

PRODUCT RANGE PUMPS

 **KLAUS  
UNION**  
QUALITY IS OUR SUCCESS



## PRODUCT RANGE PUMPS

CENTRIFUGAL / TWIN SCREW PUMPS  
ACC. DIN EN ISO / ASME / API



[www.klaus-union.com](http://www.klaus-union.com)

# KLAUS UNION PUMPS & SYSTEMS



Founded in 1946 in Bochum, Germany, today Klaus Union is a market leader for the production and supply of pump systems and valves. Klaus Union keeps numerous patents and offers a comprehensive product portfolio of centrifugal and screw pumps. Since many of the global endusers of Klaus Union Pump Systems & Valves are from the chemical, petrochemical, and oil & gas industry, particularly high requirements are placed on all related products.

Pumping / Handling aggressive, toxic and/or explosive fluids does not allow any compromise on quality, service life and safety. Klaus Union state of the art products guarantee reliable operation and protection of both, people and environment.

## KLAUS UNION INNOVATION FOR YOUR SAFETY

In the early 1950s, Klaus Union had already developed the world's first magnet drive, which was introduced at the AICHEMIA in Frankfurt in 1955.

Further trendsetting developments followed, such as the first titanium pump manufactured in Europe or state of the art magnet systems.

In 2012, Klaus Union developed Double Volute Twin Screw Pumps with pre-assembled cartridges for quick and easy maintenance. Due to safety and service reasons, today Klaus Union pumping systems are the focus for numerous industries.

## ADVANCED MATERIAL – HIGHEST QUALITY

Klaus Union's product range covers pump systems and valves for a number of industries.

They are used e.g. in temperature sensitive applications (refrigeration, heat transfer), in power stations, liquid gas plants or in galvanic processes.

Beside steel and stainless steel, corrosion-resistant materials, such as nickel- and titanium-based alloys, are forming today's basis of all Klaus Union products.

A state of the art quality management system guarantees the highest degree of quality. Endusers around the world trust in Klaus Union products. The reliability of our products is supported by comprehensive factory service, provided on-site 24/7.

Klaus Union offers worldwide services by Klaus Union Service GmbH, an affiliate of the Klaus Union Group.

Experience  
Responsibility  
Passion



## QUALITY ASSURANCE

A major element of the Klaus Union ethos is to ensure highest product quality.

Existing quality assurance procedures with Klaus Union suppliers are constantly monitored from order placement to goods receipt and final assembly. This quality assurance system, developed on latest technologies, complies with the requirements of international regulations.

Klaus Union products and processes are certified according to:

- ▶ DIN EN ISO 9001
- ▶ DIN EN ISO 50001
- ▶ Pressure Equipment Directive 2014 / 68 / EU
- ▶ Machinery Directive 2006 / 42 / EC
- ▶ Explosion Protection Directive 2014 / 34 / EU ("ATEX Directive", equipment category 2 for use in explosion protection zone 1, II 2G Ex h IIC T1-T4 Gb)
- ▶ EAC Certificate - Certificate of conformity with requirements of technical regulations CU TR 004/010/012/020/2011, Russia



In accordance with TÜV NORD CERT procedures,

KLAUS UNION GmbH & Co. KG  
Blumenfeldstraße 18, 44795 Bochum  
&  
KLAUS UNION Service GmbH & Co. KG  
Blumenfeldstraße 18, 44795 Bochum

are certified according to  
DIN EN ISO 9001



# PRODUCT PORTFOLIO MAGNET DRIVE PUMPS



DIN  
ASME  
API



## SINGLE-STAGE CENTRIFUGAL PUMP

Acc. DIN EN ISO 2858 & DIN EN ISO 15783

- ▶ Flow Rate: max. 3,500 m<sup>3</sup>/h  
max. 15,410 USGPM
- ▶ Delivery Head: max. 220 m L.C.  
max. 722 ft
- ▶ Temperature Range: -120 °C to +450 °C  
-184 °F to +842 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi

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## SINGLE-STAGE CENTRIFUGAL PUMP

Acc. ASME B73.3-2015

- ▶ Flow Rate: max. 150 m<sup>3</sup>/h  
max. 660 USGPM
- ▶ Delivery Head: max. 100 m L.C.  
max. 328 ft
- ▶ Temperature Range: -120 °C to +450 °C  
-184 °F to +842 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi

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## MULTI-STAGE SIDE CHANNEL PUMP

Following DIN EN ISO 15783

- ▶ Flow Rate: max. 42 m<sup>3</sup>/h  
max. 185 USGPM
- ▶ Delivery Head: max. 470 m L.C.  
max. 1,542 ft
- ▶ Temperature Range: -120 °C to +250 °C  
-184 °F to +482 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi

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## MULTI-STAGE CENTRIFUGAL PUMP

Ring-Section Design / Barrel Design  
Acc. DIN EN ISO 15783 / Following API 685 2<sup>nd</sup> Ed.

- ▶ Flow Rate: max. 300 m<sup>3</sup>/h  
max. 1,321 USGPM
- ▶ Delivery Head: max. 2,200 m L.C.  
max. 7,218 ft
- ▶ Temperature Range: -120 °C to +350 °C  
-184 °F to +662 °F
- ▶ Pressure Rating: max. PN 250  
max. 3,626 psi

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## VERTICALLY SUSPENDED (SUMP) PUMP

Single- / Multi-Stage  
Acc. DIN EN ISO 15783 / Following ASME B73.3-2015 / API 685 2<sup>nd</sup> Ed.

- ▶ Flow Rate: max. 900 m<sup>3</sup>/h  
max. 3,963 USGPM
- ▶ Delivery Head: max. 200 m L.C.  
max. 656 ft
- ▶ Temperature Range: -40 °C to +200 °C  
-40 °F to +392 °F
- ▶ Pressure Rating: max. PN 40  
max. 580 psi

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## SINGLE VOLUTE TWIN SCREW PUMP

Acc. API 676 3<sup>rd</sup> Ed.

- ▶ Flow Rate: max. 1,800 m<sup>3</sup>/h  
max. 7,925 USGPM
- ▶ Diff. Pressure: max. 40 bar  
max. 580 psi
- ▶ Temperature Range: -120 °C to +350 °C  
-184 °F to +662 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi

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## SINGLE-STAGE CENTRIFUGAL PUMP

Acc. API 685 2<sup>nd</sup> Ed.

- ▶ Flow Rate: max. 3,500 m<sup>3</sup>/h  
max. 15,410 USGPM
- ▶ Delivery Head: max. 220 m L.C.  
max. 722 ft
- ▶ Temperature Range: -120 °C to +450 °C  
-184 °F to +842 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi

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## VERTICAL INLINE CENTRIFUGAL PUMP

Following DIN EN ISO 2858 & DIN EN ISO 15783 / ASME B73.3-2015 / API 685 2<sup>nd</sup> Ed.

- ▶ Flow Rate: max. 900 m<sup>3</sup>/h  
max. 3,963 USGPM
- ▶ Delivery Head: max. 220 m L.C.  
max. 722 ft
- ▶ Temperature Range: -120 °C to +350 °C  
-184 °F to +662 °F
- ▶ Pressure Rating: max. PN 40  
max. 580 psi

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# PRODUCT PORTFOLIO

## MECHANICALLY SEALED PUMPS

DIN  
ASME  
API



### SINGLE-STAGE CENTRIFUGAL PUMP

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Acc. DIN EN ISO 2858 & 5199 /  
API 610 12<sup>th</sup> Ed. &  
ISO 13709 2010

- ▶ Flow Rate: max. 3.500 m<sup>3</sup>/h  
max. 15,410 USGPM
- ▶ Delivery Head: max. 220 m L.C.  
max. 722 ft
- ▶ Temperature Range: -120 °C to +450 °C  
-184 °F to +842 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi



### MULTI-STAGE CENTRIFUGAL PUMP

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Ring-Section Design /  
Barrel Design

Acc. DIN EN ISO 5199 /  
Following API 610 12<sup>th</sup> Ed. &  
ISO 13709 2010

- ▶ Flow Rate: max. 300 m<sup>3</sup>/h  
max. 1,321 USGPM
- ▶ Delivery Head: max. 2.200 m L.C.  
max. 7,218 ft
- ▶ Temperature Range: -120 °C to +350 °C  
-184 °F to +662 °F
- ▶ Pressure Rating: max. PN 250  
max. 3,626 psi



### VERTICALLY SUSPENDED (SUMP) PUMP

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Single- / Multi-Stage

Acc. DIN EN ISO 5199 /  
Following API 610 12<sup>th</sup> Ed. &  
ISO 13709 2010

- ▶ Flow Rate: max. 1.600 m<sup>3</sup>/h  
max. 7,045 USGPM
- ▶ Delivery Head: max. 200 m L.C.  
max. 656 ft
- ▶ Temperature Range: -50 °C to +250 °C  
-58 °F to +482 °F
- ▶ Pressure Rating: max. PN 40  
max. 580 psi



### SINGLE-STAGE PROPELLER PUMP

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- ▶ Flow Rate: max. 12.000 m<sup>3</sup>/h  
max. 52,835 USGPM
- ▶ Delivery Head: max. 12 m L.C.  
max. 39 ft
- ▶ Temperature Range: -120 °C to +250 °C  
-184 °F to +482 °F
- ▶ Pressure Rating: max. PN 100  
max. 1,450 psi



### SINGLE VOLUTE TWIN SCREW PUMP

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Acc. API 676 3<sup>rd</sup> Ed.

- ▶ Flow Rate: max. 1.800 m<sup>3</sup>/h  
max. 7,925 USGPM
- ▶ Diff. Pressure: max. 40 bar  
max. 580 psi
- ▶ Temperature Range: -120 °C to +350 °C  
-184 °F to +662 °F
- ▶ Pressure Rating: max. PN 400  
max. 5,802 psi



### DOUBLE VOLUTE TWIN SCREW PUMP

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Acc. API 676 3<sup>rd</sup> Ed.

- ▶ Flow Rate: max. 5.000 m<sup>3</sup>/h  
max. 22,000 USGPM
- ▶ Diff. Pressure: max. 100 bar  
max. 1,450 psi
- ▶ Temperature Range: -120 °C to +350 °C  
-184 °F to +662 °F
- ▶ Pressure Rating: max. PN 150  
max. 2,176 psi

# THE MODULAR SYSTEM FOR MAGNET DRIVE PUMPS



## THE MODULAR SYSTEM

Klaus Union's modular pump system consists of three different elements:

- ▶ Pump Hydraulic
- ▶ Magnet Coupling
- ▶ Bearing Bracket

The combination of these components allows a large operating envelope with few differing parts. The parts are even interchangeable between the screw pump and centrifugal pump series.

Over 100 different pump sizes and magnet drives cover operation parameters up to 3.500 m<sup>3</sup>/h and 400 bar. Interchangeability, stock size and servicing equipment are simplified for all users.

