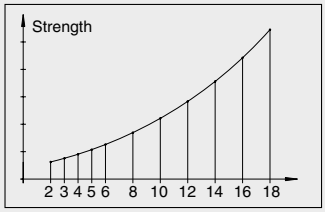
The TOX®-Clinching Technology at a glance

TOX®-Clinching Technology

Advantages TOX®-Round Joint/TOX®-SKB Die

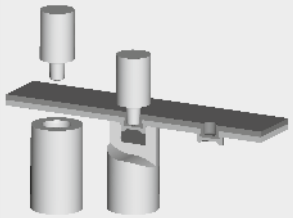
See page 2 – 3



TOX®-Clinching Tools

Flanged tools; offset die plate, flat die plate
“Extremely small flange widths, TOX®-Point in tight corners“

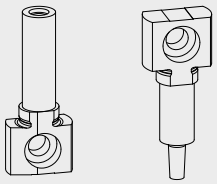
See page 4 – 7



Special shapes of tools
Individualized according to the requirements

Punch and die shapes

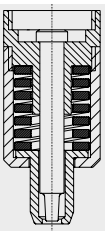
See page 8



TOX®-Stripper for punches and dies

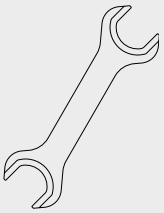
TOX®-Accessories

See page 9 – 14



Assembly tools
TOX®-Measuring Equipment

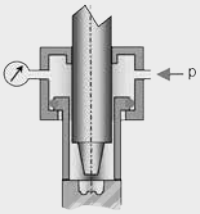
See page 15



TOX®-Spray Equipment
TOX®-ToolCheck

Pneumatic testing of clinching dies

See page 16 – 19



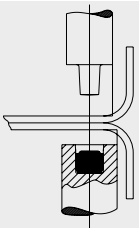
Installation and design guidelines

Lifetime of TOX®-Tools

See page 20 – 24

TOX®-Joint diameters for individual materials

See page 25 – 28



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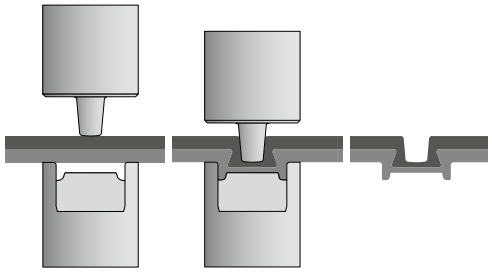
TOX®-Clinching Technology

TOX®-Round Joint – Simplicity is our strength

Process sequence



For almost all applications, the rigid TOX®-Round Joint **without** moving segments is the best solution.

It provides a unique consistency, service life and reliability of the TOX®-Joints in mass production. TOX® offers considerable advantages in terms of production and process safety.

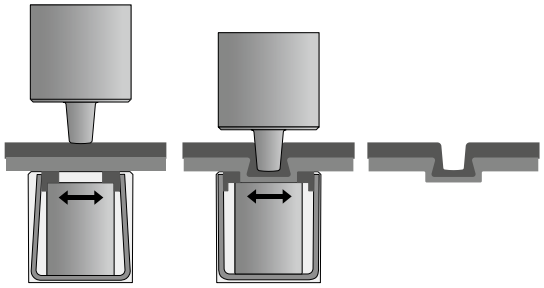
TOX® PRESSOTECHNIK supplies specially adapted process monitoring systems which help you to test and document continuously the competitive factor of quality (see leaflet TOX®-Controls).

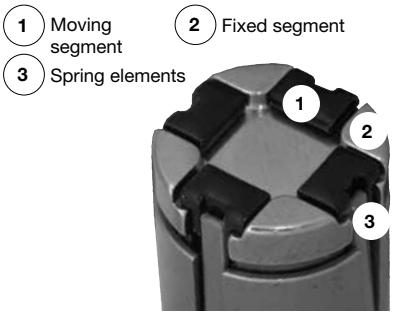
The **TOX®-MICROpoint** with point diameters of 1.5 to 2 mm is the answer to the miniaturization of components. It is ideal for sheet metal thicknesses from 0.1 – 0.5 mm and narrow flanges. The electrical conductivity between the joined layers is outstanding.

The **TOX®-TWINpoint** provides **protection against rotation** and, in comparison to the single joint, clearly increases the joint strenght.
The TOX®-TWINpoint has an excellent electrical conductivity characteristic. A solid die and the same process as for the single joint guarantee the full advantages of the TOX®-Round Joint. The TOX®-TWINpoint is ideal for small flanges and limited installation space.

TOX®-SKB Die – Ideal for complex clinching applications

Process sequence





This SKB die has 3 – 6 fixed segments and 3 – 6 moving segments.

The materials and the punch are centered by the fixed segments, thereby guaranteeing that the joint formation is perfectly concentric.

This die offers the advantages of a solid die, but at the same time eliminates the disadvantages of a die with only moving segments.

The strengths of the TOX®-SKB Die

+ specially suitable for hybrid joining „Clinching + Glueing“ in connection with intermediate layers
+ due to the high flexibility regarding sheet metal thicknesses, only few standardized die types are required and the application flexibility is increased
+ high static and dynamic joining strengths and improvied crash behaviour
+ multiple sheet joints are possible
+ can be used with all our appliances (hand-/robot tongs/presses) due to moving segment protection and centering by fixed segments
+ small height of joining point
+ strippers only required in special cases
+ **even in the case of missing moving segments, the SKB die produces a very strong joint. The process reliability is immensely increased compared to a die with only moving segments.**

The TOX®-Clinching Technology at a glance

Efficiency of the TOX®-Clinching Technology

Sheet material
+ metallic
+ same materials
+ different materials
+ sheets/profiles

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

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

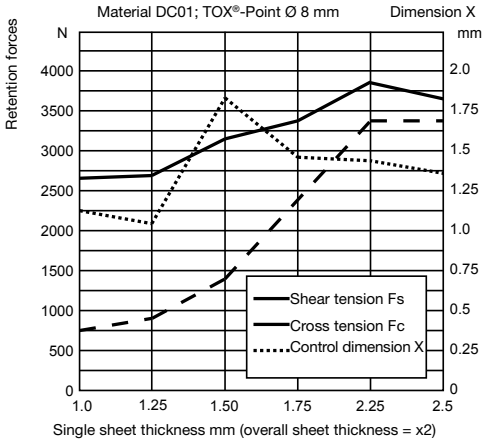
Recommendation
Sheet **thick** (punch side)
Sheet **thin** (die side)

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

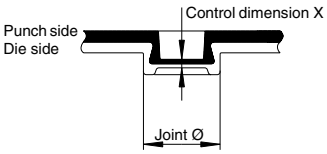
Sheet layers
+ 2 ply
+ 3 ply
+ intermediate:
  textil
  plastic
  plastic foils
  paper
  adhesive
  etc.

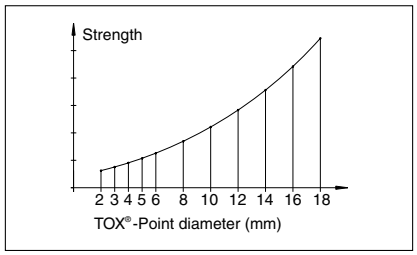
Changes in material thickness:
The diagram shows the strength of the TOX®-Joint over a wide range of material thickness, using the same TOX®-Tool combination, while changing the press force and quality control dimension X.

Performed with a tool set, point diameter 8 mm, for all thicknesses.



The critical factor in terms of durability for **all** comparable joining processes is **always** the point diameter, measured on the die side.





*Joint strength (shear and pull)

As a general rule, the larger the point diameter, the greater the joint strength.

	TOX®-Point diameter		
	6 mm	8 mm	10 mm
Single sheet thicknesses Range (mm) Steel	**0.5 – 1.5**	**1.0 – 2.5**	**1.25 – 3.0**
Shear tension (N)	1000 – 2500	2600 – 3600	3000 – 6000
Cross tension (N)	1000 – 2700	2100 – 4000	3000 – 5000
Press force (kN)	20 – 45	35 – 50	60 – 80
Stripping force punch side (N)	500 – 3500	1000 – 6000	2000 – 8000

Reference values for TOX®-Joints

TOX®-Service

We offer you the only guaranteed reliable way of applying the most up-to-date clinch technology. This system is already compulsory in many parts of the automotive industry.

The **TOX®-Test Report** contains all relevant data of your application, including guaranteed performance values of the TOX®-Joint.

You will receive a **TOX®-Tool Passport** with your delivery, providing information for your production and maintenance department.

TOX®-Data Sheet, internal follow-up system which stores all application and tool data used and allows rapid consultation with our internal and external servicing departments.

Component part tests and samples for testing purposes can be executed in our labs against cost sharing. You are welcome to visit us and to bring your component parts.

TOX®-Clinching Tools
Flanged Tools

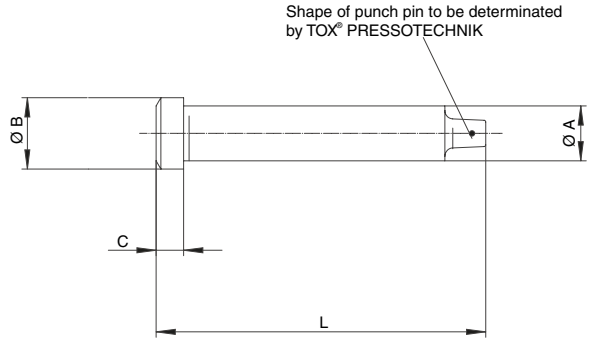
The TOX®-Round Joint is available in diameters 1.5 mm, 2 mm, 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 10 mm, 12 mm, 14 mm, 16 mm, 18 mm up to 26 mm. The TOX®-SKB flanged die comes with joint diameters of 5 mm, 6 mm, 8 mm and 10 mm.

The dimensions and shapes of TOX®-Clinching Tools are standardized, but can be adapted to the geometry of your components. By using flat die plates, installation is possible in the smallest spaces. All tools can perform single and multiple points.

The fine adjustment serves to adapt the TOX®-Clinching Tools to the required applications and loads. For example, reduced press force, greater shear or tensile forces.

Technical data and order numbers

TOX®-Flanged Punch

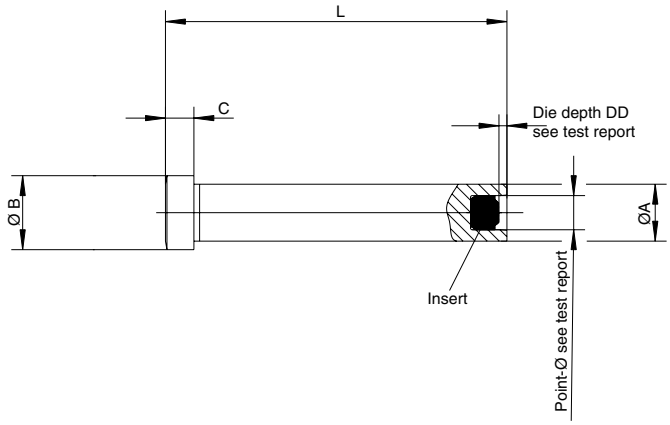


Order number	L	Location hole + 0.018 + 0 Ø A	Ø B	C	for TOX®-Point Ø mm	Press force kN per point according TOX®-Test Report
TOX® 03.140	40	3	6	3	1.5, 2	n. s.
TOX® 10.25	60	10	13	5	3 - 12	<70
TOX® 14.25	60	14	17	5	6 - 12	>70

Dimensions in mm

Special lengths of L = 30, 40, 50, 80 and 100 mm are available for the punch and die.

TOX®-Round Joint flanged die (solid die cavity)



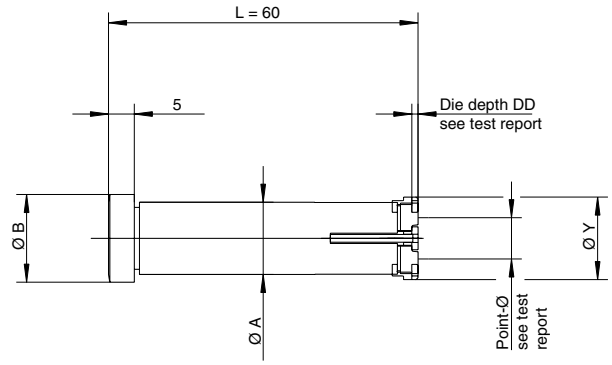
Order number	L	Location hole +0,018 +0 Ø A	Ø B	C	for TOX®-Point Ø mm
TOX® 04.130	30	4	6	3	1.5, 2
TOX® 10.25	60	10	13	5	3, 4, 5, (6)*
TOX® 14.25	60	14	17	5	6, 8
TOX® 16.25	60	16	19	5	10
TOX® 20.25	60	20	23	5	12

* only after consulting TOX® PRESSOTECHNIK.

Dimensions in mm

Die with insert features an integrated oil drainage system.

