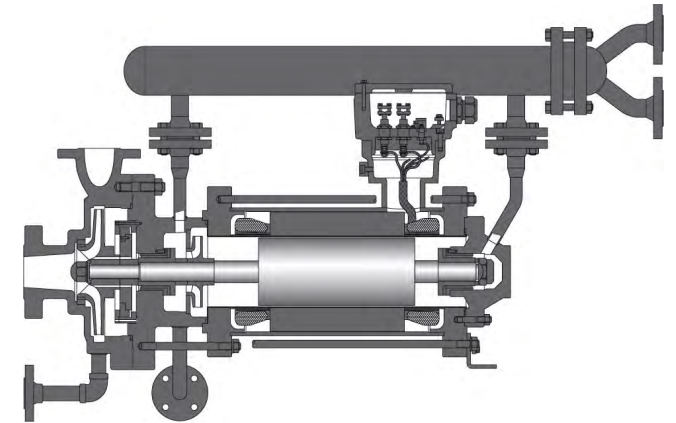
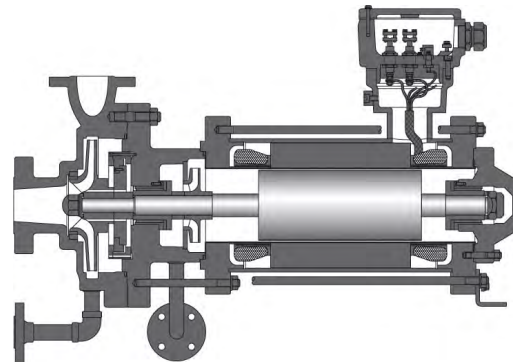
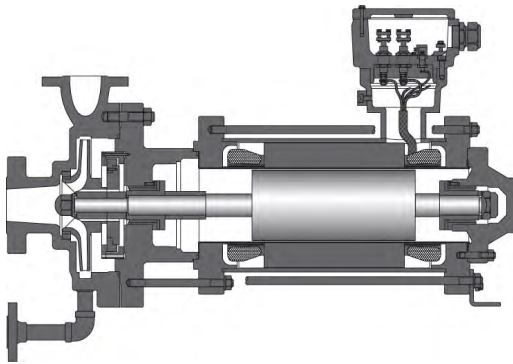


MODEL INFORMATION
CANNED MOTOR PUMPS TYPE CNP / CNPF / CNPK

HERMETIC *E-Line*

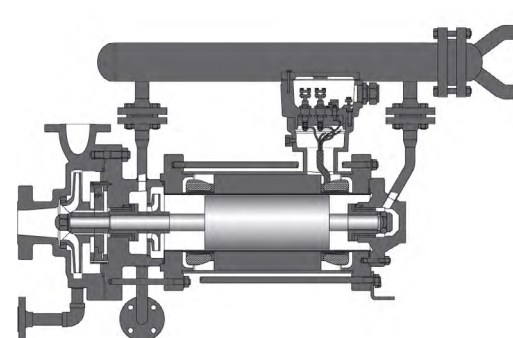
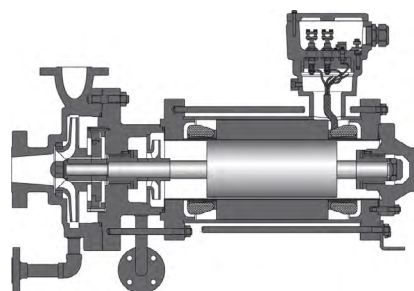
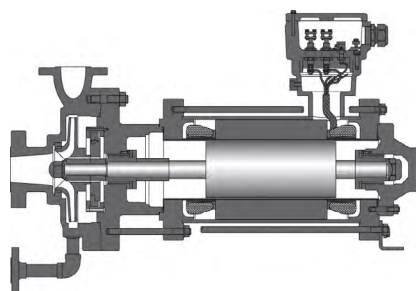


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Information

Operational areas / applications

For the safe transport of aggressive, toxic, hot, explosive, valuable and flammable liquids and liquefied gases.

Model / design

Horizontal, sealless spiral housing pumps in process design with completely closed canned motor with radial impeller, single-stage, single-flow. Design according to API 685.

Canned motor pump type CNP

The CNP model is a standard design of the HERMETIC canned motor pump and is suitable for conveying all common liquids that are not close to steam pressure (not boiling media).

Canned motor pump type CNPF

The CNPF model is the version for liquefied gases, boiling media and condensate. With an integrated auxiliary impeller and internal fluid return, it is suitable for conveying liquids close to steam pressure.

Canned motor pump type CNPK

The CNPK model is the version for conveying hot organic heat transfer oils as well as heating bath liquids.

Drive

The rotor lining, one of our core competences, is manufactured using the compact extrusion method and as a nickel-base alloy, it is an essential component of the highly efficient canned motor. The pressure-resistant enclosed version of our canned motor complies with explosion protection according to Directive 2014 / 34 / EU. The canned motor filled with liquid accelerates to the operating speed in seconds. It is wear-free and

maintenance-free during continuous operation due to the hydrodynamic sleeve bearings. The canned motor with low noise and vibration and offers double security to prevent leaks.

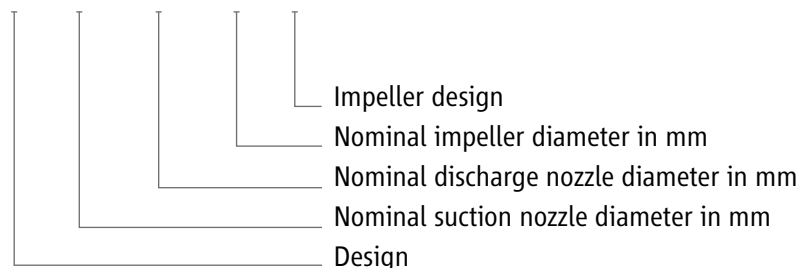
Operating data

Frequency:	50 Hz	60 Hz
Pump capacity [Q]:	max. 800 m ³ /h	max. 900 m ³ /h
Pumping head [H]:	max. 250 m	max. 300 m
Output power [P2]:	max. 520 kW	max. 622 kW
Conveyed material temperature [t] CNP / CNPF:	-120 °C to +360 °C	-120 °C to +360 °C
Conveyed material temperature [t] CNPK:	max. +425 °C	max. +425 °C
Operating pressure:	50 bar	50 bar

(Extended rating scheme available on request)

Pump and hydraulic denomination

CNP 100 x 80 x 200 B1



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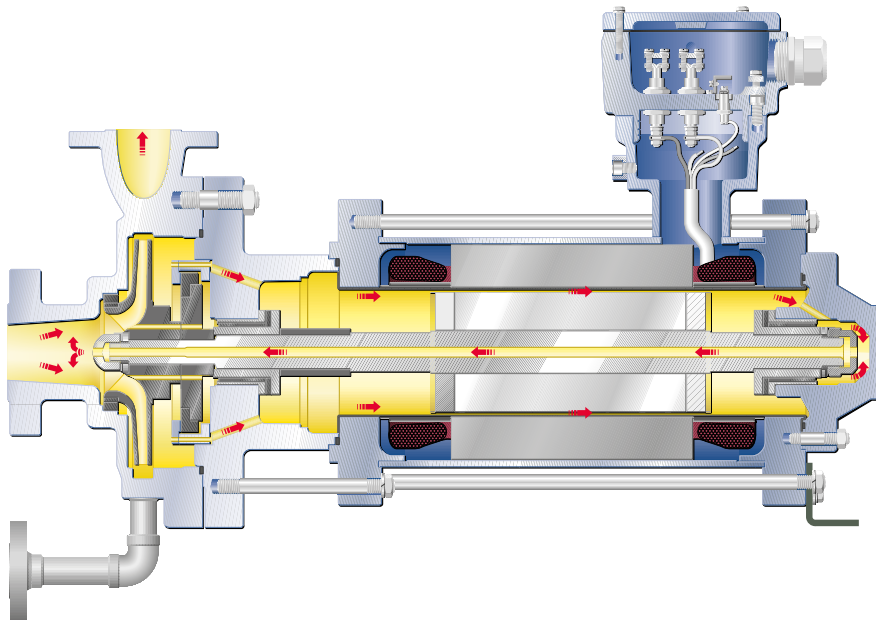
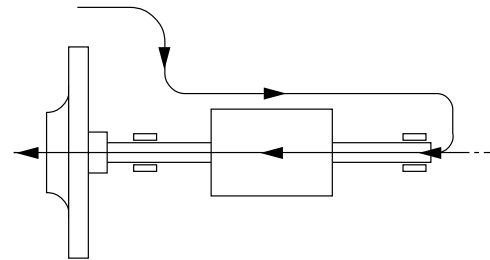
Contact