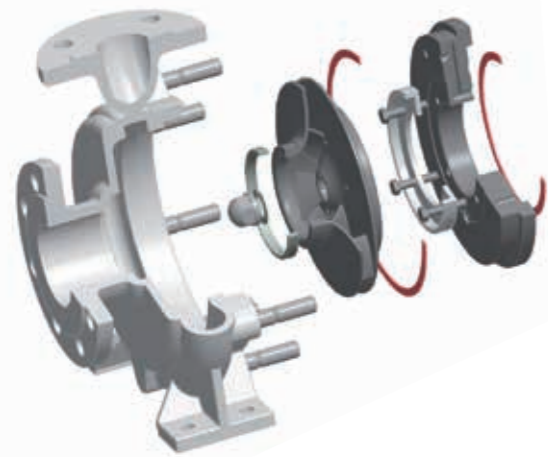


Fig. 1: Pump Hydraulic (Centrifugal Pump), 41 Sizes

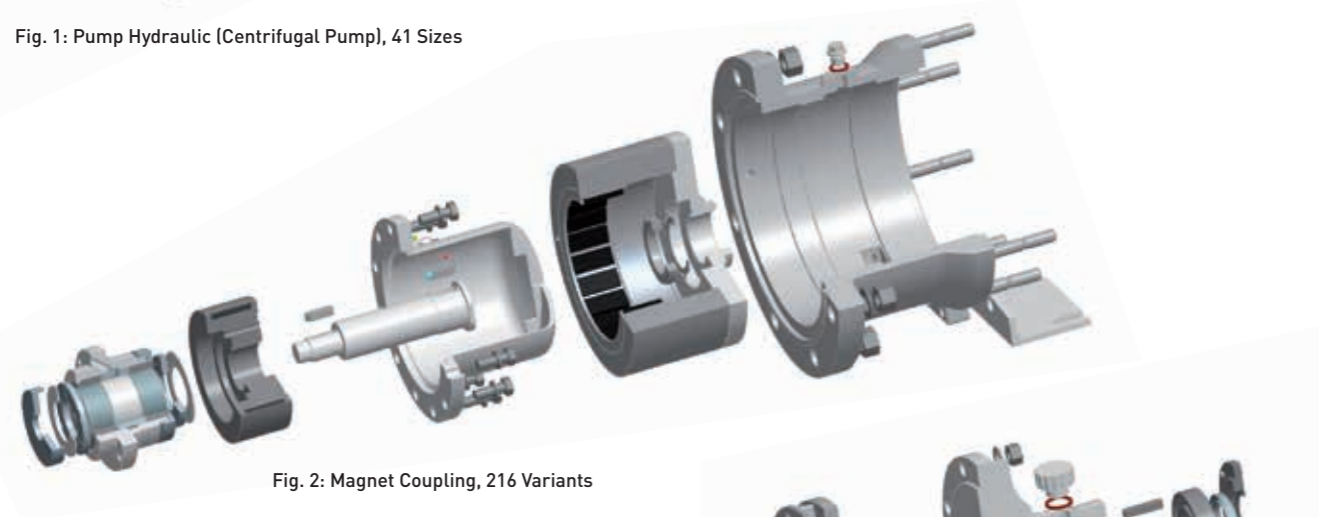


Fig. 2: Magnet Coupling, 216 Variants

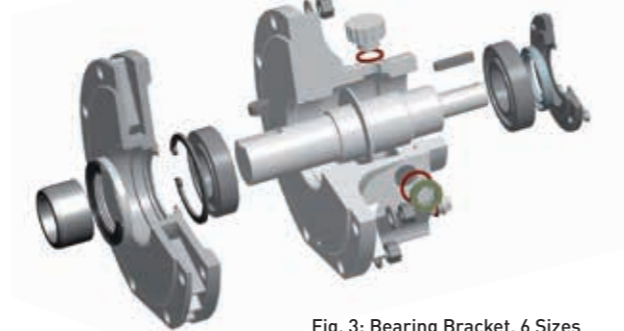


Fig. 3: Bearing Bracket, 6 Sizes

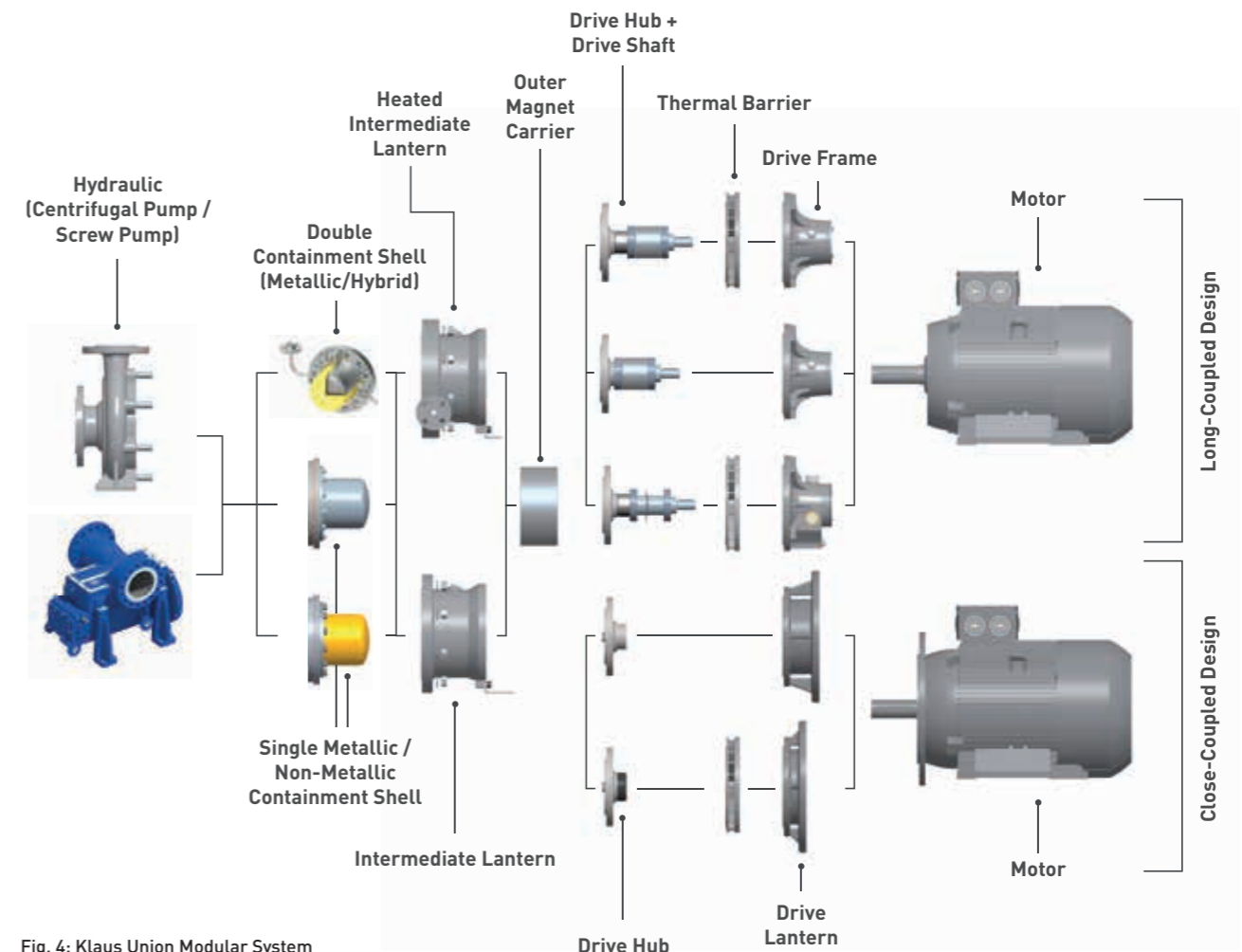


Fig. 4: Klaus Union Modular System

# KLAUS UNION MAGNET DRIVE - WHEN LEAKAGE IS NOT AN OPTION

## SEALLESS TECHNOLOGY

If pumps are used to handle dangerous products, it is essential to avoid even the smallest leakages into the environment in order to ensure the protection of both people and the atmosphere.

The ideal solution for such a case is pumps with magnet drive. The first of its kind was already introduced by Klaus Union in 1955.

## TECHNICAL DESCRIPTION

Figure 5 shows a cross sectional view of a pump with magnet drive. The drive shaft - to transfer the mechanical energy from the drive to the pump hydraulics - is not a single shaft with a gland packing or mechanical seal on it. Instead, the mechanical energy transferred from the drive to the pump shaft is transferred to an outer ring (outer magnet carrier) fitted with permanent magnets. The impeller of the centrifugal pump is firmly connected via the impeller shaft to an inner ring (inner magnet carrier) also fitted with permanent magnets. Due to the rotation of the outer magnet carrier, the inner magnet carrier is rotated synchronously via magnetic forces; the mechanical drive energy is transmitted via the magnetic field.

A containment shell is installed to separate the pumped fluid from its environment. The impeller shaft is supported by fluid-lubricated slide bearings within the pump's hydraulic system. This special design enables hermetic integrity.

There are no dynamic seals between the pumped fluid and the environment from which leaks can escape to the environment. Only two static seals (designed as flat seals or O-rings) are used between pump casing and casing cover and between casing cover and containment shell in the magnetically driven pump. The static seals are maintenance free and therefore the pump is hermetically sealed.

## ADVANTAGES VS. MECHANICALLY SEALED PUMPS

- ▶ Nearly maintenance free
- ▶ Less investment costs and less maintenance costs
- ▶ No instrumentation or special monitoring devices required in standard
- ▶ No utilities required, such as nitrogen or cooling water
- ▶ No leakage to the atmosphere
- ▶ No loss of sealant liquid
- ▶ No wear of the seals at all
- ▶ Low mechanical loads on shaft and bearings
- ▶ High stiffness of the pump shaft

## ADVANTAGES VS. CANNED MOTOR PUMPS

- ▶ Standard IEC and NEMA motors can be used
- ▶ Maintenance without disconnecting pump and motor possible
- ▶ Lower investment and repair costs
- ▶ Separate flushing of journal bearing
- ▶ Higher efficiency
- ▶ Use of non-metallic containment shell possible
- ▶ No heat generation of the rotor by electric losses
- ▶ Higher viscosities possible
- ▶ Higher temperatures without cooling possible
- ▶ No special monitoring devices necessary

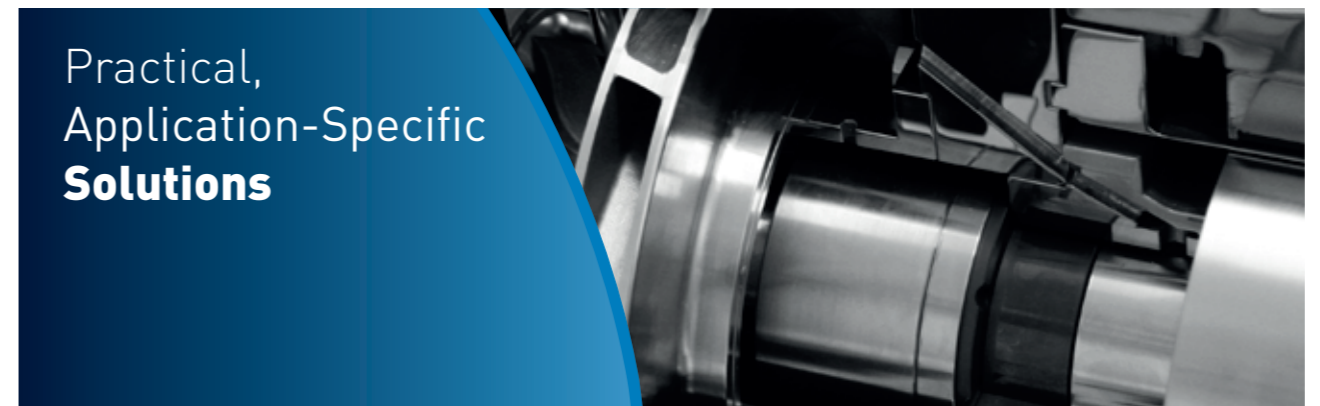
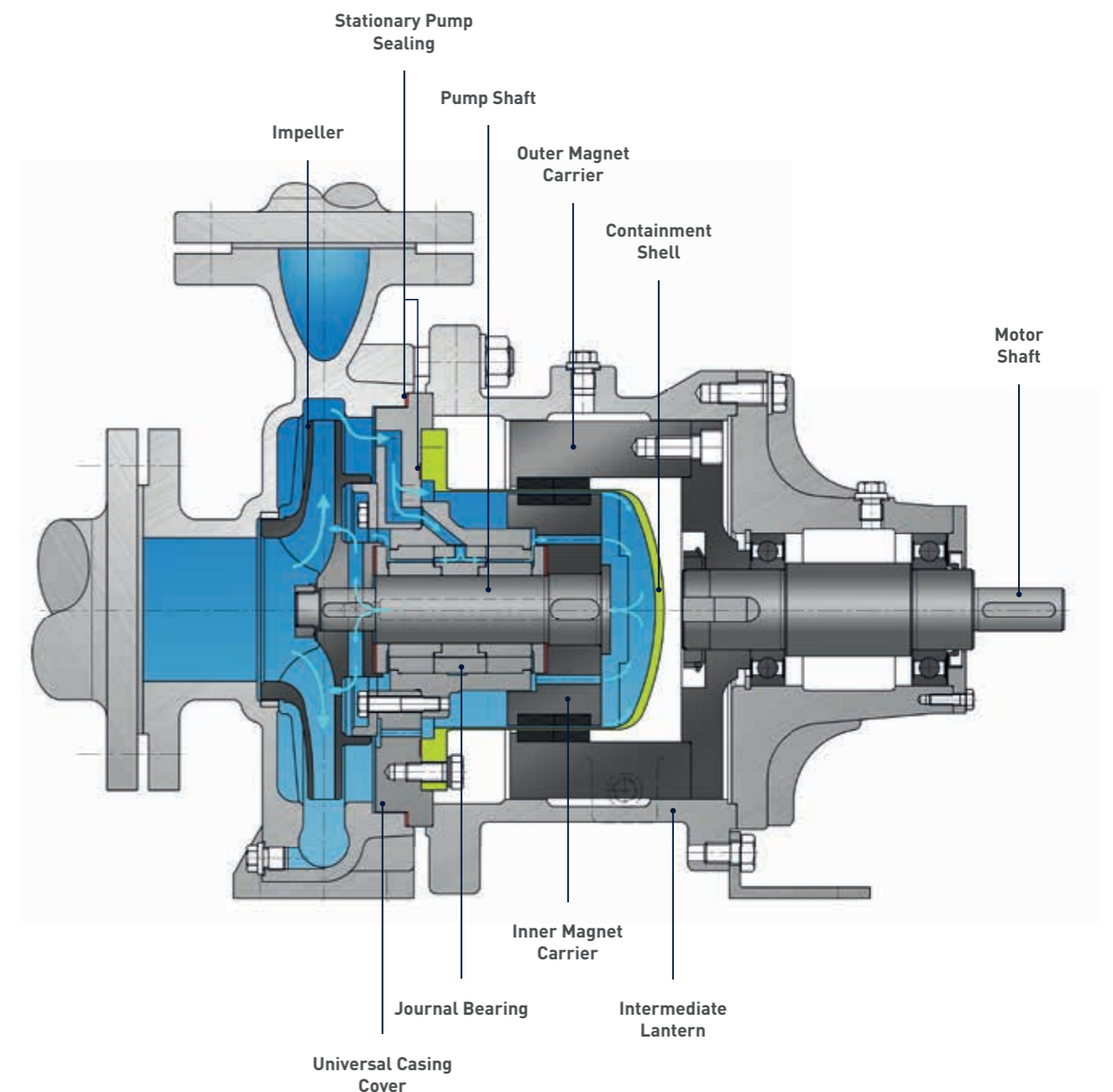


Fig. 5: Magnet Drive Pump Cutaway // Main Components & Internal Circulation (internal circulation of the fluid → )



# CLOSE-COUPLED DESIGN FOR MAGNET DRIVE PUMPS

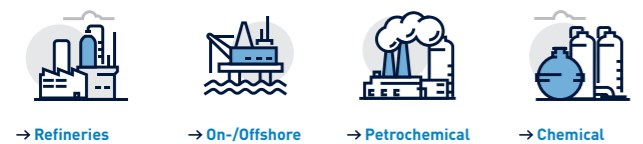
## KLAUS UNION PUMPS IN CLOSE-COUPLED DESIGN

Close-coupled pumps are the result of the continuous development of the proven Klaus Union pumps with magnet drive and without shaft seal.

Pumps in close-coupled design meet highest technical and economic requirements that chemical, petrochemical, and oil & gas industry expect today from pumps without shaft seals.

The design without shaft seal but with magnet drive guarantees that the pump operates leak free, in accordance with the TA-Luft specification (German Technical Instruction on Air Quality Control). In comparison to pumps with mechanical seal, Klaus Union's sealless magnet drive pumps operate maintenance-free.

Klaus Union's leak-free pumps are particularly suitable for pumping toxic, aggressive, inflammable and other environmentally hazardous liquids particularly in the following industries:



The design covers the complete performance range of centrifugal and twin screw pumps. Multistage centrifugal pumps and pumps designed for high pressure applications are also available as special designs.

The close-coupled design offers significant cost savings because of the following advantages:

- ▶ No alignment between pump and motor
- ▶ No coupling and coupling guard
- ▶ No ball bearings
  - Pump does not require scheduled maintenance
  - No oil lubrication necessary
  - Lower noise level
- ▶ High stiffness of the pump shaft because of small overhung compared to pumps with shaft seal
- ▶ Use of standard high efficient IEC and NEMA motors contrary to canned motors
  - Better availability with standard motors
  - Maintenance of motors is standardized and can be done by the customer on site
- ▶ Base plates for close-coupled design do not need to be rigid acc. to API 685 2<sup>nd</sup> Ed. - 7.3

All Klaus Union magnet drive pumps (excl. series SLM NVT) are available in close-coupled design.

