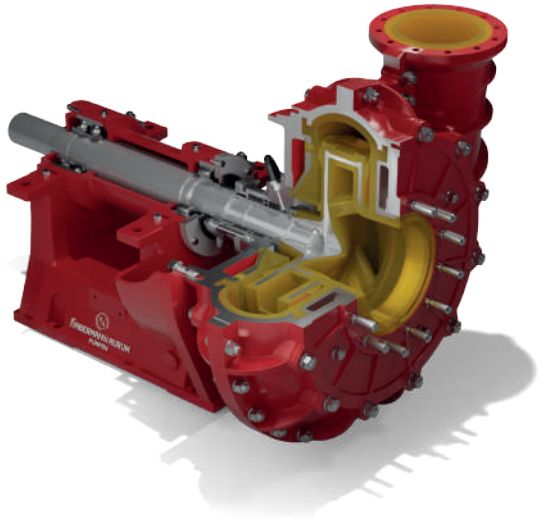
BEDU POMPEN

# SLURRY PUMPS

## FOR ABRASIVE AND CORROSIVE MEDIA



made for your process


**HABERMANN AURUM PUMPEN** has been offering reliable solutions and extensive know-how in slurry transportation since 1927.

# 1927

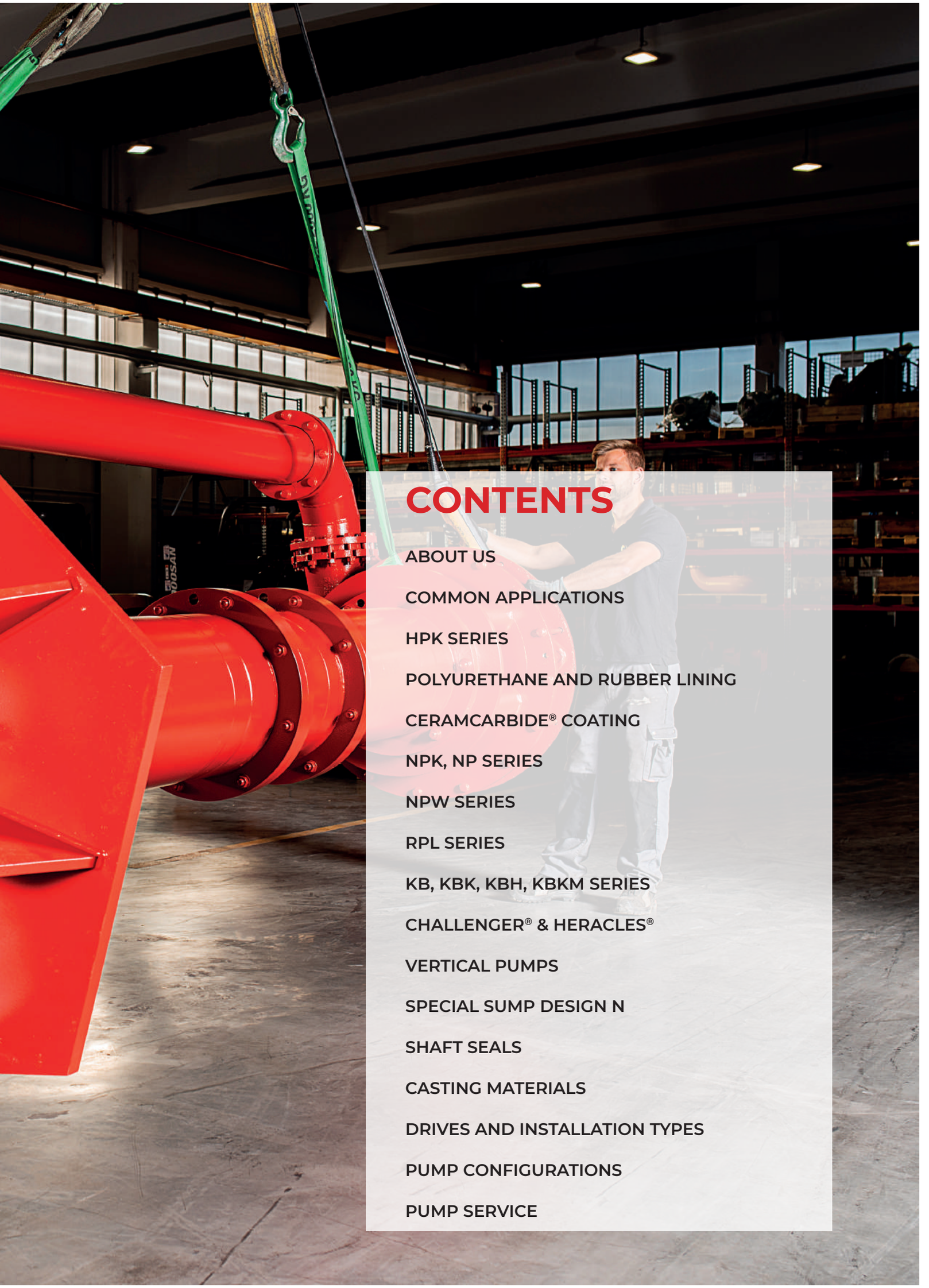
Habermann Aurum Pumpen is one of the leading manufacturers of centrifugal pumps, ideal for processing slurries. With almost 100 years of experience and more than 30,000 pumps installed worldwide, serving various applications, we have built a strong market position across the globe. Our fundamental goal is to create the most durable and sustainable industrial pumps by combining our multi-decade experience with the state-of-the-art technologies. Our pumps are integrated into a wide variety of industries, such as: mining and mineral processing, energy industry, metallurgy, chemical and pigment industries, tunnelling and special civil engineering. We are continuously improving our pumping systems to ensure their exceptional quality and optimal performance capabilities. Based on the technical skills of our work force, we customize and manufacture pumps you can rely on, most of which have been in trouble-free operation for more than 60 years, which speaks for their longevity, safety and efficiency.


We always ensure your industrial needs are covered with our proven operational designs combined with the most reliable and robust materials to make a functional unit. Our broad product line of pumps, valves and fittings complies with the most diverse and challenging pumping requirements. Thanks to our in-house engineering we can find solutions to any system demand, regardless of technical complexity or application conditions.

We have built an excellent quality profile, which allowed us to establish Habermann Aurum as a high-valued and reliable partner for industrial pumping systems. We proudly design, produce and install our pumps all over the world. Through our network of partners and branch offices, our market presence extends across continents from Europe to America, Asia and Africa. We are well prepared to meet current and future market demands and to support our customers in the best possible way.

## *Tradition meets modern technologies.*

# COMPLETE PUMP SOLUTIONS FOR ANY SLURRY TYPE



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# COMMON APPLICATIONS

| Chemical | HPK | NPK | NPW | KB |
|---|---|---|---|---|
| Separation | • | • | • | |
| Abrasive chemicals | • | • | | |
| Precipitates, sodium | • | • | • | |
| Foaming liquids | • | • | | |
| SO4, chloride | • | • | | |
| Fertilizers, PO4 | • | • | | |
| Solvents, pigments | • | • | | |
| Recycling | • | • | • | • |
| Crude oil residues | | | • | |

| Quarrying & Aggregates | HPK | NPK | NPW | KB |
|---|---|---|---|---|
| Sand & gravel extraction | • | • | • | • |
| Wet sand treatment | • | • | • | • |
| Limestone slurry | • | • | • | |
| Slate, marble, granite | • | • | • | • |
| Kaolin, clay | • | • | • | |
| Cyclone separation | • | • | | |
| Dredging (harbors, rivers) | | • | | • |

| Mining | HPK | NPK | NPW | KB |
|---|---|---|---|---|
| Coal, ore, phosphates, potash, bauxite | • | • | • | • |
| Heavy mining slurry | • | • | • | • |
| Ore slurry | • | • | • | • |
| Ferric oxide production | • | • | • | • |
| Fe, Zn, Cu, Ti, salt, Al, etc. | • | • | • | • |
| Mill scale and separation | • | • | • | • |
| Frothy slurry | • | • | | |
| Waste recycling | • | • | • | |
| Thickener underflow | • | • | | |
| Chamber filter press | • | • | | |

## COMMON APPLICATIONS

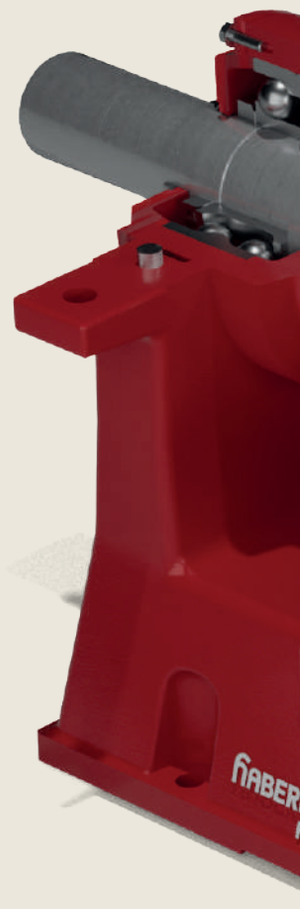
| Metallurgy & Energy Industry | HPK | NPK | NPW | KB |
|---|---|---|---|---|
| Coal & coke processing | • | • | • | • |
| Hot rolling mills | • | • | • | • |
| Sinter & scale | • | • | • | |
| Blast furnaces | • | • | • | • |
| Bottom ash | • | • | • | • |
| Flue gas desulphurization | • | • | | |
| Condensates | | | • | |

| Tunneling, Construction & Civil Engineering | HPK | NPK | NPW | KB |
|---|---|---|---|---|
| Tunnel construction | | | • | • |
| Vertical trenching (wet and dry wells) | | | • | • |
| Ready-mix concrete | | • | • | |
| Aerated concrete | • | | | |
| Bentonite and cement mixing | • | • | • | |
| Deep mining - diaphragm wall cutter | | | | • |

| Agriculture | HPK | NPK | NPW | KB |
|---|---|---|---|---|
| Sugar industry, beet pulp | | • | • | • |
| Biogas, fertilizers | | • | | |
| Livestock waste | | • | • | • |
| Washing installations | • | • | • | • |
| Organic slurry | • | • | • | |
| Sewage treatment systems | • | • | • | |