Functional principle CNP

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 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



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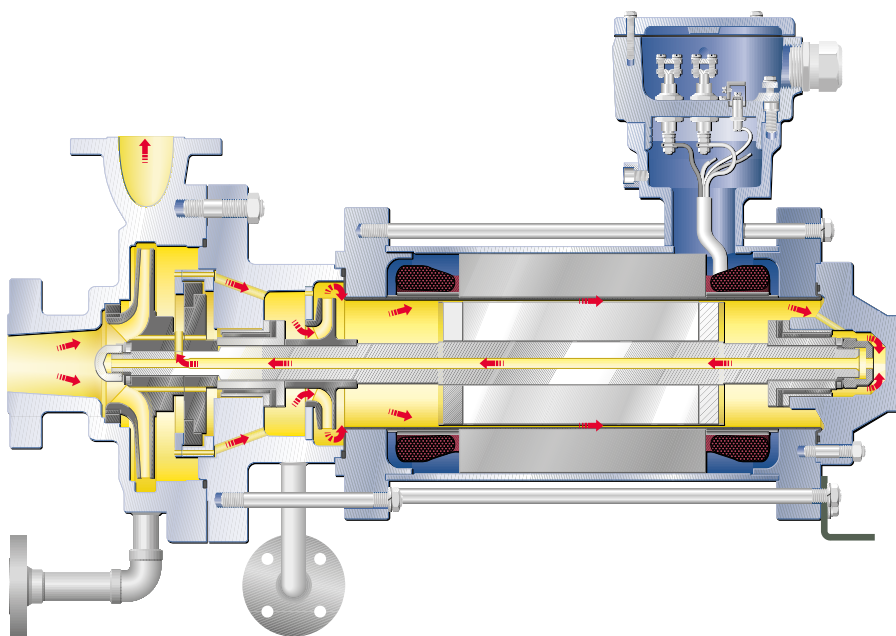
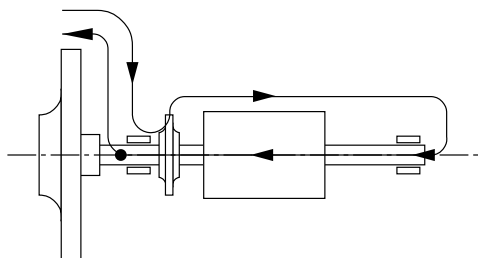
Contact



Functional principle CNPF

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



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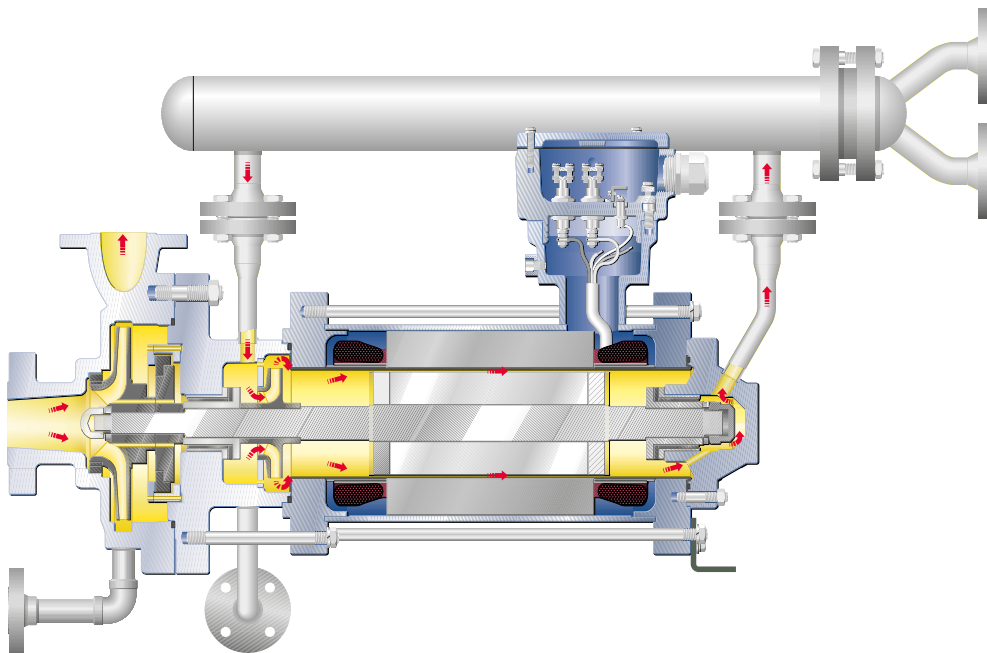
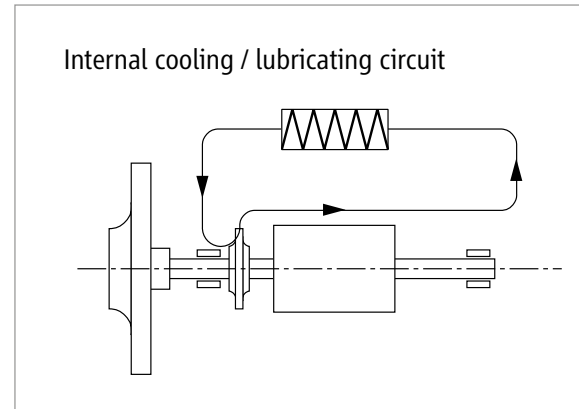
Monitoring equipment

Contact



Functional principle CNPK

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 +425 °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.



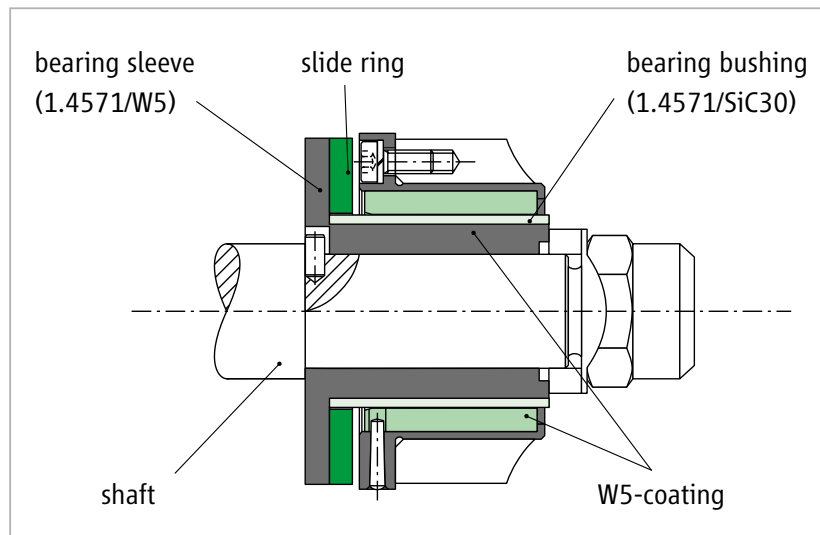
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Bearings

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.



