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Can tableting tools be polished automatically?

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Can tableting tools be polished automatically?

The care and polishing of tableting tools is a “necessary evil” in **order** to keep the quality of the pressing surfaces constant in terms of the depth of roughness of the pressing surfaces and the **natural** tendency of the tablets to stick. **It is also necessary to help reduce the** friction during the pressing process.

The problems associated with the manual polishing of tableting tools, which is today still the most common practice, has led to the development of a mechanized polishing process delivering reliable process results.



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1. The pressing process

Set-up ▼

Operator: Vicon	Batch: 01.07.2006	
Machine KTS1000	Product: Placebo	12:32

P1

DR 0 1/min FS 0 1/min

PD 2,00 mm PD 2,00 mm

FD 0,00 mm

PP 0,0 kN Srel: 0,00 % WD 0,50 mm WD 14,00 mm MP 0,0 kN Srel: 0,00 %

Tablet

Weight:	111,1 mg
Thickness:	1,11 mm
Hardness:	111 N

General

Machine output set: 58,0 x 1000 T/h Machine output actual value: 0 T/h

1000 No inputs detected

Positioning All Setpoints = Actual Values

RESET JOGGING ON OFF



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During the compressing process the workpiece slides along the pressing surfaces of the tool.

A smooth surface of the components which come in contact with the product reduces friction and consequently also the resistance encountered. In many cases this makes it possible to obtain better performance from the press.

A smooth surface also reduces the tendency of the tablet to stick when it is ejected by the lower die, since this considerably reduces the risk of **adhesion** in the tiny depressions in the pressing surface.

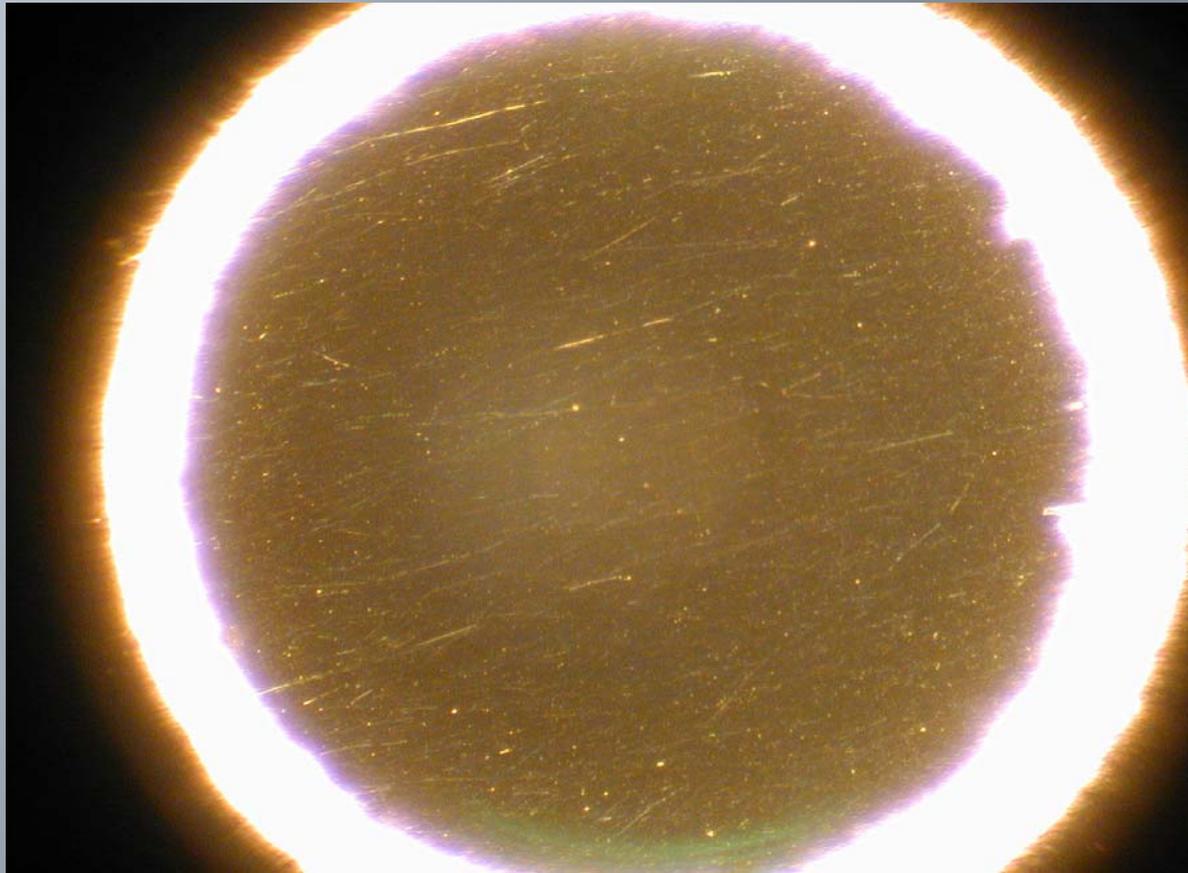
The contact surfaces of used tablet punches generally reveal considerably more roughness than new punches. The distortions can easily be seen in photographs taken under a reflected light microscope.



