



Makro-Grip® Stamping Technology

Form-Closure Technology refers to a technology in which the workpiece to be clamped (up to 45 HRC) is pre-stamped with a defined contour under high stamping pressure (up to 20 t) outside of the machine tool, before it is clamped in the clamping device.

In combination with Makro-Grip® 5-Axis Vices, our Form-Closure Technology guarantees the highest holding forces, accessibility and process reliability available in 5-sided machining.

→ External Pre-Stamping

The stamping operation is performed offline. No machine tool is required for the workpiece preparation

→ Form-Closure Technology

Form-Closure clamping offers high holding forces with low clamping pressure

→ Material Savings

Minimum clamping edge requirements equals less material removal during subsequent operations

Makro·Grip® Stamping Technology



The patented Form-Closure Technology by LANG

Unique form-closure technology makes LANG clamping the very best in 5-axis machining. Form-closure fit guarantees maximum holding power with minimal clamping forces. The external pre-stamping of the workpiece favors a variety of factors that have a positive effect on process reliability and cost-effective production.

Pre-stamping technology allows even high tensile strength materials to be held reliably and without wear in the Makro·Grip® 5-Axis Vice. Workpiece blanks are prepared with a contour at an external stamping station under high pressure and ready for the workpiece clamping device. The application of force to the workpiece happens before the actual clamping process in the vice, limiting the function of the 5-Axis Vice to simply holding the workpiece.

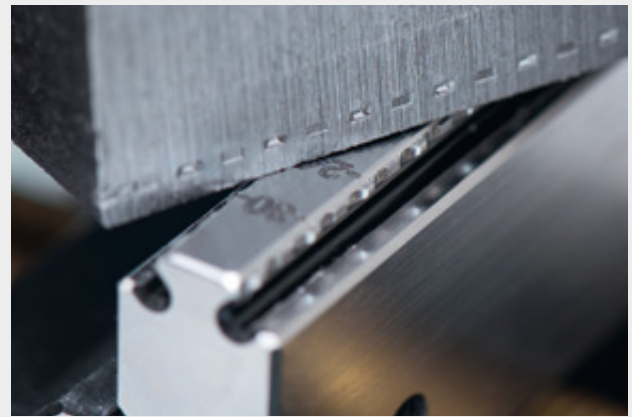
In this aspect, the stamping technique differs fundamentally from the clamping philosophies of other manufacturers. Conventional vices must fulfill a double function with their serrated jaws (1. indent the material, 2. hold the workpiece). They are only able to build up a maximum approximate pressure of 4 - 6 tons. Penetrating the workpiece becomes a challenge, especially with harder materials. To ensure the workpiece is penetrated correctly, the holding teeth of the serrated jaws must be sharp which entails an increased susceptibility to wear, and thus negatively effects the clamping quality. For soft, distortion-prone materials, holding teeth also tend to lose holding power as they can work themselves free of the workpiece during machining forces. On the other hand, stamping technology builds up to 20 tons of pressure during external pre-stamping and ensures problem-free preparation, even with hard materials of up to 1.500 N / mm² tensile strength. After pre-stamping, only low clamping pressure is required to hold the workpiece in the 5-Axis Vice allowing its design to be very compact and eliminate wear on the clamping teeth. The contour shape (truncated pyramids) and low clamping pressure don't allow the clamping teeth to seat deeper into the workpiece, always providing a defined stop.

The use of stamping technology pays off where conventional machine vices reach their limits in terms of material hardness. Despite the low clamping pressure and compact design, the resulting clamping forces of a workpiece in the 5-Axis Vice are actually higher the harder and more resistant the material is (up to 45 HRC, non-brittle).

On the following pages, you will read everything you need to know about the Makro·Grip® stamping technology and how pre-stamping affects 5-face machining with the Makro·Grip® 5-Axis Vice.



Holding teeth of a conventional vice + indentation in workpiece



Holding teeth of a Makro·Grip® 5-Axis Vice + stamping contour in workpiece

Thanks to exceptional holding power the form-closure technology has many benefits:

Minimal clamping edge requirements → Enormous material savings → **RESOURCE PROTECTION**

High cutting rates → Shortened machining times → **REDUCTION OF COSTS PER PIECE**

Reduced vibrations on workpiece → High accuracy → **INCREASED MILLING QUALITY**

Low clamping pressure in the compact 5-Axis Vice results in:

Low clamping pressure → No material deformation → **INCREASED MILLING QUALITY**

Reduced wear on the vice → Higher longevity → **REDUCTION OF PURCHASING COSTS**

Better accessibility → Use of shorter tools → **HIGH PROCESS RELIABILITY**

Lower weight → Ergonomic handling → **RELIEVE STRAIN ON EMPLOYEES**

Smaller footprint in machine → More options within the work envelope → **BETTER USAGE OF CAPACITY**



Functional principle of the Stamping Technology



1 – Sawing



2 – Stamping



3 – Clamping

5 seconds that revolutionise your machining processes!