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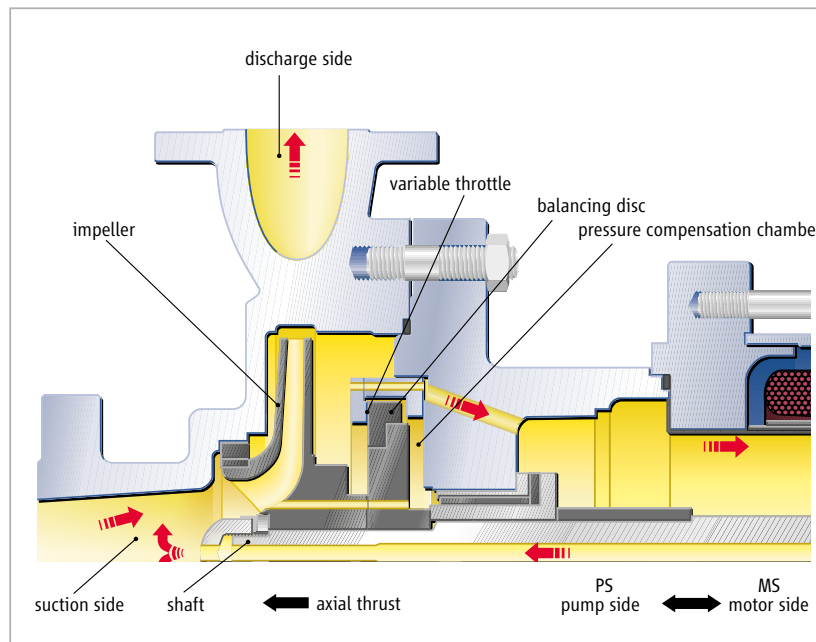
Contact



Axial thrust balancing

The development of HERMETIC pump systems depended on the solution of a central problem, namely the elimination of axial thrust at the rotor equipment. The various fluid properties exclude the possibility of using mechanical axial bearings. The only generally valid solution to this problem thus lay in hydraulic balance of the rotor.

The hydraulic balancing device of range CNP / CNPF / CNPK is based on a variable throttling device on the balancing disc. Depending on the rotor's axial position the pressure within the pressure compensation chamber may change due to the valve effect caused by the variable throttling clearance and thus, it works against the rotor's axial thrust. The pressure within the pressure compensation chamber consequently changes due to the axial position of the rotor. The axial position of the pump shaft is automatically regulated during operation so that a balanced condition is created by itself and thus, there are no effects by axial forces on the axial bearing collar of the slide bearings.



ZART®

simply best balance

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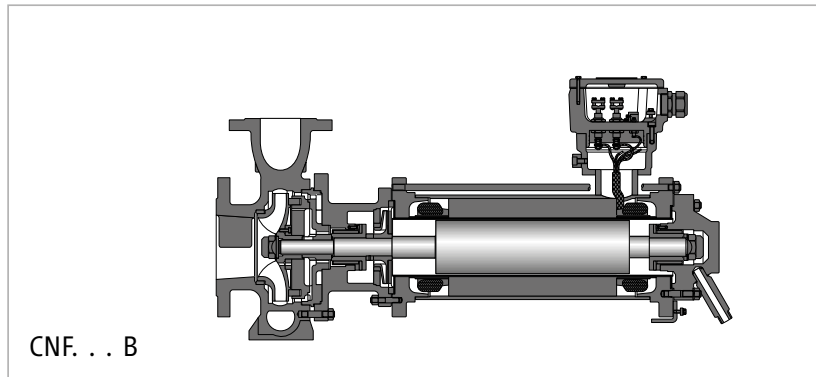
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Design

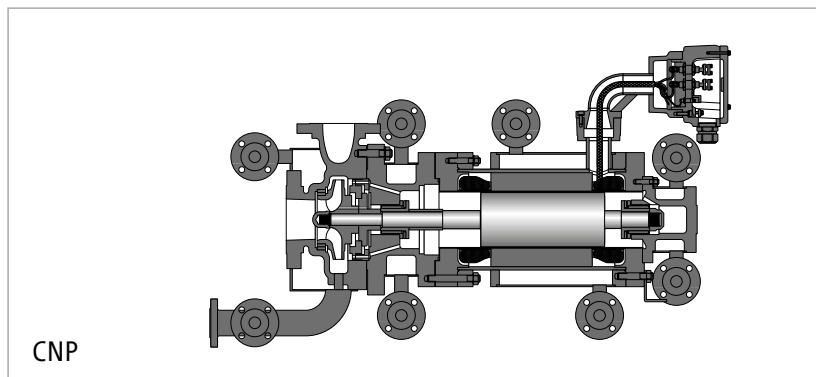
Medium Duty Design

The food-mounted construction with casing according to OH1 (API 610) and flange acc. to ANSI 150 lbs is a feature of this design. This alternative design can be used for each application that do not require a "heavy duty design" according to API 685.



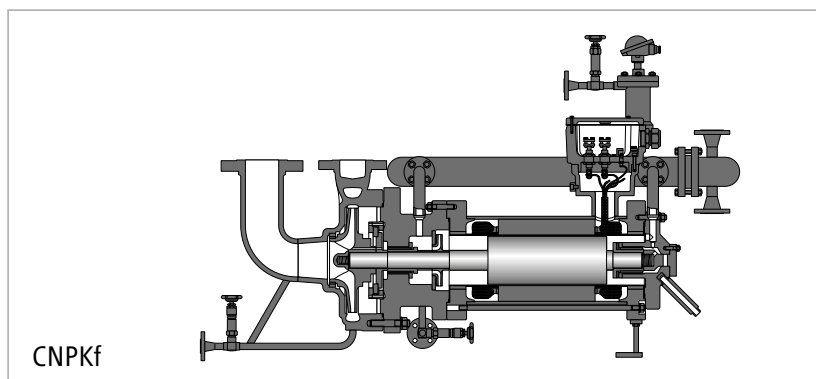
Completely heatable / coolable construction

With heating / cooling jacket on pump casing, motor casing, intermediate lantern and bearing cover. Thus, even liquids with high or different viscosity values (such as, e.g. sulfur, phenol, acrylonitrile) can be conveyed.



Top-Top configuration

In case of high-temperature applications, the suction and pressure flange can be designed vertically (the so-called TOP-TOP configuration) according to API requirements. Thus, the tubing can be effected more easily and the number of possibly required tube bends can be reduced.



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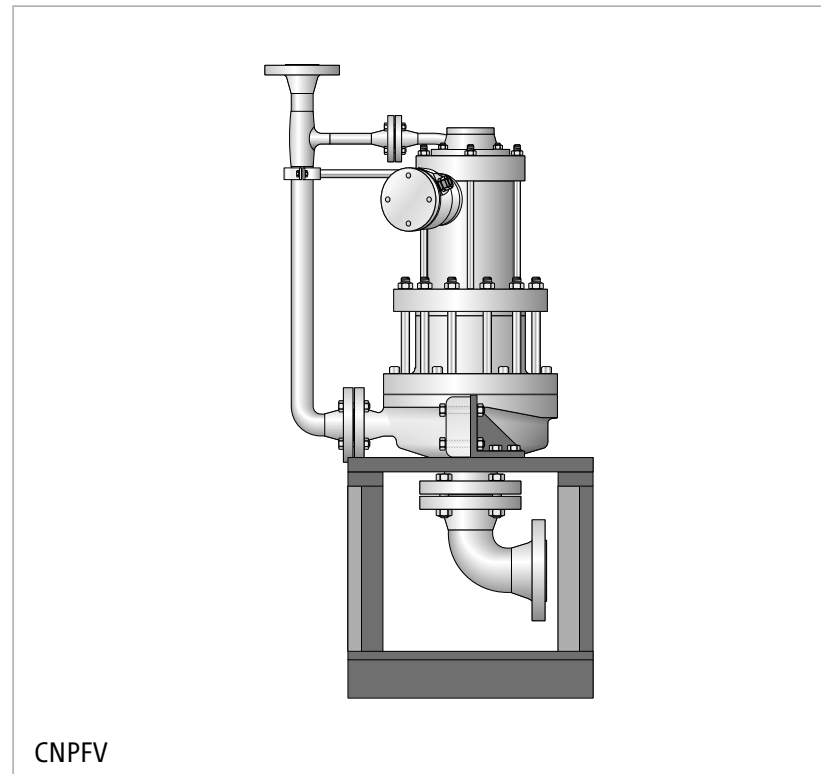
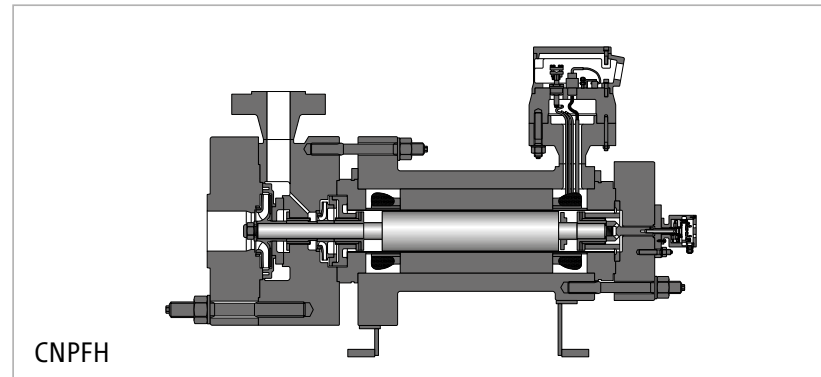
Design