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Pressing surface of a new punch

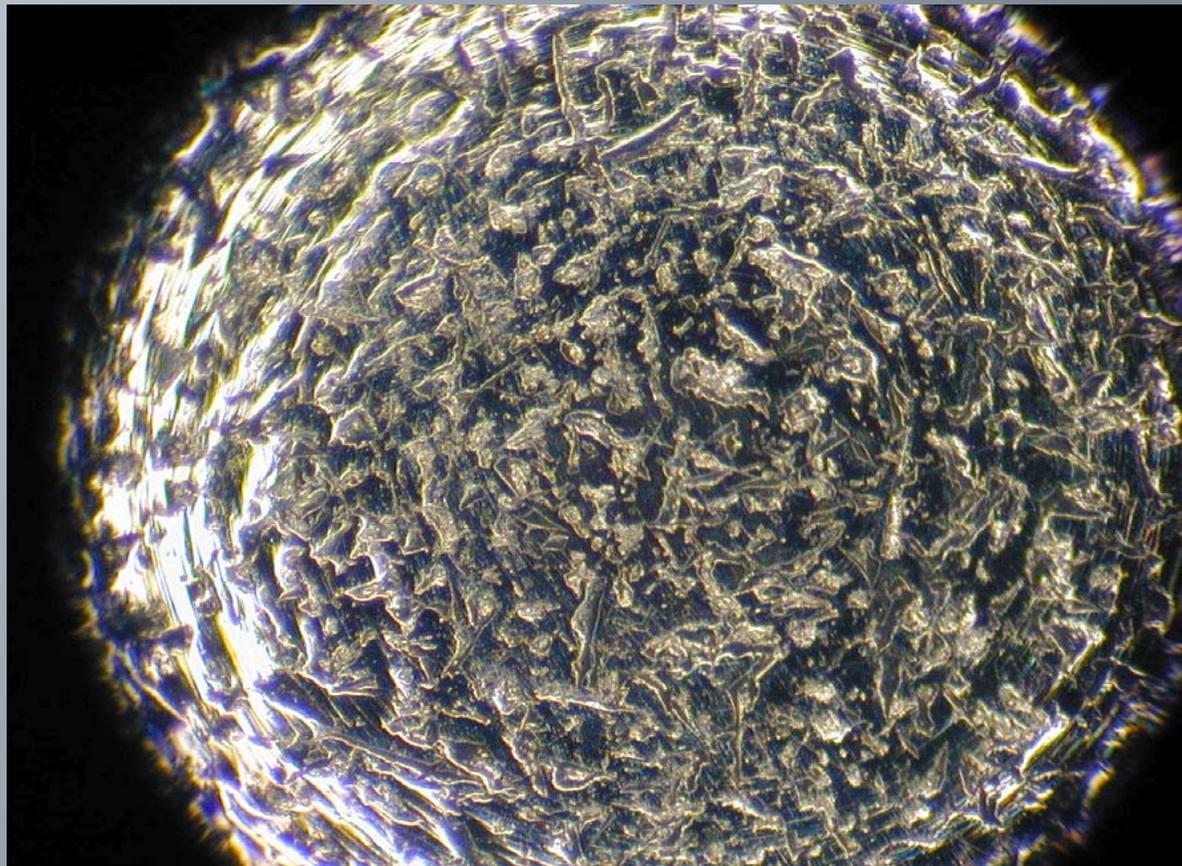




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Pressing surface of a used punch





