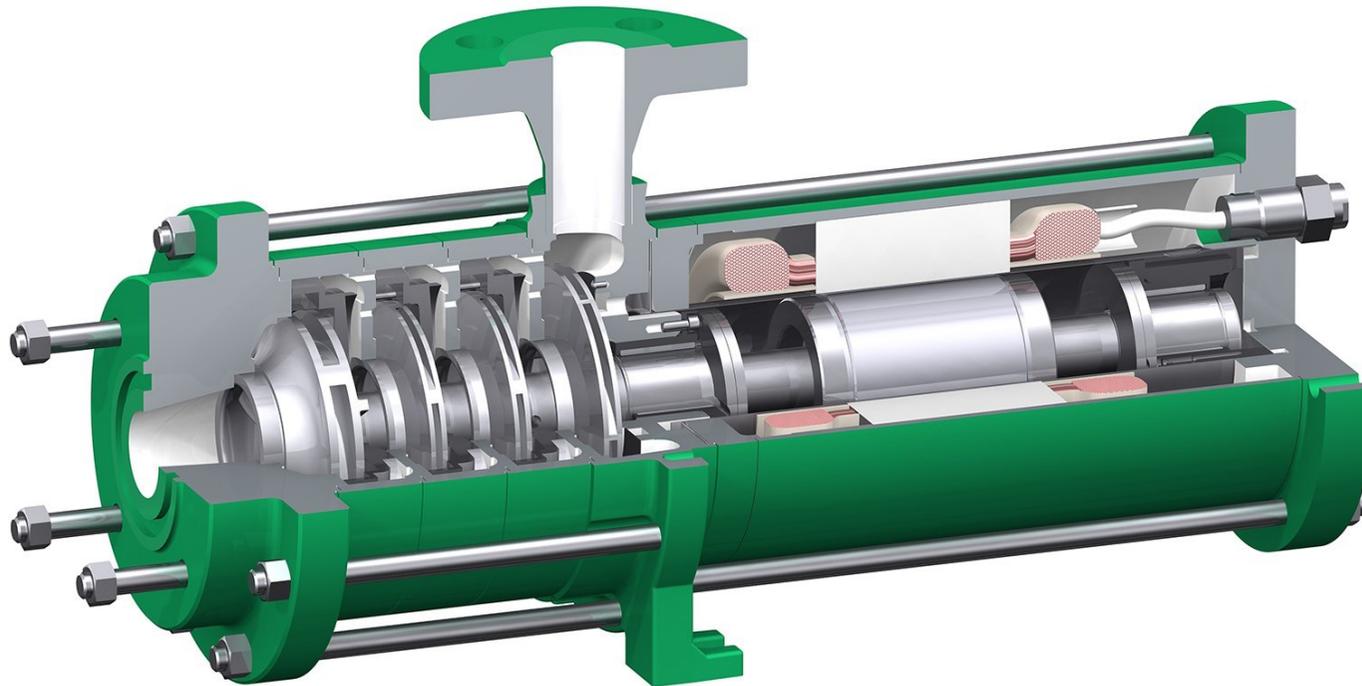


PRODUCT INFORMATION  
CANNED MOTOR PUMP TYPE CAMh

# REFRIGERATION ENGINEERING



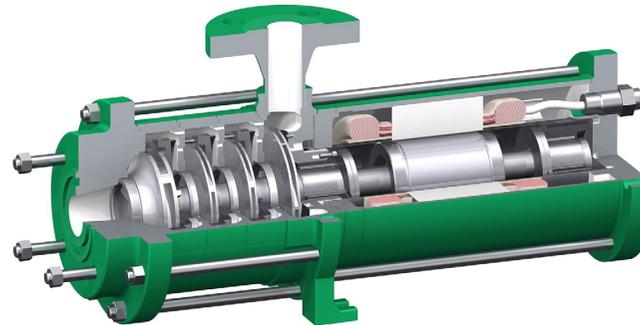
**ZART®**

*simply best balance*

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## Information

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### Applications

- Food industry: Cooling and deep-freezing with natural refrigerants
- Sports and leisure facilities, such as bobsled tracks, ice rinks or ice hockey stadiums
- Cooling modules in the chemical industry
- Freeze-drying and oil-cooling systems for transformers
- CO<sub>2</sub> cooling for mainframes and server centres

### Canned motor pump type CAMh

The CAMh type is the specially adapted solution for CO<sub>2</sub> applications. As a high-pressure version, the CAMh is optimally adapted to existing installation conditions and is suitable for 52 bar operation and standstill pressure.

### Type / design

Horizontal, seal-less 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 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 is low-noise and low-vibration and offers double security against leakage.

