PLANOS Vacuum Clamping Technology

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Superior Clamping and Gripping

SCHUNK®

PLANOS – Vacuum Clamping Technology

Manufacturer Fa. Schmalz

- Location: Glatten
- Place: Black Forest close to Freudenstadt
- Founded in the year 1910 by Johannes Schmalz
- Employees: approx. 800 world wide
- Revenue 2012: approx. 72 Mio. €
- Family-operated company (Dr. Kurt Schmalz, Wolfgang Schmalz)
- World wide leading provider in the field of Vacuum Clamping Technology
  - Vacuum components
  - Vacuum handling systems
  - Vacuum gripping systems
  - Vacuum tombstones

PLANOS – Vacuum Clamping Technology

Origin of the word „Vacuum“

Latin „vacuus“ = empty / free

Definition according to DIN 28400

Vacuum is the condition of a gas of which the particle density is lower as the particle density of the atmosphere upon the eartg surface. It is defined as Vacuum if the pressure is lower as the pressure of the atmosphere.

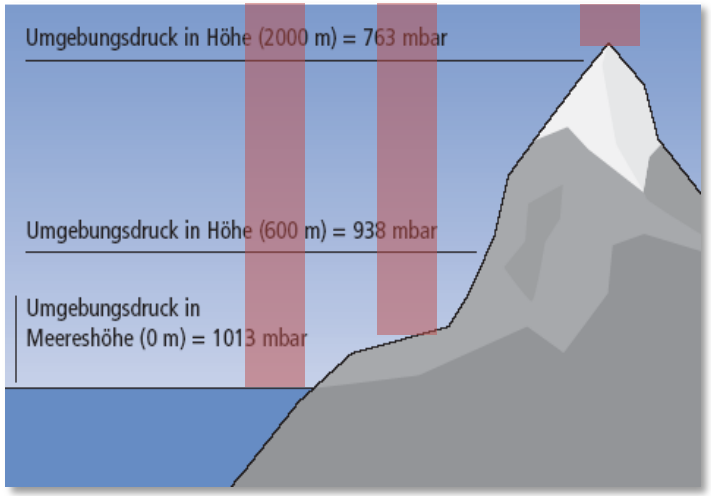
Meaning of the word Vacuum

- **Colloguial language:** Vacuum is a matter free space.
- **Technique and physics:** Vacuum specifies a condition of a fluid in a volume at a pressure which is by far lower as the pressure of the atmosphere at standard conditions.
- **Quantum physics:** A vacuum condition of an element is the condition of the lowest energy.

Properties of Vacuum

Correlation of air pressure and sea level

- Air pressure defines the hydrostatic pressure of the air
- Indicates the weight force of the air column which is located either above a plane or above a body
- For this reason the air pressure depends of the sea level and the pressure decreases with an increasing height (per 100m the pressure drops by approx. 12,5mbar on average)
- On sea level there is an air pressure of 1013mbar under standard conditions
- On 2000m, however, the air pressure only amounts to approx. 750mbar. On the Mount Everest (8850) it only amouts to approx. 320mbar
- For this reason the maximum reachable vacuum amount drops by an increasing sea level because of this fixed absolute value



Properties of Vacuum

How do pressure and force correlate?

- Pressure differences on a defined area create forces
- At this point it doesn‘t matter if it is an overpressure difference or a vacuum.
- The resulting force arises of the product of the pressure difference and effective area

$F = \Delta p \times A$

F = Force
Δp = Pressure difference
A = Effective suction area

Calculation example:

- A workpiece with 160x160mm gets sucked by an effective suction area of 150x150mm
- Vacuum amount –0,8 bar → F = 8 N/cm² x 15 cm x 15 cm = 1.800 N (in z-direction)