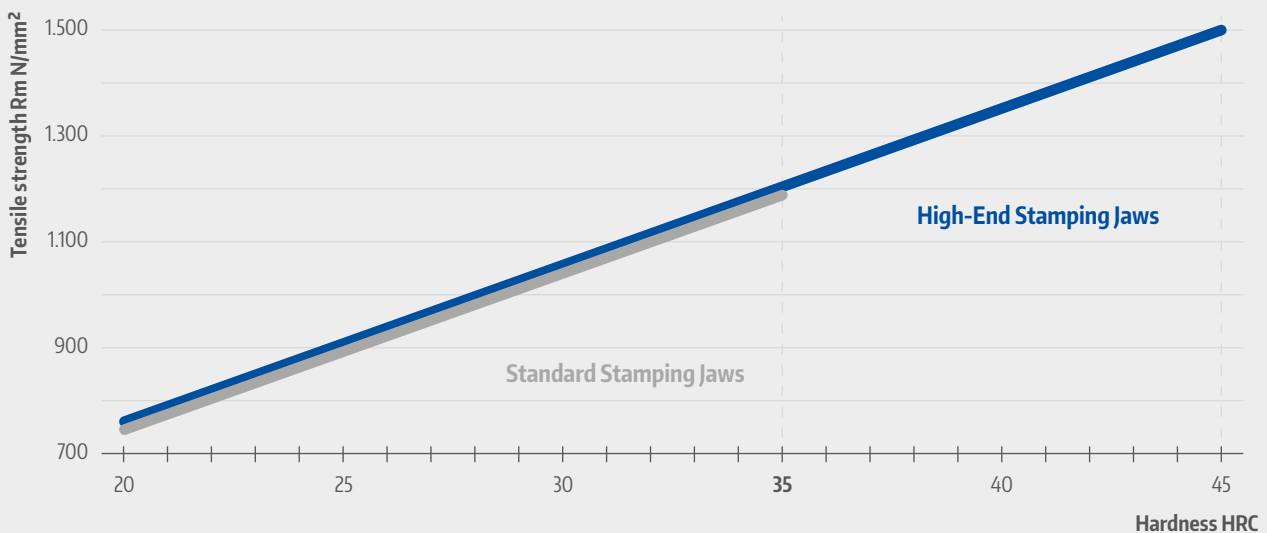
The workpiece is stamped directly on the saw cut or cinder layer of the blank. Additional preparatory work is generally not necessary. Stamping is realised within less than 5 seconds. The form-closure

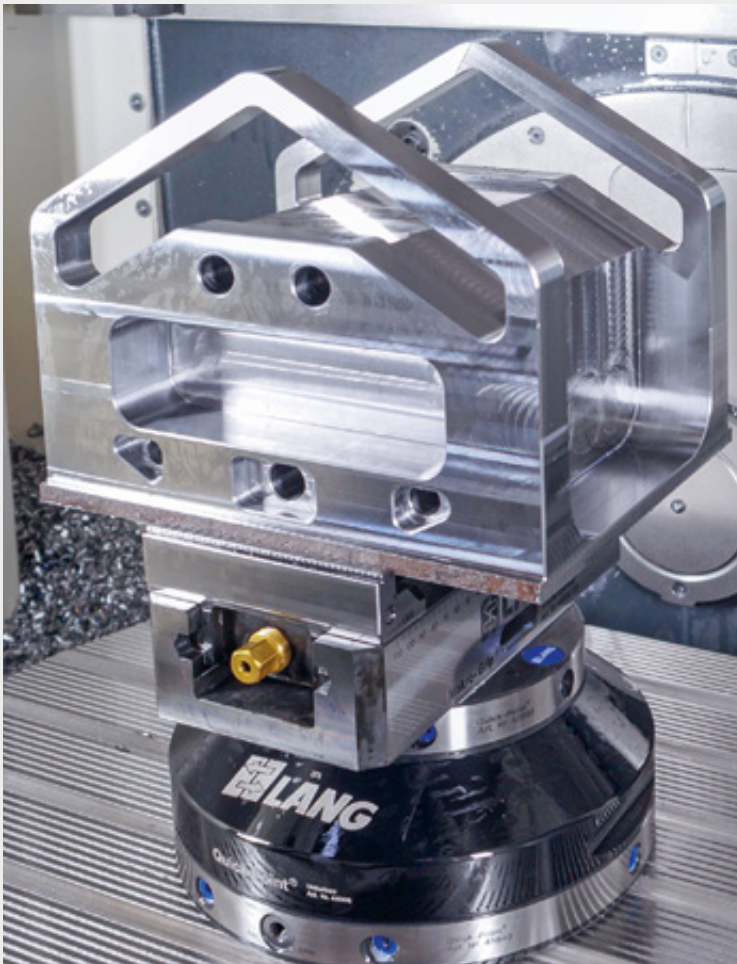
effect between the stamping contour in the workpiece (truncated pyramid indents) and the holding teeth of the 5-Axis Vice allows for an accurate repeatability even without endstops.

