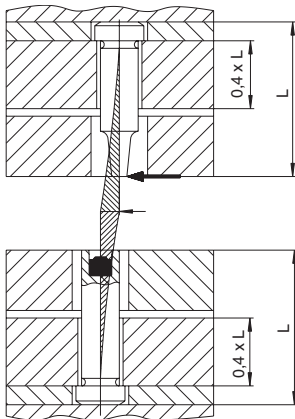


# Installation and construction guidelines TOX® Clinch tools

## Tolerances

Please observe the tolerances and exact fixing when installing the TOX® tools. The tolerances of the TOX® tools are designed to ensure secure fixing.

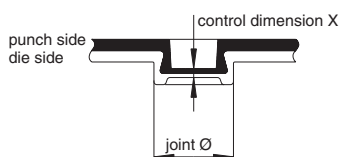
**Important:** the stripper should not touch the TOX® tools, otherwise there is a risk of tool breakage due to transverse forces. It is essential that the alignment tolerance should be maintained between the punch and die (see method of installation).



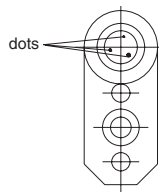
These tolerances ensure the flexible bearing which is so important for the TOX® process.

Before mounting the TOX® tools to the holding plate, coat them slightly with grease.

The testing of a TOX® joint is made non-destructive by measuring the remaining bottom thickness of the TOX® point, the "Control Dimension X". The dimension X allows to establish correlation with the shear and pull load carrying capabilities of the joint.



The measurement should be performed using measuring calipers, e.g. type CMT (see page 17), centered between the TOX® trademark dots on the die side.



The control dimension "X" is contained in the test report and has a tolerance of  $\pm 15\%$ . For sheet thicknesses of less than 0.8 mm, this tolerance is reduced (see test report for precise details). During its service life, the bottom of the die may show wear. This does not influence the quality of the TOX® point as long as the die bottom is not lowered by more than 0.1 mm. After a re-adjustment, the point durability must be checked.

## No chisel test:

In welding technology, durability is tested, for want of a better method, by driving a chisel between the sheets at the welding spot. In contrast, the quality of the TOX® joint can be checked non-destructively by simply measuring the X-Dimension.

## Process monitoring:

Continuous monitoring can be achieved using our electronic process monitoring system. See page 18.

## Operational monitoring

If the pressing force is too low, no joint will be formed, but if it is too high, this can lead to breakage of the tool. The "TOX®-Powerpackage" provides an optimal monitoring facility for ensuring the right pressing force. When the set pressing force is reached, the return stroke is initiated via an impulse from an oil high-pressure switch. If the pressing force is not reached, e.g. due to a pressure drop in the pneumatic system, this switch-over does not take place and the "TOX®-Powerpackage" stops. This provides an ideal way of checking the pressing force for each TOX® point.

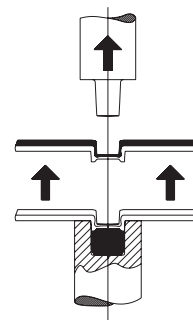
For the **drive**, pneumatic, hydraulic or electromechanical equipment can be used. Thanks to their special action, our pneumatic-hydraulic drive, the "TOX®-Powerpackage", as well as the servo units from "TOX®-ElectricDrive" are ideally suited for this purpose and offer a number of decisive advantages (see TOX®-Powerpackage or TOX®-Electric-Drive catalog).

## Operating safety precautions:

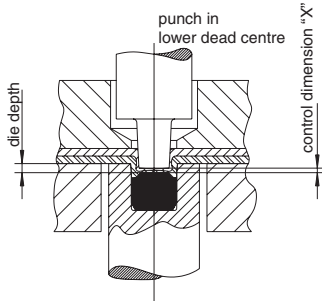
Tools must **not be closed without material**. Without material, the surface pressure at the centre of the tool is too high and leads to deformation of the die or tool breakage. This can be easily avoided by setting **stroke limiters**. They should basically be applied so that the control dimension "X" is obtained when the tool is closed. This ensures that the TOX® punch and TOX® die never touch and cannot be destroyed even if operated without material.

Withdrawing the punch or die violently without the stripper can cause deformation of the TOX® point and reduce its durability. There is also a risk of breaking the TOX® tools. Excessively **high** stripping forces affect the shaping process and reduce durability.

Due to the resulting button, either the part has to be lifted out of the die or the die has to be retracted to clear the button.