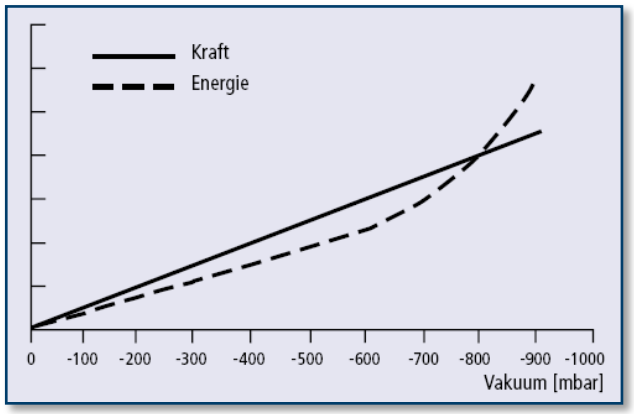
  The effective force can be changed and aligned to the task by an alteration of the parameters pressure difference and effective suction area.

Properties of Vacuum

Energy demand and Vacuum

- High Vacuum requires a high energy demand
- An enhancement of the Vacuum from -0,6 up to -0,9 bar means an enhancement of the force by a factor of 1,5.
- The evacuation time and the energy demand rise by a factor of 3 during such an enhancement.

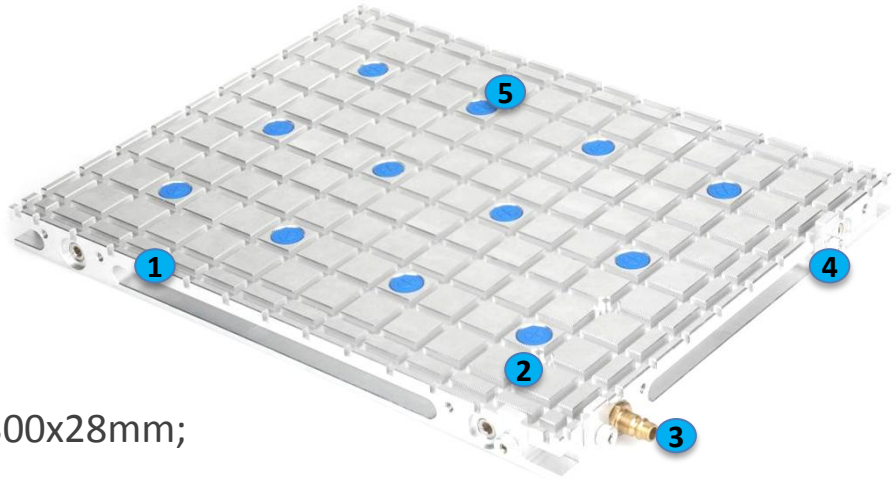
→ High Vacuums aren‘t economical in industrial applications.



Matrix Plates SMPL

Funktional cutaway view of the top of a Matrix Plate

1. Lateral grooves
2. Vacuum openings
3. Hose barb for vacuum connection
4. Mechanical stops
5. Friction island (optional)

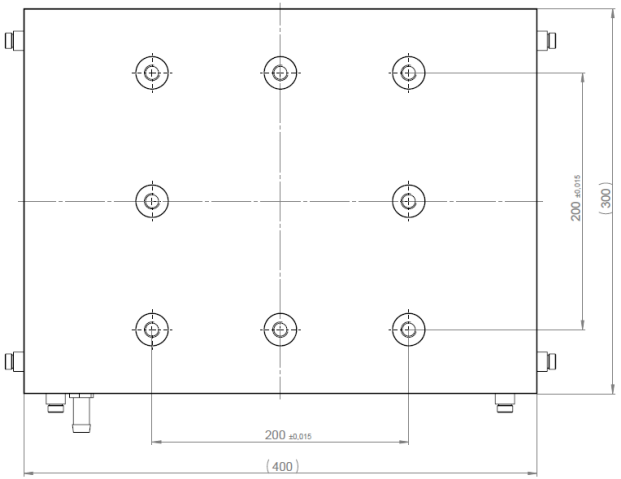


- Standard dimensions: 300x200x28mm; 400x300x28mm; 600x400x28mm
- Various grid dimensions
- Special dimensions on request