### Operating data

#### Temperature

Application conditions	-50 °C to +5 °C
Standstill	-50 °C to +15 °C

#### Canned motors

Output	up to 7.5 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 or 60 Hz
Type of protection	IP 55

### Pump and hydraulics designations

#### CAMh 2 / 3 AGX 3.0

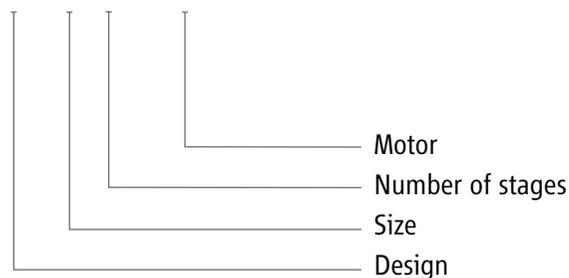


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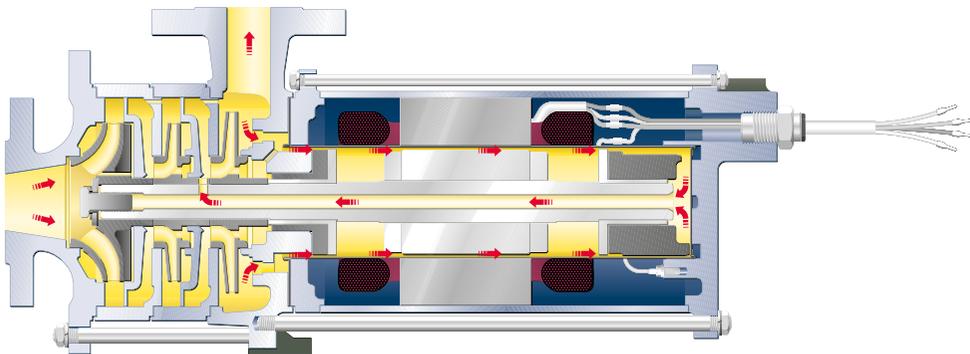
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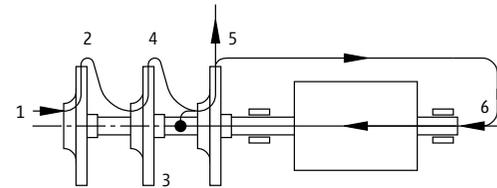


**Function CAMh**

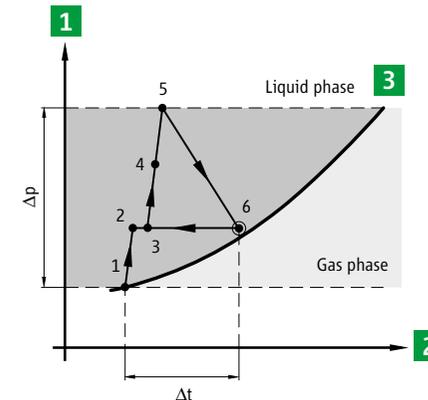
The partial flow for cooling the motor and lubricating the bearing is taken from the pressure side after the last impeller and passed through the motor chamber. The partial flow is not returned to the suction side of the pump through the hollow shaft but to an area with increased pressure between two 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.



Partial flow return between the stages



Pressure-temperature diagram



- 1 Pressure
- 2 Temperature
- 3 Vapour pressure curve

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## Bearings

The hermetically sealed design requires the arrangement of bearings in the pumped liquid. Therefore, mostly 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.

Materials based on tungsten carbide (W5) and silicon carbide (SiC30) have proven to be almost universal bearing pairings. These pairings consist of a metallic shaft sleeve made of stainless steel (1.4571) with a tungsten carbide coating using the "high-speed flame spraying" process and a fixed bearing bush made of ceramic material (SiC30) held in a stainless-steel sleeve. SiC30 is a mixed material of silicon carbide and graphite that combining the advantages of both materials. Mixed friction conditions, which occur, for example, when starting and stopping pumps, are very easy to control with SiC30. This material is also resistant to thermal shock, chemically largely inert and blister-stable (no blistering on the material surface) as well as abrasion-resistant.