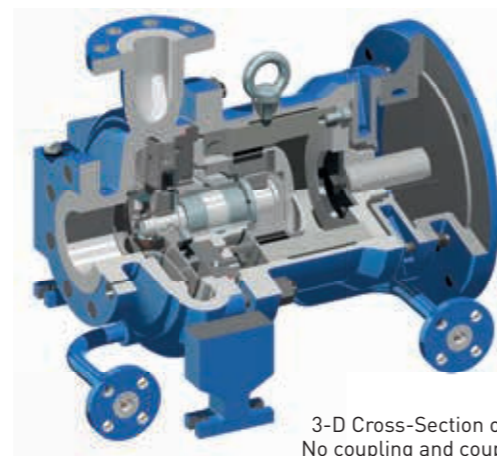


Fig. 6:  
3-D Cross-Section of SLM APC  
No coupling and coupling guard

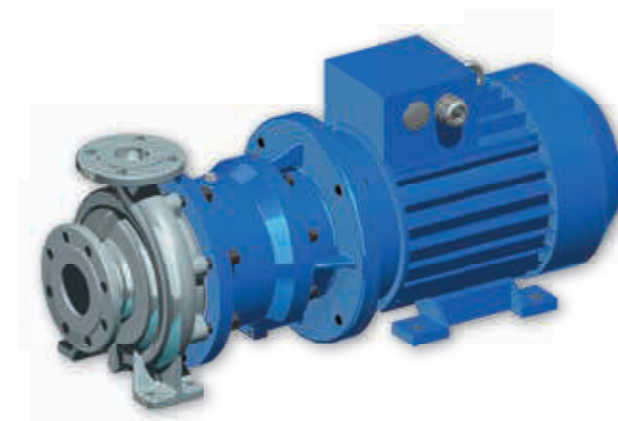


Fig. 7:  
Magnet Drive Centrifugal Pump SLM NVB  
(Close-Coupled Design)



Fig. 8:  
Magnet Drive Centrifugal Pump SLM APC  
(Close-Coupled Design)



# ENERGY EFFICIENT DESIGN FOR MAGNET DRIVE PUMPS I

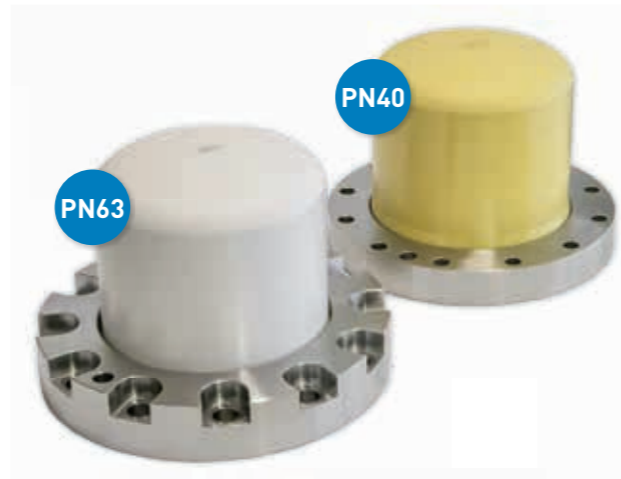
## ENHANCING PUMP EFFICIENCY WITHOUT COMPROMISING ITS PERFORMANCE

Through the use of non-metallic containment shells instead of the traditionally used metallic containment shells, Klaus Union eliminates eddy current losses and increases the efficiency of magnet drive pumps significantly.

Thanks to the zero-leakage magnet drive concept, pumps with magnet drive have a huge and significantly growing market share in the chemical, petrochemical, and oil & gas industry.

For many years, Klaus Union has used non-metallic containment shells and particularly those made from technical ceramics for various applications due to their high chemical resistance.

So far, the operation range has been limited due to the specific material characteristics. However, pump applications increasingly require higher operating pressures, temperatures and flow rates whilst still offering maximum efficiency.



Klaus Union accepted this challenge and provides the following application envelope:

**NOM. PRESSURE RANGE:**

**UP TO PN 63**

UP TO 914 PSI

**TEMPERATURE RANGE:**

**-200 °C to +400 °C**

-328 °F to +752 °F

**TRANSMITTABLE POWER:**

**UP TO 1 MW**



Fig. 9: Size Range Zirconium Oxide Containment Shells



Performance, Technology and Innovation

## MODULAR SYSTEM MAKES THE DIFFERENCE

Klaus Union offers a modular system for all sealless centrifugal and screw pumps.

This system consists of the pump hydraulic, the magnet drive and the bearing bracket. All pump types in this system use an universal casing cover, which easily allows to change the existing containment shells regardless of its material. Within the modular system, containment shells made of technical ceramic are available for every magnet drive size (09-31 E/T/P/U).

Our containment shell design is optimized by the aid of state of the art Finite Element Analysis (FEA). This simulation method allows to detect and analyze accurate approximations of stress and deformations. The result is an optimization of structural parts and its quality as well as the elimination of the risk of failure.

The graphics below show a strain behaviour (Fig. 1) and a stress analysis (Fig. 2) at a hydrotest at 94,5 bar (1370 psi).

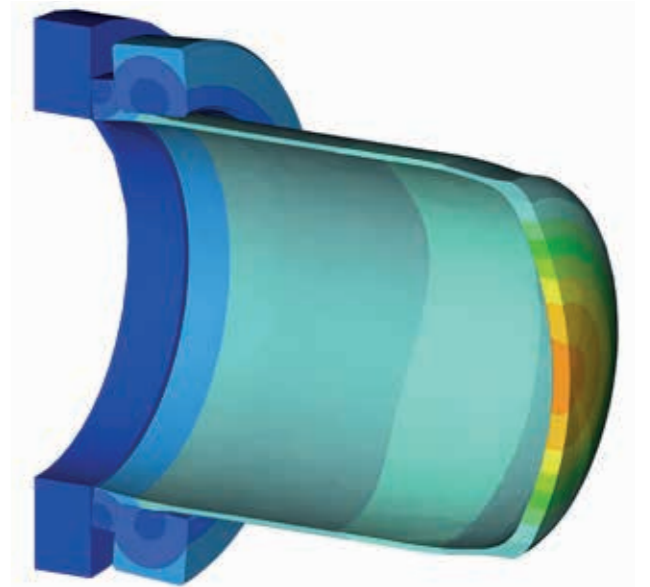


Fig. 10: Displacement Analysis



Fig. 11: Stress Analysis



# ENERGY EFFICIENT DESIGN FOR MAGNET DRIVE PUMPS II

## ADVANTAGES OF CERAMIC CONTAINMENT SHELLS

Containment Shells made of Zirconium Oxide are not magnetizable. Due to this characteristic there are no eddy current losses impacting the pump performance. In consequence, no heat is added to the pumped liquid. This has the following advantages:

- ▶ Enables for dry run capable executions (RTZ-design) and executions without continuous flush flow (OTZ-design).
- ▶ Enables for applications with high gas content.
- ▶ Pumps can handle fluids close to boiling point, e.g. liquid gas applications.
- ▶ Instrumentation to monitor the isolation shell temperature is not required anymore (since eddy current losses are eliminated).

### FURTHER ADVANTAGES:

- ▶ High mechanical strength; Extension of the application through higher pump speed.
- ▶ Vacuum-tight up to 0 bar absolute.
- ▶ High corrosion and erosion resistance; zirconium oxide has a nearly unlimited application range, especially related to lyes and acids.
- ▶ Excellent thermal shock resistance
- ▶ Enhanced energy efficiency

## RETROFIT OF PUMPS WITH SHAFT SEAL

- ▶ As there are no eddy current losses, efficiencies comparable to pumps with shaft seals can be achieved.

For quality control purposes, all Klaus Union containment shells are equipped with an individual, engraved serial number. Furthermore, Klaus Union provides material certificates on request.

## COST SAVINGS THROUGH THE APPLICATION OF ZIRCONIUM OXIDE

- ▶ Ceramic containment shells are a fundamental part of Klaus Union's modular pump system. Due to the universal casing cover containment shells can be easily and safely mounted or replaced. The operator saves stock capacities and service costs.
- ▶ There is no heat input into the pumped liquid; this significantly increases the process reliability. In consequence, no temperature monitoring is required at the containment shell.
- ▶ Energy consumption can be lowered as there are no performance-impairing eddy currents. In fact, the consumed power can be reduced by 10 to 15 %.
- ▶ Due to shaft power demand, smaller electric motors can be installed.



## ENERGY-SAVING POTENTIAL BY ELIMINATING EDDY CURRENT POWER LOSSES

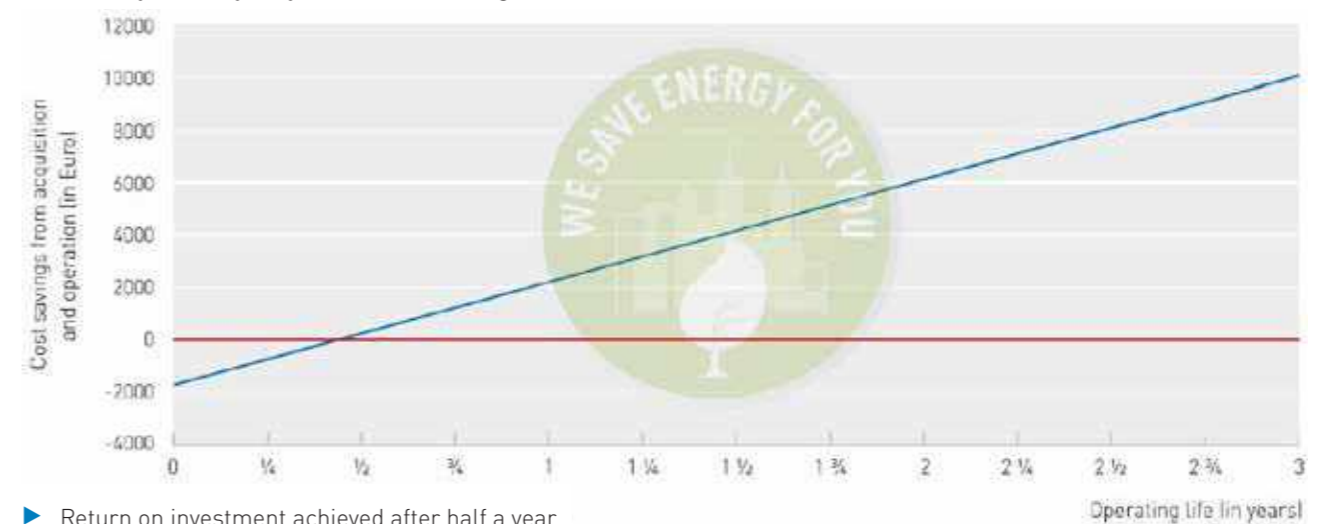
Case study during 8800 operating hours illustrating the energy saving potential

### Cost-comparison pump with 10 kW magnet drive



- ▶ Return on investment achieved after one year
- Centrifugal pump with magnet drive ▶ Energy-efficient design ▶ Standard design

### Cost-comparison pump with 100 kW magnet drive



- ▶ Return on investment achieved after half a year.
- Centrifugal pump with magnet drive ▶ Energy-efficient design ▶ Standard design

# HYBRID DOUBLE CONTAINMENT SHELL

## HYBRID DOUBLE CONTAINMENT SHELL

Pumping aggressive, explosive and highly toxic liquids requires the highest level of process safety. To protect people and the environment, leakage of the pumped liquid must be avoided - including in the event of a pump failure. For these most critical applications a magnetic drive pump equipped with a monitored, double containment shell still remains the safest solution.

To reduce the heat generated by a purely metallic, double containment shell and at the same time to improve the overall efficiency of the pump, Klaus Union has developed and patented a new hybrid double containment shell.



### ADVANTAGES

- ▶ Reduced heat input into the pumped process liquid
- ▶ Increased reliability when pumping liquids close to their boiling point
- ▶ High corrosion resistance
- ▶ Higher efficiency leading to power savings
- ▶ Wider application range than full metal, double containment shells
- ▶ Fully compliant with requirements for secondary containment system as defined by API 685, 2<sup>nd</sup> Edition, § 3.66 (page 10)
- ▶ Primary and secondary containment integrity is constantly verified by the pressure transmitter
- ▶ Easy and reliable detection of containment breach through a standard pressure transmitter
- ▶ High spare parts availability by using of standard Klaus Union components
- ▶ Ability to flush the area between shells (according API 685, 2<sup>nd</sup> Edition, § 6.7.9)
- ▶ Available across entire Klaus Union mag-drive pump range
- ▶ Reliable and maintenance friendly construction

### MAX. PRESSURE RATING:

**40 BAR at 120 °C**

580 PSI AT 248 °F

### TEMPERATURE RANGE:

**-60 °C to +400 °C**

-76 °F to +752 °F

(HIGHER ON REQUEST)

### MAX. PUMP SPEED:

**3.600 RPM**

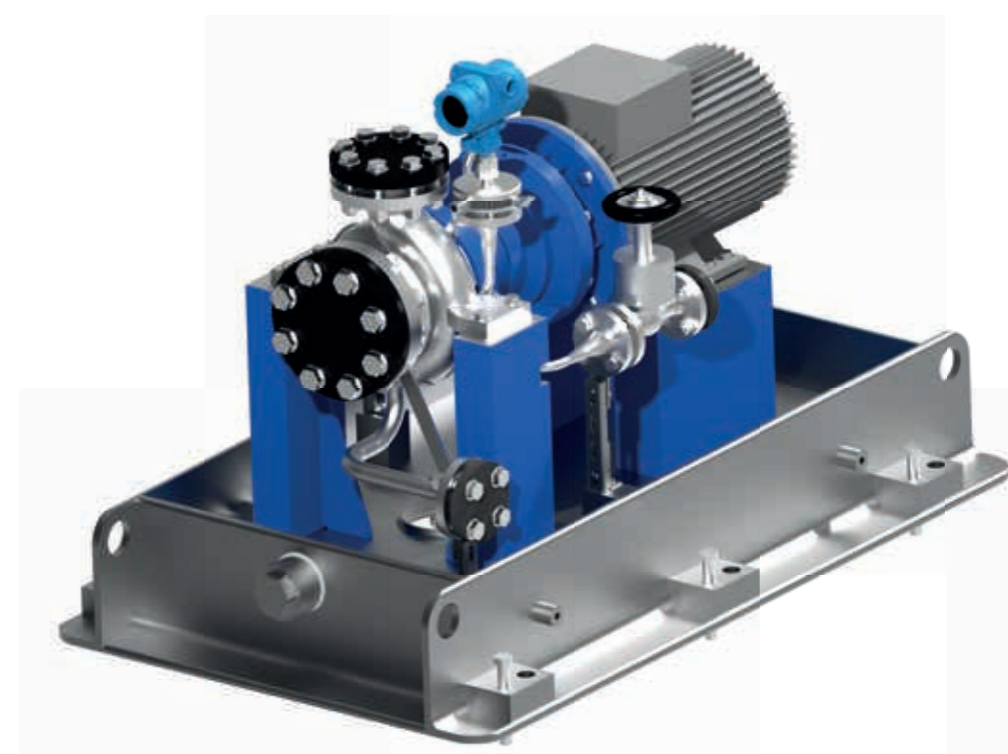
## Quality and Know-How

### WORKING PRINCIPLE

The hybrid double containment shell combines two separate shells. The inner shell is a highly corrosion resistant metallic containment shell while the outer, secondary shell is a non-metallic containment shell made from heavy duty technical ceramics. The increased electrical resistance of the materials used in this hybrid design reduces the eddy current losses. It improves the efficiency of the pump putting it about on par to traditional metallic, single containment shells. Moreover the risk of vaporization, especially when pumping media close to the boiling point or under other critical operating conditions, is significantly reduced.

