SULZER

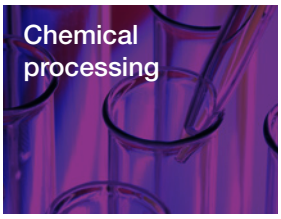
Pumps and pumping systems

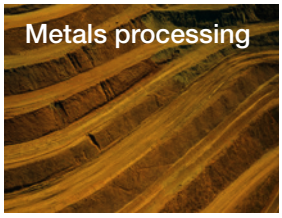
VRN liquid ring vacuum pump (LRVP)

Main industries and applications

The VRN pump range is designed for highly demanding applications, pumping all kinds of clean and contaminated gases. Thanks to its great adaptability and a wide range of designs and construction materials, the VRN pump is perfectly suited to vacuum pump applications such as:

- Concentration
- Crystallization
- Evaporation
- Filtration
- Flash cooling





Features and benefits

Sulzer VRN pumps offer high performance and durability. The advanced design, combined with a wide range of materials, makes the pumps particularly robust, using reliable and improved technology.
Key benefits include:

Large hydraulic selection

- Ten different sizes from VRN 8 to 24
- Flow range from 700 m^3/h to 23'000 m^3/h
- Suction pressure down to 67 mbara (50 mmHg)

A wide selection of highly corrosion-resistant materials

- Austenitic stainless steel
- Super austenitic stainless steel
- Duplex stainless steel
- Super duplex stainless steel
- Separator tank available with fiberglass-reinforced plastics (FRP)

High reliability and durability

- Particularly robust design allows increased lifetime and requires very little maintenance
- Shaft protected by sleeves: no contact with gas
- Designed with materials resistant to chemical attacks

Easy assembly and maintenance

- Simple and robust construction allows easy dismantling/reassembly and facilitates maintenance of the pump
- Easy access to suction and discharge port for inspections

Pump construction

1 Suction manifold
- Distribution of the gas entering the pump

2 Separator tank
- Separation of gas and liquid streams exiting the pump

3 Pump casing
- Cast or fabricated casing

4 Collector
- Contains a guide shield with a flexible membrane conveying the gas and the liquid in and out of the pump

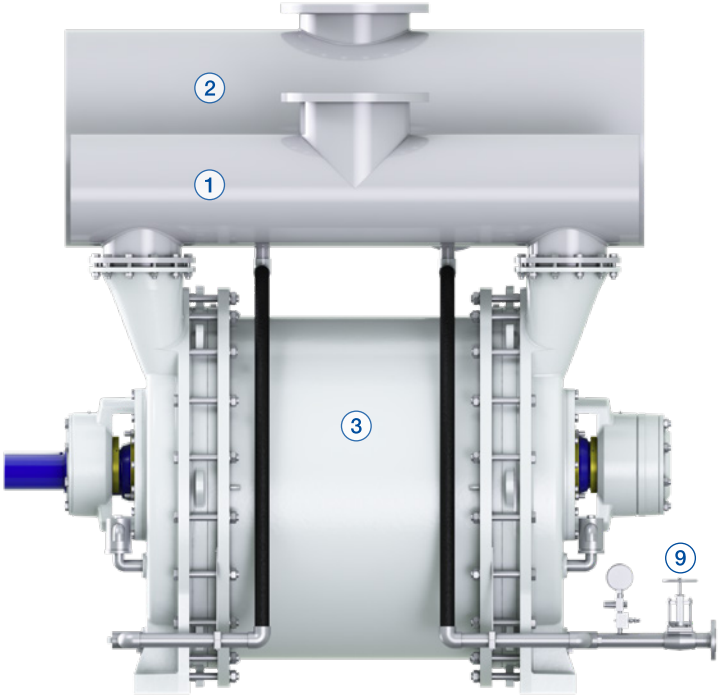
5 Impeller
- Symmetric impeller with double suction and discharge with curved blades

