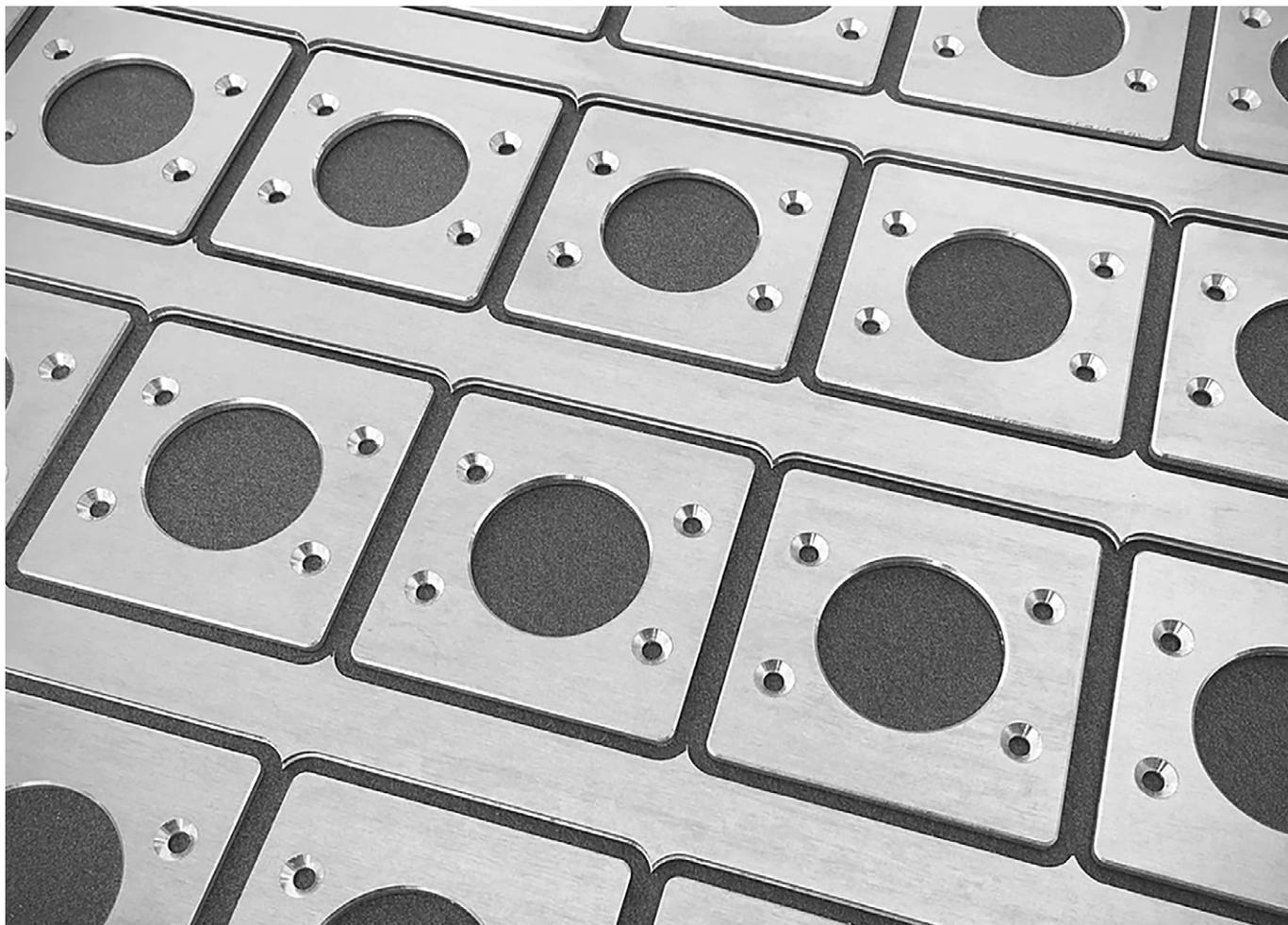


# GAIN AN OVERVIEW: VACUUM TECHNOLOGY IN CNC MACHINING

## A focused analysis

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*Milling of aluminum workpieces, fixed on a vhf vacuum table.*

Vacuum technology is the method of choice for fixing panels on CNC machining systems. Once the material is placed on the machine table, the only next step is to activate the vacuum generators. Clamping could not be quicker and more elegant. However, machine manufac-

turers frequently offer numerous variants of vacuum technology.

**How do you find the right solution for the specific requirements of customers and what are the advantages and disadvantages?**

The following considers the main vacuum generators with their basic properties to provide users with a sound basis for decision-making.

# THE MOST IMPORTANT VACUUM GENERATORS AND THEIR OPERATING PRINCIPLES

Both established and new techniques are used to fix panel materials in the CNC machining sector as listed below:



## ROTARY VANE VACUUM PUMP

A rotor runs in a cylindrical housing, which is attached eccentrically to the housing. The rotor has movable guide vanes. The vanes ensure the transport of air through the housing.



## CLAW PUMP

Two claw-shaped rotors rotate in opposite directions in a housing. The rotors do not touch. The air is sucked in, compressed and then expelled.



## SIDE CHANNEL COMPRESSOR

An impeller with individual blades is mounted in a housing. Together they form the side channel. The air is sucked in and compressed in the side channel. With single-stage devices, the air is expelled again after one revolution.



## VHF VACUUM MOTORS

A powered fan wheel is located in a housing. The centrifugal force creates a negative pressure in the center of the fan wheel, which is directed to the vacuum table.

