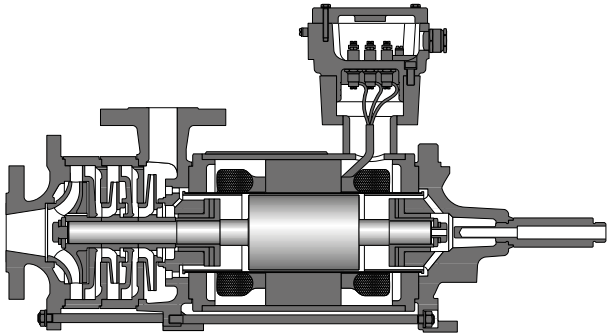
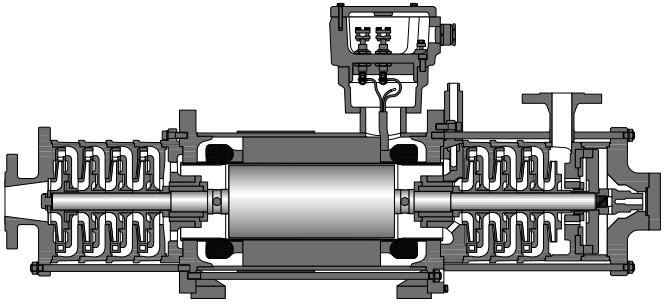
LEDERLE Hermetic

PRODUCT INFORMATION
CANNED MOTOR PUMPS TYPE CAM / CAM-TANDEM

HERMETIC *E-Line*





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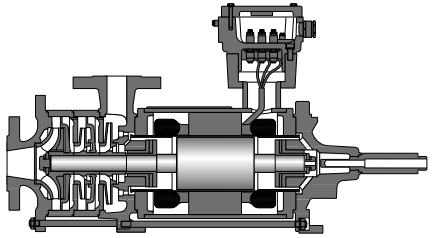

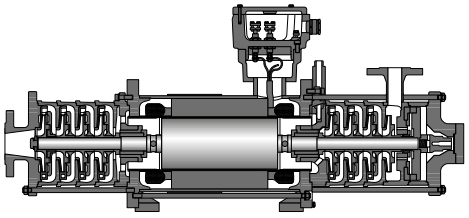

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Operational areas / applications
For the safe transport of aggressive, toxic, hot, explosive, valuable and flammable liquids and liquefied gases

Model / design
Horizontal, sealless section-type pumps with completely closed canned motor, with radial impellers, multi-stage, single-flow

Canned motor pump type CAM and CAM-Tandem
This pump is suitable for conveying liquids close to steam pressure and also for standard applications.

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 700 m^3/h	max 850 m^3/h
Pumping head [H]:	max 1650 m	max 2000 m
Output power [P2]:	max 520 kW	max 622 kW
Conveyed material temperature [t]:	–120 °C to +360 °C	–120 °C to +360 °C
Operating pressure:	25 to 500 bar	25 to 500 bar

(Extended rating scheme available on request)

Pump and hydraulic denomination

CAM XX 44 / 6 (Model series CAM)

(*) possible design options
H = high pressure design
K = with separate heat exchanger
T = barrel design
V = vertical design

- Number of stages
- Size
- Design option (*)
- Model series

CAM XX 44 / 3 + 2 (Model series CAM-Tandem)

(**) possible design options
H = high pressure design
T = barrel design
V = vertical design

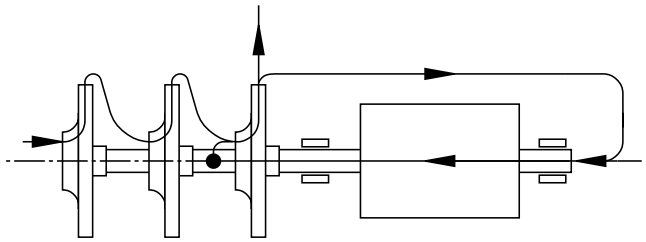
- Number of stages on pressure side
- Number of stages on suction side
- Size
- Design option (**)
- Model series

Functional principle

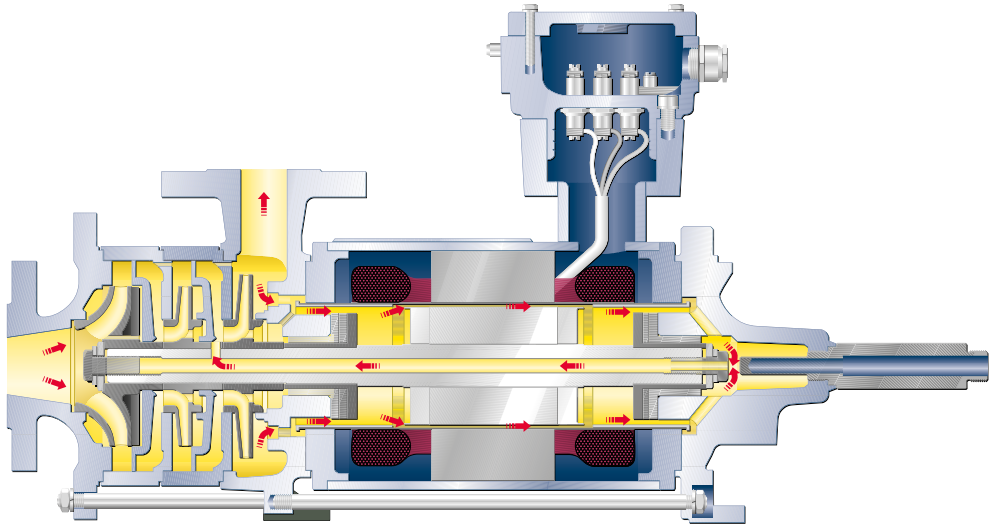
CAM

The pump output is delivered through the impellers and diffusers arranged one behind the other to the pressure nozzle and in this way an increase in pressure is achieved depending on the number of stages. The partial flow for cooling the motor and lubricating the slide bearings is tapped off on pressure side after the last impeller and after flowing through the motor is lead out again through the hollow shaft between the stages. Since, as a result, no heated part of the delivery flows back to the suction side consi derably more stable NPSH values are produced in the part load range. Aggregates of multistage design can therefore be used for considerably smaller pumping capacities, than pumps of single-stage design