6 Shaft
- Heavy-duty forged shaft, protected by shaft sleeves

7 Bearing housing
- Heavy-duty grease-lubricated bearings

8 Inspection cover
- Easy access to suction and discharge ports for inspection or maintenance

9 Water inlet
- Water feed for the liquid ring and for the sealing system



Specifications

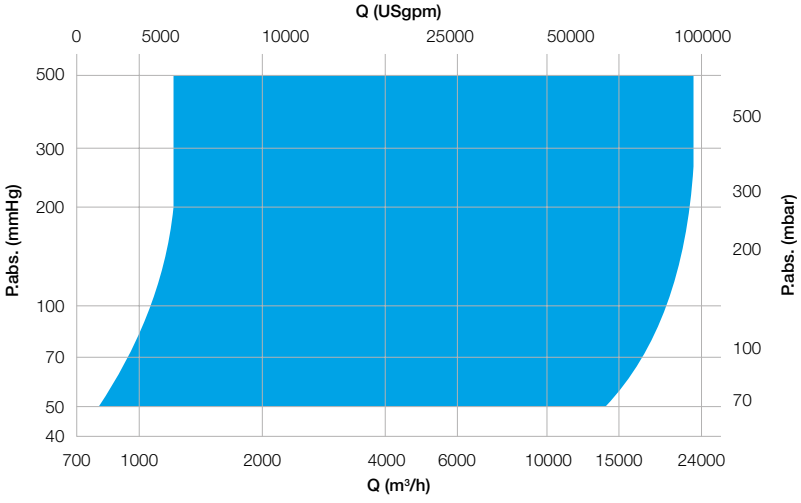
Materials

Standard construction	Castings	Fabricated
Austenitic stainless steel	ASTM A351 grade CF3M	ASTM A240/A276 Type 316L
Super austenitic stainless steel	EN 10283 1.4584	ASTM A240 Type 904L EN 10088-3 1.4539
Duplex stainless steel	ASTM A890 grade 1B	ASTM A240 UNS S31803 EN 10088-3 1.4462
Super duplex stainless steel	ASTM A890 grade 6A	ASTM A240 UNS S32760 EN 10088-3 1.4501

Operating data

	50 Hz	60 Hz
Capacities	up to 23'000 m^3/h	up to 101'200 USgpm
Absolute suction pressure	down to 50 mmHg	down to 50 mmHg
Temperatures	up to 45°C	up to 112°F
Maximum speed of rotation	up to 750 rpm	up to 750 rpm

Performance range



The performance range is only valid for the pumping of dry air at 20°C/68°F, with a discharge pressure of 760 mmHg and a water temperature of the liquid ring of 15°C/59°F.

For other temperatures and types of gases, correction coefficients are applied to determine the performance of the pump under the operating conditions on-site.

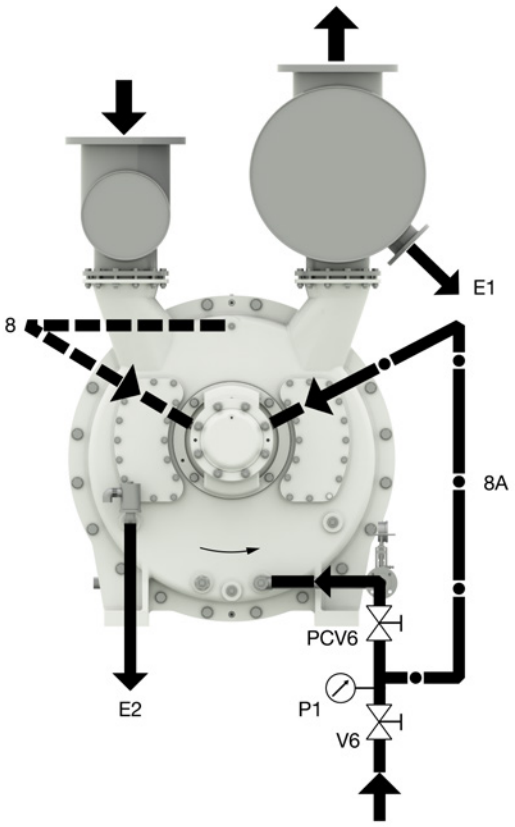
Water circuit systems

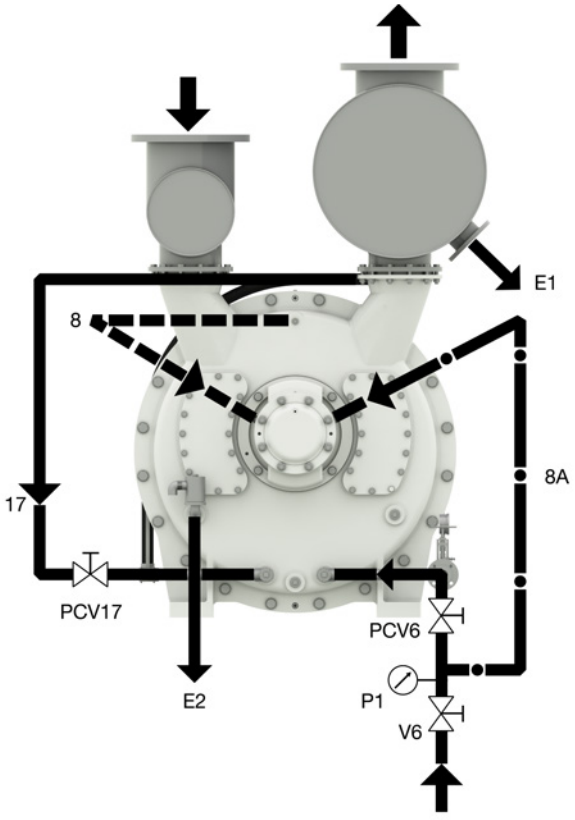
Liquid ring vacuum pumps require a continuous supply of liquid (generally water). The heat generated during pump operation must be dissipated, and the sealing must be kept well supplied to avoid any leakage. To ensure correct pump operation, the supply and recirculation flow rates are factory-set and a minimum water supply pressure of 2 barg is required.

