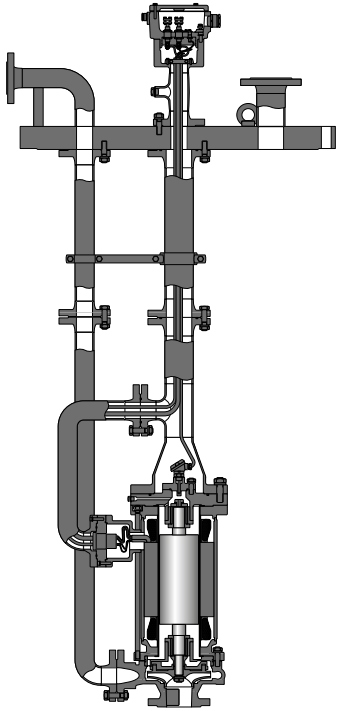
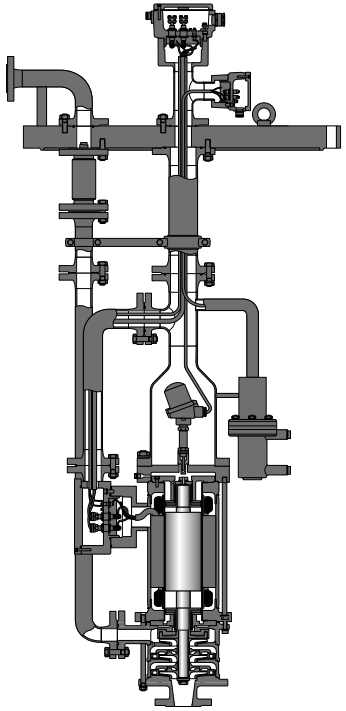
LEDERLE Hermetic

PRODUCT INFORMATION

CANNED MOTOR PUMPS TYPE TCN / TCAM

HERMETIC *E-Line*





ZART®

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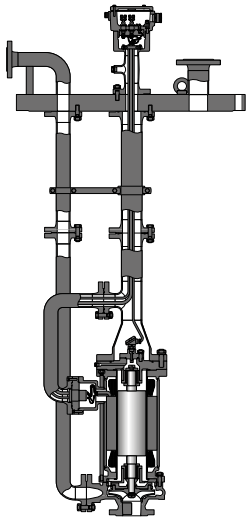

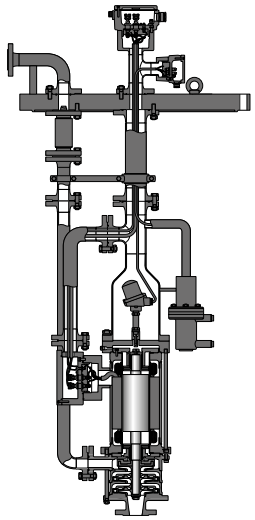

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Operational areas / applications

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

Application sectors are tank farms, terminals chemical and off-shore plants, gas accumulators, and industrial plants. In addition to the optimum design for TCN and TCAM pumps there are various mounting options.

Model / design TCN

Horizontal, sealless spiral housing pumps in process design with completely closed canned motor with radial impeller, single-stage, single-flow. The connection measurements of the housing comply with EN 22 858 / ISO 2858.

Model / design TCAM

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

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
Output power [P2]:	max. 520 kW	max. 622 kW
Conveyed material temperature [t]:	–160 °C to +250 °C	–160 °C to +250 °C
Operating pressure:	16 to 100 bar	16 to 100 bar

(Extended rating scheme available on request)

Pump and hydraulic denomination

TCN 50 – 32 – 200 N34L-2

- Motor
- Nominal impeller diameter in mm
- Nominal discharge nozzle diameter in mm
- Nominal suction nozzle diameter in mm
- Model series

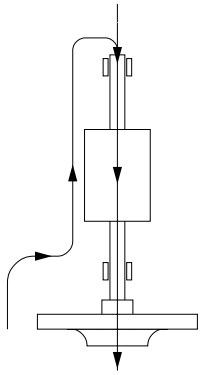
TCAM 30 / 5 N34L-2

- Motor
- Number of stages
- Size
- Model series

Functional principle

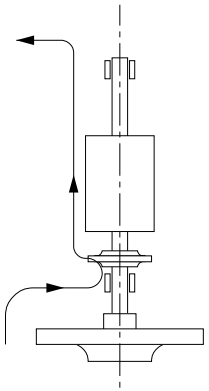
TCN
The partial flow for cooling the motor and lubricating the slide bearings is branched off at the periphery of the impeller and, after having passed through the motor, is carried back again through the hollow shaft to the suction side of the impeller.

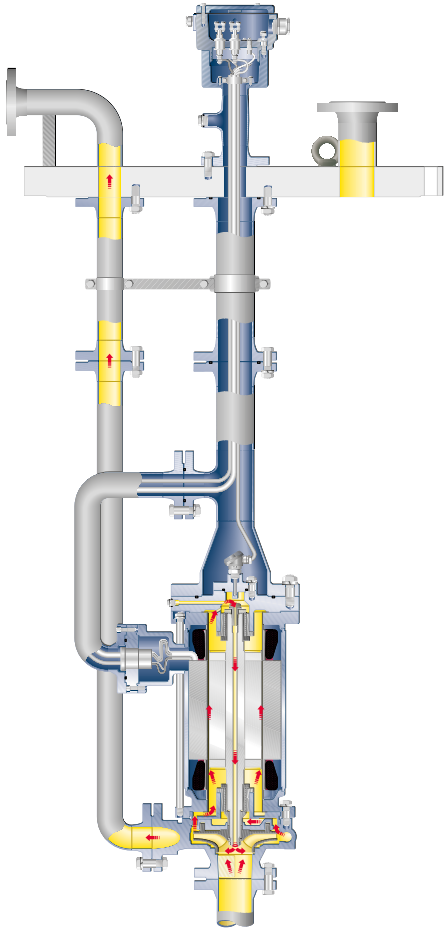
Return of partial flow to suction side



TCNF (liquefied gas design)
The partial flow for cooling the motor and lubricating the slide bearings will be branched off at the periphery of the impeller and, after having passed through the motor sealing cover, is carried back again to the pressure line via a connecting line. An auxiliary impeller serves to overcome the hydraulic losses encountered along the way. The connection line serves at the same time to vent the pump and motor.