Main and partial flow



CAM

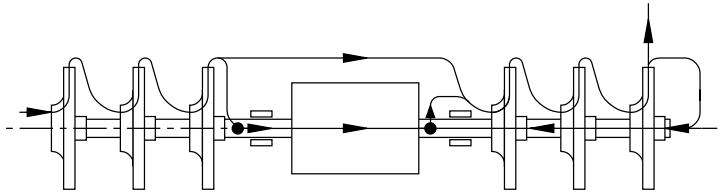


Functional principle

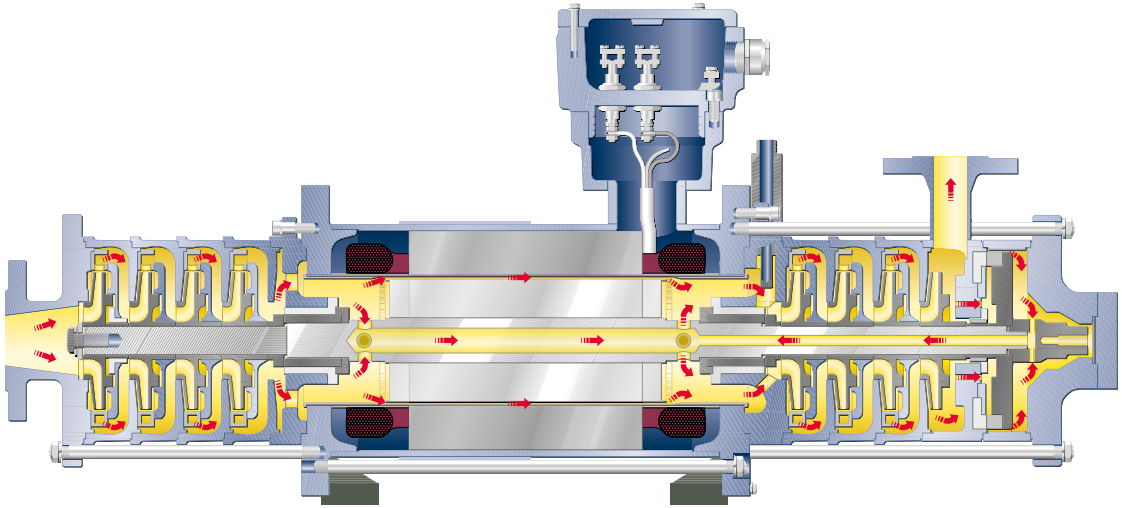
CAM-Tandem

Very high pressure differences with compact design can be achieved with this set in which the stages are arranged on both sides of the canned motor. The total quantity pumped flows through the canned motor and at the same time carries away the motor heat loss. Since, as a result, no heated part of the delivery flows back to the suction side considerably more stable NPSH values are produced in the part load range. Aggregates of Tandem design can therefore be used for considerably smaller pumping capacities, than pumps of single-stage design

Main and partial flow

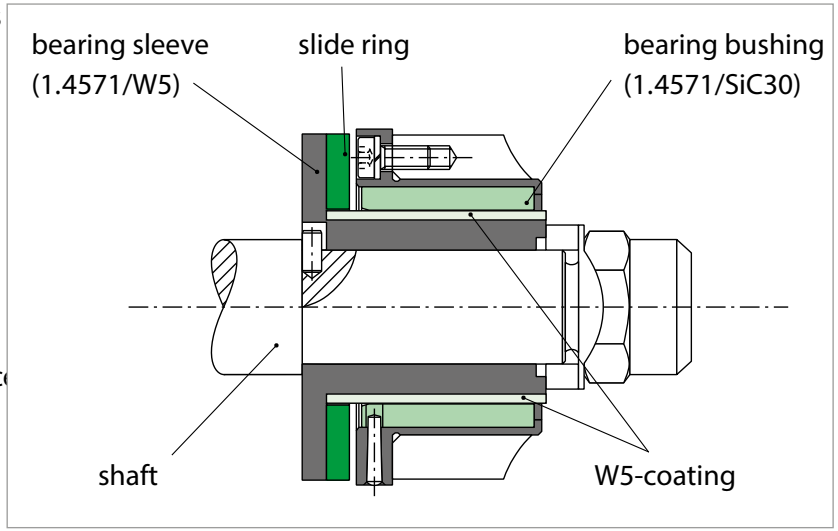


CAM-Tandem



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.

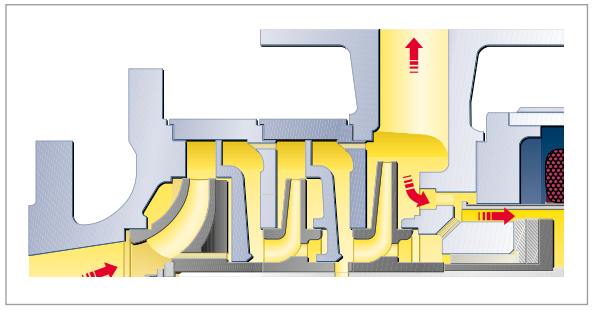
Axial thrust balancing

The development of HERMETIC pump systems depended on the solution of a central problem, namely the elimination of axial thrust at the rotor. 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.