# Installation and construction guidelines TOX® Round Joint tools

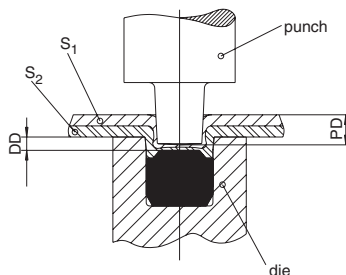


The **strength** of the holding fixtures must be able to stand up to the pressure loads of the TOX® tools in continuous operation. The press force is set according to the Test Report and the pressure area according to the tool shaft diameter or contact area.

### Stripper:

Strippers are necessary on both the punch and die side and must be placed directly on the TOX® tool. See test report for stripping force. In the case of multiple point tools with a common stripper plate, this value should be multiplied by the number of points.

**The stripping distance** on the punch side should be > the penetration depth (PD) of the punch neck. For die side stripper travel: DD (per TOX® test report) + 1.0 mm (+ part clearance if needed).



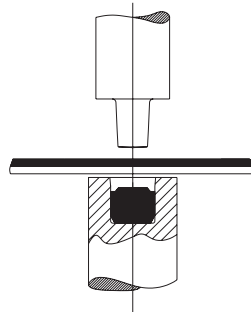
calculation of PD = penetration depth  
 $PD = S_1 + S_2 + DD - X$

$S_1$  = thickness of material punch side  
 $S_2$  = thickness of material die side  
 DD = die depth  
 X = control dimension X

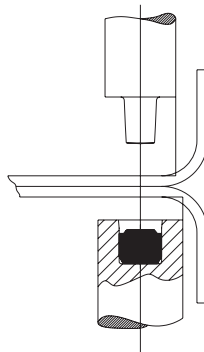
Data from TOX® test report

### Oil drainage system

All the die forms with insert feature an oil drainage system, except for the "flat plate dies". This system is necessary for very oily sheet metal and when using spray lubrication.

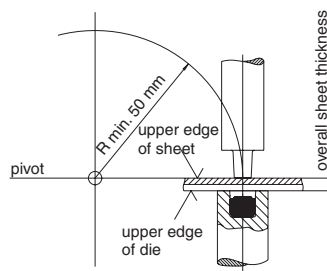


There is a risk of breakage as the tool shank hits the **bending radius**. The shoulder of the TOX® tools should, therefore, not make contact with the sheet.



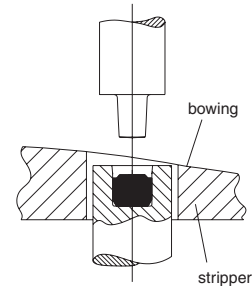
### Equipment with circular tool movement, e. g. TOX®-Power-Kurver.

Punch should be placed vertically on the sheet. This ensures similar durability to those of a linear tool feed.



An inclination of the TOX® tools to the surface of the sheet metal of max. 3° is allowed with slightly lower joint strength (for dies with solid cavity).

Also with shaped pressings or component parts that do lie flat, make sure the tolerances of the component parts are maintained to ensure optimum joining by the TOX® tool. Please contact TOX® PRESSOTECHNIK.



### Points executed during the life of TOX® joining tools:

With qualified mechanical realization and observance of our mounting instructions and test report data, the following **quantities of points and more can be expected during the life of each tool set:**

- St 1203
- 100 000 – 400 000 joining points
- ZStE 340
- 100 000 – 350 000 joining points
- aluminium
- 100 000 – 350 000 joining points
- Stainless steel
- 20 000 – 150 000 joining points

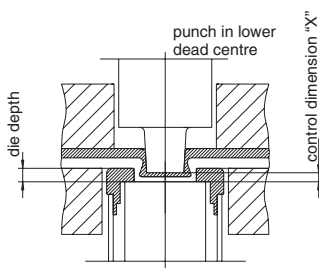
### Punch and die changes are necessary in case of:

- tool rupture
- continuous reduction of the joining point strength e.g. due to tool wear.

**We recommend testing an actual production sample to determine whether the strength of the joints is adequate.**

# Installation and construction guidelines TOX® SKB die

The installation and design guidelines for TOX®SKB dies are not much different than those for the TOX® Round Joint process (see pages 19 and 20). The following guidelines apply exclusively to the SKB die:



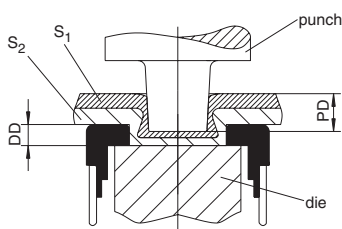
**Attention:**

The **rejoining** of an already made point, can cause the destruction of the SKB die and of the joint.

**Stripper:**

Strippers are necessary on both the punch and die side and must be placed directly on the TOX® tool. The stripper force is given in the test report. In the case of multiple point tools with a common stripper plate, this value should be multiplied by the number of points.