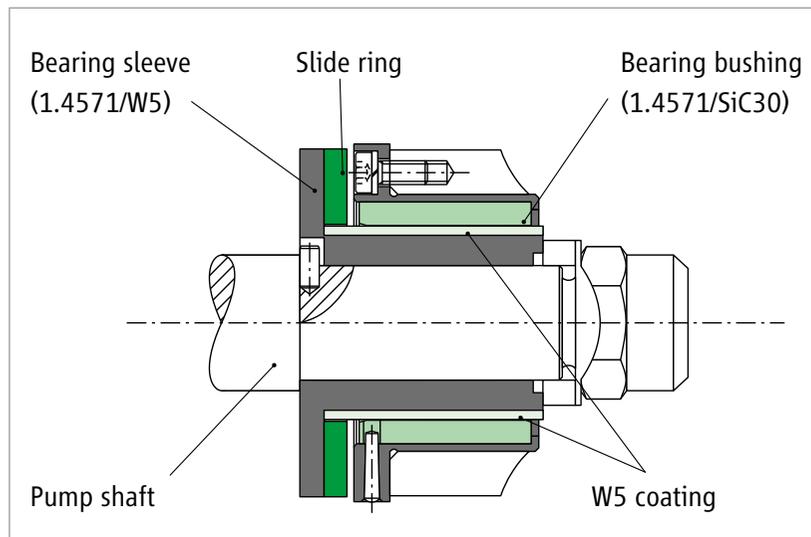


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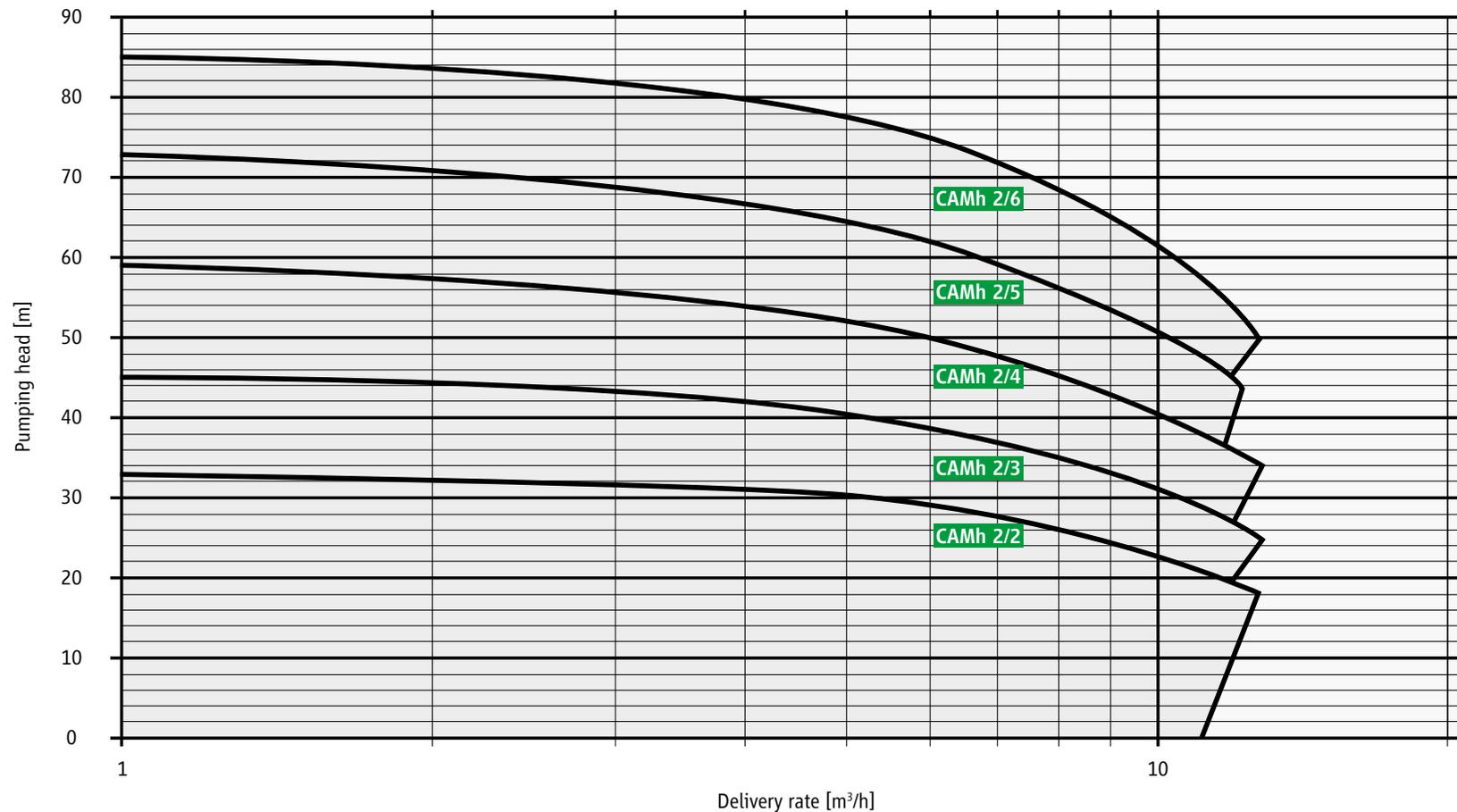
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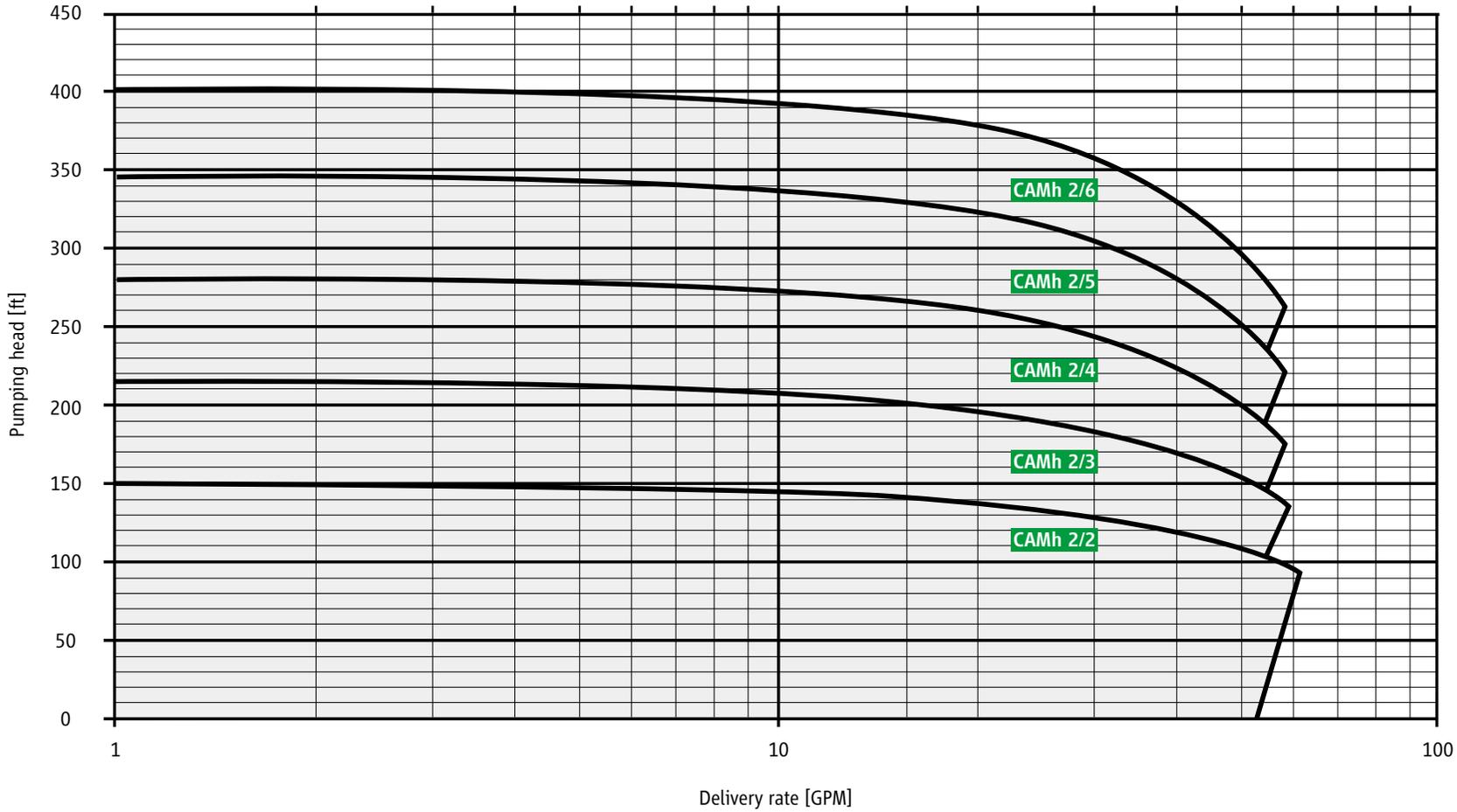
2900 rpm 50 Hz



