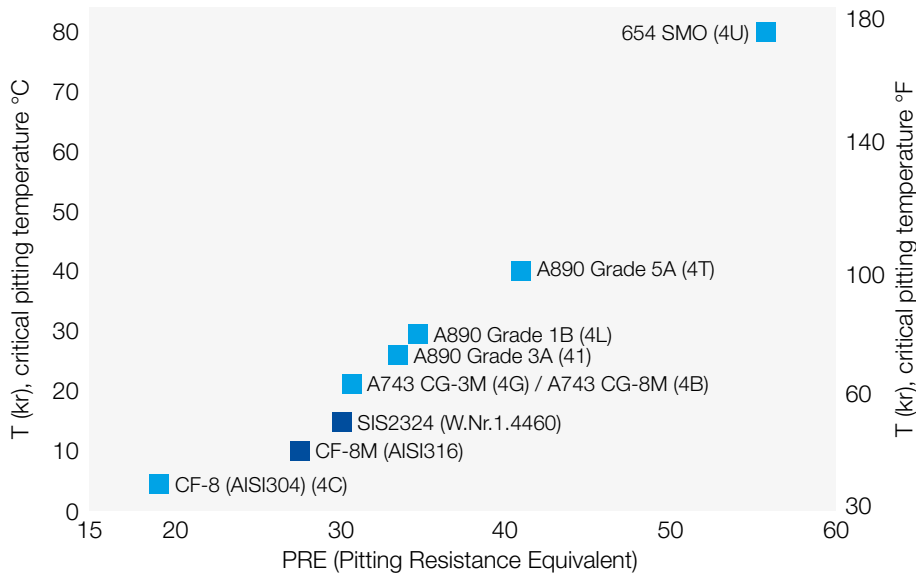
Stainless steel design			Nominal chemical composition %					
			C	Cr	Ni	Mo	Cu	N
<b>Duplex</b>	ASTM A890 3A	41	0.06 max.	24.0-27.0	4.0-6.0	1.75-2.5	-	0.15-0.25
	ASTM A890 1B	4L, EH*	0.04 max.	24.5-26.5	4.7-6.0	1.7-2.3	2.7-3.3	0.10-0.25
	ASTM A890 5A	4T	0.03 max.	24.0-26.0	6.0-8.0	4.0-5.0	-	0.10-0.30
<b>Austenitic</b>	ASTM A743 CF-8	4C	0.08 max.	18.0-21.0	8.0-11.0	-	-	-
	AVESTA 654 SMO <sup>2)</sup>	4U	0.025 max.	23.0-25.0	21.0-23.0	7.1-7.5	0.3-0.7	0.45-0.55
<b>Martensitic</b>	ASTM A747 CB7Cu-2	4E	0.07 max.	14.0-15.5	4.5-5.5	-	2.5-3.2	-
<b>Ferritic</b>	ASTM A743 CC50 (mod)	ER**	0.25-0.35	29.0-30.0	1.50-3.00	1.50-3.00	1.00-1.50	0.10-0.20
Carbon steel, cast and ductile iron, titanium design <sup>5)</sup>			C	Cr	Ni	Mo	Cu	Other
<b>Cast iron <sup>3)</sup></b>	ASTM A48 CL 35 B	53	-	-	-	-	-	-
<b>Chromium iron <sup>4)</sup></b>	ASTM A532 IIIA	5B	2.0-3.3	23.0-30.0	2.5 max.	3.0 max.	1.2 max.	Si 1.5 max.
<b>Ductile iron</b>	ASTM A395 60-40-18	5H	3.0 min.	-	-	-	-	Si 2.50 max. P 0.08 max.
<b>Carbon steel</b>	ASTM A216 WCB	46 <sup>1)</sup>	0.30 max.	0.50 max.	0.50 max.	0.20 max.	0.30 max.	Mn 1.0 max. Si 0.6 max.
<b>Titanium</b>	ASTM B367 C-3	75 <sup>1)</sup>	-	-	-	-	-	-
Material alternatives for other parts								
<b>Gasket material</b>	Reinz AFM34	Y6	Used in temperature range -50°C/-58°F...+250°C/+482°F					
	PTFE/Glass	84	Used in temperature range -190°C/-310°F...+240°C/+464°F					
<b>O-ring material</b>	EPDM	92	Used in temperature range -50°C/-58°F...+150°C/+302°F					
	FKM	93	Used in temperature range -20°C/-4°F...+200°C/+392°F					

- 1) Currently available on limited sizes
- 2) AVESTA 654SMO is a trademark owned by Outokumpu Stainless which has granted Sulzer licence to produce this material
- 3) Type APT and NPP/T pumps
- 4) For WPP/T range (5B/4E and full 5B)
- 5) Other corrosion resistant cast steels available on request

\* EH precipitation hardened to c. 300HB  
 \*\* ER for WPP/T range impeller and sideplate  
 \*\*\* Type A pumps



