

Introduction

Functions of the main components

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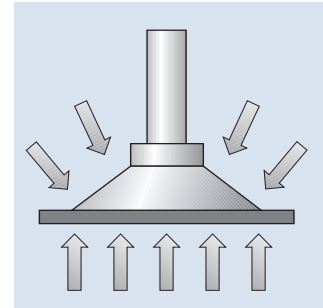
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Why does a suction pad hold a workpiece tightly?

A suction pad does not attach itself to the surface of a workpiece. Instead, the ambient air pressure (atmospheric pressure) presses the suction pad against the workpiece as soon as the ambient pressure is greater than the pressure between the suction pad and the workpiece.

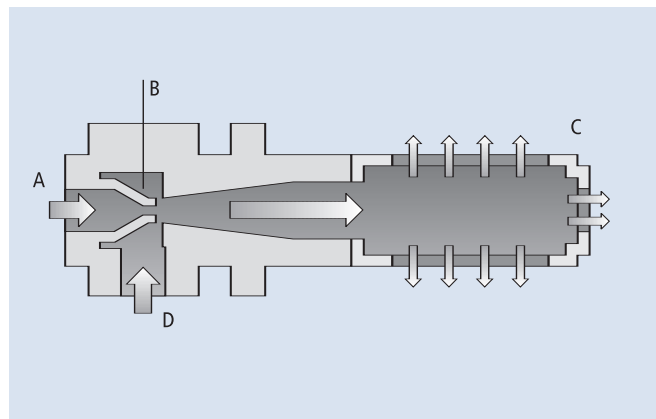
This pressure difference is achieved by connecting the suction pad to a vacuum generator, which evacuates the air from the space between the pad and the workpiece. If the suction pad is in contact with the surface of the workpiece, no air can enter it from the sides and a vacuum is generated. The holding force of the suction pads increases proportionally with the difference between the ambient pressure and the pressure inside the pad.

The holding force of a suction pad is calculated with the formula: $F = p \times A$



How does an ejector work?

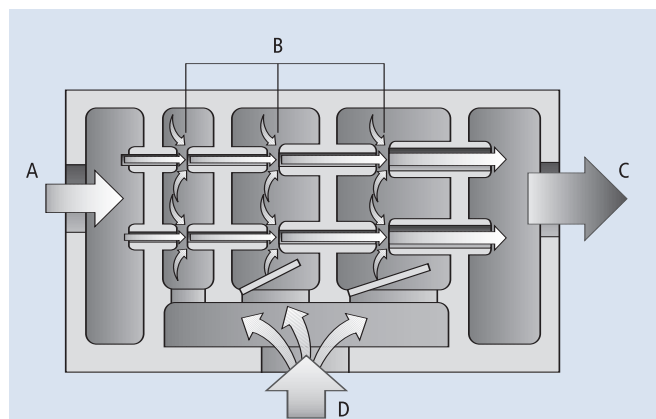
On the basis of the number of nozzle pairs, a distinction is made between single-stage and multi-stage ejectors. They generate a vacuum on the basis of the so-called Venturi principle. Compressed air enters the ejector through the inlet (A) and flows through the Venturi nozzle (B). This accelerates and compresses the air. After leaving the nozzle, the air expands again, creating a partial vacuum. Air enters the ejector through the vacuum connection (D) and is ejected, together with the compressed air, through the outlet and the silencer (C).



Principle of operation of a single-stage ejector

In addition to such single-stage ejectors, there are ejectors which have several Venturi nozzles arranged in series. Compressed air enters the ejector through the inlet (A) and flows through the several Venturi nozzle (B) arranged in series, generating a partial vacuum. Air enters the ejector through the vacuum connection (D). The suction volumes of the individual nozzles are added together to form the total suction volume \dot{V}_D . The air drawn into the ejector is ejected, together with the compressed air, through the outlet and the silencer (C).

A multi-stage ejector (SEM) has a far higher suction capacity than a single-stage ejector.