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3500 rpm 60 Hz



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## Versions CAMh

Type	Motor	Pump data		Motor data 50 Hz / 60 Hz		Weight kg	PN
		Q <sub>min</sub> m <sup>3</sup> /h	Q <sub>max</sub> m <sup>3</sup> /h	Output kW [P2]	Rated current at 400 V / 480 V		
CAMh 2/2	AGX 3.0	1.5	13.0	3.0/3.4	7.1	62	52
CAMh 2/3	AGX 3.0	1.5	13.0	3.0/3.4	7.1	67	52
CAMh 2/3	AGX 4.5	1.5	14.0	4.5/5.6	10.4	73	52
CAMh 2/4	AGX 3.0	1.5	14.0	3.0/3.4	7.1	72	52
CAMh 2/4	AGX 4.5	1.5	14.0	4.5/5.6	10.4	77	52
CAMh 2/5	AGX 3.0	1.5	14.0	3.0/3.4	7.1	76	52
CAMh 2/5	AGX 4.5	1.5	14.0	4.5/5.6	10.4	81	52
CAMh 2/5	AGX 6.5	1.5	14.0	6.5/7.5	15.2	82	52
CAMh 2/6	AGX 4.5	1.5	14.0	4.5/5.6	10.4	86	52
CAMh 2/6	AGX 6.5	1.5	14.0	6.5/7.5	15.2	86	52

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## Materials / pressure stages / flanges

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Housing	1.0619+N
Suction cover	S 355J2+N
Stage casing	1.0460
Diffuser	JL 1030
Impellers	JL 1030
Slide bearing	1.4571/W5-1.4571/SiC30
Shaft	1.4021
Rotor lining	1.4571
Seals	AFM 34*
Pressure rating	PN 52**
Flanges	according to DIN EN 1092-1; PN 64 type D (with groove)

\* asbestos-free aramid fibre, \*\* test pressure 78 bar

## Noise expectancy values

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Motors	AGX 3.0	AGX 4.5	AGX 6.5
Output power [P2 at 50 Hz]	3.0 kW	4.5 kW	6.5 kW
max. expected sound pressure level dB(A) at 50 Hz	52	54	56
Output power [P2 at 60 Hz]	3.4 kW	5.6 kW	7.5 kW
max. expected sound pressure level dB(A) at 60 Hz	52	55	56