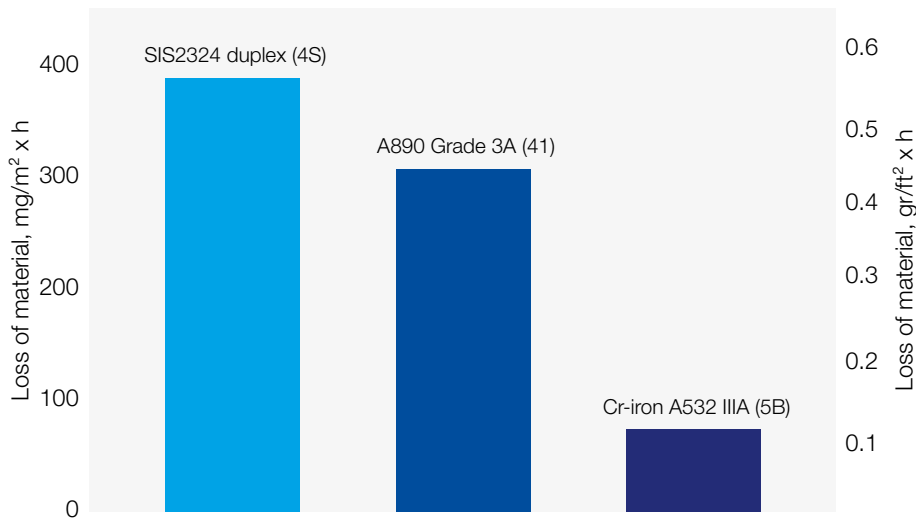




### Corrosion resistance

Ferric chloride solution test; ASTM G-48

■ typical other materials used in process industry (e.g. PPI)



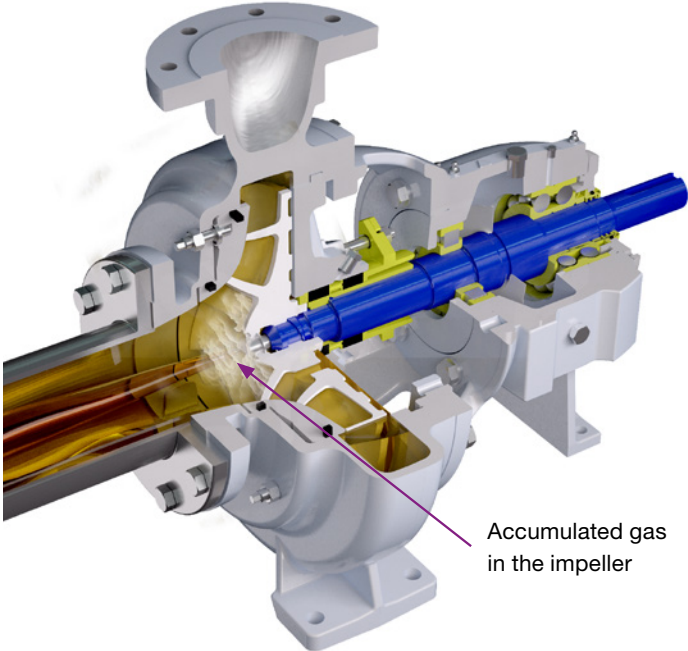
### Wear resistance

- Abrasion and corrosion test
- White liquor and lime mud +95°C/203°F ±22°C/40°F, 100 g/l/0.835 lb/gal quartz sand (Stora Enso Pulp)
- Accuracy in the test ±21 mg/m² x h / 0.03 gr/ft² x h

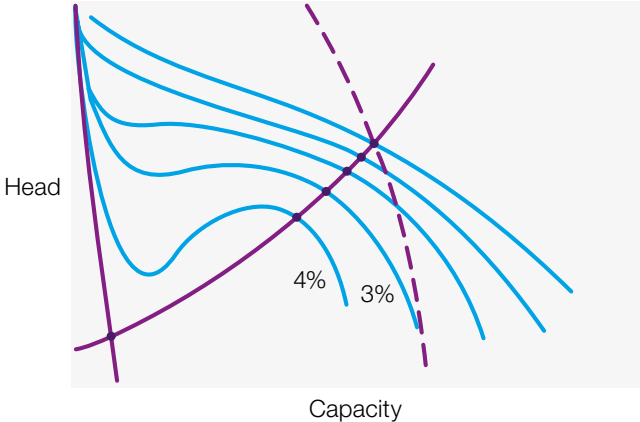
# Degassing and self-priming units

AHLSTAR pumps can be fitted with self-priming or degassing units, to enable the pump to be started with an empty inlet pipe and to allow it to pump liquids with high gas content.

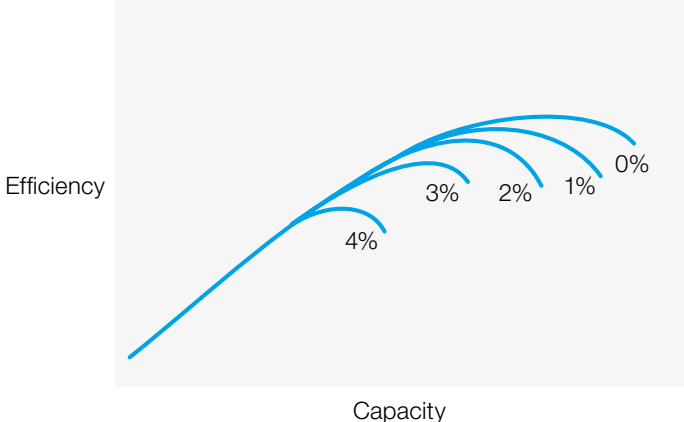
AHLSTAR degassing and self-priming units, the LM or S liquid ring pump and the GM, GS or R gas separator units, stabilize the pumping of liquids containing up to 40% weakly bonded gases or up to 70% strongly bonded gases using centrifugal pumps.



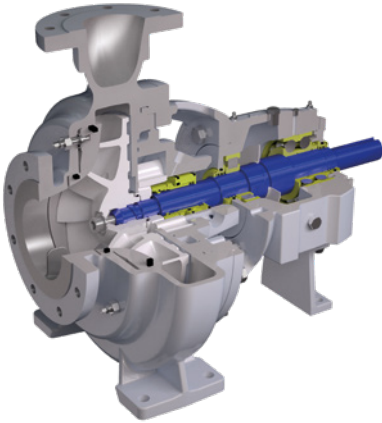
Conventional centrifugal pumps, regardless of impeller type, can operate with a gas content of up to 4%. However, once the gas content exceeds 4%, bubbles start to accumulate in the impeller eye and impair operations. This reduces capacity and pumping becomes extremely unstable.



