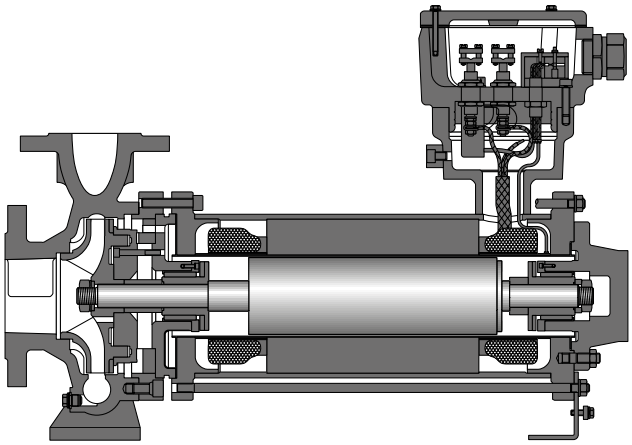
PRODUCT INFORMATION



Single-stage canned motor pumps complying with the chemical standards according to EN 22858; ISO 2858

Series CN / CNF / CNK

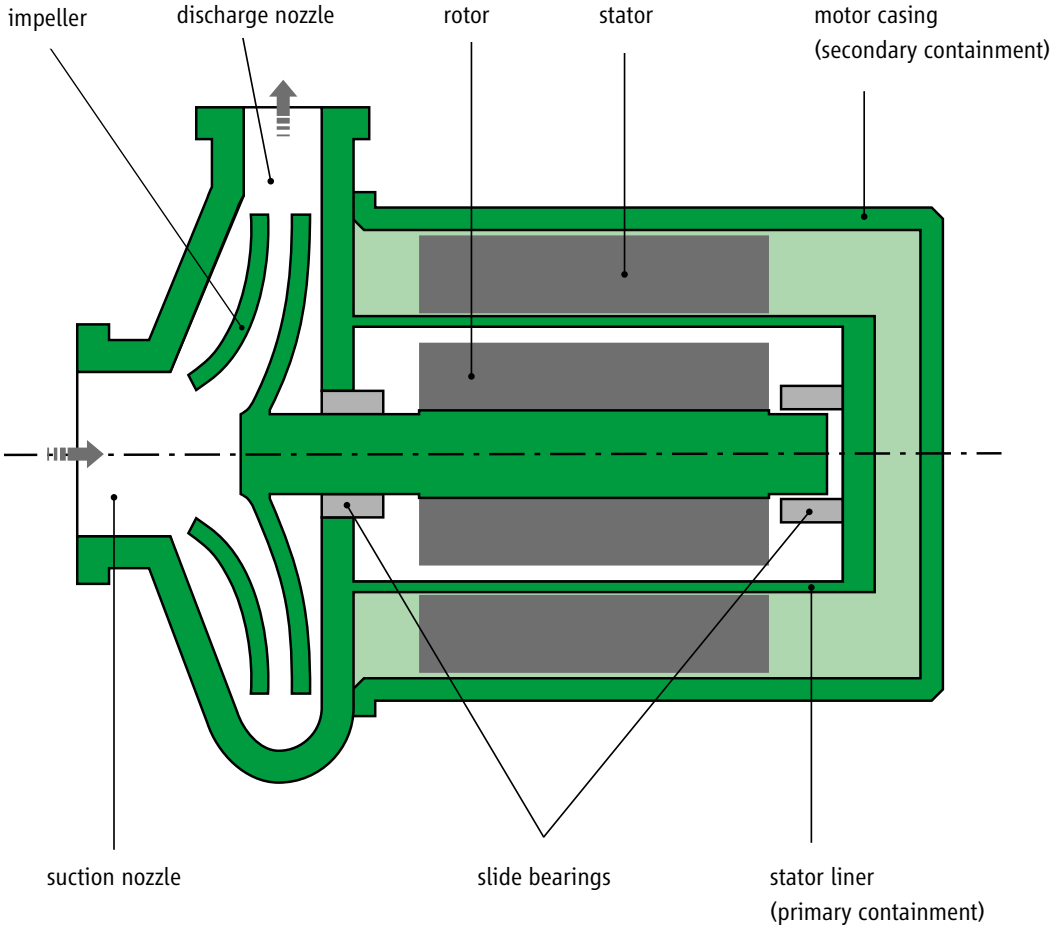
LEDERLE Hermetic

Contents

Description

General

Canned motor pumps are characterised 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, liquid-lubricated slide bearings. The stator winding of the motor is separated from the rotor chamber by means of a thin stator liner. In conjunction with the hydraulic section of the pump, the rotor chamber itself provides a combined cavity which needs to be filled with liquid to be conveyed prior to the start-up of the pump. The heat losses of the motor are dissipated by a partial flow between the rotor and the stator. At the same time, the partial flow lubricates both slide bearings in the rotor chamber. Both the stator liner, which is a hermetically sealed component, and the motor casing are used as safety containments. Because of that, canned motor pumps always ensure highest safety level when conveying dangerous, toxic, explosive and valuable liquids.

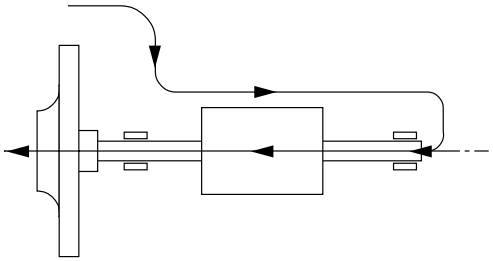


Function

CN

The partial flow for cooling the motor and lubricating the slide bearings will be deverted at the periphery of the impeller and, after having passed through the motor, is recirculated through the hollow shaft to the suction side of the impeller. This design is suitable for the delivery of uncritical liquids at low vapour pressures.

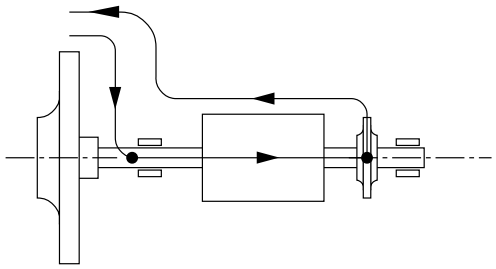
Recirculation of partial flow to suction side



CNF

The partial flow for cooling the motor and lubricating the slide bearings will be diverted at the periphery of the impeller and, after having passed through the motor, is recirculated to the discharge side. An auxiliary impeller is used to overcome the hydraulic losses encountered along the way. The recirculation of the partial flow towards discharge side ensures that the heated motor cooling flow has sufficient excess pressure above the boiling point of the pumped liquid during re-entry into the pump. This pump design can be used for liquefied gases with an extremely steep vapour pressure curve.

