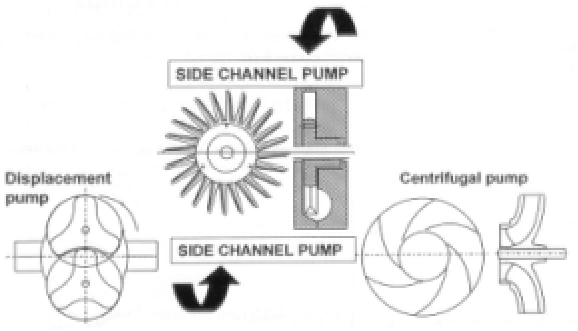
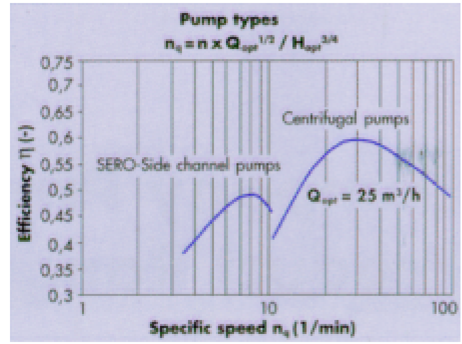
The SERO Side Channel Pump

The SERO Side Channel Pump - a niche product between displacement pump and centrifugal pump

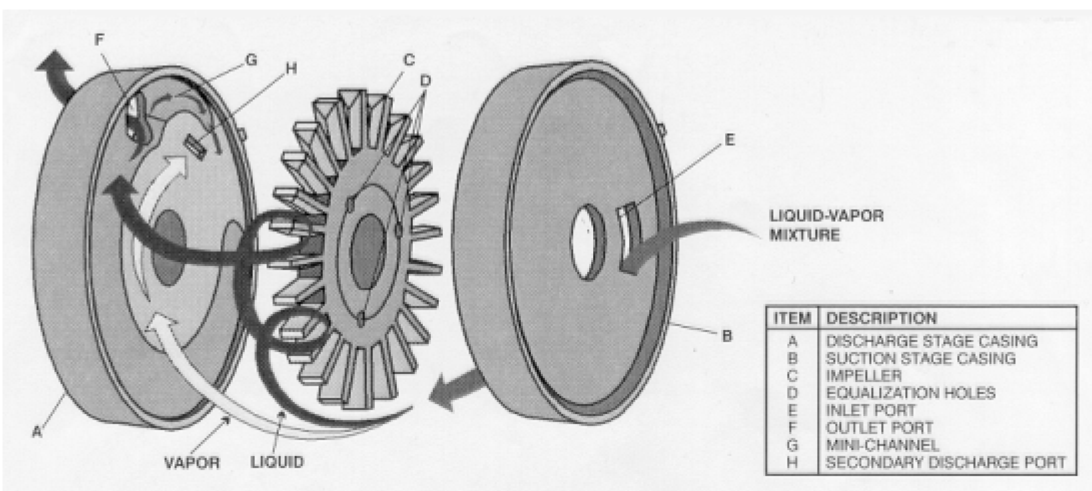




n_q-curve

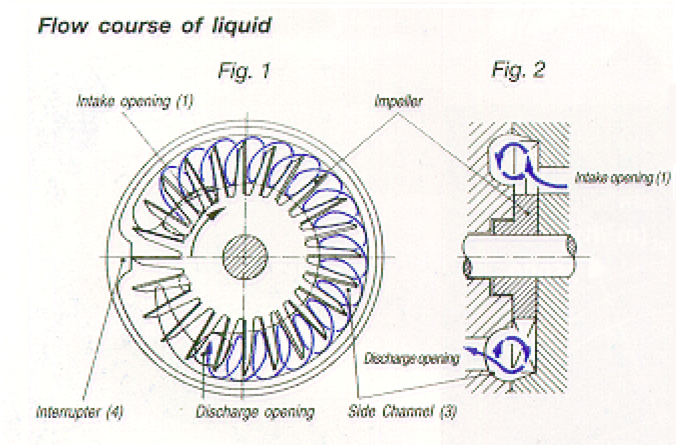
Construction of a SERO Side Channel Stage

The SERO Side Channel Stage consists of an impeller (C), a Side Channel Casing (A) und a Stage Casing (B).