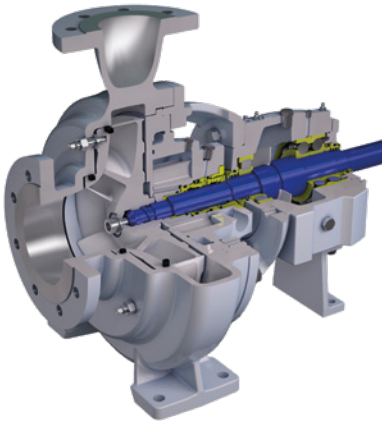
The difference in pressure between the pump inlet and the degassing unit outlet or the internal liquid ring pump eliminates gas bubbles from the impeller and thus stabilizes the system and significantly increases pump efficiency.



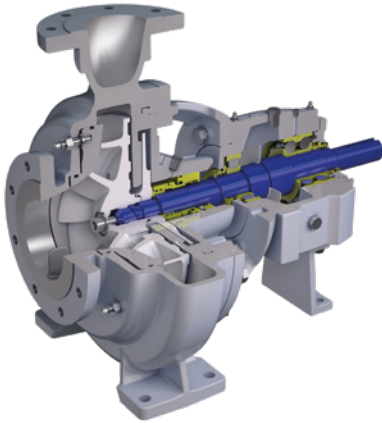
# Degassing and self-priming units



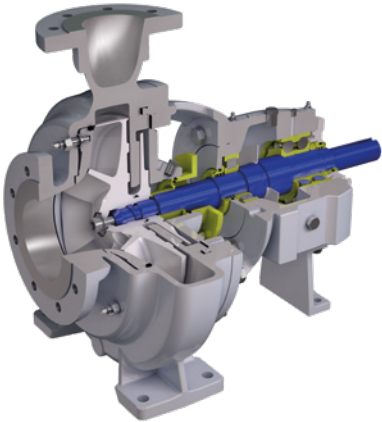
Liquid ring pump LM



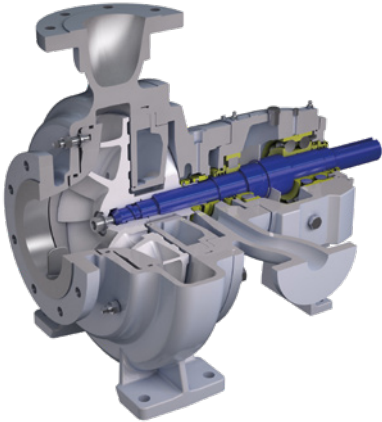
Liquid ring pump S



Gas separator GM



Gas separator GS



Gas separator R

# Degassing and self-priming solutions

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## Positive inlet head

AHLSTAR pump with LM or S integrated liquid ring pump degassing unit

- For reliable pumping of gases containing liquids in unstable inlet head applications
- Single or double mechanical seal with recirculation flushing for clean liquids or with external flushing for fibrous and non-fibrous slurries and liquids containing large solids
- When the inlet head is stable, GS, GM and R gas separator degassing units provide reliability and efficiency



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## Low or negative inlet head

AHLSTAR pump with LM or S integrated liquid ring pump

- Most reliable system for pumping gases containing liquids in low or negative inlet head applications
- Single or double mechanical seal with external flushing for clean liquids, fibrous and non-fibrous slurries and liquids containing large solids
- Double mechanical seal with recirculation flushing for clean liquids
- GM, GS or R gas separator degassing units without external vacuum pump cannot be used due to low or negative inlet head



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## Replacing the barometric leg

AHLSTAR pump with a GM or R gas separator unit

- Simplifies expensive classic barometric leg pumping systems and ensures consistent and reliable operation
- Deep wells, high buildings and long pipes with vertical or submersible pumps and liquid level control systems can be avoided, thereby minimizing initial costs
- Single mechanical seal with recirculation flushing for clean liquids or with external flushing for slurries
- Double mechanical seal for slurries



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## Self-priming pump applications

AHLSTAR pump with the LM or S integrated liquid ring pump degassing unit

- Ensures fast, reliable pump start-up and constant operation when starting with an empty inlet pipe
- Single mechanical seal with recirculation flushing for clean liquids, requires gooseneck inlet pipe
- Single mechanical seal with external flushing for slurries and liquids containing large solids





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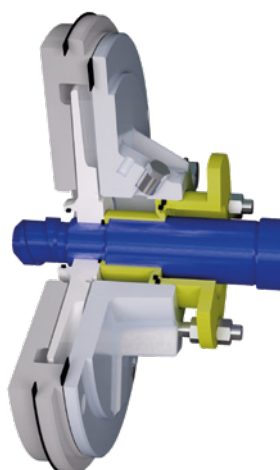
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GP

# Shaft seals

Shaft seal need to be selected carefully according to pumped liquid and operational conditions. With optimal seal selection you can maximize the lifetime of the seal and ensure reliable operation.

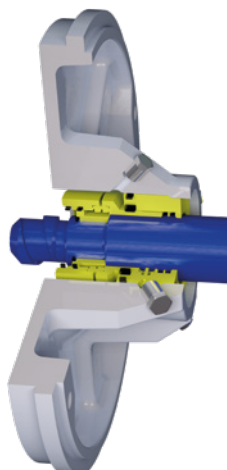
We have developed innovative Sulzer mechanical shaft seals for maximizing operational reliability and minimizing downtime costs. As Sulzer shaft seals require little or no water, they minimize also environmental costs.