TOX®-SKB flanged die



Order number	Location hole +0,018 +0 Ø A	Ø B	for TOX®-Point Ø mm	Y**
SKB 10.25	10	13	6.0 - 7.0	14.0
SKB 14.25	14	17	6.0 - 7.0 8.0 - 9.0	14.0 16.0
SKB 16.25*	16	19	8.0 - 10.0	17.5

* Joining with intermediate layer (e. g. glue/textiles ..)
** = with max. opened die

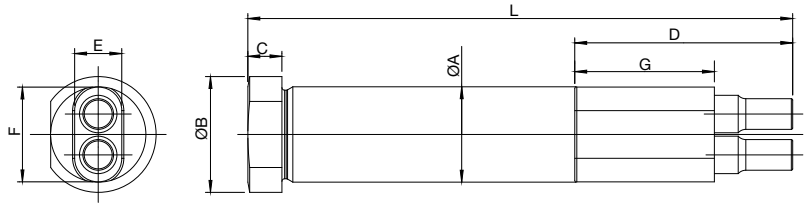
Dimensions in mm

TOX®-Clinching Tools
Flanged Tools

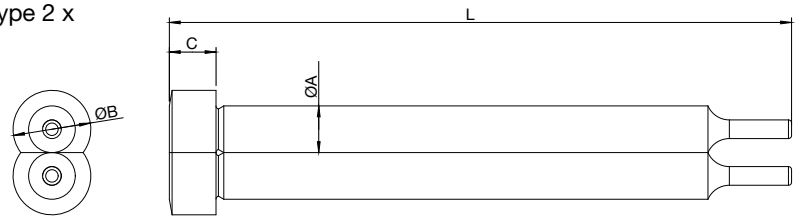
TOX®-TWINpoint flanged punch

Order number	L	Location hole +0,018 +0 Ø A	Ø B	C	D	E	F	G	for TOX®-Point Ø mm
2 x TOX® 03.141	40	3	5	3	–	–	–	–	3
TOX® 210.180	80	10	13	5	28	6	10	14.5	4
TOX® 214.180	80	14	17	5	28	7	12	14.5	5
TOX® 214.180	80	14	17	5	32	8	14	20.5	6
TOX® 218.200	100	18	21	5	32	10	18	20.5	8
2 x TOX® 10.205	100	10	13	5	–	–	–	–	10

Type TOX® 210, 214, 218

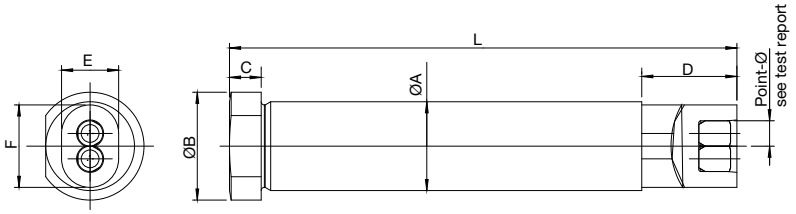


Type 2 x



TOX®-TWINpoint flanged die

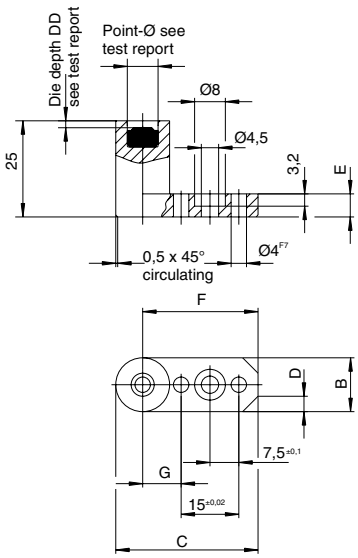
Order number	L	Location hole +0,018 +0 Ø A	Ø B	C	D	E	F	for TOX®-Point Ø mm
TOX® 210.160	60	10	13	5	15	7	10	3
TOX® 214.180	80	14	17	5	15	9	13	4
TOX® 216.180	80	16	19	5	20	10	15	5
TOX® 218.180	80	18	21	5	20	12	18	6
TOX® 222.200	100	22	25	5	20	14	22	8
TOX® 226.220	120	26	29	5	20	16	26	10



TOX®-Die, offset

The offset die is particularly useful where access to the component is difficult, e. g. C- and U-shaped sections, blanks with 90° offset, etc. Single tools, quick and easy to replace. Can be used for single and multiple points. Special shapes are possible on request.

TOX®-Round Joint Die, offset (solid die cavity)



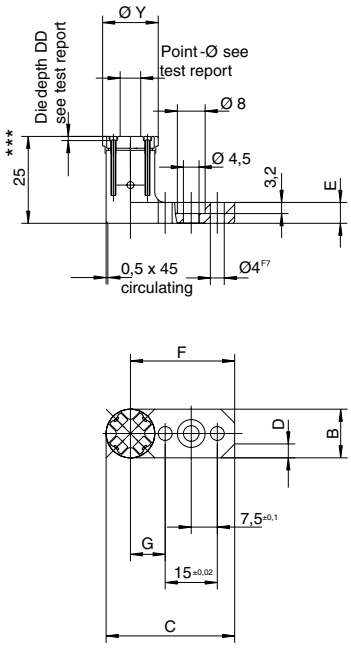
Order number	B	C	D	E	F±0.02	G±0.02	H±0.02	for TOX®-Point Ø mm
TOX® 50.25	10	35	3x45°	6	30	10	25	3, 4, 5, (6)*
TOX® 51.25	14	37	4x45°	6	30	10	25	6, 8
TOX® 53.25	16	38	4.5x45°	10	30	10	25	10
TOX® 54.25	20	45	4.5x45°	10	35	15	25	12

* only after consulting TOX® PRESSOTECHNIK

Dimensions in mm

Die with insert features an integrated oil drainage system.

TOX®-SKB Die, offset



Order number	B	C	D	E	F±0.02	G±0.02	H±0.02	for TOX®-Point Ø mm	Y**
SKB 50.25	10	35	3x45°	6	30	10	25	6.0 - 7.0	14.0
SKB 51.25	14	37	4x45°	6	30	10	25	6.0 - 7.0 8.0 - 9.0	14.0 16.0
SKB 53.25*	16	38	4.5x45°	10	30	10	25	8.0 - 10.0	17.5

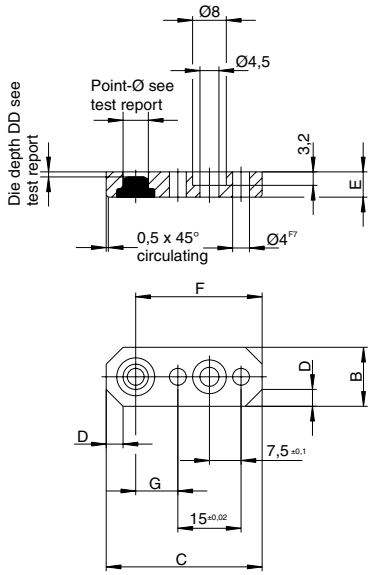
* joining with intermediate layer (e.g. glue/textiles)
** = with max. opened die
*** minimum dimension 16 mm, deliverable upon request

Dimensions in mm

TOX®-Flat die plate
Installation options of flat and offset dies

The flat die plate reaches into almost every corner of the component, allows for smaller flanges and extremely compact design. Single tool, quick and easy to replace. Tools can be used for single or multi-point applications.

TOX®-Round Joint Flat die (solid die cavity)



Order number Part 1 = design	B	C	D	E	F±0.02	G±0.02	H±0.02	for TOX®-Point Ø mm
TOX® 40.25	10	35	3x45°	6	30	10	25	3, 4, 5, (6)*
TOX® 41.25	14	37	4x45°	6	30	10	25	6, 8
TOX® 43.25	16	38	4.5x45°	10	30	10	25	10
TOX® 44.25	20	45	4.5x45°	10	35	15	30	12

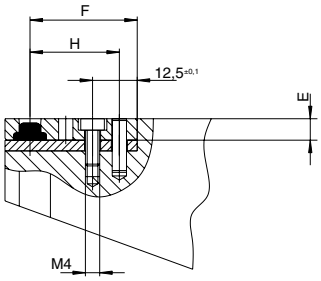
* only after consulting TOX® PRESSOTECHNIK

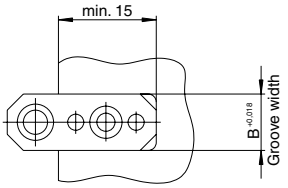
Dimensions in mm

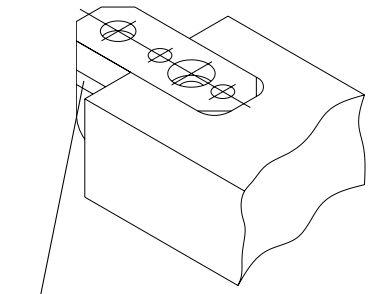
Die with insert features an integrated oil drainage system.

The installation options shown here are applicable for both, flat dies and offset dies.

Installation with groove

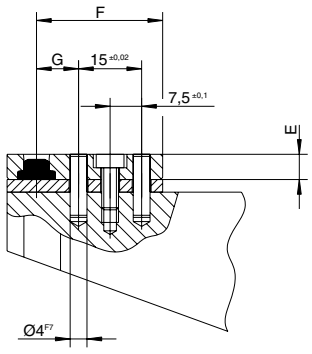


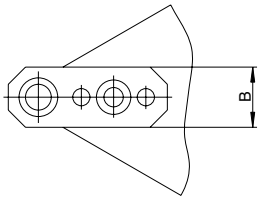


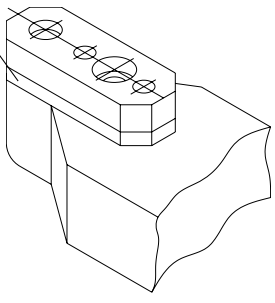


Pressure plate

Installation with dowel pin





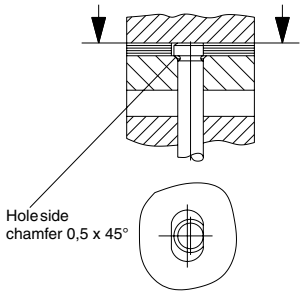


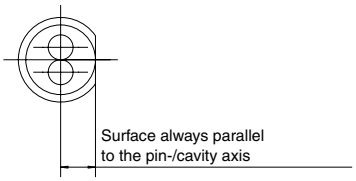
The die should always be supported by a pressure plate or hardened shim plate.

Attention: Observe installation guidelines and TOX®-Test Report

TOX®-Clinching Tools
Special shapes

Protection against rotation





TOX®-Flanged Tools
Optional: Proctection against rotation by a surface at the flange. Allows closely spaced points and small flanges. The surfaces can be ground subsequently.

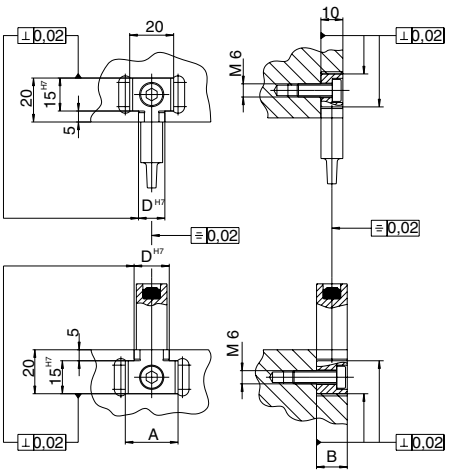
TOX®-TWINpoint
When using the TOX®-TWINpoint, punch and die always need an anti-rotation fixture. Here the surface at the flange is available by default. Attention must be paid to the continuity of the anti-rotation fixture. Suitable strippers see page 12 and 13.

TOX®-Side mount tools

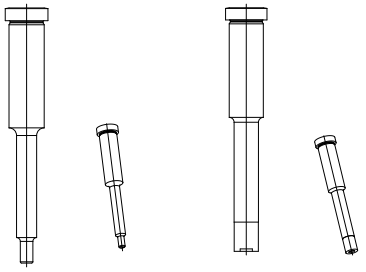
Side mount tools can be used as single or mulitple point solutions. They are availabel for TOX®-Round Joints with diameters 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 10 mm and 12 mm. The dies of the side mount tools are also equipped with the proven insert with oil drainage system.

Advantages:
+ space-saving mounting
+ quicker and easier tool change
+ tools can be exchanged individually

Exact dimensions can be obtained on demand. The dimension A, B, D etc. are dependent on the point diameter.



Tapers

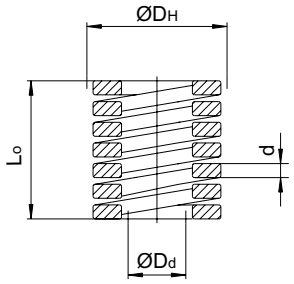


TOX®-Punch TOX®-Die

For components with small flange widths or for components which require a penetration of the tool, flanged tools with tapered flange can be used. Please contact TOX® PRESSOTECHNIK.

