MODEL INFORMATION
CANNED MOTOR PUMP TYPE CN / CNF / CNK

HERMETIC E-Line
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</table>
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. The connection measurements of the housing comply with EN 22 858 / ISO 2858.

Canned motor pump type CN
The CN 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 CNF
The CNF 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 CNK
The CNK model is the version for conveying hot organic heat transfer oils as well as heating bath liquids. Depending on the application, this version are equipped with plate heat exchanger or tubular coolers.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CN/50 Hz</th>
<th>CN/50 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency [Hz]</td>
<td>50 Hz</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Pump capacity [Q]:</td>
<td>max. 1700 m³/h</td>
<td>max. 1800 m³/h</td>
</tr>
<tr>
<td>Pumping head [H]:</td>
<td>max. 150 m</td>
<td>max. 220 m</td>
</tr>
<tr>
<td>Output power [P2]:</td>
<td>max. 520 kW</td>
<td>max. 622 kW</td>
</tr>
<tr>
<td>Conveyed material temperature [t]:</td>
<td>–120 °C to +360 °C</td>
<td>–120 °C to +360 °C</td>
</tr>
<tr>
<td>Conveyed material temperature [t]:</td>
<td>max. +400 °C</td>
<td>max. +400 °C</td>
</tr>
<tr>
<td>Operating pressure:</td>
<td>16 / 25 bar</td>
<td>16 / 25 bar</td>
</tr>
</tbody>
</table>

(Extended rating scheme available on request)

Pump and hydraulic denomination

CN 50 – 32 – 200 N34L-2

Motor
Nominal impeller diameter in mm
Nominal discharge nozzle diameter in mm
Nominal suction nozzle diameter in mm
Design
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.
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.
Functional principle 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.
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

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.

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

**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.
CHARACTERISTIC MAPS

2900 rpm 50 Hz

Denomination of hydraulics shown in the characteristics maps

1 40-25-160  7  65-40-160  13  80-50-250  19  125-80-200
2 40-25-200  8  65-40-200  14  80-50-315  20  125-80-250
3 50-32-125  9  65-40-250  15  100-65-160  21  125-80-315
4 50-32-160 10  65-40-315  16  100-65-200  22  125-100-200
5 50-32-200 11  80-50-160  17  100-65-250  23  125-100-250
6 50-32-250 12  80-50-200  18  100-65-315  24  125-100-315
1450 rpm 50 Hz

Denomination of hydraulics shown in the characteristics maps

2 40-25-200  7 65-40-160  12 80-50-200  17 100-65-250  22 125-100-200  27 125-315  32 150-500  37 250-315
3 50-32-125  8 65-40-200  13 80-50-250  18 100-65-315  23 125-100-250  28 125-400  33 200-250  38 250-400
5 50-32-200  10 65-40-315  15 100-65-160  20 125-80-250  25 100-400  30 150-315  35 200-400  40 300-400
Characteristics lists

3500 rpm 60 Hz

Denomination of hydraulics shown in the characteristics maps

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

1750 rpm 60 Hz

Denomination of hydraulics shown in the characteristics maps

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

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 EN / ISO / ANSI

High level of functional safety by self-venting

Standardised hydraulics with a block design and foot mounting

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)

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

Without shaft seal / sealing system
### Materials

<table>
<thead>
<tr>
<th>VDMA No.</th>
<th>Parts designation</th>
<th>Model CN / CNF / CNK</th>
<th>Material design S1</th>
<th>Material design S2</th>
<th>Material design C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>Pressure rating PN 25</td>
<td>Pressure rating PN 25</td>
<td>Pressure rating PN 16</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>Volute casing</td>
<td>JS 1025</td>
<td>1.0619+N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>161</td>
<td>Casing cover</td>
<td>1.0570 / 1.0460</td>
<td>1.0570 / 1.0460</td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>Impeller</td>
<td>JL 1040 / JS 1025</td>
<td>JL 1040 / JS 1025</td>
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<td></td>
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<tr>
<td>230</td>
<td>Auxiliary impeller (1)</td>
<td>JL 1030</td>
<td>JL 1030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>344</td>
<td>Bearing support lantern</td>
<td>1.0570 / 1.0460</td>
<td>1.0570 / 1.0460</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>Bearing cover</td>
<td>1.0570 / 1.0460</td>
<td>1.0570 / 1.0460</td>
<td></td>
<td></td>
</tr>
<tr>
<td>472</td>
<td>Slide ring</td>
<td>PTFE / K</td>
<td>PTFE / K</td>
<td>PTFE / K</td>
<td></td>
</tr>
<tr>
<td>513</td>
<td>Wear ring insert</td>
<td>JL 1030</td>
<td>JL 1030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>529</td>
<td>Bearing sleeve</td>
<td>1.4571 / W5 (2)</td>
<td>1.4571 / W5 (2)</td>
<td>1.4571 / W5 (2)</td>
<td></td>
</tr>
<tr>
<td>545</td>
<td>Bearing bush</td>
<td>1.4571 / SiC30</td>
<td>1.4571 / SiC30</td>
<td>1.4571 / SiC30</td>
<td></td>
</tr>
<tr>
<td>816</td>
<td>Stator liner</td>
<td>Hastelloy C4</td>
<td>Hastelloy C4</td>
<td>Hastelloy C4</td>
<td></td>
</tr>
<tr>
<td>817</td>
<td>Rotor liner</td>
<td>1.4571</td>
<td>1.4571</td>
<td>1.4571</td>
<td></td>
</tr>
<tr>
<td>819</td>
<td>Motor shaft</td>
<td>1.4571 / 1.4021</td>
<td>1.4571 / 1.4021</td>
<td>1.4571</td>
<td></td>
</tr>
<tr>
<td>811</td>
<td>Motor casing</td>
<td>1.0254</td>
<td>1.0254</td>
<td>1.0254</td>
<td></td>
</tr>
</tbody>
</table>