High system pressures

High system pressures (up to 1200 bar) can be handled by canned motor pumps in a technically simple manner. The wall thickness of the outer components corresponds to the required pressure rate.

Pressure gases / liquefied gases

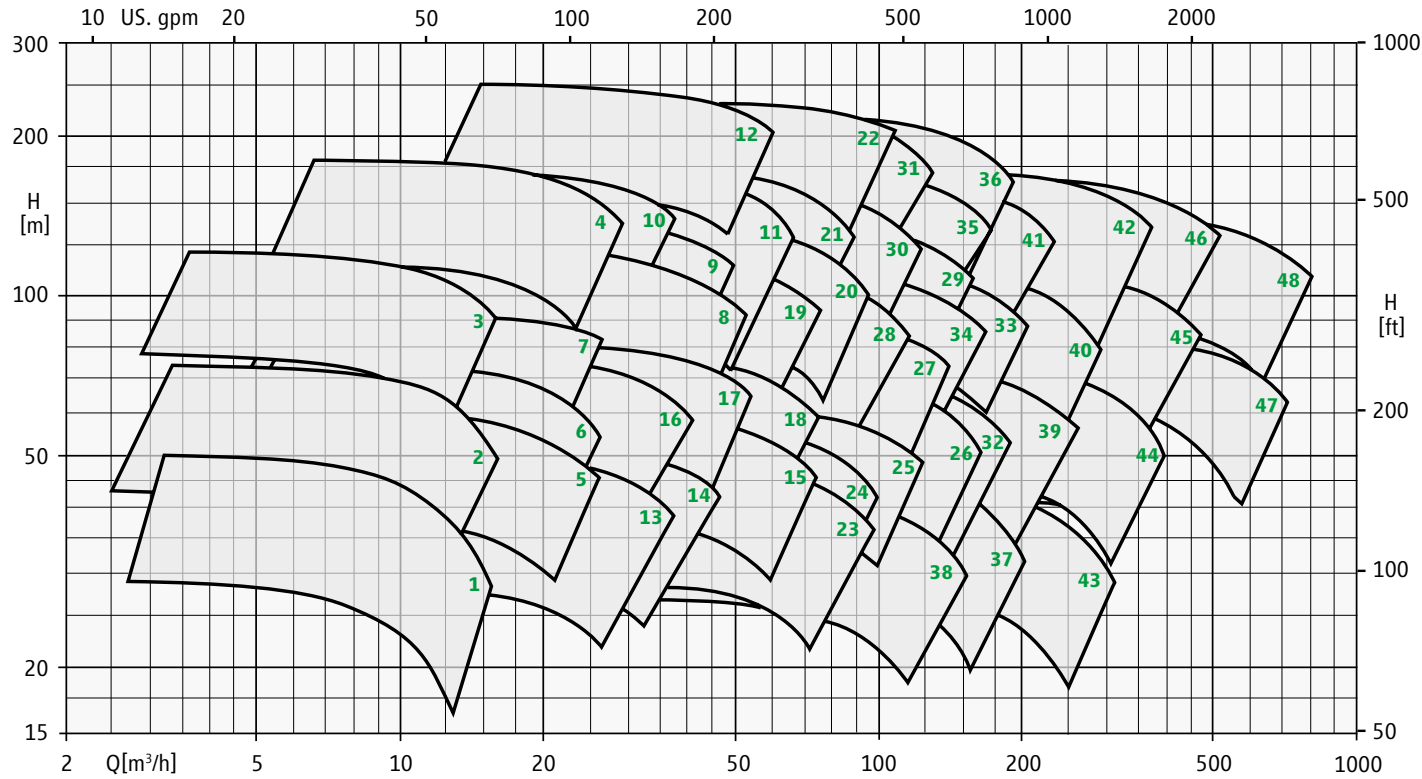
Due to the low viscosity and the resulting reduced capacity of the slide bearings, the pump can be erected vertically. In this case, the slide bearings do not have support properties, but only a leading function. The rotor weight is hydrostatically supported here.



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2950 rpm 50 Hz



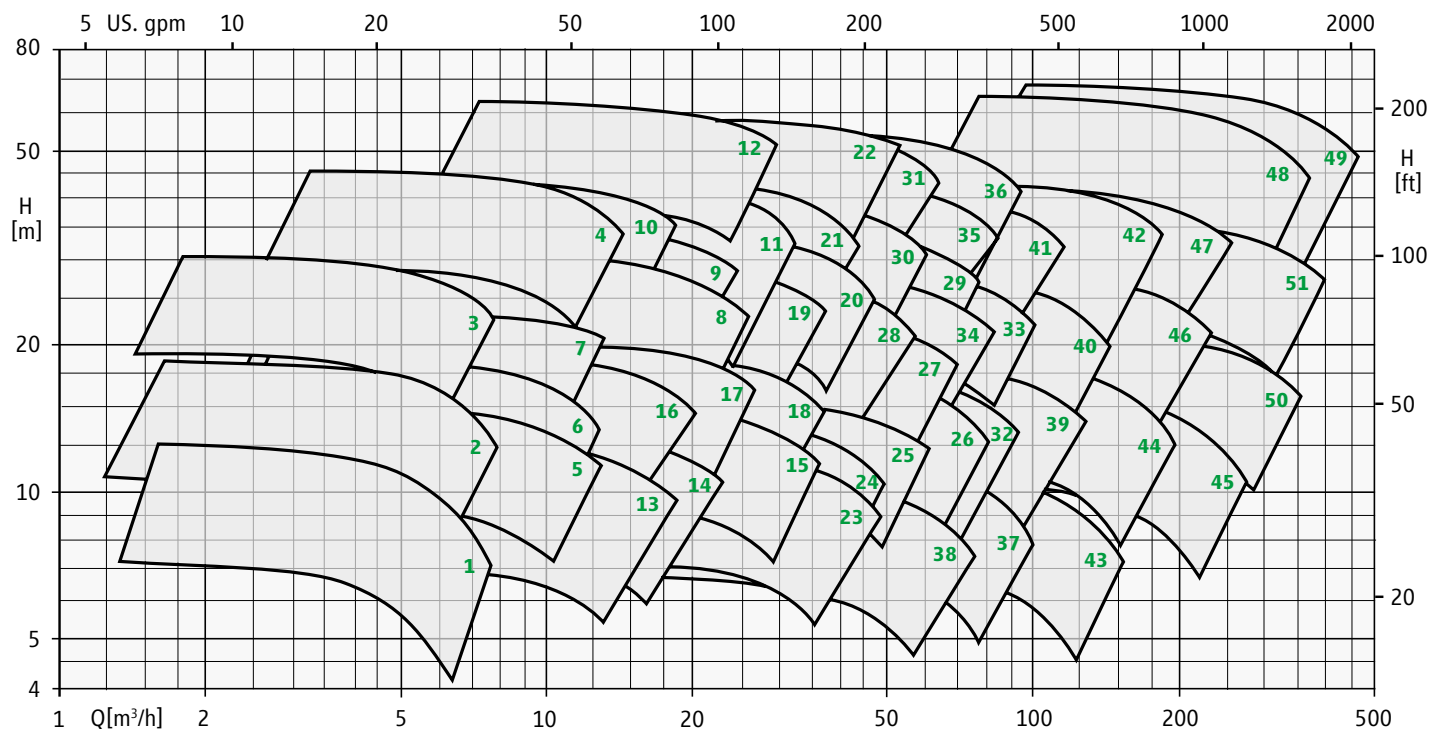
Denomination of hydraulics shown in the characteristics maps

