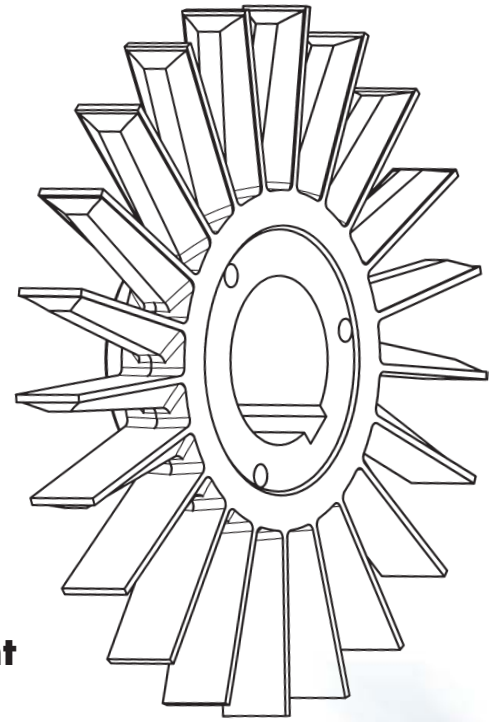
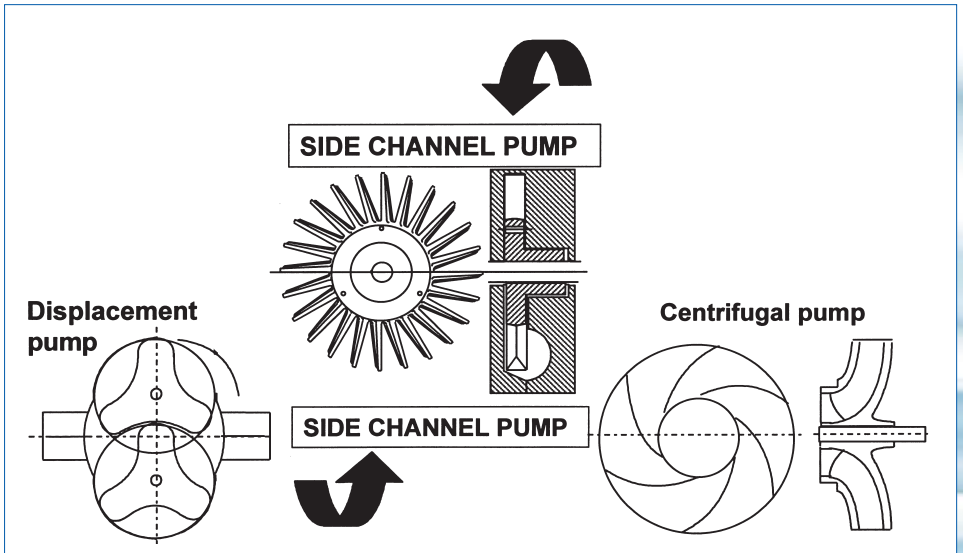
SERO PumpSystems