**The punch side stripper travel** should be larger than the penetration depth PD of the punch tip.



Calculation of PD = (penetration depth)

$$PD = S_1 + S_2 + DD - X$$

S<sub>1</sub> = thickness of material punch side

S<sub>2</sub> = thickness of material die side

DD = die depth

X = control dimension X

Data from TOX® test report

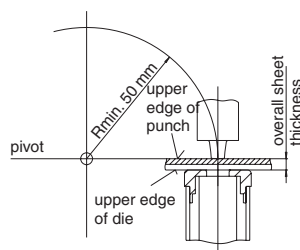
Withdrawing the punch or die violently without the stripper can cause deformation of the TOX® point and reduce its durability. There is also a risk of breaking the TOX® tools. Excessively **high** stripping forces affect the shaping process and reduce durability.

The **strength** of the holding fixtures must be able to stand up to the pressure loads of the TOX® tools in continuous operation. The press force is set according to the test report, and the load area according to the tool shank diameter or bearing surface.  
Pressure load = 350 N/mm<sup>2</sup>  
(Conforms to safety S = 3)

**The close sitting of the die** to the sheet metal on the die side is compulsory. Marks of firm parts must be slightly visible and uniform.

Equipment with **circular tool movement**, e. g. TOX®-PowerKurver. Punch should be placed vertically on the sheet. This ensures similar retention forces to those of a linear tool movement.

Flange must be wide enough to fully cover the die diameter. Partial overlap results in loss and to potential cracks in the die side material.



An inclination of the TOX®-Tools to the sheet metal surface ≤ 1° is allowed with a slight reduction of the retaining forces.

**Points executed during the life of TOX® joining tools with SKB die:**

With qualified mechanical realization and observance of our mounting instructions and test report data, the following **quantities of points and more can be expected during the life of each tool set:**

- St 1203: 200 000 - 400 000 joining points
- ZStE 340: 200 000 - 350 000 joining points
- Aluminium: 200 000 - 350 000 joining points

**Punch and die changes are necessary in case of:**

- tool rupture
- continuous reduction of the strength values
- tool wear

**We recommend that you test for joint strength according to the intended usage of the assembly component.**

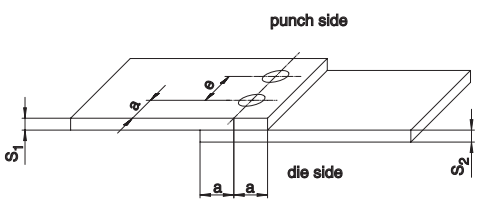
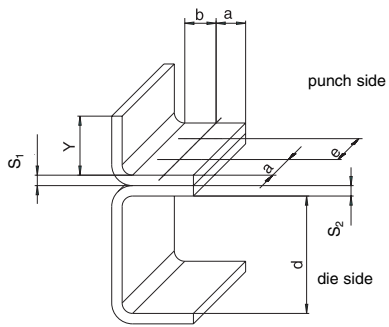
# Design guidelines for TOX® users

The values below are intended as a standard design for users of the TOX® joining process. Their purpose

is to provide the designer with guidelines for planning according to the TOX® method. If it is not possible to

design your particular application using this guideline, please contact us.

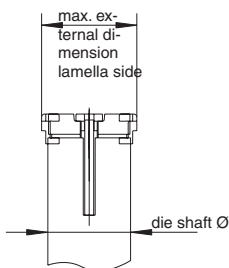
	Round point die							SKB die			
	3	4	5	6	preferred series			6	8	8**	10
Point diameter	3	4	5	6	8	10	12	6	8	8**	10
Sheet thickness Punch side $S_1$	$S_1 = \text{approx. } 2,5 \text{ to } 3,0 \times S_2$										
Sheet thickness Die side $S_2$	$S_2 = \text{approx. } 2 \text{ to } 2,5 \times S_1$										
Overall sheet thickness [mm] $S_1 + S_2$	0,6-1,5	0,6-2,0	0,9-2,5	1,0-3,0	1,5-6,0	1,7-7,0	4,0-12,0	0,4-2,5	0,6-5,0	0,6-5,0	1,0-6,0
Edge distance [mm] $\geq a$	5	5	5	6	7	8	10	7	8	9	9
Distance to border $\geq b$ Note border radius [mm]	5	5	5	6	7	8	10	7	8	9	9
Point to point distance [mm] $\geq e^*$	10	10	10	12	14	16	20	14	16	18	18
Min. die height	6	6	6	6	6	6	6	14	14	14	14
Clearance [mm] $\geq d$	15	15	20	20	20	25	30	30	30	30	35
Flange length [mm] $Y$	unlimited										

\* + tolerance range

Please take note of the stripper dimensions on pages 13 and 14 when determine the distance from edges and radius borders (a, b). Special shapes available.