1 50x25x190	8 80x40x290	15 80x50x200	22 100x50x400	29 100x80x320	36 150x80x400	43 150x150x190
2 50x25x230	9 80x40x320	16 80x50x230A	23 100x80x190	30 100x80x350	37 150x100x190A	44 150x150x230
3 80x25x290	10 100x40x350A	17 80x50x230B	24 100x80x200A	31 100x80x430	38 150x100x190B	45 200x150x290
4 100x25x350	11 100x40x350B	18 100x50x230	25 100x80x200B	32 150x80x230	39 150x100x230	46 200x150x350A
5 80x40x200	12 100x40x400	19 100x50x290	26 100x80x230	33 150x80x290A	40 150x100x290	47 200x200x250
6 80x40x230	13 80x50x190A	20 100x50x320	27 100x80x250	34 150x80x290B	41 150x100x350A	48 200x200x320
7 80x40x250	14 80x50x190B	21 100x50x350	28 100x80x290	35 150x80x350	42 150x100x350B	

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1475 rpm 50 Hz



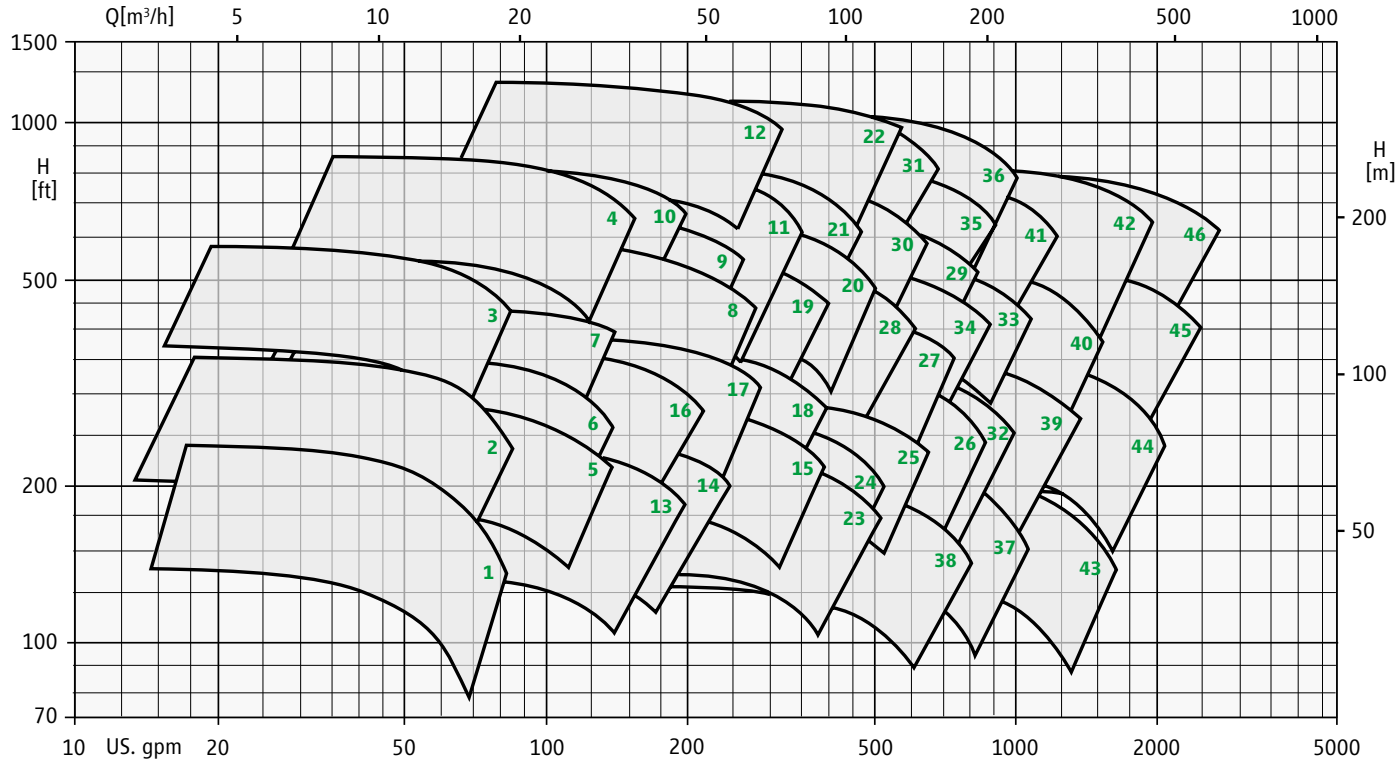
Denomination of hydraulics shown in the characteristics maps

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2 50x25x230	9 80x40x320	16 80x50x230A	23 100x80x190	30 100x80x350	37 150x100x190A	44 150x150x230	51 200x200x320
3 80x25x290	10 100x40x350A	17 80x50x230B	24 100x80x200A	31 100x80x430	38 150x100x190B	45 200x150x230	
4 100x25x350	11 100x40x350B	18 100x50x230	25 100x80x200B	32 150x80x230	39 150x100x230	46 200x150x290	
5 80x40x200	12 100x40x400	19 100x50x290	26 100x80x230	33 150x80x290A	40 150x100x290	47 200x150x350A	
6 80x40x230	13 80x50x190A	20 100x50x320	27 100x80x250	34 150x80x290B	41 150x100x350A	48 200x150x430A	
7 80x40x250	14 80x50x190B	21 100x50x350	28 100x80x290	35 150x80x350	42 150x100x350B	49 200x150x430B	

