

CHEMICAL

OIL & GAS

REFRIGERATION

POWER GENERATION

SERVICE



Convincing worldwide:
HERMETIC pumps
in the oil and gas industry

 **LEDERLE**
Hermetic

Simply the best pump technology

CLEAR SIGHT AND
RESPONSIBILITY



Constant processes are considered as a common main characteristic of the oil and gas industry. Refineries, petrochemical plants, the gas process industry and further applications require the highest availability and safety in your production plants.

The previous as well as future challenges are being increasingly characterized by a strong competition, fast changes of markets and the strong focusing of life-cycle costs.

Solutions that individually met your requirements are a contribution to improve your production and to convey valued liquids and to reduce arising operating costs.



Competence in the oil and gas industry.

There are various mineral oil products made of crude oil produced in refineries. The hydrocarbons consisting in the crude oil are separated, transferred, split and cleaned. The resulting products are re-fabricated in the petrochemical industry.

The petrochemical industry forms the link between the mineral oil and chemical industry. They process certain fractions of the crude oil distillation into petrochemical crude products which are converted into a great number of finished products.

The gas process industry, a worldwide expanding market segment in the energy sector, cleans the domestic gas or crude oil – accompanying gas (LNG and LPG, respectively) from undesirable impurities and afterwards, it is liquefied for further transport in tank ships. At every time, it is to ensure here that the process runs safe and reliable, no matter whether it is destined for transport, storage and subsequent treatment.

HERMETIC pumps provide solutions for special requirements.

Your production is based on:

high availability

environment protection and operational safety

cost-intensive research

high-grade engineering

various applications

Our solution:

We provide you with a reliable and nearly maintenance-free pump technology to safe and optimize various processes.

The leakage-free pump technology ensures a safe conveying of valuable and dangerous fluids.

As an experienced partner in optimizing and developing processes, we already integrate our know-how into the developing phase of the process.

Simple constructions allow safe operating methods and minimize the complexity. Thus, it can be reached more process safety.

We can put a wide range of pumps at your disposal for standardized applications as well as for customized processes.

INNOVATION AND
EXPERIENCE



*HERMETIC pumps are made fit to your process conditions and requirements. They became integrated into your system as a significant component of your production. The only thing that counts is: **Availability at maximum safety.***

The products of the company HERMETIC-Pumpen GmbH stand for best quality and maximum operational safety in the chemical and petrochemical industry, as well as in refrigeration and power generation.

HERMETIC engineers combine selected materials suitable for process and individual solutions to sophisticated units. Products are developed in partnership with our customers in a flexible construction and production process coming up to the special process requirements. Long service lives and low life-cycle costs are a main characteristic of HERMETIC products from the beginning.

An integral part of our developments are the requirements for explosion protection according to the directive 94/9/EC (ATEX).

The complete production line of HERMETIC-Pumpen GmbH is an essential contribution in observing the directive 96/61/EC, the so-called IPPC directive (Integrated Pollution Prevention and Control), respectively.

Further national laws such as the Federal Immission Control Act (BImSchG) and TA-Luft respectively, or international laws such as the VOC directive favor the use of hermetic pumps.

HERMETIC pumps are "**Best Available Technology**" when handling dangerous and harmful fluids, either with single or double mechanical seal, magnetic coupling or canned motor.

We offer a highest level of safety – also with extreme parameters.

HERMETIC pumps are designed for extreme conditions.

Thus, they always are used if conventional technologies come to their limit.

High system pressures, strong temperature fluctuations, most difficult pumping liquids – HERMETIC pumps won't be impressed by that. But they convince with impressive performance!

For others it is "extreme", for us it is standard

- corrosive and toxic fluids
- high and low temperatures
- explosive and flammable fluids
- abrasive slurries hot or cold
- polymer solutions with variable viscosity
- shear sensitive media

High potential risk originating from the medium to be conveyed

The liquid to be conveyed such as hydrocarbons (HC) and their compounds such as propane, butane, ethene/ethylene, propylene, aromatics to state only a few, represent a very high potential of risk and danger to human and the environment. It is to ensure that the pump is hermetically sealed.

Fluids to be conveyed at extreme temperatures

In different processes there are extremely deep or high temperatures rising to additional requirements in respect of safety and availability of the pumps.

HERMETIC pumps are in a position to convey liquids and vapors in the temperature ranges of $-160\text{ }^{\circ}\text{C}$ to $+480\text{ }^{\circ}\text{C}$.



HERMETIC PUMPS IN THE MINERAL OIL PROCESSING



Crude oil is not as crude oil. The numerous oil fields on earth provide different sorts of crude oil. They differ considerably from their nature and quality. However, one thing is the same: they mostly consist of chemically compound carbons and hydrocarbons.

At the beginning of every mineral oil processing the different groups of hydrocarbons are sorted. Further process units are necessary to transfer the different groups of hydrocarbons into the products which are needed by the market:

- The **Distillation** separates the hydrocarbons according to the size of the molecule (fractions).
- The **Desulfurization** helps to clean and improve the sulfur containing HC components.
- The **Cracking** splits larger hydrocarbon molecules originating from the distillation into smaller ones.
- The **Reformation** reconverts molecules of certain hydrocarbon groups that are produced in the distillation.

The following products can be conveyed by HERMETIC pumps in a refinery process

- Aromatics
- Naphtha
- Ethane, Butane, Propane
- Ethylene, Propylene
- Benzene, Xylole, Toluene
- Amine, Mercaptane
- Phosgene, Sulfur

HERMETIC pumps are an integral part of your process.