Patented impeller balancing holes together with optimized impeller back vanes improve liquid circulation and create ideal conditions in the seal chamber.



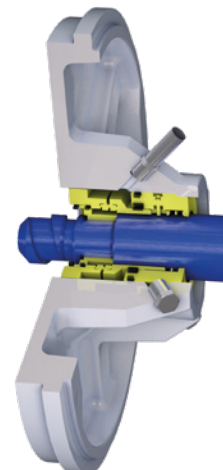
## Trusted Sulzer dynamic seal

- Suitable for clean liquids, viscous or non-fibrous slurries and liquids containing large solids
- No external sealing water required
- For applications with positive pump inlet head and a temperature below boiling point in atmospheric pressure



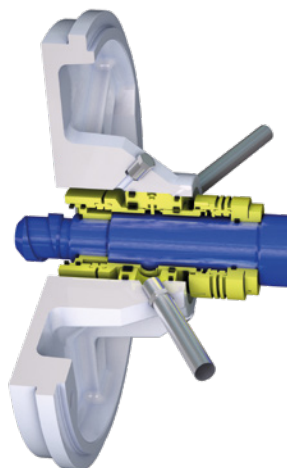
## Optimal bore Sulzer integrated single mechanical seal

- Suitable for clean or viscous liquids and liquids containing large solids
- For applications with positive pump suction head
- Liquid temperatures of 10°C / 20°F below boiling point in atmospheric pressure



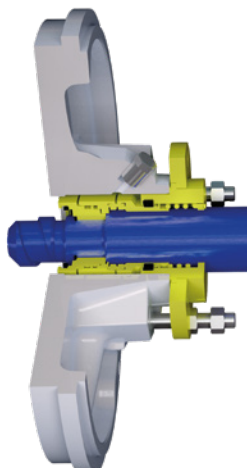
## Optimal bore Sulzer integrated throttled single mechanical seal

- Suitable for clean liquid applications with a negative pump suction head with internal flushing
- The impeller can be equipped with or without balancing holes
- For non-fibrous slurries with external sealing liquid flushing preventing abrasive particles penetrating the mechanical seal faces
- Temperatures up to 120°C / 248°F (with recirculation flushing), up to 180°C / 355°F (with external flushing)



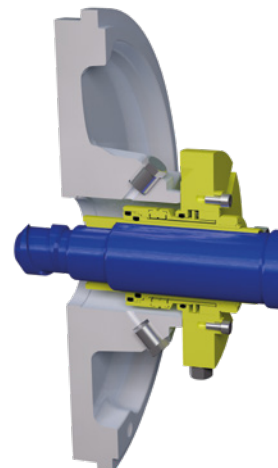
**Optimal bore Sulzer integrated double mechanical seal**

- Suitable for clean liquids, slurries, and liquids containing large solids
- Negative or positive pump suction head
- The impeller can be equipped with or without balancing holes
- In applications where large solids containing liquids are pumped, the impeller typically does not have balancing holes
- Temperatures of up to 180°C / 355°F



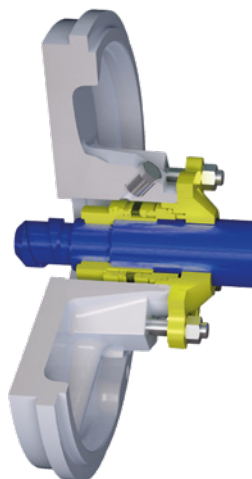
**Ready-fitted mechanical seals**

- Suitable for clean or viscous liquids and liquids containing large solids
- More space in seal chamber because no shaft sleeve needed
- Strong and solid design
- Single and double seal options



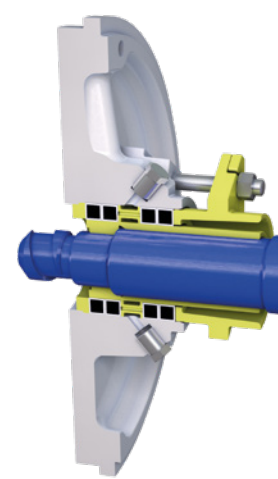
**Cartridge mechanical seals**

- Suitable for clean or viscous liquids and liquids containing large solids
- Single and double seal options



**Standard element mechanical seals**

- Requires shaft sleeve and seal housing
- Standard dimensions (L1K) for seals
- Suitable only for light-duty applications, e.g. clean liquids, low pressure, low temperature
- Single and double seal options



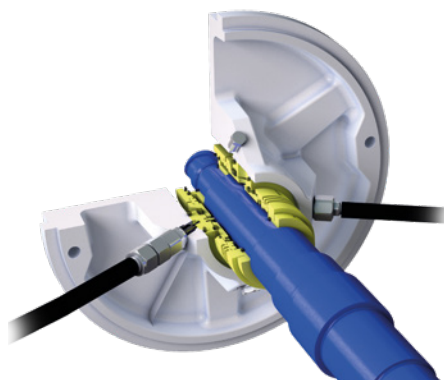
**Gland packing**

- Designed in accordance with ISO dimension standards
- Requires a sleeve to protect the shaft from corrosion and wear
- Reliable operation, but small (50 drops/minute) leakage required by seal/sleeve lubrication
- Easy maintenance, without having to open the pump, due to a split gland design



# Sealing water equipment

Sealing water equipment regulates the volume and pressure of external sealing water for optimum pump performance. The equipment is attached directly to the supply connection using a hose or pipe/tube.