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3550 rpm 60 Hz



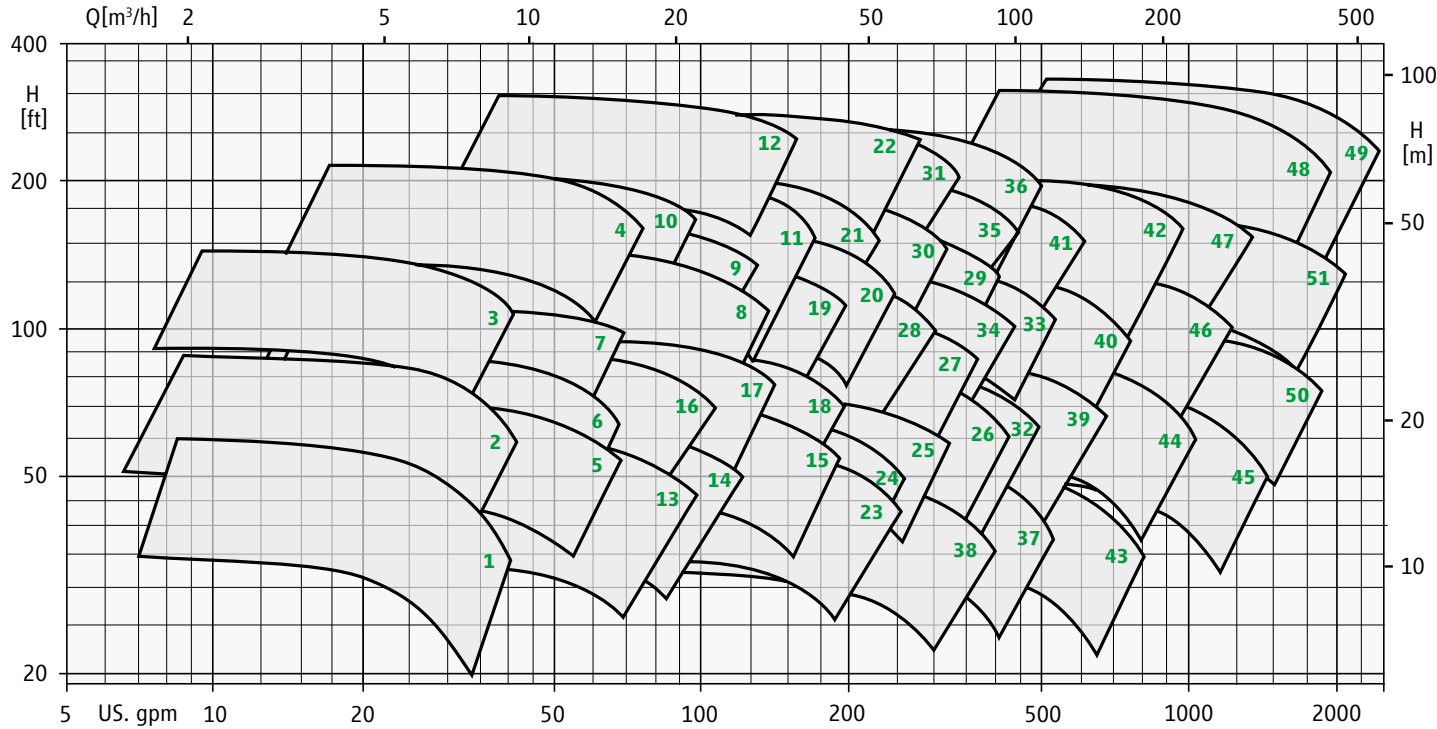
Denomination of hydraulics shown in the characteristics maps

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3 80x25x290	10 100x40x350A	17 80x50x230B	24 100x80x200A	31 100x80x430	38 150x100x190B	45 200x150x290
4 100x25x350	11 100x40x350B	18 100x50x230	25 100x80x200B	32 150x80x230	39 150x100x230	46 200x150x350A
5 80x40x200	12 100x40x400	19 100x50x290	26 100x80x230	33 150x80x290A	40 150x100x290	
6 80x40x230	13 80x50x190A	20 100x50x320	27 100x80x250	34 150x80x290B	41 150x100x350A	
7 80x40x250	14 80x50x190B	21 100x50x350	28 100x80x290	35 150x80x350	42 150x100x350B	

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1775 rpm 60 Hz



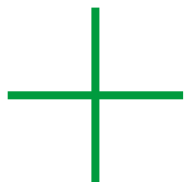
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1 50x25x190	8 80x40x290	15 80x50x200	22 100x50x400	29 100x80x320	36 150x80x400	43 150x150x190	50 200x200x250
2 50x25x230	9 80x40x320	16 80x50x230A	23 100x80x190	30 100x80x350	37 150x100x190A	44 150x150x230	51 200x200x320
3 80x25x290	10 100x40x350A	17 80x50x230B	24 100x80x200A	31 100x80x430	38 150x100x190B	45 200x150x230	
4 100x25x350	11 100x40x350B	18 100x50x230	25 100x80x200B	32 150x80x230	39 150x100x230	46 200x150x290	
5 80x40x200	12 100x40x400	19 100x50x290	26 100x80x230	33 150x80x290A	40 150x100x290	47 200x150x350A	
6 80x40x230	13 80x50x190A	20 100x50x320	27 100x80x250	34 150x80x290B	41 150x100x350A	48 200x150x430A	
7 80x40x250	14 80x50x190B	21 100x50x350	28 100x80x290	35 150x80x350	42 150x100x350B	49 200x150x430B	

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Advantages of the canned motor pump



Best Available Pump Technology according to IPCC / TA-LUFT

Leakage-free, long-lasting operation: protection of personnel and environment

No shaft seals

Low space requirement

High level of reliability

Low expenditure for repairs / spare parts

Simple assembly and installation

Long service life of pump and motor

Low life cycle costs

Very smooth running

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Advantages of the canned motor pump

100 % tightness by two safety casings

Corrosion-resistant rotor lining

Explosion-proof motor (2014 / 34 / EU), vacuum-dried N₂-inertised

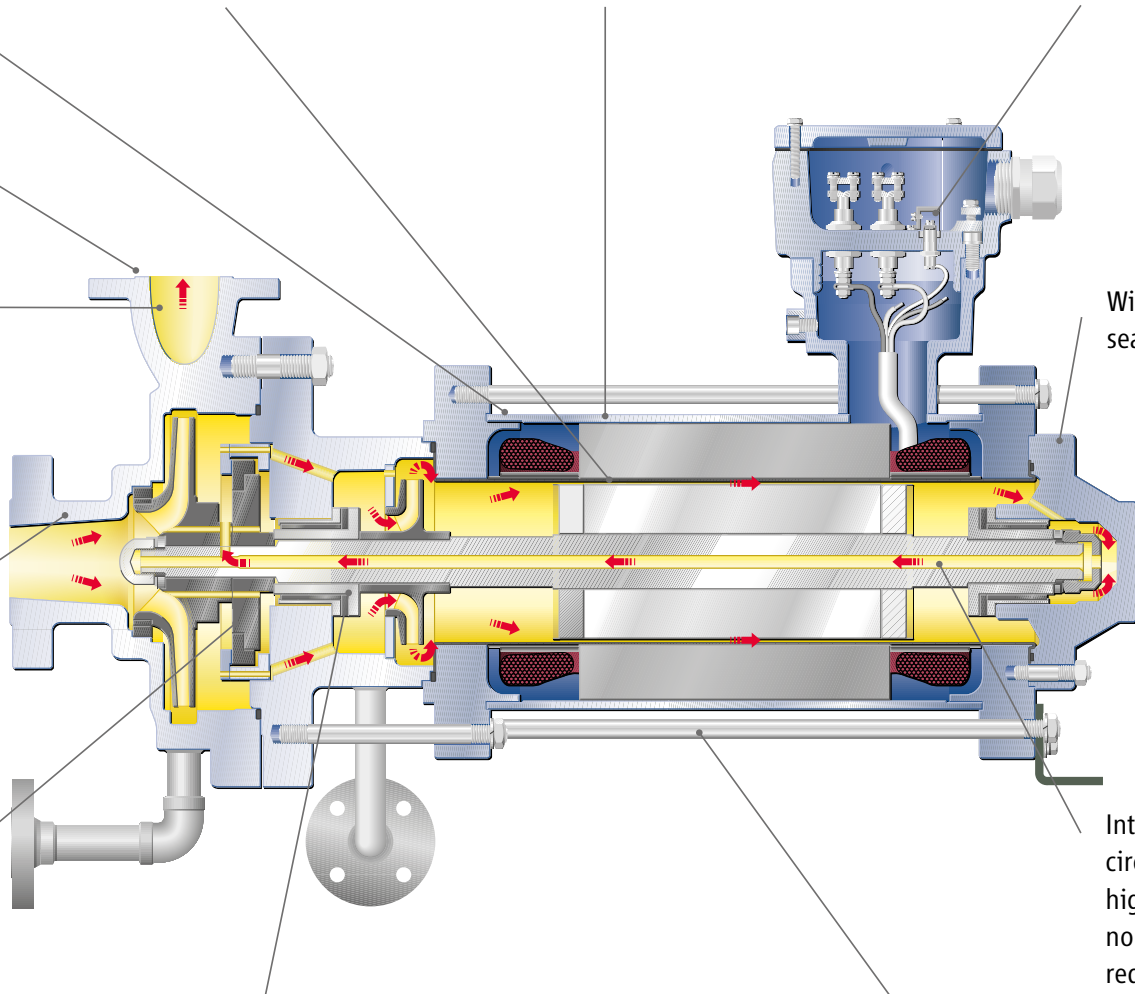
Thermal motor protection to prevent overload