# HPK

## HPK SERIES

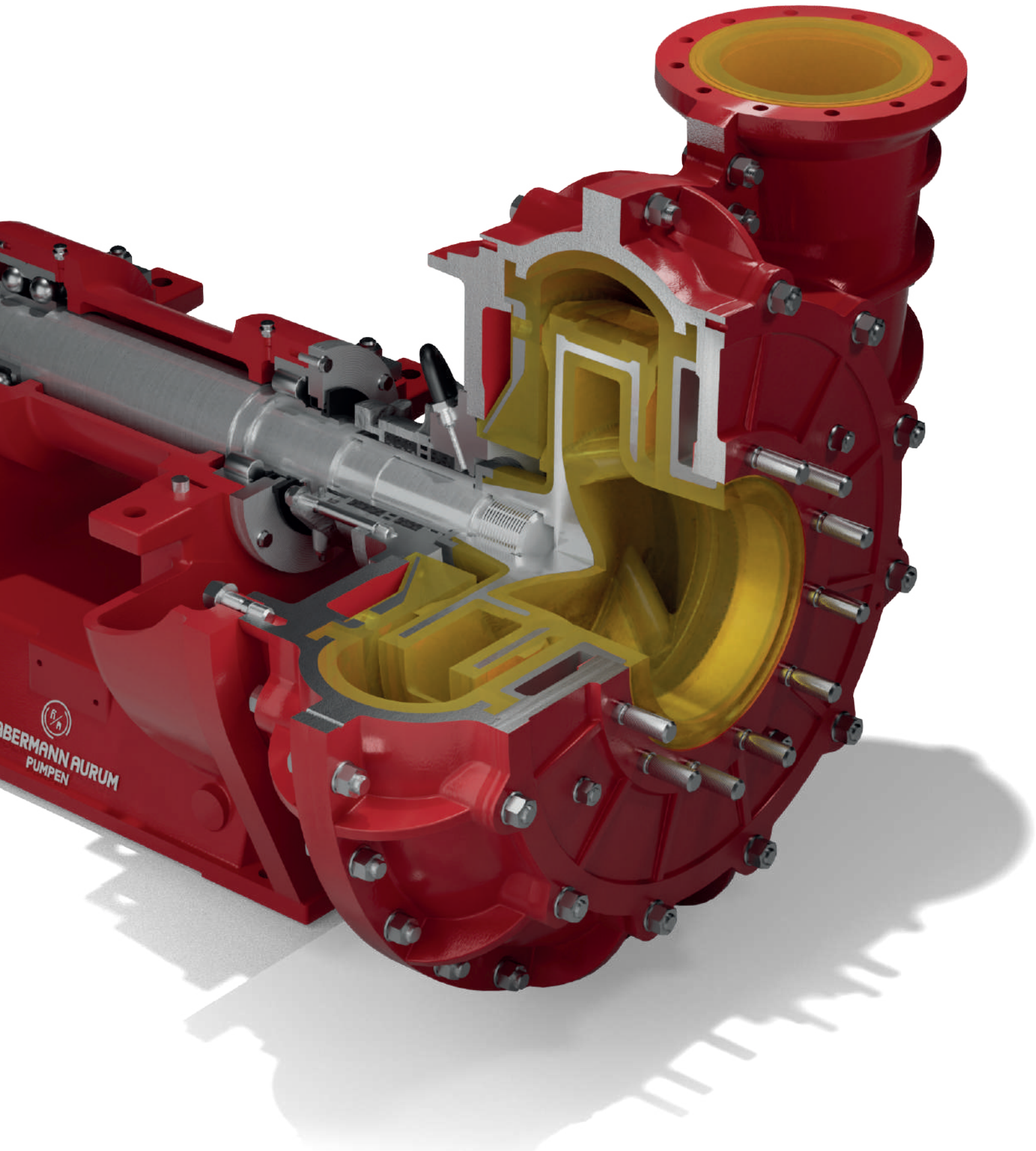


### PUMPS WITH ELASTIC LINING OF ALL INNER PARTS EXPOSED TO THE SLURRY

The design is intended to withstand **the highest slurry temperatures** of up to 130 degrees Celsius.

**130°C**

Centrifugal pumps of HPK series are widely used in extreme wear applications and have a proven track record of high resistance to aggressive chemicals, in particular acids and chlorides.
The key attribute of these pumps is their inner lining of all wet parts with elastic materials, such as polyurethane and rubber, which slow down the abrasion process and serve as a protective layer. These durable and long-lasting materials enhance pump's internal resistance to stress and corrosion by chloride-bearing fluids and significantly decrease its wear issues. Another lining option for HPK series is our special CeramCarbide® coating, which provides a quantum improvement over a single metallic casing and offers a greater resistance to high concentration of acids. This particular material can sustain solid particles up to a maximum size of 5-10 mm. For convenience, the pump casing design of HPK Series was optimized to allow easy replacement of all wear parts and simplified maintenance.


BERMANN AURUM
PUMPEN

# HPK SERIES

## PUMPS WITH ELASTIC LINING OR CERAMCARBIDE® COATING

All parts of the unit interacting with the pump media are protected with a hard-wearing lining to eliminate the damage under demanding applications. Our wide range of high-quality lining materials ensures exceptional resistance against wear for abrasive and corrosive media. Pumps with elastic lining consist of ductile iron outer housing and an inner protection layer. Our CeramCarbide® coating is a non-metallic lining which covers walls of the casing, as well as some other pump parts. The appropriate lining solution is determined according to working fluid properties, its temperature and the average particle size.

## COMMON APPLICATIONS

### CHEMICAL
Waste recycling, SO4, chloride, separation, precipitates, sodium, foaming liquids, pigments, fertilizers, PO4, aggressive chemicals

### AGGREGATES
Sand and gravel extraction, dewatering, wet treatment, mineral processing

### METALLURGY & ENERGY INDUSTRY
Ash removal, condensates, coal and coke processing, flue gas desulphurization

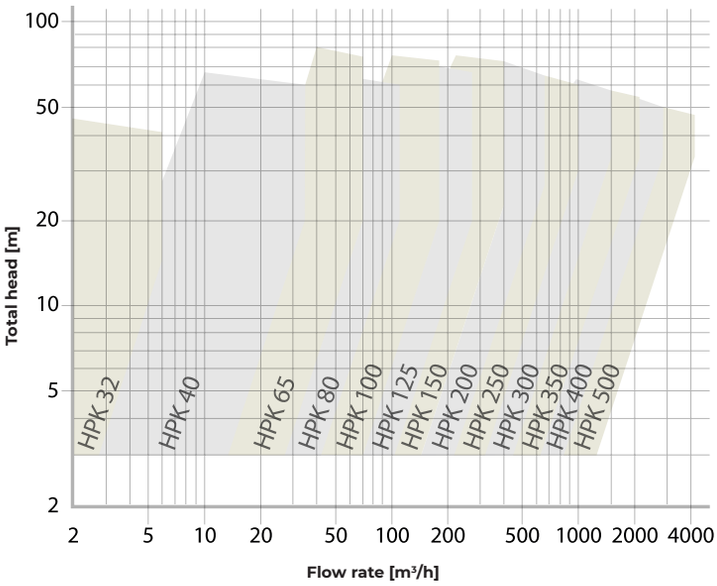
### SUGAR PRODUCTION AND AGRICULTURAL WASTE
Washing installations, organic slurry, biogas, fertilizers, sewage treatment systems

### MINING
Chamber filter press, waste recycling, slurry and sump pumps, thickener underflow, separation, ferric oxide production, ore slurry, Fe, Zn, Cu, Ti, salt, Al, etc., frothy slurry, ceramics, glass waste

### TUNNELLING, CONSTRUCTION AND SPECIAL CIVIL ENGINEERING
Kaolin, clay, slate, marble, granite, sand & gravel, aerated concrete, limestone slurry, bentonite and cement mixing, cyclone separation

### STEEL INDUSTRY
Sinter and scale, blast furnaces, hot rolling mills

# PERFORMANCE CHARACTERISTICS OF HPK




| Performance characteristics of HPK | |
|---|---|
| Flow rate, up to | 4600 [m³/h] |
| Maximum head | 70 [m.l.c] |
| Pump speed, depending on the size, up to | 2950 [min⁻¹] |
| Pump sizes | DN 32 to DN 500 |
| Maximum operating pressure | 10 to 40* [bar] |
| Temperature of the slurry, up to | 130 [°C] |
| Static head | 8 [mW.C.] |
| Discharge nozzle arrangement | rotatable |
| Highly corrosion resistant at pH levels | 0 to 14 de-pending on material |

*Special design

## POLYURETHANE **APFlex®**

All wear parts that come into direct contact with process fluid have special elastic lining, which is selected based on individual application requirements and only after careful evaluation of the abrasive, thermal and chemical properties of the fluid. Read more on page 14.

## **CeramCarbide®** COATING

This special coating is mainly used for critical applications, comparable with corrosive and abrasive media with the maximum particle size of 10mm.

## LINING SOLUTIONS

## RUBBER

All wet parts of the pump are protected with special rubber lining. This particular solution is ideally suited for pumping fluids with high temperatures.

## METALLIC VARIANT

Fully metallic pump design, made from high-alloy cast material, is also available for special applications.

## **MATERIAL VARIANTS** DEPENDING ON SLURRY TYPE

| Slurry Characteristics | Metallic | Rubber | Polyurethane APFlex® | CeramCarbide® |
|---|---|---|---|---|
| Fine-grained, rounded shape | | X | X | X |
| Fine-gained, sharp-edged < 5 mm | X | X | X | X |
| Abrasive, sharp-edged > 5 mm | X | | | |
| Coarse-grained > 5 mm | X | | | |
| Chemically aggressive | X | X | X | X |