The gap between both shells is provided with a vacuum and can be monitored with a standard pressure sensor; typically a pressure transmitter following customer instrumentation standards. In the event of damage to either containment shell the sensor immediately detects the change in pressure and alerts the operator, identifying which shell has been breached. This immediate and detailed information allows the operator to take any necessary steps to avoid any leakage of the dangerous pumped liquid to the atmosphere.

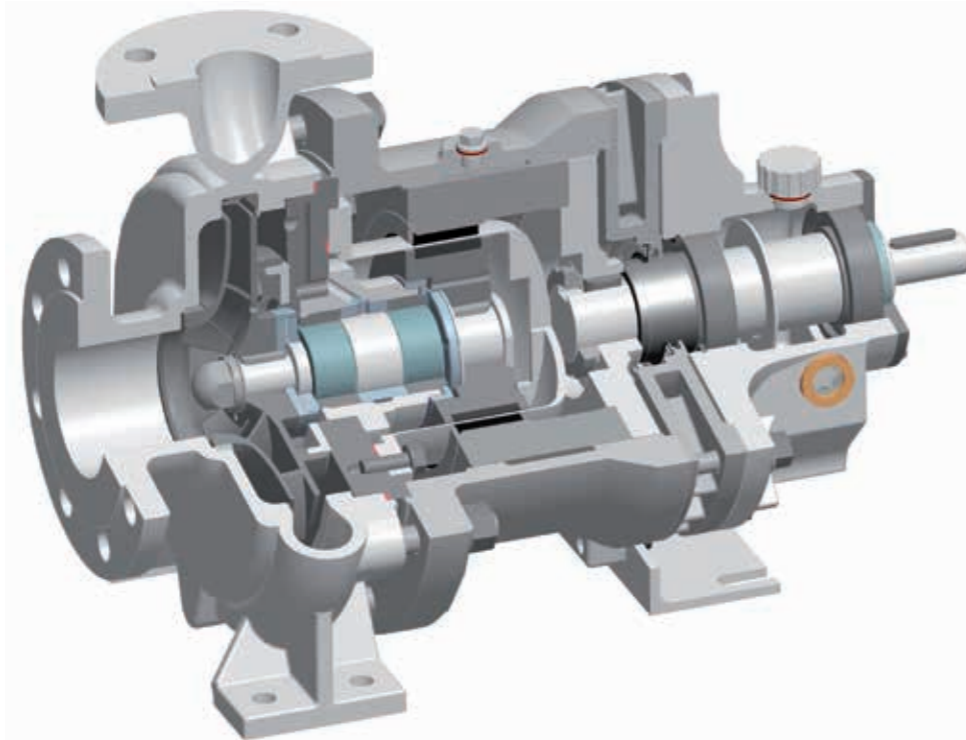
The patented hybrid double containment shell design substantially increases safety and reliability for operators in all kinds of industries reducing operation costs for the most critical applications where leakage is not an option - ever.



# SINGLE STAGE CENTRIFUGAL PUMP WITH MAGNET DRIVE

## SERIES SLM NV

ACC. DIN EN ISO 2858 & DIN EN ISO 15783



## DIN EN ISO

MAX. FLOW RATE:

**3.500 M<sup>3</sup>/H**

15,410 USGPM

MAX. DELIVERY HEAD:

**220 M L.C.**

722 FT

TEMPERATURE RANGE:

**-120 °C to +450 °C**

-184 °F to +842 °F

MAX. PRESSURE RATING:

**PN 400**

5,802 PSI

### DESIGN

- ▶ Horizontal centrifugal pump, process design
- ▶ Hydraulic performance and dimensions according to DIN EN ISO 2858
- ▶ Design based on DIN EN ISO 15783
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with anti-friction bearings, oil-lubricated or greased-for-life
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Close-coupled design (SLM NVB)
- ▶ Centerline mounting OH2
- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit
- ▶ Semi Submerged Design
- ▶ Vertical dry mounted arrangement

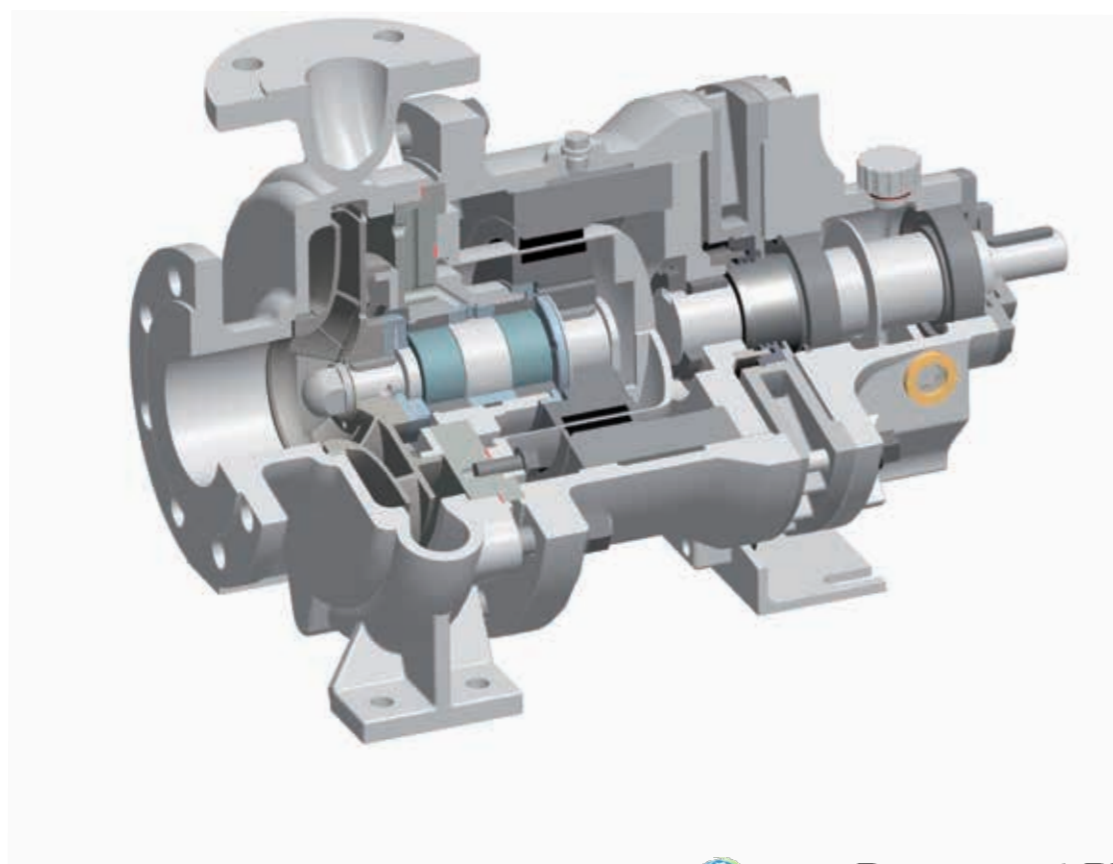
### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Heat transfer liquids
- ▶ Coolants
- ▶ Liquid gases
- ▶ Aggressive, explosive, toxic and malodorous liquids
- ▶ Valuable liquids
- ▶ Liquids containing solids
- ▶ And many more

# SINGLE STAGE CENTRIFUGAL PUMP WITH MAGNET DRIVE

## SERIES SLM AV

ACC. ASME B73.3-2015



# ASME



MAX. FLOW RATE:

**150 M<sup>3</sup>/H**

660 USGPM

TEMPERATURE RANGE:

**-120 °C to +450 °C**

-184 °F to +842 °F

MAX. DELIVERY HEAD:

**100 M L.C.**

328 FT

MAX. PRESSURE RATING:

**PN 400**

5,802 PSI

### DESIGN

- ▶ Horizontal centrifugal pump, process design
- ▶ Hydraulic performance and dimensions according to ASME B73.3-2015
- ▶ Design based on DIN EN ISO 15783
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with anti-friction bearings, oil-lubricated or greased-for-life
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Close-coupled design (SLM AVB)
- ▶ Centerline mounting OH2
- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit
- ▶ Semi Submerged Design
- ▶ Vertical dry mounted arrangement

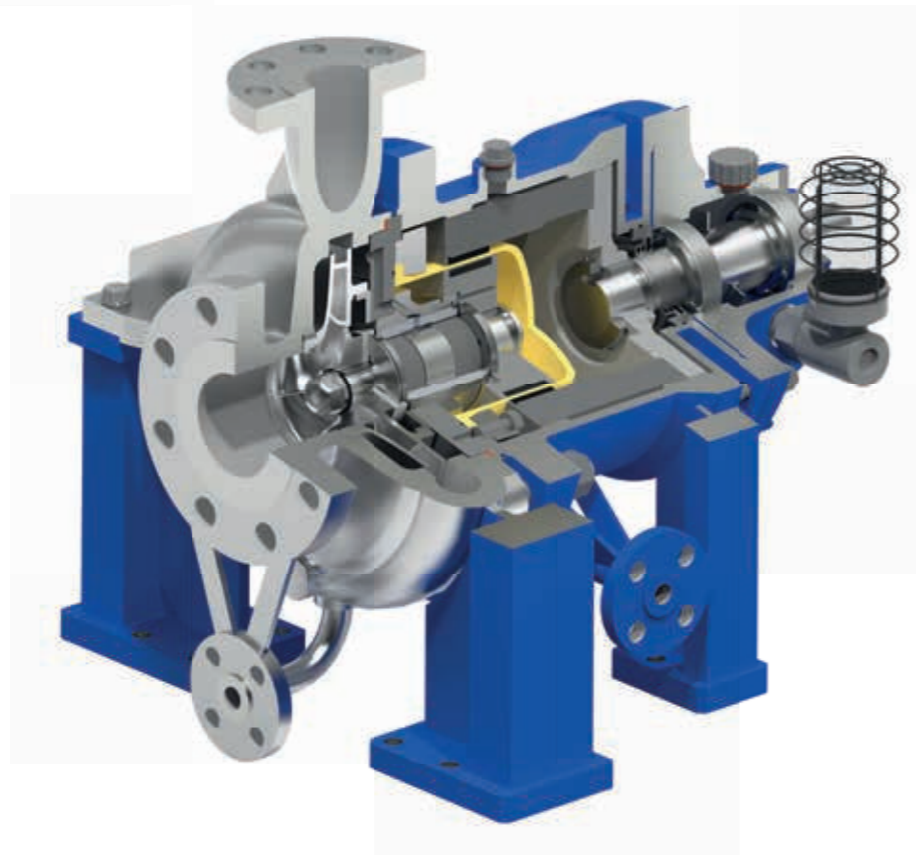
### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Heat transfer liquids
- ▶ Coolants
- ▶ Liquid gases
- ▶ Aggressive, explosive, toxic and malodorous liquids
- ▶ Valuable liquids
- ▶ Liquids containing solids
- ▶ And many more

# SINGLE STAGE CENTRIFUGAL PUMP WITH MAGNET DRIVE

## SERIES SLM AP

ACC. API 685 2<sup>ND</sup> ED.



### MAX. FLOW RATE:

**3.500 M<sup>3</sup>/H**

15,410 USGPM

### MAX. DELIVERY HEAD:

**220 M L.C.**

722 FT

### TEMPERATURE RANGE:

**-120 °C to +450 °C**

-184 °F to +842 °F

### MAX. PRESSURE RATING:

**PN 400**

5,802 PSI

### DESIGN

- ▶ Horizontal centrifugal pump, process design
- ▶ Hydraulic performance and dimensions with reference to ASME B73.3-2015
- ▶ Technical design according to API 685 2<sup>nd</sup> Ed.
- ▶ Flanges according to ANSI/ASME B16.5, class 150 (PN 20), class 300 (PN 50)
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with oil-lubricated anti-friction bearings
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Close-coupled design (SLM APC)
- ▶ Centerline mounting OH2 (required as per API standard from 175°C)
- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Bearing bracket with greased-for-life anti-friction bearings
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit
- ▶ Semi Submerged Design
- ▶ Vertical dry mounted arrangement

### PUMPING OF

- ▶ Hydrocarbons
- ▶ Liquid gases
- ▶ Aggressive, explosive, toxic and malodorous liquids
- ▶ Valuable liquids
- ▶ Heat transfer liquids
- ▶ Coolants
- ▶ Acids
- ▶ Lyes
- ▶ And many more

# VERTICAL INLINE CENTRIFUGAL PUMP WITH MAGNET DRIVE

## SERIES SLM NVBI

ACC. DIN EN ISO 2858 / 15783

## SERIES SLM AVBI

ACC. ASME B73.3-2015

## SERIES SLM APCI

ACC. API 685 2<sup>ND</sup> ED.