Return of partial flow to motor side



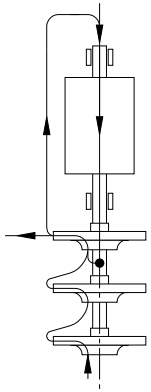


Functional principle

TCAM

The flow rate is delivered through the impellers and diffusers arranged one behind the other to the pressure nozzles and in this way an increase in pressure is achieved depending on the number of stages. The partial flow for cooling the motor and lubrication 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.

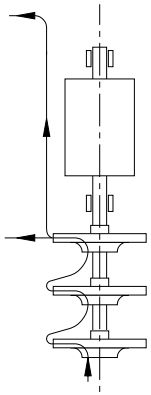
Main and partial flow

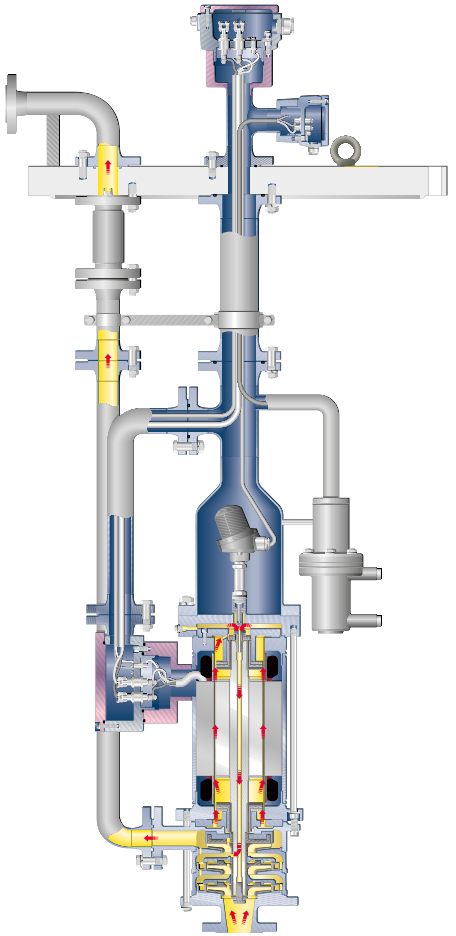


TCAMF (liquefied gas design)

The flow rate is delivered through the impellers and diffusers arranged one behind the other to the pressure nozzles and in this way an increase in pressure is achieved depending on the number of stages. The partial flow for cooling the motor and lubrication the slide bearings is tapped off at the periphery of the impeller and after flowing through the motor it flows back to the motor cover via a connection line to the pressure line. At the same time, the connection line serves to vent the pump and motor.

Main and partial flow

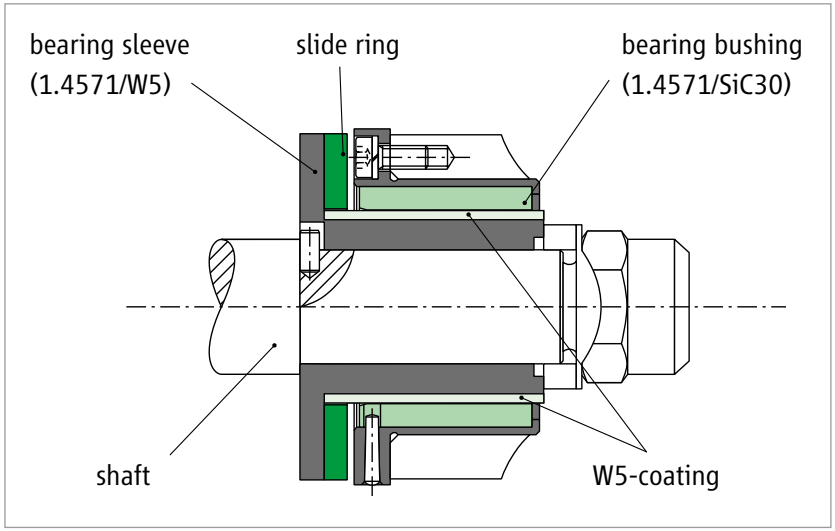




Bearings

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.



Installation vessel pump

The HERMETIC canned motor submersible pump provides the optimum solution for difficult installations. Essentially there are two different installations in the tank and in the vessel:

a) direct placing in the tank (figure 1)

b) installation of the pump with the opportunity to separate the pump from the liquid in the vessel (figure 2)

Installation vessel pump

The direct placing of the submersible pump in the tank is recommended for small container volumes, e.g. for NPSHA improvement in vessel loading/unloading stations.