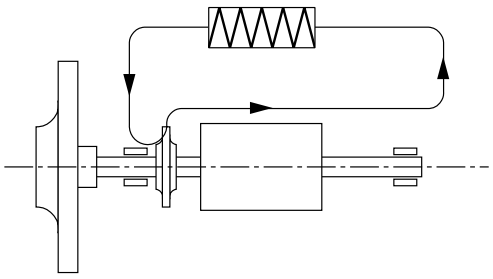
Recirculation of partial flow to discharge side



CNK

The liquid is delivered from the suction side through the impeller to the discharge side. A thermal barrier avoids the direct heat transfer from the pump to the motor part. The motor heat losses are dissipated by a secondary cooling / lubricating circuit via a separate heat exchanger. This cooling / lubricating circuit also supplies the slide bearings. Thus the liquids at temperatures up to +400 °C can be conveyed while the secondary cooling cycle is at a lower temperature level. This construction is also suitable for conveying polluted or particle-containing liquids. If applicable, pure process liquid needs to be injected into the motor circuit.

Internal cooling / lubricating circuit



Application and use

Fields of application

CN

For the delivery of aggressive, toxic, explosive, precious, inflammable, radioactive and slightly volatile liquids e. g. sulfuric acid, nitric acid, hydrofluoric acid, hydrocyanic acid, ethanoic acid, formic acid, NaOH, KOH, D_2O solvent, etc.

CNF

Liquefied gases, e. g. ammonia, freons, carbon dioxide, amines, propane, butane, vinyl chloride, ethylene oxide, chlorine, phosgene, propylene, carbon bisulphide, hydrocarbon, diphenyl (> 250 °C) etc.

CNK

For the delivery of hot organic heat transfer oil, as well as heating bath liquids. This design can also be used for aggressive, toxic, explosive, precious, inflammable, radioactive and slightly volatile liquids.

Application ranges

CN: –120 °C to +360 °C
CNF: –120 °C to +360 °C
CNK: –120 °C to +400 °C

Canned motors

Power:	up to 300 kW at 1450 rpm [50 Hz]
	up to 400 kW at 2900 rpm [50 Hz]
	up to 336 kW at 1750 rpm [60 Hz]
	up to 448 kW at 3500 rpm [60 Hz]
Operation:	S1
Voltage:	400 / 690 V
	(additional tensions possible)
Insulation class:	H-180
	C-220 / C-400
Frequency:	50 or 60 Hz
	(also suitable for operation with frequency converter)
Degree of protection:	IP 67
Motor protection:	PTC thermistor e.g.
	KL180 (for H winding)
	KL210 (for C-220 winding)
	alternative Pt100 resistance thermometer (for all windings)

Pump and hydraulic denomination

e. g.

CN 40 – 25 – 160

- 160 – impeller diameter in mm
- 25 – discharge nozzle diameter in mm
- 40 – suction nozzle diameter in mm
- CN – series

Explosion protection according to Directive 94/9/EC

incl. EC-type-examination certificate
Marking: ⟨Ex⟩ II 2 G Ex de IIC T1 to T6 (*)

(*) Due to explosion protection requirements, the following restrictions apply to the explosion group:
Thickness of coating > 200 µm – explosion group IIB
Thickness of coating ≤ 200 µm – explosion group IIC

Documentation according to HERMETIC-Standard

- instruction manual incl. instructions for commissioning, operation and maintenance
- technical specification
- sectional drawing with position numbers
- dimensional drawing
- spare part list with order numbers
- test report
- test performance curve
- EC Declaration of Conformity

Inspections and guarantees

Standard inspections

Hydraulic inspection:

- each pump is subjected to a test run and the operating point is guaranteed according to ISO 9906 – class 2 (5 measuring points)
- pressure test
- axial thrust measurement
- leakage test

Additional inspections

The following inspections can be carried out and certified at additional cost (e. g. NPSH test, Helium leakage test, vibration test, ultrasonic test, PMI test). Any further inspections and tests are specified in the technical specification. The guarantees are effected according to the valid conditions of supply.