A reliable wear-free clamping process for high-tensile materials

The stamping unit adds the form-closure contour to the workpiece with up to 20 tons of pressure. This allows you to clamp even high-tensile materials up to 1.500 N/mm² tensile strength reliably and virtually wear-free. Different material hardness requires

different stamping jaws to extend longevity and guarantee safe clamping. Our standard jaws allow you to stamp workpieces up to 35 HRC, whereas high-tensile materials up to 45 HRC require High-End stamping jaws.





Machining with the form-closure grip Before ↔ After



Stamping Technology allows the Makro-Grip® 5-Axis Vice to clamp workpieces which substantially exceed its volume. Despite a clamping depth of only 3 mm the Makro-Grip® Stamping Technology guarantees highest process reliability. The compact design in relation to the maximum allowed workpiece size ensures ideal accessibility and thus allows for short tools which results in reduced vibrations and higher cutting rates.

As a guideline, the Makro-Grip® 5-Axis Vice is able to clamp parts of following size:

- Width of workpiece:
3 × jaw width of vice
- Height of workpiece:
2 × jaw width of vice

Setting the Stamping Depth and Pressure Correctly

The large number of alloys makes it difficult to make an exact statement about the stamping pressure to be set. The two main parameters are workpiece width and material. In general, we recommend always starting with a low stamping pressure and slowly increasing it until the desired stamping depth in the workpiece is achieved.

For the material type 1.7131 (16MnCr5) we have made a measurement in this regard and set rough guide values for setting the stamping pressure.

Material type 1.7131 (16MnCr5)

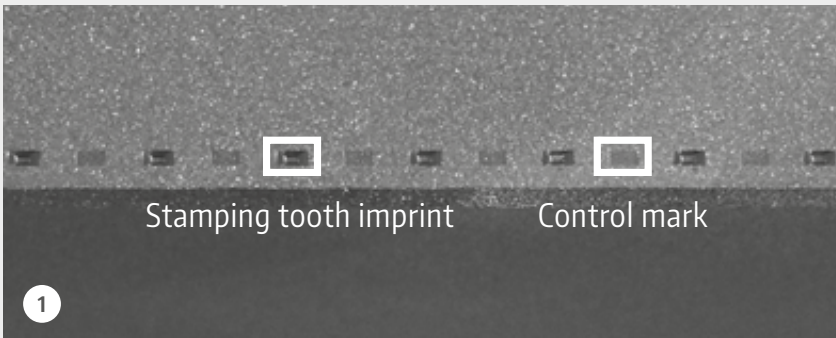
MATERIAL WIDTH	STAMPING PRESSURE
76 mm	100 bar
126 mm	140 bar

Please note: Depending on the surface quality, the required inlet pressure may deviate from these values. Therefore, carry out a test stamping and check the stamping contour with a visual inspection before each stamping series.