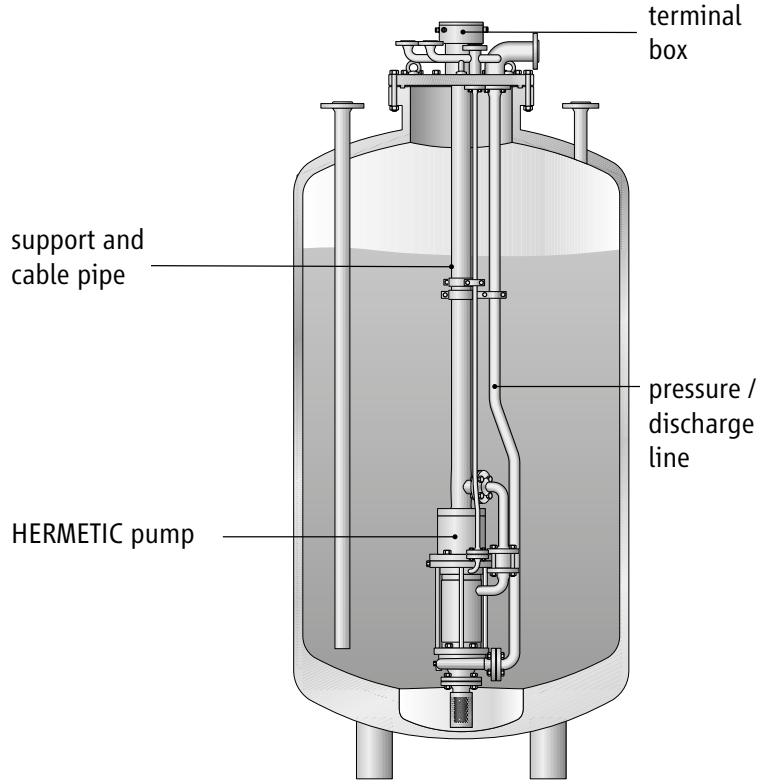


Figure 1

Installation pump with the opportunity to separate the pump from the liquid in the vessel

If it is necessary that the submersible pump with a filled tank is removed and reinstalled during a revision, the installation when the pump is separate from the liquid has proved to be the best optimum solution.

In this system, there is a shut-off valve close to the tank bottom, which can be operated with a gear or with a pressure medium run system.

The delivery medium can be pushed back into the tank by inertisation. After closing of the valve and releasing the pressure the submersible pump can be removed or installed without emptying the vessel.

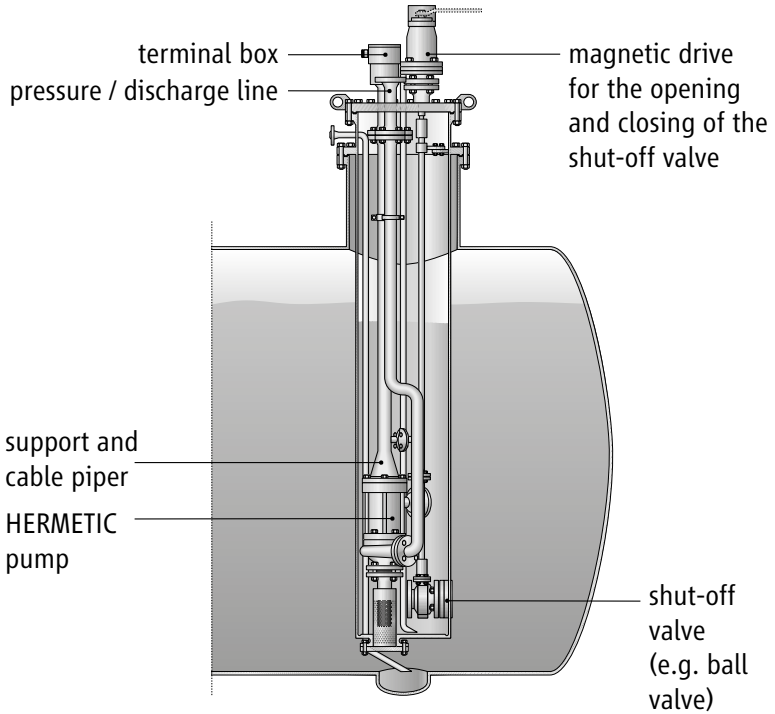
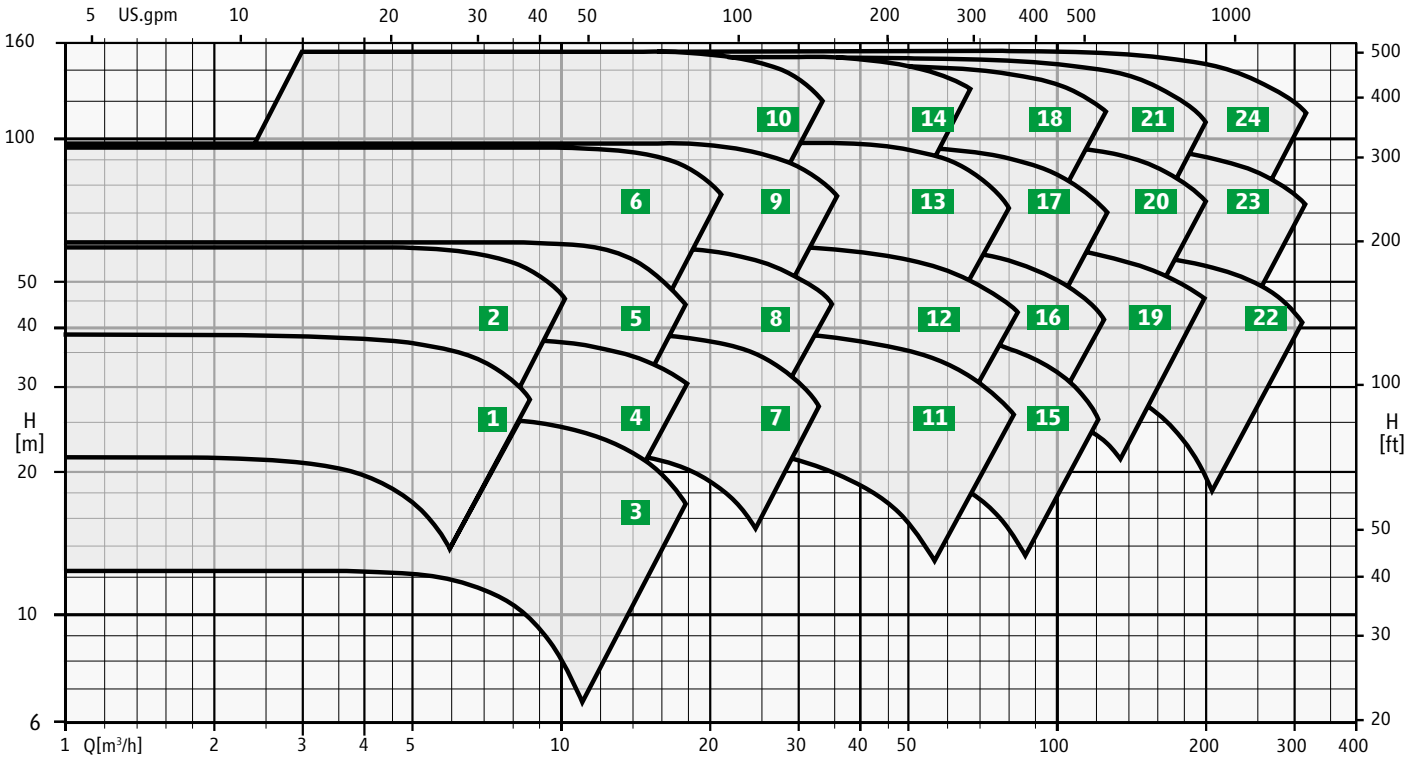