Materials

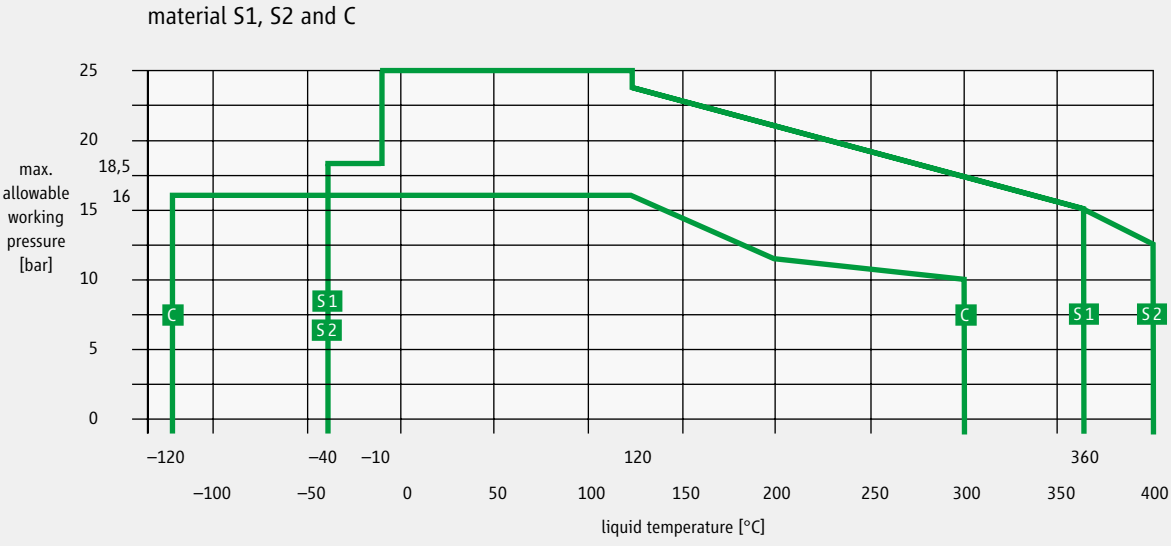
Materials and pressure ratings

VDMA-no.	description	series CN / CNF / CNK		
		material S1	material S2	material C
		pressure rating PN 25	pressure rating PN 25	pressure rating PN 16
wetted parts				
102	volute casing	JS 1025	1.0619+N	1.4408
161	casing cover	1.0570/1.0460	1.0570/1.0460	1.4571
230.01	impeller	JL 1040 / JS 1025	JL 1040 / JS 1025	1.4408
230.03	auxiliary impeller (1)	JL 1030	JL 1030	1.4581
344	bearing support lantern	1.0570 / 1.0460	1.0570 / 1.0460	1.4571
360	bearing cover	1.0570 / 1.0460	1.0570 / 1.0460	1.4571
472.01/02	slide ring	PTFE/K	PTFE/K	PTFE/K
513	wear ring insert	JL 1030	JL 1030	1.4571
529.01/02	bearing sleeve	1.4571/W5 (2)	1.4571/W5 (2)	1.4571/W5 (2)
545.01/02	bearing bushing	1.4571/SiC30	1.4571/SiC30	1.4571/SiC30
816	stator liner	Hastelloy C4	Hastelloy C4	Hastelloy C4
817	rotor liner	1.4571	1.4571	1.4571
819	shaft	1.4571	1.4571	1.4571
non-wetted parts				
811	motor casing	1.0254	1.0254	1.0254

special materials / higher pressure ratings are possible on demand

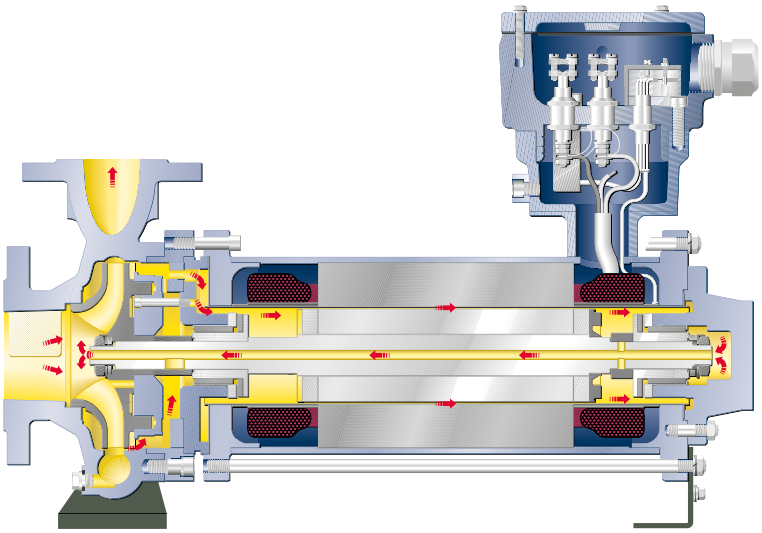
(1) parts only for CNF and CNK
(2) high velocity tungsten carbide coating