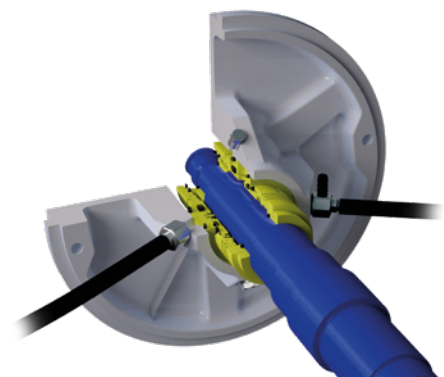
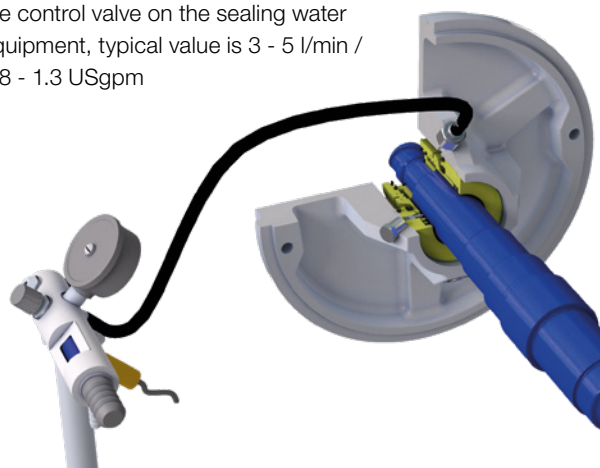


## Classic adjustable sealing water equipment

- Suitable for single or double mechanical seals and gland packings
- Incoming water supply pressure must be at least 0.5 bar / 7 psi higher than in the seal chamber
- The volume of sealing water can be regulated via the control valve on the sealing water equipment, typical value is 3 - 5 l/min / 0.8 - 1.3 USgpm

## Automatic constant flow sealing water equipment

- Suitable for single or double mechanical seals and gland packings
- Incoming water supply pressure must be at least 0.5 bar / 7 psi higher than in the seal chamber
- Automatically regulates the volume of sealing water to a constant 2 l/min / 0.5 USgpm



## Sulzer integrated smart flow sealing water equipment

- Suitable for double mechanical seals
- Automatically reduces the volume of sealing water to the minimum required
- Incoming water supply pressure must be at least 0.5 bar / 7 psi higher than in the seal chamber
- Potential water savings of up to 90%, compared to standard sealing water equipment
- The seal chamber must be ventilated before use

## Sulzer SP8 seal pot

- Suitable for double mechanical seals equipped with pumping feature
- Connected to the pressurized water network, or can be pressurized with hand pump
- The reservoir pressure must be at least 0.5 bar / 7 psi higher than in the seal chamber
- Maximum process temperature of 100°C / 210°F
- Maximum pressure of 10 bar / 145 psi
- Suitable for water and glycol-water mixture
- Potential water savings of up to 96%, compared to standard sealing water equipment

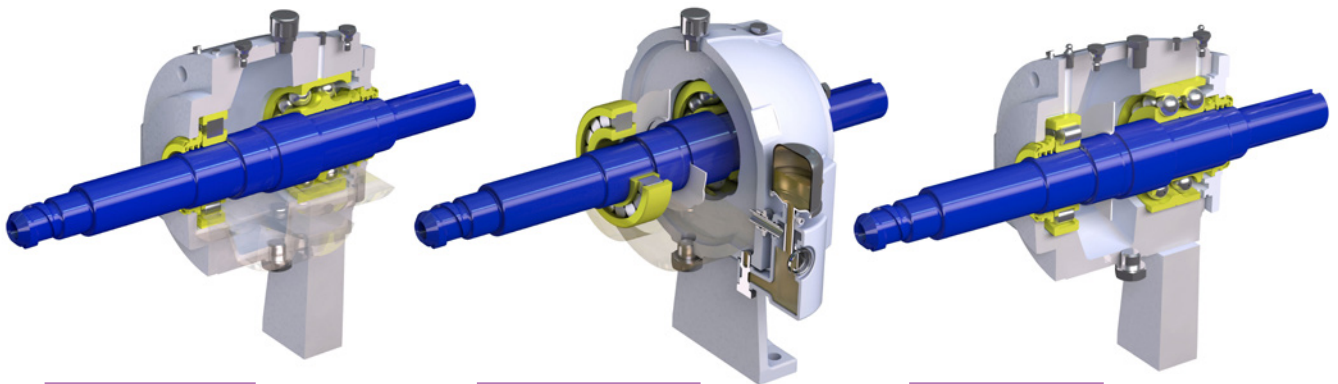




# Heavy-duty bearing units

Sulzer's AHLSTAR bearing units are reliable and heavy-duty, resulting in minimized maintenance costs.