Accessories
TOX®-Spring and Stripper

Special helical spring
Type: CZF



Ø D_H = Sleeve diameter
+0.2 mm tolerance

Ø D_d = Mandrel diameter
-0.2 mm tolerance

L_O = Free length

d = Wire diameter

Sn = Spring travel

F = Force

R = Rate of spring ± 10 % tolerance

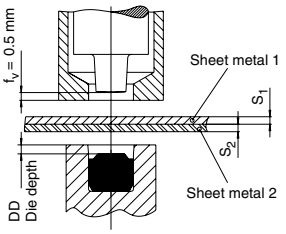
Special helical spring suitable for stripper type CSR and type CMR, ground to parallel and angular requirements.

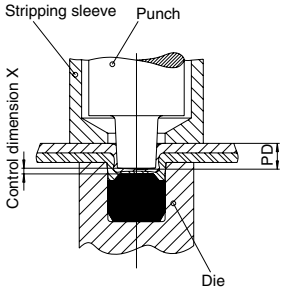
Type	Ø D_H (mm)	Ø D_d (mm)	L_O (mm)	d (mm)	Rate of spring R (N/mm)	Long lifetime 60 % Sn (mm)	F(N)	Average lifetime 80 % Sn (mm)	F (N)	Max. spring travel Sn (mm)	$F_{max.}$ (N)	Color
CZF 24	25	15.2	33	Ø4.1	93	6.3	586	8.4	781	10.5	977	-
CZF 22	25	12.5	31	3.3	110	6.7	737	9.0	990	11.2	1232	blue
CZF 23	25	12.5	31	4.3	275	5.8	1595	7.7	2118	9.6	2640	red
CZF 25	25	12.5	31	5.0	370	4.8	1776	6.4	2368	8.0	2960	yellow
CZF 30	32	16	37	4.2	170	8.0	1360	10.6	1802	13.3	2261	blue
CZF 31	32	16	37	5.4	350	6.8	2380	9.1	3185	11.4	3990	red
CZF 32	32	16	37	4.8	485	5.7	2765	7.6	3686	9.5	4608	yellow
CZF 36	40	20	49.5	4.9	170	10.7	1819	14.3	2434	17.9	3043	blue
CZF 37	40	20	49.5	6.2	325	9.2	2990	12.2	3965	15.3	4973	red
CZF 38	40	20	49.5	7.4	580	7.7	4466	10.2	5916	12.8	7424	yellow
CZF 49	50	25	62	6.1	195	13.4	2613	17.9	3491	22.4	4370	blue
CZF 50	50	25	62	7.8	385	11.5	4428	15.4	5929	19.2	7392	red
CZF 51	50	25	62	9.2	670	9.6	6432	12.8	8576	16.0	10720	yellow

Note:
To avoid any side forces on the TOX®-Tool, no standard die springs must be used.

Selection of spring and stripper

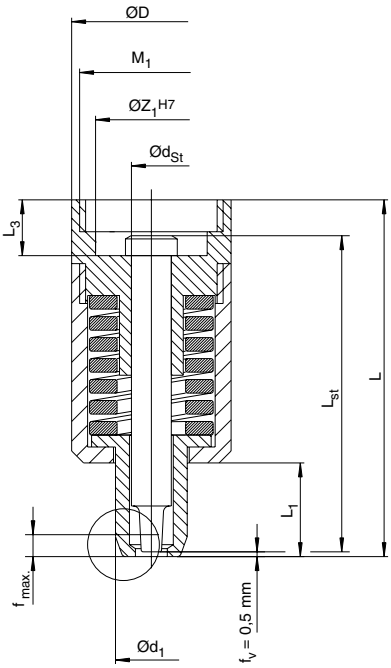
1. See stripping force indicated in the TOX®-Test Report.
2. The spring is preloaded in the stripper with F_V (see page 10 – 13).
3. When producing the point, the punch travel is PD = penetration depth. With this, the stripping force is increased by the spring rate R. With increasing spring travel, the lifetime of the spring is reduced (see spring table), $f_{max.}$ must not be exceeded.
4. Calculation of PD = penetration depth:
   PD = S_1 + S_2 + DD - X
   DD = Die depth from TOX®-Test Report.
   X = Control dimension from the TOX®-Test Report.

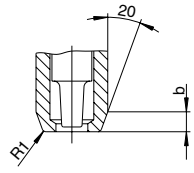




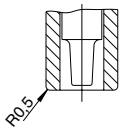
5. Calculation of the stripping force F of stripper:
   F = R · (PD + f_V) + F_V
   F_V = Preload force from table
   R = Rate of spring from table
6. Using materials with a tendency to excessive cold welding (e. g. aluminium), the punch stripping sleeve must tightly embrace the punch neck in order to avoid a drawing-up of the material during the stripping pocess.

TOX®-Punch Stripper, round





Standard shape



Special shape in exceptional cases
For point diameters >10 mm please consult TOX® PRESSOTECHNIK.
Other special shapes available on request.

Type: CSR
For TOX®-Flanged Punch for TOX®-Round Joint and TOX®-MICROpoint
For single and multi-point solutions, with punch holder installed directly on plate with holding flanges type CZE and CZW and for mounting to TOX®-Powerpackage with holding flange type CZP.
TOX®-Tool and spring can be exchanged separately.

L_{St} = Length of punch
d_{St} = Diameter of punch
F_V = Preload force
f_v = Punch recessed

By means of the length of the TOX®-Tools it is possible to vary the tool space L_1 and hence the interference contour.
F_{max} = max. stripping force and
f_{max} = max. spring travel depend on the used TOX®-Tool and on the TOX®-Test Report.

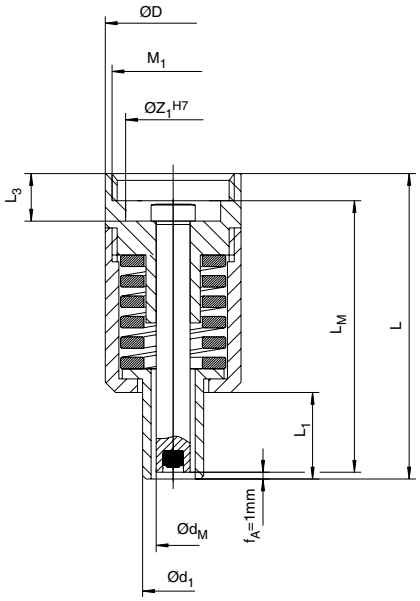
Type	L_{St}	d_{St}	F_V(N)	Rate of spring R (N/mm)	ØD	L	Ød_1	b	ØZ_1^{H7}	M_1	L_1	L_3	Spring type	Recommended die stripper
CSR 016.03.40	40	3	300	250	30	48	7	–	18	M20x1.5	13	10	SZ8590.016	
CSR 25.10.060	60	10	925	370	32	67,5	15	2,5	22	M24x1,5	11	12	CZF25	CMR 24...
CSR 25.10.080	80	10	925	370	32	87,5	15	2,5	22	M24x1,5	31	12	CZF25	CMR 24...
CSR 25.10.100	100	10	925	370	32	107,5	15	2,5	22	M24x1,5	51	12	CZF25	CMR 24...
CSR 32.10.080	80	10	970	485	40	88,5	18	5	28	M32x1,5	23,5	13	CZF32	CMR 24...
CSR 32.10.100	100	10	970	485	40	108,5	18	5	28	M32x1,5	43,5	13	CZF32	CMR 31...
CSR 38.10.080	80	10	2610	580	50	90,5	22	7	28	M42x1,5	12,5	15	CZF38	CMR 24.../31...
CSR 38.10.100	100	10	2610	580	50	110,5	22	7	28	M42x1,5	32,5	15	CZF38	CMR 32.../37...
CSR 51.10.100	100	10	4020	670	65	110,5	24	7	40	M56x1,5	19,5	15	CZF51	all CMR

Punch stripper with thread M24x1,5, for drives RZK, RZH, EPMR

Type	L_{St}	d_{St}	F_V(N)	Rate of spring R (N/mm)	ØD	L	Ød_1	b	ØZ_1^{H7}	M_1	L_1	L_3	Spring type	Recommended die stripper
CSR 025.10.060	60	10	925	370	32	75.5	18	2.5	22	M24x1.5	11	20.05	CZF25	CMR 024
CSR 025.10.080	80	10	925	370	32	95.5	18	2.5	22	M24x1.5	31	20.05	CZF25	CMR 024
CSR 025.10.100	100	10	925	370	32	110.5	18	2.5	22	M24x1.5	51	20.05	CZF25	CMR 024...
CSR 032.10.080	80	10	970	485	40	95.5	18	5	22	M24x1.5	23.5	20.05	CZF32	CMR 024/030
CSR 032.10.100	100	10	970	485	40	115.5	18	5	22	M24x1.5	43.5	20.05	CZF32	CMR 024/030
CSR 032.10.120	120	10	970	485	40	135.5	18	5	22	M24x1.5	63.5	20.05	CZF32	CMR 024/030
CSR 038.10.080	80	10	2610	580	50	95.5	22	7	22	M24x1.5	12.5	20.05	CZF38	CMR 030/031
CSR 038.10.100	100	10	2610	580	50	115.5	22	7	22	M24x1.5	32.5	20.05	CZF38	CMR 030/031
CSR.038.10.120	120	10	2610	580	50	135.5	22	7	22	M24x1.5	52.5	20.05	CZF38	CMR 030/031
CSR 051.10.100	100	10	4020	670	65	115.5	24	7	22	M24x1.5	19.5	20.05	CZF51	all CMR
CSR 051.10.120	120	10	4020	670	65	135.5	24	7	22	M24x1.5	39.5	20.05	CZF51	all CMR

Dimensions in mm

TOX®-Die Stripper, round



Type: CMR
For TOX®-Flanged Die for TOX®-Round Joint and TOX®-SKB
Die holder, for single and multi-point solution, with die holder installed directly on plate with holding flanges type CZE and CZW and for mounting to TOX®-Powerpackage with holding flange type CZP. TOX®-Tool and spring can be exchanged separately.

L_M = Length of die
d_M = Diameter of die
F_V = Preload force
F = Stripping force
f_A = Stripping travel

By means of the length of the TOX®-Tools it is possible to vary the tool space L_1 and hence the interference contour.

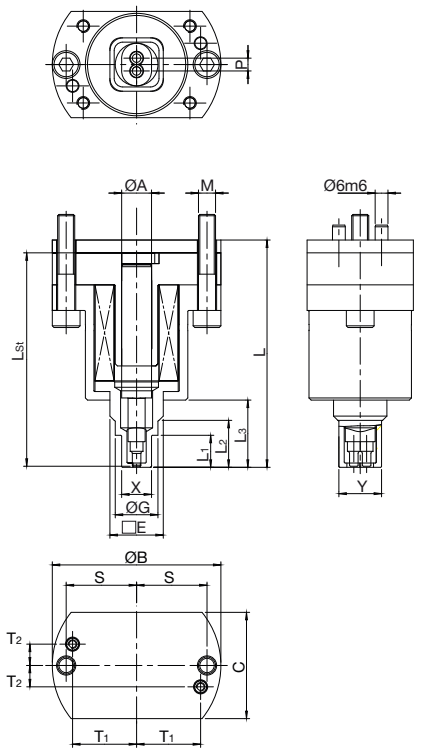
Type	L_M	d_M	F_V(N)	Rate of spring R (N/mm)	Ø D	L	Ø d_1	Ø Z_1^{H7}	M_1	L_1	L_3	Spring type
CMR 016.04.30	30	4	300	250	30	38	10	18	M20x1,5	3	10	SZ8590.016
CMR 24.14.060	60	14	900	95	32	68	19	22	M24x1,5	11,5	12	CZF24
CMR 24.14.080	80	14	900	95	32	88	19	22	M24x1,5	31,5	12	CZF24
CMR 24.14.100	100	14	900	95	32	108	19	22	M24x1,5	51,5	12	CZF24
CMR 25.10.060	60	10	2035	370	32	68	15	22	M24x1,5	11,5	12	CZF25
CMR 25.10.080	80	10	2035	370	32	88	15	22	M24x1,5	31,5	12	CZF25
CMR 25.10.100	100	10	2035	370	32	108	15	22	M24x1,5	51,5	12	CZF25
CMR 31.14.080	80	14	2275	350	40	89	18	28	M32x1,5	20	13	CZF31
CMR 31.14.100	100	14	2275	350	40	109	18	28	M32x1,5	40	13	CZF31
CMR 32.14.080	80	14	3150	485	40	89	18	28	M32x1,5	20	13	CZF32
CMR 32.14.100	100	14	3150	485	40	109	18	28	M32x1,5	40	13	CZF32
CMR 37.14.080	80	14	3410	325	50	91	22	28	M42x1,5	9	15	CZF37
CMR 37.14.100	100	14	3410	325	50	111	22	28	M42x1,5	29	15	CZF37
CMR 38.14.080	80	14	6090	580	50	91	22	28	M42x1,5	9	15	CZF38
CMR 38.14.100	100	14	6090	580	50	111	22	28	M42x1,5	29	15	CZF38

Die stripper with thread M24x1,5, for drives RZK, RZH, EPMR

Type	L_M	d_M	F_V(N)	Rate of spring R (N/mm)	Ø D	L	Ø d_1	Ø Z_1^{H7}	M_1	L_1	L_3	Spring type
CMR 024.14.060	60	14	900	95	32	76	19	22	M24x1.5	11.5	20.05	CZF24
CMR 024.14.080	80	14	900	95	32	96	19	22	M24x1.5	31.5	20.05	CZF24
CMR 025.10.060	60	10	2035	370	32	76	15	22	M24x1.5	11.5	20.05	CZF25
CMR 025.10.080	80	10	2035	370	32	96	15	22	M24x1.5	31.5	20.05	CZF25
CMR 031.14.080	80	14	2258	350	40	96	18	28	M24x1.5	24	20.05	CZF31
CMR 031.14.100	100	14	2258	350	40	116	18	28	M24x1.5	44	20.05	CZF31
CMR 032.14.080	80	14	3150	485	40	96	18	28	M24x1.5	24	20.05	CZF32
CMR 032.14.100	100	14	3150	485	40	116	18	28	M24x1.5	44	20.05	CZF32
CMR 037.14.080	80	14	3735	325	50	96	22	28	M24x1.5	13	20.05	CZF37
CMR 037.14.100	100	14	3735	325	50	116	22	28	M24x1.5	33	20.05	CZF37
CMR 038.14.080	80	14	6670	580	50	96	22	28	M24x1.5	13	20.05	CZF38
CMR 038.14.100	100	14	6670	580	50	116	22	28	M24x1.5	33	20.05	CZF38

Dimensions in mm

TOX®-Punch Stripper TWINpoint



Type: CSRT
For TOX®-TWINPoint Punch
For single and multi-point solution, with punch holder installed directly on plate.
TOX®-Tool and spring can be exchanged separately.

