SERIES INFORMATION
CANNED MOTOR PUMP TYPE CAM / CAMR
REFRIGERATION ENGINEERING
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Applications

- Food industry: Cooling and deep-freezing with natural and synthetic refrigerants
- Sports and leisure facilities, such as: Bobsled tracks, ice rinks or ice hockey stadiums
- Electronics and power converters: modules in mobile (railway) and stationary (offshore wind turbines) applications
- Cooling modules in the chemical industry (optionally in explosion-proof design)
- Freeze-drying and oil-cooling systems for transformers
- CO₂ cooling for mainframes and server centres
- Absorption refrigeration applications with lithium bromide and NH₃

Pumped media

Liquids and liquefied gases, such as NH₃ (R717), CO₂ (R744), R22, R134a, hydrocarbons, R404a, R11, R12, Baysilone (M3, M5), methanol, silicone oil KT3, Syltherm XLT, water glycol mixtures. In principle, the refrigerant pumps are suitable for conveying all types of refrigerant. However, this must be checked for each case.

Canned motor pump type CAM

This pump is suitable for conveying liquids near vapour pressure and for standard applications.

Canned motor pump type CAMR

The CAMR pump with radial suction port is particularly suitable for compact systems with small collecting tanks. Due to the degassing on the suction side, the pump is ready for operation sooner after switching off. The pump can be suspended directly under the tank to save space.

Drive

The rotor lining - one of our core competencies - is manufactured by impact extrusion and, as a nickel-based alloy, is an essential component of the highly efficient canned motor. The liquid-filled canned motor accelerates to operating speed within seconds and operates wear-free and maintenance-free in continuous operation due to the hydrodynamic plain bearings. The canned motor is low-noise and low-vibration and offers double security against leakage.
## Operating data

### Temperature

**Areas of application**  -50 °C to +30 °C

### Canned motors

**Output**  up to 25.0 kW

**Speed**  2800 rpm or 3500 rpm (frequency control possible – with frequency converter from 1500 rpm to 3500 rpm)

**Voltage**  230, 400, 480, 500, 575, 690 Volt

**Frequency**  50 Hz or 60 Hz

**Type of protection**  IP 55

### Pump and hydraulics designations

**CAM 2 / 3 AGX 3.0**

- Motor
- Number of stages
- Size
- Design
**Function**

**CAM function**

The partial flow for cooling the motor and lubricating the bearing is taken from the pressure side after the last impeller and passed through the motor chamber. The partial flow is not returned to the suction side of the pump through the hollow shaft but to an area with increased pressure between two impellers. Therefore, point 3 in the pressure-temperature diagram that corresponds to the greatest heating has sufficient distance from the vapour pressure curve to prevent gasification within the pump.
OPERATING PRINCIPLE

Bearings

The hermetically sealed design requires the arrangement of bearings in the pumped liquid. Therefore, only hydrodynamic plain bearings are used in HERMETIC pumps. With correct operational mode, these bearings have the advantage that there is no contact between the bearing sliding surfaces. As a result, they are wear-free and maintenance-free in continuous operation. A service life of 20 years is common for hermetically sealed pumps.

In refrigeration engineering, carbon graphite is used as the bearing bush material that can withstand particularly high radial and axial loads. In addition, the material has a high resistance to elevated and low temperatures and high fatigue strength.
CHARACTERISTIC MAPS

2900 rpm 50 Hz

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CHARACTERISTIC MAPS

3500 rpm 60 Hz

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## Versions CAM / CAMR

<table>
<thead>
<tr>
<th>Type</th>
<th>Motor</th>
<th>Pump data</th>
<th>Motor data 50 Hz / 60 Hz</th>
<th>Weight kg</th>
<th>PN</th>
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<td></td>
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<td>Q&lt;sub&gt;min&lt;/sub&gt; m&lt;sup&gt;3&lt;/sup&gt;/h</td>
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<td>Output kW [P2]</td>
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<td>AGX 8.5</td>
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<td>CAM 3/3</td>
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## Versions