- Optimized construction, making assembly fast and simple
- Heavy-duty shaft minimizes deflection at stuffing box < 0.05 mm / 0.002 in, thereby extending the life cycle of the shaft seal
- Oil bath or oil splash lubrication for applications up to 180°C / 355°F and grease lubrication up to 120°C / 250°F
- The strong, over-sized bearing design far exceeds the ISO 5199 standard life cycle of 17'500 hours
- A sturdy support foot provides a solid base and prevents coupling alignment changes



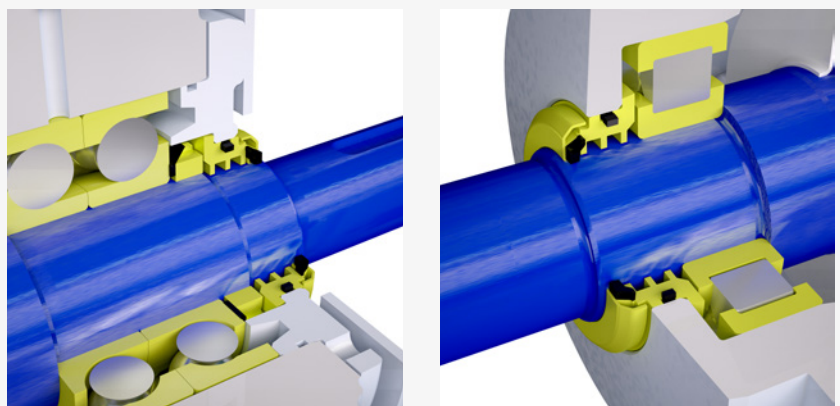
Oil bath lubrication

Oil splash lubrication

Grease lubrication

## Innovative bearing isolators

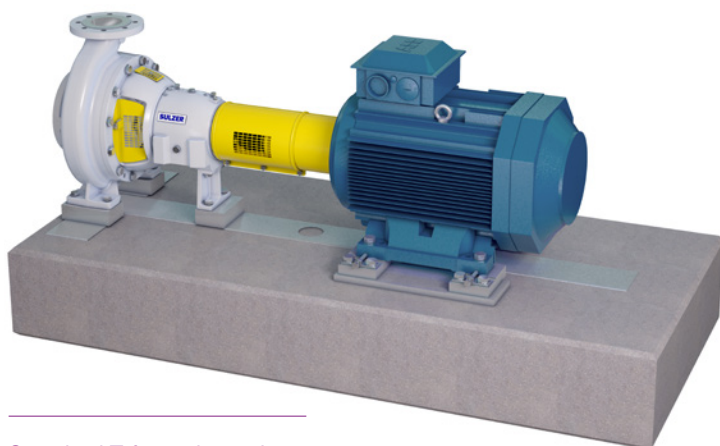
Sulzer's innovative, non-contacting bearing isolators at the both ends of the bearing house consist of three elements: a deflector, a lip seal and a labyrinth. This triple bearing protection prevents lubricant leaks from the bearing house and keeps contaminants out. No contact between the lip seal and shaft when the pump is rotating also means no wear, which extends the lifecycle of the unit.



# Baseplate options

## Standard T-frame baseplates

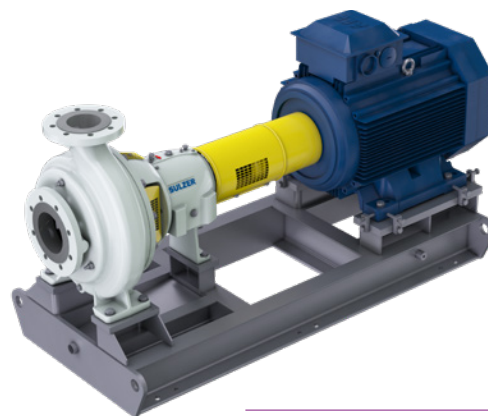
- The purpose of the baseplate is to facilitate installation of the pump-motor combination at the installation site
- The robust and rigid baseplate supports the substantial load of the piping and drive motor
- Galvanized riser blocks as standard enable installation of the next size of drive motor frame, when required
- Stainless steel alignment blocks as standard facilitate fast and simple adjustment of the motor when aligning the coupling
- Alternative foundation bolts available, depending on application (welded, grouted or chemical anchors)



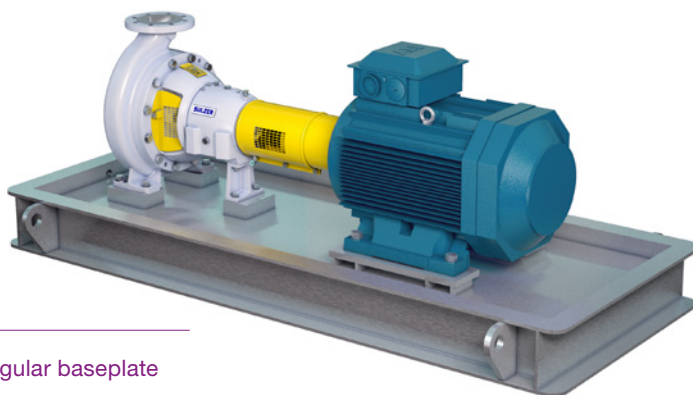
Standard T-frame baseplate

## Heavy-duty and API rectangular baseplates

- Heavy-duty and API standard rectangular baseplates are grouted into the concrete foundation
- Possible leaks are collected on the baseplate or drip pan
- Stainless steel alignment blocks as standard facilitate fast, simple adjustment of the motor when aligning the coupling
- Alternative foundation bolts available, depending on application (welded, grouted or chemical anchors)