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2. Manual polishing

For this reason the tableting tools of almost all manufacturers are repolished repeatedly. In many cases, this work is carried out at manual polishing stations.

The punches are clamped in **fixtures** or in small lathe chucks and then manually polished using small motorized polishing tools such as brushes and felts with the aid of polishing paste and muscle power.

Compared with an automated polishing process this is time-consuming and expensive. Depending on the size and shape of the pressing surface, it can take up to 5 minutes to polish a simple punch by hand. And complex shapes such as oblong tools, inscriptions and/or score lines are by and large unsuited to manual polishing.



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Examples





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Examples





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After manual polishing, complex punch geometries reveal the largest deviations **with regard to** the shape and quality of the surface. **The reason for this is that** all parameters of this polishing process, such as contact pressure, processing time, use of polishing paste, etc. are left to the discretion of the polisher and are dependent on his skill.

Most tablet presses are equipped with a system for monitoring the contact pressures.

Fluctuations in the contact pressure caused by variations in the manual polishing process often bring the production line to a halt and **require** the replacement or repolishing of individual punches.



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3. Drag finishing - definition and description

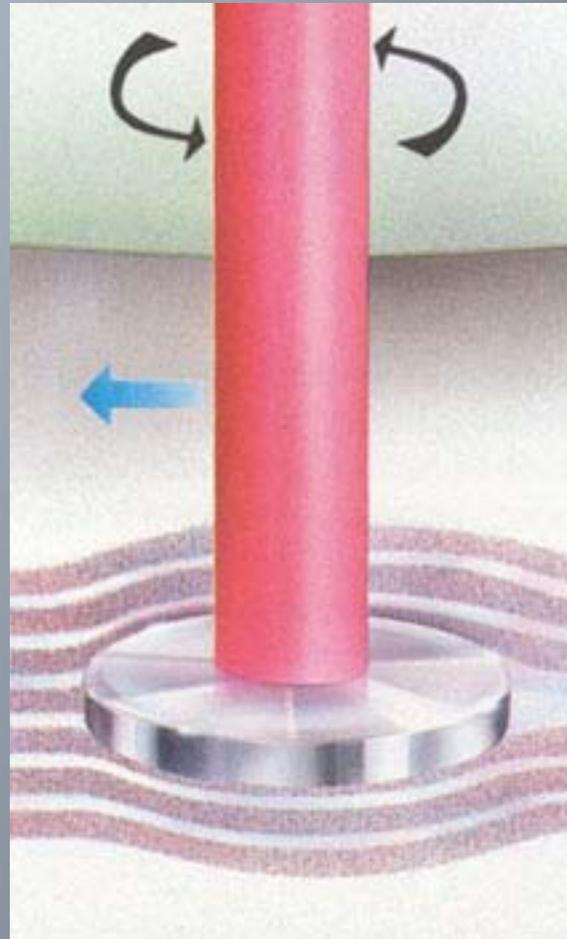
Drag finishing is a process which enables high-quality and sensitive components to be polished using a vibratory grinding technique.

In this process the workpieces are clamped to rotating spindles and **dragged** through a stationary bed of grinding or polishing media.