Pressure and temperature limits

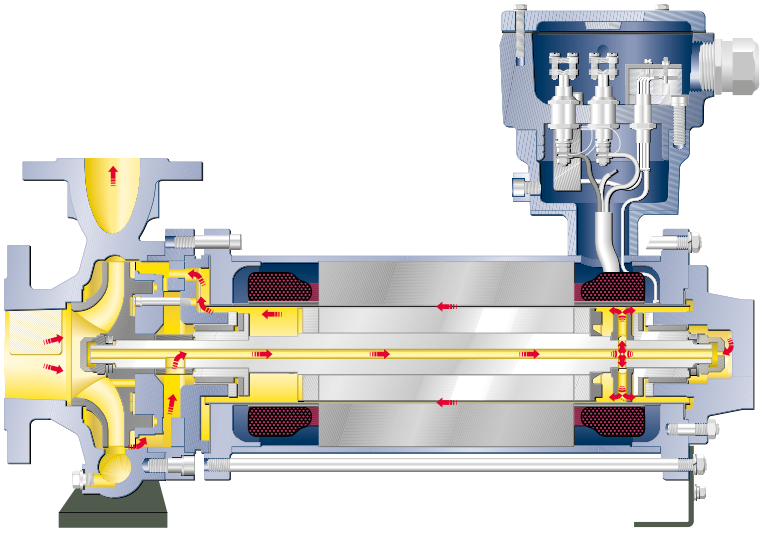


Functional principle

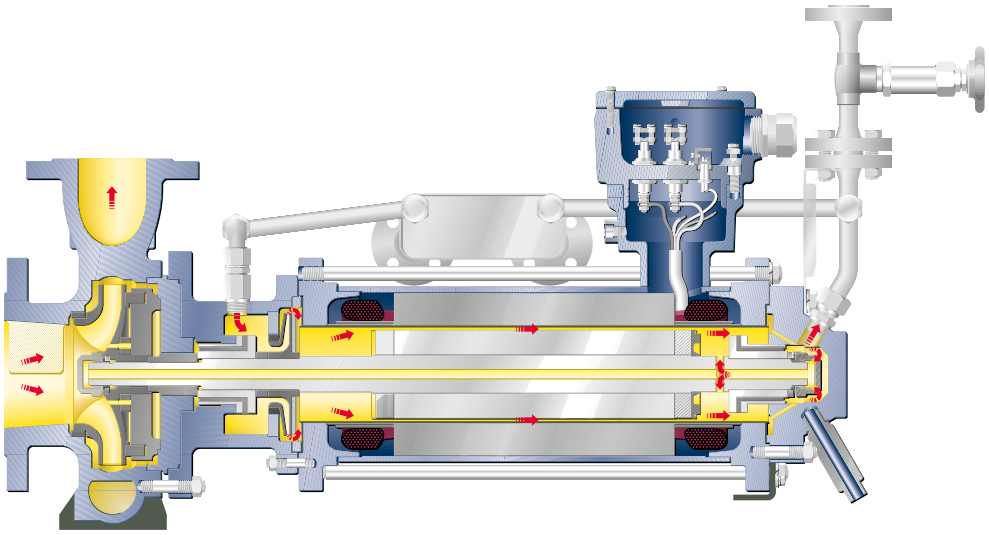
CN



CNF



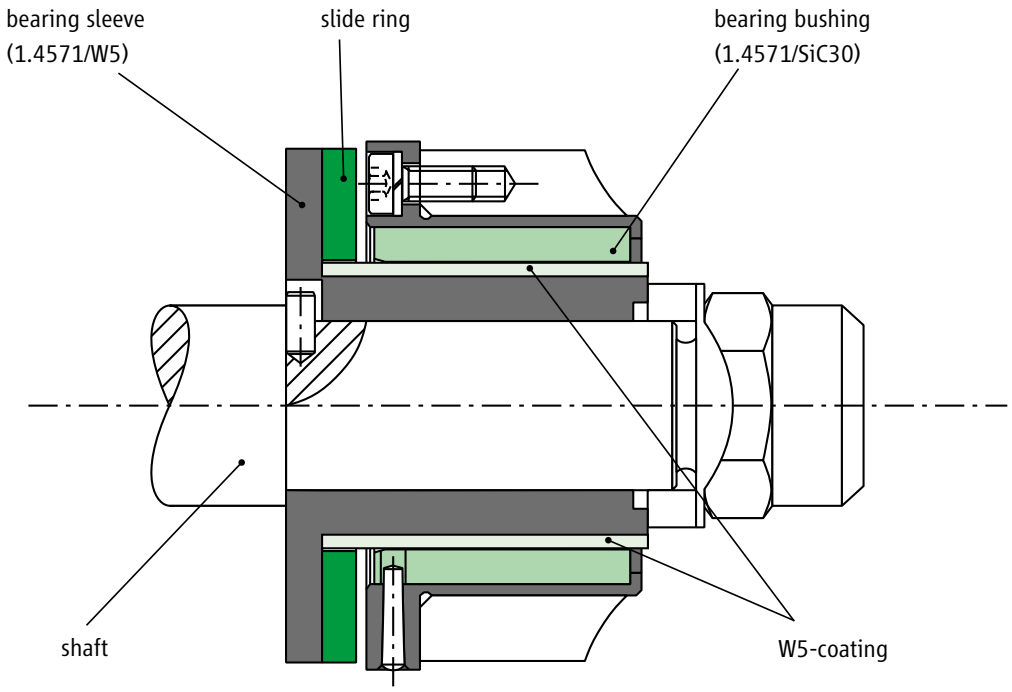
CNKp



Bearings

The hermetically sealed design requires the arrangement of the bearings within the pumped liquid. Therefore, only hydrodynamic slide bearings are used in most cases. During normal operation slide bearings have the advantage that there is no contact between the sliding surfaces of the bearing. In continuous operation, they are wear- and maintenance-free. Service life of 8 to 10 years can be easily achieved by using hermetically sealed pumps.

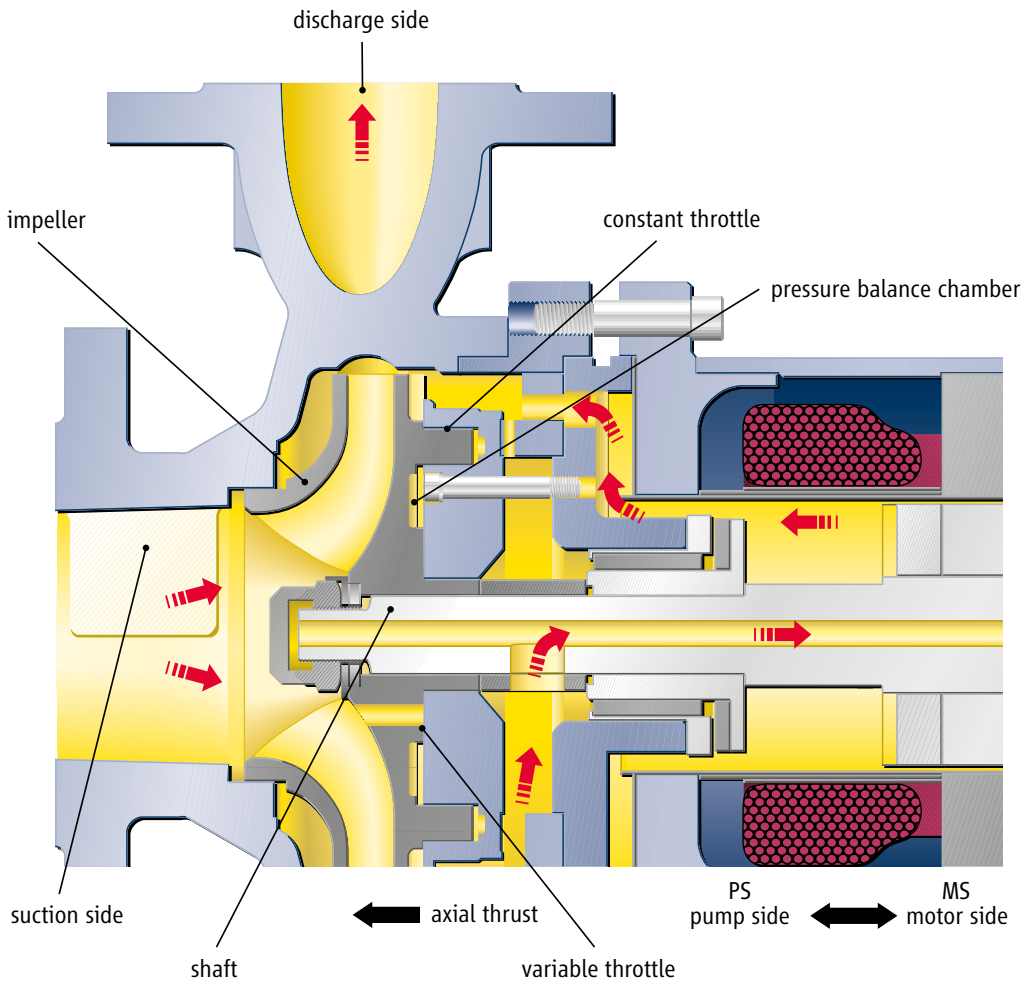
The almost universal bearing combination materials based on tungsten carbide (W5) and silicon carbide (SiC30) have proven to be the best choice. These combinations consist of a metallic shaft sleeve made of stainless steel (1.4571) coated with tungsten carbide by means of a "High Velocity Oxygen Fuel" process and a fixed bearing bushing made of ceramic material (SiC30) that is surrounded by a sleeve made of stainless steel. SiC30 is a mixed material of silicon carbide and graphite, combining the product advantages of both materials. Conditions of mixed friction, as they may arise for example during start-up and stopping of the pump, can be easily handled with SiC30. Moreover, this material is thermal shock resistant (high resistance against changes in temperature), as well as chemically inert, blister resistant (no formation of bubbles at material surface) and abrasion resistant.