### Materials / pressure stages / flanges

<table>
<thead>
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<th>Component</th>
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<td>Housing</td>
<td>JS 1025</td>
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<tr>
<td>Suction cover (suction housing CAMR 2)</td>
<td>JS 1025</td>
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<td>Stage casing (CAM 1, CAM 2, CAMR 2)</td>
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<td>Stage casing (CAM 3)</td>
<td>JS 1025</td>
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<td>Diffuser (guide wheel CAM 3)</td>
<td>JL 1030</td>
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<td>Impellers</td>
<td>JL 1030</td>
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<td>Slide bearing</td>
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<td>Pressure rating</td>
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<td>Flanges</td>
<td>according to DIN EN 1092-1, PN 40 and PN 25 type D</td>
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* asbestos-free aramid fibre, ** test pressure 60 bar

## Noise expectancy values

<table>
<thead>
<tr>
<th>Motors</th>
<th>AGX 1.0</th>
<th>AGX 3.0</th>
<th>AGX 4.5</th>
<th>AGX 6.5</th>
<th>AGX 8.5</th>
<th>CKPx 12.0</th>
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<td>Output power [P2 at 50 Hz]</td>
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<td>Output power [P2 at 60 Hz]</td>
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<td>3.4 kW</td>
<td>5.6 kW</td>
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<td>9.7 kW</td>
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<td>25.0 kW</td>
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<tr>
<td>max. expected sound pressure level dB(A) at 60 Hz</td>
<td>48</td>
<td>52</td>
<td>55</td>
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<td>59</td>
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</table>
List of parts CAM 1 / CAM 2

- 230.1 Impeller
- 400.1 Flat seal
- 108 Stage casing
- 230.2 Impeller
- 400.5 Flat seal
- 400.6 Flat seal
- 162 Suction cover
- 174.2 Guide blade insert
- 101 Pump casing
- 174.1 Guide blade insert
- 230.4 Impeller
- 400.3 Flat seal
- 545.1 Bearing bushing
- 821 Rotor pack
- 813 Stator pack
- 819 Motor shaft
- 545.2 Bearing bushing
- 812.1 Cover for motor housing
- 529.1 Bearing sleeve
- 816 Rotor lining
- 811 Motor housing
- 529.2 Bearing sleeve
- 400.4 Flat seal
Dimension drawing for motors of size: AGX 1.0 / AGX 3.0 / AGX 4.5 / AGX 6.5

1 Cable U1, V1, W1 + protective conductor
   AGX 1.0: 4 x 1.5 mm²
   AGX 3.0: 4 x 1.5 mm²
   AGX 4.5: 4 x 2.5 mm²
   AGX 6.5: 4 x 4 mm²
   Cable length 2.5 m

2 Cable for PTC thermistor
   2 x 1.0 mm², cable 5 + 6,
   Cable length 2.5 m

3 Pressure gauge connection G 1/4

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<table>
<thead>
<tr>
<th>Dimensions</th>
<th>CAM 1 / 2-stage</th>
<th>CAM 1 / 3-stage</th>
<th>CAM 1 / 4-stage</th>
<th>CAM 1 / 5-stage</th>
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### Versions CAM 2

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<th>CAM 2 / 4-stage</th>
<th>CAM 2 / 5-stage</th>
<th>CAM 2 / 6-stage</th>
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<tbody>
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List of parts CAMR 2

106 Suction housing
131 Inlet ring
230.1 Impeller
174.2 Diffuser
108 Stage casing
230.3 Impeller
230.4 Impeller
400.1 Flat seal
174.1 Diffuser
400.3 Flat seal
400.5 Flat seal
400.6 Flat seal
400.3 Flat seal
400.4 Flat seal
160 Cover for motor housing
545.1 Bearing bushing
821 Rotor pack
813 Stator pack
819 Motor shaft
545.2 Bearing bushing
812.1 Cover for motor housing
529.1 Bearing sleeve
816 Rotor lining
811 Motor housing
529.2 Bearing sleeve
400.4 Flat seal