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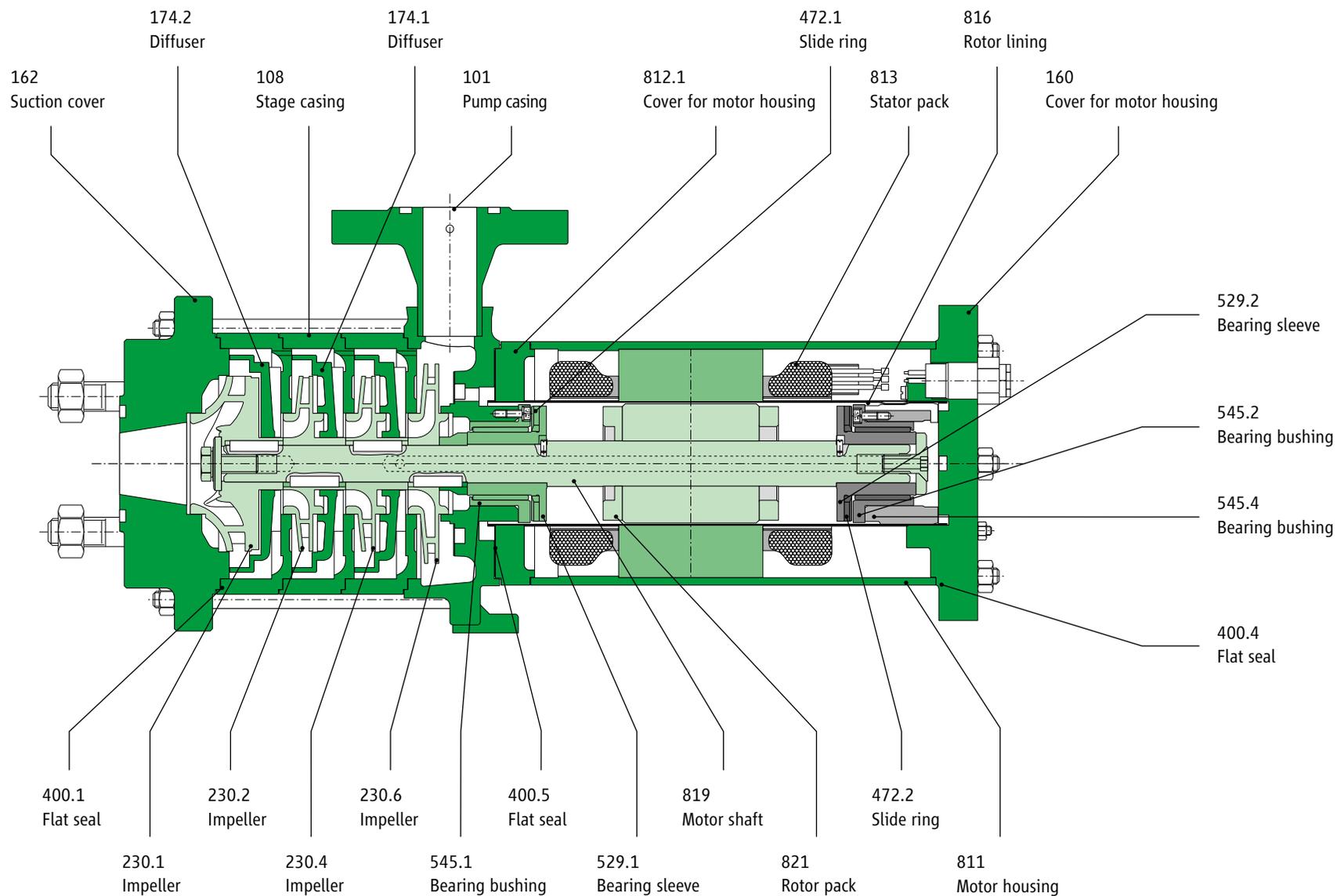
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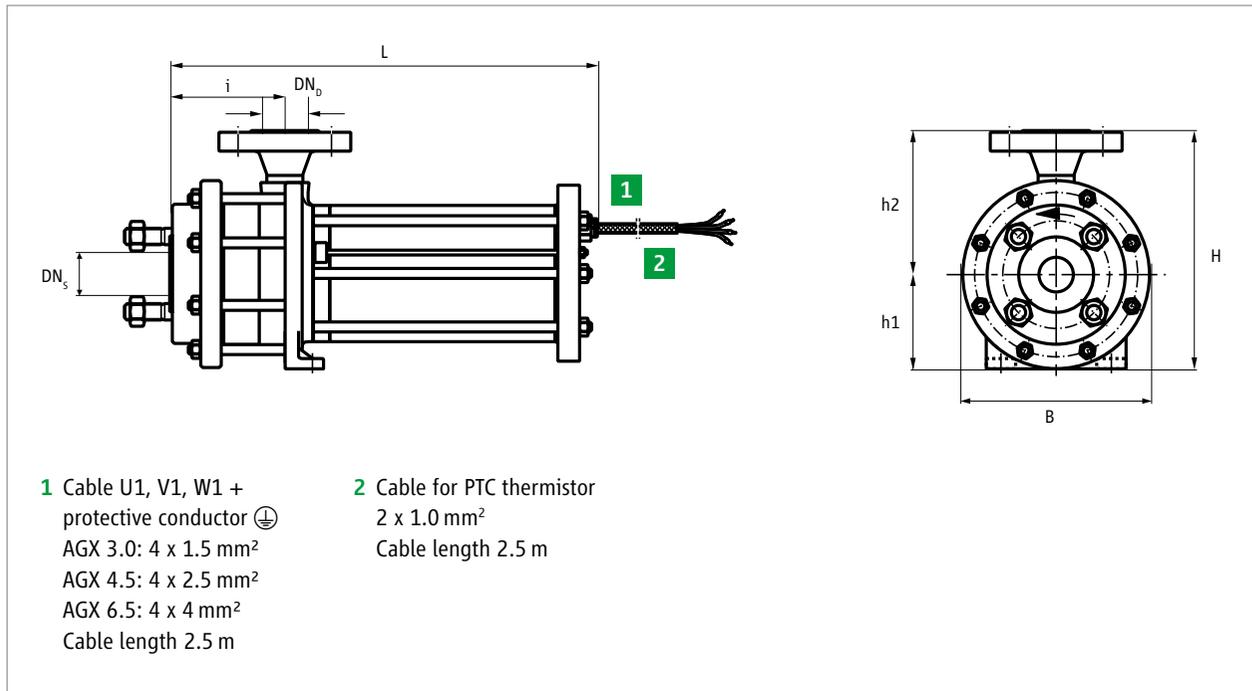