Axial thrust balancing

The development of hermetically sealed pumps was dependent on the solution of a central problem, namely the elimination of axial forces of the rotor equipment. The various liquid properties exclude the possibility of using mechanical axial bearings. The only universal solution to this problem lay in hydraulic balancing of the rotor.

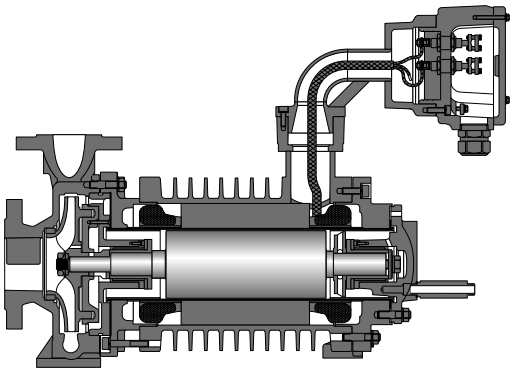
The functional principle of the hydraulic balancing device of series CN / CNF / CNK is based on the combination of a constant throttle (labyrinth gap) at the outer diameter of the impeller and a variable throttle near the impeller hub. If the rotor will be axially displaced from its balanced position, the pressure within the pressure balance chamber changes due to the valve effect of the variable throttle and thus counteracts the rotor displacement. Therefore, the axial position of the shaft is automatically controlled during operation in order that a balanced condition is reached and thus no axial forces act on the axial bearing collar.



Design options

Construction without cooling

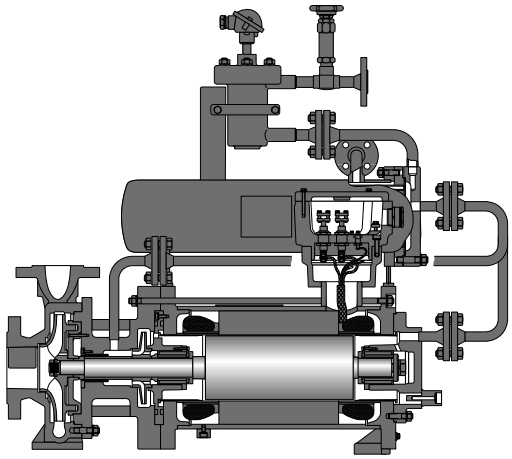
In the absence of cooling liquid, special windings of insulation class C-220 or C-400 can be used for conveying liquids with a temperature up to +360 °C. This design is characterised by fins used for convection cooling and by a terminal box extension.



CN and CNF

Cooled construction

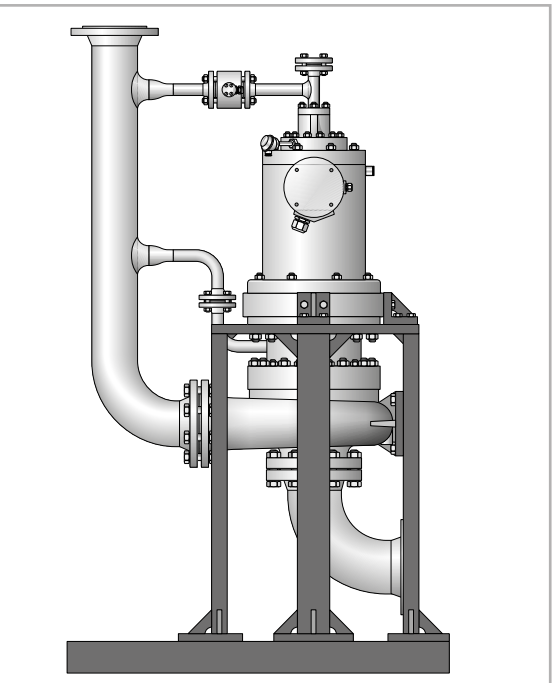
As an option to the plate heat exchanger, also tubular coolers can be used. Cleaning and maintenance can be effected more easily.



CNKr

Pressure gases / liquefied gases

The vertical design of the pump can be necessary if the capacity of the slide bearings is too small due to a lower viscosity of the pumped liquid. In this case, the slide bearings do not have a supporting function in radial direction, but only a guiding function. In axial direction, the rotor weight is hydrostatically supported.



CNV and CNFV

Monitoring equipment

Hermetic centrifugal pumps are principally manufactured for use in potentially explosive atmospheres. For this reason the pumps comply with electrical as well as non-electrical explosion protection requirements.

Level monitoring

The pump's interior and rotor chamber must be always filled with the pumped liquid for reasons of safety. HERMETIC provides suitable level monitoring equipment for each pump complying with the explosion protection requirements acc. to directive 94/9/EC.

Level monitoring can be recommended principally for application cases which do not mandatory comply with explosion protection requirements. Level monitoring prevents the pump from running dry and to be affected by major damages such as by destruction of the slide bearings or by exceeding inadmissible high temperatures caused by missing cooling and lubricating flow. In addition the pump can be prevented from cavitation damages by means of level monitoring equipment which are caused by evaporation of boiling liquids in the suction pipe.

Temperature monitoring

Temperature monitoring ensures that the pump is switched off when achieving inadmissible high temperatures. HERMETIC provides suitable temperature monitoring equipment for each pump complying with explosion protection requirements acc. to directive 94/9/EC.

Monitoring of the liquid temperature allows a reliable control to ensure the operation of the pump within the admissible range and to ensure the internal motor cooling of a canned motor pump. For liquids with a pour point that is higher than the ambient temperature, the liquid temperature monitoring can also be used to prevent the start-up of the pump as long as the maximum admissible viscosity of the liquid is reached.

In order to protect canned motors against inadmissible high temperatures, the winding is equipped either with PTC thermistors or Pt100 resistance thermometers.