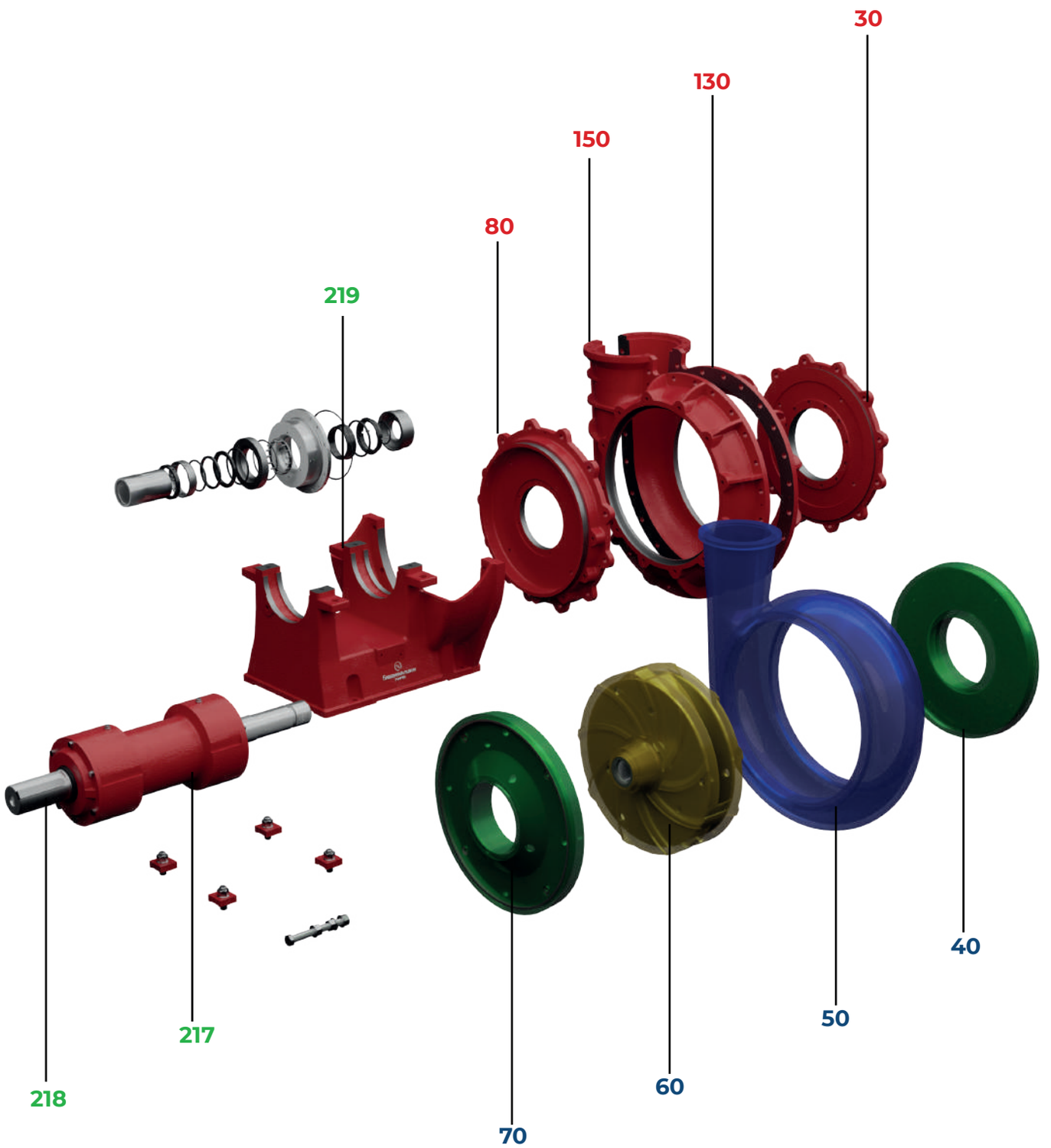
WEAR PARTS OF HPK SERIES

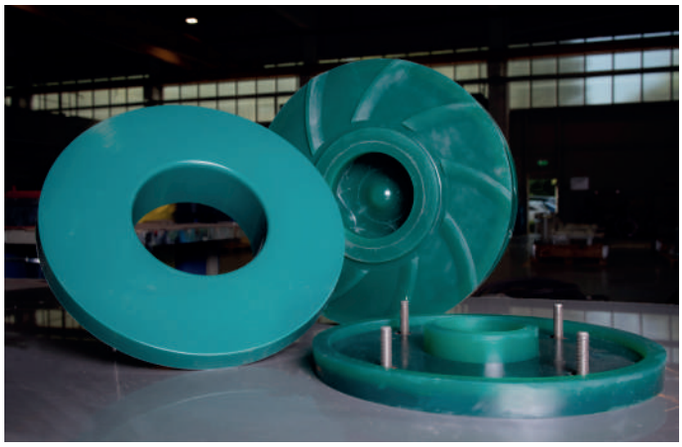
# REPLACEABLE PARTS

| Outer casing | Ref. |
|---|---|
| Front casing cover | 30 |
| Back casing cover | 80 |
| Front half casing | 130 |
| Back half casing | 150 |

| Bearing unit | Ref. |
|---|---|
| Bearing bracket | 219 |
| Bearing housing | 217 |
| Shaft | 218 |

| Wear parts | Ref. |
|---|---|
| Closed impeller | 60 |
| Suction side plate | 40 |
| Discharge side plate | 70 |
| Inner lining | 50 |



The HPK Series are single-stage centrifugal pumps equipped with protective lining of all wear parts and an adjustable clearance on the suction side.

| **Wear Plates** on Suction and Discharge Sides | **Impeller** | **Inner Lining** made of Elastic Materials |
|---|---|---|
| Both wear plates have metallic body, which is lined with either polyurethane APFlex® or rubber. The elastic material is vulcanized to ensure an optimal bond. The wear plates are screwed tight to the pump casing cover to ensure the highest rigidity. | The impeller also has a metallic body lined with our elastic materials. Closed and semi-open impellers are typically used for HPK pumps, three- or four-blade configurations are also available. The cover plates of the impeller are equipped with relief vanes, which allow to relieve the pressure on the shaft seal and reduce the backflow of the slurry. | The outer pump casing is protected against wear and corrosion with our Polyurethane APFlex® or rubber lining. Depending on the operating pressure, the outer casing is configured either in ductile cast iron or stainless steel, suitable for higher pressures of up to PN25. For more details on protective lining, please see pages 14-17. |

# POLYURETHANE AND RUBBER

## INNOVATIVE POLYURETHANE APFlex®

Based on polyurethane's excellent elastic properties, it is ideal for the inner lining of pump parts and is highly effective in achieving the so-called "trampoline effect", which presents a great advantage in pump wear behavior with abrasive and corrosive media. APFlex® easily adapts to the fine-grained slurries with particle size up to 5 mm and in some cases up to 10 mm, as well as high temperatures. Due to its elasticity, high tear and chemical resistance, this material is far superior to any wear-resistant castings, which translates to lower operating expenses and extended service life.

**APFlex® 10-01**
Is abrasion and corrosion resistant, suitable for acids or alkalis and offers good oil resistance

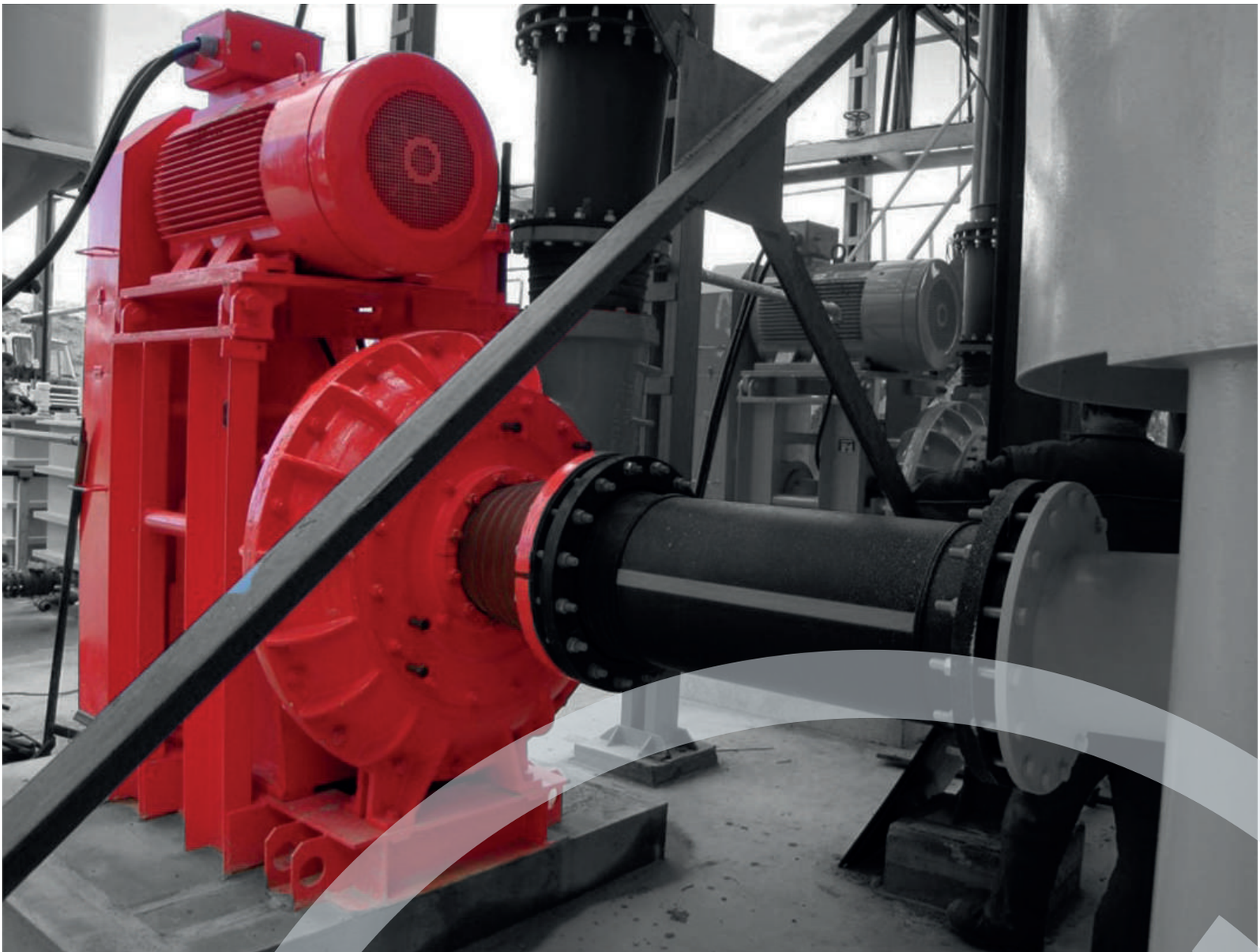
**APFlex® 60-01**
Is suitable for sand and gravel, particularly abrasion-resistant and exceptionally durable against reconditioned oils

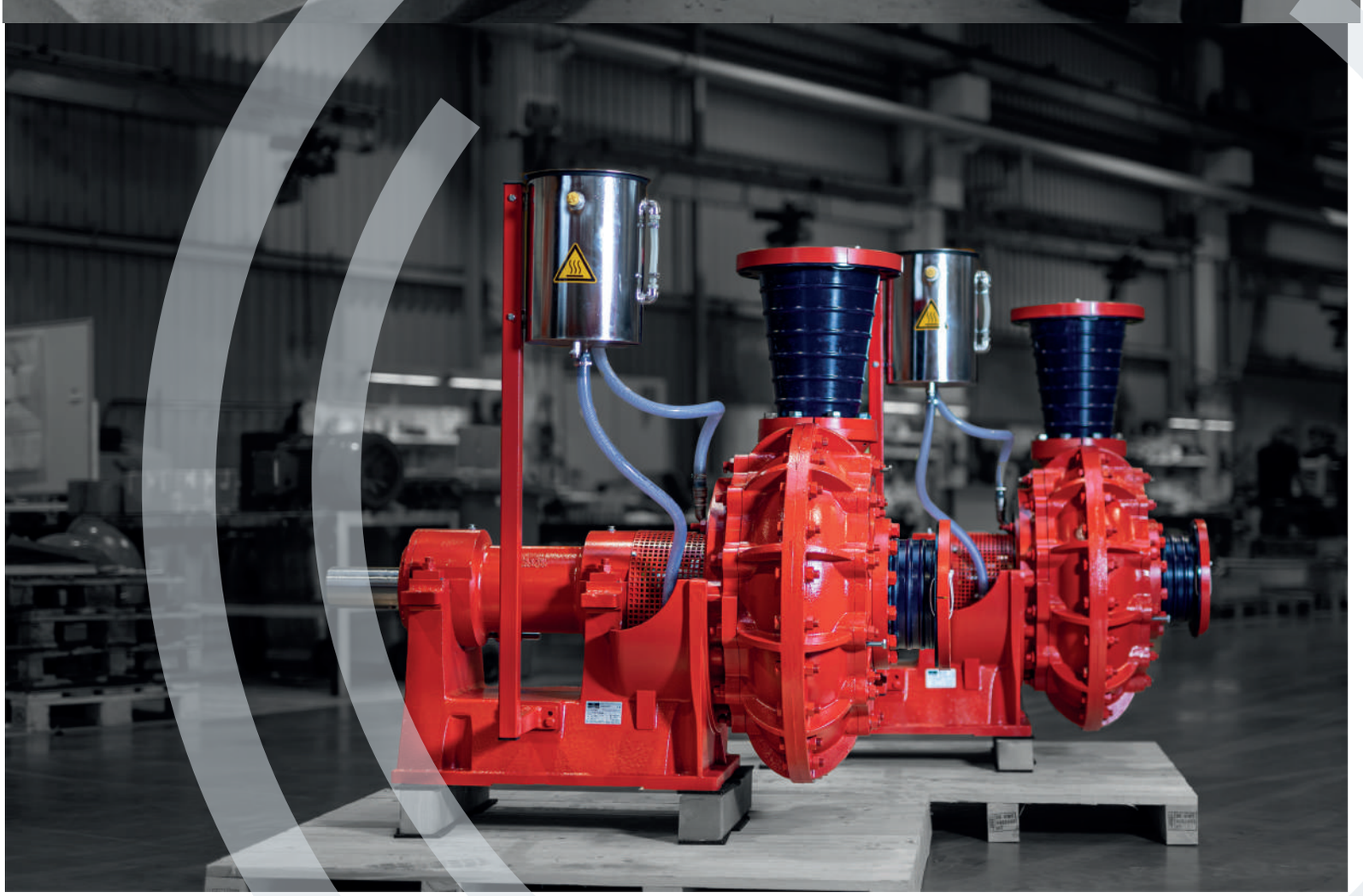
**APFlex® 50-01**
Is a further refined APFlex® 10-01, which enables higher temperature resistance