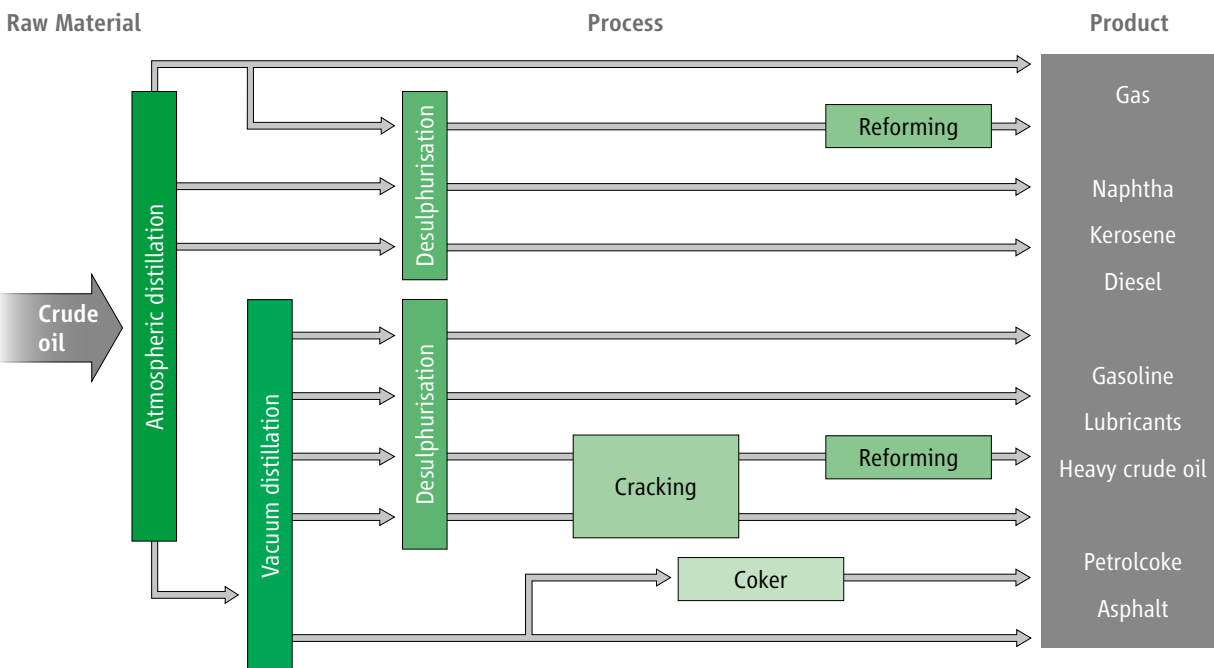
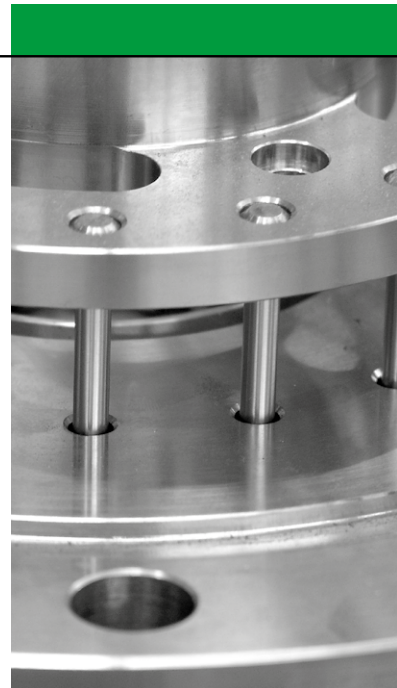


Diagram of the mineral oil processing (petroleum processing)



TECHNOLOGY
AT THE HIGHEST
STAGE

One critical item when using conventional centrifugal pumps is to seal the shaft passages on the pump casing. The high rate of repairs is a reason for the steadily increasing use of sealless pumps.

Centrifugal pumps in the refinery and petrochemical plants are generally used according to the requirements of the API 610.

Besides the pump hydraulics, these standardized pumps are equipped with a separate electric motor and a jointing coupling to transfer the turning moment from the motor to the pump shaft.

The shaft sealing is a central machinery element that is designed acc. to the requirements of the API 682. For the safe functioning of the shaft sealing, it is necessary to look for monitoring devices with very complex Lube-systems (for ex. acc. to plan B-52) beside the lubrication. Based on statistics, the shaft sealing and monitoring system were declared as a central element with pumps acc. to API 610, however, it was recognized as a "trouble maker" to the pump (and as a consequence, to the complete plant).

The reliability of the machines required in the production plants has resulted

in the enlargement of the API standard concerning the centrifugal pumps. By taking into consideration that the shaft sealless centrifugal pump (especially the canned motor pump) has already been used in different industries since decades as a rule, this pump was standardized consequentially in the new API 685 range (shaft sealless centrifugal pumps for refineries and the petrochemical industry).

The canned motor pump acc. to API 685 is equipped without accident-sensitive shaft sealing and without ball bearings which are liable to wear. Thus, it is possible to achieve a longer service life. A smaller amount of repairs with expensive spare parts means the considerable reduction of life-cycle costs.

As a consequence, the canned motor pump contributes considerably to the process cost optimization as well as to the compliance with international requirements for environmental protection.

Pump principle of canned motor pumps.

Functional principle of canned motor pumps

Canned motor pumps are characterized by a compact, integrated unit without mechanical seal. The motor and pump form a unit with the rotor and the impeller fitted onto a common shaft. The rotor is guided by two identical, medium-lubricated slide bearings. The stator on the drive motor is separated from the rotor space using a thin stator liner. The rotor cavity itself, along with the hydraulic section of the pump, creates a combined cavity which needs to be filled with pumping medium before commissioning. The heat loss from the motor is carried off by a partial flow between the rotor and the stator. At the same time, the partial flow lubricates both slide bearings in the rotor cavity.

Both, the can which is a hermetically sealed component, and the motor casing are used as a safety containment. Because of that, canned motor pumps always ensure a highest safety level when conveying dangerous, toxic, explosive and valuable media.

