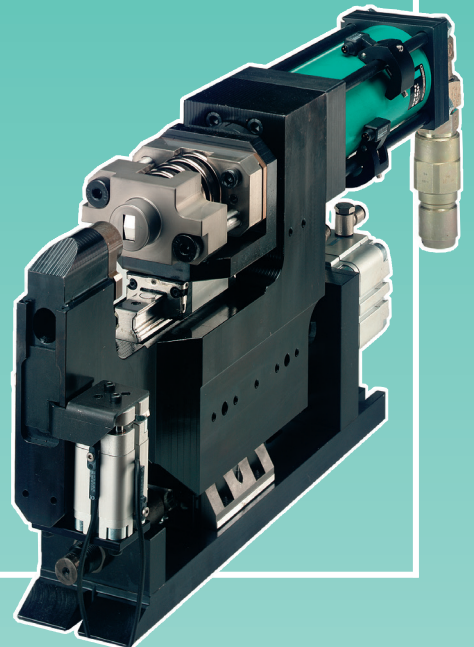
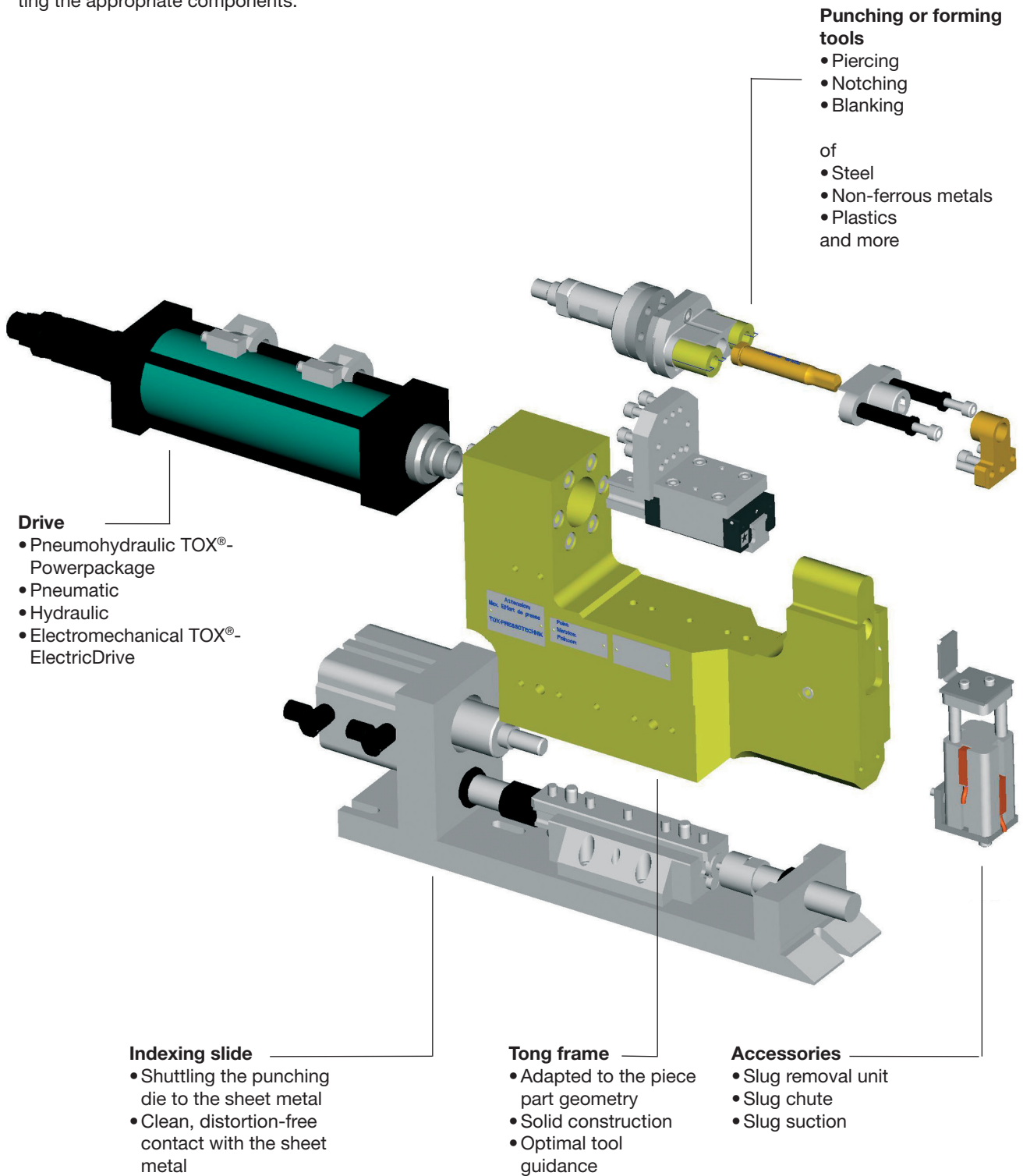