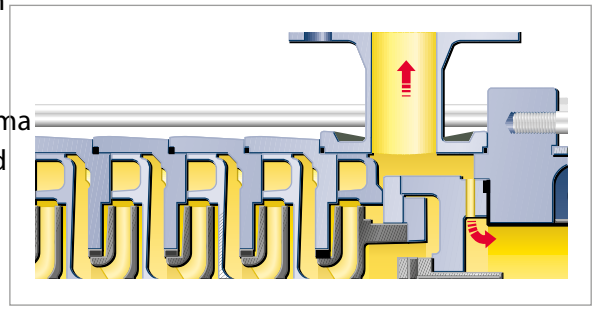
With canned motor pumps the axial position of the pump shaft is automatically regulated during operation to achieve a self-created balanced condition and thus, there are no effects by axial forces on the axial bearing collar.

The technical design of the axial thrust balancing generally depends on the construction size and stage number of the respective pump as well as on the liquid to be conveyed.

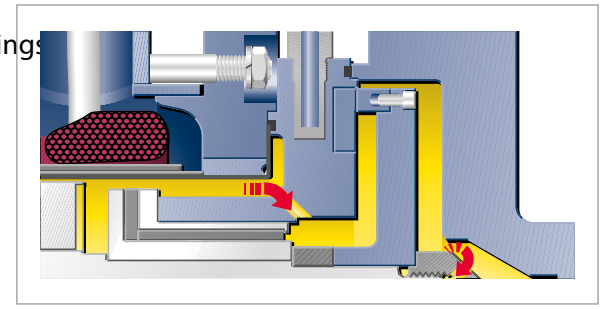
Example
Pump size CAM 1 and CAM 2
The axial thrust balancing is effected by back vanes and balancing borings on the first impeller



Pump size CAM 30 and CAM 32
The axial thrust balancing is guaranteed by a balancing disc (pump side arrangement) and balancing borings



Pump size CAM 41 to CAM 80
The axial thrust balancing is guaranteed by a balancing disc (motor side arrangement) and balancing borings



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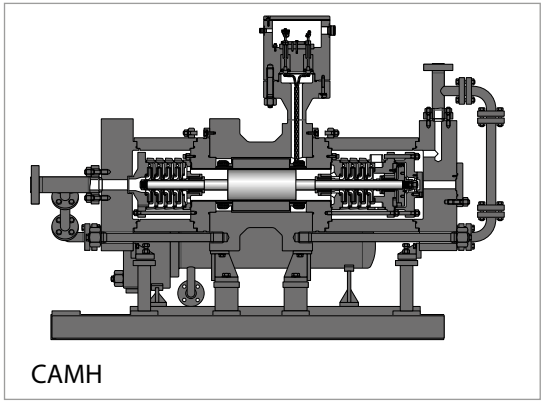
Design

High system pressures

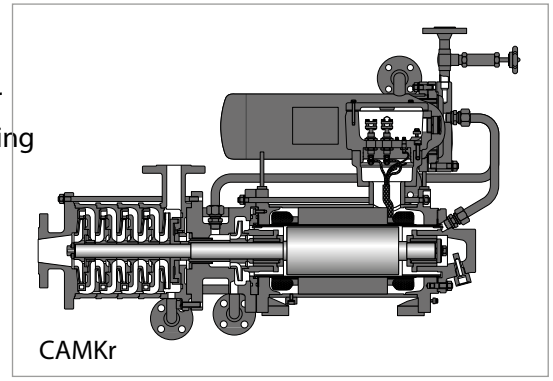
High system pressures (up to 1200 bar) can be handled by canned motor pumps in a technically simple manner. The wall thickness of the outer components corresponds to the required pressure rate



CAMH

High temperature design

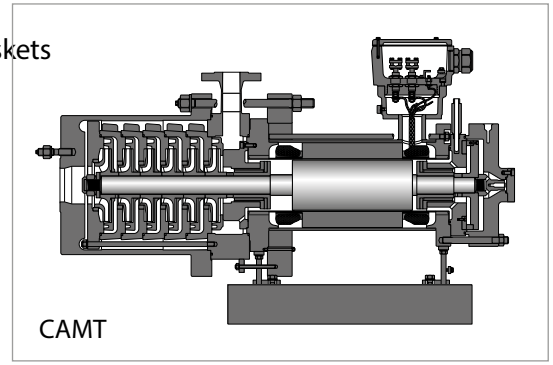
The external cooling of the pump allows the application of liquids to be conveyed up to +400 °C. By default, when conveying these liquids, tubular coolers are used, but also plate coolers or air coolers can be used according to the production and plant conditions



CAMKr

Barrel design

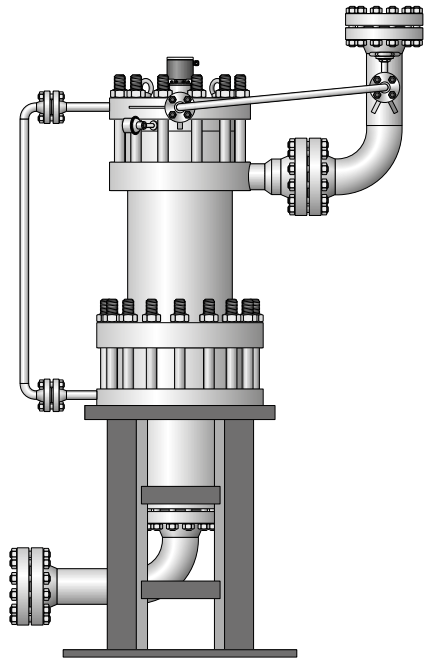
The number of stages determines the number of the required static gaskets By using pressure barrels, this number can be reduced. Moreover, through the use of pressure barrels, higher system pressures can be achieved