Diagram of a single-stage canned motor pump

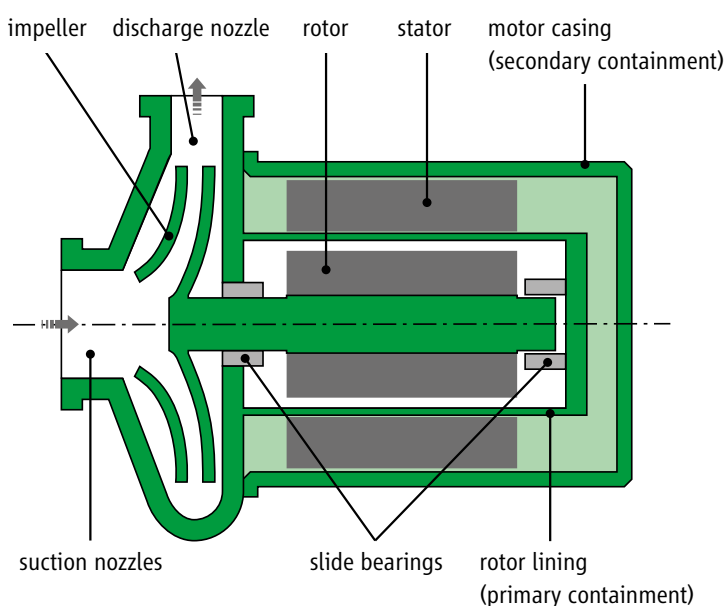
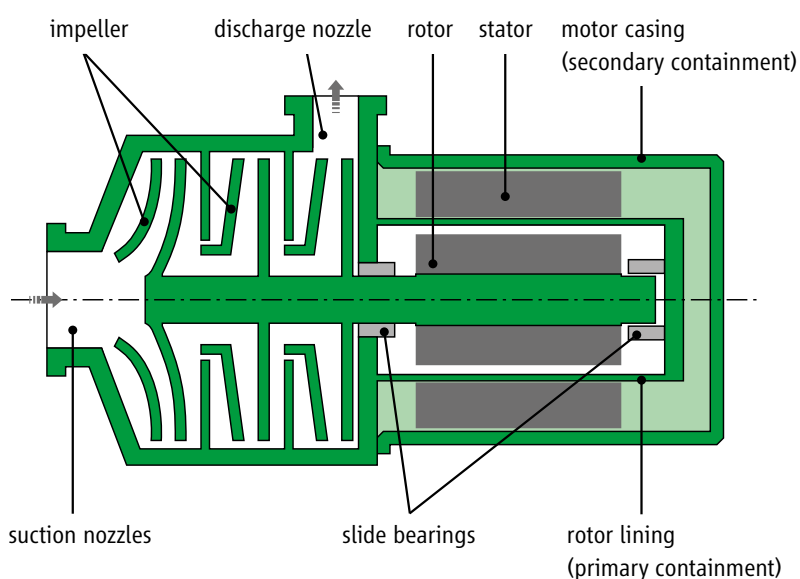


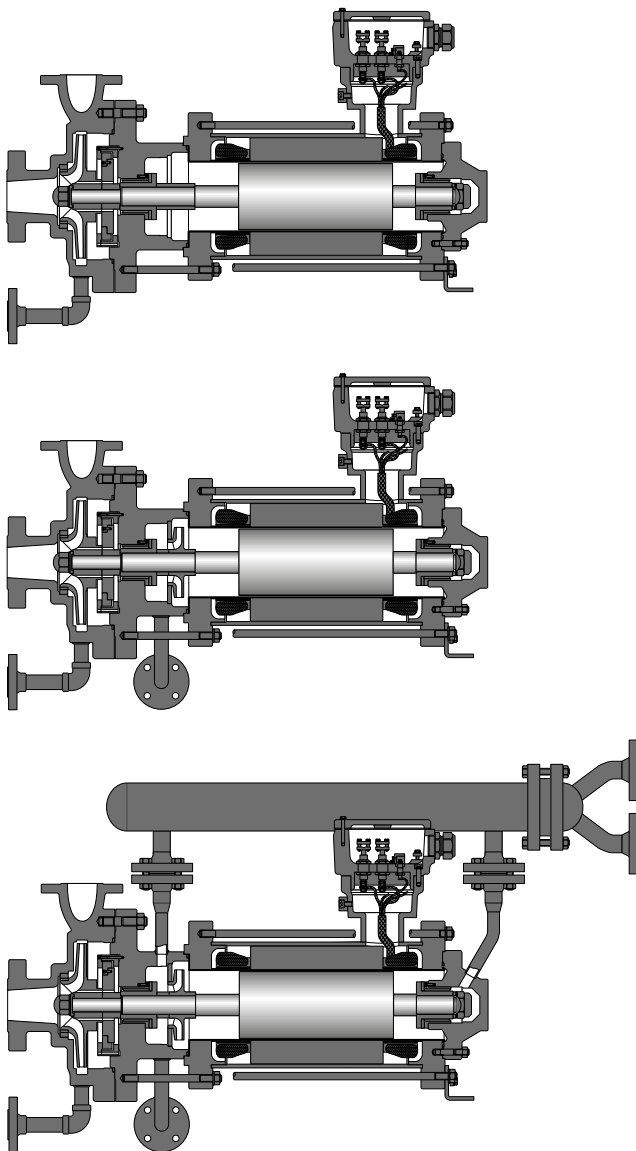
Diagram of a multistage canned motor pump



Single-stage canned motor pumps according to API 685.

Technical Facts:

- horizontal casing design acc. to API 610 / latest edition – OH2
- truly axial positioning (centerline mounted)
- end suction – top discharge
- self-venting and self-draining
- flanges acc. to ANSI B16.5 – 300 lbs RF
- impeller (overhung design)
- material classes: S-5, S-6, C-6, A-8 and others acc. to API 685 attachment H2



CNP (basic design)

Design for conveying liquids at low vapor pressures (temperature and pressure insensitive) and for the handling of aggressive, toxic, explosive, valuable, inflammable and also for volatile fluids.

CNPF (liquefied gas design)

Design for conveying liquids at high vapor pressures (insensitive to temperature and pressure). Design includes auxiliary impeller to increase the pressure and including internal circulation. The external recirculation to the suction vessel is therefore not required. For the handling of almost all sorts of hydrocarbons, such as liquefied gases, aromatics, paraffines.

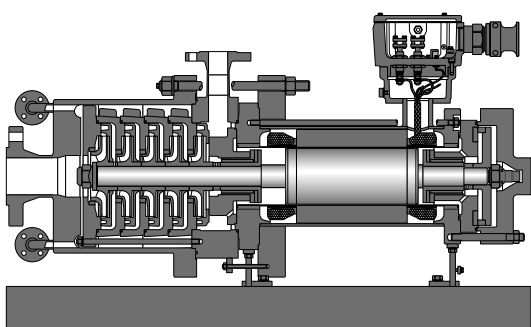
CNPKf (high-temperature design)

Design with external heat exchangers to convey hot products in the vacuum distillation; to convey organic heat transfer oils or heat bath liquids. These types are used for aggressive, toxic, explosive, valuable, inflammable and also for volatile fluids up to a temperature of +425 °C. This constructional principle is also suitable for the handling of liquids containing solids/slurries (construction type CNPKf+D acc. to plan no. D2 23-5).

Multistage canned motor pumps according to API 685 – customized design.