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Principle





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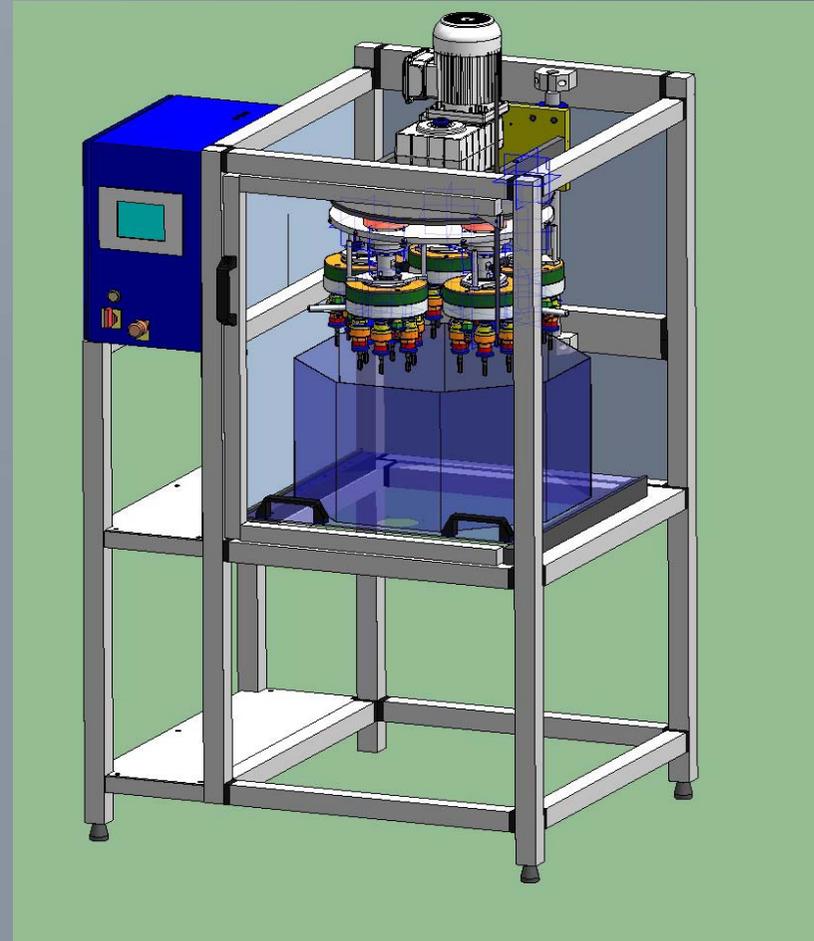
4. Automated polishing

Drag finishing is a process which enables high-quality and sensitive components to be polished using a vibratory grinding technique. In this process the workpieces are clamped to rotating spindles and **dragged** through a stationary bed of grinding or polishing media.





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Quick-change holder for all common punches





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For the purposes of this test the tablet punches were repolished in a specially designed DF drag finishing machine. Depending on the size of the machine and the **geometry** of the punch, up to 120 punches can be repolished in a single process. The processing time was set to 30 minutes.

The polishing **media** used in this instance was a polishing paste which was added to a granulated carrier **media** consisting of walnut shell or plastic granulate. The main ingredients of the polishing paste are aluminium oxide and glycerine.

The rotary motion of the punch in the granulate generates a relative movement between the carrier **media** and the punch, which in turn creates the polishing effect on the surface. The geometry of the process container is designed to briefly accelerate the polishing **media**, followed immediately by a braking effect.