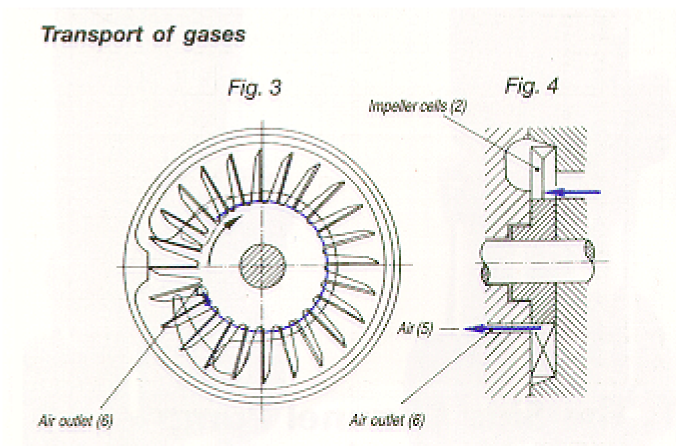


Working principle of a SERO Side Channel Pump

The pumped liquid or liquid/gas mixture enters the impeller cells (2) and side channel (3) via the intake opening (1). The side channel is interrupted (4) at one point in the casing, rather than extending over the entire circumference.
Rotation of the impeller, combined with the centrifugal force that builds up, causes the pumped liquid to move back and forward many times between the cells of the star wheel and the side channel, creating a very intense transfer of energy (arrows in figure 1 and figure 2).
This creates a pump head (increase in pressure) which is 5 to 10 times that generated by normal pump impellers rotating at the same speed.
The side channel is tapered. As a result, the liquid is pumped into the discharge opening just before the interrupter (4) and passes either to the next stage or to the pump's discharge nozzles..

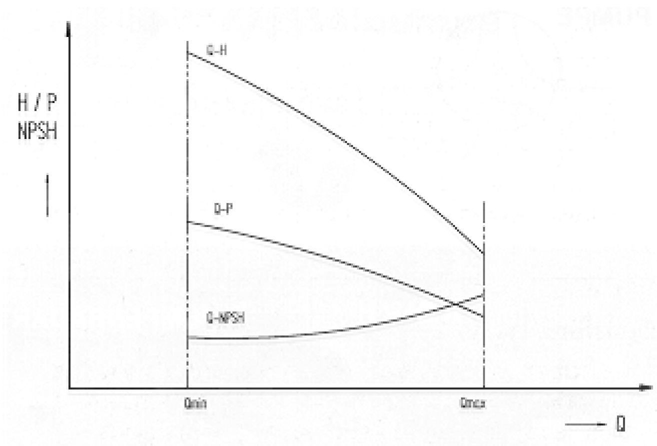


The centrifugal effect of the impeller separates air from the liquid. The liquid collects in the outer region of the impeller cells and side channel, whereas the air builds up in the inner part (5).
The higher pressure in the vicinity of the discharge opening forces the air through a separate air outlet (6) into the next stage and, from there, to the delivery line. In this way, more and more air is evacuated from the intake line until the liquid level reaches the top of the pump and full pumping starts.
The intake line can be vented even if it is empty, provided that there is sufficient liquid still left in the pump. The pump is designed so that there is always enough auxiliary liquid remaining to repeat the suction process.



Characteristic of the SERO Side Channel Pump

- The Side Channel Pump has its highest power consumption at the lowest capacity!
- The steep Q-H characteristic curve is especially well suited for a pressure-dependent circolatory control.
- Small gaps allow no abrasive particles in the liquid.



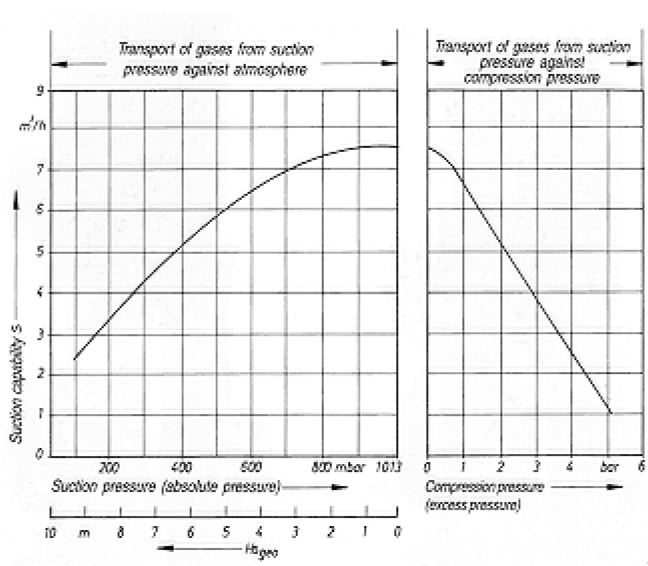
Working field of the SERO Side Channel Pump

Low nq

At low flows and high pressures SERO has an essential advantage against normal centrifugal pumps in view to investment and operating costs.