TOX®-Punching Systems

- TOX®-Punching Tongs
- TOX®-Punching Presses

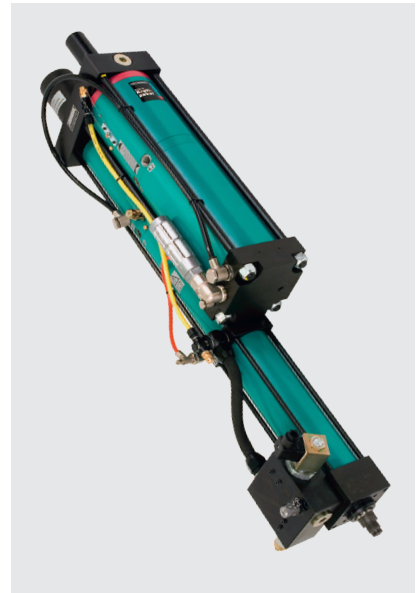
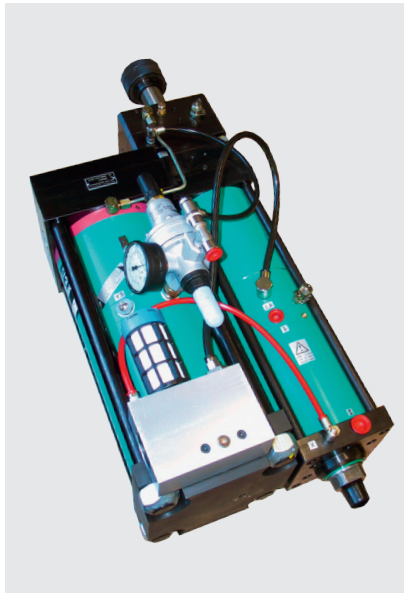
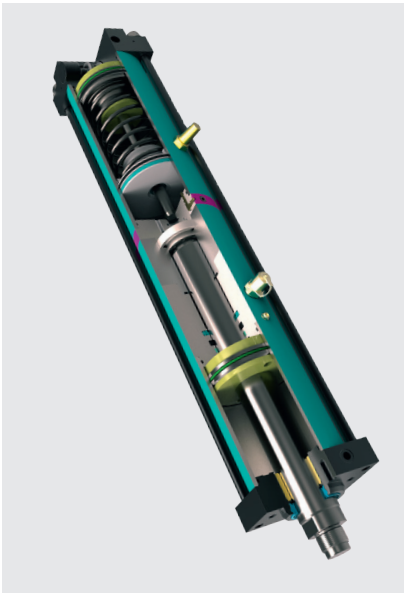


The well thought-out modular system of TOX® PRESSOTECHNIK provides complete solutions for almost all punching applications. The configuration of the system required for the application is done by selecting the appropriate components.



TOX[®]-Powerpackage – Specials

TOX[®]-Powerpackage with power bypass (ZLB)



Ideal for damping in punching applications and for smooth operation of machines during approach or power strokes. Available for all TOX[®]-Powerpackages with total stroke limiter.

Advantages:

- + Hydraulic damping of end of stroke
- + Cushioning infinitely adjustable
- + Total stroke infinitely adjustable
- + Protects tooling and machine
- + Noticeable noise reduction
- + Low Maintenance

The electrical adjustable solution for all damping functions. Many adjustment options are available e.g. damping and speed as well as Soft-Touch.

Advantages:

- + Hydraulic damping can be **electrically** initiated at any point of the stroke
- + Damping is continuously adjustable
- + Reduction of cutting impact when punching
- + Stroke sensing ZHU (without sensors) and positive stop with elastomeric damping FUD integrated
- + Option: speed control via proportional hydraulic valve
- + Option: integrated travel measuring system, type ZKW

Drive kinematics

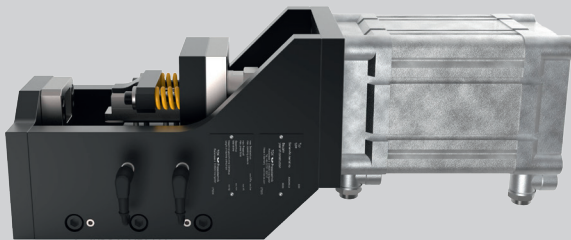
Examples from the TOX[®]-Modular Kit System:

The kinematics and the drive are designed in accordance to the required punching application.

The modular kit system allows to optimally adapt the press respectively the C-bow geometry, the drive and the pivoting curve to the piece part.