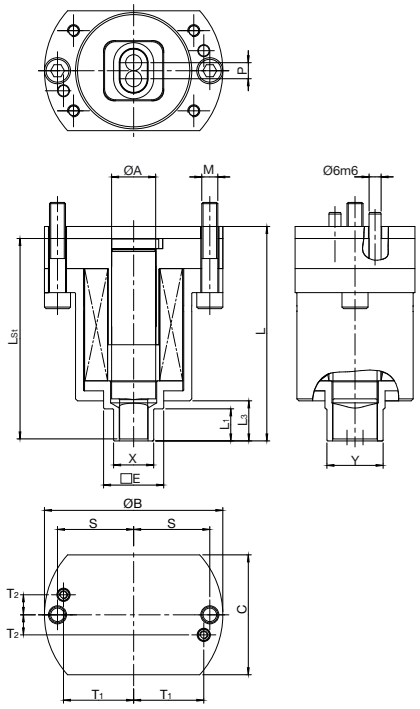
L_{St} = Length of punch
d_{St} = Diameter of punch
F_V = Preload force
f_v = Punch recessed

By means of the length of the TOX®-Tools it is possible to vary the tool space L_1 and hence the interference contour.
F_{max} = max. stripping force and
f_{max} = max. spring travel depend on the used TOX®-Tool and on the TOX®-Test Report.

Type	L_{St}	ØA	P	F_V(N)	Rate of spring R (N/mm)	ØB	C	L	M	X	Y	E	ØG	L_1	L_2	L_3	T_1	T_2	S	Point Ø
CSRT 32.10.04.080.035.00	80	10	4	970	485	71	42	86.5	M8	10	14	21		18		20.5	29	9	29	4
CSRT 32.10.04.100.035.00	100	10	4	970	485	71	42	107	M8	10	14	21	15	18	30	40.5	29	9	29	4
CSRT 32.10.04.120.035.00	120	10	4	970	485	71	42	127	M8	10	14	21	15	18	50	60.5	29	9	29	4
CSRT 38.14.06.080.065.00	80	14	6 (5)	2610	580	79	50	86.5	M8	14	20	25	–	8	–	10.5	30	10	33	6 (5)
CSRT 38.14.06.100.065.00	100	14	6 (5)	2610	580	79	50	107	M8	14	20	25	–	14	–	30.5	30	10	33	6 (5)
CSRT 38.14.06.120.065.00	120	14	6 (5)	2610	580	79	50	127	M8	14	20	25	–	14	–	50.5	30	10	33	6 (5)
CSRT 51.18.08.100.075.00	100	18	8	4020	670	89	60	107	M8	15	23	30	–	9	–	19.5	35	10	38	8
CSRT 51.18.08.120.075.00	120	18	8	4020	670	89	60	127	M8	15	23	30	–	19	–	39.5	35	10	38	8
CSRT 51.10.10.100.100.00	100	2 x 10	10	4020	670	89	60	107	M8	18	18	30	–	11	–	19.5	35	10	38	10
CSRT 51.10.10.120.100.00	120	2 x 10	10	4020	670	89	60	127	M8	18	28	30	–	31	–	39.5	35	10	38	10

Dimensions in mm

TOX®-Die Stripper TWINpoint



Type: CMRT
For TOX®-TWINpoint Flanged Dies
Die holder, for single and multi-point solution, with die holder installed directly on plate.
TOX®-Tool and spring can be exchanged separately.

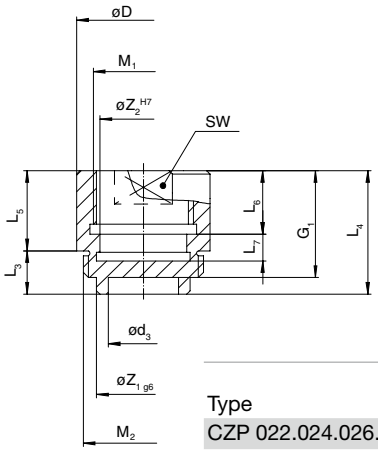
L_M = Length of die
d_{St} = Length of punch
F_V = Preload force
f_v = Punch recessed

By means of the length of the TOX®-Tools it is possible to vary the tool space L_1 and hence the interference contour.
F_{max} = max. stripping force and
f_{max} = max. spring travel depend on the used TOX®-Tool and on the TOX®-Test Report.

Type	L_M	ØA	P	F_V(N)	Rate of spring R (N/mm)	ØB	C	L	M	X	Y	□E	L_1	L_3	T_1	T_2	S	Point Ø
CMRT 31.14.04.080.00	80	14	4	1400	350	71	42	87	M8	14	18	21	12	21	29	9	29	4
CMRT 37.18.06.080.00	80	18	6	1788	325	79	50	87	M8	18	24	25	10	11	30	10	33	6 (5)
CMRT 50.22.08.100.00	100	22	8	2310	385	89	60	107	M8	20	28	30	16	20	30	10	38	8
CMRT 62.26.10.120.00	120	26	10	3150	630	102	73	127	M8	22	32	34	15	27	35	15	44.5	10

Dimensions in mm

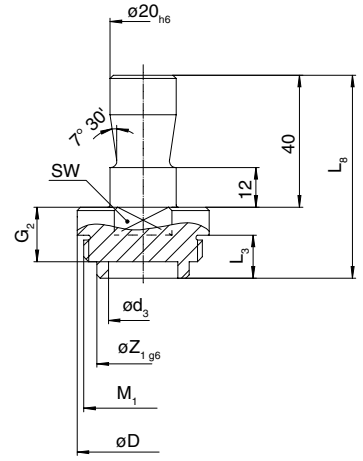
TOX®-Holding Flange



Type: CZP
Holding flange (hardened and ground) for stripper type CSR and CMR, for screwing onto TOX®-Powerpackage working piston.

Type	Previous type	ØD-0,2	L3	L4	L5	L6	L7	M1	M2	Z1 g6	ØZ2 H7	Ød3	G1	SW	Power-package
CZP 022.024.026.000	CZP 25.01	31.8	12	38	26	14	7	M22x2	M24x1.5	22	18	18	33	27	S/K 4
CZP 030.024.032.001	CZP 25.02	39.8	12	44	32	19	8	M30x2	M24x1.5	22	26	18	39	36	S/K 8-15
CZP 022.032.023.000	CZP 32.01	39.8	13	36	23	14	7	M22x2	M32x1.5	28	18	21	31	36	S/K 4
CZP 030.032.032.000	CZP 32.02	39.8	13	45	32	19	8	M30x2	M32x1.5	28	26	21	40	36	S/K 8-15
CZP 030.042.027.000	CZP 38.00	49.8	15	42	27	19	8	M30x2	M42x1.5	28	26	21	37	46	S/K 8-15
CZP 030.056.029.000	CZP 51.00	64.8	15	44	29	19	8	M30x2	M56x1.5	40	26	25	39	60	S/K 8-15

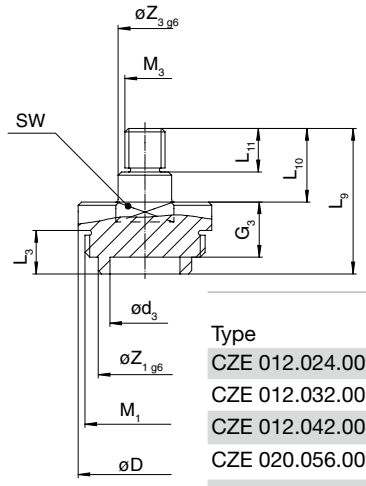
Dimensions in mm



Type: CZW
Holding flange (hardened and ground) for stripper type CSR and CMR, adaptable on plate side.

Type	Previous type	L3	L8	ØD-0,2	M1	Z1 g6	Ød3	G2	SW
CZW 020.024.008.000	CZW 25.00	12	60.5	31.8	M24x1.5	22	18	15.5	27
CZW 020.032.008.000	CZW 32.00	13	61.5	39.8	M32x1.5	28	21	16.5	36
CZW 020.042.008.000	CZW 38.00	15	63.5	49.8	M42x1.5	28	21	18.5	46
CZW 020.056.009.000	CZW 51.00	15	64.5	64.8	M56x1.5	40	25	19.5	60
CZW 020.024.009.000		19	67.5	32	M24x1.5	22	17.3	23.5	30

Dimensions in mm



Type: CZE
Holding flange (hardened and ground) for stripper type CSR and CMR, for screwing into plate.

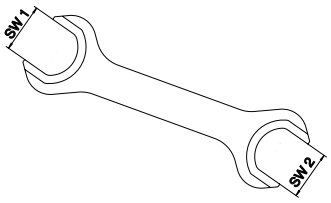
Type	Previous type	ØD-0,2	L3	L9	L10	L11	M1	M3	Z1 g6	ØZ3 g6	Ød3	G3	SW
CZE 012.024.009.000	CZE 25.00	31.8	12	43.0	22	13	M24x1.5	M12x1.5	22	16	18	16.0	27
CZE 012.032.008.000	CZE 32.00	39.8	13	43.5	22	13	M32x1.5	M12x1.5	28	16	21	16.5	36
CZE 012.042.008.000	CZE 38.00	49.8	15	45.5	22	15	M42x1.5	M12x1.5	28	16	21	18.5	46
CZE 020.056.009.000	CZE 51.00	64.8	15	49.5	22	15	M56x1.5	M20x1.5	40	24	25	19.5	60
CZE 012.024.012.001		39.8	19	53.0	22	13	M24x1.5	M12x1.5	22	16	17.5	27.0	36

Dimensions in mm

Assembly tools

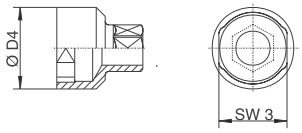
Open end wrench CZG

Special tool for changing TOX®-Tools, TOX®-Coil Springs and holding flanges.



Type	SW 1	SW 2	appropriate for
CZG 27-30.00	27	30	CZP / CZW / CZE 25 CSR / CMR 25 / CMR 24
CZG 36-38.00	36	38	CZP / CZW / CZE 32 CSR / CMR 32 / CMR 31
CZG 46-60.00	46	60	CSR / CMR / CZP / CZW / CZE 38 / CMR 37 CSR / CMR / CZP / CZW / CZE 51

Special hexagon socket CZN



Type	SW 3	Ø D4	appropriate for	
CZN 25	30	36.5	CSR / CMR 25	CMR 24
CZN 32	38	45.5	CSR / CMR 32	CMR 31
CZN 38	46	55.5	CSR / CMR 38	CMR 37
CZN 51	60	69.5	CSR 51	

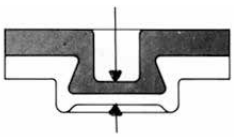
TOX®-Measuring Equipment

Measuring Gauges

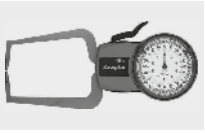
These gauges serve to measure the control dimension X, i. e. the residual bottom thickness of the TOX®-Joints or the TOX®-ClinchRivet joint. Three analogue and digital gauges are available. Special versions e. g. with longer jaws can be supplied.