Matrix Plates SMPL

Funktional image of the Matrix Plate bottom side

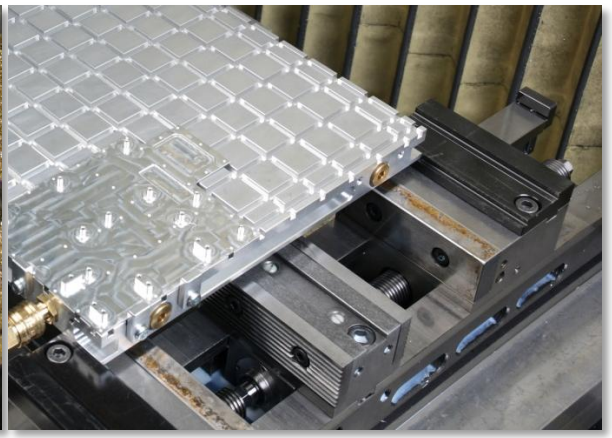
- VERO-S interface
- Example: Plate 400x300 prepared for
  NSL plus 200 and NSL plus 400 (Pitch 200 mm)
- Matrix prepared for extensions



Matrix Plates SMPL

Mounting on the maschine table

Clamping Claws



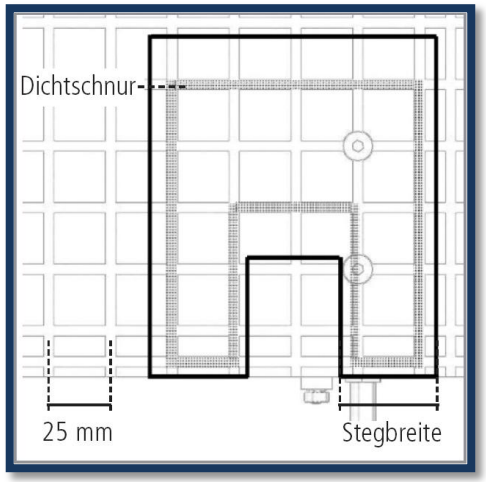
Vise

VERO-S

Matrix Plates SMPL

Setup

Simple workpiece:

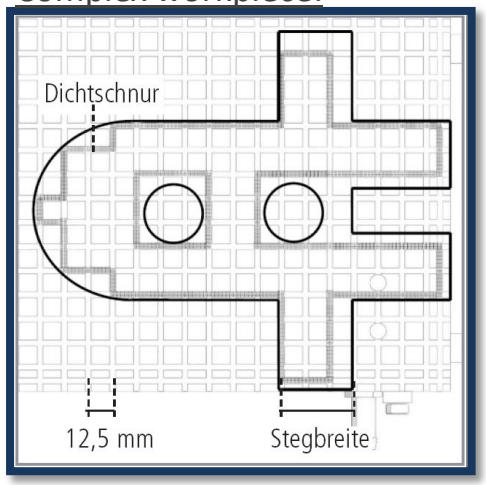


- Simple geometric structure
- Less bars and recesses
- Bar width < 30 mm

Recommendation:

→ Grid dimensions 25x25 mm

Complex workpiece:



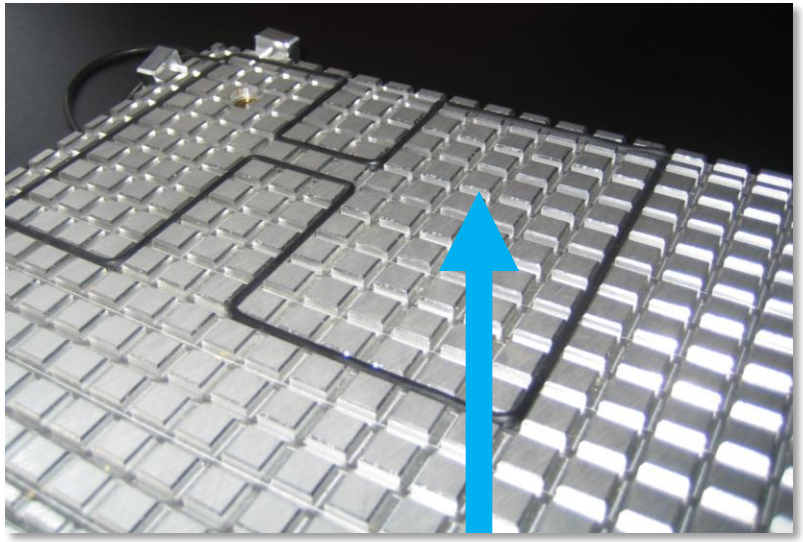
- Complex geometric structure
- Several bars and recesses
- Bar width < 30 mm