List of parts CAMh



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**Dimension drawing for motors of size: AGX 3.0 / AGX 4.5 / AGX 6.5**

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## Versions CAMh

Dimen- sions	CAMh 2/2-stage	CAMh 2/3-stage	CAMh 2/3-stage	CAMh 2/4-stage	CAMh 2/4-stage	CAMh 2/5-stage	CAMh 2/5-stage	CAMh 2/5-stage	CAMh 2/6-stage	CAMh 2/6-stage
	AGX 3.0	AGX 3.0	AGX 4.5	AGX 3.0	AGX 4.5	AGX 3.0	AGX 4.5	AGX 6.5	AGX 4.5	AGX 6.5
Length / L	505	546	615	590	655	630	696	695	737	740
Width / W	218	218	218	218	218	218	218	218	218	218
Height / H	277	277	277	277	277	277	277	277	277	277
h1	110	110	110	110	110	110	110	110	110	110
h2	167	167	167	167	167	167	167	167	167	167
i	136	177	177	218	218	259	259	259	300	300
DN <sub>s</sub>	40	40	40	40	40	40	40	40	40	40
DN <sub>d</sub>	32	32	32	32	32	32	32	32	32	32

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## Documentation and tests

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### Documentation according to HERMETIC Standard consisting of:

Operating manual for the HERMETIC pump

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Technical specifications

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Characteristic curve of the pump

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Sectional drawing

---

Bills of materials

---

Dimensional drawing

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Cable connection diagram

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Plain bearing play

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EU Declaration of Conformity

### Warranty

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30 months from delivery

### Standard tests

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Hydrostatic pressure test with 1.5x nominal pressure

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Balancing of shaft and impeller according to DIN ISO 1940, 6.3

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Leak test of the complete pump

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Functional test (optionally with protocol)

### Additional test

---

Factory certificate according to EN 10204 / 3.1 for pressurised parts in contact with medium (chemical analysis)

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Factory certificate according to EN 10204 / 3.1 for counter flanges

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Factory certificate according to EN 10204 / 2.2 for impeller and pump shaft

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EUR.1 movement certificate (after examination)