Standardised flange connections according to ANSI

High level of functional safety by self-venting

Centerline-mounted hydraulics in block design

Contactless operation by hydrodynamic axial thrust balancing (ZART®)



Wear-resistant and smooth running slide bearing (no roller bearings subject to wear)

No coupling (no alignment of pumps / motor shaft required)

Without shaft seal / sealing system

Internal partial flow circulation (also for high steam pressures), no external return line required

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Materials

VDMA No.	Parts designation	Model CNP / CNPF / CNPK			
		Material class S-5 Carbon steel	Material class S-6 Carbon steel / Chrome steel	Material class C-6 Chrome steel	Material class A-8 Stainless steel
		Pressure rating PN 50	Pressure rating PN 50	Pressure rating PN 50	Pressure rating PN 50

Parts coming into contact with conveying fluid

102	Volute casing	1. 0619	1. 0619	1. 4317	1. 4409
230	Impeller	1. 0619	1. 4317	1. 4317	1. 4409
230	Auxiliary impeller ⁽¹⁾	JS 1025	1. 4408	1. 4408	1. 4408
472	Slide ring	PTFE / K	PTFE / K	PTFE / K	PTFE / K
502	Wear ring	1. 4028	1. 4028	1. 4028	1. 4404
503	Impeller wear ring	1. 4028	1. 4028	1. 4028	1. 4404
529	Bearing sleeve	1. 4571 / W5 ⁽²⁾	1. 4571 / W5 ⁽²⁾	1. 4571 / W5 ⁽²⁾	1. 4571 / W5 ⁽²⁾
545	Bearing bush	1. 4571 / SiC30	1. 4571 / SiC30	1. 4571 / SiC30	1. 4571 / SiC30
816	Stator liner	Hastelloy C4	Hastelloy C4	Hastelloy C4	Hastelloy C4
817	Rotor liner	1. 4571	1. 4571	1. 4571	1. 4571
819	Motor shaft	1. 4021	1. 4021	1. 4021	1. 4571 / 1. 4462

Parts that do not come into contact with conveying liquid

811	Motor casing	1. 0254	1. 0254	1. 0254	1. 0254
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special materials / higher pressure ratings are possible on demand

(1) parts only for CNPF and CNPK

(2) tungsten carbide coating

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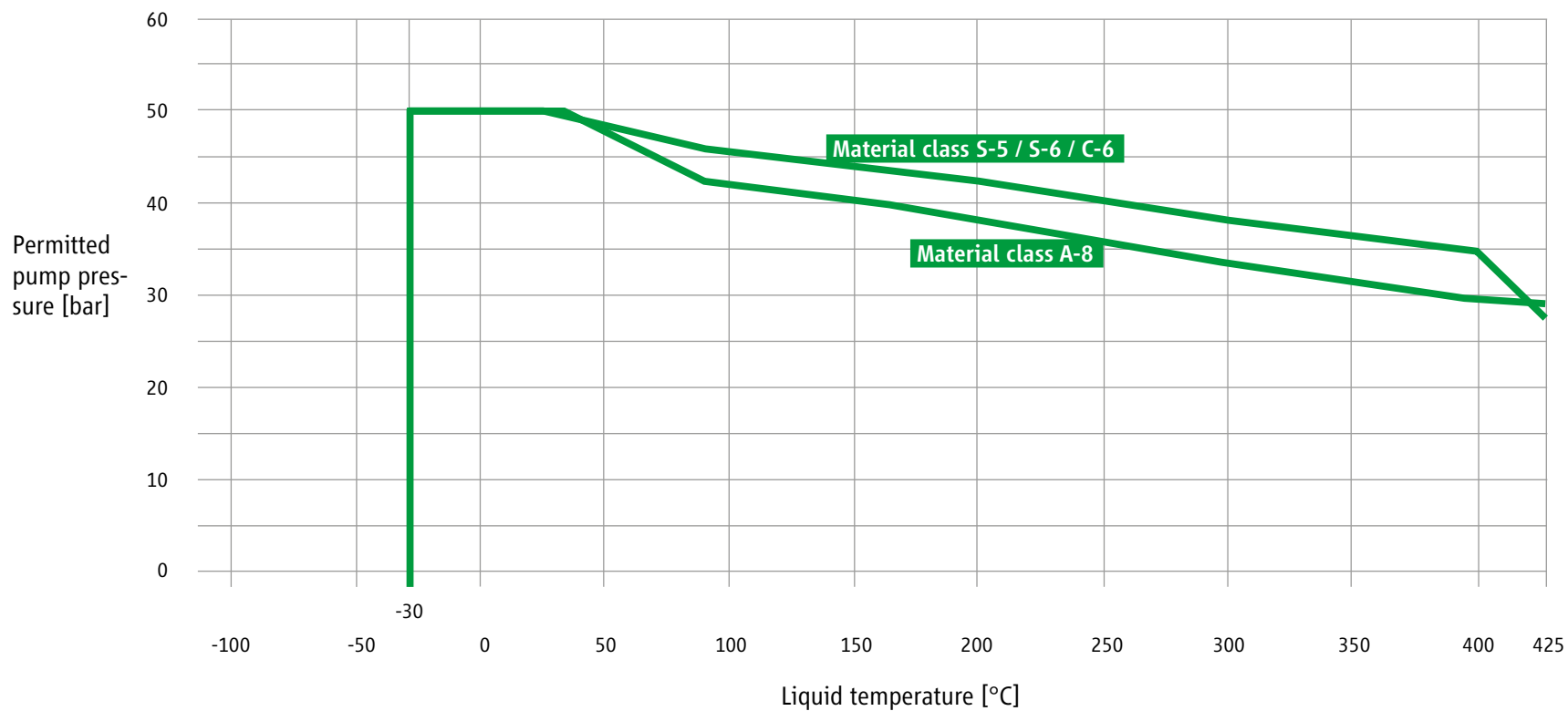
Monitoring equipment

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Pressure and temperature limits

Material class S-5, S-6, C-6 and A-8




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Canned motors

Canned motor data

Output power P2:	max. 520 kW (50 Hz) / max. 622 kW (60 Hz)
Voltage (±10%) / frequency / circuit:	400V / 50 Hz / delta 480V / 60 Hz / delta 500V / 50 Hz / delta 600V / 60 Hz / delta 690V / 50 Hz / star (all canned motors are suitable for inverter operation)
Insulation class:	H-180 / C-220 / C-400
Operating mode:	S1 according to EN 60034-1
Protection class:	IP 67 (stator), IP 55 (terminal box)
Motor protection in winding:	Thermistor KL180 (for H-180 winding), Thermistor KL210 (for C-220 winding), alternative PT100 Thermometer (for all windings) / PT100 for C-400 winding (inclusive)
Rotation monitoring:	ROMi (from motor size N34 / T34)
Explosion protection according to Directive 2014 / 34 / EU Incl. EC type-examination certificate Marking:  II 2 G Ex de IIC T1 to T6*	(*) Based on the requirements of the non-electrical explosion protection, the gas groups are classified as follows: Thickness of coating > 200 µm – gas group IIB Thickness of coating ≤ 200 µm – gas group IIC

Noise expectancy values [examples of different motor sizes]

Motors	N34L-2	N34XL-2	N54XL-2	N64XL-2
Output power [P2 at 50 Hz]	8.0 kW	14.8 kW	24.0 kW	41.0 kW
max. expected sound pressure level dB(A) at 50 Hz	57	59	61	64
Output power [P2 at 60 Hz]	10.5 kW	17.2 kW	27.0 kW	48.0 kW
max. expected sound pressure level dB(A) at 60 Hz	58	60	62	64

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Documentation and tests

Documentation according to HERMETIC Standard, consisting of:

Operating manual for the HERMETIC pump

Technical specifications

Sectional drawings with position numbers

Dimensional drawing

Cable connection diagram

Acceptance report and pump characteristic curve

Electric test report

Slip ring report / gap size report, slide bearing clearancies

EC type-examination certificate PTB 99 ATEX

EU Declaration of Conformity

Standard tests

Hydrostatic pressure test with 1.5x nominal pressure

Test run according to DIN EN ISO9906, Class 2 B (5 measuring points)