Heavy-duty baseplate



API rectangular baseplate

# Instrumentation and monitoring

## Versatile measurement options

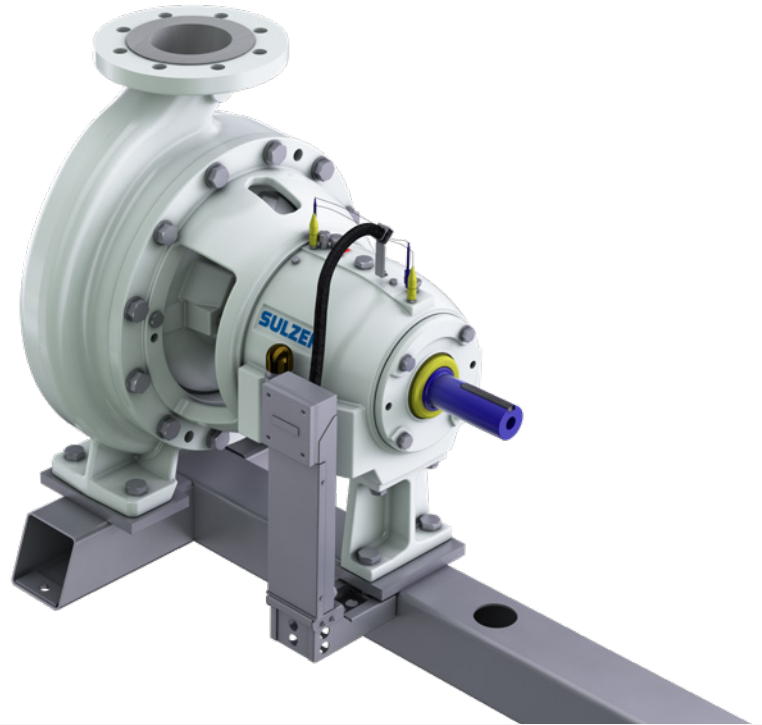
- Bearing temperature
- Bearing vibration
- Liquid temperature
- Pressure

## Junction box options

- Wired or with transmitter

## Pressure gauge panels

- Analog gauges, transmitter option available

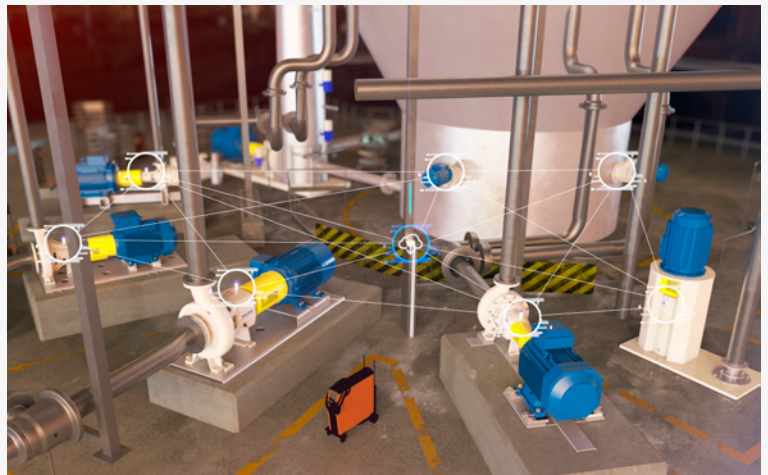
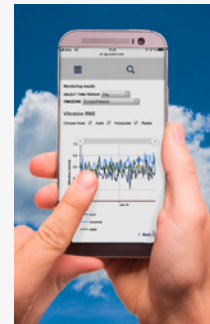


## Sulzer Sense wireless IoT condition monitoring solution

Now it is possible to turn pumps into smart, interconnected devices with help of Sulzer Sense, a smart wireless condition monitoring solution. The system measures temperature and vibration. The Sense data is sent to the cloud and can be monitored in Sulzer's online service on a mobile, tablet, laptop, etc. anywhere and anytime.

The Sulzer Sense system consists of wireless sensors, gateway and cloud services. Wireless sensors are battery powered which means that they are easy to install and cost-efficient to operate.

The system enables predictive maintenance and helps to avoid sudden pump failure and eventual downtime.



# Surface treatment options

## Internal surface treatment

- Standard surface cleaning for normal applications
- Ground Ra 6.3 surfaces
- Cotton ball tested surfaces
- Hardening with plasma nitration
- Cleaning for drinking water and food contact applications (ACS and EC1935)
- Special inside surface treatment on request

## External surface treatment

- ISO 12944-2 C4 EPZn[R]/EP painting for corrosive atmospheres
- ISO 12944-2 C4 ESIZn[R]/SI\* painting for high temperatures >150°C / 300°F applications
- ISO 12944-2 C5 EPZn[R]/EP\*\* painting for aggressive atmospheres
- Special external treatment available on request



\* ESIZn[R]/SI = zinc-rich ethyl-silicate paint / silicon aluminium paint

\*\* EPZn[R]/EP = 2-pack zinc-rich epoxy paint / 2-pack epoxy paint

# Tests and certification options

## Performance tests

- Capacity, head, efficiency and NPSHr tests in accordance with ISO 9906:2012 / HI 14.6-2011
- Noise tests
- Vibration test in accordance with ISO 5199 / ISO 10816-7, Category II
- Mechanical tests in accordance with HI 14.6-2016
- Pressure pulsation test

## Material and NDT tests

- EN 10204.2.2 and 3.1
- Liquid penetration in accordance with ISO 1371-1 level 3
- Magnetic particle examination in accordance with ISO 1369 level 3
- PMI positive material identification
- Food Contact Materials Regulation EC 1935/2004
- ACS drinking water certification

## Structural tests

- Balancing of impellers in accordance with ISO 21940-11 grade 6.3 and 2.5
- Hydrostatic pressure test in accordance with ISO 5199

## Inspection of assembly

- Dimensional checking of installation
- Dimensional checking of clearances
- Paint film thickness checking
- Final assembly checking

Customized tests available on request.