Rotor position monitoring

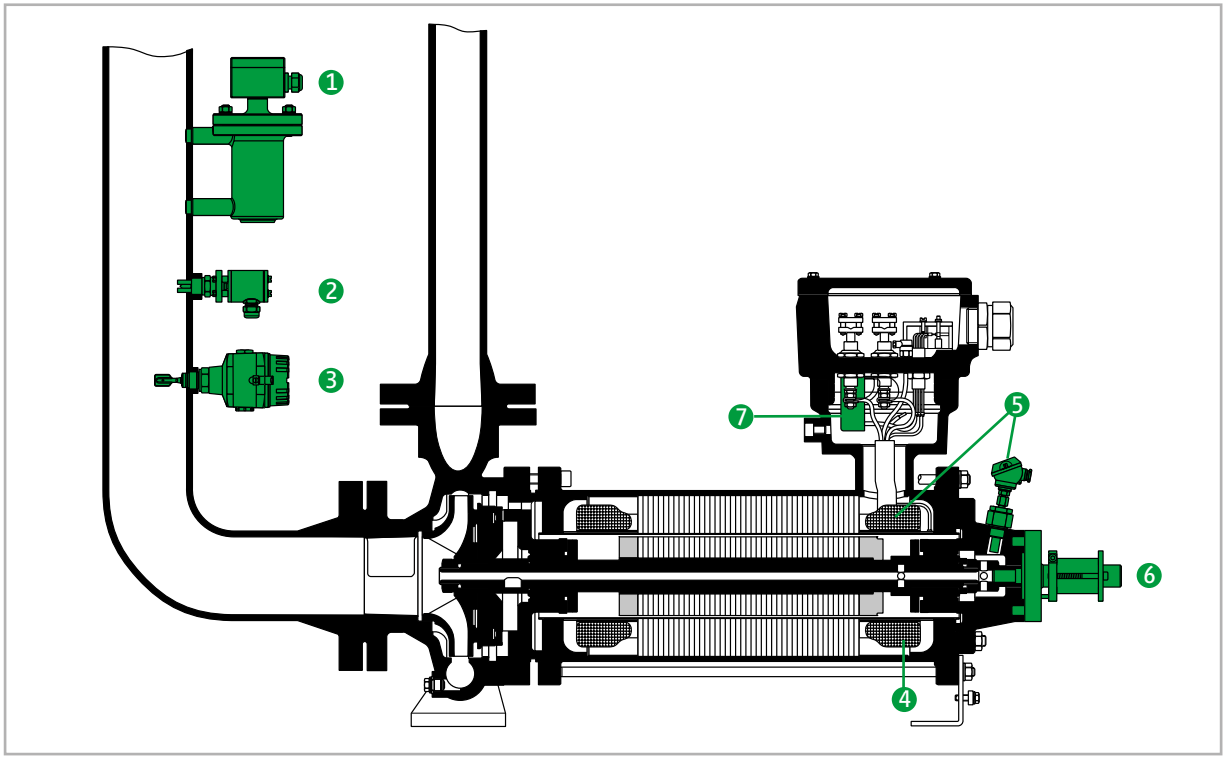
Axial thrust balancing is mainly influenced by the operating method of the pump, plant conditions and various physical properties of the pumped liquid. For an early detection of an imminent malfunction it is recommended to install a rotor position monitoring device. This electronic protection equipment monitors the axial shaft position of the rotor during operation in a hermetically sealed and contact-free way. Combined with the level and temperature monitoring an efficient detection of imminent failures is possible.

Rotation monitoring

The correct rotating direction of hermetic centrifugal pumps with canned motor cannot be checked visually from the outside. Due to a wrong phase sequence in the power line the pump is operated with an incorrect rotating direction without being noticed what might result in considerable damages to the pump.

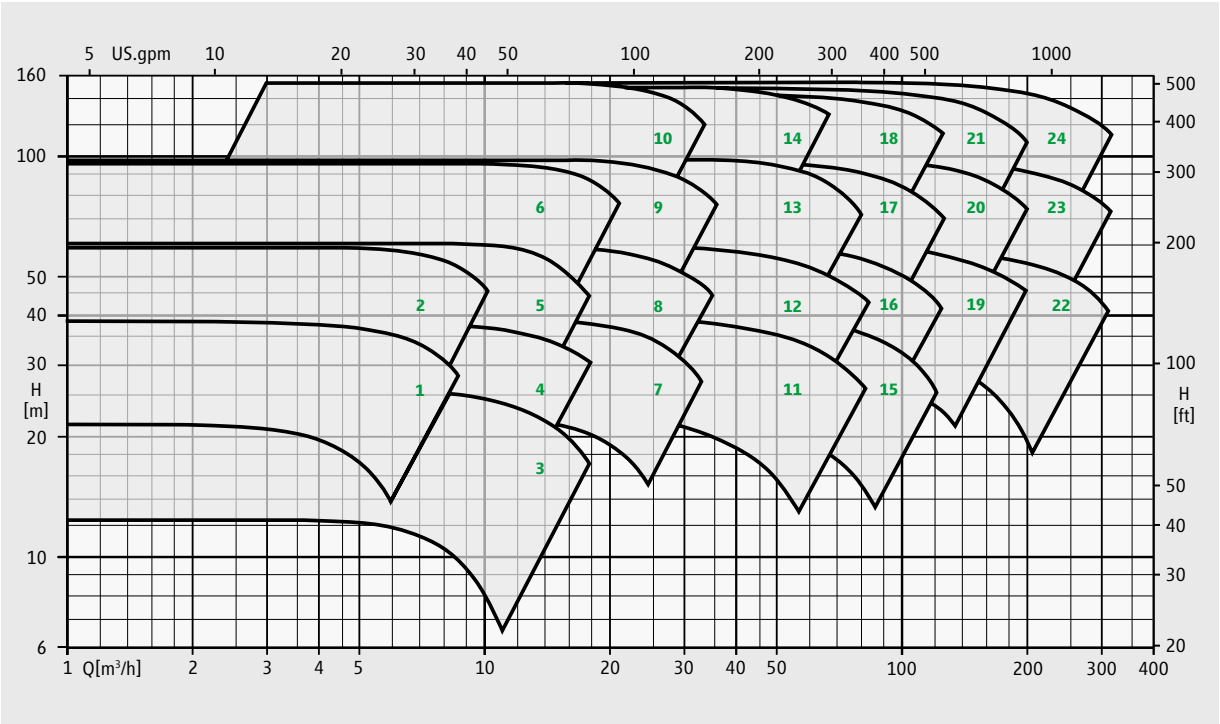
By default, hermetic centrifugal pumps with canned motor are equipped with an electronic rotation monitor in the form of a phase sequence relay.

potential monitoring equipment			
1	magnetic float switch	LS	level
2	optoelectronic transducer	LS	
3	vibration limit switch	LS	
4	PTC thermistor	TS	temperature
5	Pt100	TI	
6	MAP	GI	rotor position
7	ROM	GS	direction of rotation