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RMRS / DNV / Hapag Lloyd

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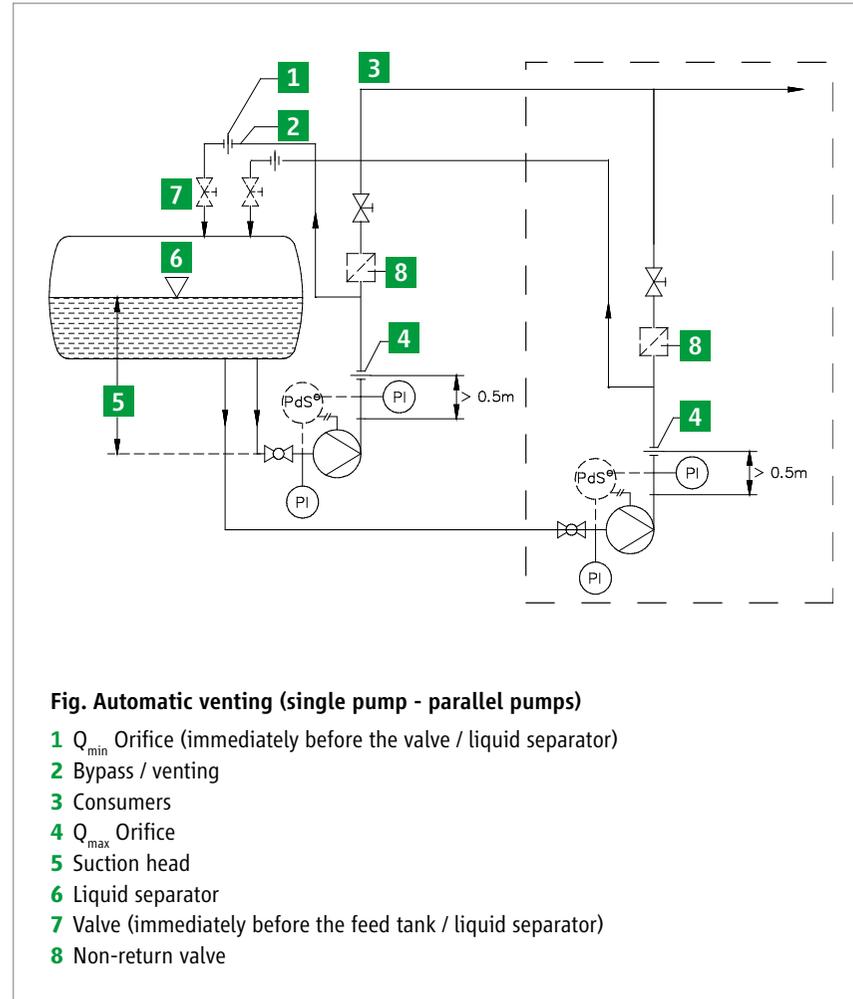
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### Automatic venting

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.
  - Ahead of the non-return valve.
  - Please note: do not provide non-return valves in the bypass pipe.
2. For parallel operation:
  - Separate supplies for the pumps
  - Separate bypass pipes



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## 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  $Q_{\max}$  orifice. The adjacent graph shows the added operating range obtained by using a flow regulator instead of a  $Q_{\max}$  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  $Q_{\max}$  orifice, the flow rate  $< Q_{\max}$  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.

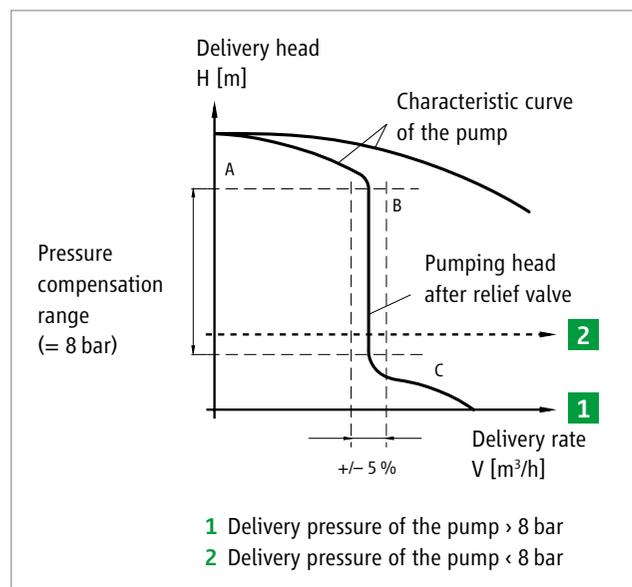


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## Flow regulator

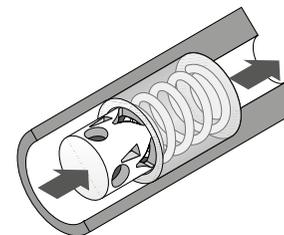
### Working principle

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

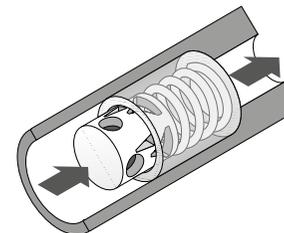
##### Position A

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  $\pm 5\%$ .



