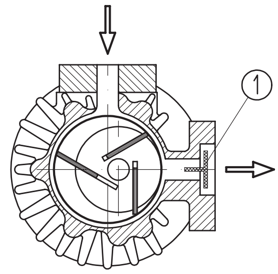
Working principle

The rotor rotates eccentrically inside a stator and it has grooves in which the vanes move freely and are pushed against the stator inside wall due to the centrifugal force, thus creating as many chambers as the number of vanes. During rotation, the volume of these chambers varies according to their position with respect to the eccentric axis. The chamber volume increase makes the air inside of them expand, thus creating vacuum (suction phase); the volume reduction, on the other hand, generates air compression (exhaust or delivery phase). The internal design is the same for both rotating compressors and vacuum pumps. We have created two different sucked air conveying principles for our pumps.
Figure 1 illustrates a system with three rotary blades and discharge valve (1); this system is mainly used in the high vacuum field.
Figure 2 illustrates a system with six rotary blades and therefore with several chambers, which is mainly used in the rough vacuum field.



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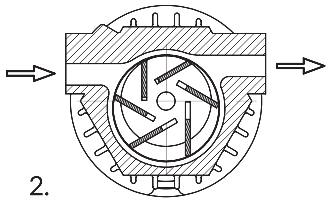
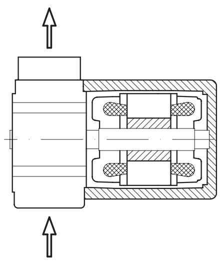


2.

Rotor housing

In smaller and more compact pumps, the rotor is cantilevered on the crankshaft extension (fig.1), while in the versions with high installed power or with frequent start-ups, the rotor is supported by bearings on both sides (fig. 2).
In this case, the pump and the electric motor are two independent units and the two shafts are coupled together by an elastic transmission joint.



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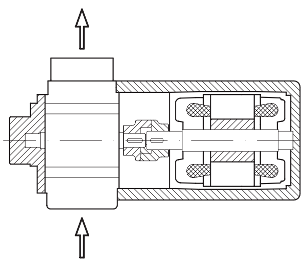
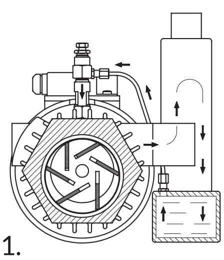


2.

Lubrication system

The main lubrication systems used by us are vacuum with oil recirculation or waste oil for vacuum pumps in the VTL series and an oil bath for pumps in the RVP series.
In oil recirculation lubrication (fig.1), the oil sucked into the working chamber through the adjustable oilers that dose the flow is discharged together with the air sucked into the recovery tank and, through a special filter contained in it, is separated from the air and put back into the cycle.
With disposable oil lubrication (fig.2), the lubrication oil is contained in a special transparent container, controlled by a magnetic level switch, and follows the same route previously described but is collected in the recovery tank without being put back into the cycle. This lubrication system is recommended when there are water condensates, solvent vapours or anything else that can pollute the oil in the intake air.
With oil-bath lubrication (fig.3), the oil is sucked into the working chamber directly from the recovery tank through calibrated pipes that measure the quantity and is held and separated from the air during discharge by special dehydrating microfibre cartridges, contained in the tank itself.
In this lubrication system, the quantity of oil in circulation is significantly higher than that of the two systems described above. This leads to a better seal between the stator and the rotor and lower friction between the rotating and fixed parts, with a resulting increase in the degree of vacuum, less heating and less noise.



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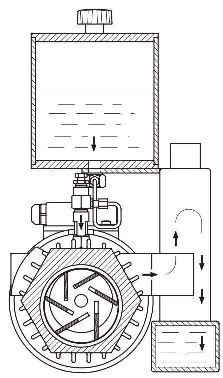

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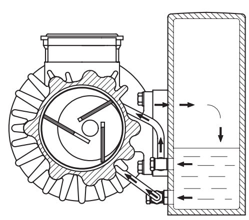


3.

3D drawings are available on **vuototecnica.net**

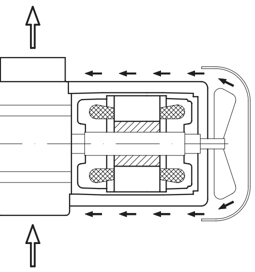
7

Dry vacuum pumps

The particular shape of the working chamber and the special graphite with which the blades and closing flanges are made allow these pumps to work without any need for lubrication.
Use of these pumps is not recommended when the fluid to be suctioned contains vapours or water or oil condensation.

Cooling

The pump cooling system we use is the surface air type. The heat developed by the vacuum pump is dispersed from the external, specially finned surface by the fan of the electric motor on smaller pumps and by a radial fan keyed on the pump shaft on larger pumps. Pumps with capacities from 100 m^3/h upwards are also equipped with a serpentine radiator (1). In this case, the lubricating oil, passing through the radiator before entering the working chamber, is cooled by the radial fan, which sucks the cooling air through the radiator itself, allowing a further reduction of the heat developed by the pump.



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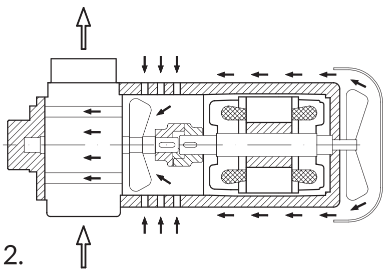

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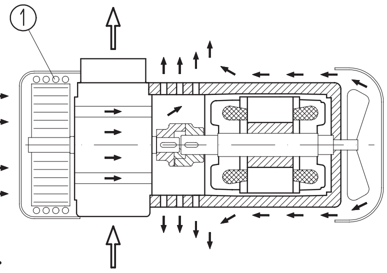

3.

Materials used

The stator and the flanges of the pumps are made of spheroidal cast iron, the transmission shaft and the rotor are made of carbon steel, while the vanes are in carbon fibre or glass for lubricated pumps and in graphite for dry pumps.

Electric motors

All vacuum pumps with flow rate up to 21 m^3/h can be supplied either with three-phase or single-phase electric motors; for those with higher flow rates, only three-phase.
All the pumps are equipped as standard with multi-voltage electric motors, according to EC regulations. Upon request, they can be supplied with UL-CSA compliant motors or with special voltages and frequencies.
The pumps are driven by an electric motor, in compliance with IEC International Standard 60034 requirements for rotating machines and European Directives for Low Voltage (LV) 2006/95/EC, for Electromagnetic Compatibility (EMC) 2004/108/EC, for the limitation of use of hazardous substances RoHS 2011/65/EC and Machine Directive 2006/42/EC for CE marking.
With the exception of electric motors with power lower than 0.75 KW, the efficiency class corresponds to IE3 = Premium Efficiency, with protection degree IP 55, Tolerance of nominal Voltage ± 10% and Class of Insulation F.

Certifications

The design and construction of our vacuum pumps comply with European safety directives. The "CE" mark is in fact reported along with the technical characteristics of the pumps on all the identification plates and the instructions for use and maintenance that accompany them are always provided with a Declaration of Compliance with Machinery Directive 2006/42/EC and subsequent changes.