Recommendation:

→ Grid dimensions 12,5x12,5 mm

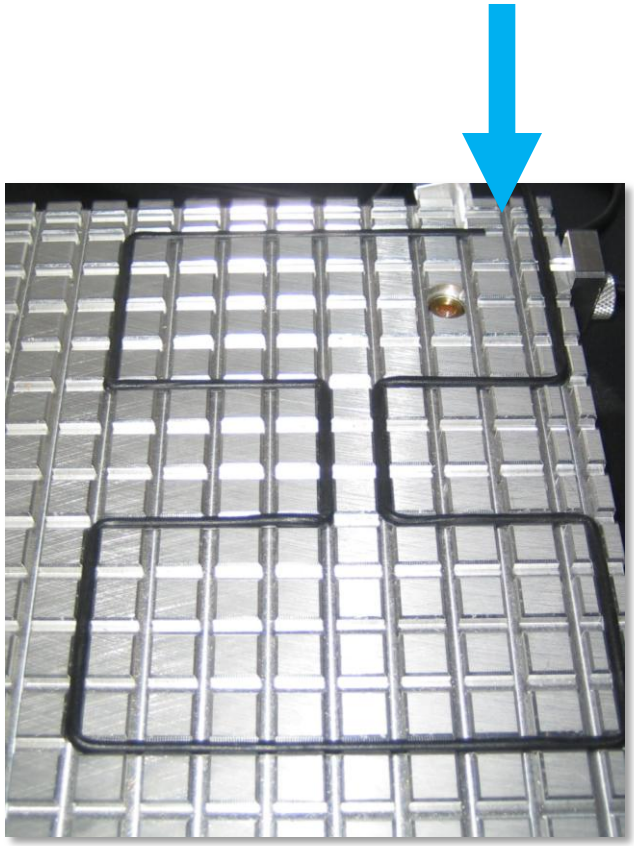
Matrix Plates SMPL

Caulking strip



Useless area

Wrong inserted caulking strip leads to a leakeage

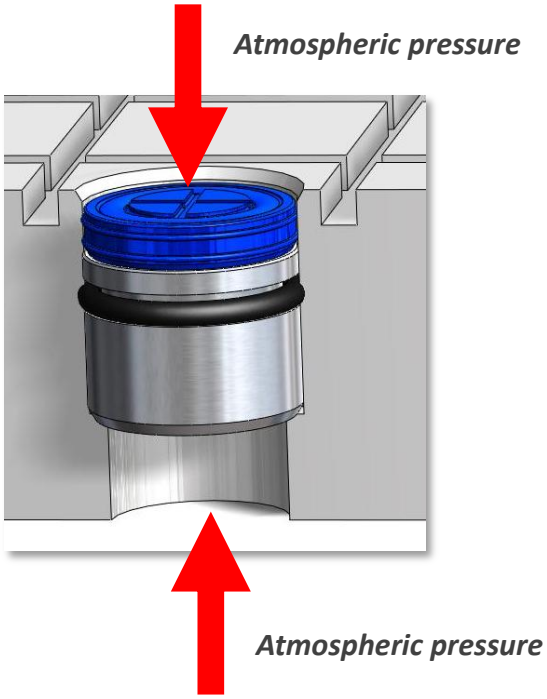


Matrix Plates SMPL

Function Friction Island

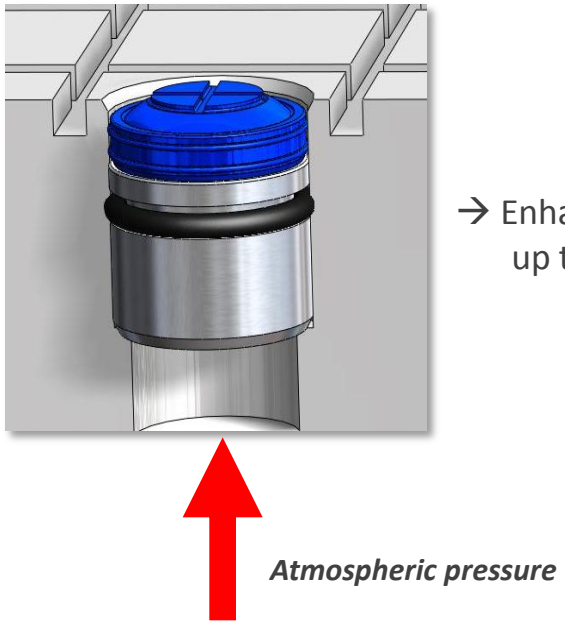
Inactive friction island:

(Turned off vacuum)



Active friction island:

(Turned on vacuum)

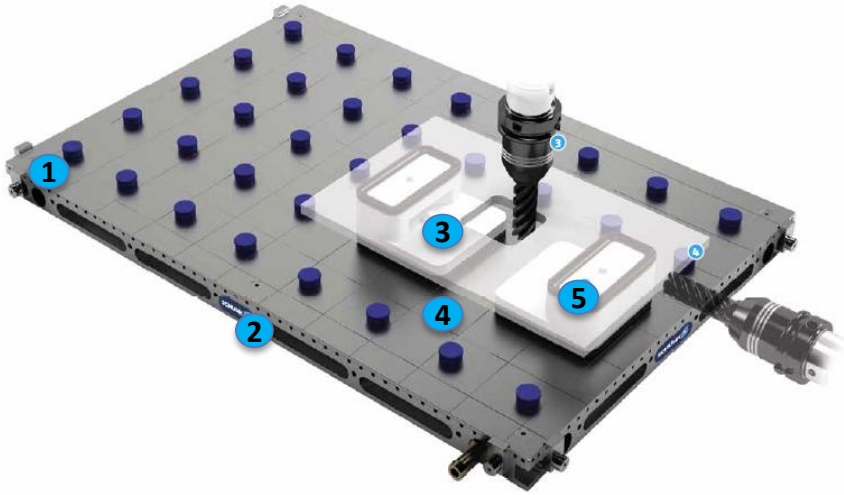


→ Enhanced shearing force up to 30%!

Support Plates SZPL

Support Plate

- Usage of individual suction cups (Heights 38 mm and 97 mm)
- Cut-outs and recesses possible
- Suitable for every standard matrix plate
- Support plate extendable
- Special support plates on request



1. Mounting bore
2. Matrix plate
3. Workpiece
4. Support plate
5. Suction cup

3D Clamping Systems

Basic Holding Fixture BHF

1. Suction Cup
2. Clamping lever to secure the angle set
3. Ball joint
4. Clamping lever to secure the height
5. Star grip for height adjustment
6. Magnetic baseplate
7. Air connection

3D Spannsysteme

Standard-Aufsatzsauger

Uni-Base (UB)

Suction Cup Balance (SCB)

Innospann Suction Cup (ISCUP)

Reference Suction Cup (RSC)

Vacuum Unit SVAGG

Functional cutaway view of a Vacuum Unit

1. Water separator for a long service life of the pump
2. Visual fill level indication and audible warning device
3. Hose connection with ball valve
4. Pressure gauge
5. Drain valve
6. Liquid tank
7. Interface for coupling with emergency-off of the maschine
8. Vacuum-Boost for increasing the vacuum level and for maintaining of the pump oil