Principle of operation of a multi-stage ejector

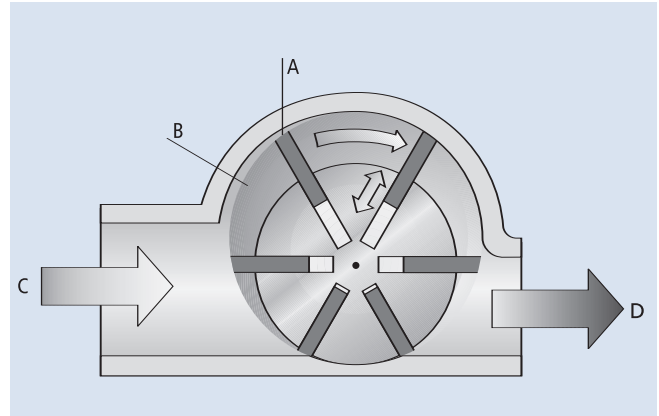
The Schmalz compact ejectors are also single-stage ejectors, but they also have two valves for direct control of the functions "grip" and "blow off". In addition, these ejectors are also available with vacuum switches for system monitoring and regulation. The combination of the "grip" valve and a vacuum switch permits implementation of an automatic air-saving function which ensures that compressed-air is consumed only when the vacuum measured by the vacuum switch drops below a value defined by the customer.

The advantages of compact ejectors are their compact design, resulting in lower space requirements and a lower weight, combined with the many integrated functions.

How does a vacuum pump work?

This pump has an eccentrically mounted impeller with lamellas (A) which are pressed against the walls of the housing by centrifugal force and thus provide a seal. As the impeller rotates, the size of each chamber (B) varies. As the chamber becomes larger, the air in it expands and the pressure drops, resulting in a partial vacuum. The air is drawn in through the inlet (C), compressed, and ejected through the outlet (D).

Due to their high compression factor, pumps generate a very high vacuum and, according to the type, have a very high suction capacity.

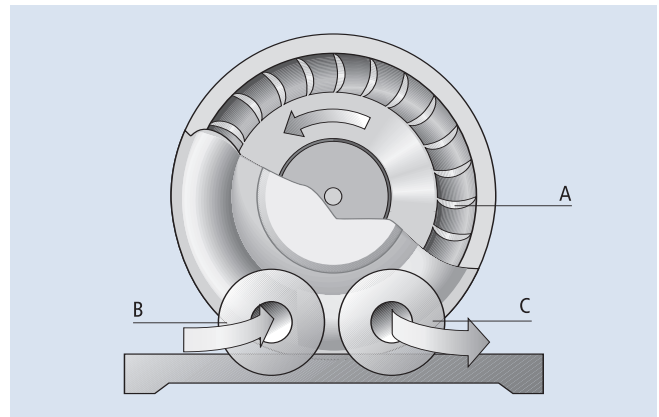


Principle of operation of a vacuum pump

How does a vacuum blower work

The blades (A) of the impeller transport, accelerate and compress the air on the pulse principle, since they carry the air with them. This results in a partial vacuum on the inlet side (B). The compressed air is ejected through the outlet (C).

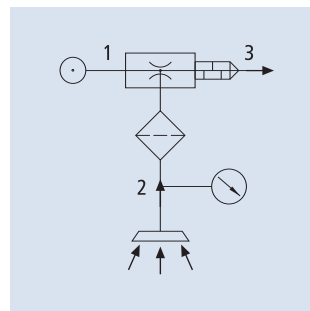
Due to their large air-channel volume and their specially shaped fan blades, blowers have a high suction capacity.



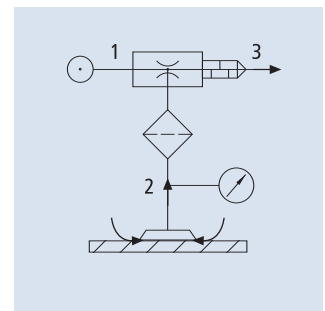
Principle of operation of a vacuum blower

Important:

The suction capacity of all vacuum generators is specified in l/min or m³/h. These specifications are based on an ambient pressure of 1000 mbar and an ambient temperature of 20 °C.



Suction with the pad not covered



Evacuation with a workpiece attached

How does a vacuum switch work?

Vacuum switches operate mechanically, pneumatically or electronically. In the mechanical and pneumatic versions, a diaphragm reacts to changes in the air pressure and actuates a mechanical switch or a valve. In the electronic version, the pressure is measured with the aid of a piezo-resistive sensor and an electrical, digital (on/off) output signal is generated. It is also possible to generate an electrical analogue signal which is proportional to the measured pressure.

Vacuum switches can be used to monitor and control processes. Most vacuum switches permit adjustment of the switching point, and some also permit adjustment of the hysteresis.