DIN EN ISO  
ASME  
API



MAX. FLOW RATE:

900 M<sup>3</sup>/H

3,963 USGPM

TEMPERATURE RANGE:

-120 °C to +350 °C

-184 °F to +662 °F

MAX. DELIVERY HEAD:

220 M L.C.

722 FT

MAX. PRESSURE RATING:

PN 40

580 PSI

### DESIGN

- ▶ Vertical inline centrifugal pump, close-coupled design (OH3 CC)
- ▶ Hydraulic performance and dimensions following DIN EN ISO 2858 & 15783 / ASME B73.3-2015 / API 685 2<sup>nd</sup> Edition
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit

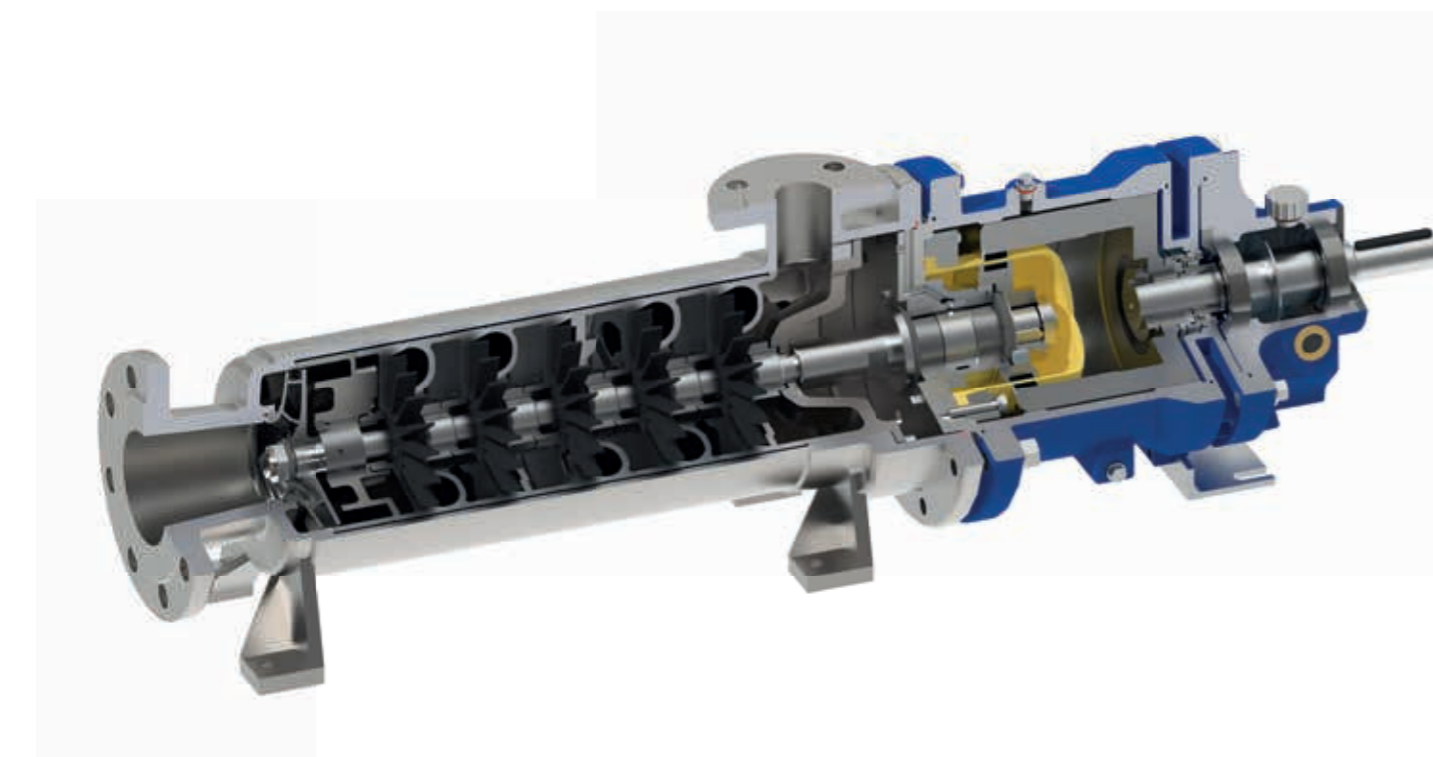
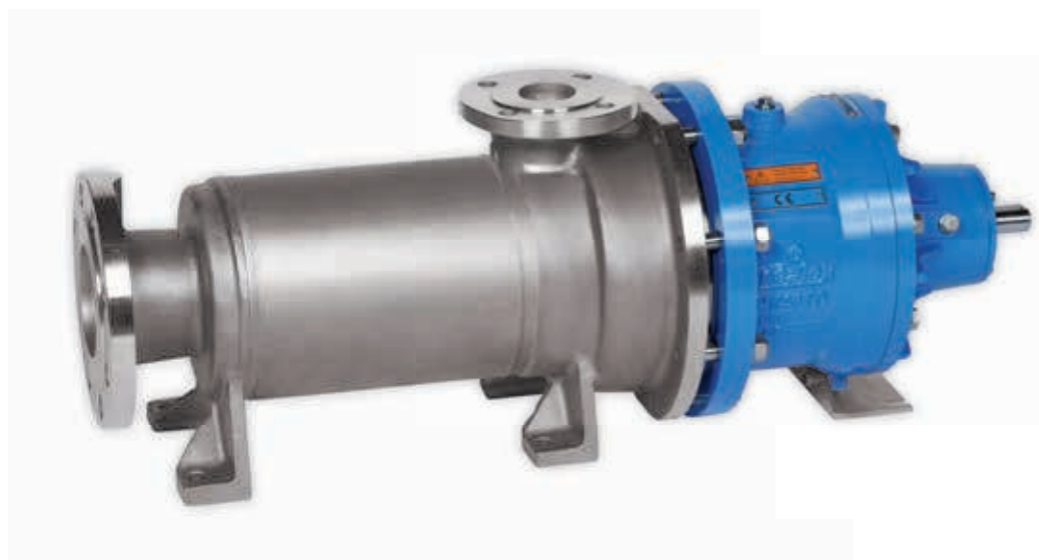
### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Heat transfer liquids
- ▶ Coolants
- ▶ Liquid petroleum gases
- ▶ Aggressive, explosive, toxic and malodorous liquids
- ▶ Valuable liquids
- ▶ Liquids containing solids
- ▶ And many more

# MULTI-STAGE SIDE CHANNEL PUMP WITH MAGNET DRIVE

## SERIES SLM SV

ACC. DIN EN ISO 15783



## DIN EN ISO



### MAX. FLOW RATE:

42 M<sup>3</sup>/H

185 USGPM

### TEMPERATURE RANGE:

-120 °C to +250 °C

-184 °F to +482 °F

### MAX. DELIVERY HEAD:

470 M L.C.

1,542 FT

### MAX. PRESSURE RATING:

PN 400

5,802 PSI

### DESIGN

- ▶ Horizontal side channel pump, process design
- ▶ Magnet drive based on DIN EN ISO 15783
- ▶ Maximum number of stages: 8
- ▶ Vanes made of duplex, with DLC coating
- ▶ Self-priming
- ▶ Barrel housing design with just two static gaskets
- ▶ Gas handling
- ▶ First low-NPSH stage for improved suction performance
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials
- ▶ Bearing bracket with anti-friction bearings, oil-lubricated or greased-for-life
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Close-coupled design (SLM SVB)
- ▶ Centerline mounting OH2
- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit

### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Solvents
- ▶ Liquid gases
- ▶ Refrigerants
- ▶ And many more

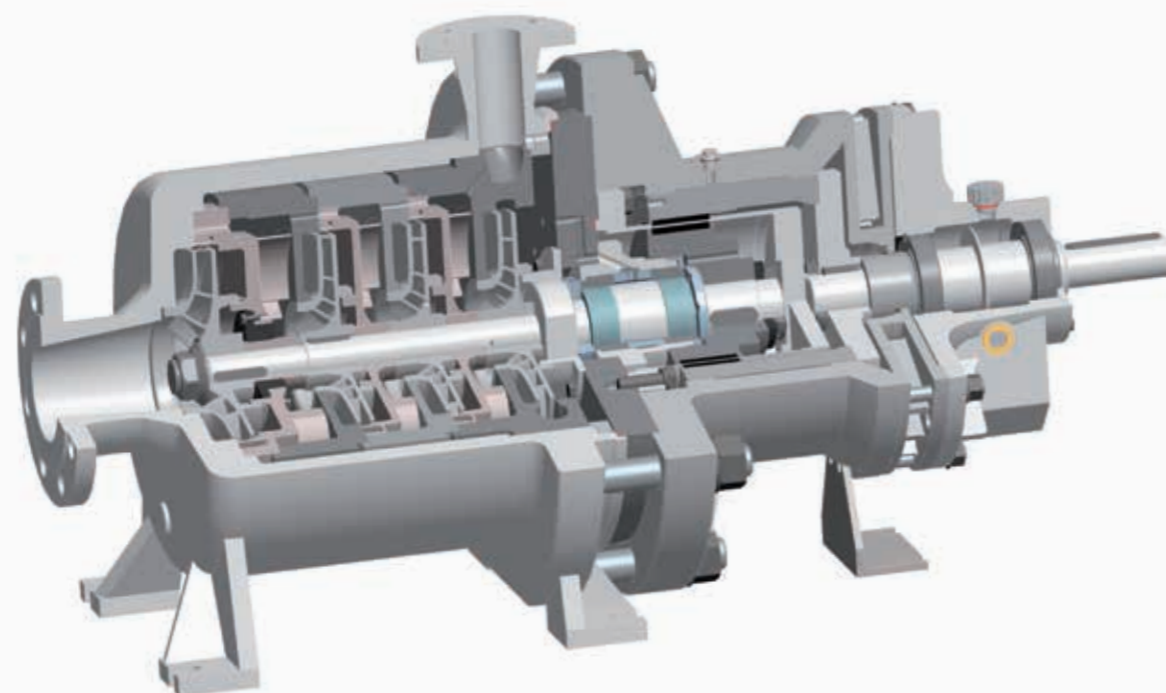
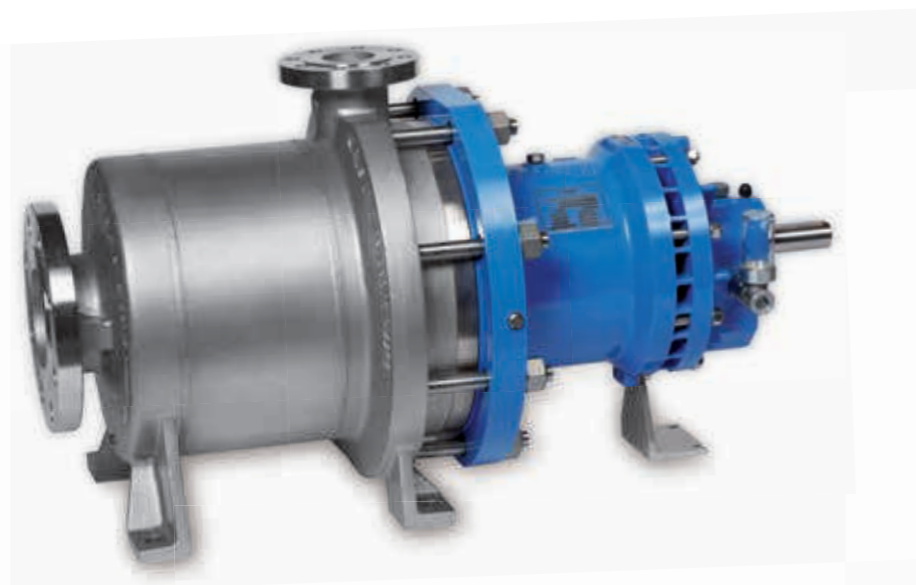
# MULTI-STAGE CENTRIFUGAL PUMP WITH MAGNET DRIVE

SERIES SLM GV / GVxT

ACC. DIN EN ISO 15783

SERIES SLM APG

ACC. API 685 2<sup>ND</sup> ED.



## DIN EN ISO API



MAX. FLOW RATE:

**300 M<sup>3</sup>/H**

1,321 USGPM

TEMPERATURE RANGE:

**-120 °C to +350 °C**

-184 °F to +662 °F

MAX. DELIVERY HEAD:

**2.200 M L.C.**

7,218 FT

MAX. PRESSURE RATING:

**PN 250**

3,626 PSI

### DESIGN

- ▶ Horizontal centrifugal pump, process design
- ▶ Magnet drive based on DIN EN ISO 15783
- ▶ Maximum number of stages: 15
- ▶ First low-NPSH stage for improved suction performance
- ▶ Barrel housing (SLM GVxT / SLM APG) or ring-section design (SLM GV)
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with anti-friction bearings, oil-lubricated or greased-for-life
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Close-coupled design (SLM GVB)
- ▶ Centerline mounting OH2
- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit
- ▶ Semi Submerged Design

### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Hot water
- ▶ Heat transfer liquids
- ▶ Liquid gases
- ▶ Aggressive, explosive, toxic and malodorous liquids
- ▶ Valuable liquids
- ▶ And many more



# VERTICALLY SUSPENDED (SUMP) PUMP WITH MAGNET DRIVE

## SERIES SLM NVT

ACC. DIN EN ISO 2858 / 15783

## SERIES SLM AVT

ACC. ASME B73.3-2015

## SERIES SLM APT

ACC. API 685 2<sup>ND</sup> ED.

SINGLE- &  
MULTI-STAGE  
DESIGN

DIN EN ISO  
ASME  
API

MAX. FLOW RATE:

900 M<sup>3</sup>/H

3,963 USGPM

TEMPERATURE RANGE:

-40 °C to +200 °C

-40 °F to +392 °F

MAX. DELIVERY HEAD:

200 M L.C.

656 FT

MAX. PRESSURE RATING:

PN 40

580 PSI

### DESIGN

- ▶ Vertically suspended (sump) pump
- ▶ Single-stage / multi-stage
- ▶ Submerging Depth: max. 6.000 mm
- ▶ Hydraulic performance and dimensions according to DIN EN ISO 2858 / ASME B73.3-2015 / API 685 2<sup>nd</sup> Ed.
- ▶ Design based on DIN EN ISO 15783
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses / lubrication of journal bearings)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with anti-friction bearings, oil-lubricated or greased-for-life
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials
- ▶ Rub zones as per standard for increased safety

### OPTIONS

- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Pull out-unit
- ▶ High viscosity optimized design
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit

### PUMPING OF

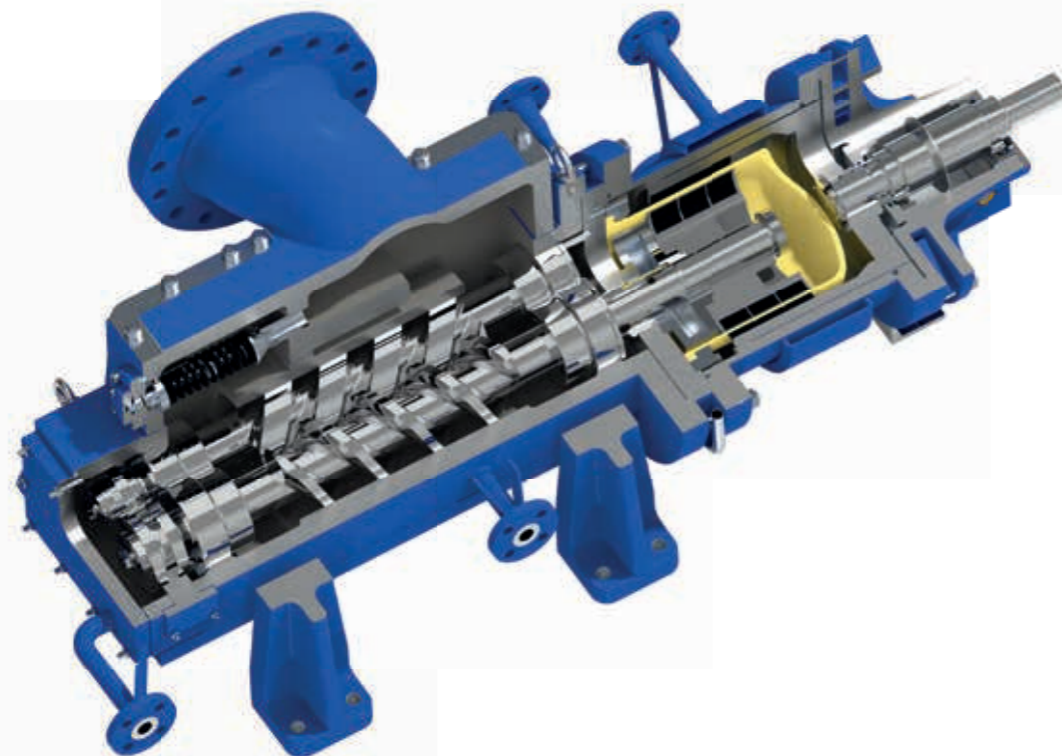
- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Heat transfer liquids
- ▶ Aggressive, explosive, toxic and malodorous liquids
- ▶ Valuable liquids
- ▶ Industrial effluent
- ▶ And many more



# SINGLE VOLUTE TWIN SCREW PUMP WITH MAGNET DRIVE

SERIES SLM DSP-2C

ACC. API 676 3<sup>RD</sup> ED.