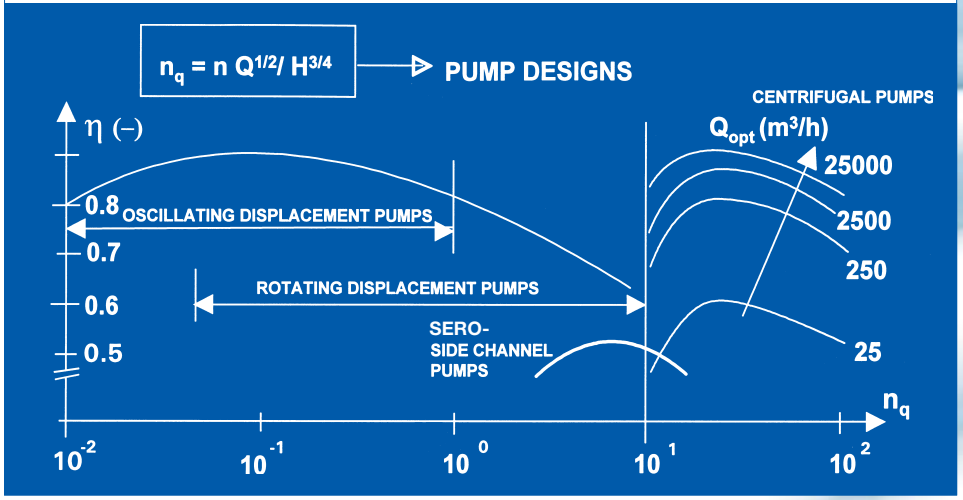
Side Channel Pump

Product information



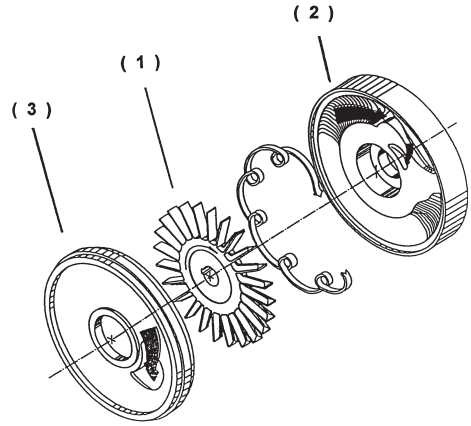
1. The Side Channel Pump – a niche product between displacement pump and centrifugal pump





2. Construction of a SERO Side Channel Stage

The Side Channel Stage consists of an impeller (1), a Side Channel Casing (2) and a Stage Casing (3).



3. Working Principle of SERO Side Channel Pumps

The pumped liquid or liquid/gas mixture enters the impeller cells (2) and side channel (3) via the intake opening (1).

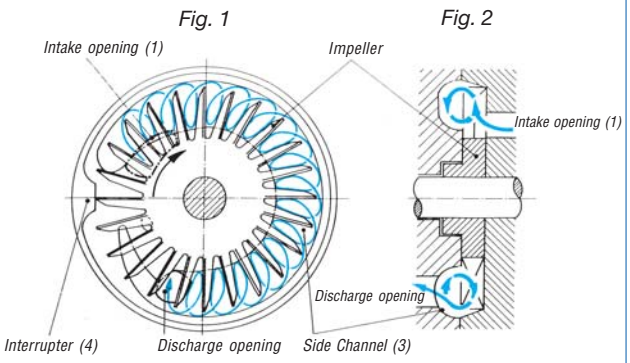
The side channel is interrupted (4) at one point in the casing, rather than extending over the entire circumference.

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 figures 1 and 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.

Flow course of liquid



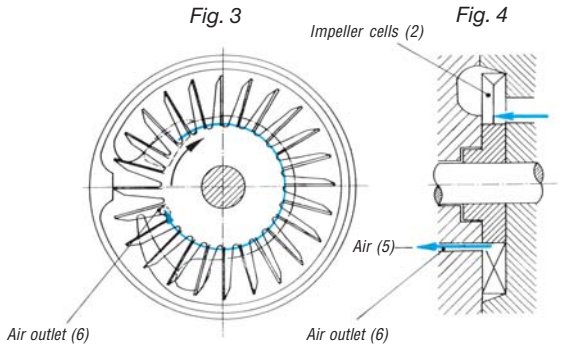
The centrifugal effect of the impeller separates air from the liquid. The liquid collects in the outer region of the impeller cells and side channel, whereas the air builds up in the inner part (5).

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.

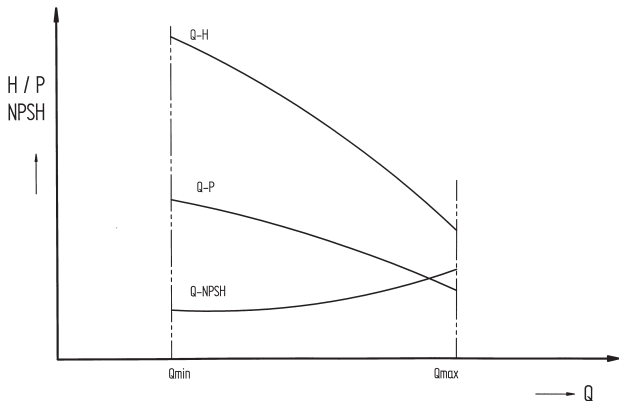
The intake line can be vented even if it is empty, provided that there is sufficient liquid still left in the pump. The pump is designed so that there is always enough auxiliary liquid remaining to repeat the suction process.