Linear kinematics

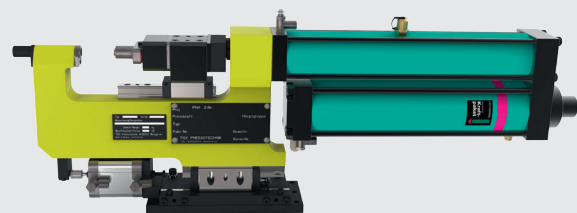
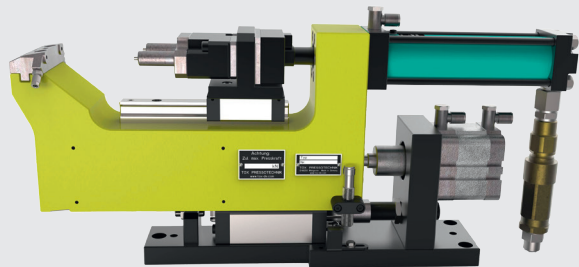
Pneumatic drive



Characteristics

- 0.7t punching force max.
- Stable framing design with guide carriage
- Cutting impact damping by spring assemblies in the holding-down clamp
- Additional damping can be integrated

Pneumohydraulic drive



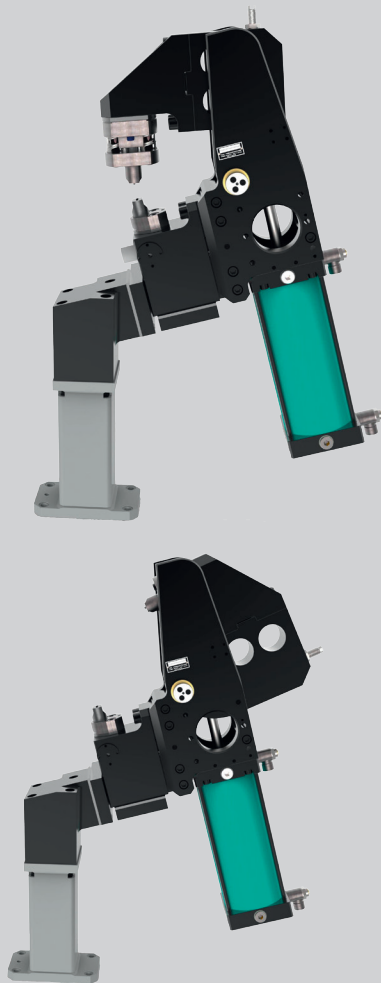
Characteristics

- 1 to 200t punching force
- C-bow versions with guide carriage
- Cutting impact damping possible in tool or in drive

TOX®-Punching Systems are ideally suited for highly productive production processes. The extensive product program of TOX® PRESSOTECHNIK covers handheld tongs, machine tongs and robot tongs as well as C-frame presses and further press versions.

Pivoting kinematics

Pneumatic drive



Characteristics

- All advantages of the TOX®-PowerKurveur with up to 5 t punching force
- Opening angle selectable from 30° to 90°
- Cutting impact damping by spring assemblies in the holding-down clamp

Pneumohydraulic drive



Characteristics

- Very compact design
- Especially designed for cutting processes
- Good integration into workpiece carrier substructure

Technical Information

Material characteristics for cutting

Tensile strength R_m (N/mm²) or shear strength k_s (N/mm²) for various materials

Material designation	R_m N/mm ²	Material designation	R_m N/mm ²	Material designation	k_s N/mm ²
Steel		Non-ferrous metals		Non-metals	
DC01	270...410	Al 99.5 Al99 soft	70 ... 100	Paper and cardboard	20 ... 50
DC03	270...370	Al 99.5 Al99 half-hard	100 ... 150	Hard board	70 ... 90
DC04	270...350	Al Mg 3/5/7 soft	180 ... 380	Klingerit u.ä.	40 ... 60
DX51	270...500	Al Mg 3/5/7 half-hard	220 ... 450	Synthetic resin	100 ... 140
S235	370...450	Al Cu soft	160 ... 220	Synthetic resin, pure	20 ... 30
S275	430...580	Al Cu half-hard	380 ... 440	Mica	50 ... 80
S355	500...600	Kupfer (Cu)	210 ... 240	Wood	10 ... 30
E335	590...770	Zinc (Zn)	120 ... 140	Birch plywood	20 ... 30
C35E	600...750	Nickel (Ni)	400 ... 450	Celluloid	40 ... 60
C45E	650...800	Lead (Pb)	200 ... 300	Leather	7
1.4301	540...750	Al Bz 4	300 ... 400	Soft rubber	7
1.4305	500...700	CuZn 10 F 30	350 ... 430	Hard rubber	20 ... 60