Figure 2

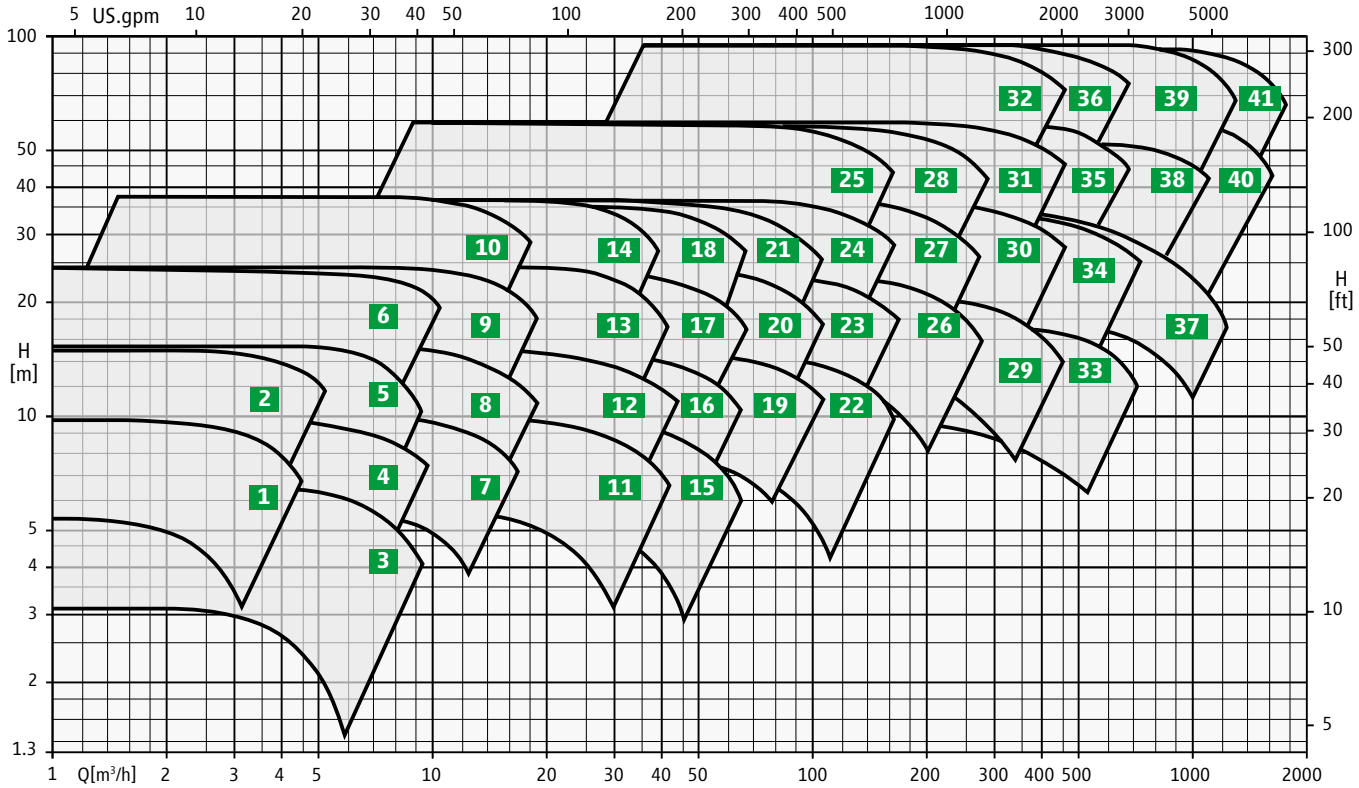
TCN / 2900 rpm 50 Hz



Denomination of hydraulics shown in the characteristics maps

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

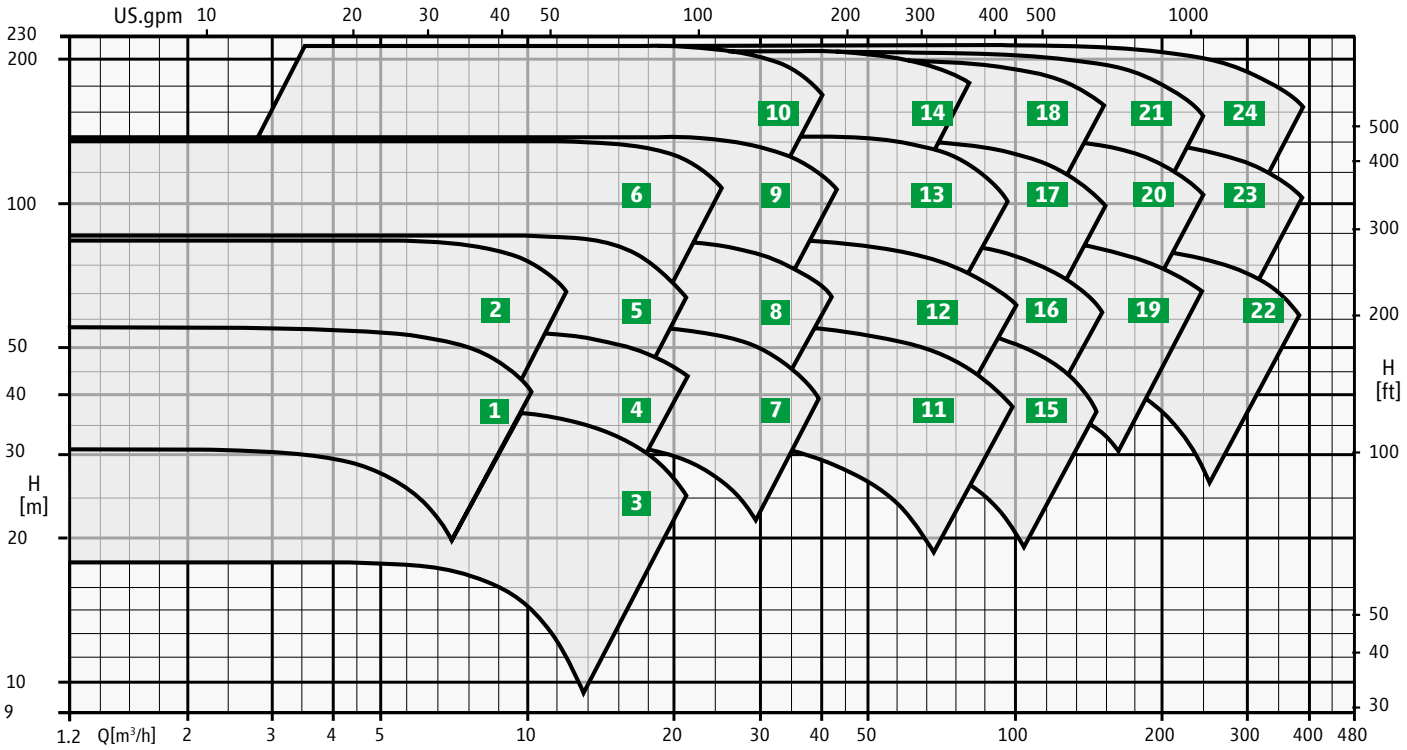
TCN / 1450 rpm 50 Hz



Denomination of hydraulics shown in the characteristics maps

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