## DIN EN ISO API



MAX. FLOW RATE:

**1.800 M<sup>3</sup>/H**

7,925 USGPM

TEMPERATURE RANGE:

**-120 °C to +350 °C**

-184 °F to +662 °F

MAX. DIFFERENTIAL PRESSURE:

**40 BAR**

580 PSI

MAX. PRESSURE RATING:

**PN 400**

5,802 PSI

### DESIGN

- ▶ Single volute twin screw pump, process or tank farm design
- ▶ Design based on API 676, 3<sup>rd</sup> Ed. and DIN EN ISO 14847
- ▶ Axial split modular casing (larger sizes with radial split casings)
- ▶ Permanent & synchronous magnet drive
  - Maintenance-free
  - Separation of liquid chamber and atmosphere by means of containment shell
- ▶ Pressurized partial flush flow (cooling of eddy current losses)
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with anti-friction bearings, oil-lubricated or greased-for-life
- ▶ Spare parts of magnetic coupling and bearing brackets are interchangeable with centrifugal pump series

### OPTIONS

- ▶ Close-coupled design (SLM DSP-2CB)
- ▶ Centerline mounting OH2
- ▶ Various containment shell executions (metallic / non-metallic, single / double shell)
- ▶ Energy efficient design
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Low & high viscosity optimized design
- ▶ Thermal barrier
- ▶ Various heating designs
- ▶ Secondary control / secondary control system / secondary containment system acc. API 685 2<sup>nd</sup> Ed.
- ▶ Temperature protection system
- ▶ Back pull out-unit / cartridge unit
- ▶ Differential pressure limiting valve using Klaus Union Valve Series Internals
- ▶ Magnet drive acc. API 685 2<sup>nd</sup> Ed.
- ▶ Retrofit
- ▶ Semi Submerged Design (SLM DSP-2CT)
- ▶ Vertical dry mounted arrangement (SLM DSP-2CBI)

### PUMPING OF

- |                               |   |
|-------------------------------|---|
| ▶ Hydrocarbons                | ▶ Aggressive, explosive, toxic and malodorous liquids |
| ▶ Bitumen / asphalt           | ▶ Valuable liquids                                    |
| ▶ Tar                         | ▶ Liquids containing solids                           |
| ▶ Fuel oils (light and heavy) | ▶ Acids   |
| ▶ Polymers                    | ▶ Lyes  |
| ▶ High-viscosity liquids      | ▶ And many more                                       |

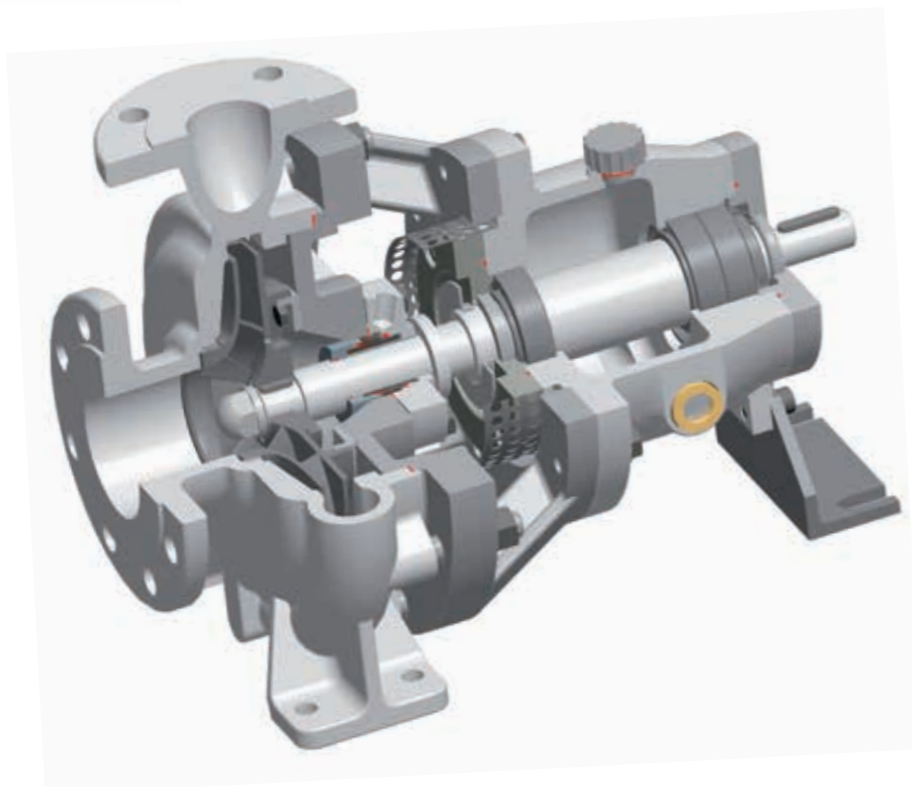
# SINGLE-STAGE CENTRIFUGAL PUMP WITH MECHANICAL SEAL

SERIES NOV

ACC. DIN EN ISO 2858

SERIES APL

ACC. API 610 12<sup>TH</sup> ED.



## DIN EN ISO API



MAX. FLOW RATE:

**3.500 M<sup>3</sup>/H**

15,410 USGPM

TEMPERATURE RANGE:

**-120 °C to +450 °C**

-184 °F to +842 °F

MAX. DELIVERY HEAD:

**220 M L.C.**

722 FT

MAX. PRESSURE RATING:

**PN 400**

5,802 PSI

### DESIGN

- ▶ Horizontal centrifugal pump, process design
- ▶ Hydraulic performance and dimensions according to DIN EN ISO 2858 / API 610 12<sup>th</sup> Ed.
- ▶ Design according to DIN EN ISO 5199
- ▶ Shaft sealing space for installation of mechanical seals according to DIN EN 12756 / API 682 4<sup>th</sup> Ed. or stuffing box packings
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with oil-lubricated anti-friction bearings

### OPTIONS

- ▶ Centerline mounting
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Back pull out-unit
- ▶ Retrofit
- ▶ Semi submerged design

### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Heat transfer liquids
- ▶ Coolants
- ▶ Liquid gases
- ▶ Sewage
- ▶ Colouring matters
- ▶ Salt solutions
- ▶ Pulp
- ▶ And many more

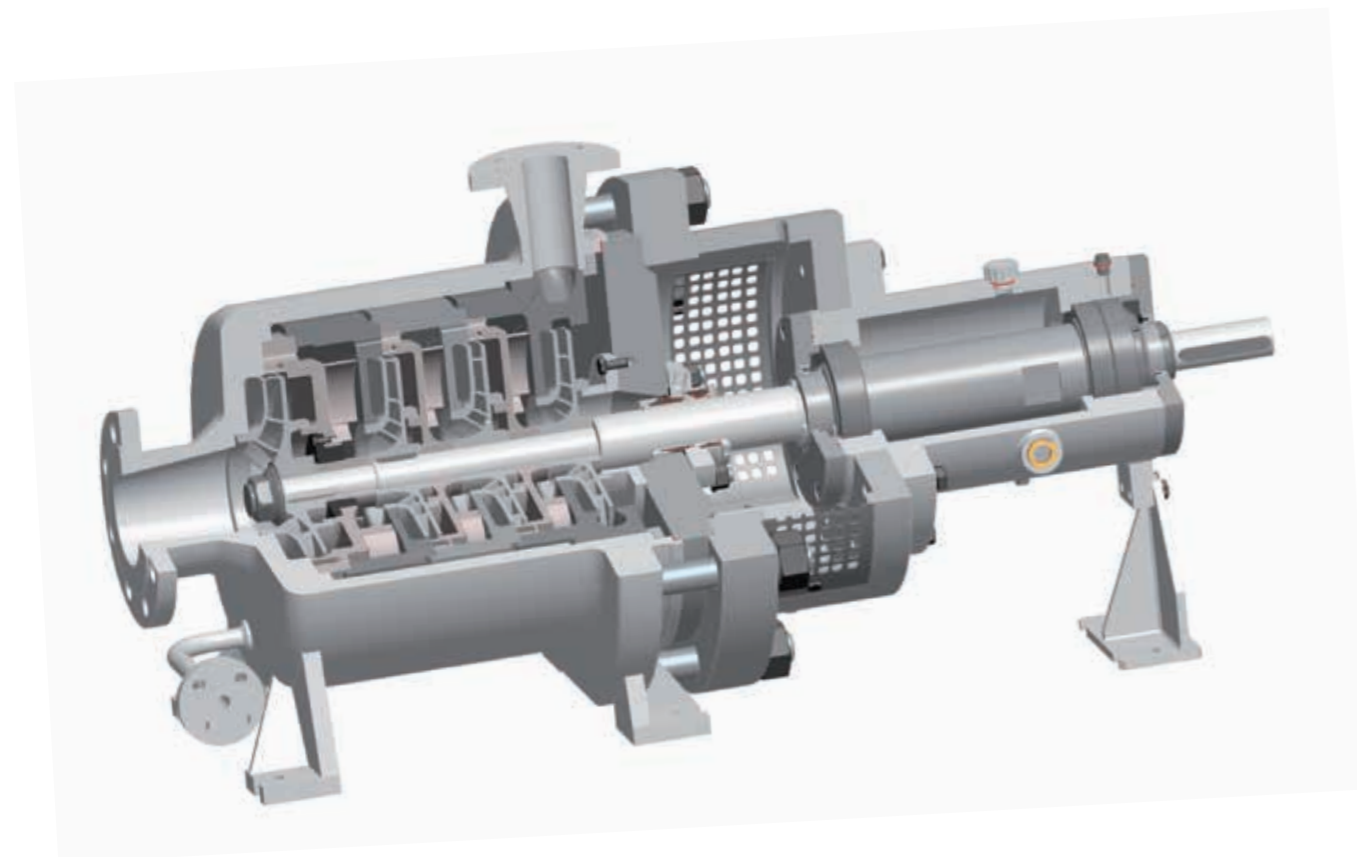
# MULTI-STAGE CENTRIFUGAL PUMP WITH MECHANICAL SEAL

## SERIES GOV / GOVT

ACC. DIN EN ISO 5199

## SERIES APG

ACC. API 610 12<sup>TH</sup> ED. &  
ISO 13709 2010



# DIN EN ISO API

MAX. FLOW RATE:

**300 M<sup>3</sup>/H**

1,321 USGPM

TEMPERATURE RANGE:

**-120 °C to +350 °C**

-184 °F to +662 °F

MAX. DELIVERY HEAD:

**2.200 M L.C.**

7,218 FT

MAX. PRESSURE RATING:

**PN 250**

3,626 PSI

### DESIGN

- ▶ Horizontal centrifugal pump, process design
- ▶ Technical design based on DIN EN ISO 5199 or acc. API 610 12<sup>th</sup> Ed. & ISO 13709 2010
- ▶ Impeller arrangement in series, maximum number of stages: 15
- ▶ Barrel housing (GOVT / APG) or ring-section design (GOV)
- ▶ First low-NPSH stage for improved suction performance
- ▶ Shaft sealing space for installation of mechanical seals according to DIN EN 12756 / API 682 4<sup>th</sup> Ed. or stuffing box packings
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with oil-lubricated anti-friction bearings

### OPTIONS

- ▶ Centerline mounting
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Back pull out-unit
- ▶ Retrofit
- ▶ Semi submerged design

### PUMPING OF

- ▶ Liquid gases
- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Hot water
- ▶ Heat transfer liquids
- ▶ And many more

# VERTICALLY SUSPENDED (SUMP) PUMP WITH MECHANICAL SEAL

## SERIES TP NO

ACC. DIN EN ISO 2858 / 5199

## SERIES APT

ACC. API 610 12<sup>TH</sup> ED. &  
ISO 13709 2010

SINGLE- &  
MULTI-STAGE  
DESIGN



# DIN EN ISO API



MAX. FLOW RATE:

1.600 M<sup>3</sup>/H

7,045 USGPM

TEMPERATURE RANGE:

-50 °C to +250 °C

-58 °F to +482 °F

MAX. DELIVERY HEAD:

200 M L.C.

656 FT

MAX. PRESSURE RATING:

PN 40

580 PSI

### DESIGN

- ▶ Vertically suspended (sump) pump
- ▶ Single-stage / multi-stage
- ▶ Submerging depth: max. 6.000 mm
- ▶ Hydraulic performance according to DIN EN ISO 2858
- ▶ Design based on DIN EN ISO 5199 or acc. API 610 12<sup>th</sup> Ed. & ISO 13709 2010
- ▶ Shaft sealing space for installation of mechanical seals according to DIN EN 12756 / API 682 4<sup>th</sup> Ed. or stuffing box packings
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Product-lubricated journal bearings; made of silicon carbide (SSiC) or customized materials