Technical Facts:

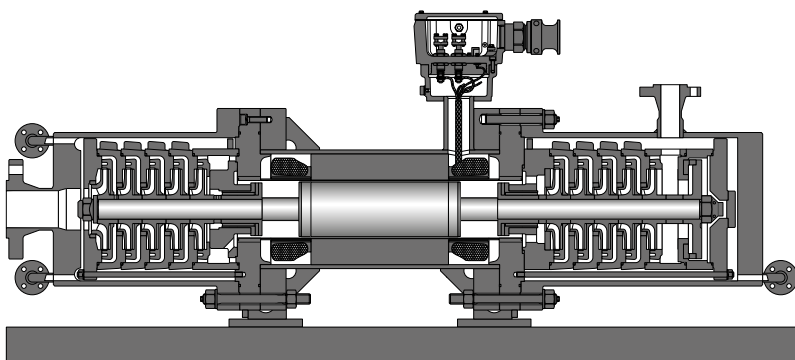
- nominal design pressure max. 120 MPa
- preferably low flow / high head – services with optimized efficiency
- radial split casing
- end suction - top discharge
- foot-mounted with double casing (barrel design with reduced number of gaskets)
- flanges acc. to ANSI B16.5 – 300 / 600 lbs RF
- material classes: S-5, S-6, C-6, A-8 and others acc. to API 685 attachment H2



CAM and CAM-Tandem

For the handling of aggressive, toxic, explosive, valuable, inflammable and also for volatile fluids, such as amine, propane, butane, propylene, sulphuric acid, nitric acid, hydrofluoric acid, hydrocyanic acid, phosgene, dimethyl sulphate, vinyl chloride, ether, ethylene chloride, chlorine, etc.

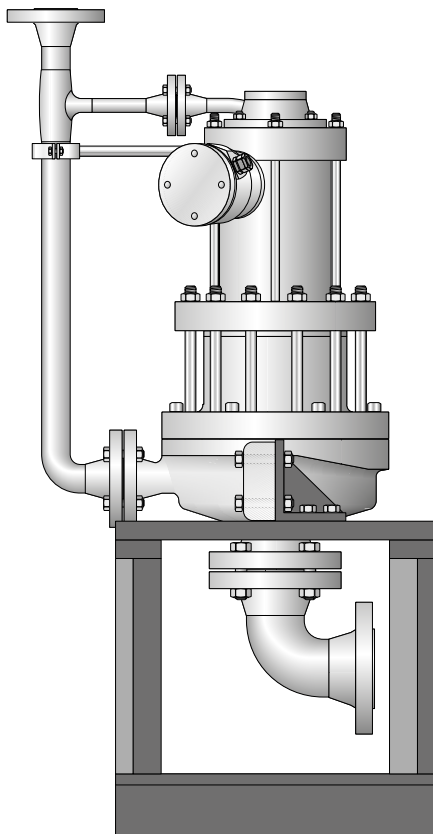
Canned motor pumps of type range CAM-Tandem is deemed to be a low-maintenance, reliable, pulsation-free and favorable alternative compared to piston pumps for “low flow – high head”-applications.



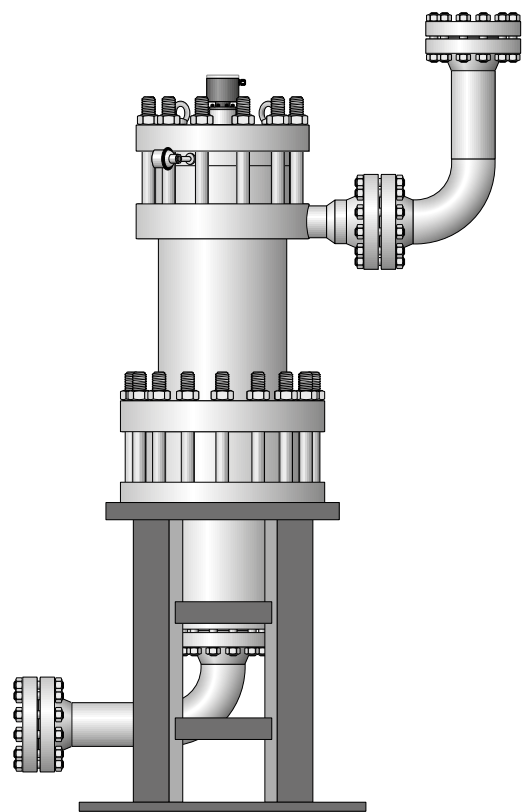
Canned motor pumps in vertical installation.

Characteristics:

- suitable to convey liquids with extreme physical properties, such as light hydrocarbons with low density, high vapor pressure and low viscosity
- unloading of slide bearings
- space-saving arrangement
- optimized venting
- single- or multistage design
- materials and technical design acc. to API 685