Characteristics diagram

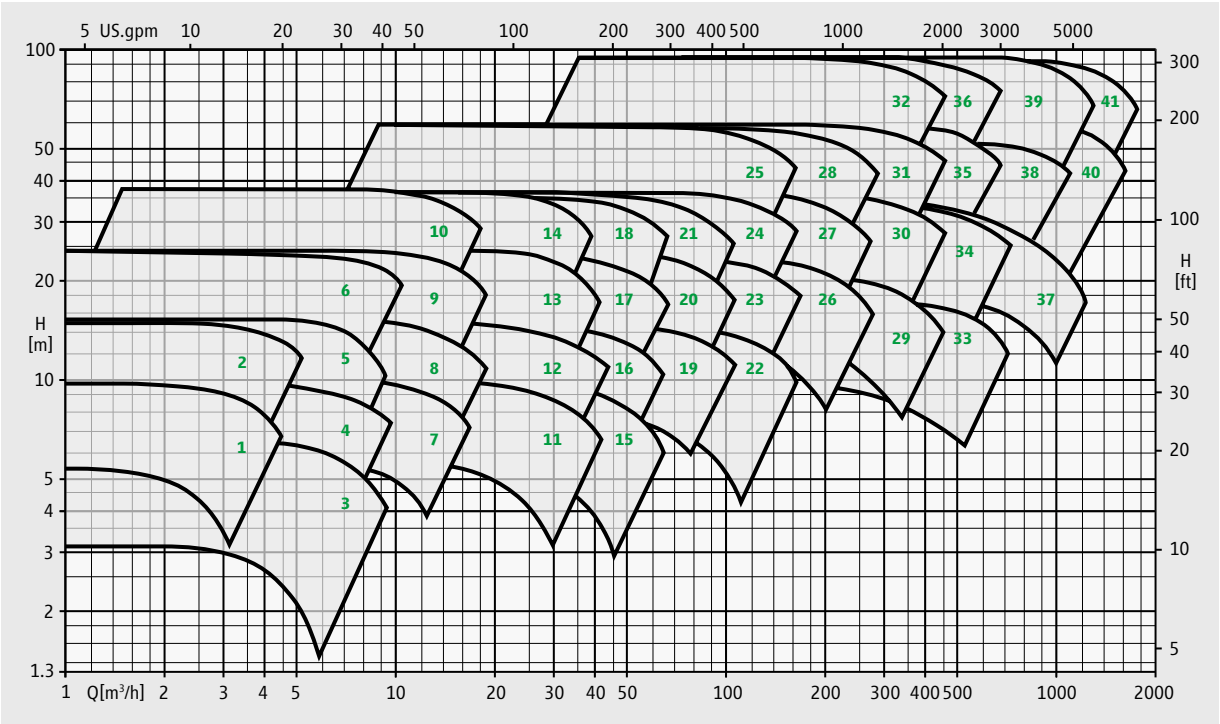
Characteristics diagram 2900 rpm 50 Hz



Denomination of hydraulics shown in the characteristics diagram

1	40-25-160	**10**	65-40-315	**19**	125-80-200
2	40-25-200	**11**	80-50-160	**20**	125-80-250
3	50-32-125	**12**	80-50-200	**21**	125-80-315
4	50-32-160	**13**	80-50-250	**22**	125-100-200
5	50-32-200	**14**	80-50-315	**23**	125-100-250
6	50-32-250	**15**	100-65-160	**24**	125-100-315
7	65-40-160	**16**	100-65-200		
8	65-40-200	**17**	100-65-250		
9	65-40-250	**18**	100-65-315		