### OPTIONS

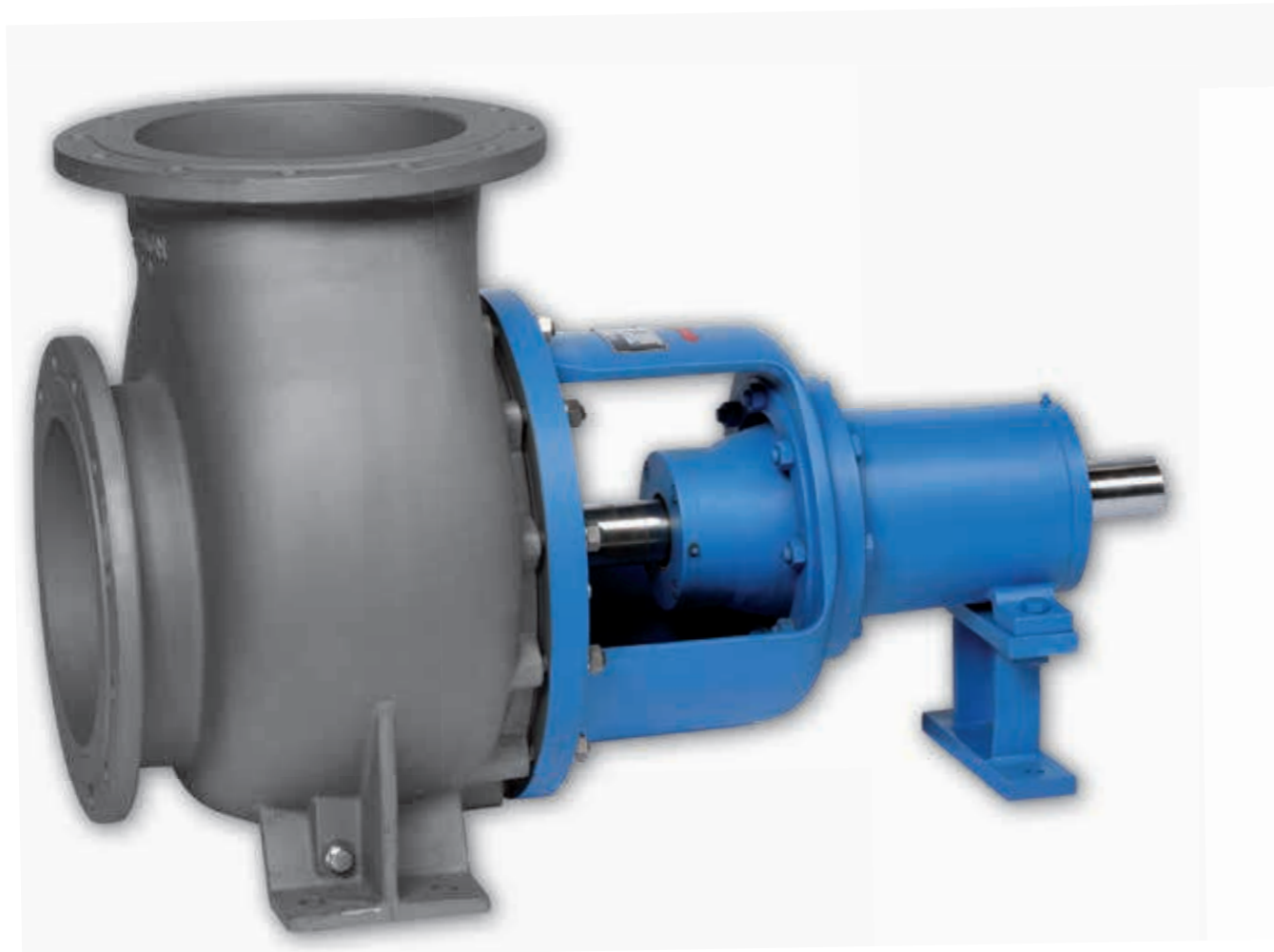
- ▶ Multi-stage design (TP G0)
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Open impeller
- ▶ Various heating designs
- ▶ Inducer to significantly improve pump's NPSH(R)
- ▶ Retrofit

### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Hydrocarbons
- ▶ Heat transfer liquids
- ▶ Liquid gases
- ▶ And many more

# HORIZONTAL AXIAL FLOW PROPELLER PUMP WITH MECHANICAL SEAL

SERIES P



## DIN EN ISO

MAX. FLOW RATE:

**12.000 M<sup>3</sup>/H**

52,835 USGPM

MAX. DELIVERY HEAD:

**12 M L.C.**

39 FT

TEMPERATURE RANGE:

**-120 °C to +250 °C**

-184 °F to +482 °F

MAX. PRESSURE RATING:

**PN 100**

1,450 PSI

### DESIGN

- ▶ Horizontal axial flow pump
- ▶ Pump casing in cast or welded construction
- ▶ Shaft sealing space for installation of mechanical seals according to DIN EN 12756 or stuffing box packings
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with oil- or grease-lubricated anti-friction bearings
- ▶ Pumping direction freely selectable
- ▶ Modification of performance possible by means of adjusting propeller blades

### OPTIONS

- ▶ Special execution with magnet drive
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Various heating designs
- ▶ Shaft sealing space for installation of mechanical seals according to API 682 4<sup>th</sup> Ed.
- ▶ Back pull out-unit
- ▶ Retrofit
- ▶ Semi submerged design

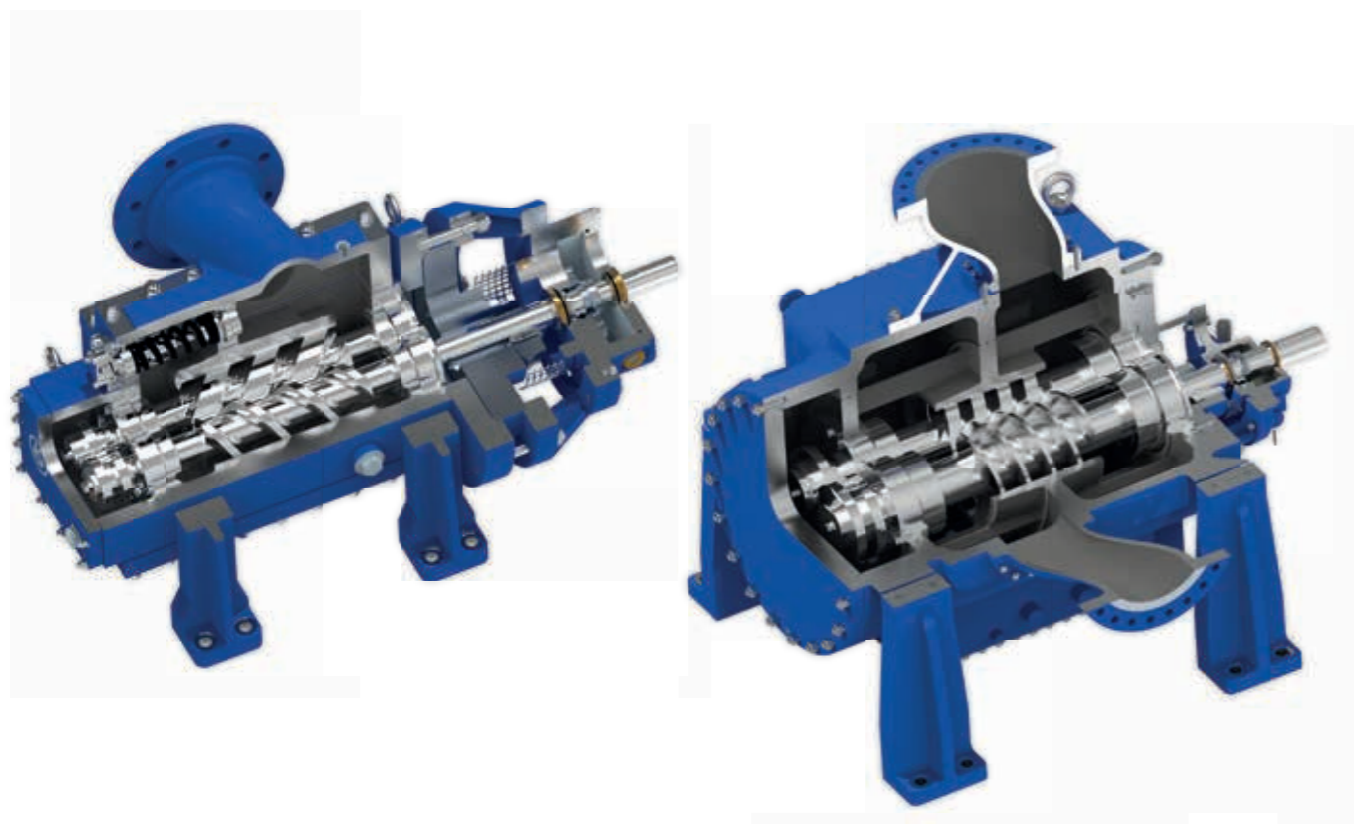
### PUMPING OF

- ▶ Acids
- ▶ Lyes
- ▶ Paper and cellulose mash
- ▶ Brine (evaporation plants)
- ▶ Mineral fertilisers (liquid)
- ▶ Sea water
- ▶ Cooling water
- ▶ Dyes
- ▶ And many more

# SINGLE VOLUTE TWIN SCREW PUMP WITH MECHANICAL SEAL

## SERIES DSP-2C

ACC. API 676 3<sup>RD</sup> ED.



# API



MAX. FLOW RATE:

1.800 M<sup>3</sup>/H

7,925 USGPM

TEMPERATURE RANGE:

-120 °C to +350 °C

-184 °F to +662 °F

MAX. DIFFERENTIAL PRESSURE:

40 BAR

580 PSI

MAX. PRESSURE RATING:

PN 400

5,802 PSI

### DESIGN

- ▶ Single volute twin screw pump, process or tank farm design
- ▶ Technical design based on API 676, 3<sup>rd</sup> Ed.
- ▶ Axial split modular casing (Larger sizes with radial split casings)
- ▶ Shaft sealing space for installation of mechanical seals according to API 682 4<sup>th</sup> Ed. or stuffing box packings
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Bearing bracket with oil-lubricated or greased-for-life anti-friction bearings

### OPTIONS

- ▶ Other shaft sealing possibilities such as lip seals or stuffing box packings
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Low & high viscosity optimized design
- ▶ Various heating designs
- ▶ Back pull out-unit / cartridge unit
- ▶ Differential pressure limiting valve Klaus Union valve Series internals
- ▶ Retrofit
- ▶ Semi submerged design (DSP-2CT)

### PUMPING OF

- |                               |   |
|-------------------------------|---|
| ▶ Hydrocarbons                | ▶ Aggressive, explosive, toxic and malodorous liquids |
| ▶ Bitumen / asphalt           | ▶ Valuable liquids                                    |
| ▶ Tar                         | ▶ Liquids containing solids                           |
| ▶ Fuel oils (light and heavy) | ▶ Acids   |
| ▶ Polymers                    | ▶ Lyes  |
| ▶ High-viscosity liquids      | ▶ And many more                                       |

# DOUBLE VOLUTE TWIN SCREW PUMP WITH MECHANICAL SEAL

SERIES DSP-4U / 4C

ACC. API 676 3<sup>RD</sup> ED.



MAX. FLOW RATE:

**5.000 M<sup>3</sup>/H**

22,000 USGPM

TEMPERATURE RANGE:

**-120 °C to +350 °C**

-184 °F to +662 °F

MAX. DIFFERENTIAL PRESSURE:

**100 BAR**

1,450 PSI

MAX. PRESSURE RATING:

**PN 150**

2,176PSI

## DESIGN

- ▶ Horizontal, double volute twin screw pump
- ▶ Drive torque transfer by timing gear located outside of pumping chamber
- ▶ Materials: steel, stainless steel, duplex steel, nickel-based materials, titanium
- ▶ Rotors manufactured from single piece bar stock
- ▶ Bearings located outside of pumping chamber
- ▶ Inline or side in / top out
- ▶ Improved NPSH / NPIP
- ▶ Casted design

## OPTIONS

- ▶ Centerline mounting
- ▶ Various design options when pumping critical liquids (e.g. liquids containing solids)
- ▶ Various heating designs
- ▶ Cartridge unit (DSP-4C)
- ▶ Differential pressure limiting valve
- ▶ Retrofit

## PUMPING OF

- ▶ Viscous liquids containing considerable amount of solids
- ▶ Lube, crude or fuel oils
- ▶ Bitumen
- ▶ Tar
- ▶ Asphalt
- ▶ Fats
- ▶ Resins
- ▶ Residues
- ▶ Multiphase products containing liquids, gas and solids
- ▶ And many more



# CUSTOM MATERIALS OF CONSTRUCTION

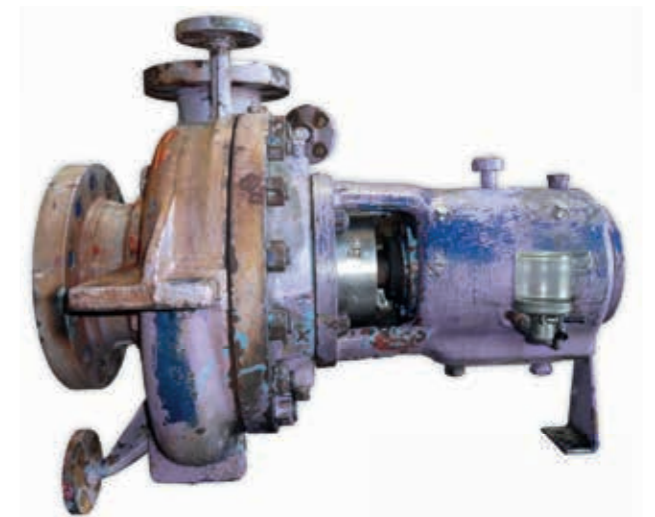
Steel			
Castings DIN/EN	[AISI / ASTM]	Rolled Material DIN/EN	[AISI / ASTM]
1.0619 / GP240GH	[A216 WCB]	1.0038 / S235JR	[A283M]
1.6220 / G20Mn5	[A352]	1.0460 / P250GH	[A105]
		1.7225 / 42CrMo4	[A331, A505, A519, A646]
		1.7227 / 42CrMoS4	[A331, A505, A519, A646]
		1.8550 / 34CrAlNi7-10	[A355-89]
Stainless Steel			
Castings DIN/EN	[AISI / ASTM]	Rolled Material DIN/EN	[AISI / ASTM]
1.4308 / GX5CrNi 19-10	[304L]	1.4122 / X39CrMo 17-1	[-]
1.4408 / GX5CrNiMo 19-11-2	[A351 CF8M]	1.4404 / X2CrNiMo 17-12-2	[316L]
1.4409 / GX2CrNiMo19-11-2	[CF3M]	1.4462 / X2CrNiMoN 22-5-3	[S31803]
1.4470 / GX2CrNiMoN 22-5-3	[UNS J92205]	1.4541 / X6CrNiTi 18-10	[SS321]
		1.4571 / X6CrNiMoTi 17-12-2	[316Ti]
Nickel-Based Materials			
Castings DIN/EN	[AISI / ASTM]	Rolled Material DIN/EN	[AISI / ASTM]
9.4170 / G-Ni95	[CZ100]	1.4539 / X1NiCrMoCu 25 20 5	[904L]
9.4365 / G-NiCu30Nb	[A494 M35-1]	2.4068 / Ni99	[N02201]
9.4539 / GX2NiCrMoCu25-20-5	[A743 CN3M]	2.4360 / NiCu30Fe	[N04400]
9.4600 / G-NiMo29Cr	[N3M, N7M]	2.4600 / NiMo29Cr	[B564, B335]
9.4610 / G-NiMo16Cr16	[CW2M]	2.4610 / NiMo16Cr16Ti	[N06455]
9.4660 / GX1NiCrMoCuN35-20	[A743 CN7M]	2.4660 / NiCr20CuMo	[B473, N08020]
Titanium			
Castings DIN/EN	[AISI / ASTM]	Rolled Material DIN/EN	[AISI / ASTM]
3.7031 / G-Ti2 (Ti Grade 2)	[-]	3.7035 / Ti2	[B348, B338, B861, B265]
3.7032 G-Ti2Pd (TiPd Grade 7)	[-]	3.7165 / Ti6Al4V	[B348, B265]