Stamping tooth imprint with correct stamping

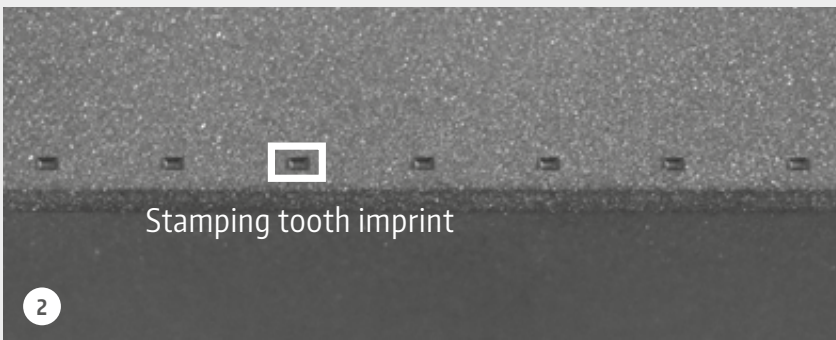
The visual inspection gives the user reliable feedback as to whether the inlet pressure has been selected correctly or whether readjustment is required. Depending on the material hardness, there are two different stamping tooth imprints. Soft material needs a bit

more “holding surface” due to the higher toughness. Therefore, it must be stamped in such a way that control marks between the stamping tooth imprints are visible. With harder materials, it is not necessary to stamp as deeply because of the higher resistance.



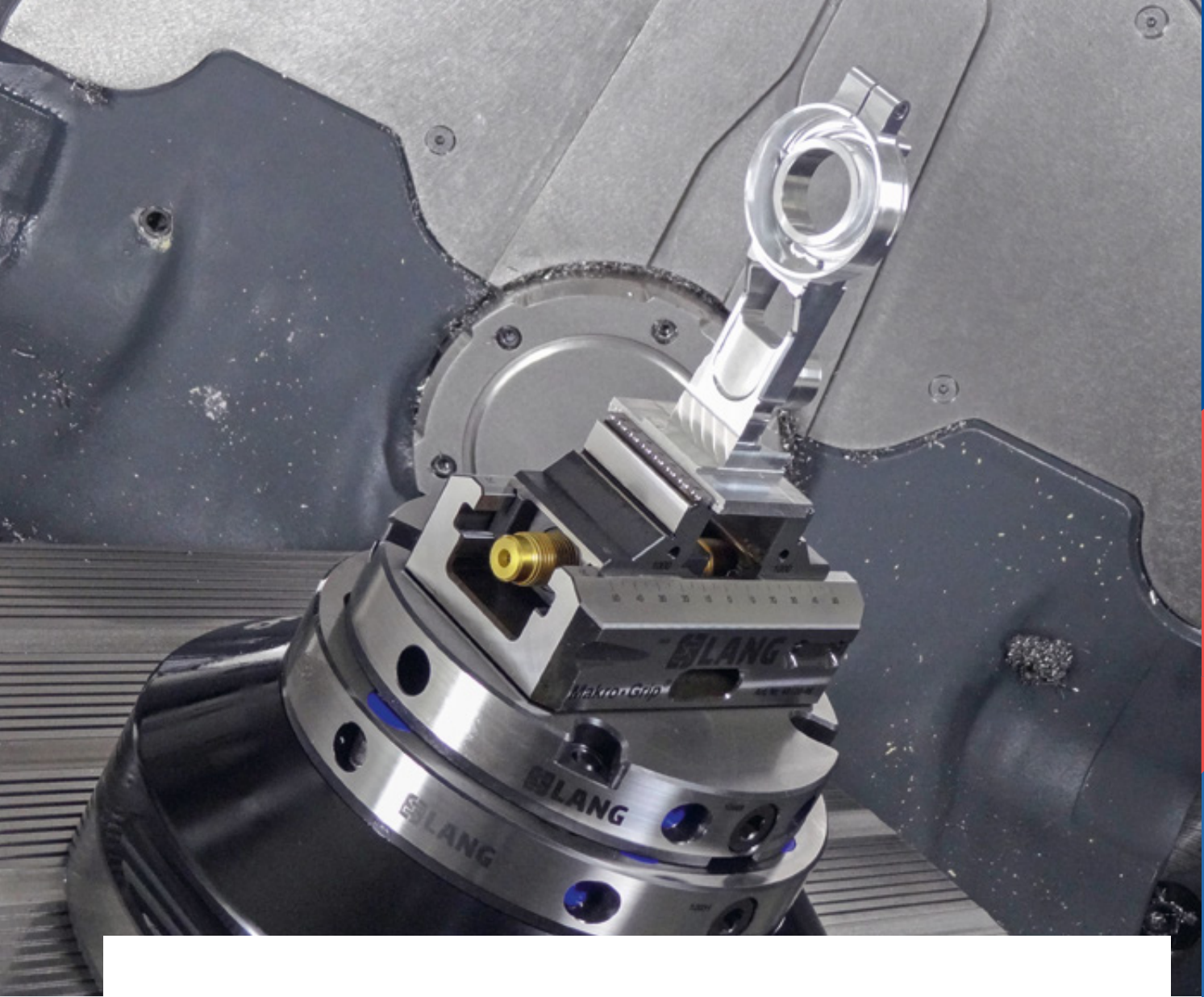
1 Material < 35 HRC with Standard stamping jaws

The stamping contour with alternating stamping tooth imprints and control marks is clearly visible. The depth of the control marks should be about 0.1 mm. The depth of the imprints should be about 0.25 mm.