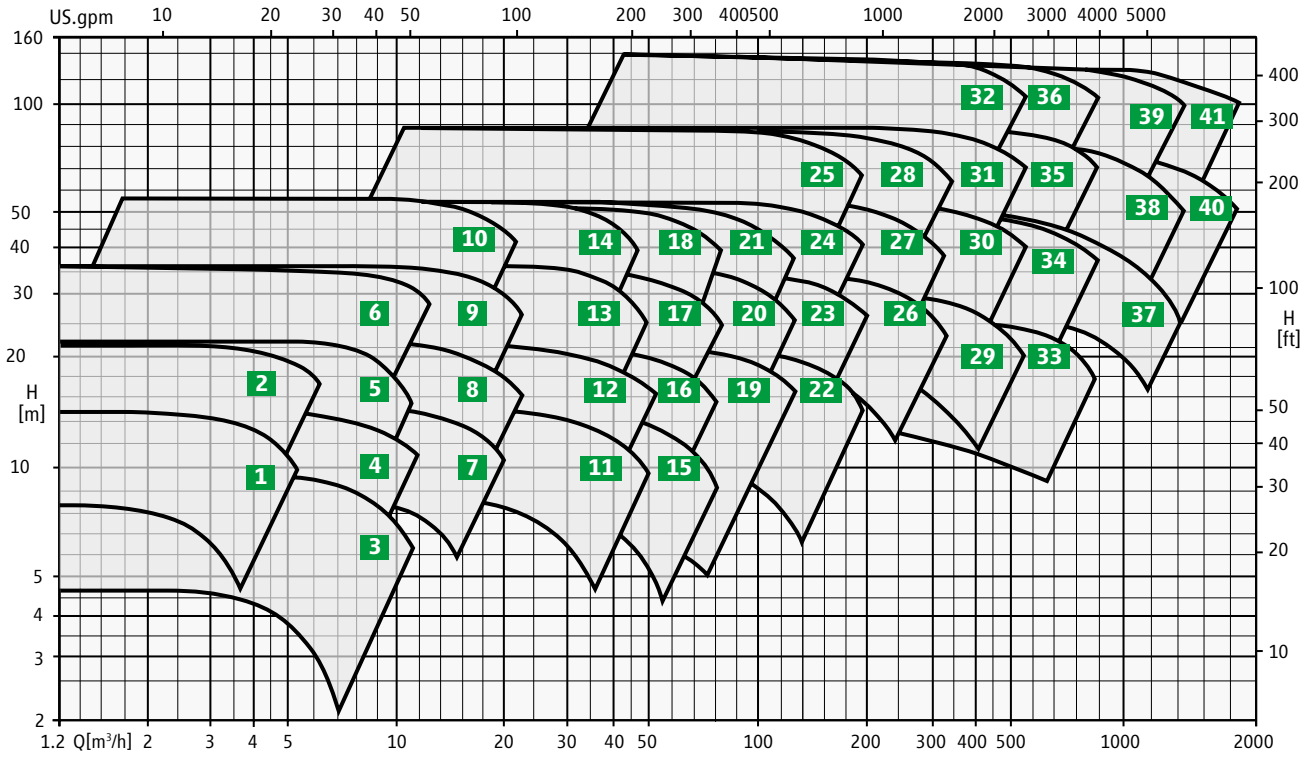
TCN / 3500 rpm 60 Hz



Denomination of hydraulics shown in the characteristics maps

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

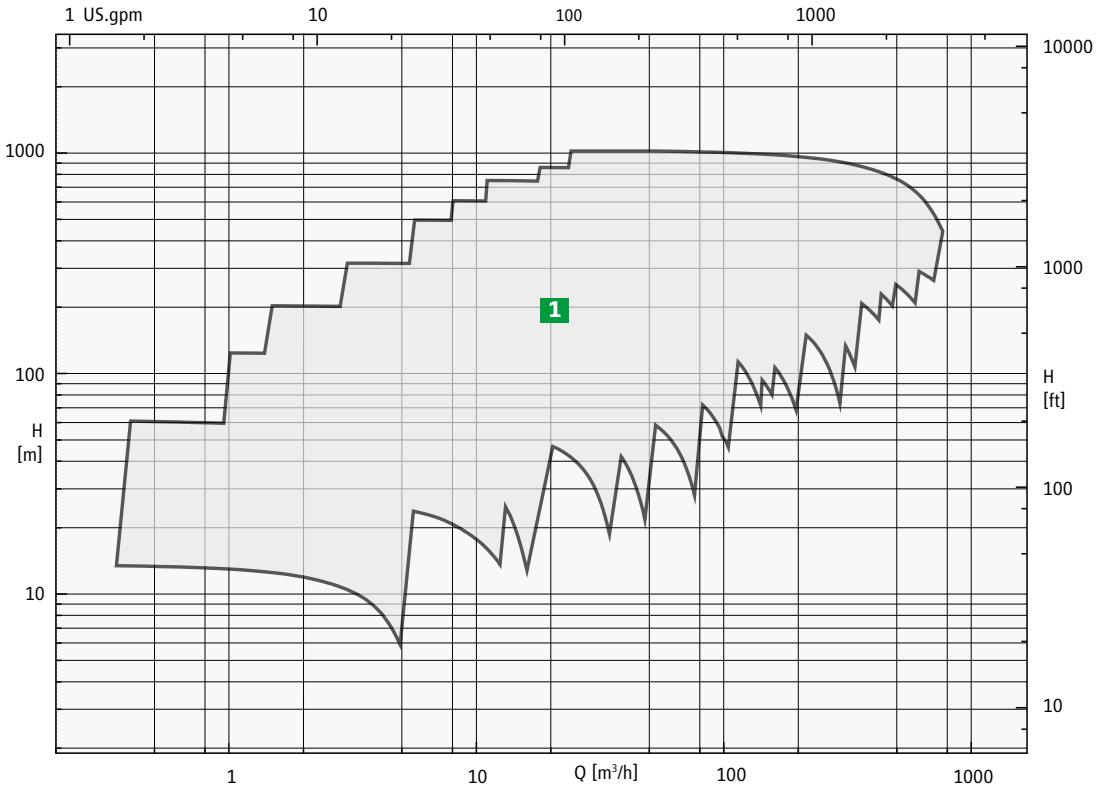
TCN / 1750 rpm 60 Hz



Denomination of hydraulics shown in the characteristics maps

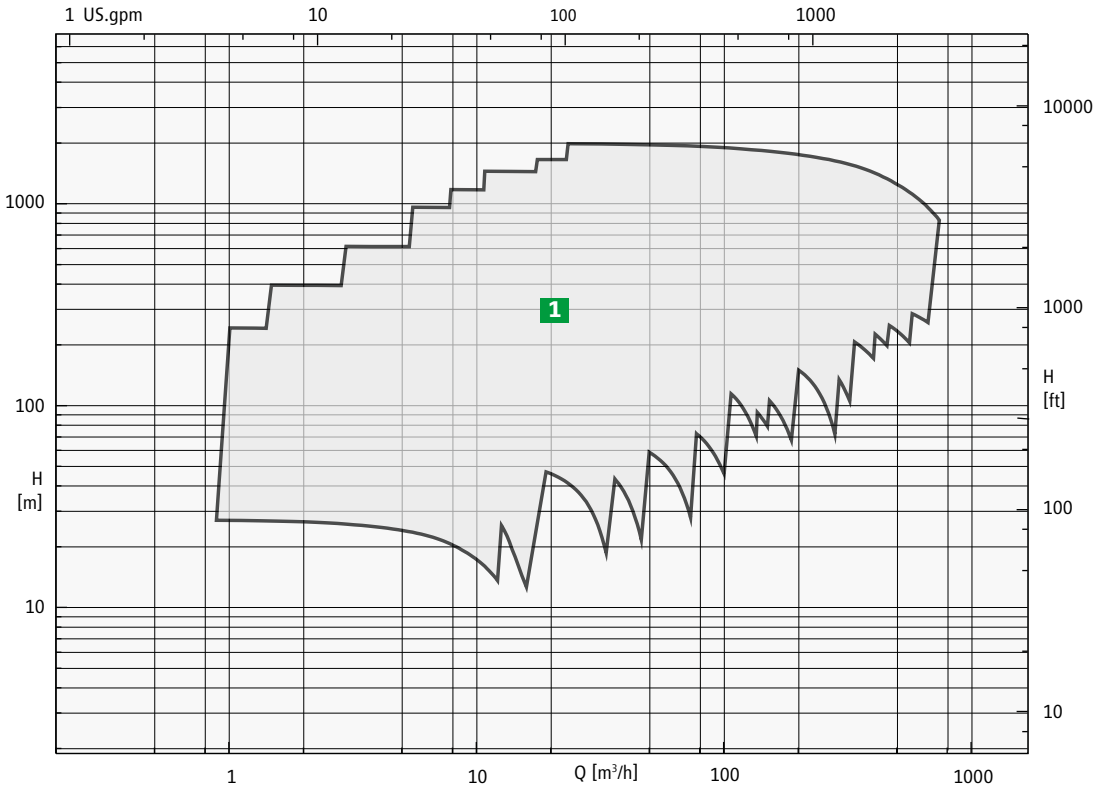
1	25-160	**8**	40-200	**15**	65-160	**22**	100-200	**29**	150-250	**36**	200-500
2	25-200	**9**	40-250	**16**	65-200	**23**	100-250	**30**	150-315	**37**	250-315
3	32-125	**10**	40-315	**17**	65-250	**24**	100-315	**31**	150-400	**38**	250-400
4	32-160	**11**	50-160	**18**	65-315	**25**	100-400	**32**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