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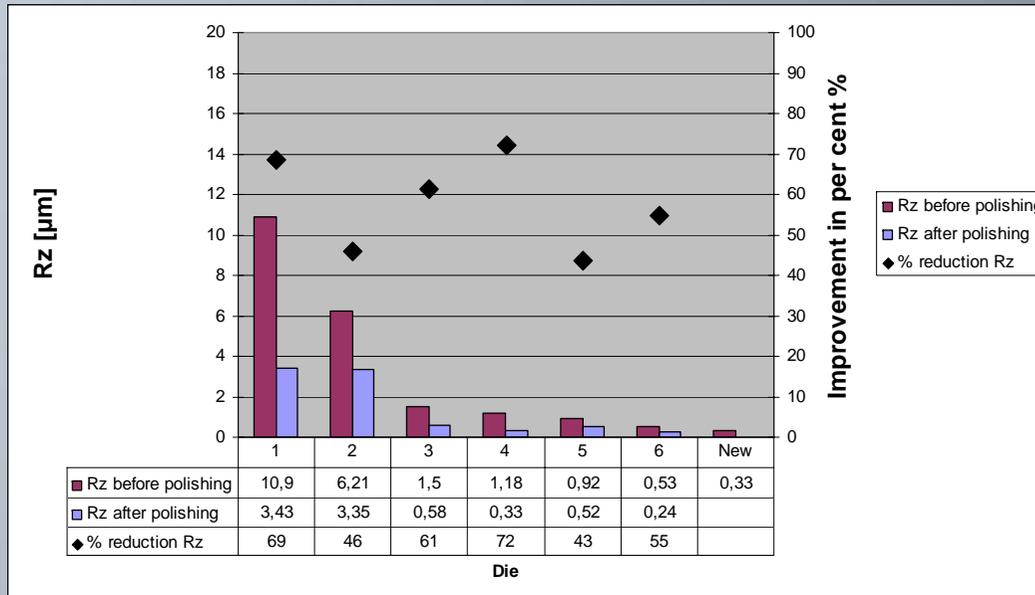


During the polishing process the direction of rotation repeatedly alternates in adjustable cycles. This ensures that all punches are treated evenly. The tools are held in an upright position at a predefined angle to improve the polishing effect on the pressing surfaces. This enables even **complex geometric** surfaces to be treated easily and efficiently.

There is no danger of any change to the dimensions of the punch, since the polishing process only removes the peaks of the roughness profile.



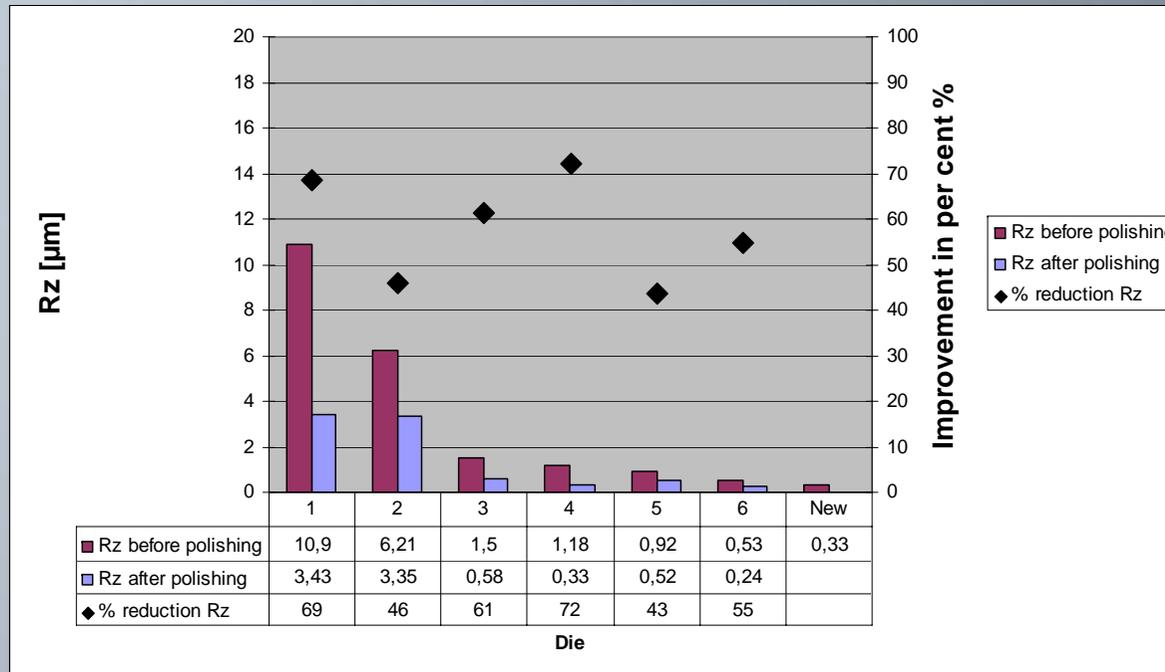
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What is immediately evident here is the considerable reduction in the depth of roughness by an average of over 50% after only 30 minutes' polishing time. In the group of very worn punches used for a long period, Nos. 1 and 2, the roughness is so extreme that longer polishing times are called for. (The best results were obtained with polishing times of up to 60 minutes.)