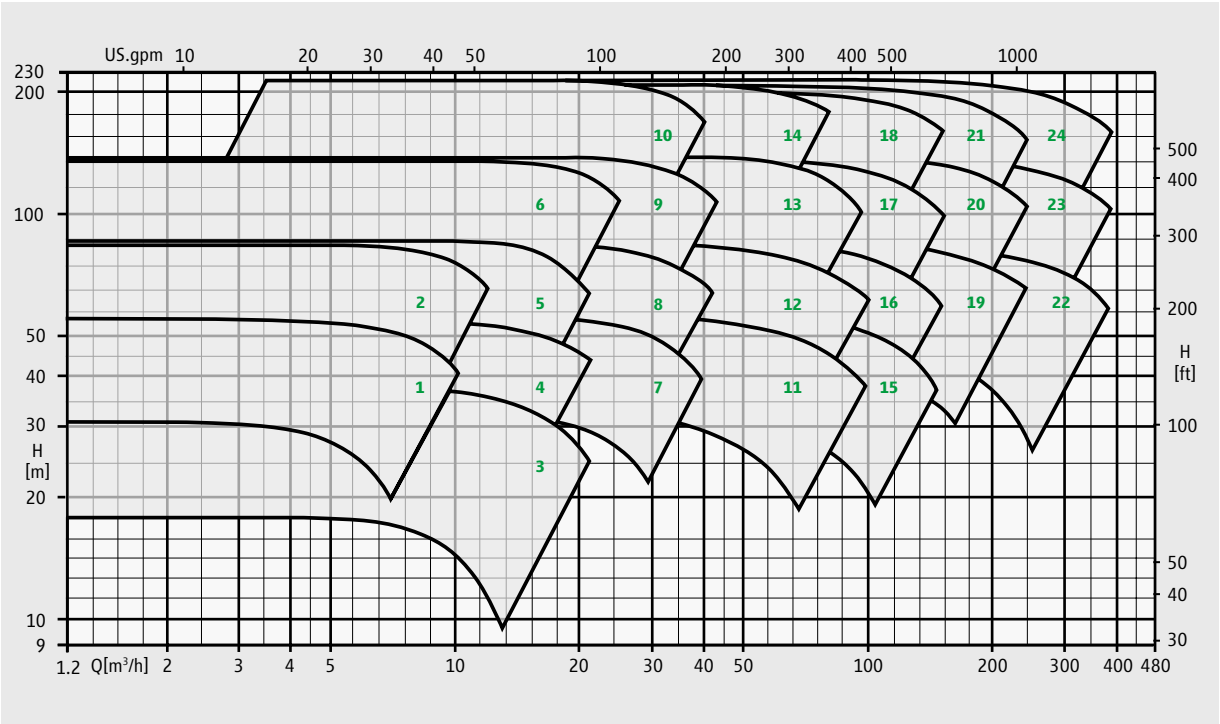
Characteristics diagram 1450 rpm 50 Hz



Denomination of hydraulics shown in the characteristics diagram

1 40-25-160	**10** 65-40-315	**19** 125-80-200	**28** 125-400	**37** 250-315
2 40-25-200	**11** 80-50-160	**20** 125-80-250	**29** 150-250	**38** 250-400
3 50-32-125	**12** 80-50-200	**21** 125-80-315	**30** 150-315	**39** 250-500
4 50-32-160	**13** 80-50-250	**22** 125-100-200	**31** 150-400	**40** 300-400
5 50-32-200	**14** 80-50-315	**23** 125-100-250	**32** 150-500	**41** 300-500
6 50-32-250	**15** 100-65-160	**24** 125-100-315	**33** 200-250	
7 65-40-160	**16** 100-65-200	**25** 100-400	**34** 200-315	
8 65-40-200	**17** 100-65-250	**26** 125-250	**35** 200-400	
9 65-40-250	**18** 100-65-315	**27** 125-315	**36** 200-500	

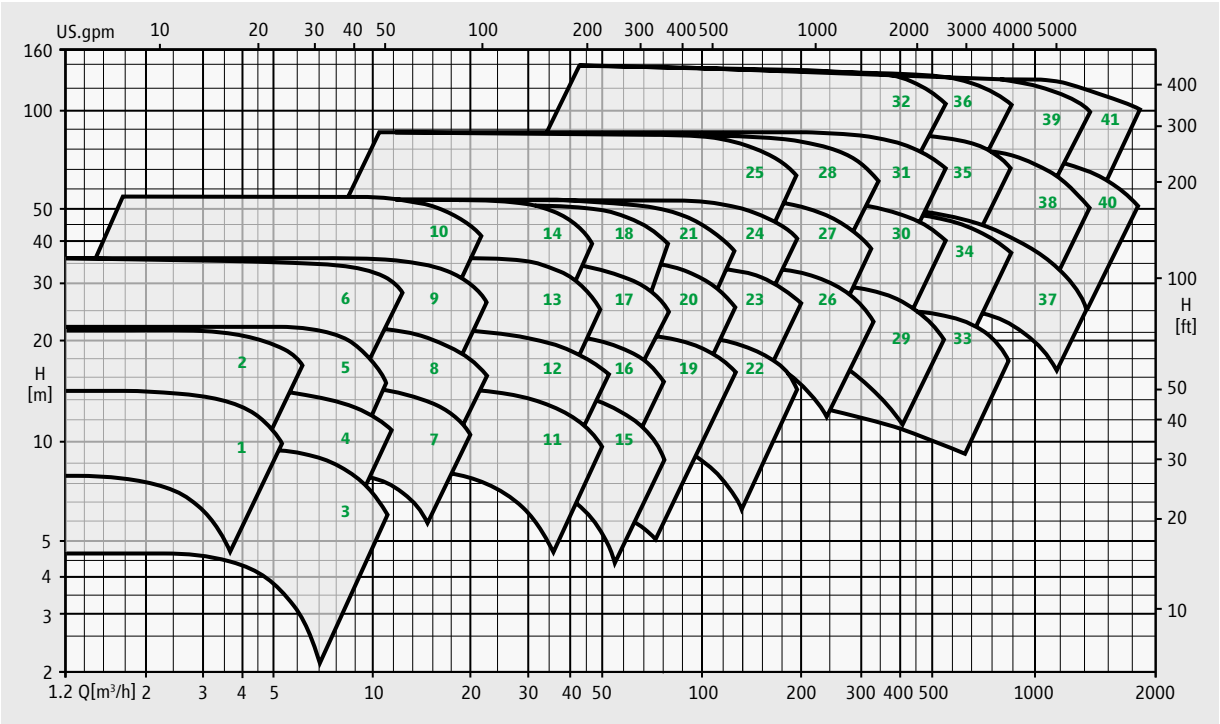
Characteristics diagram 3500 rpm 60 Hz



Denomination of hydraulics shown in the characteristics diagram

1	40-25-160	**10**	65-40-315	**19**	125-80-200
2	40-25-200	**11**	80-50-160	**20**	125-80-250
3	50-32-125	**12**	80-50-200	**21**	125-80-315
4	50-32-160	**13**	80-50-250	**22**	125-100-200
5	50-32-200	**14**	80-50-315	**23**	125-100-250
6	50-32-250	**15**	100-65-160	**24**	125-100-315
7	65-40-160	**16**	100-65-200		
8	65-40-200	**17**	100-65-250		
9	65-40-250	**18**	100-65-315		

Characteristics diagram 1750 rpm 60 Hz



Denomination of hydraulics shown in the characteristics diagram

1 40-25-160	**10** 65-40-315	**19** 125-80-200	**28** 125-400	**37** 250-315
2 40-25-200	**11** 80-50-160	**20** 125-80-250	**29** 150-250	**38** 250-400
3 50-32-125	**12** 80-50-200	**21** 125-80-315	**30** 150-315	**39** 250-500
4 50-32-160	**13** 80-50-250	**22** 125-100-200	**31** 150-400	**40** 300-400
5 50-32-200	**14** 80-50-315	**23** 125-100-250	**32** 150-500	**41** 300-500
6 50-32-250	**15** 100-65-160	**24** 125-100-315	**33** 200-250	
7 65-40-160	**16** 100-65-200	**25** 100-400	**34** 200-315	
8 65-40-200	**17** 100-65-250	**26** 125-250	**35** 200-400	
9 65-40-250	**18** 100-65-315	**27** 125-315	**36** 200-500	

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; GOST; GOST R
- 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
- Directive 94/9/EC
- GOST R; Rostechnadzor
- 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

Convincing service.

Important features are readiness, mobility, flexibility, availability and reliability. Our aim is to guarantee the maximum availability and performance of your pump.

Installation and commissioning

- service effected on site by own service technicians

Spare part servicing

- prompt and longstanding availability
- consulting service on customized spare part stockkeeping

Repair and maintenance

- professional repairs including test run executed in our headquarter
- or executed by one of our service centers 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

- individually developed concepts to increase the availability of your production facilities

Training and workshops

- Additional qualification of your staff to ensure your production

PRODUKTINFO
CN-CNF-CNK/E/12/2012

LEDERLE Hermetic

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