CNPV

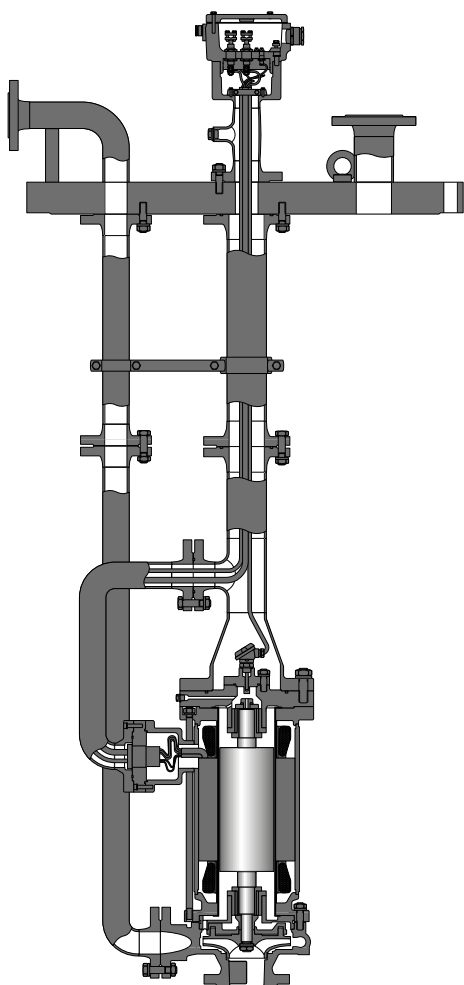


CAMTV

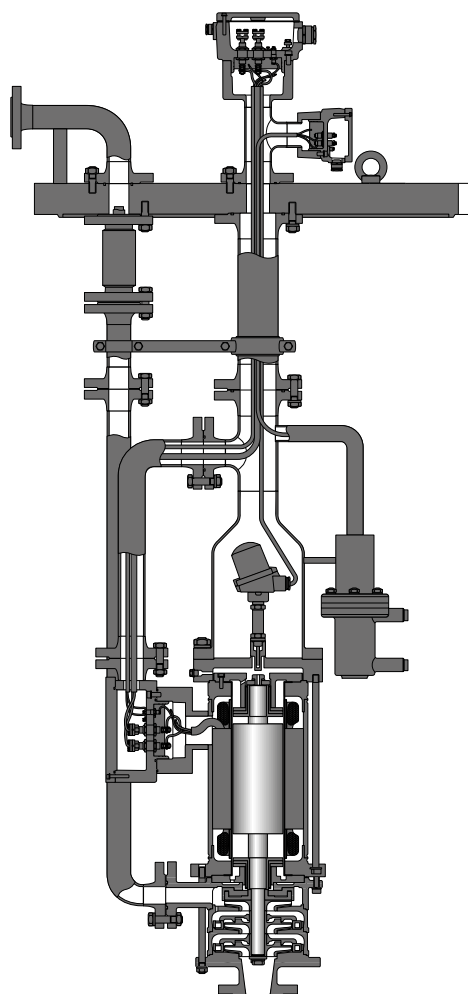
Canned motor pumps in submersible design.

Characteristics:

- supporting and pressure pipe with non rotating parts
- prolonged service lives and increased reliability (no components available which are liable to wear such as slide bearings, couplings, long drive shaft or shaft sealing)
- service independent on the immersion depth
- suitable for low NPSHA services
- particularly suitable for vessels, loading terminals and tank ships
- single- or multistage design
- materials and technical design acc. to API 685



TCN



TCAM

Vacuum package units – the suitable solution for process engineering requirements.

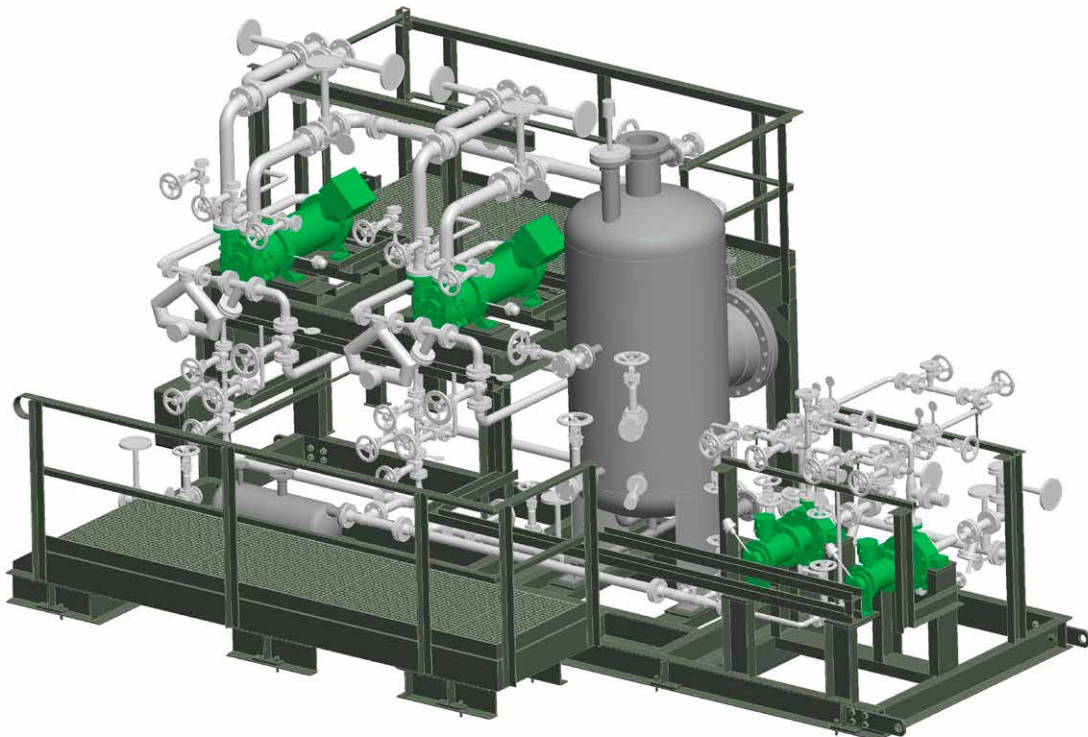
Characteristics:

- design of liquid ring vacuum pumps with mechanical shaft seal, magnetic coupling or canned motor
- vacuum package units are especially designed according to your process requirements
- package units are completed with all necessary pipework, measuring instruments, fittings and vessels
- actual engineering tools guarantee an effective project procedure
- applications are for example hydrogen sulphide, sour gas, benzene vapours
- typical ring liquids are for example sour water, organic solvents and condensates
- toxic vapours are handled with process condensates and solvents
- safe, hermetically sealed, reliable and low maintenance

Sample of a vacuum package unit type ALVPH 320

The vacuum package unit is equipped with two liquid ring vacuum pumps type LVPH 320 (with canned motor, single-flow) and two canned motor pumps type CNP 50x25x190.

- for suction of benzene vapours
- suction temperature from 45 to 80 °C
- suction capacity from 100 to 210 m³/h
- suction pressure from 50 to 300 mbar
- compression pressure 1400 mbar



Compression package units.