VRN pumps can be used in various configurations, as shown below:

Pump without recirculation circuit

V6	Valve on water supply circuit
P1	Pressure gauge on water supply circuit
PCV6	Pressure control valve for flow regulation
8A	Injection of cold water to packing
8	Injection to packing by internal circulation
E1	Separator overflow
E2	Pump level overflow





Pump with partial recirculation circuit

V6	Valve on water supply circuit
P1	Pressure gauge on water supply circuit
PCV6	Pressure control valve for flow regulation
8A	Injection of cold water to packing
8	Injection to packing by internal circulation
E1	Separator overflow
E2	Pump level overflow
17	Recirculation
PCV17	Pressure control valve for recirculation

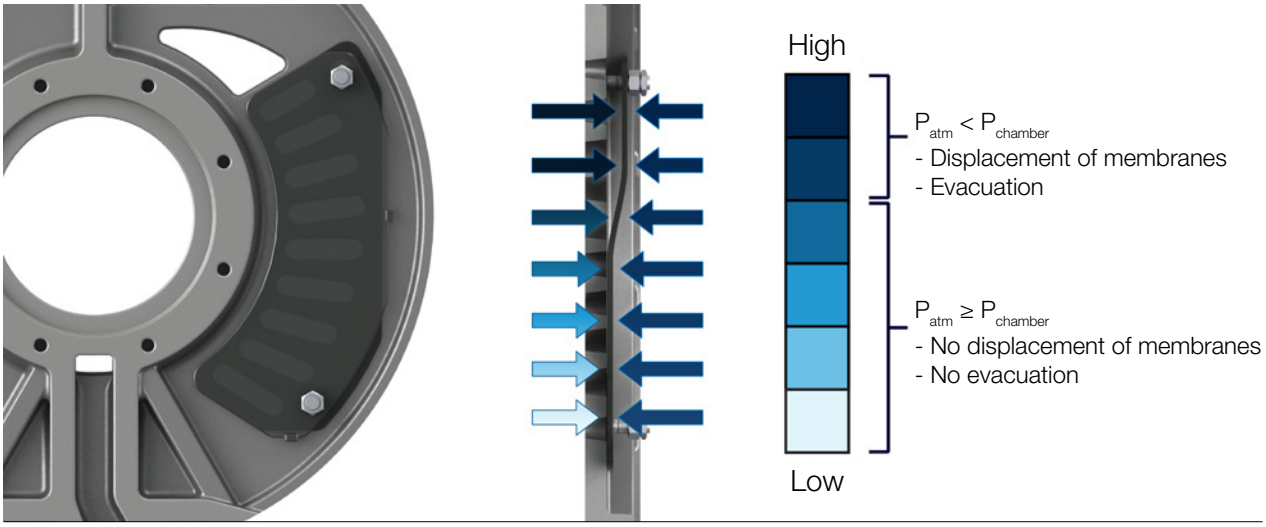
Transmission options

V-belt drive
V-belt transmission is available up to 250 kW. This transmission provides an efficient and straightforward operation. Its simple design offers an economical and reliable solution as well as easy installation and maintenance.

Gearbox drive
Gearbox transmission is used for applications above 250 kW.This transmission stands out for its robust design. The modular construction simplifies maintenance, offering durability and reliability for high-power applications.

Compression ratio regulation

Thanks to its unique design with flexible membranes, the discharge ports of the VRN are continuously adapted to ensure operation at the maximum efficiency point. The position of the membranes depends on the pressure distribution and automatically adjusts the surface area of the discharge ports according to the compression ratio produced.