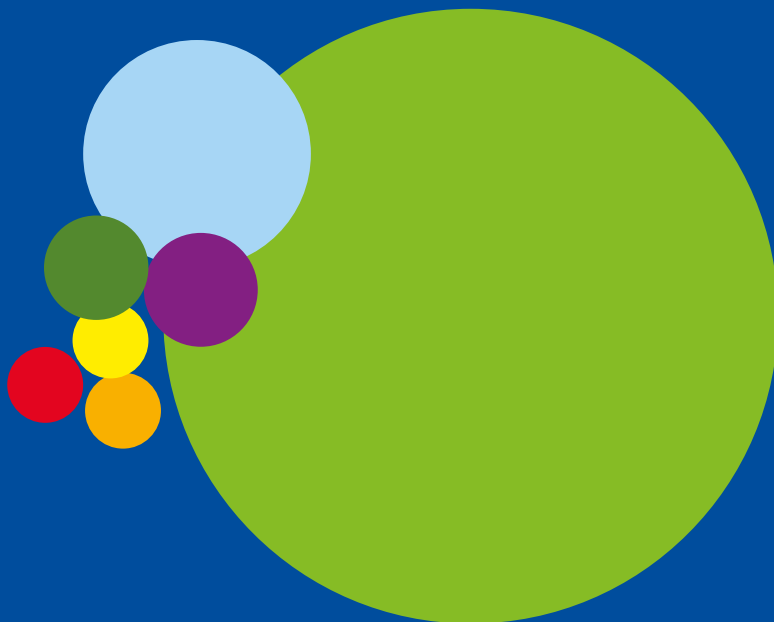


# Standards and directives

<b>Legislation</b>	Directive 2006/42/EC	Machinery directive
	Directive 93/68/EEC	CE Marking
	Directive 2014/34/EU	Equipment and Protective systems intended for use in Potentially Explosive Atmospheres (ATEX)
	Regulation (EC) No 1935/2004	Materials and articles intended to come into contact with food
<b>Product safety</b>	EN 809:1998 + A1:2009/AC:2010	Pumps and pump units for liquids - Common safety requirements
	ISO 12100:2010	Safety of machinery - General principles for design. Risk assessment and risk reduction.
	ISO 80079-36:2016	Non-electrical equipment for explosive atmospheres. Basic method and requirements
	ISO 80079-37:2016	Non-electrical equipment for explosive atmospheres. Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k".
<b>Quality system</b>	EN ISO 9001:2015	Quality management systems. Requirements.
<b>Environmental system</b>	ISO 14001:2015	Environmental management systems - Requirements with guidance for use
	ISO 45001:2018	Occupational health and safety management systems. - Requirements with guidance for use
<b>Dimensions</b>	ISO 2858:1975	End-suction centrifugal pumps (rating 16 bar) - Designation, nominal duty point and dimensions (up to size 44-200) (not for EPP)
<b>Design</b>	EN ISO 5199:2002	Technical specifications for centrifugal pumps – Class II
<b>Testing</b>	ISO 9906:2012 HI 14.6-2016	Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1E and 1B (pump type A) - Grade 2B (pump type A, NPP, WPP, EPP)
	EN 10204:2004	Metallic products - Types of inspection documents - Inspection document type 2.2 - Inspection document type 3.1
	EN 735:1995	Overall dimensions of rotodynamic pumps. Tolerances.
	<b>Flange drilling</b>	ASME B16.1:2020
ASME B16.5:2020		Pipe flanges and flanged fittings NPS ½ through NPS 24 - Class 150, 300
JIS B 2220:2016		Steel pipe flanges - 10K, 16K, 20K, 30K
JIS B 2239:2013		Cast iron pipe flanges - 10K, 16K
EN 1092-1:2018		Flanges and their joints - Part 1: Steel flanges - PN10, PN16, PN25
EN 1092-2:1997		Flanges and their joints - Part 2: Cast iron flanges - PN10, PN16

# Typical distribution of Total Cost of Ownership (TCO)

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- Energy cost (81%)
- Operation cost (10%)
- Initial cost (3%)
- Downtime cost (1.5%)
- Decommissioning cost (1.5%)
- Installation cost (1%)
- Environmental cost (1%)
- Maintenance cost (1%)

# Proper maintenance drives cost savings and improves safety

When it comes to process equipment, performance is everything. Pumps need to be in working order at all times. Obtaining optimum working life from your equipment requires regular and efficient servicing. With Sulzer as your partner, you can always get the best out of your process. Our globally available Customer Support Services teams deliver fast, reliable and innovative solutions during the whole life cycle of your equipment.



## Spare parts

Sulzer has a worldwide network of spare part delivery centers to quickly deliver original spare parts from the stock or manufacture them promptly based on your order.



## Field services

Our field services cover installation, start-up service, regular inspections, trouble-shooting, performance measurements, condition monitoring and more.



## Service centers

We offer full service for your process equipment and spare parts availability for daily maintenance and repairs, process optimization and know-how, and complete energy audits.



## Repairs

With our modern equipment and highly skilled personnel at our service centers we can repair and refurbish even the most demanding equipment back to its original performance. We also offer modernizations that enhance the performance or increase the lifetime of your equipment.



## Process optimization and know-how

With Sulzer at your doorstep, you can improve your competitive advantage and ensure safe operation. Our partnership program offers you customized solutions for your process improvements and future applications.



## Service contracts

If you need to free your own resources to other valuable tasks or if you want to save money by not keeping spare parts in your own stock, Sulzer can offer various service contract options for you.

**The Sulzer Flow Equipment division keeps your processes flowing. Wherever fluids are treated, pumped, or mixed, we deliver highly innovative and reliable solutions for the most demanding applications.**

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The Flow Equipment division specializes in pumping solutions specifically engineered for the processes of our customers. We provide pumps, agitators, compressors, grinders, screens and filters developed through intensive research and development in fluid dynamics and advanced materials. We are a market leader in pumping solutions for water, oil and gas, power, chemicals and most industrial segments.

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