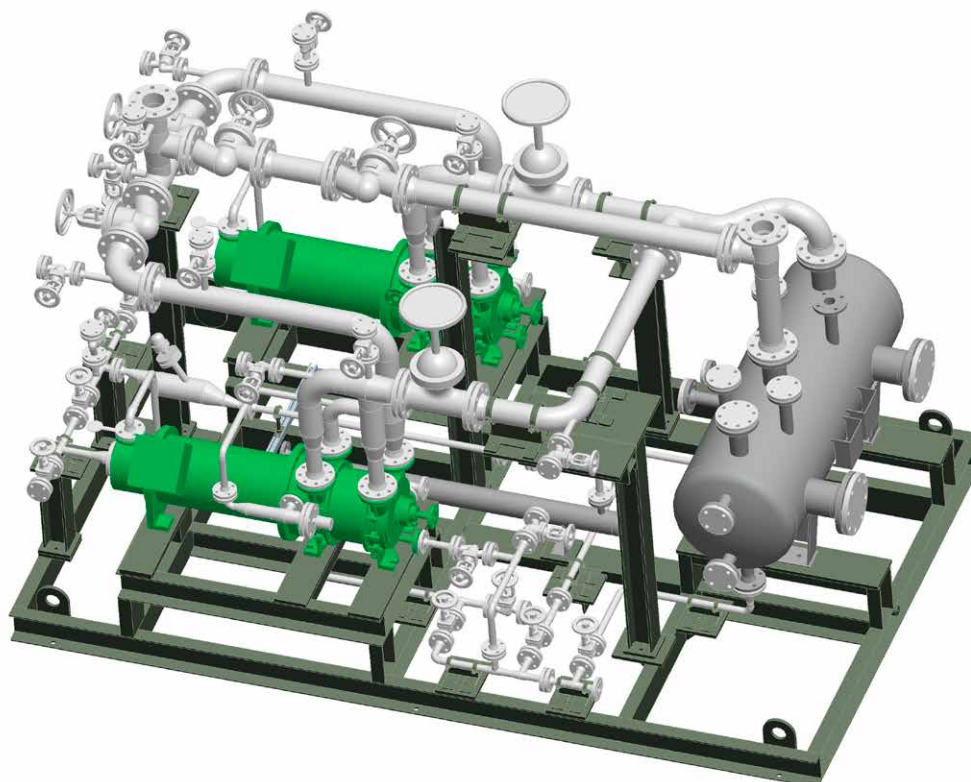
Characteristics:

- design of liquid ring compressors with mechanical shaft seal, magnetic coupling or canned motor
- compressor units are especially designed according to your process requirements
- package units are completed with all necessary pipework, measuring instruments, fittings and vessels
- actual engineering tools guarantee an effective project procedure
- applications are for example hydrogen sulphide, sour gas, benzene vapours
- typical ring liquids are for example sour water, organic solvents and condensates
- toxic vapours are handled with process condensates and solvents
- safe, hermetically sealed, reliable and low maintenance

Sample of a compressor unit type ALVPH 600

The compressor unit is equipped with two liquid ring compressors type LVPH 600 (with canned motor, double-flow).

- for compression of waste gas containing hydrogen sulphides
- suction temperature 36 °C
- suction capacity 270 m³/h
- suction pressure 1022 mbar
- compression pressure from 1840 to 2500 mbar



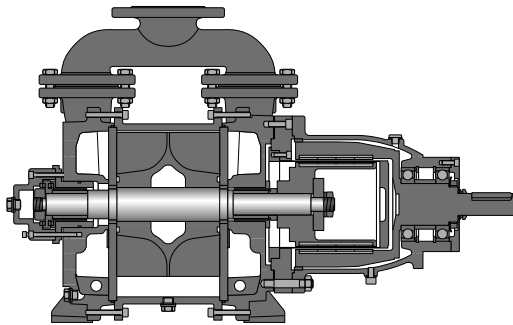
Liquid ring vacuum pumps.

Characteristics:

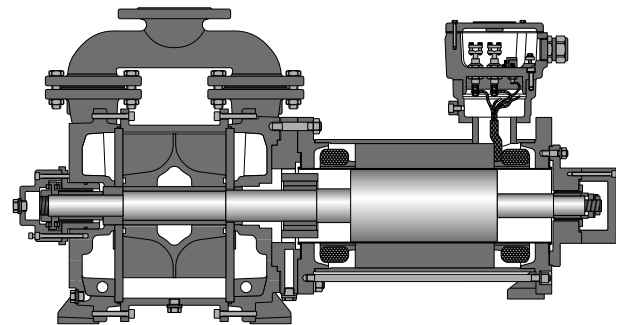
- vacuum pumps in design with magnetic coupling (LVPM) or canned motor (LVPH)
- with slide bearings lubricated by the product
- with single- or double-flow impeller
- in explosion-proof design, suitable for the handling of explosive gases in pump interior (ATEX device group I for Zone 0)
- possible up to 2 bar (0,2 MPa) differential pressure
- nominal pressure 10 bar (1 MPa)
- test pressure 15 bar (1,5 MPa)

Technical facts:

Suction capacity:	max. 3000 m ³ /h
Suction pressure:	min. 33 mbar (abs)
Rotating speed LVPM:	700 to 1800 rpm
Rotating speed LVPH:	1000 to 3500 rpm
Operating temperature:	-20 °C to +100 °C
Pressure rating:	PN 10



LVPM



LVPH

Positive displacement pumps (gear pumps).

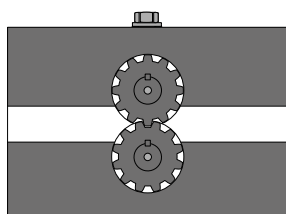
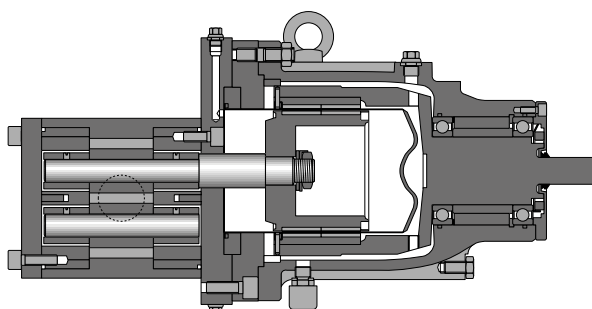
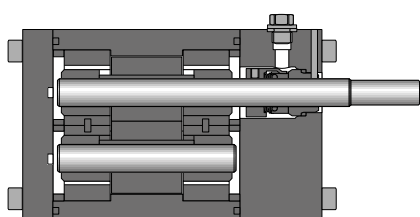
Characteristics:

- gear pumps are resistant against corrosion and can be adapted to individual process requirements
- for the handling of acids and bases, organic solvents and viscous oils, at low and high temperatures
- suitable for low to high-viscous fluids

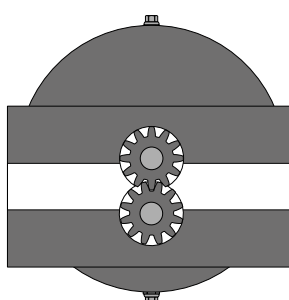
Technical facts:

Capacity:	0.5 to 120 m ³ /h
Discharge pressure:	max. 100 bar (10 MPa)
Rotating speed:	max. 1450 rpm
Operating temperature:	-20 °C to +250 °C
Viscosity LZ:	0.3 to 5,000,000 mm ² /s
Viscosity LZM:	0.3 to 6,000 mm ² /s
Pressure ratings:	PN 25 to PN 100

Standard material: chromium nickel steel
(further special materials possible on request)



LZ



LZM

Positive displacement pumps (internal gear pumps).