Control dimension X

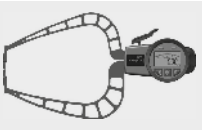
Punch side
Die side



CMT 38 analogue


CMT 85 analogue

CMT 35 digital


CMT 167 digital

	Analogue Display			Digital Display		
Type	CMT 38	CMT 85	CMT 167 A	CMT 35	CMT 116	CMT 167 D
Measuring range	0 – 10	0 – 20	0 – 50	0 – 10	0 – 30	0 – 50
Scale graduation / Graduations	0.1	0.01	0.05	0.005	0.02	0.02
Usable jaw length	38	85	167	35	116	167

Dimensions in mm

Measuring device CMT 001.000.00

The measuring device CMT 001 permits, in combination with an elongation compensating TOX®-Process Monitoring System CEP or a TOX®-ElectricDrive servo drive, the highest measuring accuracy at a moderate handling effort. The measured data are fully filed. In order to maintain this precision, the CEP or the electric drive have to be calibrated by using the CMT device. A tolerance of just ± 0,01 mm will be achieved.

TOX®-Spray Equipment
Type SP 02

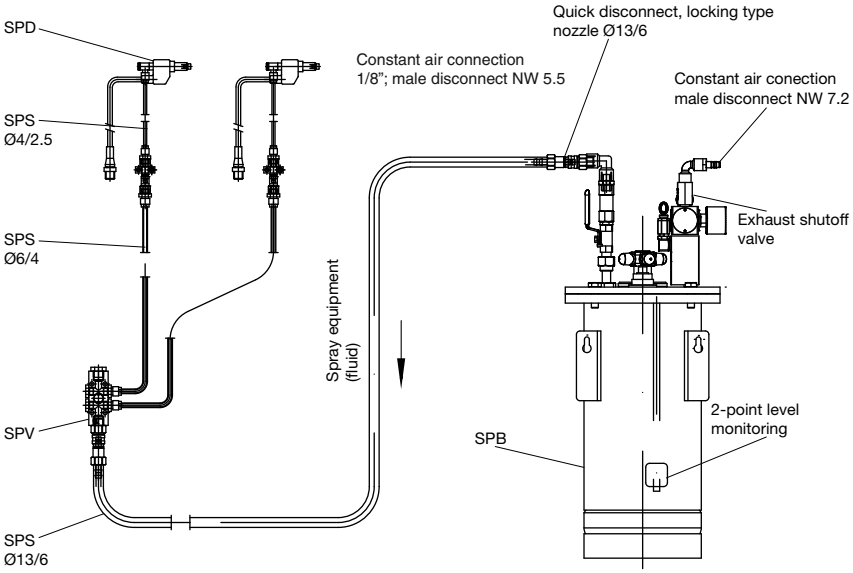
This spray equipment has been specially developed to lubricate the sheet metal surface or the TOX®-Tools just before the joining process, in order to reduce the pressing and stripping forces for the TOX®-Tools and by changing the lubrication condition to increase the formability of the materials by changing the lubricating conditions.

Several valves can be connected in parallel to a central pressurized reservoir which dispenses spray media to the nozzles. Spray heads for various applications can be used with this system. The application flexibility is provided by the modular design of the TOX®-Spray Equipment.

The system can be easily expanded depending on requirement changes in complex installations.

The acceptable spray media, with maximum viscosity of 22 mm²/sec, will be optimized with the TOX®-Test for the particular application.

Attention:
If non-volatile spray media is used, then media residues can remain on the sheet metal surface.



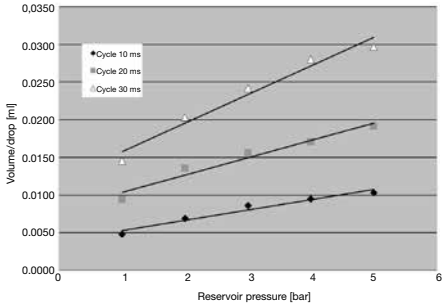
Function of complete system
The reservoir is charged with compressed air at approximately 2 bar pressure. By using as many manifolds as desired, an individual nozzle or groups of nozzles can be connected with hoses.

Minimum flow rates for the spray equipment at a reservoir pressure of 2 bar and 10 msec cycle time:

Viscosity e. g. (mm²/s)	Flow Rate (ml)
1	0.0075
2.5	0.008
22	0.009

Each spray nozzle has an integrated valve, which can be controlled individually. The complete system is compact and simple.

Flow rate diagram:
Spray medium: water, T = 18° C



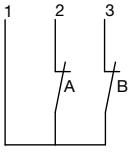
Reservoir type SPB:
Reservoir volume 6 l;
max. air pressure 6 bar
- Pressure regulator
- Pressure gauge
- Safety relief valve
- Dirt filter
- Quick exhaust
- Pressure relief valve
- Filling hopper
- 2-point level monitor

Ordering number
SPB 06.02.02.20

Technical data level monitor:
2 potential free NC contacts

Operating voltage:	24 V DC
Operating current:	150 mA
Protection class:	IP65

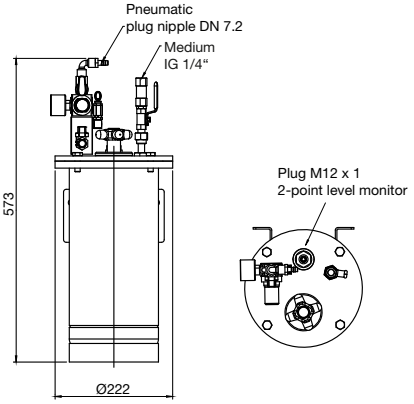
Connection of 2-point level monitor



Plug M12 x 1
4-pole

Switching state for filled reservoir. If the medium level is falling, the contacts are opened.

A = approx. 30 % filling level
B = approx. 10 % filling level

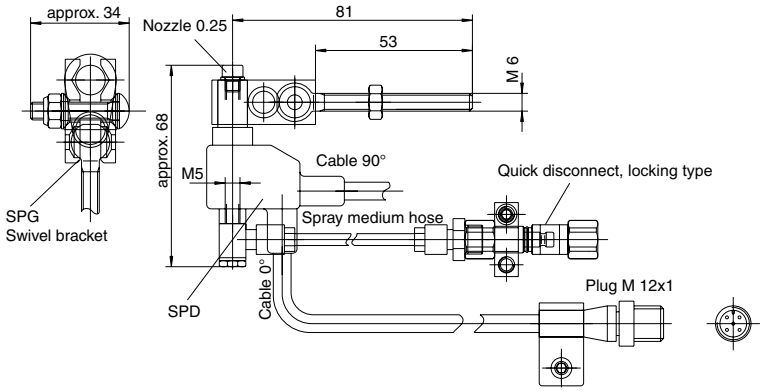


TOX®-Spray Equipment
Type SP 02

Spray head type SPD, complete:
- main body with integrated valve
- spraying distance of up to 300 mm
- includes 1000 mm cable with M12 x 1 plug
- includes 1000 mm spray medium hose

- version 00 and 01 cable connection 0°
- 00 includes quick disconnect and fittings
- 01 without quick disconnect and fittings

- version 03 and 04 cable connection 90°
- 03 includes quick disconnect and fittings
- 04 without quick disconnect and fittings



Ordering example
SPD 02.00
- Version
- Electric connection M12 x 1 plug
- Type: spray head

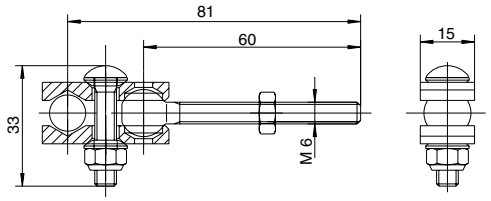
Technical data spray valve:

Voltage:	24 V DC
Power:	5 Watt
Connection:	M12 plug 5-pole
	+ 24 V PIN 4
	0 V PIN 3

Swivel bracket type SPG:
- clamp spray head
- connecting threads M6

Flexible mounting for the spray head. Allows for accurate positioning of spray equipment.

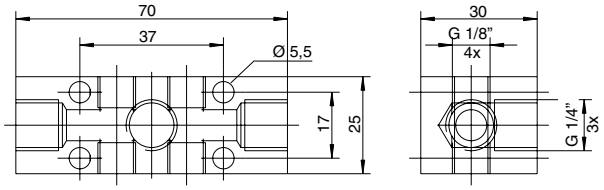
Order number
SPG 01.00



Spray manifold type SPV:
- manifold for spray heads

Depending on number of spray heads and application.

Order number
SPV 04.00



The hoses and fittings for the spray system installation are individually defined in the bill of materials for the schematic diagram.

Hose types SPS in use:

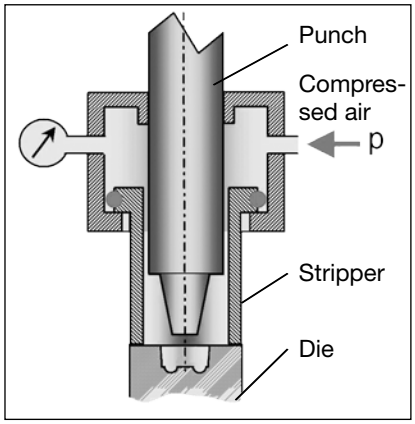
SPS Ø 13/6:	spray media compatible and abrasion resistant
SPS Ø 6/4:	spray media compatible
SPS Ø 4/2.5:	spray media compatible

TOX®-ToolCheck
Pneumatic testing of clinching dies

The die monitoring system TOX®-ToolCheck, together with the process monitoring, checks the condition of the TOX®-Clinching Dies. This ensures that the joining process is always performed with an intact die. Any potential defects (like missing or e.g. by contamination jammed moving elements of the SKB die, as well as ruptures on either the solid TOX®-Die or on the fixed segments of SKB) are identified within < 1 second.

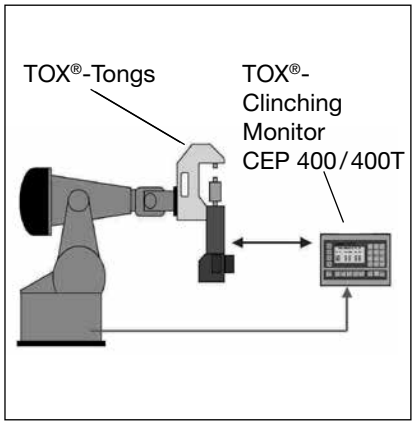
Optimum production reliability
- a cost effective, robust and compact system with a control quality which was previously not possible
- already the first defective part can be identified
- in contrast to trend monitoring, a conclusion can be reached after only one measurement

Optimum productivity
- maximum tool life usage, since a preventive die change is no longer required

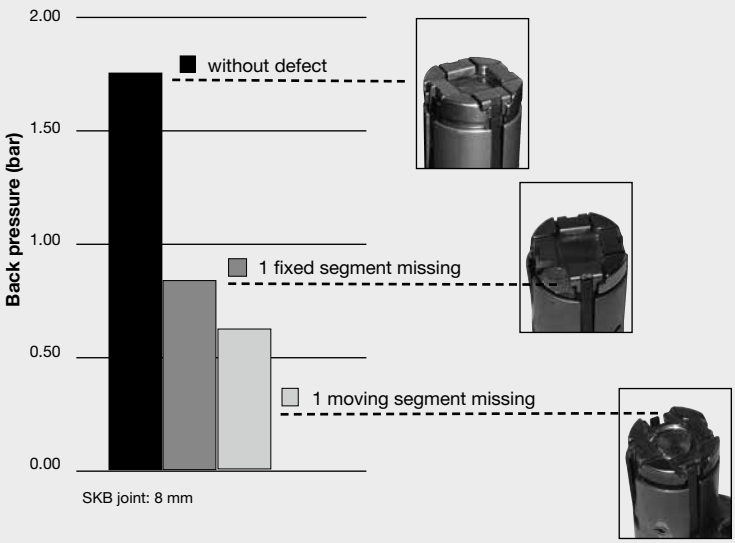


Functional principle
Every clinching die has a flow resistance characteristic dependent on its geometry when a jet of compressed air is applied. A defect in the die reduces this flow resistance and thus the back pressure of the air jet. An error signal is generated when a defined back pressure value is not reached. The system's robustness results from the significant drop of the back pressure in the defective die (as shown in the diagrams below).

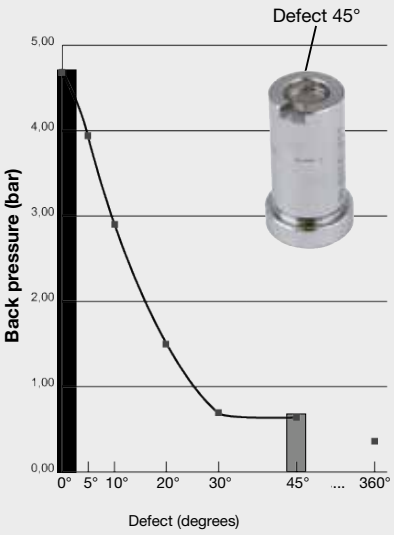
Evaluation
Any changes in back pressure can be detected reliably by the die check TOX®-ToolCheck. The evaluation of the measured value is performed by the robot control system, the PLC or ideally by the TOX®-Clinching Monitor CEP 400/400T.
If the CEP is used for process control, the robot only reports its positon to the CEP. The complete tongs control is carried out by the TOX®-Clinching Monitor.