2 Materials > 35 HRC with High-End stamping jaws

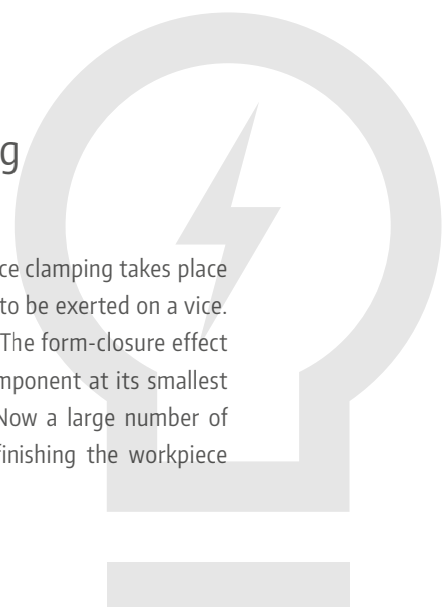
For material with a hardness between 35 and 45 HRC, the control marks should not be visible. The depth of the imprints is about 0.15 mm.



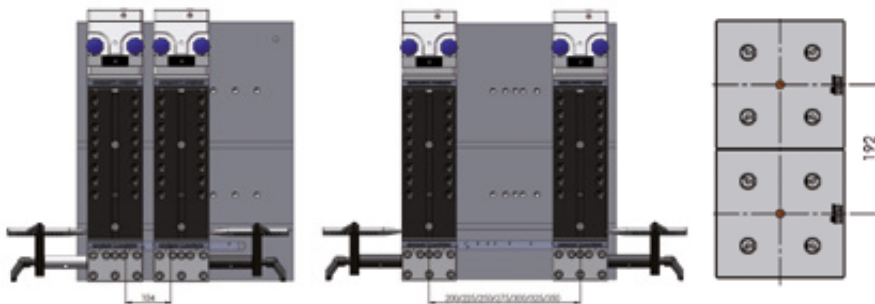
Tip for your benefit:

Using a side-milling cutter for finishing parts in one operation

By pre-stamping a workpiece, the force application of the workpiece clamping takes place outside the machine. This significantly reduces the clamping force to be exerted on a vice. A small, compact vice is sufficient to clamp oversized workpieces. The form-closure effect created by pre-stamping makes it possible to safely pick up a component at its smallest cross-section and clamp it edgewise and for ideal accessibility. Now a large number of components can be machined in one clamping process before finishing the workpiece with a side-milling cutter.



Stamping trolley with Makro·Grip® Dual Stamping Unit, extended, on T-slot plate



The dual stamping unit is ideal for preparing long parts with two stamping vises simultaneously and clamping these stamped parts accordingly in two 5-Axis Vices on the machine table.

The distance of the two units can be adjusted individually using the T-slots or marking bores, in order to match the distance of Quick·Point® pitch and thus the position of the Makro·Grip®'s' holding teeth.

STAMPING TROLLEY WITH MAKRO·GRIP® DUAL STAMPING UNIT, EXTENDED, ON T-SLOT PLATE

ITEM NO.	TYPE	MAX. STAMPING RANGE	TYPE OF STAMPING JAWS	WEIGHT	PRICE
41402	Extended	2 × 355 mm	Standard stamping jaws for material up to 35 HRC	350 kg	
41402-HE	Extended	2 × 355 mm	High-End stamping jaws for material up to 45 HRC	350 kg	

- Scope of delivery:
- 2 stamping vises
 - T-slot plate 596 × 496 mm
 - 2 pairs of stamping jaws with parallels, 3 mm
 - Pneumatic-hydraulic power multiplier (1-360 bar)
 - Workshop trolley
 - Gauging blocks for measuring wear of stamping teeth
 - 2 scaled workpiece endstop
 - 2 protection shield