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1 Cable U1, V1, W1 + protective conductor
   AGX 3.0: 4 x 1.5 mm²
   AGX 4.5: 4 x 2.5 mm²
   AGX 6.5: 4 x 4 mm²
   Cable length 2.5 m

2 Cable for PTC thermistor
   2 x 1.0 mm²,
   Cable 5 + 6,
   Cable length 2.5 m

3 Pressure gauge connection
   G 1/4
   4 Drain with screw plug G 1/4 on
      the suction housing (optional)
## Versions CAMR 2

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<thead>
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174.2 Diffuser
101 Pump casing
174.1 Diffuser
230.4 Impeller
400.3 Flat seal
400.6 Flat seal
230.1 Impeller
400.1 Flat seal
108 Stage casing
400.5 Flat seal
812.1 Cover for motor housing
160 Cover for motor housing
162 Suction cover
545.1 Bearing bushing
821 Rotor pack
813 Stator pack
819 Motor shaft
545.2 Bearing bushing
230.3 Impeller
529.1 Bearing sleeve
816 Rotor lining
811 Motor housing
529.2 Bearing sleeve
400.4 Flat seal
Dimension drawing for motors of size: AGX 8.5 / CKPx 12.0 / CKPx 19.0

1 Cable U1, V1, W1 + protective conductor
   AGX 8.5: 4 x 6 mm²
   CKPx 12.0: 4 x 6 mm²
   CKPx 19.0: 4 x 6 mm²
   Cable length 2.5 m

2 Cable for PTC thermistor
   2 x 1.0 mm², cable 5 + 6,
   Cable length 2.5 m

3 Pressure gauge connection G 1/4

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**DOCUMENTATION AND TESTS**

**Documentation and tests**

**Documentation according to HERMETIC Standard consisting of:**
- Operating manual for the HERMETIC pump
- Technical specifications
- Characteristic curve of the pump
- Sectional drawing
- Bills of materials
- Dimensional drawing
- Cable connection diagram
- Plain bearing play
- EU Declaration of Conformity

**Warranty**
- 30 months from delivery

**Standard tests**
- Hydrostatic pressure test with 1.5x nominal pressure
- Balancing of shaft and impeller according to DIN ISO 1940, 6.3
- Leak test of the complete pump
- Functional test (optionally with protocol)

**Additional test**
- Factory certificate according to EN 10204 / 3.1 for pressurised parts in contact with medium (chemical analysis)
- Factory certificate according to EN 10204 / 3.1 for counter flanges
- Factory certificate according to EN 10204 / 2.2 for impeller and pump shaft
- EUR.1 movement certificate (after examination)
- RMRS / DNV / Hapag Lloyd
Automatic venting

1. Use a non-return valve between the discharge nozzle and gate valve to ensure that the medium does not flow back after switching off the pump.

2. To allow venting, provide a bypass pipe:
   - Ahead of the non-return valve.
   - Please note: do not provide non-return valves in the bypass pipe.

3. For parallel operation:
   - Separate supplies for the pumps
   - Separate bypass pipes

Fig. Automatic venting (single pump - parallel pumps)

- Qmin - Orifice (immediately before the valve / liquid separator)
- Bypass / venting
- Consumers
- Qmax - Orifice
- Suction head
- Liquid separator
- Valve (immediately before the feed tank / liquid separator)
- Non-return valve
Orifice and inducer

Orifice
We recommend protecting the HERMETIC pumps by using two orifices against any outside influence (for example by operating personnel). Orifice 1 ($Q_{\text{min}}$) ensures the minimum throughput required to dissipate the motor heat loss. Orifice 2 ($Q_{\text{max}}$) maintains the minimum differential pressure in the rotor space that is needed to stabilise the hydraulic axial thrust balancing and to prevent the evaporation of the partial flow. A flow regulator can be used instead of the $Q_{\text{max}}$ orifice.