Vacuum Unit SVAGG

Funktional cutaway view of a Vacuum Unit

Vacuum pump with sight glass (Oil level)

Drain valve

Vacuum pressure gauge

Junction box with potential-free contact and audible warning device

Sight glass (Liquid level)

4 different unit sizes

- 6 L up to a clamping area < 1.200cm²
- 18 L up to a clamping area < 5.000cm²
- 40 L up to a clamping area < 10.000cm²
- 63 L up to a clamping area < 20.000cm²

Vacuum Operation Center VOC

Functional cutaway view Vacuum Operation Center

1. Signal lamps and audible alarm sounds
2. Vacumm gauge for vacuum level in tank
3. Vacuum switch
4. Vacuum and liquid tank
5. Power switch, kill switch and other operating elements
6. Interface for autoamtic liquid recirculation
7. Water separator
8. Vacuum pump

3 different VOC sizes

- VOC-AD-S-40
- VOC-AD-S-63
- VOC-AD-S-100

Keister

Keister

Accessories

- Set of allen keys
- Pneumatic hose
- Caulking strip

- Specimen

- Friction islang demoblock
- Single friction island
- Hose barb

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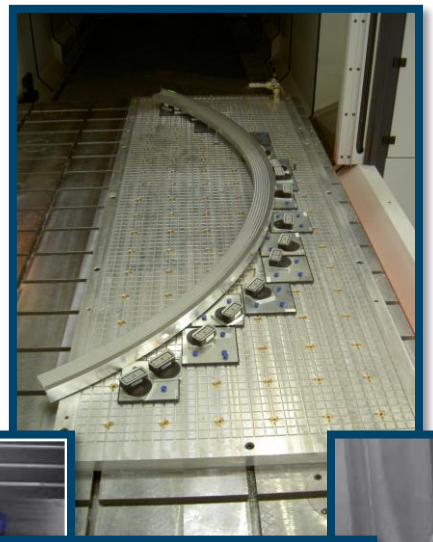
Examples for application



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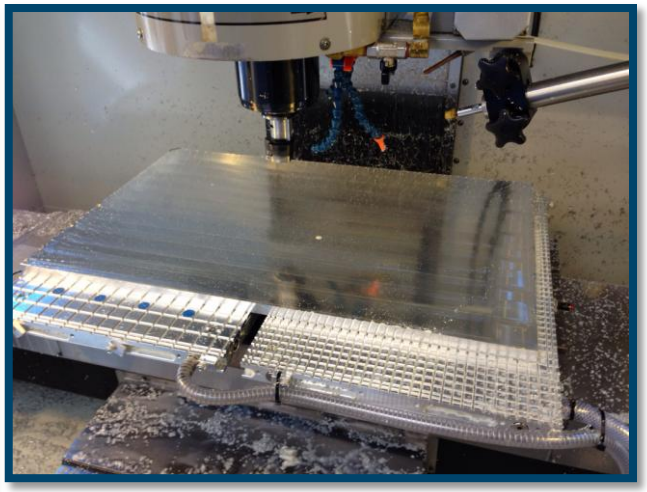
Examples for application



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Examples for application

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Examples for application

PLANOS – Vacuum Clamping Technology

Your advantages	Your benefits
Base body made out of high-strength and precisely produced aluminum, height tolerance ± 0.02 mm	Distortion-free clamping of flat and thin components
Easy handling	Short set-up times
Lateral attached mechanical back stops	Simple positioning of the workpiece and additional absorption of shearing forces
Patented friction islands as an option	Increase of the holding forces by up to 30% without deformation of the workpiece
Support plate in combination with suction cups	5-side machining and simple production of cut-outs and recesses
Modular system	Flexible design of the workpiece

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SCHUNK®

Jens Lehmann, deutsche Torwartlegende, seit 2012 Markenbotschafter des Familienunternehmens SCHUNK

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