##### Position C

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

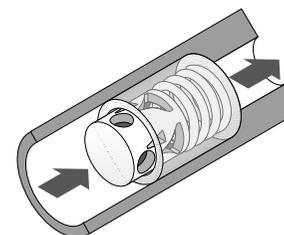


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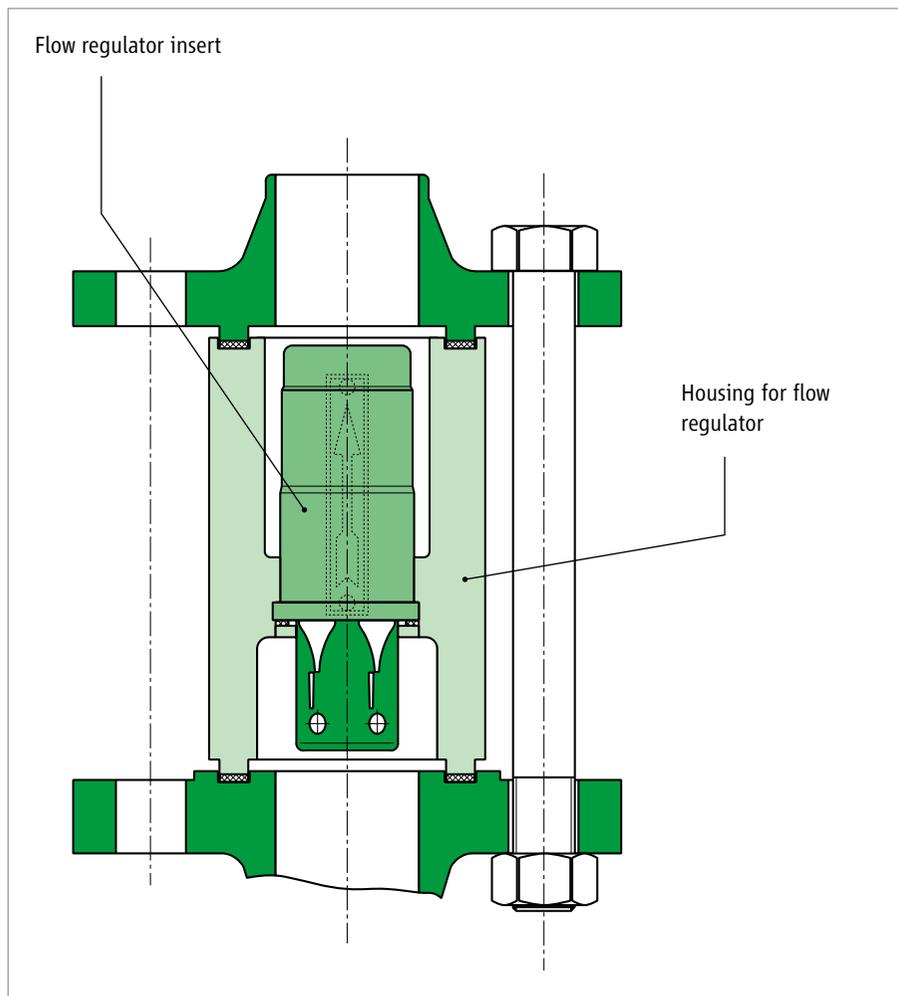
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**Flow regulator and list of parts**

**The valve is available for the following flow rates**

Model	Pressure rating	NW	max. flow rate for H <sub>2</sub> O
32-63-40-10	63 bar	32	10,00 m <sup>3</sup> /h



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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

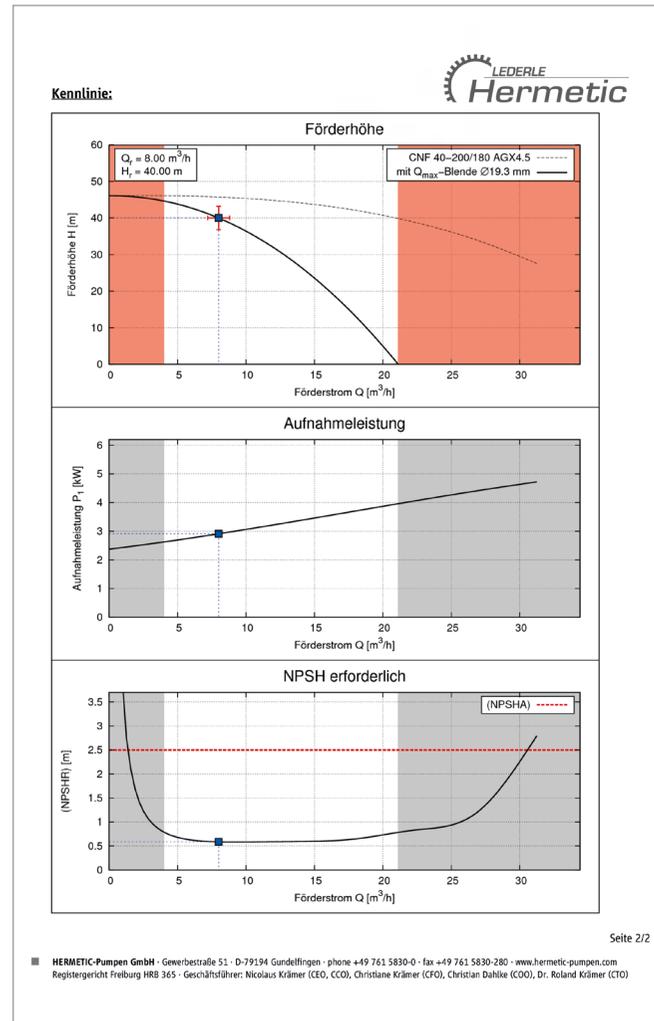
Do you want to know more about the many benefits of our new design software?

Simply register as a new user on our homepage  
[www.hermetic-pumpen.com](http://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.



Example view after pump selection

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## Benefits of the design software

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Direct entry of the required refrigeration capacity

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Dynamic selection according to power consumption, NPSH

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The database contains all common refrigerants

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Integration of different pump protection systems, such as  $Q_{\max}$  orifice or flow regulator

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Design for variable-speed drives

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[www.hermetic-pumpen.com](http://www.hermetic-pumpen.com)

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