TOX®-SKB Die
Influence of defects on back pressure



TOX®-Solid Die
Back pressure for various defects

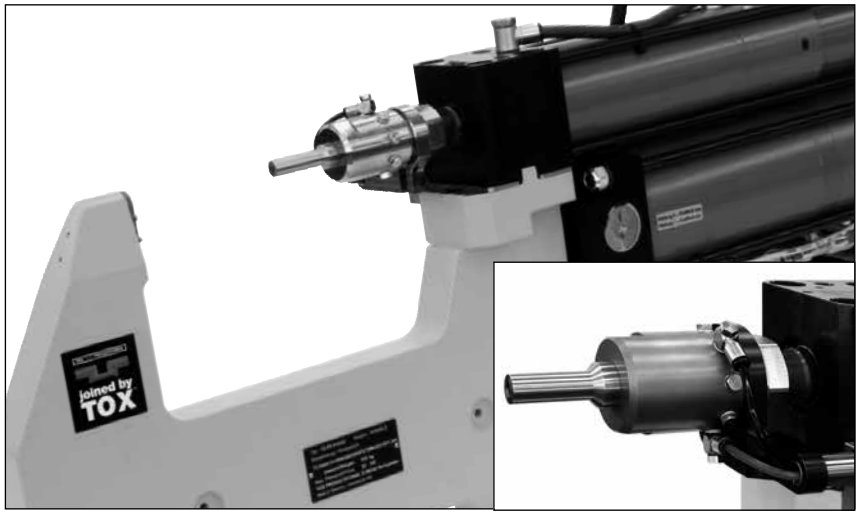


TOX®-ToolCheck
Mobile or stationary

Mobile die check type ZCM

Application
Everywhere where TOX®-Standard Stripper can be used: at mobile or stationary C-bows, handheld or robot tongs, presses in single- or multi-point-tooling, with pneumohydraulic, hydraulic or electric drive.

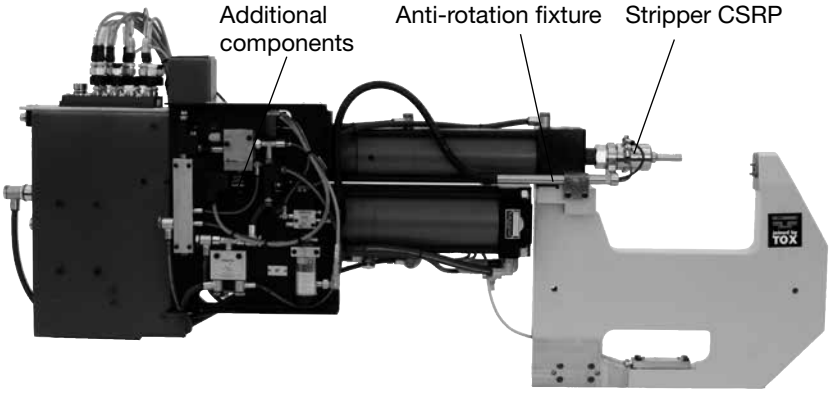
Function
The monitoring system is integrated in the TOX®-Stripper CSRP, which is moved onto the die during the control cycle, then it is pressurized with air. The back pressure in the stripper is measured, and this value is checked in the tongs control, in the TOX®-Clinching Monitor CEP 400/400T, the TOX®-ElectricDrive Controller or in the PLC of the assembly line. The controls receive a signal corresponding to the condition of the die.



Control system ZCM on TOX®-Tongs

Ordering description: ZCM
Each die check type ZCM includes the anti-rotation fixture, additional components and the stripper required for the used application.

Advantages
+ compact, integrated in the assembly
+ measuring cycle < 1 s possible for tongs applications
+ can be retrofitted



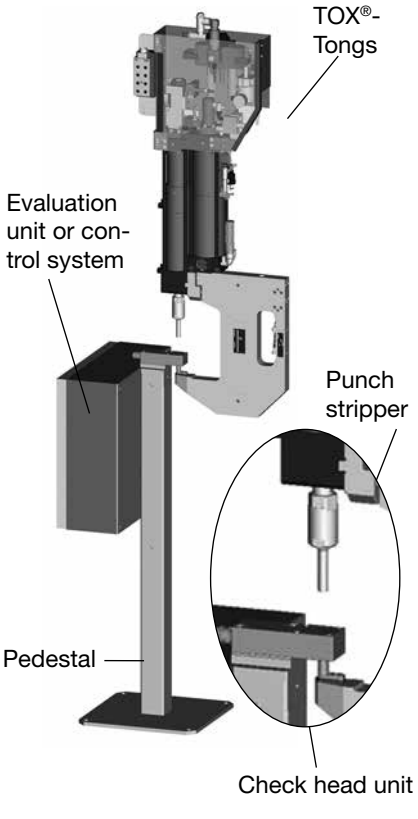
Stationary die check type ZCT

Function
The die check ZCT is installed within the robot range. The robot moves the TOX®-Tongs to the TOX®-ToolCheck and positions the die at the check head. The die is pressurized with the air, and the back pressure is processed by the evaluation unit or the integrated controls. The resulting signal is given to the higher level control system.

Advantages
+ several tools can be checked by one centralized check station
+ minimizes any interference with the work-piece in the tool area of the tongs

Ordering description: ZCT

Each die check type ZCT includes the pedestal, evaluation unit or integrated control system and the check head unit.

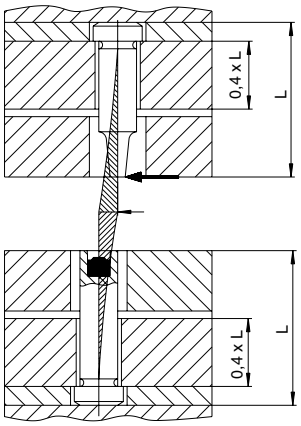


Stationary check system ZCT

Installation and design guidelines TOX®-Clinch Tools

Tolerances
Please observe the tolerances and exact fixing when installing the TOX®-Tools (see pages 4 – 7 and 23). The tolerances of the TOX®-Tools are designed to ensure secure fixing.

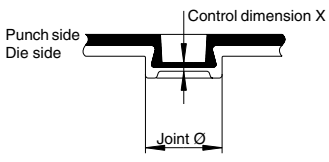
Important: The stripper must not touch the TOX®-Tools, otherwise there is a risk of tool breakage due to side forces. It is essential that the alignment tolerance should be maintained between the punch and die (see method of installation page 23).



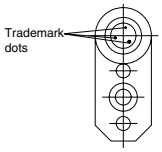
These tolerances ensure the flexible bearing which is so important for the TOX®-Process.

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 must be performed using a measuring gauge, e.g. type CMT (see page 15), centered between the trademark dots on the die side.



The control dimension X is contained in the TOX®-Test Report and has a tolerance of ± 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 of 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 control dimension X.

Process monitoring:
Continuous monitoring can be achieved using our electronic process monitoring system.

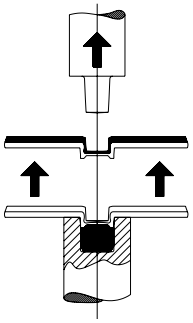
Operational monitoring
If the press force is too low, no joint will be formed, but if it is too high, this can lead to breakage of the tool. The TOX®-Powerpackage provides an optimal monitoring facility for ensuring the right pressing force. When the set pressing force is reached, the return stroke is initiated via an impulse from an oil high-pressure switch. If the press 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 press 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®-ElectricDrive catalog).

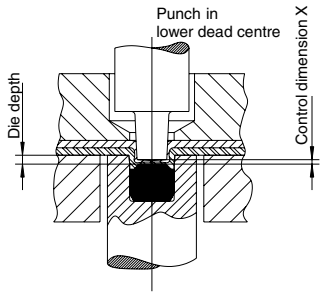
Operating safety precautions:
Tools must not be closed without material. Without material, the sur-face pressure at the tool is too high and leads to deformation or tool damage. This can be easily avoided by setting stroke limiters. They should basically be applied so that the control dimension X is obtained when the tool with sheet metal is closed.

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 of the TOX®-Point.

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.



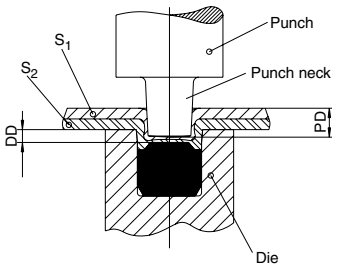
Installation and design guidelines TOX®-Round Joint tools



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 TOX®-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 TOX®-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 must 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).

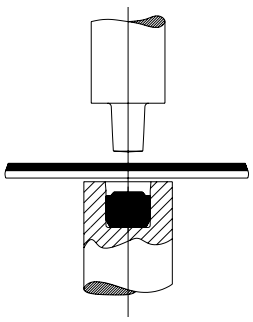


Calculation of PD = penetration depth
$PD = S_1 + S_2 + DD - X$

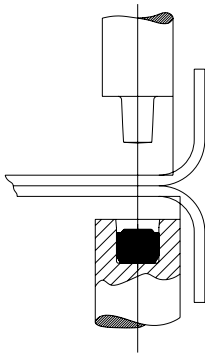
S_1 = Thickness of material punch side
S_2 = Thickness of material die side
DD = Die depth
X = Control dimension X

See TOX®-Test Report

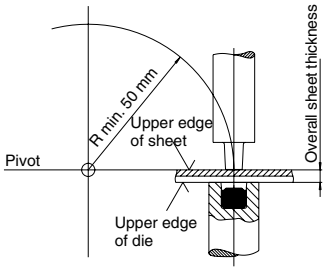
Oil drainage system
All the die forms with insert feature an oil drainage system. This system is necessary for very oily sheet metal and when using spray equipment.



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.

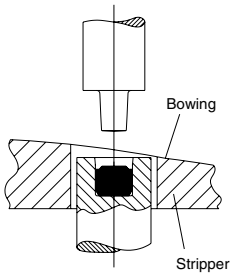


Equipment with circular tool movement, e. g. TOX®-PowerKurver. Punch should be placed vertically on the sheet. This ensures similar durability to those of a linear tool feed.



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 ensoure optimum joining by the TOX®-Tool. Please contact TOX® PRESSOTECHNIK.



Points executed during the life of TOX®-Round Joint Tools:

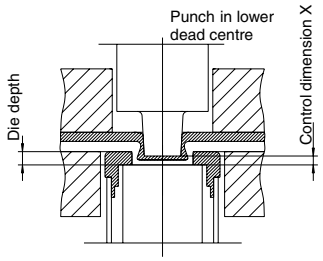
With qualified mechanical realization and observance of our mounting instructions and test report data, the following **quantities of points and more can be expected during the life of each tool set:**
DC01: 100 000 – 400 000 joining points
H340LAD: 100 000 – 350 000 joining points
Aluminium: 100 000 – 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 design guidelines TOX®-SKB Die

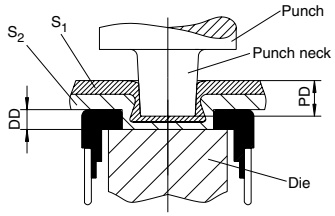
The installation and design guidelines for TOX®-SKB Dies are not much different than those for the TOX®-Round Joint process (see pages 20 and 21). The following guidelines apply exclusively to the SKB die:



Attention:
The rejoining of an already made point, can cause the destruction of the TOX®-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 TOX®-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 stripping distance on the punch side must be ≥ the penetration depth (PD) of the punch neck.