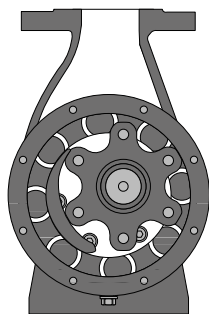
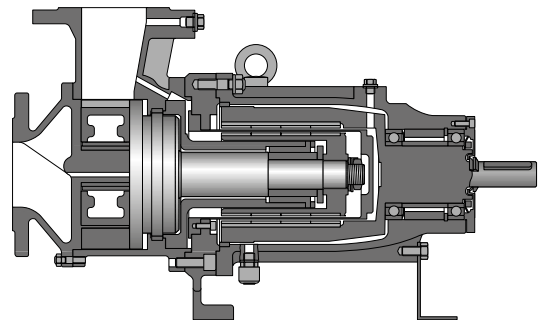
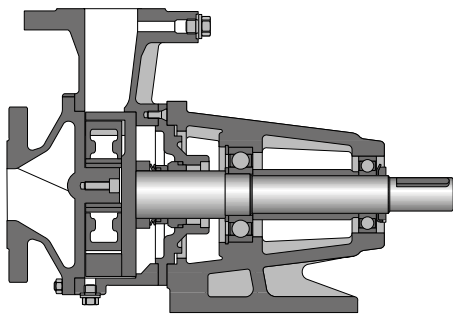
Characteristics:

- internal gear pumps are resistant against corrosion and can be adapted to individual process requirements
- for the handling of acids and bases, organic solvents and viscous oils, at low and high temperatures
- suitable for low to high-viscous fluids
- nearly pulsation-free conveyance in higher speed range
- good suction ability
- low noise conveyance

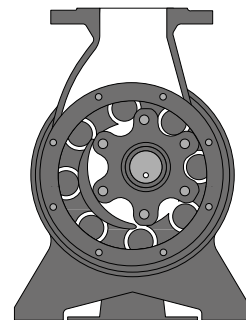
Technical facts:

Capacity:	1 to 60 m ³ /h
Discharge pressure:	max. 12 bar (1.2 MPa)
Rotating speed:	max. 1450 rpm
Operating temperature:	-20 °C to +200 °C
Viscosity HP:	1 to 1.000.000 mm ² /s
Viscosity MHP:	1 to 5.000 mm ² /s
Pressure rating:	PN 16

Standard material: chromium nickel steel
(further special materials possible on request)



HP



MHP

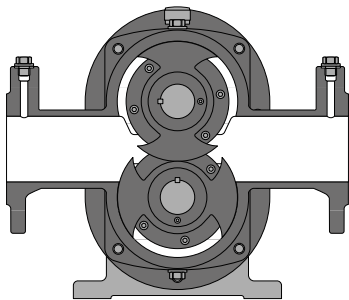
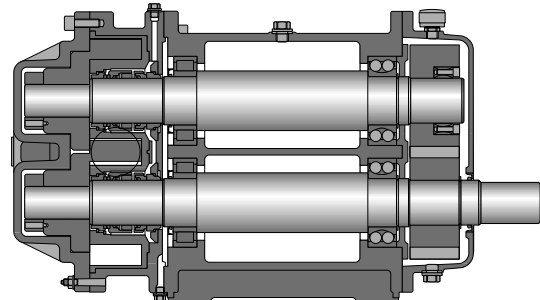
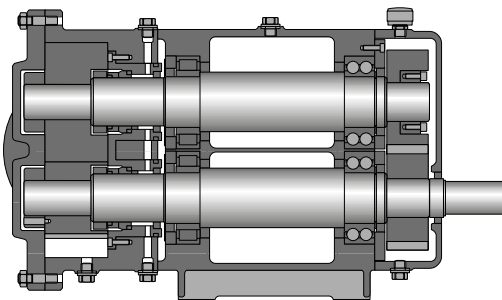
Positive displacement pumps (rotary piston pumps).

Characteristics:

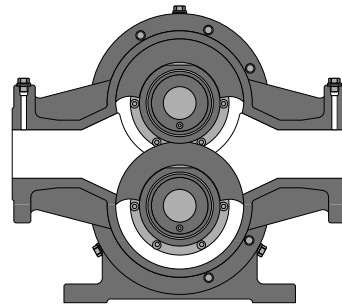
- solve problems for viscous slop and slurries (liquid containing solids), when fluid-lubricated slide bearings cannot be used
- suitable for changing viscosities
- system pressures possible up to 200 bar (20 MPa)

Technical facts:

Capacity:	1 to 300 m ³ /h
Discharge pressure:	max. 100 bar (10 MPa)
Rotating speed:	max. 1450 rpm
Operating temperature:	-20 °C to +280 °C
Viscosity:	1 to 5,000,000 mm ² /s
Pressure ratings:	PN 16 and PN 25



KRL



KRH

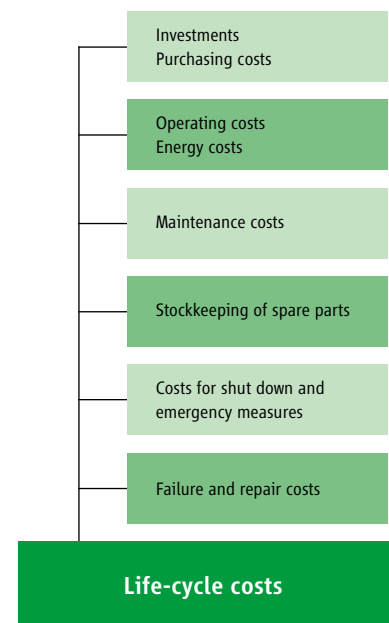
YOU MAY COUNT
ON US



The purchasing process for pumps now also involves considering the life-cycle costs. Looking at the total costs a pump generates in the course of its service life, the sealing system constitutes a significant proportion.

This is why pumps without shaft seals are increasingly being used for conveying media in refineries and petrochemical plants. This development has been accelerated by the tightening of legal restrictions and by increased environmental awareness in the chemical and petrochemical industry.

The total costs of a pump over its working life are calculated primarily using the investment costs, and the costs for installation, energy, maintenance, servicing and repairs. As the purchase costs for a pump normally only represent 5 to 10 % of the total costs, it is well worth taking a look at the life-cycle costs of pumps in the medium- to longterm.



Life-cycle costs.