The various operating principles and designs result in different **properties** and **requirements** that have a direct effect on the **investment**, **installation** and **ongoing operation** of the machine.

## THE PROPERTIES OF VACUUM GENERATORS AT A GLANCE

	Category	Maintenance	Machine connection	Underlay	Investment volumes	Noise emissions	Holding force at volumetric flow rate		
							low	medium	high
<b>Rotary vane vacuum pump</b>	High Pressure	low	generally external	generally MDF panels	medium	medium	+++	-	-
<b>Claw pump</b>	High Pressure	low	generally external	generally MDF panels	expensive	high	+++	+++	-
<b>Side channel compressor</b>	High Flow	none	generally external	generally MDF panels	low	medium	++	++	-
<b>vhf vacuum motors</b>	High Flow	none	integrated into machine table	vacuum fleece	medium	low	++	++	++

# COMPARISON OF VACUUM GENERATION CONCEPTS: HIGH FLOW VS. HIGH PRESSURE

**Negative pressure** and **volumetric flow rate** are the most important factors in the holding force of vacuum generators. The **high flow** concept works with a high volumetric flow rate and minimal negative pressure. The **high pressure** concept is the opposite, as the following comparison shows.

## HIGH FLOW

The vacuum generators in the high flow category are able to transport very high volumes of air. The negative pressure drops only slowly with the increasing air volume (due to the milling out of elements), and a considerable negative pressure continues to be generated even after many elements have been milled out.

In addition, an underlay such as the vhf vacuum fleece increases the protection against a lateral movement of the workpieces due to its surface structure.

▶ **Almost constant holding force – even after many elements have been milled out**

## HIGH PRESSURE

The vacuum generators in the high pressure category are able to generate a very high negative pressure, provided the air volume transported is not excessively high. When elements are milled out, the vacuum table surface coverage decreases and the volumetric flow rate therefore increases. A sharply increasing volumetric flow rate leads to equally sharply falling negative pressure. An expensive MDF board underlay should reduce the risk of an excessive air volume and a sharp drop in negative pressure due to its density.

▶ **High holding force with high table coverage, minimal holding force after many elements have been milled out**

## OPTIMAL INTERACTION:

## VHF VACUUM FLEECE AND HIGH-FLOW VACUUM



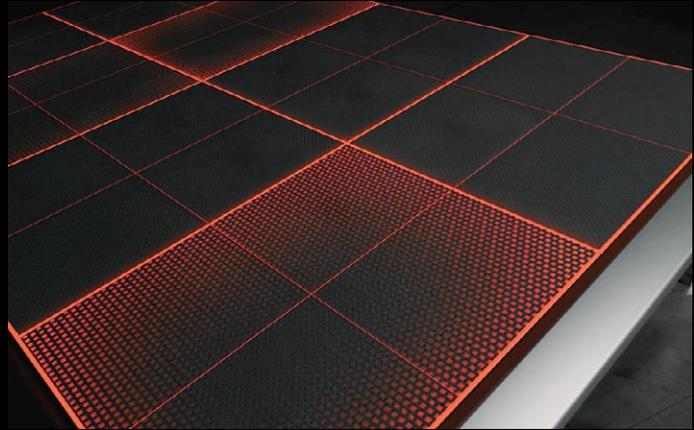
*The vacuum elements with a hole grid are fixed on a T-slot table.*



*The vhf vacuum fleece not only ensures a fine distribution of the air sucked in through the hole grid, but also serves as outlet material for the milling cutter.*

# THE VHF CONCEPT FOR THE X SERIES

As the milling out of different elements predominates in daily practice and this requires technology that can manage a high volumetric flow rate, vhf has opted for an optimized high-flow vacuum solution for the X-series machines, which offers a high degree of security and ease of use.



## **1** No additional space required for vacuum generators and no losses through supply lines

The vacuum table consists of eight separate vacuum fields, each of which is controlled by a vacuum motor. The vacuum motors are integrated into the machine table.

## **2** Save energy with ease

With the X-series machines, the operator only activates the areas on which material is placed. The negative pressure required is determined before the start of the job.

## **3** Secure fixing with no interruption

The vacuum system requires no servicing (no replacement of the motor, gear oil or wear parts). The motors are brushless, continuous runners with a long service life.

## **4** Secure and constant hold during parts production

The vhf X has a very high volumetric flow rate and, in combination with the effective vacuum fleece, ensures a secure, constant holding force.

## **5** A pleasant working environment thanks to low noise emissions

The vhf vacuum motors are characterized by their low noise level. They are considerably quieter compared to devices at similar performance levels.

# CONCLUSION

The **material fixation** during milling and cutting is an essential factor in the production of parts and therefore represents an essential criterion for every machine purchase along with the investment costs and emission values. Decision-makers and purchasers should be aware of the advantages and disadvantages of the respective technologies and the level of maintenance required during the service life of the machine.

**THE X-SERIES MACHINES PRODUCED BY VHF OFFER CUSTOMERS A SMART AND INTEGRATED SOLUTION WITH MINIMAL MAINTENANCE**, which also guarantees a reliable hold even after a number of parts have been milled and the vacuum motors are required to manage a higher volumetric flow rate due to increasing air leakage.





## CREATING PERFECTION.

vhf has been developing and manufacturing high-end CNC milling machines, CAM software and tools of the best quality at its headquarters in Ammerbuch near Stuttgart for 35 years. Here, we combine the art of engineering made in Germany with decades of experience and a passion for milling and cutting.

The vhf Group employs approximately 350 people worldwide. True to the motto *Creating Perfection*, we offer vhf customers the highest product quality coupled with excellent service and support.

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