Cutting force

The shearing process and the quality of the resulting cut surfaces depend on tool geometry, die clearance, tool sharpness as well as the type of material and its characteristics such as sheet metal thickness, material flow and microstructure. The shearing force for cutting tools with parallel ground surfaces can be determined using the following mathematical formula:

$$F_s = l_s \times s \times k_s$$

where $k_s \approx 0.8 \cdot R_m$

F_s = shearforce

l_s = length of cut

s = material thickness

R_m = material tensile strength

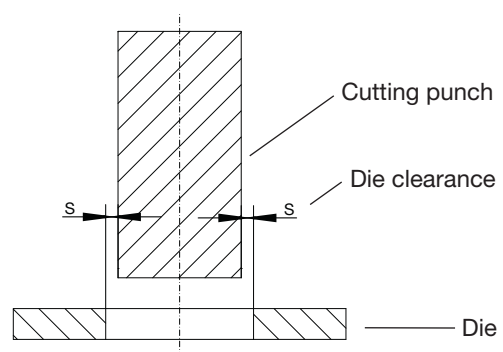
k_s = material shear strength

Using shear punches can reduce cutting forces up to 30%. The stripping force is typically about 10–40% of the required shearing force.

Recommended die clearance S in μm based on shear strength k_s :

Sheet metal thic kn. mm	250 N/mm ²	250 – 400 N/mm ²	400 – 750 N/mm ²
0.8	25	32	40
1.0	30	40	50
1.25	38	50	63
1.5	45	60	75
2.0	60	80	100
2.5	75	100	125
3.0	90	120	150
3.5	105	140	175
4.0	120	160	200
4.5	135	180	225
5.0	150	200	250

Proper die clearance is essential for optimum shear effect, high cut quality and long tool life. The required die clearance (S) is primarily dependent on material shear strength and thickness.



Important data for the configuration of a TOX®-Punching System

In order to select the appropriate system from the TOX®-Modular System, the data below is required:

Piece part

- Denomination of material
- Tensile strength (N/mm²)
- One layer/multilayer
- Dimensions l x w x h (mm)
- Thickness of material (mm)

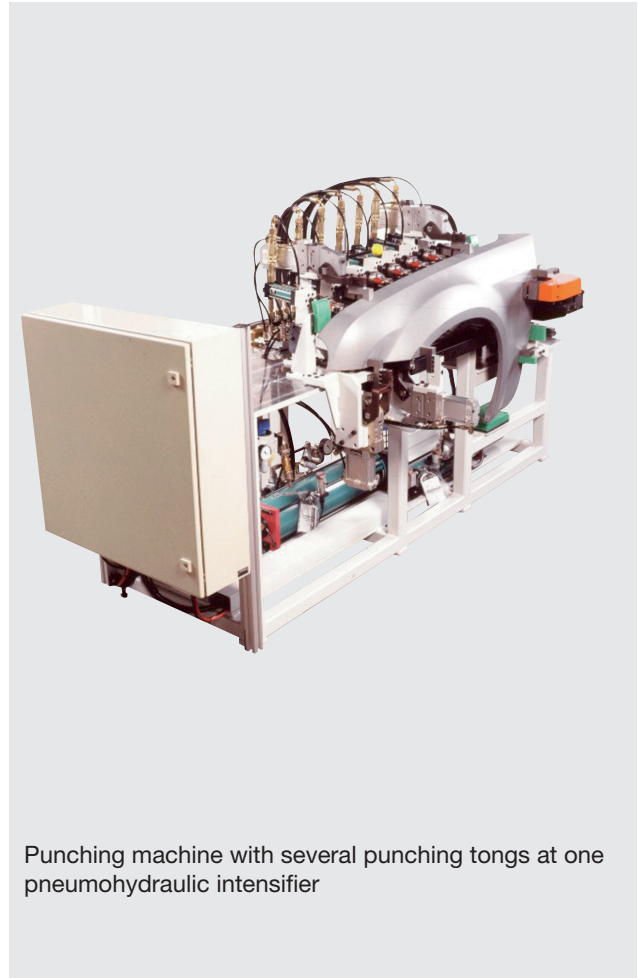
Punching pattern

- Dimensions of punched aperture (mm)
- Length of cutting edges (mm)
- Required tolerances
- Number of punched apertures per component

Pre-requisites of the punching system

- Stationary or mobile punching unit
- Type of the slug removal unit
- Required piece of punched parts per hour/day

Application Examples of Punching Systems





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Product Range

TOX®-Powerpackage



TOX®-ElectricDrive



TOX®-PowerKurver



TOX®-FinePress



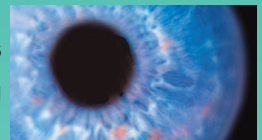
TOX®-Presses



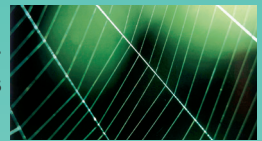
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Systems



TOX®-Punching
TOX®-Coining



TOX®-Press-Fitting



TOX®-Production
Systems