**Rubber APG 2201, APG 2210**
Withstands the highest slurry temperatures and provides abrasion and corrosion resistance

## POLYURETHANE AND RUBBER CHARACTERISTICS

| Type | APFlex® 10-01 (yellow)) | APFlex® 60-01 (green) | APFlex® 50-01 (blue) | APG 2201 | APG 2210 |
|---|---|---|---|---|---|
| Shore hardness | A 88-90 | A 75-80 | A 88-90 | 65 | 55 |
| Temperature | -30 to+75 °C | -30 to +75 °C | -30 to +95 °C | 100-105 °C | max. 130 °C |
| pH | 0-14 | 5-9 | 0-14 | 0-14 | 0-14 |
| Special features | Suitable for acids and alkalis | Extra abrasion resistant | Suitable for acids and alkalis | Suitable for acids and alkalis | Suitable for acids and alkalis |



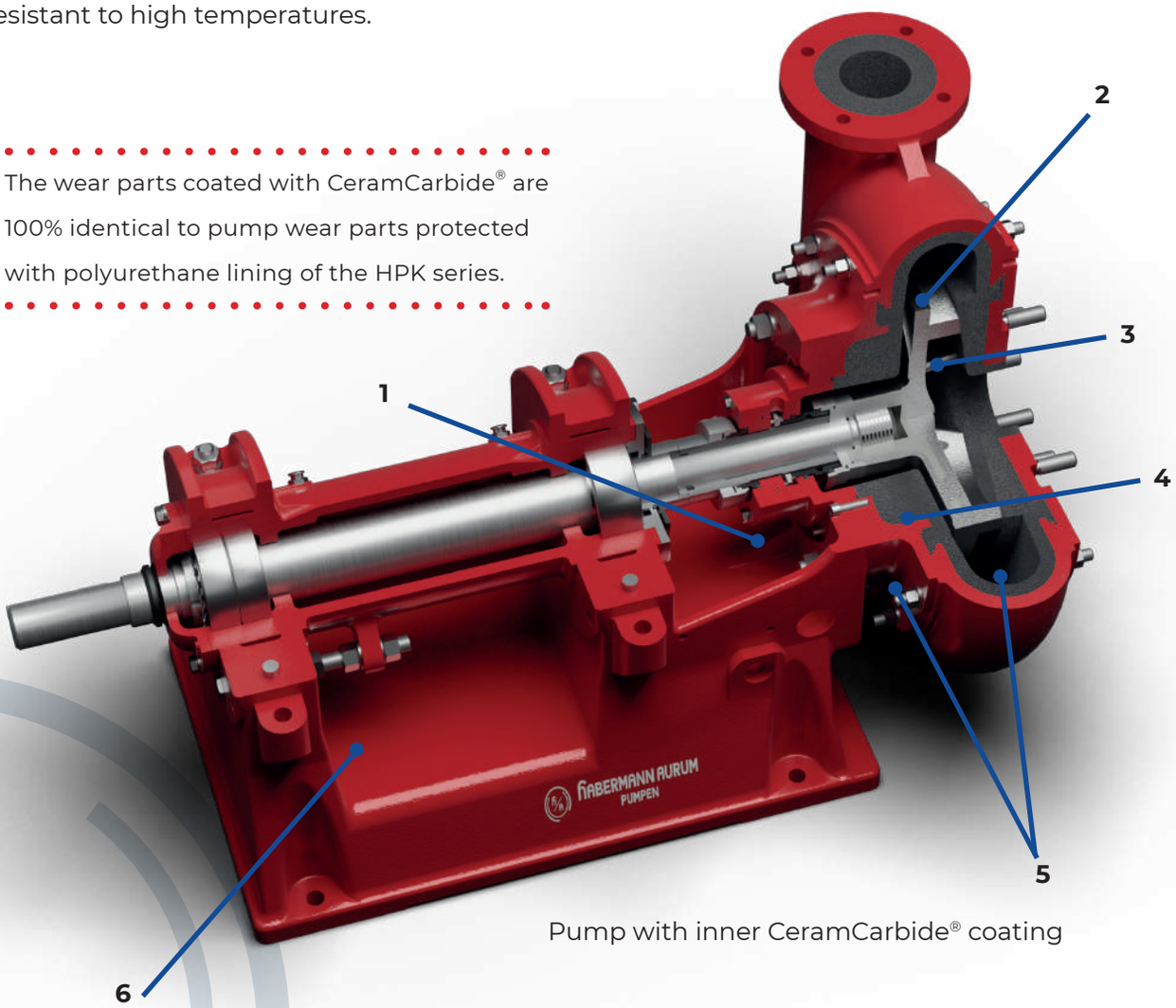


# CERAMCARBIDE® COATING FOR HPK PUMPS

## HIGHLY WEAR-RESISTANT SLURRY PUMP HPK WITH POLYMER CAST LINING

Our further improvement of pump performance is the use of CeramCarbide®, a non-metallic composite material consisting of 80% silicon carbide and 20% vinyl ester resin as a binder. The pump wet parts are coated with CeramCarbide® which is particularly used for application with hypochlorite and highly concentrated acids and alkalis. CeramCarbide® is a good choice for applications with sliding wear and is very resistant to high temperatures.

The wear parts coated with CeramCarbide® are 100% identical to pump wear parts protected with polyurethane lining of the HPK series.




Pump with inner CeramCarbide® coating

## MAIN FEATURES

**1.** Double mechanical seal HGD-2 with thermosiphon cooling system has proven effective in processing high concentration of solids.

**2.** One-piece, cast iron outer casing for optimum performance under high operating pressures.

**3.** All wet parts of the pump are coated with CeramCarbide®, which forms another protective layer.

**4.** Open, thick blade impeller with CeramCarbide coating. Under certain conditions, a metallic design of the impeller either in high chrome tempered casting or duplex stainless steel can also be accommodated.

**5.** Thick-walled, easily to replace wear plates on suction and discharge sides.

**6.** Axial displacement in the bearing unit enables an easy clearance adjustment between the impeller and wear plate on the suction side.

# CERAMCARBIDE® MATERIAL

**Silicon carbide** is a non-oxide ceramic with exceptional properties. It is the lightest, but also the hardest ceramic material, its hardness (HV10>22GPa) is similar to that of diamonds. Silicon carbide exhibits excellent resistance to acids and alkalis and can withstand wear and corrosion at high temperatures.

**Vinyl ester resin**, also referred to as VE-resin, is a synthetic compound material, which after hardening results in a thermosetting material of great strength and chemical resistance. VE-resins are often used in the production of fiberglass, specifically for chemical equipment (containers, pipes, cooling towers), in addition to technical, chemical and thermal applications.

## OUTTER CASING

One-piece metallic outer casing with inner coating as protection layer

## SHAFT SEAL

Proven Habermann Aurum double mechanical seal HGD-2/ HN 401

## IMPELLER

Open, three-blade impeller includes a metallic body and protective coating

## WEAR PLATES

On suction and discharge sides, easily serviced and replaced, with pump casing cover made of ductile iron

## ADVANTAGES

- Double-protection casing design ensures safe operation even under high operating pressures
- Advanced structural stability in high impact and aggressive chemical applications
- Permissible pressure of up to PN 10 (higher operating pressures are allowed, depending on the outer casing material)
- Durable one-piece casing eliminates tear and wear issues

# SHAFT SEALS

# MATERIALS

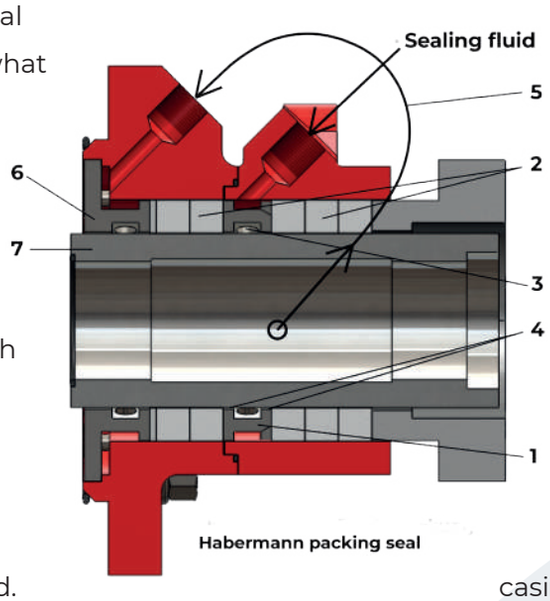
# SHAFT SEALING WITH PACKING SEAL

Shaft protective seals are extremely important and must be assembled for prevention the passage of fluids along a rotating shaft. To prevent any inappropriate operation, shafts must have a reliable and secure sealing system that will shield them away from harmful solid particles contained in the working media. Depending on the operating conditions, the shaft is sealed using either packing seal, mechanical seal, or hydrodynamic seal with an expeller.

## STANDARD DESIGN OF THE **GLAND PACKING SEAL**

In addition to the excessive pressure on the gland packing, insufficient lubrication of the seal components can cause the seal to start over-leaking and wear over time. However solid particles slipping into the seal arrangement is ultimately what creates the efficiency loss and the need for the seal to be repacked.

To relieve the pressure on the gland packing, the impeller is equipped with back relief blades. In order to keep abrasive particles away from the vulnerable seal components, the seal is flushed with the sealing fluid. The locking ring (1) of the seal is injected with the sealing fluid on the discharge side, which ensures the necessary lubrication of the packing rings (2).



Habermann packing seal

Additionally, it is recommended to install a throttle valve and manometer to set the required pressure and to adjust the amount of the sealing fluid in packing rings. To control the flow of the sealing fluid, a flow control display should also be installed. Sealing fluid enters the locking ring chamber (3) and from there moves to the packing rings (2) via the shaft clearance (4). It flows through the radial holes in the locking ring and via fixed pipe (5) into the locking ring (6), on the suction side. Then the sealing water flows into the pump casing via the shaft clearance (7). The sealing pressure must be at least 0.3 bar greater than the pressure on the impeller hub. To make it easier to replace the packing rings on the suction side, the gland packing has an axially split housing.