Inducer
Inducers are axial impellers that are arranged on the same shaft immediately in front of the first impeller of a centrifugal pump to generate an additional static pressure in front of the blade cascade of the impeller. Inducers are primarily used where the energy level provided by the system is insufficient ($\text{NPSHA} > \text{NPSHR}$). The HERMETIC inducer reduces the NPSHR value of the pump by approx. 0.5 m over the entire characteristic curve. In many cases, inducers are also used prophylactically if the expected resistance of the inlet or suction line cannot be accurately determined or if fluctuations in NPSHA are expected due to changes in the geodetic height of the inlet liquid level or its pressure superimposition. Inducers are also particularly suitable for conveying boiling liquids (that are afflicted with gas bubbles). In both cases, the inducer can be used to prevent cavitation or reduced output provided it is correctly calculated and matches the flow rate of the impeller it feeds.
Flow regulator

General information
The flow regulator was specially developed for refrigerant systems. This type of valve allows the safe operation of pumps in a range normally not possible for pumps with $Q_{\text{max}}$ orifice. The adjacent graph shows the added operating range obtained by using a flow regulator instead of a $Q_{\text{max}}$ orifice. Often, a smaller, less expensive pump can be used.

Operation
The flow regulator must be filled with liquid during operation. The operation of the valve depends on the material data of the pumped medium. When ordering the valve, it is therefore important that complete information on the characteristics of the pumped medium in the operating range to be regulated is available. The density of the pumped medium is the most important characteristic for the correct design of a valve.

Maintenance
The flow regulator requires no regular maintenance or readjustment. The valve inserts can be reordered if necessary.

Area of application
The flow regulator is mounted on the discharge branch of the pump. The flow regulator limits the maximum flow rate of the pump. However, in contrast to the $Q_{\text{max}}$ orifice, the flow rate $< Q_{\text{max}}$ is almost equal to the full delivery pressure of the pump behind the valve. The flow regulator regulates the delivery rate to ensure that the maximum pump capacity is not exceeded. This protects the pump from overload and keeps the delivery rate within the optimum NPSH range of the pump.
Flow regulator

Working principle
The flow restriction is achieved by specially shaped openings in a spring-loaded, movable piston. The pressure difference in front of and behind the piston moves it. This ensures that only the appropriate amount flows through the openings. It follows that with increasing pressure difference, the spring is compressed. This means that the specially shaped openings are only partially released. When the pressure difference in front of and behind the valve decreases, the spring pushes the piston back in line with the changing pressure difference releasing a larger part of the opening. If the pressure difference exceeds the specified maximum value (pressure compensation range, generally 8 bar), the spring is compressed up to the stop, and the valve then works like a fixed orifice. The same applies when the required minimum pressure is not reached.

Functional schematic of the valve
Position A
In position A, the insert works as an orifice. As a result, little pressure is relieved at the valve.

Position B
In the pressure compensation range, the insert limits the maximum volumetric flow rate as a function of the differential pressure with an accuracy of +/- 5 %.

Position C
Behind the pressure compensation area, the insert is completely compressed and acts as an orifice.
Flow regulator

The valve is available for the following flow rates

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<th>max. flow rate for H₂O</th>
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Design software / services

Online design
The user-oriented design software simplifies the selection of the right refrigerant pump. It is also possible to calculate the energy-saving options with the software. The software-based design for frequency-controlled operation is easily possible. Minimum and maximum speeds and the appropriate operating range are displayed.

Quick registration
Do you want to know more about the many benefits of our new design software?

Simply register as a new user on our homepage www.hermetic-pumpen.com

After registration and receiving the access data, you can test the design software free of charge. Registered users simply log in using their access data – a new registration is not required.

Other online services
We provide free 3D CAD models for your planning and your design office.
Benefits of the design software

- Direct entry of the required refrigeration capacity
- Dynamic selection according to power consumption, NPSH
- The database contains all common refrigerants
- Integration of different pump protection systems, such as $Q_{\text{max}}$ orifice or flow regulator
- Design for variable-speed drives
SERIES INFORMATION

Contact

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www.hermetic-pumpen.com