TCAM / 3000 rpm 50 Hz



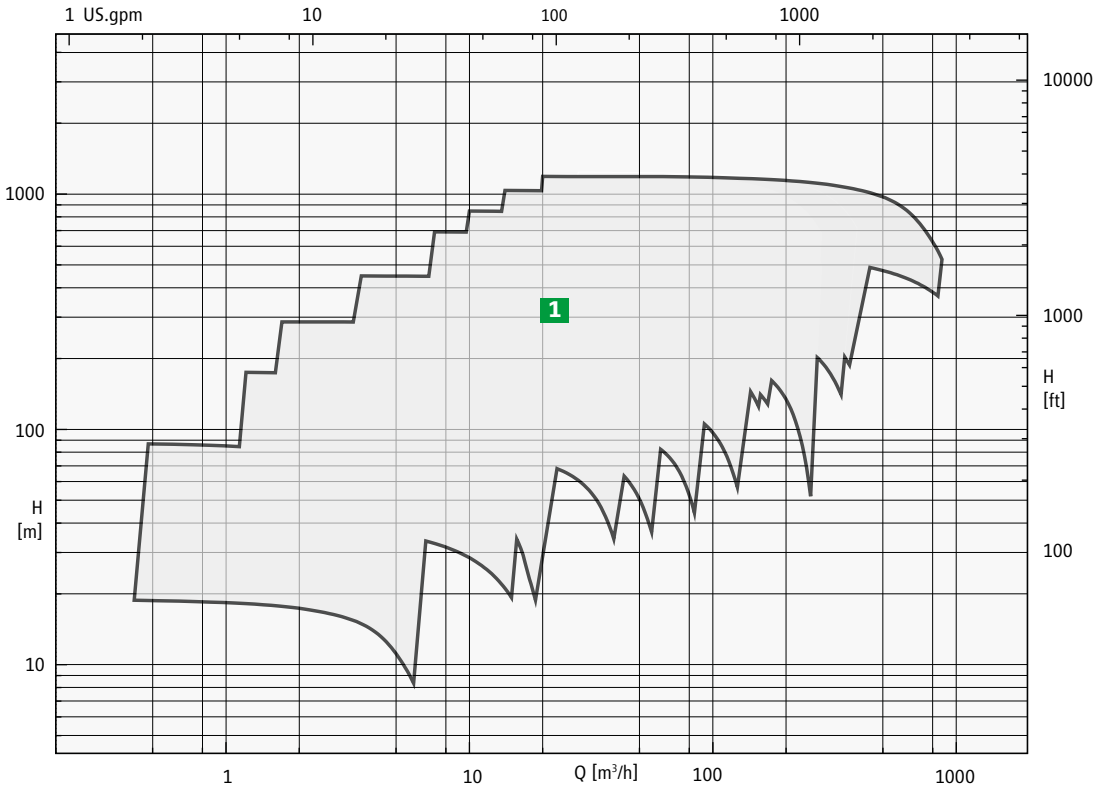
1 TCAM 1 to TCAM 80 with maximum number of stages

TCAM-Tandem / 3000 rpm 50 Hz



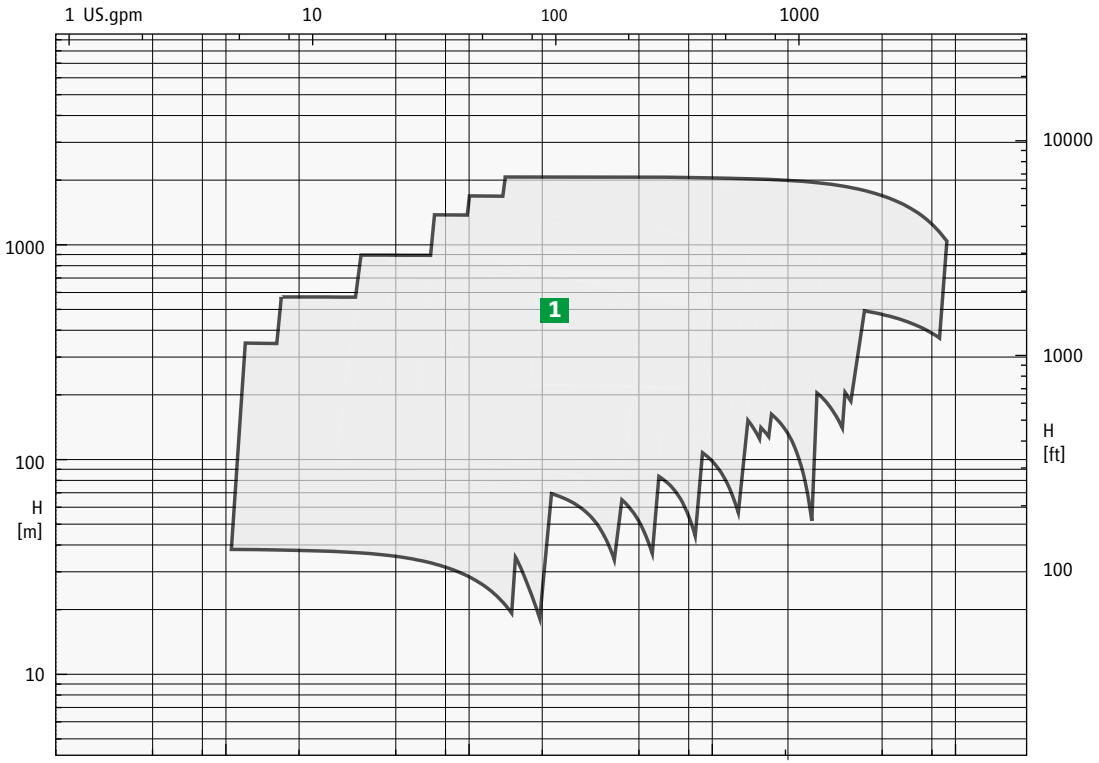
1 TCAM 2 to TCAM 80 with maximum number of stages