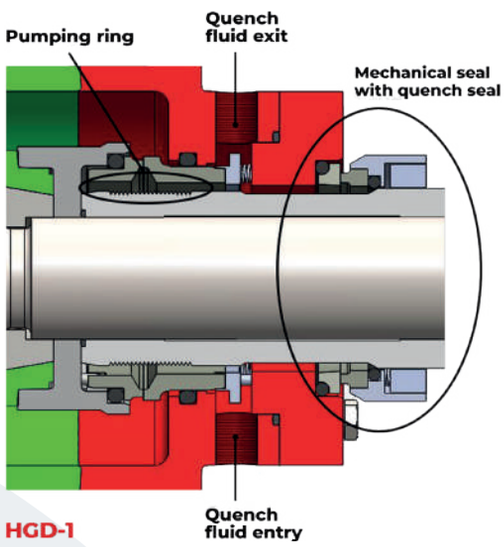
**Alternatives to packing seal:**

- Single-acting mechanical seal
- Double-acting mechanical seal comprising of HGD-1 mechanical seal on the suction side, mechanical seal on the discharge side and the quench chamber
- Hydrodynamic seal with an expeller and gland packing
- Stationary seal for special pumps

# SHAFT SEALING WITH MECHANICAL SEAL

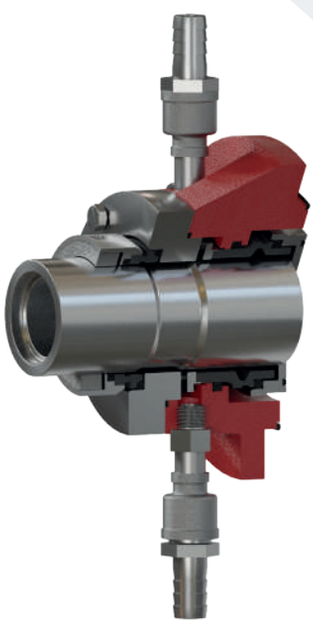
## DOUBLE-ACTING MECHANICAL SEAL

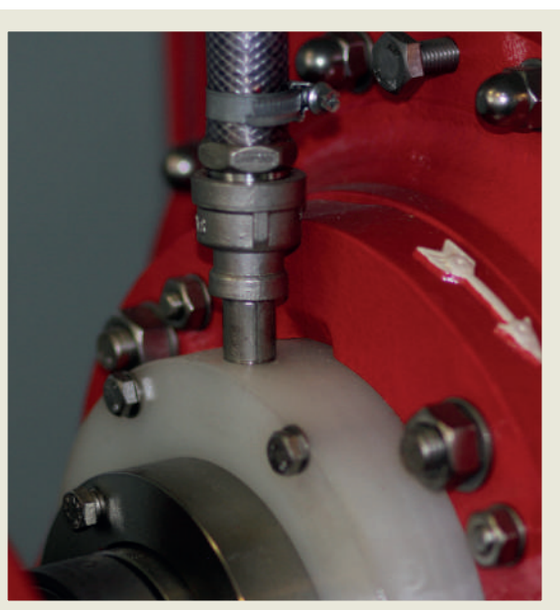
Mechanical seals are available in various designs to handle diverse operating conditions. Due to our precisely machined assembly, the leakage from mechanical seal is extremely low. Our innovative design can withstand high pressures from 16 up to 25 bar. A complex pressurized sealing system is not required. The hydraulic and mechanical forces generated during operation create a tight and leak-free arrangement and prevent solid particles from entering the seal. The space between two seals is lubricated and cooled by means of cooling water.



HGD-1

When the seal is flushed, the water entry pressure should not exceed 0.5 bar. With mechanical seals ranging from ø43 to ø100 in size, cooling water consumption is about 5-20 l/h. As an alternative, thermosyphon system with unpressurized quench fluid may be used to flush the seals. Since the fluid absorbs the friction from the seals, it is cooled and recycled in a closed loop. In addition, the quench fluid must be extremely clean (drinking water), as the seal is quite sensitive to the abrasion by solid particles. The transfer port on the protective shaft sleeve supports fluid's recirculation in the seal.

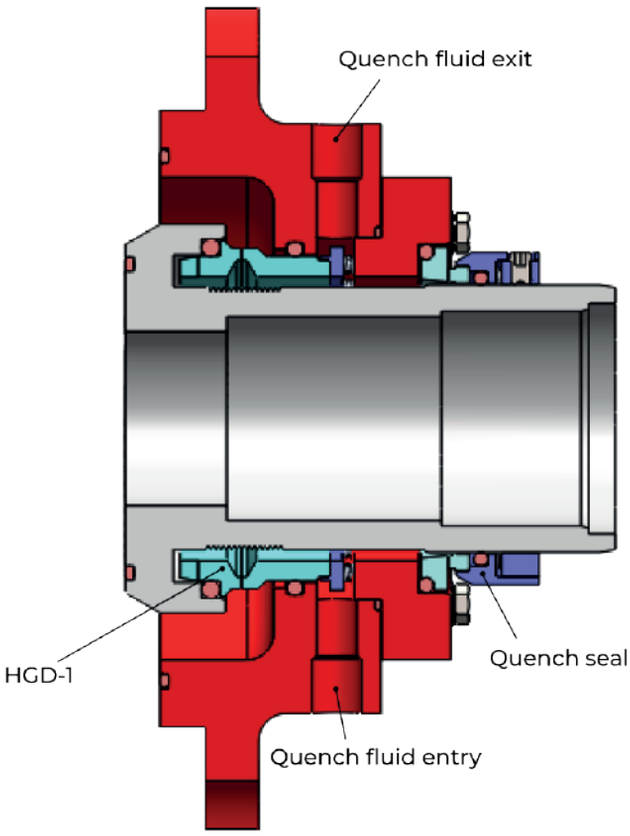




HGD-1 AND HGD-2

## HGD-1
CARTRIDGE VERSION

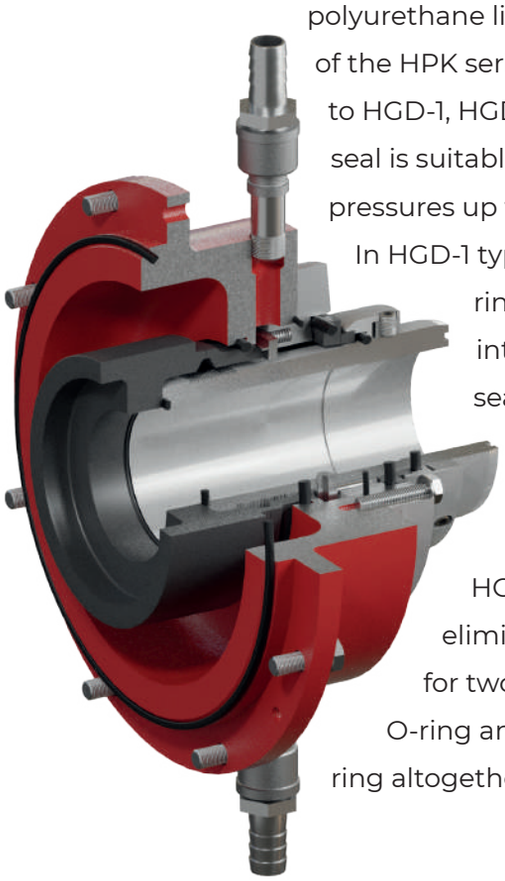
The cartridge seal version is based on a proven HGD-1 design. It consists of an entirely pre-assembled and factory tested seal unit, which allows to avoid assembly errors. After installing it into the pump, the only thing left to do is to remove the assembly locks and the seal will be ready for operation. It is not necessary to realign the primary seal after impeller adjustment. The self-adjusting design ensures the seal alignment to be compensated automatically. The HGD-1 cartridge version is available in both double and single mechanical seal types.




MECHANICAL VERSION

## HGD-2

The HGD-2 is a further modified HGD-1 version and is the mechanical seal used for polyurethane lined impellers of the HPK series. Similarly to HGD-1, HGD-2/QD shaft seal is suitable for operating pressures up to 25 bar.



In HGD-1 type the mating ring is integrated into the rotating seal, which was replaced as a single seal ring for the HGD-2 seal. This eliminated the need for two springs, the O-ring and the mating ring altogether.

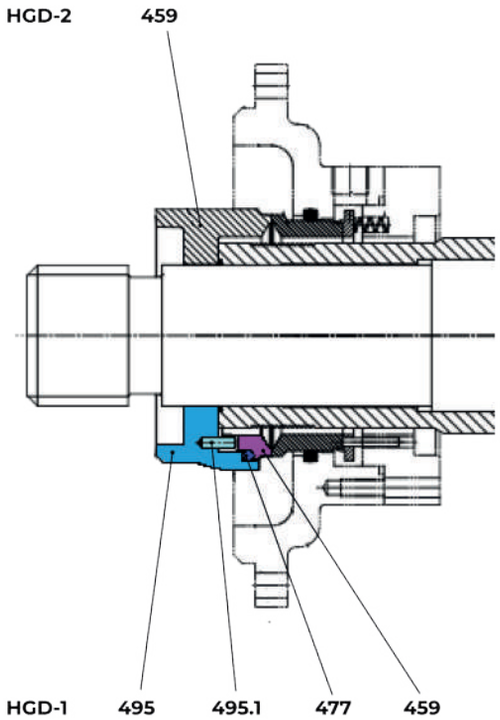
Thereby, the cooling water located in the quench chamber is not exposed to the pumped media, and the compact seal design enables relatively simple and fast installation in case of repair.

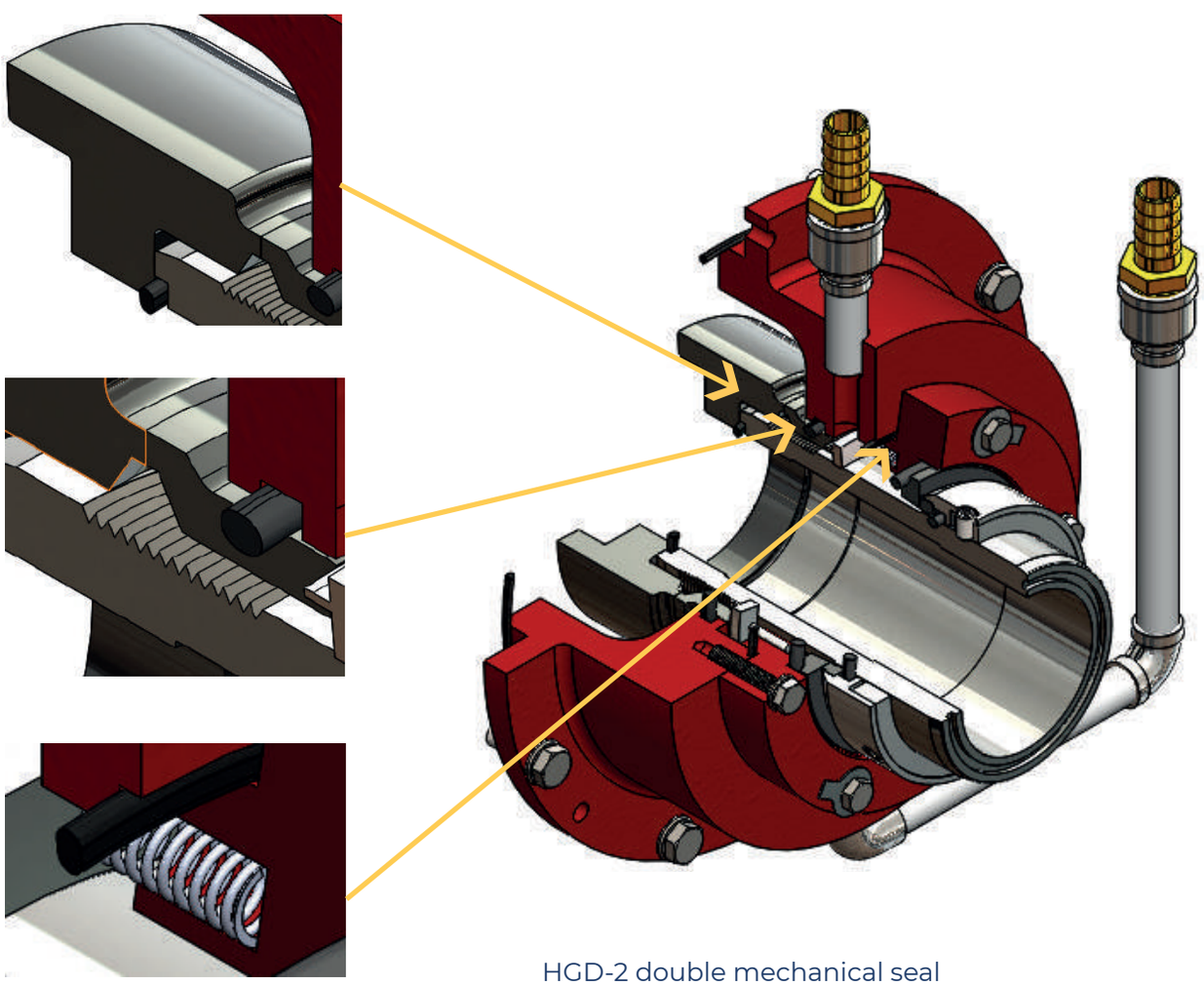
The other advantages, such as the elimination of a complex pressurized sealing system, direct cooling of the seal rings through the quench chamber, and restricted entry of solid particles due to generated rotational forces, are identical to those of HGD-1 type. The required cooling water consumption of approx. 5-20 l/h is also similar to the HGD-1. Alternatively, as with HGD-1, an unpressurized thermosiphon system can also be used. The transfer port on the protective shaft sleeve supports fluid's circulation for cooling and lubrication of the seal.