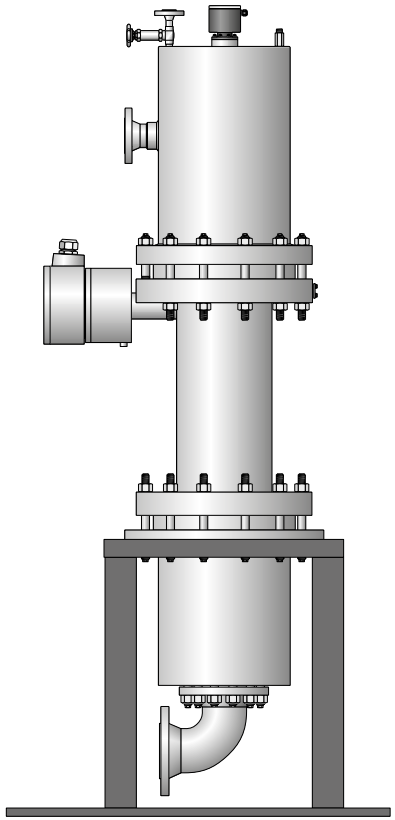
CAMT

Design

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. Besides the pump range CAM, also pump size CAM-Tandem can be erected vertically

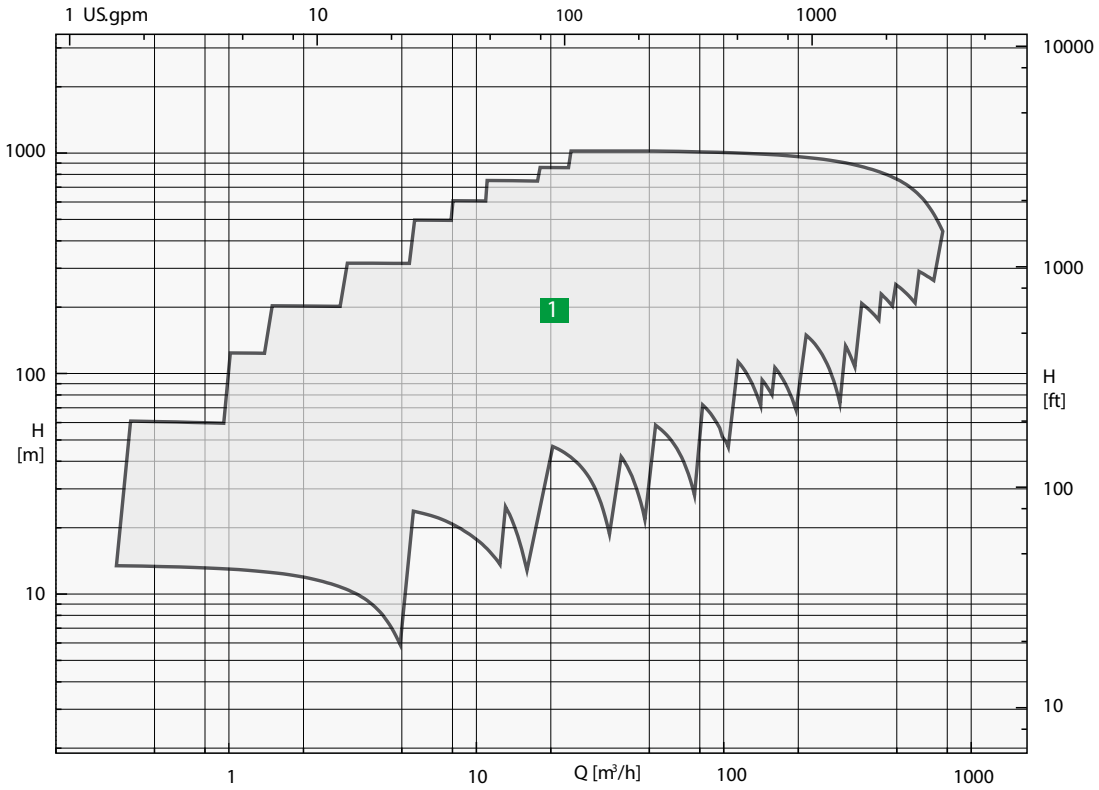


CAMTV



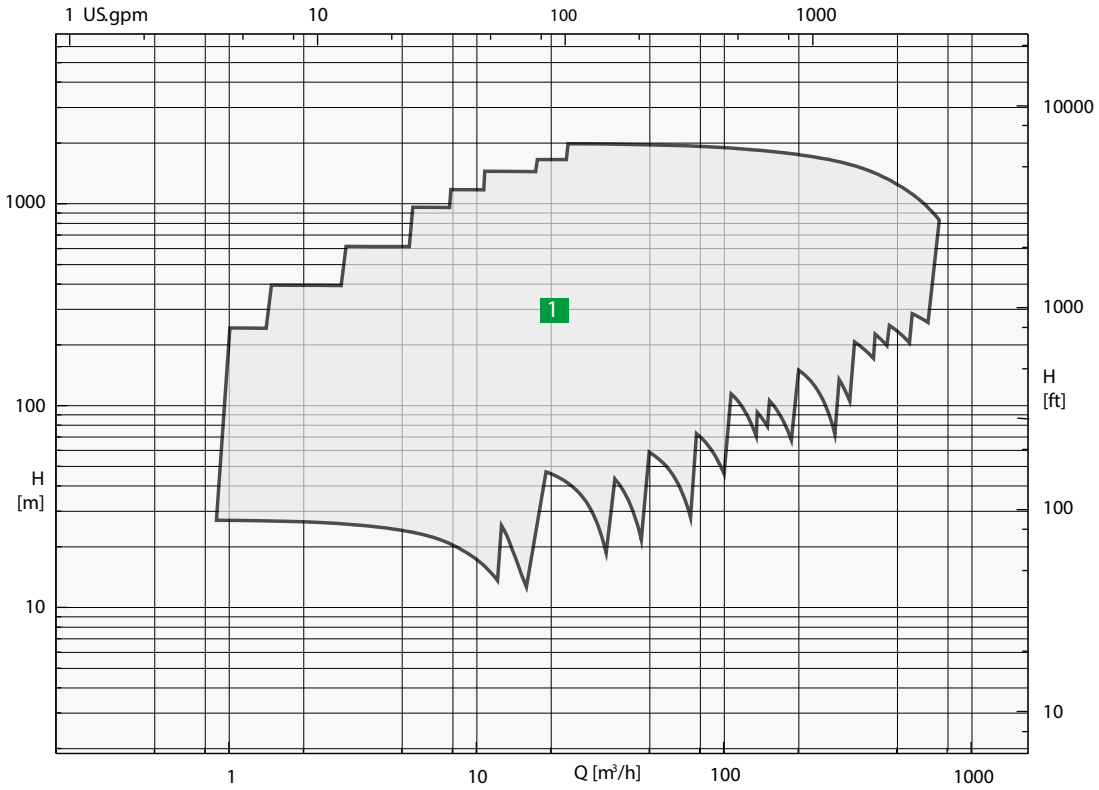
CAMTV-Tandem

CAM / 3000 rpm 50 Hz



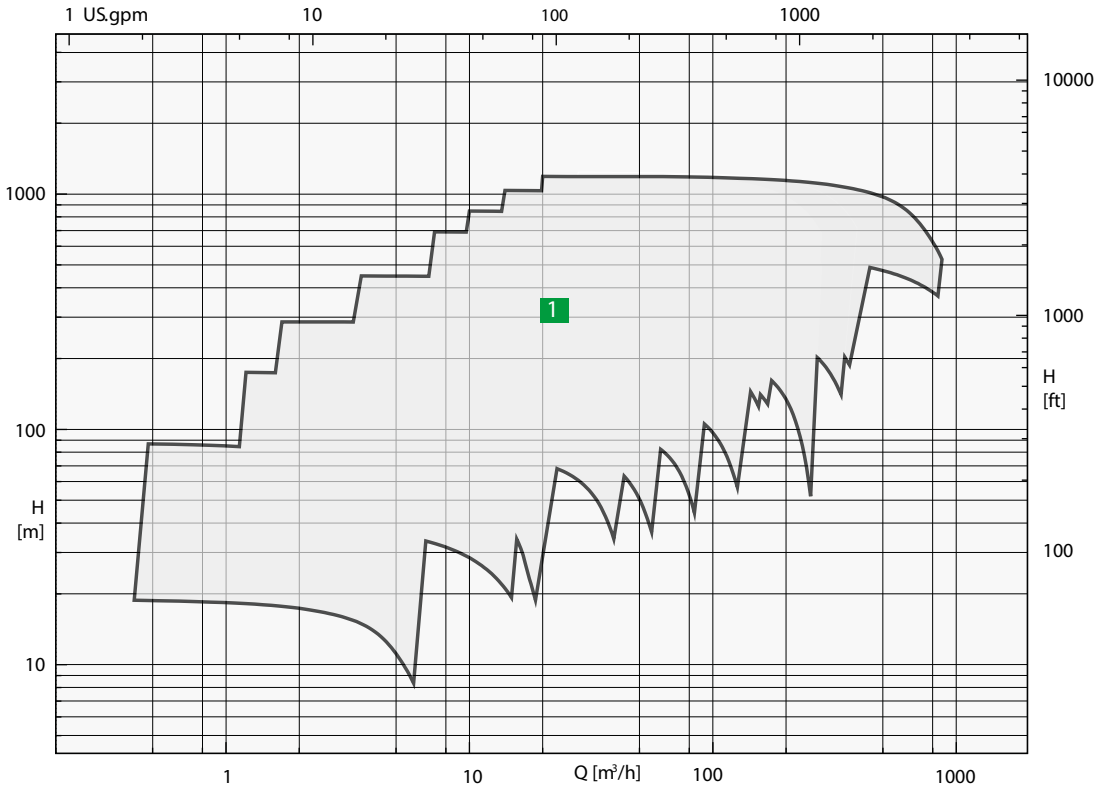
1 CAM 1 to CAM 80 with maximum number of stages