Transport of gases



4. Characteristics of SERO Side Channel Pumps

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



5.The working field of SERO Side Channel Pumps

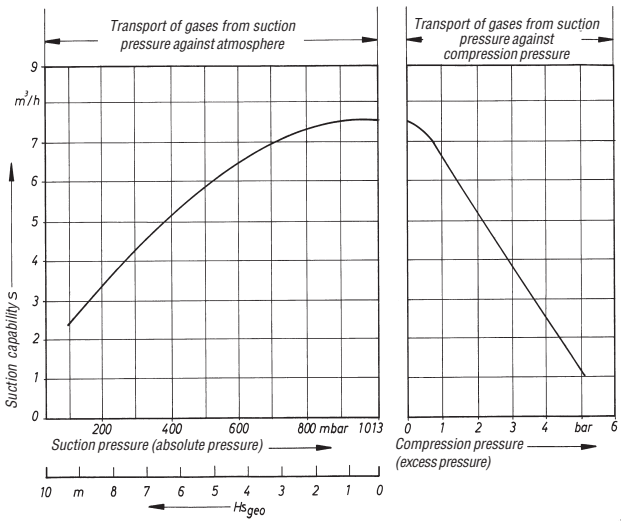
Low nq

At low flows and high heads 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, installation above the storage tank is required (no need for an auxiliary 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 conctructional 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 on 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).

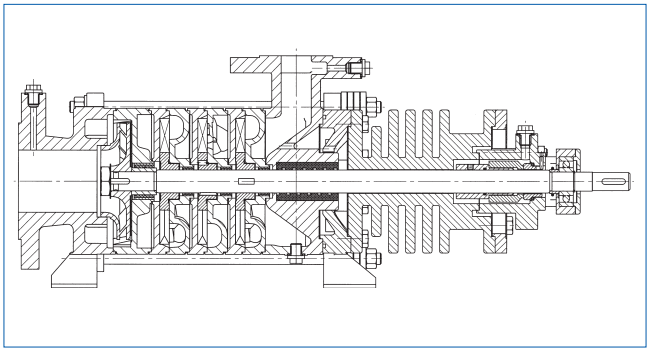
Pressure increasing

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

6. SERO-Pump in Combi Design

A further development of the side channel pump is the side channel combi pump (SRZS) where the first stage is designed with a centrifugal impeller for reaching low NPSH-values.

Because of their favourable NPSH-values these pumps are often preferred when liquids (condensate, refrigerants and others) near the boiling point have to be pumped, or when the NPSH-value of the plant requires the use of a pump with a good suction ability.



When mounting the centrifugal impellers, either one or two, in a series connection with one or more Side Channel Stages, the specific favorable characteristics of the two delivery principles complement one another.

The Combi Pumps are installed economically for

capacities up to Q = 36 m^3/h
heads up to H = 350 m

Due to its low intake heights of less than 0.3 m for boiling liquids, they allow a simple system construction.

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7. 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:

$$NPSH_{system} = \frac{P_e + P_b - P_v}{g \times \rho} + H_{z\,geo} - H_{vs}\ (m)$$

$NPSH_{system}$ = existing system-sided NPSH-value
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.
P_v = absolute vapor steam pressure of the pumped liquid at working temperature being defined in bar.
ρ = density of the pumped liquid at working temperature being defined in kg/dm^3.
$H_{z\,geo}$ = 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.
g = 9,81 (m/s^2).
(Conversion: 1 bar = 10^5 N/m^2)

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

$$NPSH_{system} \geqq NPSH_{pump} + 0.5\ (m)$$

Refrigerant pump with Canned Motor

8. Profit from our SERO competence in the following applications

Applications	Product Superiority
Condensate recovery	Competence in temperatures up to 220 °C Extremely low suction lifts reduce system costs Cavitation-proof operation at variable vapor pressure guarantees troublefree production process The output is not interrupted even during partial degassing
Refrigerant transfer	High engineering competence in this field The SERO Side Channel Pump-Hydraulic System is the optimum technical solution Temperatures to -60 °C (-75 °F) Pressures up to 40 bar (580 PSI)
Pumps in tank farm installation	Competence in all processing parameters Easy installation because of inline design Outstanding self priming ability for underground tank installations or top tank unloading

9. Products for the future: SERO Side Channel Pumps

Superior system technology with high efficiencies and liquids with low evaporation pressures used in process engineering set new standards in pump technology.

Within a process numerous liquids form gases or foam, which may influence the delivery in the pump systems and lead to breakdowns.

The delivery process with normal centrifugal pumps will be instable and unreliable.

The SERO Side Channel Pump, which transports trouble-free areated liquids, save you costs and trouble.

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