## COMPARISON
## **HGD-1 / HGD-2**

HGD-2 type is just as reliable as HGD-1, but has a more compact design. In HGD-1 type the mating ring (Item 495) is integrated into the rotating seal (Item 459), which was replaced by a single seal ring (Item 459) for HGD-2. As a result, springs (item 495.1), the O-ring (item 477) and the mating ring (item 495) are no longer required for the overall assembly.

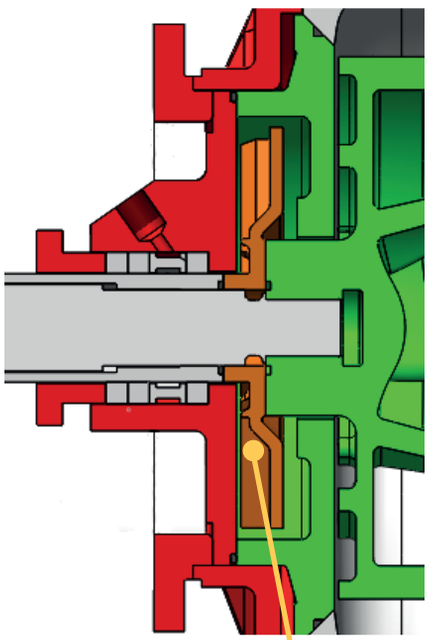
COMPARISON OF HGD-1 AND HGD-2



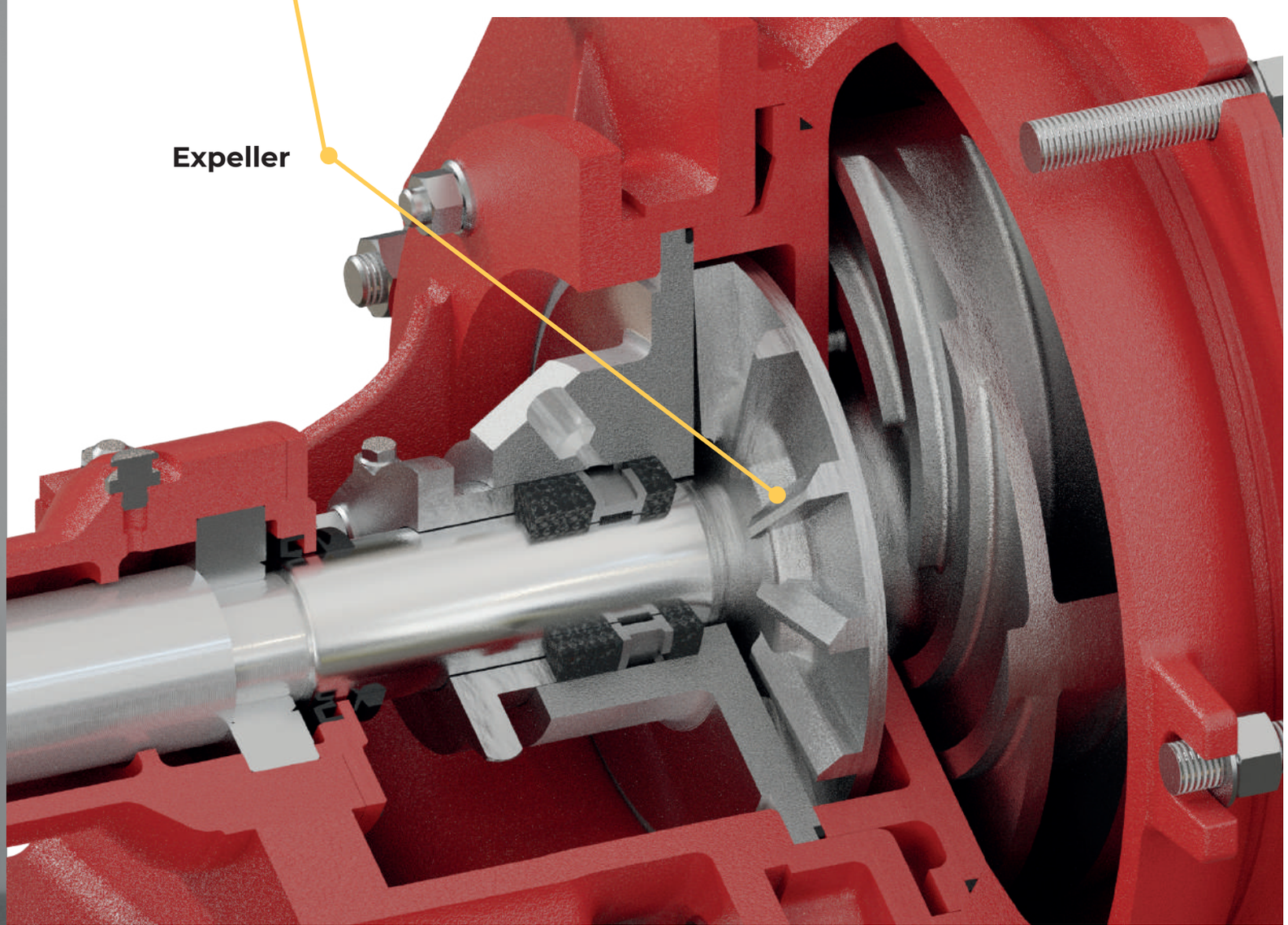
HGD-2 double mechanical seal with quench chamber

# SEALING WITH HYDRODYNAMIC SEAL



## EXPELLER

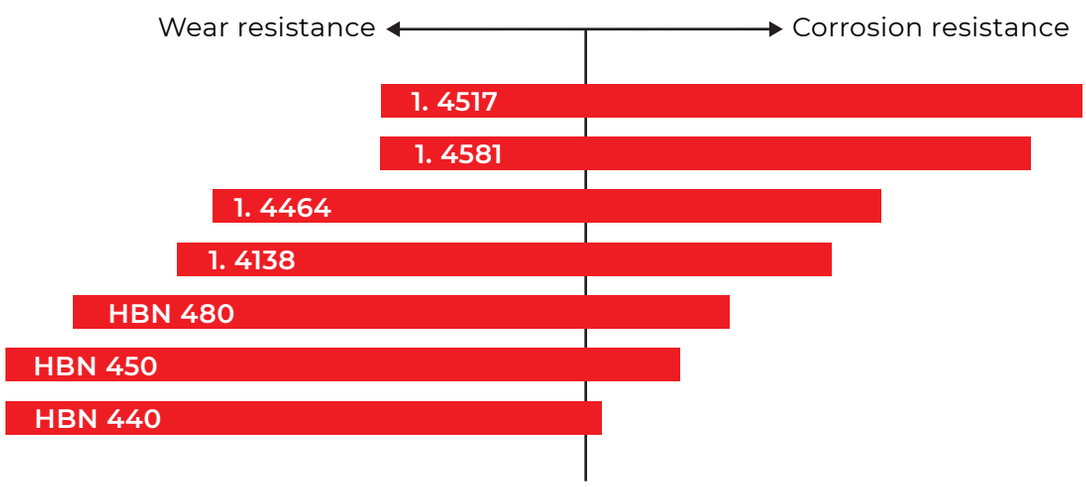
Shaft sealing by means of expeller, also known as relief impeller, is available for most of our pump series. This sealing type is particularly suitable for fine-grained pulp. It can be used as an alternative to mechanical seals for extreme applications or if the supply of clean sealing water is not possible due to the installation conditions. The application limit is close to the boiling point of the pumped media. The gland packing serves as a stationary seal and the expeller - as a dynamic component. The most commonly used materials for the relief impeller are metal and polyurethane.