**\*\*Attention:** with glue applications or other intermediate layers, the die shaft diameter 16.0 mm must be used for TOX® point SKB 80.



## TOX® efficiency

### Sheet material

- metallic
- same materials
- different materials
- sheets/profiles

### Sheet thickness

- same thickness
- thick in thin 2,5:1
- thin in thick 1:2
- min. single thickness approx. 0.2 mm
- max. overall thickness approx. 12.0 mm

### Sheet surface

- dry
- oiled
- uncoated
- coated on one or all sides
- painted
- plastic

### Sheet layers

- 2 ply
- 3 ply
- intermediate textil
- plastic
- plastic foils
- paper
- adhesive
- etc.

### Recommendation

**hard** (punch side)  
**soft** (die side)

### Recommendation

**thick** (punch side)  
**thin** (die side)

**TOX® Evaluation Order,**

P/O No. ....

at best returned by facsimile

**TOX®: THE ONLY WAY FOR A RELIABLE APPLICATION OF CLINCHING WITH FUNCTIONAL GUARANTEE:**

**TOX® Test Report:** contains all relevant data of the application, with guaranteed performance values of the TOX®-joint.

**TOX® Tool Passport:** included with every delivery of TOX® tools, valuable information for your production and maintenance department.

**TOX® Data Sheet:** which is constantly updated with all available data about tool and application.

Please complete the framed areas

<p><b>Your name and address:</b></p>   <p>Tel.-No. ....</p> <p>Fax-No. ....</p> <p><b>Your TOX® PRESSOTECHNIK contact person:</b></p>	<p><b>Choose from following TOX® Test alternatives:</b></p> <p>1. Qualification Test, TOX® Test Report with joint strength data of test sample strips, joining of up to 2 components. With the supply of 20 sheet metal strips minimum 25 x 50 mm or adequate flat metal sheets, for material on punch and die side each <b>Free of charge</b> <input type="checkbox"/></p> <p><b>Additional to 1.:</b></p> <p>2. With components supplied, requiring preparatory work for test samples, at cost</p> <p style="text-align: right;">Fixed Charge EUR 255,- <input type="checkbox"/></p> <p><b>Additional to 1. or 2.:</b></p> <p>3. Joining of component samples. Quantity ..... pcs.                  Effort required, estimated by yourself:                  .....hrs x EUR 48,- = <input type="checkbox"/></p>
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**TOX® Application Information:**

Project & component designation .....	Production rate per year: .....
Required/calculated joint strength: Shear Strength ..... (N), Pull Strength .....(N), Data not available <input type="checkbox"/>	
Anticipated start of production: .....	

**For the TOX® Tests the following information is also required together with the, the above mentioned test material:**

Requested TOX®-joint Ø (mm), please circle: 3   4   5   6   8   10   12   best possible		TOX® Flat Point:   yes <input type="checkbox"/> no <input type="checkbox"/>
Material (punch side) Acc. to DIN, ASTM, ISO:		Material (die side) Acc. to DIN, ASTM, ISO:
Thickness (mm):		Thickness (mm):
Coating (kind of, thickness):		Coating (kind of, thickness):
Surface:   dry <input type="checkbox"/> oily <input type="checkbox"/>		Surface:   dry <input type="checkbox"/> oily <input type="checkbox"/>
3 <sup>rd</sup> layer inbetween <input type="checkbox"/> no <input type="checkbox"/> yes, Material:		Thickness:   Coating:

Supplementary information / sketch / drawing (if needed, use 2<sup>nd</sup> page)

<b>Please send more information about:</b>			
<input type="checkbox"/> TOX®-Single Point Tools	<input type="checkbox"/> TOX®-Multiple Point Tools	<input type="checkbox"/> TOX®-ClinchRivet	<input type="checkbox"/> TOX®-Hand Tongs
<input type="checkbox"/> TOX®-Machine Tongs	<input type="checkbox"/> TOX®-Robot Tongs	<input type="checkbox"/> TOX®-Powerpackage/Drives	<input type="checkbox"/> TOX®-ElectricDrive
<input type="checkbox"/> TOX®-PowerKurver	<input type="checkbox"/> TOX®-Presses	<input type="checkbox"/> TOX®-Piercing and Marking	
<input type="checkbox"/> TOX®-Process Control	<input type="checkbox"/> TOX®-Pressing Control	<input type="checkbox"/> TOX®-Special machines	
I would like to be contacted by telephone <input type="checkbox"/> meet with a specialist, preferably on ..... <input type="checkbox"/>			