TCAM / 3600 rpm 60 Hz



1 TCAM 1 to TCAM 80 with maximum number of stages

TCAM-Tandem / 3600 rpm 60 Hz



1 TCAM 2 to TCAM 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

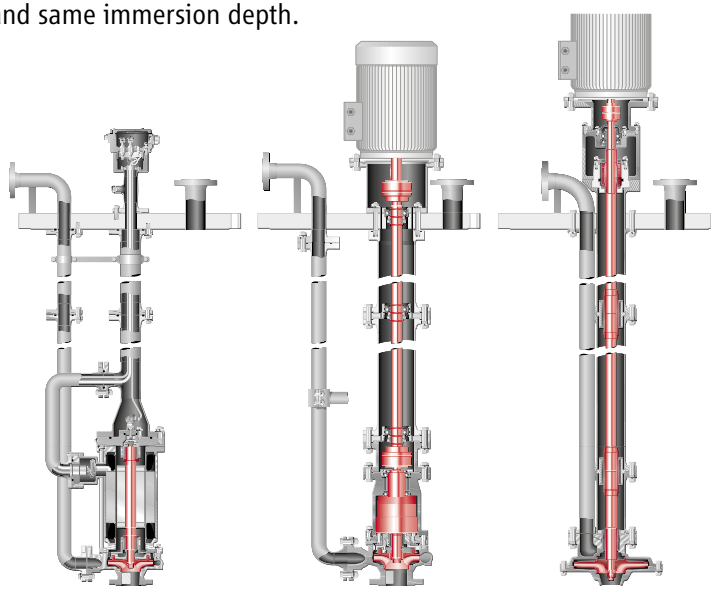
Advantages of hermetically sealed motor-driven submersible pumps

The hydraulic part is arranged above close to the vessel bottom. The pressure line is placed in parallel to the pump drive shaft via manhole door to the outside. The impeller is arranged at the shaft which is fixed by medium-lubricated guide bearings. Depending on the immersion depth several bearings will be required. The following reference value will apply: according to the pump size, one guide bearing per 1.2 m to 1.6 m is required. The bearings are installed in a support pipe that is fixed to the manhole door. The sealing to the atmosphere is effected by using a mechanical seal. The conventional drive motor is installed outside the vessel and can be used for every protection type according to the explosion requirements.

The basic and outer construction of a conventional pump with mechanical seal can be compared with the design of a submersible pump with magnetic drive. The difference of sealing to the atmosphere is the containment shell of the magnetic coupling that is directly installed to the pump component. The containment shell ensures an absolute leakage-free pump operation and can also be installed on the outside of the vessel.

Because of that, the drive shaft of this construction type is not medium-lubricated but operates in a dry place. The bearings used are prelubricated roller bearings which are placed in a support tube under dry conditions. The cable passage at the manhole door is sealed by a mechanical seal. According to the depth of assembly several bearings need to be installed here as well. Conventional electric motors can also be used here as a drive. When installing canned motor pumps the drive shaft having a length according the immersion depth is no longer needed. The rotating parts of the pump shaft are placed in the canned motor pump and are therefore extremely short. The pump is fixed to a support pipe which is arranged at the manhole door. The single task of the support pipe is to carry the pump and to lead the cables to the outside. Mediumlubricated guide bearings or prelubricated roller bearings are not necessary since the usually used long drive shaft is not required for operational reasons. Therefore, in case of vertical submersible pumps with canned motor, the length of the drive shaft is irrespective of the immersion depth.

This figure clearly shows the proportion of the rotating shafting depending on the construction and same immersion depth.



Submersible pump with canned motor | Submersible pump with magnetically coupled drive | Conventional submersible pump

Technical specification

	TCN	TCAM
Function / Design	single-stage, in vertical or horizontal design	multistage, in vertical or horizontal design
Pump capacity	max. 1800 m^3/h	max. 850 m^3/h
Pumping head	max. 220 m	max. 2000 m
Viscosity	max. 300 mm^2/s	max. 300 mm^2/s
Operating pressure	PN 16 to PN 100	PN 16 to PN 100
Materials (casing)	Nodular cast iron (JS 1025) Cast steel (1.0619+N) Stainless steel (1.4408) (special materials / higher pressure ratings are possible on demand)	Nodular cast iron (JS 1025) Cast steel (1.0619+N / 1.0460 / 1.0570) Stainless steel (1.4571 / 1.4581) (special materials / higher pressure ratings are possible on demand)

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 68 (stator), IP 65 (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: Ⓔx II 2 G Ex de IIC T1 to T6

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 1.5x 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 N_2 at 6 bar

Additional testing possible on request, e.g.:

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

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

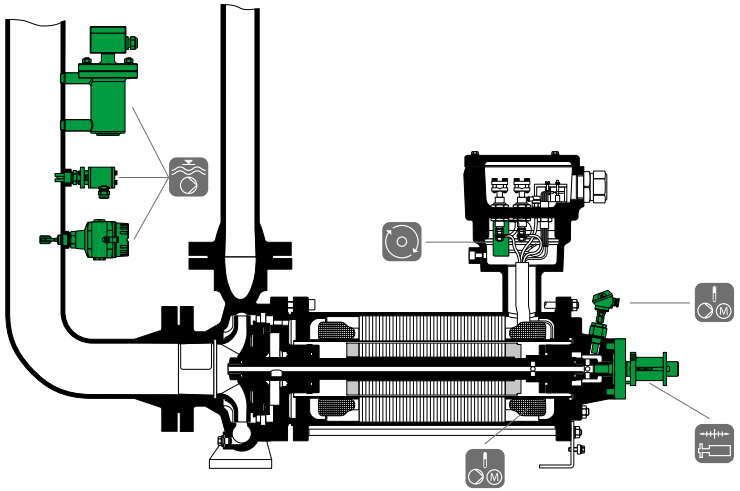
Temperature monitoring by / with:
- Resistance thermometer PT100 [TI]
- Thermistor [TS]

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

PRODUCT INFORMATION

Contact

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www.hermetic-pumpen.com

YouTube | LinkedIn | Expert tool

Product information TCN / TCAM / EN / 06 / 2022

LEDERLE Hermetic
Sealless Technology Unlimited