# CASTING MATERIALS

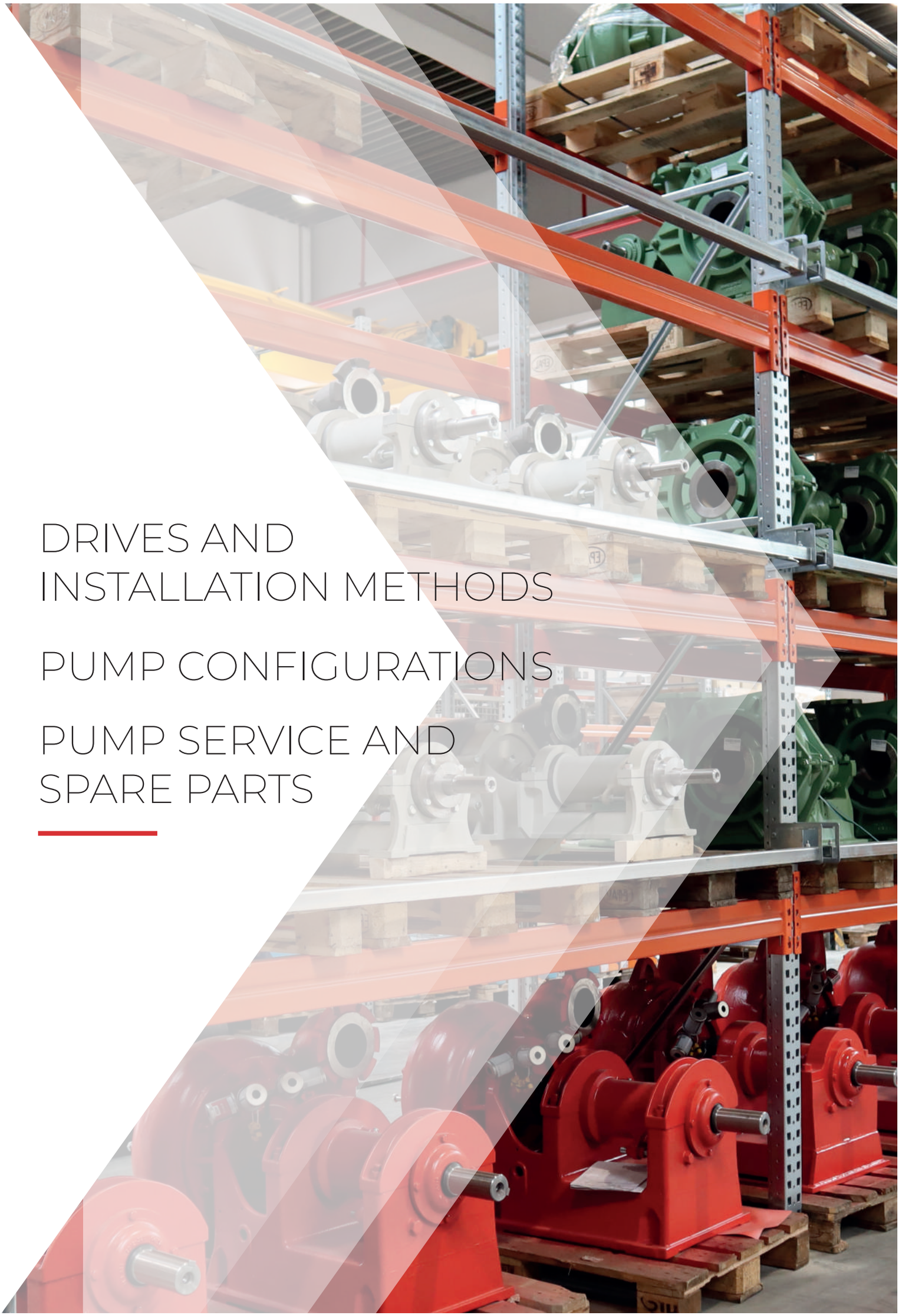
Highly wear-resistant casting materials from Habermann Aurum Pumpen were modified and perfected throughout the years based on our own experience and research. We have developed wear and corrosion resistant alloys specifically for pumps processing aggressive media and used for medium to heavy duty applications. Due to their unique combination and high hardness level, these materials significantly improve mechanical properties of the pump components. In addition to tempered steel and duplex steel, we offer cast materials of our own alloy development that are tailored to respective applications: HBN 440, HBN 450, HBN 480 with a Brinell hardness of up to 650 HB.

## WEAR AND CORROSION RESISTANCE
OF VARIOUS HABERMANN AURUM MATERIALS




## MATERIALS AND THEIR HARDNESS ACCORDING TO BRINELL SCALE

| Material No. | Hardness [HB] |
|---|---|
| 1.4517 | 230 - 300 |
| 1.4581 | 130 - 200 |
| 1.4464 | 230 - 300 |
| 1.4138 | 260 - 330 |
| HBN 480 | 620 |
| HBN 450 | 650 |
| HBN 440 | 600 |



# DRIVES AND INSTALLATION METHODS

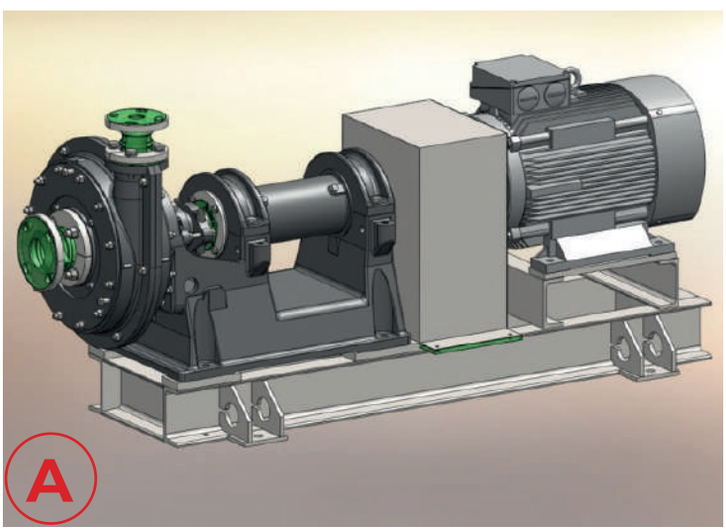
# PUMP CONFIGURATIONS

# PUMP SERVICE AND SPARE PARTS

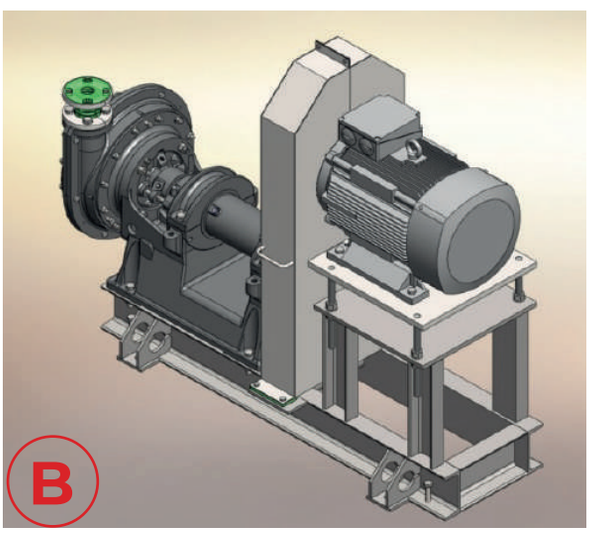
# DRIVES AND INSTALLATION

## V-BELT DRIVE

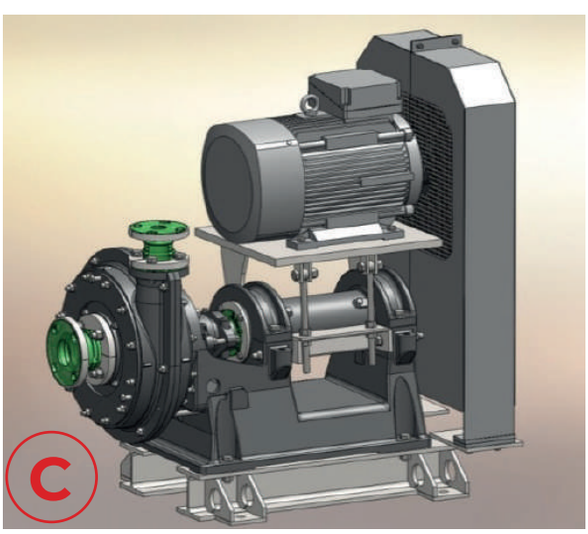
Slurry pumps are directly coupled with the electric motor only in exceptional cases. This method may be accommodated in case of compatible motor speed, depending on the pump size.
Today, the most commonly used drives are V-belt drives with high motor powers of up to 315 kW. The taper lock bushes make it easier to install and remove the V-belt pulleys, eliminating the need for tensioner to hold it together. Further advantage of the V-belt drive is that the operating characteristics of the pump can be easily adapted to the workflow changes by replacing the V-belt pulleys. This flexible design with easy installation and alignment has a very long shelf life and high efficiency.



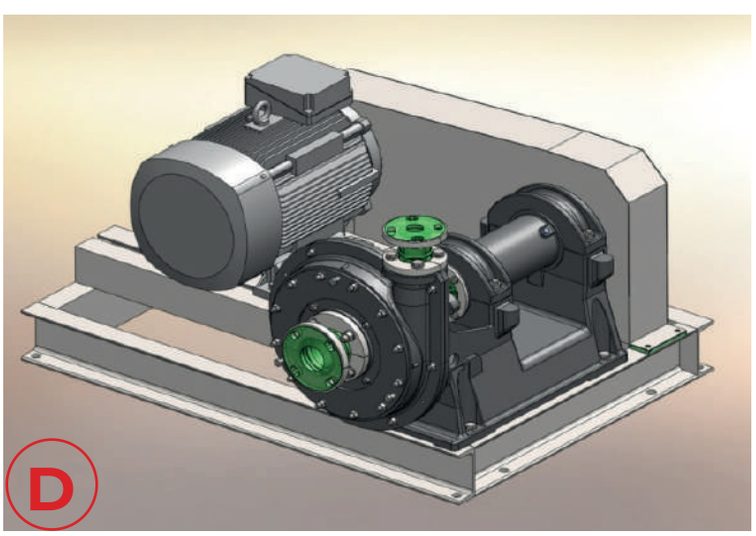

Direct coupling




V-belt drive with e-motor mounted in longitudinal axis of the pump




V-belt drive with e-motor mounted above the pump bearing




V-belt drive with e-motor next to the pump on the suction side, to the left or right optionally.
(On request, with separate base frames for pump and motor)

# PUMP SERVICE

Our professional team of experts is here to offer you complete optimization and repair services to ensure the safety and efficiency of your pumping system. Our goal is to not only properly repair your pump, but to clarify why a possible failure could occur and ensure that all pump components are in fully operational condition.

## SPARE PARTS

With original spare parts from Habermann Aurum Pumpen, you get the highest quality and functionality when replacing individual components. Powered by our multi-decade experience and a vast network of partners, we can support you with suitable products and solutions globally.