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

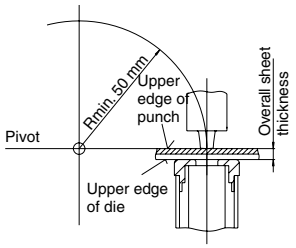
See TOX®-Test Report

With drawing 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 TOX®-Test Report, and the load area according to the tool shank diameter or bearing surface.
Pressure load = 350 N / mm²
(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:**
DC01: 200 000 – 400 000 joining points
H340LAD: 200 000 – 350 000 joining points
Aluminium: 200 000 – 350 000 joining points

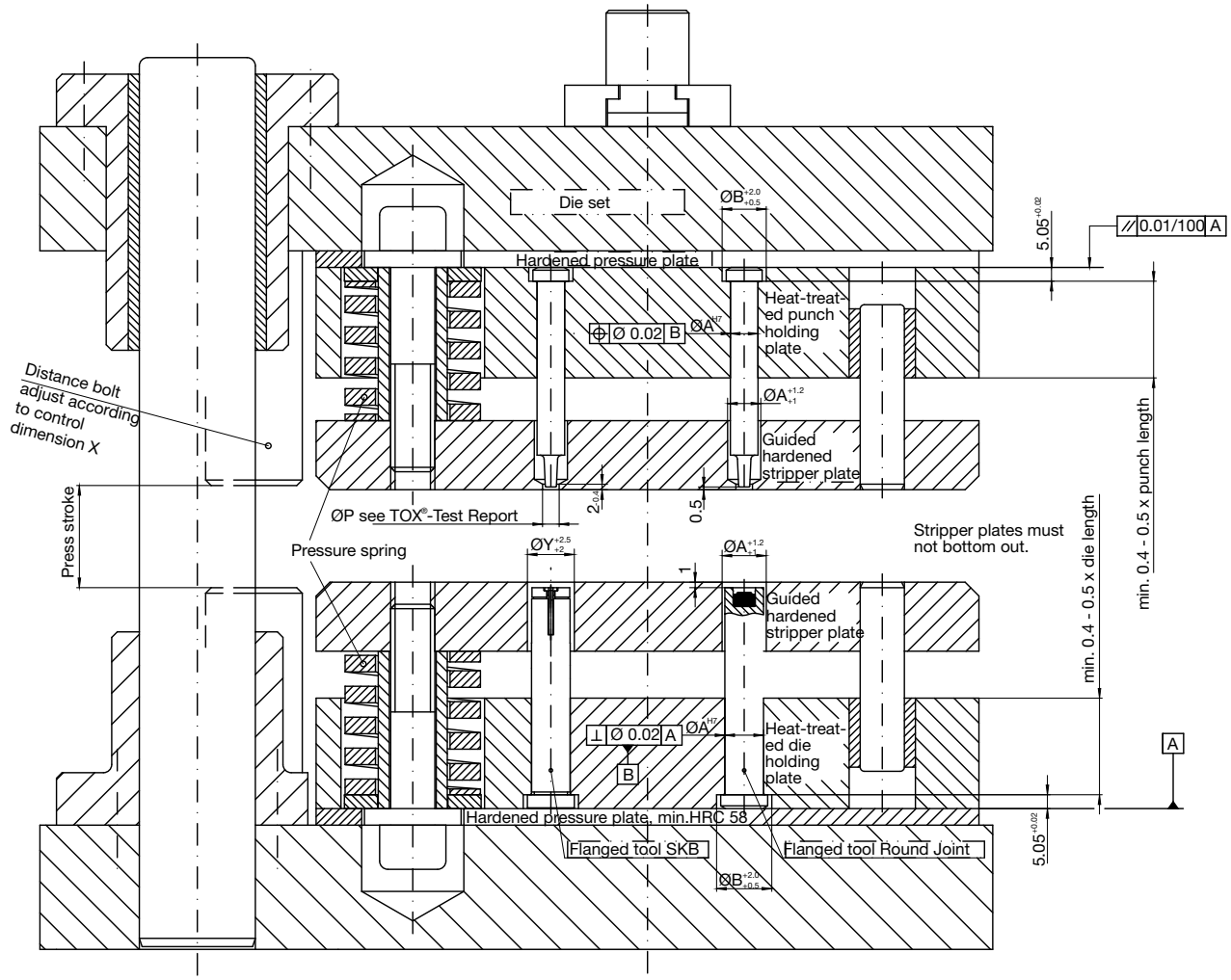
Punch and die changes are necessary in case of:
- tool rupture
- continuous reduction of the strength values
- tool wear

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

Installation in column-mounted tools

Please take into consideration ØY for SKB dies compared to the TOX®-Round Joint tools with solid die (see pages 4, 6.

Attention: Observe installation guidelines and TOX®-Test Report (see pages 20 – 28)

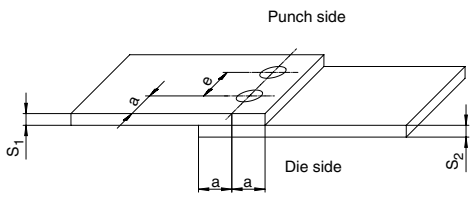


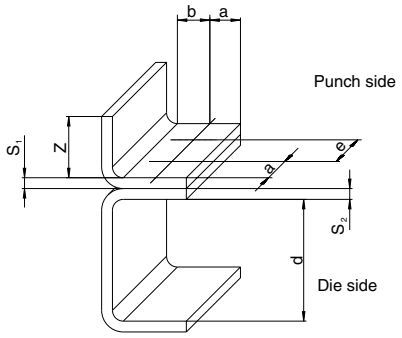
Design guidelines
Joining direction and joint position

The values below are intended as a design requirement for designers of the TOX®-Joining process.

If it is not possible to design your particular application using this guideline, please contact us.

		Round Point Die							SKB Die			
Point diameter [mm]		3	4	5	6	preferred series 8	10	12	6	8	8**	10
Sheet thickness Punch side [mm]	S_1	S_1 = approx. 2.5 to 3.0 x S_2										
Sheet thickness Die side [mm]	S_2	S_2 = approx. 2 to 2.5 x S_1										
Overall sheet thickness [mm]	$S_1 + S_2$	0.5 - 1.5	0.6 - 2.0	1.0 - 2.5	1.0 - 3.0	1.6 - 6.0	1.75 - 7.0	4.5 - 11.0	0.4 - 2.5	0.6 - 5.0	0.6 - 5.0	1.0 - 6.0
Edge distance [mm]	≥ a	5	5	5	6	7	8	10	7	8	9	9
Distance to border Note border radius [mm]	≥ b	5	5	5	7	7	8	10	7	8	9	9
Point to point distance [mm]	≥ e*	10	10	10	12	14	16	20	14	16	18	18
Min. die height [mm]		6	6	6	6	6	6	6	14	14	14	14
Clearance [mm]	≥ d	15	15	20	20	20	25	30	30	30	30	35
Flange length [mm]	Z	unlimited										

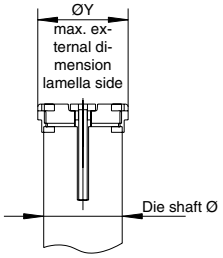




* + tolerance range

Please take note of the stripper dimensions on pages 10 - 13 when determining the distance from edges and radius borders (a, b, as well as the points to one another (e)).

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



Please take into consideration ØY for SKB dies compared to the TOX®-Round Joint tools with solid die (see pages 6 and 7).

TOX®-Joint Diameter for various materials

The way to a reliabel and quick clinching

On the following pages, material combiantions, material thicknesses and the corresponding TOX®-Joint diameter can be found. Additionally, you get information on the feasible holding forces and the required point diameter. Detailed data and our guarantee for your joint you will receive with the TOX®-Test Report coming from our test lab. For this purpose, please fill in the form on page 28 and send it together with your material to TOX® PRESSOTECHNIK.

Material designation

Designation EN 10027	Designation DIN 17600
DC01	St 12
DC01	St 1203
DC01	St 2k 60
DC03	RRSt 13
DC04	FePo4
DC04	St 14
DC04	St 1403
DC04 (Z)	St14 ZE75
DX51D	St 02
DX52	St 3

Designation EN 10027	Designation DIN 17600
DX52 (Z)	St 03 Z 275 SB
DX53	St 05
DX53D (Z)	ST 05 Z140 NA
DX54D	St 06Z
ENAW-5182	AlMg5Mn
ENAW-5182	AlMg5Mn W27 bonazinc
ENAW-5754 H111	AlMg3 W19
ENAW-5754 H12	AlMg3F22
H220BD	ZStE 220

Designation EN 10027	Designation DIN 17600
H340LAD	ZStE 340
H420LAD	ZStE 420
S235	ST 37
S315	QStE 300
S355	QSt 52-3
S355	St 52
S380	QStE 380
S420	QStE 420
S500	QStE 500

Special steel

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
10	2.50	1.25	1.4401	1.4401	8500	4400	105
8	0.60	2.00	1.4016	1.4016	1600	1300	67
6	0.50	0.50	1.4510	1.4510	1700	650	37
6	0.60	1.00	1.4016	1.4016	1800	1300	35
6	0.70	0.70	1.4016	1.4016	2000	1100	40
6	0.75	1.00	V2A	V2A	2000	1500	45
6	0.80	0.75	1.4301	1.4316	1700	950	40
6	0.90	0.90	1.403 plastic foil	1.403 plastic foil	2100	1050	42
6	1.00	1.00	1.4512	1.4512	2400	2200	40
6	1.00	1.00	1.4571	1.4571	2800	1650	37
6	1.00	1.00	1.4016	1.4016	2600	2100	47
6	1.25	0.60	1.4016	1.4016	3400	1400	32
5	0.60	0.60	1.4016	1.4016	1700	1000	30
5	0.70	0.70	special steel one side enamelled	special steel one side enamelled	1500	770	32
5	0.80	0.80	1.4301	1.4301	2000	930	30
4	0.80	0.80	1.4301	1.4301	1100	500	21

Others

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
12	6.00	5.00	Cu	Cu	6200	4200	101
6	0.30	0.60	tin plate	tin plate	560	320	30
6 T	0.80	0.80	Cu	Cu	1550	800	42
6 T	0.80	1.00	Cu ETP	Cu	1950	1200	43
6	1.00	1.00	Cu	Cu	1300	900	26
6	1.00	1.50	CW409J	CW409J	1600	1250	40
5	0.50	0.50	tin plate	tin plate	770	400	20
5 T	1.00	1.00	Cu ETP R290-3	Cu ETP R290-3	1600	1000	17
5 T	1.50	0.60	Cu ETP R290	Cu ETP R290	1750	500	23
4	0.70	0.80	brass, chromated	brass, chromated	930	500	14
4	0.75	0.50	CW505L	CW505L	730	350	13
4 T	0.80	0.60	Cu ETP	Cu ETP	1200	650	17
4 T	1.00	0.40	Cu ETP R240	Cu ETP R290-3	950	220	13
4	1.00	0.60	Ms63 nickeled	CW508L	1000	480	16
4 T	1.00	0.80	Cu ETP R240	Cu ETP R290-3	1300	600	15
3	0.40	0.75	CW409J Zn20	CW409J Zn20	240	110	10
3	0.80	0.30	new silver	new silver	450	210	9
3 T	0.80	0.80	E-Cu	E-Cu	400	350	12
3 T	0.80	1.20	E-Cu	E-Cu	300	180	9
2	0.25	0.25	CuSn0.15	CuSn0.15	125	55	3.5
2	0.60	0.60	CuZn37	CuZn37	260	60	3.6
2	0.80	0.30	C2600R-1/2	CAC19	390	170	4

T = TWINpoint. Diameter per single joint.

Examples of joint diameters and holding forces

Steel uncoated

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
12	3.00	2.00	DC01	DC01	7800	6100	98
10	0.75	1.00	DC01	DC01	3000	1600	82
10	1.00	0.75	DC01	DC01	3400	1100	82
10	1.00	1.00	DC01	DC01	3500	1700	72
10	1.00	1.50	DC01	DC01	3100	2500	86
10	1.50	1.00	DC01	DC01	5400	2200	89
10	2.00	0.90	DC01	DC01	4700	2100	57
10	2.00	2.00	S420MC	S420MC	4800	4000	70
10	2.00	2.75	S315	S315	3900	3300	68
10	2.50	2.50	DC01	DC01	5000	5300	76
10	3.00	3.00	DC01	DC01	6500	5800	95
8	0.75	1.00	DC01	DC01	2000	1200	51
8	0.75	1.25	H220BD	H220BD	1850	1600	45
8	1.00	1.00	H420LAD	H420LAD	4000	2200	52
8	1.00	1.00	DC01	DC01	2700	1400	49
8	1.00	1.50	DC01	DC01	2400	2700	54
8	1.00	2.00	DC01	DC01	2500	2400	55
8 T	1.20	1.20	H 400 TD	H 400 TD	4100	1950	70
8	1.50	1.00	DC01	DC01	3800	1900	60
8	1.50	1.50	H340LAD	H340LAD	3600	2000	50
8 T	2.00	1.50	S355MC	DD 13	8150	4750	75
8	2.00	2.00	S420MC	S420MC	3600	2600	55
8 T	2.00	2.00	S420MC	S420MC	8900	7050	79
8	3.00	1.50	S420MC	S420MC	6200	4400	50
6	0.60	0.60	H180BD	H180BD	1300	650	27
6 S	0.60	0.60	St 07	St 07	1100	580	21
6	0.75	1.00	DC01	DC01	1400	1200	36
6	1.00	0.75	DC01	DC01	2000	1000	36
6	1.00	1.00	DC01	DC01	1800	1400	33
6	1.00	1.50	DC01	DC01	1500	2100	40
6	1.50	1.00	DC01	DC01	2100	1800	28
6 T	1.50	1.50	St	St	1900	650	32
5	1.50	0.63	DC01	DC01	1700	800	17
5 T	1.50	1.00	DC01	DC01	3100	1500	39
4	1.00	1.00	DC01	DC01	1300	850	15
3	0.25	0.25	steel	steel	260	130	11
2	0.35	0.20	St	St	220	60	3