Further materials upon request

## Klaus Union RETROFIT

### RETROFIT OF CENTRIFUGAL PUMPS W/O NECESSARY MODIFICATION

- ▶ Record & evaluation of existing pump parameters & dimensions
- ▶ 3D-laserscan for precise pump & installation measurements
- ▶ Entire pump engineering within the boundaries of an existing installation
- ▶ Conversion of old pumps to latest state-of-the-art high efficient pumps
- ▶ Certification of pump compliance acc. to Machinery Directive 2006/42/EG and ATEX 94/9/EG



### USER ADVANTAGES

- ▶ Significant reduction of facility emissions by employing enhanced sealing technologies
- ▶ Alteration of non-compliant pump systems into latest state-of-the-art installations and conformity to the relevant and current EU-directives (Machinery and ATEX)
- ▶ Updated pump installations to most recent standards
- ▶ No change of existing piping, baseplates or drives
- ▶ Reduction of OPEX due to significant energy savings through the use of highly efficient hydraulics
- ▶ Considerable increase of MTBF

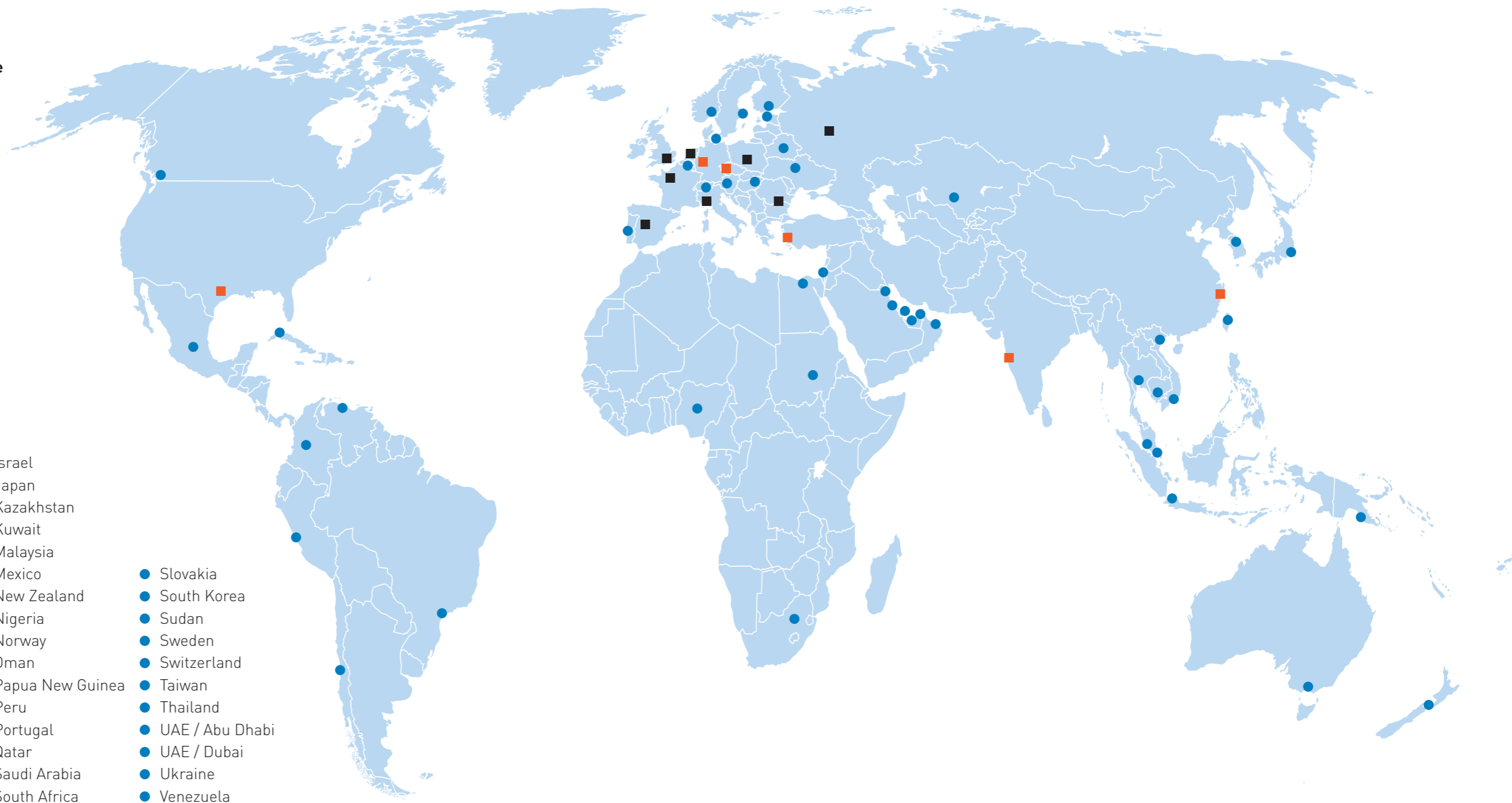
# KLAUS UNION GLOBAL PRESENCE



- Klaus Union Center of Competence
- Klaus Union Subsidiary
- Klaus Union Sales Office

- Germany/ Bochum
- China/ Ningbo
- Czech Republic/ Krnov
- India/ Pune
- Turkey/ Izmir
- USA/ Houston
- England
- France
- Italy
- The Netherlands
- Poland
- Romania
- Russia
- Spain

- Australia
- Austria
- Belarus
- Belgium
- Brazil
- Cambodia
- Canada
- Chile
- Colombia
- Cuba
- Denmark
- Egypt
- Estonia
- Finland
- Hungary
- Indonesia
- Iraq
- Israel
- Japan
- Kazakhstan
- Kuwait
- Malaysia
- Mexico
- New Zealand
- Nigeria
- Norway
- Oman
- Papua New Guinea
- Peru
- Portugal
- Qatar
- Saudi Arabia
- South Africa
- Singapore
- Slovakia
- South Korea
- Sudan
- Sweden
- Switzerland
- Taiwan
- Thailand
- UAE / Abu Dhabi
- UAE / Dubai
- Ukraine
- Venezuela
- Vietnam



# KLAUS UNION SERVICE

## KLAUS UNION WORLDWIDE SERVICE

Following our service philosophy „your worldwide partner“, Klaus Union works with subsidiaries, approved representatives and service partners worldwide.

Since the founding of Klaus Union Service GmbH in 2006 our efforts focus on providing service and support for our customers quickly and comprehensively. As an independent service company with exceptionally strong customer focus, we provide full service, using state of the art technologies and experience. Klaus Union Service draws on 75 years of process engineering with pumps, valves and agitator drives.

We provide service and planning advice, clearly arranged documentation and other required services, including the delivery of spare parts on short lead times.

Our individual service and maintenance contracts provide safety and certainty with your specific needs and location in mind. Through our worldwide network of partners we have highly trained maintenance staff worldwide along with fully equipped workshops to provide service, training and onsite services.

Quality is at the centre of all we do. Quality assurance measures certified to international standards are implemented across our company and sub suppliers providing the best product and service possible.



Worldwide  
Close to the  
Customer



## OUR RANGE OF SERVICES

We will analyse your technical problem and provide a technically inspired solution to solve the issue and get you back in service. Areas that we can look at is equipment reliability and availability, maintenance planning, risk management, equipment upgrades and other operational reviews.

We work with our customers by engaging with all stakeholders to provide the best solutions that benefit your business.

As part of the Klaus Union family Klaus Union Service GmbH has access to all Klaus Union knowledge and state of the art technology.

Providing expertise in logistics worldwide we are provide high availability and fast delivery of all key spare parts. We are always working on improving our systems to keep them best in class and provide you with fast service to keep your equipment online.

## SERVICE PERFORMANCE

- ▶ Workshop Repairs
- ▶ On-Site Repairs
- ▶ Genuine Spare Part Delivery Worldwide
- ▶ Spare Parts Storage
- ▶ Customized Spare Parts Management
- ▶ On-Site Maintenance
- ▶ Installation
- ▶ Retrofitting
- ▶ On-Site Testing
- ▶ Customer Advisory Service
- ▶ Laser Alignment
- ▶ Start Up & Commissioning
- ▶ Individual 24/7-Service
- ▶ Trouble-Shooting
- ▶ In-House & On-Site Training
- ▶ On-Site Assembly and Disassembly
- ▶ Long-Term Maintenance Contracts
- ▶ On-Site Monitoring
- ▶ Maintenance Planning and Consulting
- ▶ Diagnostics

# KLAUS UNION SERVICE

## TESTING FACILITIES

In our modern testing facility, pumps are tested up to DN 1200. Testing of the repaired pumps with appropriate test reports gives you optimum plant safety and availability.

- ▶ Testing range:
  - Q = 0.1 m<sup>3</sup>/h up to 5.000 m<sup>3</sup>/h
  - H = 2 m L.C. up to 1.000 m L.C.
  - ΔP = up to 100 bar
  - Motor power: up to 1.800 kW
  - n = up to max. 3.500 rpm
- ▶ NPSH-measurements
- ▶ Axial thrust measurements
- ▶ Vibration measurements
- ▶ Noise measurements
- ▶ Test run according to HI 14.6 / DIN EN ISO 9906 and API 685 2<sup>nd</sup> Edition.

## COMMISSIONING

Klaus Union Service GmbH accompanies you from the offer complying with the specifications, via the commissioning of complete plants, to the assurance of plant availability with scheduled maintenance intervals and process optimisation.



## WORKSHOP REPAIRS

Klaus Union Service uses state of the art manufacturing machinery for the production and repair of pumps and valves. The following different types of welding processes can be carried out:

- ▶ TIG
- ▶ MIG/MAG
- ▶ E
- ▶ Plasma

Plant-specific modifications and changes of pumps are accompanied, executed and documented by the design department of Klaus Union.



Worldwide  
Close to the  
Customer



## HOW TO FIND US ...

Klaus Union Service GmbH & Co. KG  
Blumenfeldstr. 18      P.O. Box 10 13 49  
44795 Bochum      44713 Bochum  
Germany      Germany

Phone +49 (0) 234 45 95-0  
Fax +49 (0) 234 45 95 7016

E-Mail [service@klaus-union.com](mailto:service@klaus-union.com)  
Service Helpdesk +49 700 55 28 77 37



## Product Range Pumps:

### Magnet Drive Pumps

- ▶ Centrifugal Pumps according to DIN EN ISO 2858 & DIN EN ISO 15783
- ▶ Centrifugal Pumps according to ASME B73.3-2015
- ▶ Centrifugal Pumps according to API 685 2<sup>nd</sup> Edition
- ▶ Multi-Stage Centrifugal Pumps (Barrel-Type Design available)
- ▶ Side Channel Pumps following DIN EN ISO 15783
- ▶ Twin Screw Pumps, Single Volute, according to API 676 3<sup>rd</sup> Edition
- ▶ Pumps in Close-Coupled Design
- ▶ Pumps for High Pressure Applications
- ▶ Pumps for High Temperature Applications
- ▶ Self-Priming Pumps
- ▶ Vertically Suspended (Sump) Pumps, Single- / Multi-Stage and Twin Screw Design
- ▶ Vertical Inline Pumps

### Mechanically Sealed Pumps

- ▶ Centrifugal Pumps according to DIN EN ISO 2858 & DIN EN ISO 5199
- ▶ Centrifugal Pumps following API 610 12<sup>th</sup> Edition & ISO 13709 2010
- ▶ Multi-Stage Centrifugal Pumps (Barrel-Type Design available)
- ▶ Propeller Pumps, Horizontal / Vertical / Bottom-Flange
- ▶ Side Channel Pumps
- ▶ Twin Screw Pumps, Single / Double Volute, according to API 676 3<sup>rd</sup> Edition
- ▶ Pumps for High Pressure Applications
- ▶ Pumps for High Temperature Applications
- ▶ Self-Priming Pumps
- ▶ Vertically Suspended (Sump) Pumps, Single- / Multi-Stage and Twin Screw Design
- ▶ Vertical Inline Pumps

## Product Range Valves:

- ▶ Globe Valves, T-Pattern
- ▶ Globe Valves, Y-Pattern
- ▶ Control Valves
- ▶ Gate Valves, Isomorphous Construction Series
- ▶ Gate Valves, Wedge or Wedge Plates
- ▶ Check Valves
- ▶ Butterfly Valves, Metal Seated
- ▶ Control Butterfly Valves, Metal Seated

## Klaus Union Service Performance:

- ▶ Workshop / On-Site Repairs
- ▶ Genuine Spare Part Delivery Worldwide
- ▶ Spare Parts Storage
- ▶ Customized Spare Parts Management
- ▶ On-Site Maintenance
- ▶ Installation
- ▶ Retrofitting
- ▶ On-Site Testing / Monitoring
- ▶ Customer Advisory Service
- ▶ Start Up & Commissioning
- ▶ Individual 24 / 7 Service
- ▶ Trouble-Shooting
- ▶ In-House & On-Site Training
- ▶ On-Site Assembly and Disassembly
- ▶ Long-Term Maintenance Contracts
- ▶ Maintenance Planning and Consulting
- ▶ Diagnostics

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[www.klaus-union.com](http://www.klaus-union.com)



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