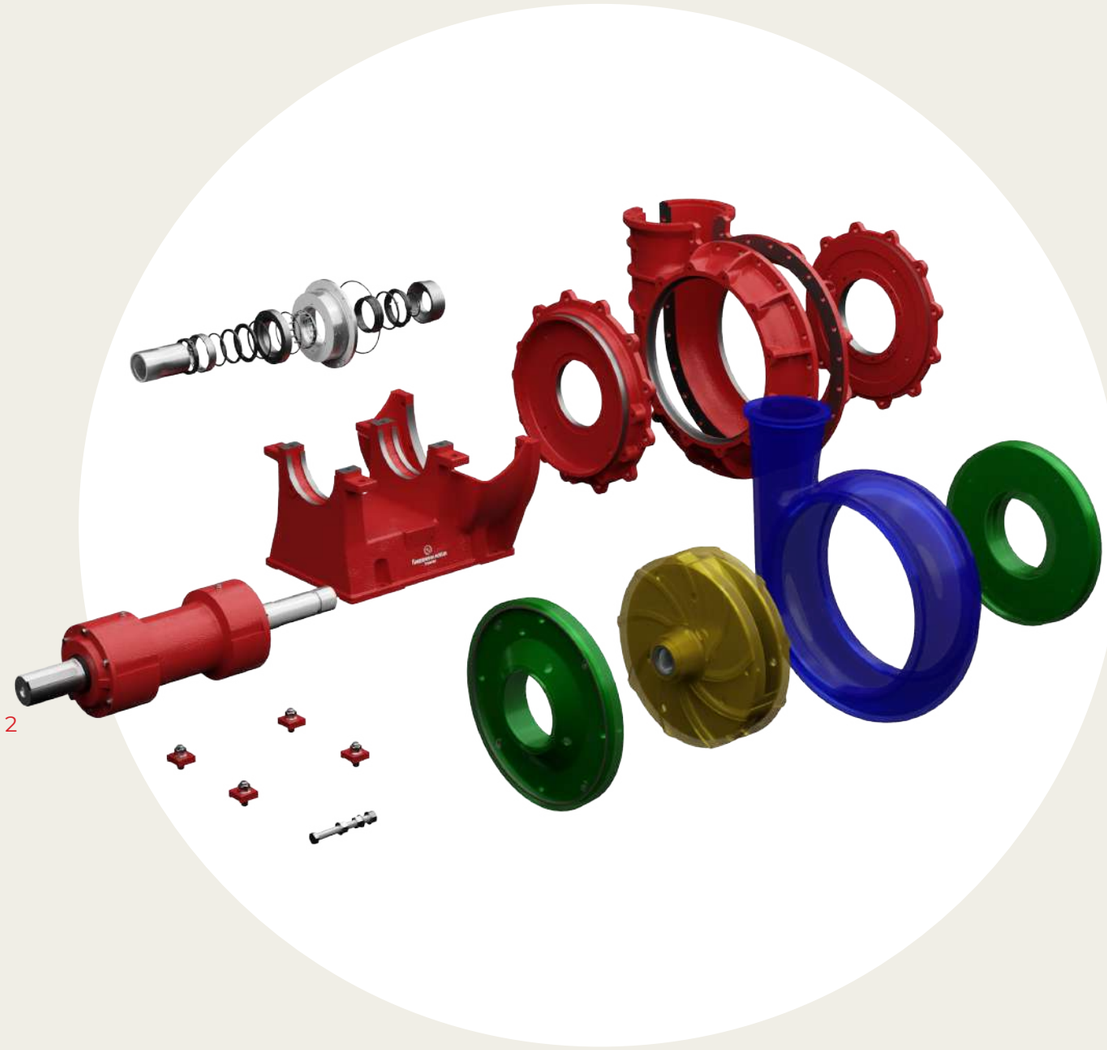
## MODERNIZATION

Our modernization services allow you to modify and improve Habermann Aurum pumps and systems that have been in operation for a number of years. Whether you wish to maximize your production capacity or optimize specific processes within an application, we will assist you every step of the way.
Thereby you can ensure an optimal performance across your network and extend your pump's shelf life without having to invest in new systems. We will work with you to find the best possible solutions that are tailored to your needs.

## MAINTANANCE AND REPAIR SERVICES

- System analysis
- Pump optimization
- Productivity assessment
- Pump commissioning and integration
- Maintenance and repair services

WE HAVE THE SOLUTION FOR YOU



Individual adaptation to your plant situation, thanks to the greatest variety of materials. This is the greatest advantage of the HPK pump series.



# Content.

# APFlex®.

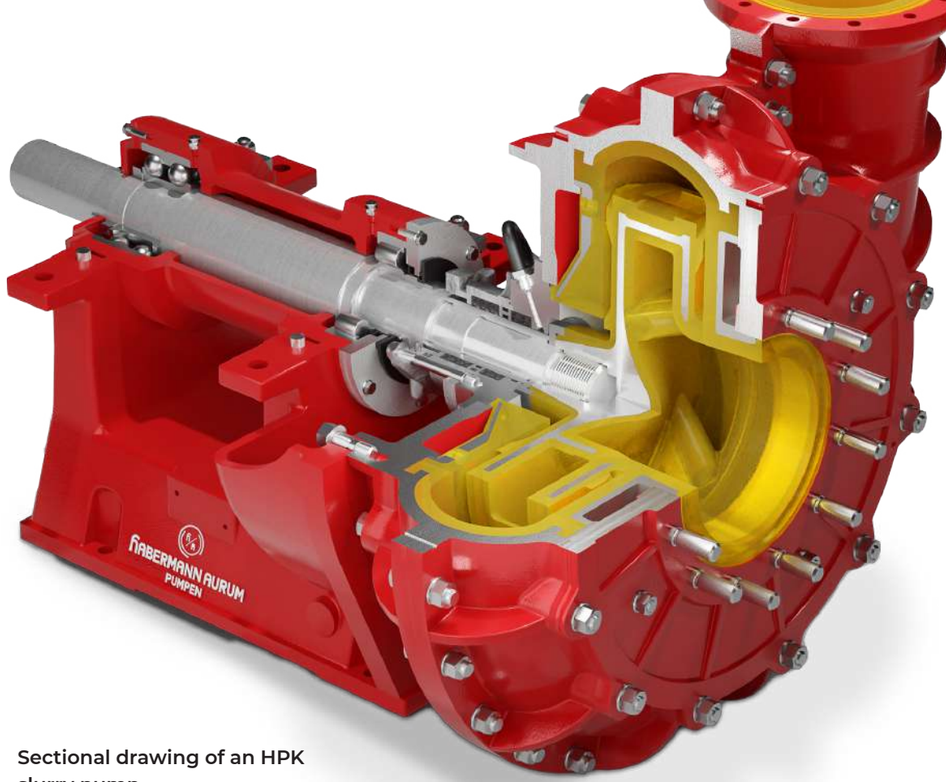
## Innovative special polyurethanes

### Hot-cast, highly elastic, hydrolysis-resistant

APFlex® special polyurethanes have high wear, cut and oil resistance. APFlex® materials utilize the so-called „trampoline effect, which gives them great advantages of their wear behaviour compared to metallic cast materials. Due to special formulations of the APFlex® It can be used in corrosive or abrasive media.

For diluted acids, for example, the following empirical values are available:

- H2SO4 up to 35%
- P2O5 up to 70%
- HCL up to 25%
- Alkaline solutions: e.g. NaOH compound without limitation of concentration.




**Sectional drawing of an HPK slurry pump**
APFlex® lining in 10-01 quality





The special polyurethanes are differently dyed for easier recognition of the quality of materials, since the components are interchangeable.

## APFlex® polyurethane materials in comparison

| Quality | APFlex® 10-01 | APFlex® 60-01 | APFlex® 50-01 |
|---|---|---|---|
| **Shore hardness** | A 88 - 90° | A 75 - 80° | A 88 - 90° |
| **Operating temperature** | -30 to +75 °C | -30 to +75 °C | -30 to +95 °C |
| **pH suitability** | 0 - 14 | 5 - 10 | 0 - 14 |
| **Properties** | abrasion and corrosion resistant, suitable for acids and alkalis, oil resistant. | particularly abrasionresistant and resistant to the known treatment oils. | thermal resistance; chemically as resistant as APFlex® 10-01 |

The abrasion values possible with APFlex® cannot be achieved with any other rubber or FKM quality.

# CeramCarbide®.

## Non-metallic composite material

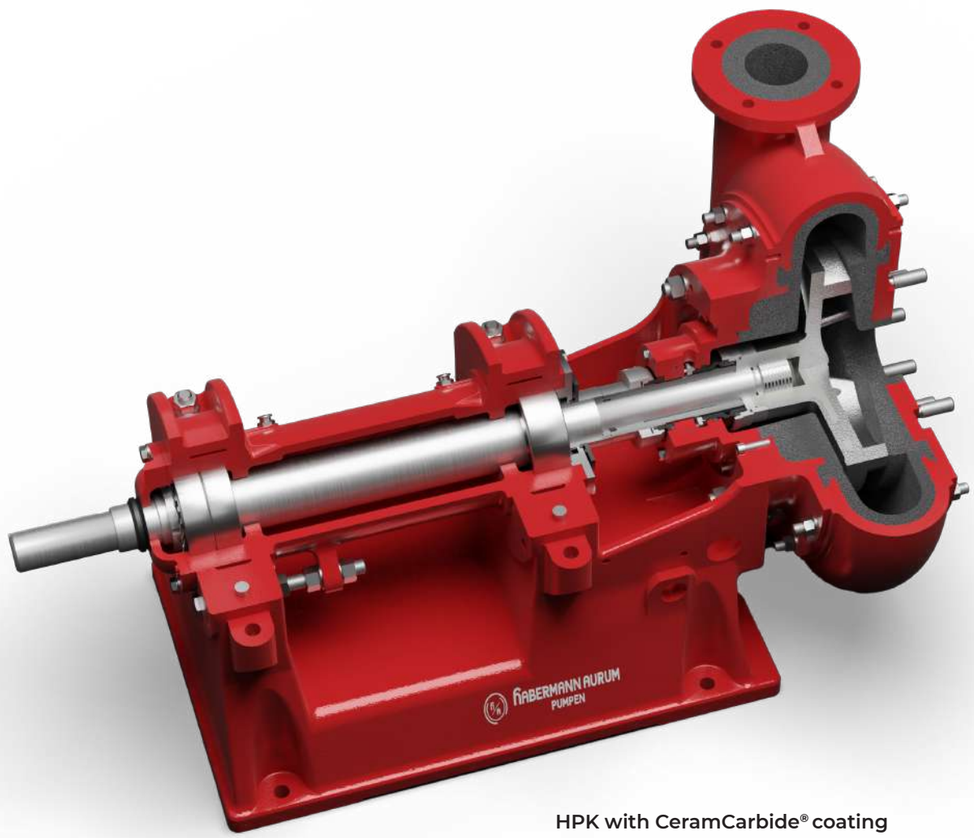
### Wear and corrosion resistant

CeramCarbide® is a non-metallic composite material which consists of more than 80% of silicon carbide and about 20% of a vinyl ester resin as a binder. Silicon carbide is a non-oxide ceramic. It has a very good resistance to acids and alkalis and it is still wear and corrosion resistant even at very high temperatures.

The silicon carbides are treated with a predefined mixture with vinyl ester resins and then casted.

Vinyl ester resins, also known as VE resins, are synthetic resins that form thermosetting plastics of high strength and chemical resistance when cured.






HPK with CeramCarbide® coating



CeramCarbide® is a lightweight material, which is almost as hard as a diamond (approx. 9.5 on the Mohs hardness scale).

## CeramCarbide® properties

| | |
|---|---|
| **Operating temperature** | up to 160°C |
| **pH suitability** | 0 - 14 |
| **Characteristics** | abrasion and corrosion resistant, suitable for acids or alkalis, high hardness due to silicon carbide inclusions, application in very fine-grained media |

For mixed stresses from corrosion and abrasion and grain sizes up to 3 mm CeramCarbide® lined pump is an ideal solution.

# APG Rubber and FKM.

## Hot-pressed, highly elastic materials

### Temperature, abrasion and corrosion resistant

Temperature, abrasion and corrosion resistant rubber and FKM (fluorocarbon rubber) grades are hot-pressed, highly elastic rubber or FKM materials.
They have a high wear resistance. These materials also utilize the so-called „trampoline effect“, and have great advantages in terms of their wear performance compared with metallic cast materials.

The special compositions allow these materials to be used in corrosive or abrasive/ corrosive media.


**HPK pump with rubber lining**



Due to their high elasticity and incision resistance, rubber parts made with APG rubber or FKM material are much more suitable for pumps handling fine-grained media than any highly wear-resistant cast steel.



## APG and FKM grades in comparison

| Quality | APG 2201 | APG 2210 | FKM |
|---|---|---|---|
| **Shore hardness** | 65° | 55° | 65° |
| **Temperature** | max. 130 °C | 100 - 105 °C | max. 100 °C |
| **pH suitability** | 0 - 14 | 0 - 14 | 0 - 14 |
| **Characteristics** | abrasion and corrosion resistant, suitable for acids and alkalis, use with fine-grained media | more abrasion resistant, suitable for acids and alkalis, use with fine-grained media | abrasion and corrosion resistant, suitable for acids and alkaline solutions (e.g. hydrochloric acid up to 98 % resistant), for use with fine for fine-grained media |

All rubber wear parts which come into the contact to the medium have a higher temperature resistance.

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# made for your process

- Expert advice
- A customer-oriented organization that adapts to the requirements and wishes of your organization
- Innovative and customized solutions
- Breakdownservice, 24 hours a day, 7 days a week
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- Wide range of liquid pumps
- Repair, maintenance and revision


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