Priming Capability

- SERO pumps are capable of producing a high suction vacuum and are therefore **self-priming**. This makes them an ideal choice if for reasons of safety or difficult access, installatin above the storage tank is required (no need for an auxialary priming device).
- Self-priming process is also guaranteed in the event of excess pressure on the discharge cup (emptying process max. 2-3 minutes).



The above illustration shows a side channel pump's characteristical suction ability curve at air suction. The data depend on pump size and number of stages. During the suction period the pump works in this range until the liquid level increases due to a vacuum in the pump. For a short time a gas/liquid mixture is pumped until the pump reaches its stationary liquid flow. The states of operation switch over without any influence from outside. When the pump is turned off, its constructional measurements make sure that it does not get empty. The liquid rest will make sure that the self-priming pump can start suction again without using a footvalve in the suction pipe. In this way the self-priming ability increases safety during operation where high operating readiness in periodic operation is demanded or where suction must be done over hills, resp. where an evacuation of the suction pipe is necessary when starting the pump.

Gas Fraction Pumping

- SERO pumps are capable of handling liquids with **gas or vapor inclusions (up to 50 %)**, and also media close to boiling temp., e.g. LPG
- SERO pumps are **cavitation-proof** at variable vapor pressure (flow is not interrupted during partial degassing).

Pressure increasing

- Pressure rate is up to 10 times higher than that generated by normal pump impellers rotating at the same speed.

SERO Multi-Function Pump

The Multi-Function Pump is used for applications where the need is for handling liquids with gas or vapor entrainments, without risk of flow interruption.
The special features of the Multi-Function Pump offer substantial advantages towards major failure causes of 'normal' centrifugal pumps. Their high self-priming ability combined with their insusceptibility to cavitation make the Multi-Function Pumps best choice for liquids pumped near their boiling point, such as **condensate, liquified gas, hydrocarbons, aerosoles** or **refrigerants**.

Multi-Function Pump SRZS 224 W KK G12E.62

The Multi-Function Pump combines the advantages of two pumping systems:

- The side channel pump hydraulic has an **excellent priming ability**. It allows trouble-free handling of **maximum gas contents of 50%** and attains **pump heads which are up to 4 times greater** per stage than that generated by radial flow centrifugal pumps.
- The radial flow centrifugal pump hydraulic of the inlet stage is used to achieve **extremely low NPSH values** at a low motor speed of n=1450 rpm (correspondingly n=1750 rpm at 60 Hz)

The NPSH values are between 20 cm (0.6 ft) and 1 m (3 ft) at n=1450 rpm. This allows inlet heads of less than 0.5 m (1.5 ft) for boiling liquids, resulting in substantial savings on system costs.
The Multi-Function Pump has no definite fixed cavitation limit line. At variable vapor pressure the Multi-Function Pump is considerably less sensitive to cavitation than a radial flow centrifugal pump. With this increased operational safety, the Multi-Function Pump guarantees trouble-free production processes.
Due to its considerable pressure rating and the compact dimensions of a modular design the Multi-Function Pump is definitely the optimal solution, technically and also economically, for processes involving gaseous liquids.

Net Positive Suction Head (NPSH)

To guarantee a troublefree operation, the feed conditions of the system have to be adapted to the NPSH of the pump. Applicable for the determination of the NPSH(system)-value are the factors temperature, vapor pressure, density, **geodetic suction lift** and losses in the suction piping. Simplified it applies:

$$NPSH_{system} = \frac{P_e + P_b - P_D}{e \cdot g} + H_{z\,geo} - H_{vs}\,(m)$$

NPSH(system)	=	existing system-sided NPSH-value (m)
P_e	=	gauge pressure or vacuum on suction side; liquid level in bar (with vacuum P_e becomes negative)
P_b	=	lowest atmospheric pressure at place of installation being defined in bar (N/m^2)
P_D	=	absolute vapor steam pressure of the pumped liquid at working temperature being defined in bar (N/m^2)
e	=	density of the pumped liquid at working temperature being defined in kg/m^3
g	=	9,81 (m/s^2)
$H_{z\,geo}$	=	geodetic suction lift (difference of altitude between suction fluid level and centre line of pump) being defined in m
H_{vs}	=	friction losses in the suction pipe-line being defined in m

(Conversion: 1 bar = 10^5 N/m^2)

Results from the calculation of the NPSH(system) a smaller value than the the NPSH(pump) (to be taken from the performance curve), steps have to be taken to reach a proportion of

Comparison of energy costs between Side Channel and Radial Flow Centrifugal Pump