Depending on the operator's point of view, the results are by their very nature variable, but they all indicate that considering the investment costs alone is not enough in the long-term.

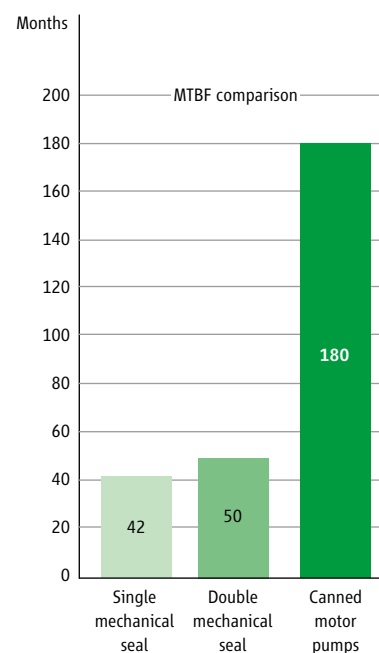
Right figure shows the MTBF values (MTBF = Mean Time Between Failure) between different pump systems. The values for this system show that canned motor pumps (CMP) have a much higher MTBF value than standard pumps with mechanical seal (single- and double-stage).

When focussing the life-cycle costs the economic efficiency of the total system plays an important role. There are partly too many safety factors which need to be taken into account when a system is planned. Consequently, the pump operation is often not effected at its best efficiency.

Studies executed by the "Hydraulic Institute" and "Europump" show that the greatest potential to reduce life-cycle costs depends on the correct dimensioning of the plant. An important portion of the pressure losses in the system is resulted in the dimensioning of tubes and valves, particularly the one of the control and regulating valve.

Through the use of frequency converters there is no further need to install valves for the regulation of the volume flow. Moreover, because of the variable number of rotations, the pump can be operated at different required operating points. Thus, the operation of this pump is effected at a considerably increased efficiency, compared with the throttling via valves.

The clearly stated advantages of our solutions will convince you.



FOR YOUR SAFETY –
ALWAYS BEING
ONE STEP AHEAD



Our longstanding experience and the intensive exchange of experience with our customers allow us to adapt our products according to the individual requirements of technology.

Explosion protection acc. to ATEX

All HERMETIC pumps designed according to explosion protection requirements. The pumps meet the requirements of the electrical as well as of the non-electrical explosion protection.

Provided that the rotor cavity, as part of the process system, is permanently filled with liquid, no explosive atmosphere may arise. Internal motor cavity can be considered as "no explosive area."

Customer benefits when using canned motor pumps

- 100% leakage-free thanks to double containment design
- canned motor pumps comply with the most significant requirements regarding environmental protection
- extremely low noise level
- virtual lack of wear and minimized maintenance
- high availability and long service life
- higher MTBF values compared to pumps with mechanical seal
- easy installation, since no shaft alignment of motor and coupling is required



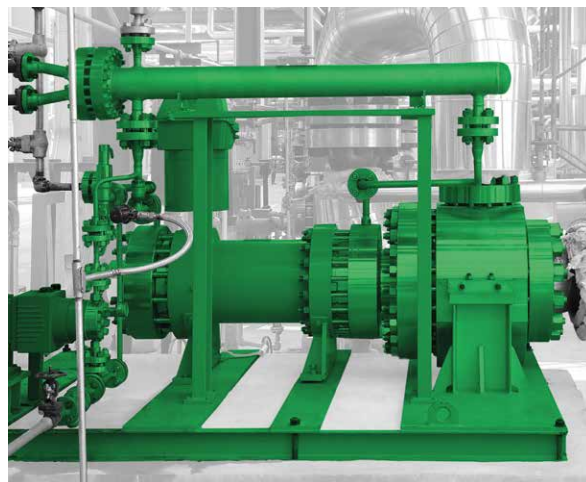
Canned motor pump type CNPFV 80x40x290



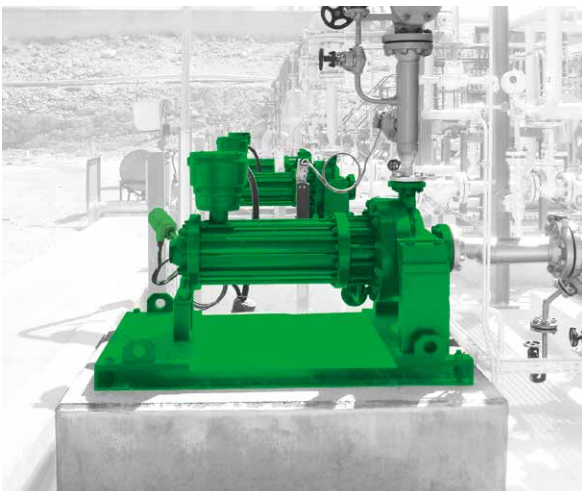
Canned motor pump type CAMTV 44/6



Canned motor pump type CAMT 52/2



Canned motor pump type CNKFH+D 150-360



Canned motor pump type CNPF 80x40x320



Rotary lobe pump type KRHZ 150

Convincing service.

Important features are readiness, mobility, flexibility, availability and reliability. We are anxious to ensure a pump operation at best availability and efficiency to our customers.

Installation and commissioning

- service effected on site by own service technicians

Spare part servicing

- prompt and longstanding availability
- customized assistance in spare part stockkeeping

Repair and overhauling

- professional repairs including test run executed by the parent factory
- or executed by one of our service stations worldwide

Retrofit

- retrofit of your centrifugal pumps by installing a canned motor to comply with the requirements of the IPPC Directive

Maintenance and service agreement

- concepts individually worked out to increase the availability of your production facilities

Training and workshops

- extra qualification of your staff to ensure the course of your manufacture

Among others, our products comply with:

- Directive 2006/42/EC (Machinery Directive)
- Explosion protection acc. to Directive 94/9/EC (ATEX); UL; KOSHA; NEPSI; CQST; CSA; Rostechnadzor
- Directive 96/61/EC (IPPC Directive)
- Directive 1999/13/EC (VOC Directive)
- TA-Luft
- RCC-M, Niveau 1, 2, 3

HERMETIC-Pumpen GmbH is certified acc. to:

- ISO 9001:2008
- GOST; GOST "R"
- Directive 94/9/EC
- AD 2000 HP 0; Directive 97/23/EC
- DIN EN ISO 3834-2
- KTA 1401; AVS D 100 / 50; IAEA 50-C-Q
- Certified company acc. to § 19 I WH