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Parts coming into contact with conveying fluid

Parts that do not come into contact with conveying liquid

special materials / higher pressure ratings are possible on demand

(1) parts only for CNF and CNK
(2) tungsten carbide coating
Pressure and temperature limits

Material design S1, S2 and C

Permitted pump pressure [bar]

Liquid temperature [°C]
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: Ex 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]

<table>
<thead>
<tr>
<th>Motors</th>
<th>N34L-2</th>
<th>N34XL-2</th>
<th>N54XL-2</th>
<th>N64XL-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output power [P2 at 50 Hz]</td>
<td>8.0 kW</td>
<td>14.8 kW</td>
<td>24.0 kW</td>
<td>41.0 kW</td>
</tr>
<tr>
<td>max. expected sound pressure level dB(A) at 50 Hz</td>
<td>57</td>
<td>59</td>
<td>61</td>
<td>64</td>
</tr>
<tr>
<td>Output power [P2 at 60 Hz]</td>
<td>10.5 kW</td>
<td>17.2 kW</td>
<td>27.0 kW</td>
<td>48.0 kW</td>
</tr>
<tr>
<td>max. expected sound pressure level dB(A) at 60 Hz</td>
<td>58</td>
<td>60</td>
<td>62</td>
<td>64</td>
</tr>
</tbody>
</table>
## Documentation and tests

<table>
<thead>
<tr>
<th>Documentation according to HERMETIC Standard, consisting of:</th>
<th>Standard tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating manual for the HERMETIC pump</td>
<td>Hydrostatic pressure test with 1.5x nominal pressure</td>
</tr>
<tr>
<td>Technical specifications</td>
<td>Test run according to DIN EN ISO9906, Class 2 B (5 measuring points)</td>
</tr>
<tr>
<td>Sectional drawings with position numbers</td>
<td>Balancing of the shaft and impeller according to DIN ISO 1940, 6.3 [without report]</td>
</tr>
<tr>
<td>Dimensional drawing</td>
<td>Axial thrust measurement</td>
</tr>
<tr>
<td>Cable connection diagram</td>
<td>Leak test for the complete pump with ( N_2 ) at 6 bar</td>
</tr>
<tr>
<td>Acceptance report and pump characteristic curve</td>
<td><strong>Additional testing possible on request, e.g.:</strong></td>
</tr>
<tr>
<td>Electric test report</td>
<td>NPSH-test / Helium leakage test / vibration test</td>
</tr>
<tr>
<td>Slip ring report / gap size report, slide bearing clearancies</td>
<td>ultrasonic test / PMI-test</td>
</tr>
<tr>
<td>EC type-examination certificate PTB 99 ATEX</td>
<td></td>
</tr>
<tr>
<td>EU Declaration of Conformity</td>
<td></td>
</tr>
</tbody>
</table>
Reduced part list / example for pump type CNF
## Reduced part list

<table>
<thead>
<tr>
<th>VDMA Pos.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>Volute casing</td>
</tr>
<tr>
<td>513</td>
<td>Wear ring insert</td>
</tr>
<tr>
<td>381</td>
<td>Bearing support</td>
</tr>
<tr>
<td>545</td>
<td>Bearing bush</td>
</tr>
<tr>
<td>400</td>
<td>Gasket</td>
</tr>
<tr>
<td>816</td>
<td>Stator liner</td>
</tr>
<tr>
<td>812</td>
<td>Motor casing cover, front</td>
</tr>
<tr>
<td>812</td>
<td>Motor casing cover</td>
</tr>
<tr>
<td>811</td>
<td>Motor casing</td>
</tr>
<tr>
<td>360</td>
<td>Bearing cover</td>
</tr>
<tr>
<td>545</td>
<td>Bearing bush</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VDMA Pos.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>819</td>
<td>Motor shaft</td>
</tr>
<tr>
<td>230</td>
<td>Impeller</td>
</tr>
<tr>
<td>529</td>
<td>Bearing sleeve</td>
</tr>
<tr>
<td>230</td>
<td>Auxiliary impeller (*)</td>
</tr>
<tr>
<td>472</td>
<td>Slide ring</td>
</tr>
</tbody>
</table>

(*) only CNF and CNK

### Recommended spare parts stock

For two-year operation: **none**

For overhaul: **for each pump**

- 4 pcs. Pos. 400 gasket
- 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 from 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. 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.
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]
# Contents
- General information
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- Characteristic maps
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- Technical data
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- Spare parts
- Monitoring equipment
- Contact

## Contact

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