CAM-Tandem / 3000rpm 50 Hz



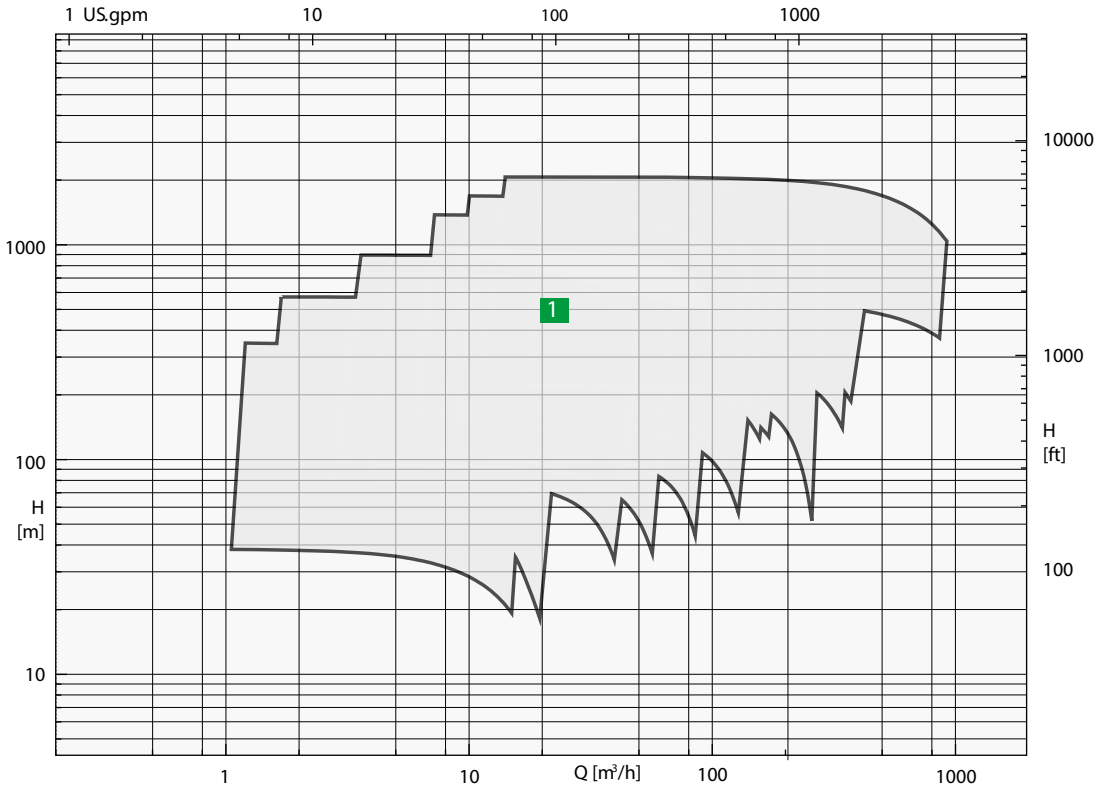
1 CAM 2 to CAM 80 with maximum number of stages