Balancing of the shaft and impeller according to DIN ISO 1940, 6.3
[without report]

Axial thrust measurement

Leak test for the complete pump with N₂ at 6 bar

Additional testing possible on request, e.g.:

NPSH-test / Helium leakage test / vibration test

ultrasonic test / PMI-test

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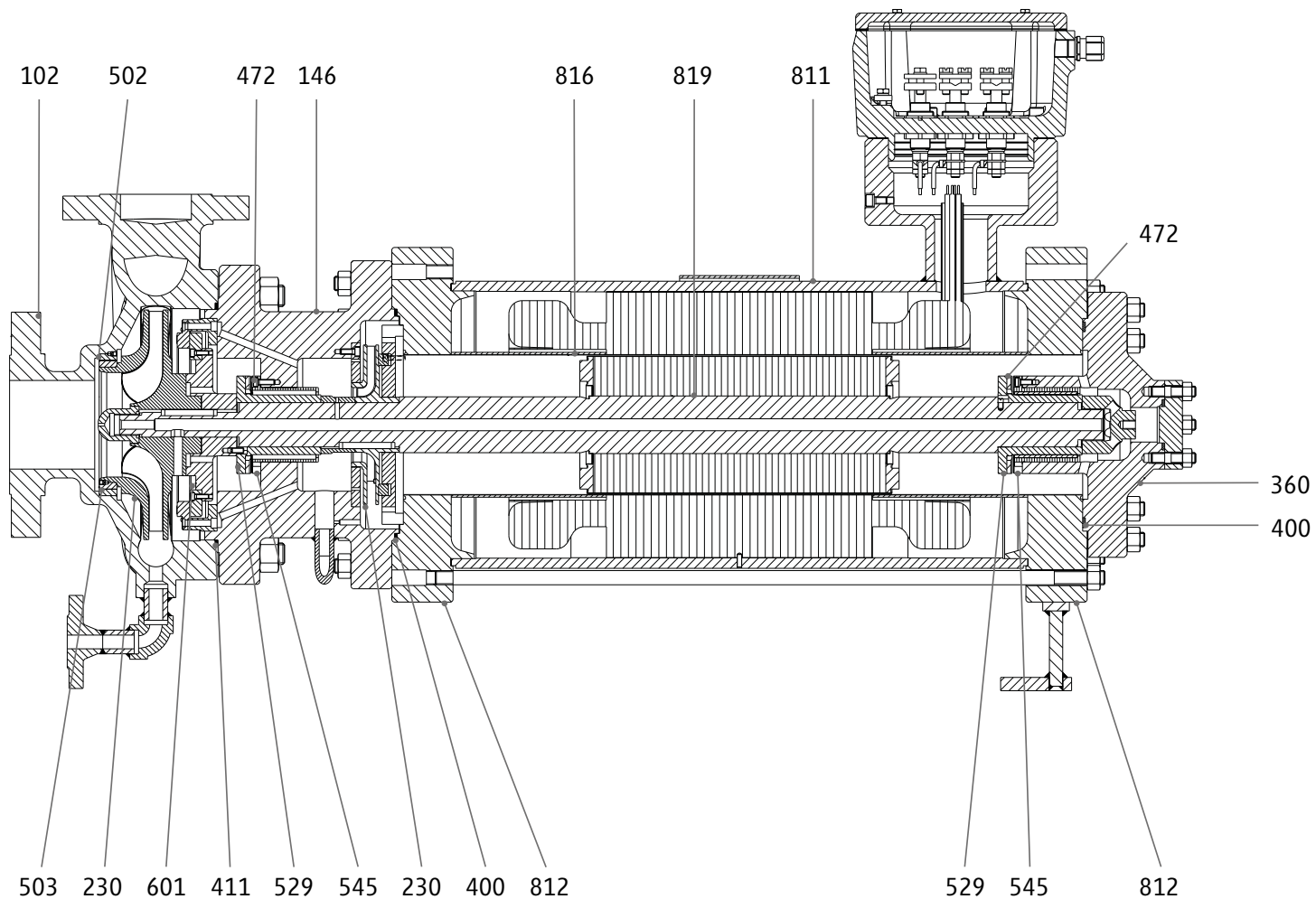
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Reduced part list / example for pump type CNPF



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Reduced part list

VDMA Pos.	Name
102	Volute casing
411	Spiral wound
502	Wear ring
503	Impeller wear ring
601	Balancing disc
146	Intermediate lantern
545	Bearing bush
400	Gasket

816	Stator liner
812	Motor casing cover, front
812	Motor casing cover
811	Motor casing
360	Bearing cover
545	Bearing bush

Refer to the relevant assembly drawing for the full list of the complete parts. These from part of the standard documentation.

VDMA Pos.	Name
819	Motor shaft
230	Impeller
529	Bearing sleeve
230	Auxiliary impeller (*)
472	Slide ring

(*) only CNPF and CNPK

Recommended spare parts stock

For two-year operation: **none**

For overhaul: **for each pump**

4 pcs. Pos. 400 gasket

4 pcs. Pos. 411 spiral wound

2 pcs. Pos. 529 bearing sleeve

2 pcs. Pos. 545 bearing bush

2 pcs. Pos. 472 slide ring

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Overview of the safety- and function-related monitoring equipment

Hermetically sealed 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 of the pumped liquid for detecting and avoiding dry run

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 according to directive 2014 / 34 / EU. 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 for detecting and avoiding inadmissible high temperatures in the pump and the motor

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 according to directive 2014 / 34 / EU. 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 for detecting and avoiding axial wear

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 for detecting and avoiding incorrect phase sequence

The correct rotating direction of hermetically sealed 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, hermetically sealed centrifugal pumps with canned motor are equipped with an electronic rotation monitor in the form of a phase sequence relay.

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Overview of the safety- and function-related monitoring equipment

Level monitoring of the pumped liquid for detecting and avoiding dry running



Level monitoring by / with:

- KSR magnetic float switch [LS]
- Vibration limit switch [LS]
- Optoelectronic liquid level limit transducer [LS]

Temperature monitoring for detecting and avoiding inadmissible high temperatures in the pump and the motor



Temperature monitoring by / with:

- Resistance thermometer PT100 [TI]
- Thermistor [TS]

Rotor position monitoring for detecting and avoiding axial wear



Rotor position monitoring by / with:

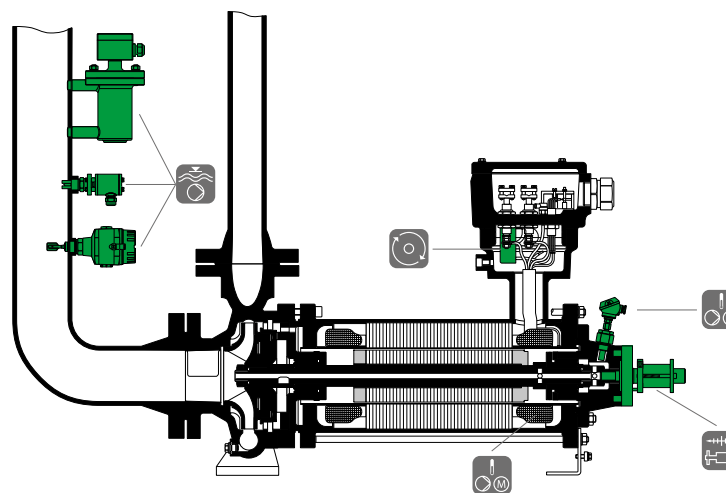
- MAP [GI]

Rotation monitoring for detecting and avoiding incorrect phase sequence



Rotation monitoring by / with:

- ROMi [GS]



Example shown

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MODEL INFORMATION

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Model information CNP-CNPF-CNPK / E / 02 / 2019

All information given in this document corresponds to the state of the art at the time of print.
We reserve the right to make technical improvements and changes at any time.


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