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In the group of punches Nos. 3 – 6 results observed show a quality very close to that of a new punch.

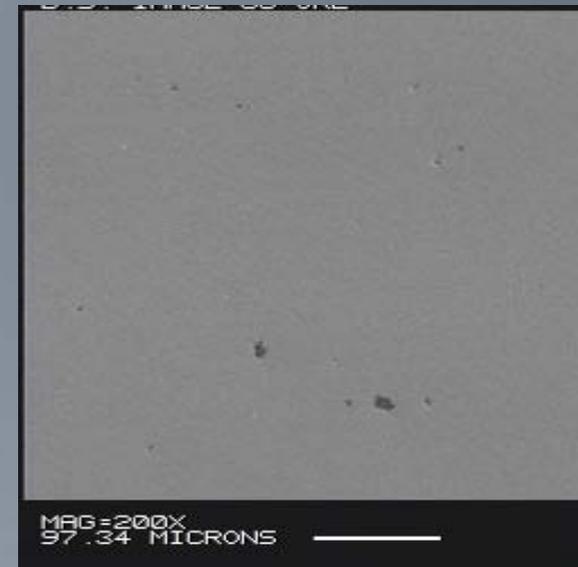
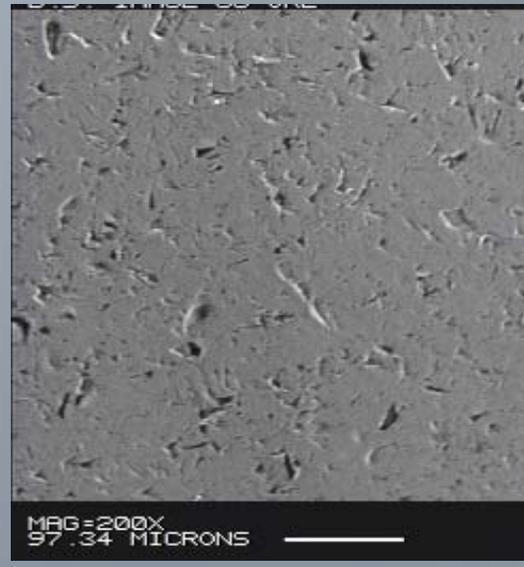
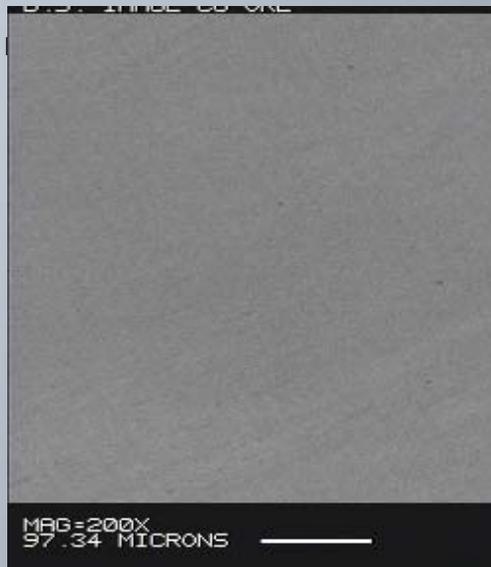
The plastic granulates often used today reduce these polishing times by about 30%.



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These 200x enlargements taken with a scanning electron microscope are a perfect illustration of the beneficial effect of the polishing process.





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Here there is no observable difference between the pressing surface of a new punch and that of a repolished one. The pressing surface of the used punch, on the other hand, reveals numerous convolutions on the surface which increase the tendency of the tablet to stick. In order to exclude any operator-related deviations in the polishing process, all parameters (processing time, speeds, cycles, paste dosing, etc.) are PLC-controlled. **In this way, the polishing process in the drag finishing machine will be repeatable time after time.**



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Thank you
for your attention!