CAM / 3600 rpm 60 Hz



1 CAM 1 to CAM 80 with maximum number of stages

CAM-Tandem / 3600rpm 60 Hz

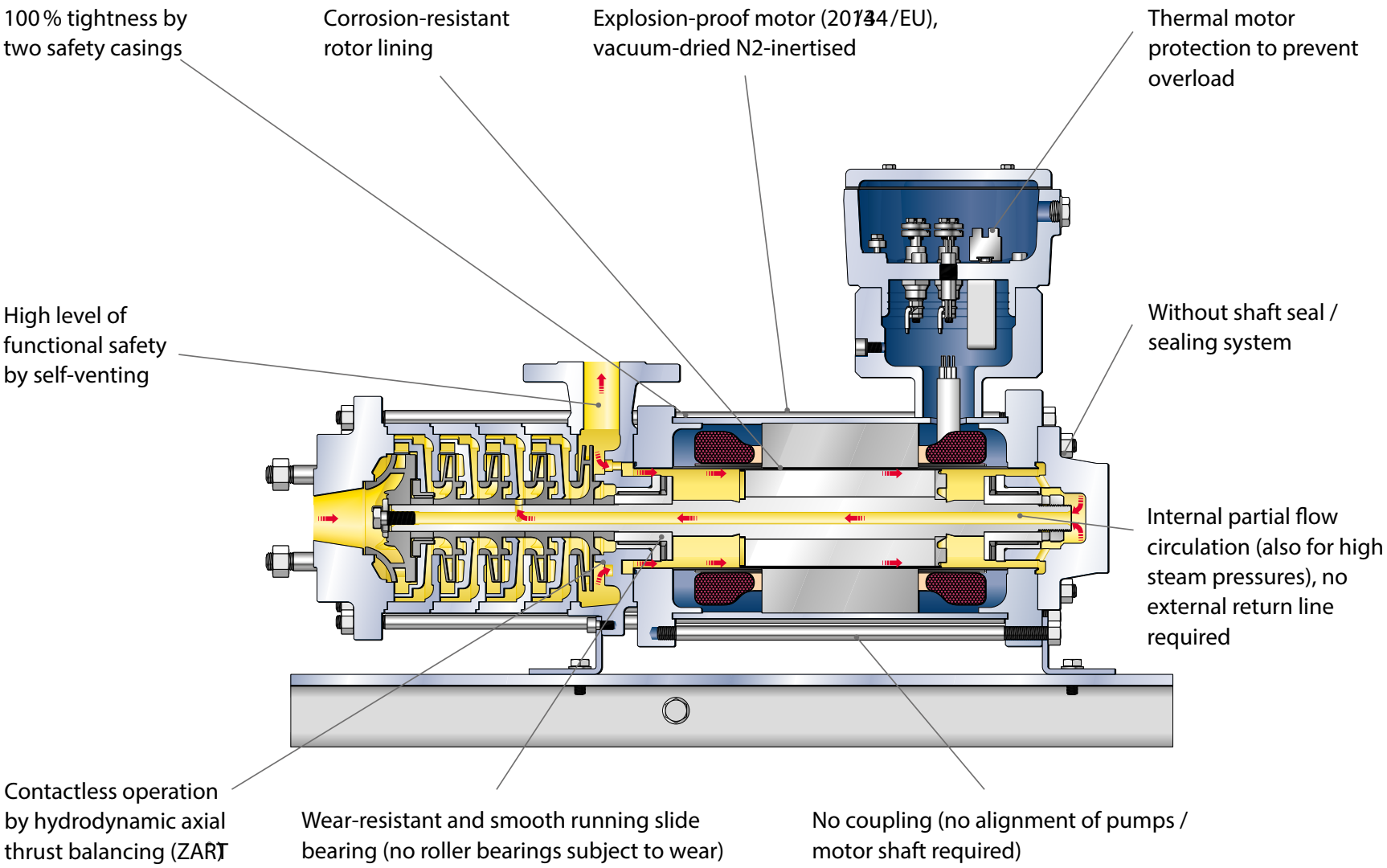


1 CAM 2 to CAM 80 with maximum number of stages

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

Advantages of the canned motor pump



Materials / CAM 1 and CAM 2

VDMA No	Part designation	Model CAM 1 and CAM 2		
		Material design S1	Material design S2	Material design C
		Pressure rating CAM 1: PN 25 CAM 2: PN 25	Pressure rating CAM 2: PN 25 to PN 40	Pressure rating CAM 1: PN 25 CAM 2: PN 25 to PN 40
Parts coming into contact with conveying fluid				
101	Pump casing	JS 1025	1.0619+N	1.4581 / 1.4571
108	Stage casing	1.0460	1.0460	1.4571
162	Suction cover	JS 1025	1.0460	1.4581 / 1.4571
174	Diffuser insert	JL 1030	JL 1030	1.4581
230	Impellers	JL 1030	JL 1030	1.4581
472	Slide ring	PTFE / K	PTFE / K	PTFE / K
529	Bearing sleeve	1.4571 / W5(1)	1.4571 / W5(1)	1.4571 / W5(1)
545	Bearing bush	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	Motor shaft	1.4021 / 1.4571	1.4021 / 1.4571	1.4571
Parts that do not come into contact with conveying liquid				
811	Motor casing	1.0570 / 1.0037	1.0037	1.0570 / 1.0037

special materials / higher pressure ratings are possible on demand
(1) tungsten carbide coating

Materials / CAM 30 and CAM 32

VDMA No	Part designation	Model CAM 30 and CAM 32	
		Material design S2	Material design C
		Pressure rating PN 25 to PN 64	Pressure rating PN 25 to PN 64
Parts coming into contact with conveying fluid			
101	Pump casing	1.0460 / 1.0570	1.4571
108	Stage casing	1.0460	1.4571
162	Suction cover	1.0570	1.4571
174	Diffuser insert	JS 1030	1.4408
230	Impellers	JS 1030	1.4408
512	Balancing ring	JL 1030	0.7660 / 1.4462
472	Slide ring	PTFE / K	PTFE / K
529	Bearing sleeve	1.4571 / W5(1)	1.4571 / W5(1)
545	Bearing bush	1.4571 / SiC30	1.4571 / SiC30
816	Stator liner	Hastelloy C4	Hastelloy C4
817	Rotor liner	1.4571	1.4571
819	Motor shaft	1.4021	1.4571
Parts that do not come into contact with conveying liquid			
811	Motor casing	1.0254	1.0254

special materials / higher pressure ratings are possible on demand
(1) tungsten carbide coating

Materials / CAM 41 to CAM 80

VDMA No	Part designation	Model CAM 41 to CAM 80	
		Material design S2	Material design C
		Pressure rating PN 25 to PN 64	Pressure rating PN 25 to PN 64
Parts coming into contact with conveying fluid			
101	Pump casing	1.0460[2] / 1.0570	1.4571
108	Stage casing	1.0619	1.4408
162	Suction cover	1.0570	1.4571
174	Diffuser insert	JL 1030	1.4408
230	Impellers	JL 1030[2] / 1.4008	1.4408
472	Slide ring	PTFE / K	PTFE / K
512	Balancing ring	JL 1030	0.7660 / 1.4462
529	Bearing sleeve	1.4571 / W5[1]	1.4571 / W5[1]
545	Bearing bush	1.4571 / SiC30	1.4571 / SiC30
816	Stator liner	Hastelloy C4	Hastelloy C4
817	Rotor liner	1.4571	1.4571
819	Motor shaft	1.4021	1.4571
Parts that do not come into contact with conveying liquid			
811	Motor casing	1.0254	1.0254

special materials / higher pressure ratings are possible on demand
(1) tungsten carbide coating
(2) only possible for CAM 44 and CAM 52

Materials / CAM-Tandem

VDMA No	Part designation	Model CAM-Tandem		
		Material design S1	Material design S2	Material design C
		Pressure rating PN 25	Pressure rating PN 25 to PN 64	Pressure rating 25 to PN 64
Parts coming into contact with conveying fluid				
101	Pump casing	JS 1025	1.0619+N / 1.0460 / 1.0570	1.4581 / 1.4571
108	Stage casing	1.0460	1.0460 / 1.0619	1.4571 / 1.4408
162	Suction cover	JS 1025	1.0460 / 1.0570	1.4581 / 1.4571
174	Diffuser insert	JL 1030	JL 1030 / JS 1030	1.4581 / 1.4408
230	Impellers	JL 1030	JL 1030 / JS 1030 / 14008	1.4581 / 1.4408
472	Slide ring	PTFE / K	PTFE / K	PTFE / K
529	Bearing sleeve	1.4571 / W5(1)	1.4571 / W5(1)	1.4571 / W5(1)
545	Bearing bush	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	Motor shaft	1.4021 / 1.4571	1.4021 / 1.4571	1.4571
Parts that do not come into contact with conveying liquid				
811	Motor casing	1.0570 / 1.0037	1.0037 / 1.0254	1.0570 / 1.0037 / 1.0254

special materials / higher pressure ratings are possible on demand
(1) tungsten carbide coating

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 N34T34)

Explosion protection according to Directive 2014 / 34 / EU
Incl. EC type-examination certificate
Marking: Ⓔx 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