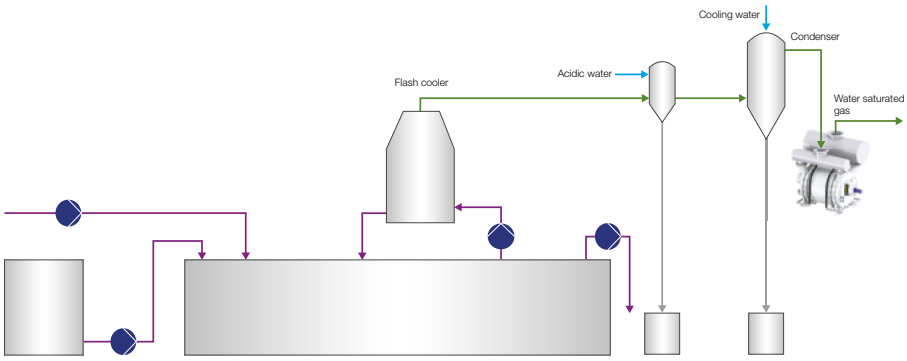


Proven fertilizer performance

VRN pumps are primarily used in the fertilizer industry, with numerous references and a track record of proven performance. Phosphoric acid production plants are the most common sites where VRN pumps are utilized, with three main applications:

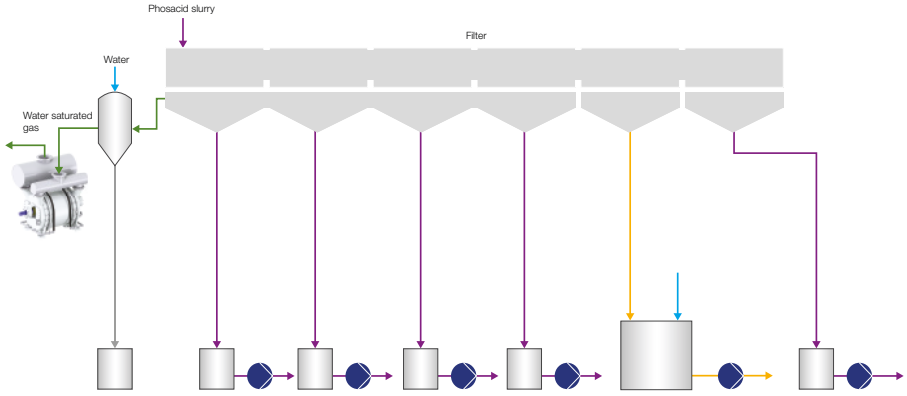
Attack reaction unit

The purpose of the VRN in the attack reaction unit is to create a vacuum in the flash cooler so that the water present in the process can evaporate, thus cooling the highly exothermic reaction of phosphoric acid production.



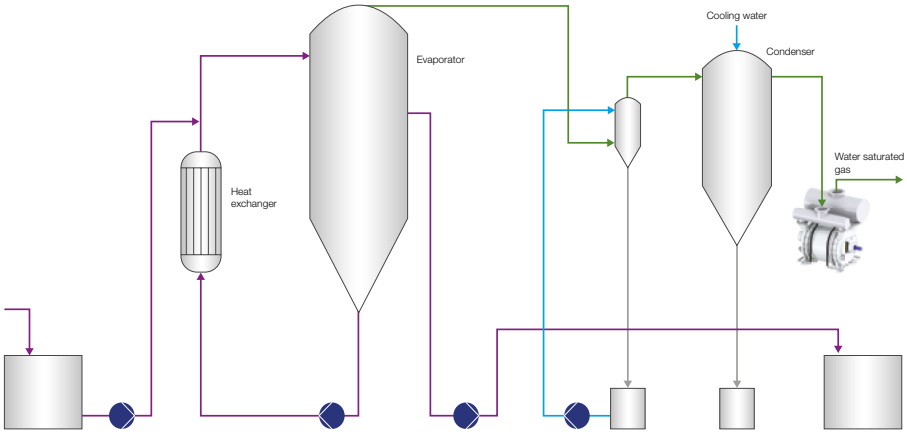
Filtration unit

In the filtration unit, the use of a liquid ring vacuum pump speeds up filtration and improves its efficiency. Moreover, it also draws gases from the self-regulating pumps, capable of pumping highly aerated fluids.



Concentration unit

The purpose of the concentration unit is to partially remove the water present in the aqueous phosphoric acid solution in order to increase its concentration. Phosphoric acid is heated and circulated through the evaporator maintained under vacuum to promote water vaporization.



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The Sulzer Flow division keeps your processes flowing. Wherever fluids are treated, pumped, or mixed, we deliver highly innovative and reliable solutions for the most demanding applications.

The Flow division specializes in pumping solutions specifically engineered for the processes of our customers. We provide pumps, agitators, compressors, grinders, screens and filters developed through intensive research and development in fluid dynamics and advanced materials. We are a market leader in pumping solutions for water, oil and gas, power, chemicals and most industrial segments.