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

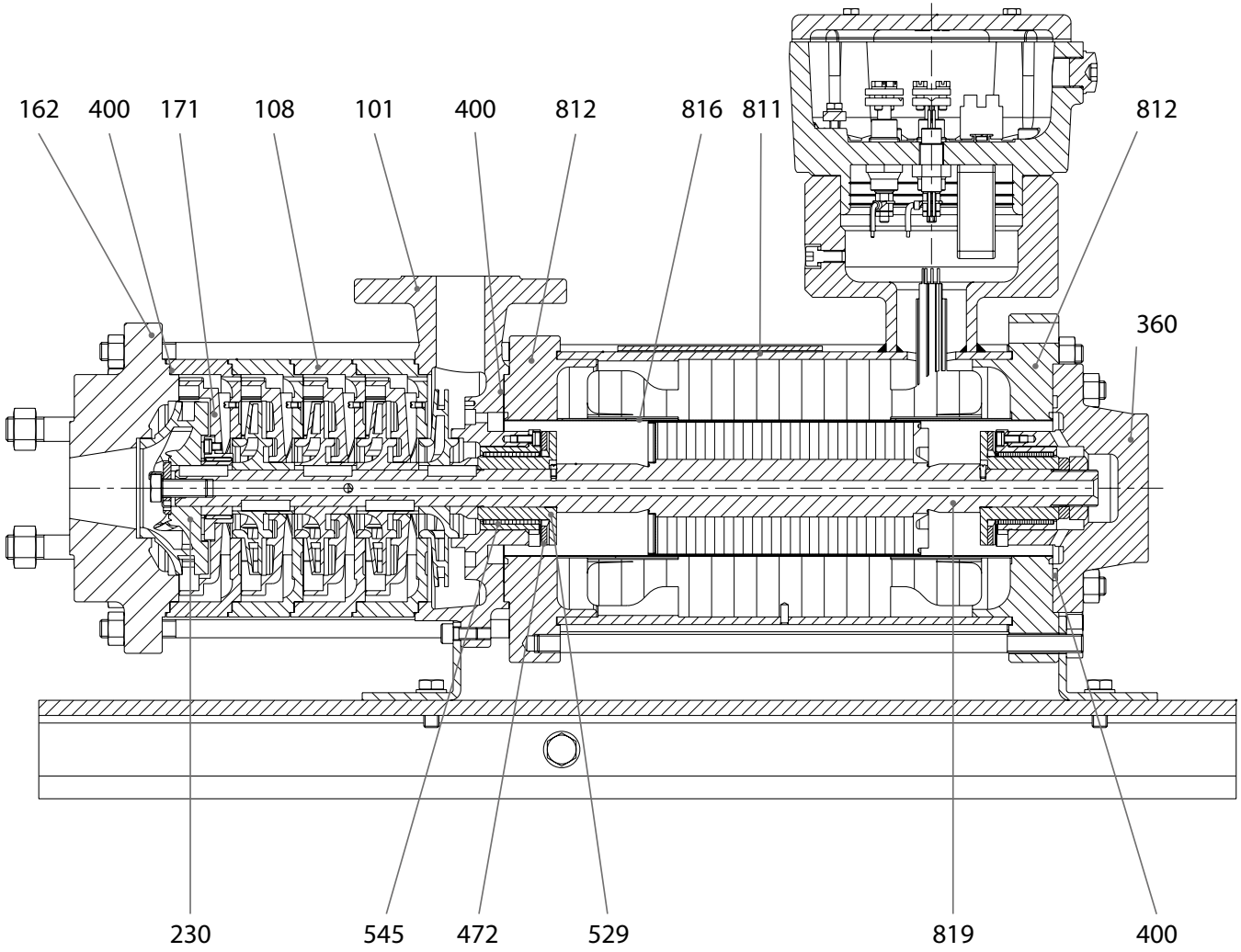
Standard tests

- Hydrostatic pressure test with 1.5 x 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 [without report]
- Axial thrust measurement
- Leak test for the complete pump with N_2 at 6 bar

Additional testing possible on request, e.g.:

- NPSH-test / Helium leakage test / vibration test
- ultrasonic test / PMI-test

Reduced part list / example for pump type CAM 2



Reduced part list

VDMA Pos.	Name
102	Pump casing
108	Stage casing
171	Diffuser insert
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

VDMA Pos.	Name
819	Motor shaft
230	Impellers
529	Bearing sleeve
472	Slide ring

Recommended spare parts stock

For two-year operation: none
For overhaul: for each pump

Pos. 400 gasket (depending on number of stages)
2 pcs. Pos. 529 bearing sleeve
2 pcs. Pos. 545 bearing bush
2 pcs. Pos. 472 slide ring

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

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.

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.

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

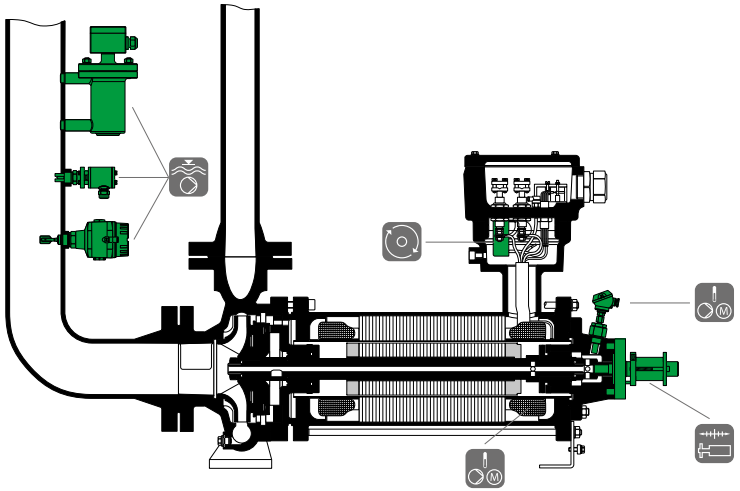
Temperature monitoring by / with:
- Resistance thermometer PT100 [TI]
- Thermistor [TS]

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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