Steel coated / enamelled

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
12	3.00	2.50	DX53D (Z)	DX53D (Z)	6300	4300	62
12	3.00	3.00	S235JR	S235JR	7000	6000	120
12	3.30	3.30	S355JOC powdercoated	S355JOC powdercoated	7200	6200	100
12	4.00	4.00	S235JR	S235JR	7500	7500	120
10	1.45	1.70	DC01 (Z) SB	DC01 (Z) SB	3750	3400	62
10	1.50	2.00	DC01 galvanized	DC01 galvanized	3500	2600	65
10	2.00	2.00	DC01 enamelled	DC01 enamelled	3900	3800	65
10 S	2.50	1.00	DX51D	DX51D	4100	1200	43
10	3.00	3.00	DC01 galvanized	DC01 galvanized	6100	5300	7
10	4.00	2.50	steel enamelled	steel enamelled	6250	6200	78
8	0.40	2.00	DX51D	DX51D	510	290	44
8 S	0.60	0.80	DX56D	DX56D	1450	850	35
8 S	0.60	1.20	DX56D	DX56D	1100	950	38
8	0.70	1.20	DX54D hot galvanized	DX54D hot galvanized	1800	1000	50
8	0.75	1.25	DC04 galvanized	DC04 galvanized	2000	1400	38
8	0.90	0.90	DX53D enamelled	DX53D enamelled	2050	1500	62
8	0.90	0.90	DC01enamelled on one side	DC01 enamelled on one side	1900	1100	45
8	1.00	1.00	DX51D	DX51D	3500	2400	45
8	1.00	1.00	S235JR	S235JR	2500	1500	40
8	1.00	1.25	DX52D Z275 SB. enamelled	DX52D Z275 SB. enamelled	2100	1550	45
8	1.00	1.50	DX52D Z275 SB. enamelled	DX52D Z275 SB. enamelled	1950	1700	38
8 T	1.20	0.60	DX54D	DX54D	2600	750	36
8 T	1.20	1.50	DX53D	DX53D	2870	1800	42
8	1.25	1.25	steel powder coated	steel powder coated	2100	1300	37
8	1.50	0.80	DX51D	DC01	3300	2000	42
8	1.70	1.20	DC01 KTL-enamelled	DC01 KTL-enamelled	2800	1600	43
8	1.75	1.75	S380MC pickled	S380MC pickled	3350	2800	51
8	2.20	2.20	steel enamelled	steel enamelled	2900	2400	50
8	2.50	2.50	steel enamelled	steel enamelled	3350	2800	50
6 S	0.40	0.50	DX53D	DX53D	450	250	20
6 S	0.50	0.50	DX53D	DX51D	550	250	12
6	0.50	0.80	DC01 enamelled	DC01 bright	800	500	36
6	0.50	0.90	S235JR (Z)	S235JR (Z)	950	530	30
6	0.70	0.70	steel F30 100 µ zinc	steel F30 100 µ zinc	1500	1100	32
6	0.75	0.75	DC01 enamelled	DC01 enamelled	1040	730	30
6	0.75	0.75	DX51D galva-nized	DX51D galva-nized	1500	1300	30
6	0.80	0.80	AP04ZM	AP04ZM	1600	1150	33
6	0.80	0.80	DC01 galvanized + enamelled	DC01 galvanized + enamelled	1200	1000	30
6	0.80	1.00	DC03 white/gold	DX51D (Z)	1200	1150	33
6	0.90	0.90	DC01 enamelled on one side	DC01 enamelled on one side	1300	1000	32
6 S	1.00	0.60	DX56D	DX56D	1400	700	20
6	1.00	0.80	DC03 enamelled	DC03 enamelled on one side	1600	1100	33
6	1.00	1.00	DC04 hot alumi-nized	DC04 hot alumi-nized	2400	1800	35
6	1.20	1.20	steel PVC-enamelled	steel PVC-enamelled	1300	1100	33
6 S	1.50	0.60	DX56D	DX56D	2200	700	20
5	0.44	0.44	steel aluminized	steel aluminized	930	390	15
5	0.50	0.50	steel aluminized	steel aluminized	1000	550	20
5	0.55	0.55	DC01 enamelled	DC01 enamelled	1000	730	22
5	0.60	0.40	S235JR hot aluminized	S235JR hot aluminized	1100	400	20
5	0.60	1.00	DC04 aluminized	DC04 hot galva-nized	750	600	30
5	0.75	1.00	DX51D zinc-coated	DX51D zinc-coated	1000	700	22
5 T	1.25	0.87	DX51D	DX51D	2600	1350	34
5	1.50	0.90	DX53D galva-nized	DX51D enamelled	2400	1250	25
4	0.30	0.30	DC04 galvanized	DC04 galvanized	380	120	13
4	0.50	0.80	steel enamelled	steel enamelled	940	700	28
4	0.60	0.60	DC04 aluminized	DC04 aluminized	710	470	17
4 T	0.75	1.00	DX54D	DX51D	800	320	27
4	0.80	0.80	steel enamelled with plastic foil	steel enamelled with plastic foil	1000	800	20
3	0.60	0.60	steel galvanized	steel galvanized	400	270	8
3	0.70	0.70	steel enamelled	steel enamelled	610	360	15
3	0.85	0.85	DC01 electrogal-vanized	DC01 hot galva-nized	1130	790	20
2	0.20	0.20	DC03+LC-MA	DC03+LC-MA	150	55	5

T = TWINpoint. Diameter per single joint.
S = SKB joint

Aluminium

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
12	3.00	3.00	ENAW-5754	ENAW-5754	3000	2850	61
12	5.20	2.80	ENAW-5019	ENAW-5019	3700	3500	66
12	5.80	5.70	aluminium profile	aluminium profile	2700	1100	64
12	6.00	3.90	aluminium profile	aluminium profile	3100	2300	64
10	1.00	1.00	ENAW-5754	ENAW-5754	1600	1100	58
10	1.00	1.20	ENAW-5754	ENAW-5754	2100	1500	45
10	1.00	1.50	ENAW-5754	ENAW-5754	1700	1800	45
10	1.20	1.50	ENAW-5754	ENAW-5083	1600	1150	36
10 S	1.50	2.50	ENAW-5182	ENAW-5182	2900	2000	45
10	2.00	1.00	ENAW-5754	ENAW-5754	3200	800	52
10	2.00	2.50	ENAW-5556A	ENAW-6082	1800	1550	44
10 S	2.50	1.50	ENAW-5182	ENAW-5182	3500	1050	41
10	2.50	2.50	ENAW-5556A	ENAW-6082	2100	1950	44
8	0.80	0.80	ENAW-5556A	ENAW-5556A	1100	800	28
8	1.00	1.00	ENAW-5754	ENAW-5754	1000	900	30
8	1.00	1.50	ENAW-5754	ENAW-5754	1100	1200	32
8	1.00	2.00	ENAW-5754	ENAW-5754	1000	1200	37
8	1.00	2.00	ENAW-5005	ENAW-5005	560	580	18
8	1.20	1.20	ENAW-6082	ENAW-5556A	1700	1400	27
8	1.50	1.00	ENAW-5754	ENAW-5754	2000	1200	40
8	2.00	1.00	ENAW-5754	ENAW-5754	2500	1300	40
8 S	2.00	1.00	AlMg4.5Mn0.4	AlMg4.5Mn0.4	3000	1000	44
8 T	3.00	2.00	AlSi1MgMn	AlMg0.7Si	2700	1200	46
6 S	0.50	0.50	Al99.5	Al99.5	250	100	12
6	1.00	1.00	ENAW-5754	ENAW-5754	1000	900	30
6	1.00	1.50	ENAW-5754	ENAW-5754	800	1000	23
6	1.50	1.00	ENAW-5754	ENAW-5754	1100	1100	20
6	2.00	1.00	ENAW-5754	ENAW-5754	1600	1200	37
5	1.00	0.80	ENAW-5182 bonazinc	ENAW-5182 bonazinc	950	600	20
3	0.50	0.50	ENAW-5556A	ENAW-5556A	210	180	7
2	0.40	0.40	Al 98.8	Al 98.8	55	50	2.2

Aluminium surface treated

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
8	1.20	1.20	aluminium anodized	Al 99.5	1600	1100	82
8	1.40	1.20	ENAW-5754 anodized	ENAW-5556A KTL-enamelled	1750	1650	36
8	1.70	1.30	ENAW-6082 anodized	ENAW-6082 anodized	2100	1900	37
8	4.00	2.00	aluminium profile	aluminium sheet enamelled	3400	2400	51
6	0.50	0.50	aluminium enamelled	aluminium enamelled	530	400	12

T = TWINpoint. Diameter per single joint.
S = SKB joint

Combined joining

TOX®-Round Joint Ø (mm)	Total sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)
12	4.00	1.25	S420MC	DC04	10000	5400	125
12	5.00	1.25	S355J2G4	DC04	10000	6000	115
10	1.50	1.30	steel zinc-coated	ENAW-6082 anodized	2200	1400	50
10	1.80	1.60	aluminium profile enamelled	steel enamelled	2200	1900	54
10	3.00	2.50	S500MC	DX52D	7500	4450	78
10	3.10	1.20	aluminium profile anodized	steel enamelled	3300	3200	52
8	0.80	1.00	DC04	H340LAD	1900	1400	50
8	0.80	1.20	DC04 (ZE75)	ENAW-5182 bonazinc	2000	1500	40
8	1.00	0.80	H340LAD	DC04	3100	1000	50
8	1.20	0.80	ENAW-5182	DC04 (ZE75)	1750	1000	40
8	1.25	1.00	H340LAD	DC04	3600	2300	46
8	1.30	1.00	ENAW-6082	DC04 enamelled	1300	1200	40
8 S	1.50	1.50	AlMg3.5Mn	DP-K34/60	1150	450	64
8	2.50	1.20	ENAW-5754	1.4016	2550	1400	47
6	0.50	1.00	1.4301 with plastic foil	DC01 zinc-coated	1050	600	30
6	0.60	1.20	DC01	H340LAD	950	720	35
6	0.80	1.25	1.4301	ENAW-6082	1400	500	40
6	1.00	1.00	aluminium	DC01 zinc-coated	720	450	28
6	1.00	1.00	aluminium anodized	DC01 electro galvanized	1100	700	31
6	1.00	2.00	ENAW-5556A	zinc die-casting	560	300	22
6	1.40	1.20	ENAW-6082	DC04 enamelled	1080	800	30
5	1.00	0.40	DC01 zinc-coated	1.4301	1550	400	26
5	1.00	1.50	DC01 (ZE75)	zinc die-casting	1030	200	23
3	0.80	0.60	DC01 zinc-coated	CW452K	520	310	11

... and many more combinations. Please order your test report!

TOX® PRESSOTECHNIK

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Fax +49 (0)751-52391, E-Mail: info@tox-de.com, www.tox-en.com

Order form for TOX®-Test Report
P/O No. .....

Please return by fax.

TOX® PRESSOTECHNIK offers the only way for a reliable application of clinching with functional guarantee!

Please fill in the framed areas as completely as possible.

Your name and address:	**Choose from following TOX®-Test alternatives:**
	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. **Free of charge** ☐
	Additional to 1:
Tel.-No.	2. With components supplied, requiring preparatory work for test samples, at cost.
Fax-No.	Fixed charge EUR 255,- ☐
E-Mail	**Additional to 1 or 2:**
Your TOX® PRESSOTECHNIK contact person:	3. Joining of component samples. Quantity ..... pcs. Effort required, estimated by yourself: .....hrs x EUR 63,- = ☐

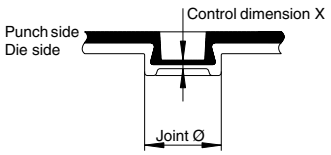
Information on your application:

Project / component designation: ..... Production rate per year: .....

Required/calculated joint strength: Shear Strength ..... (N), Pull Strength .....(N), Data not available ☐

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: 1.5, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 26, best possible		Round joint or variant (see catalog TOX®-Joining Systems):
Material (punch side): Thickness (mm): Coating (type, thickness): Surface: dry ☐ oily ☐		Material (die side): Thickness (mm): Coating (type, thickness): Surface: dry ☐ oily ☐
Intermediate layer ☐ no ☐ yes, material: Thickness: Coating:		

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

Please send more information about:

☐ TOX®-Single Point Tools	☐ TOX®-Multiple Point Tools	☐ TOX®-ClinchRivet	☐ TOX®-Hand Tongs
☐ TOX®-Machine Tongs	☐ TOX®-Robot Tongs	☐ TOX®-Powerpackage/Drives	☐ TOX®-ElectricDrive
☐ TOX®-PowerKurver	☐ TOX®-Presses, -FinePress	☐ TOX®-Punching, Coining and Press-Fitting	
☐ TOX®-Process Control	☐ TOX®-Pressing Control	☐ TOX®-Special Machines	

I would like to be contacted by telephone ☐ meet with a specialist, preferably on ..... ☐

Subject to technical modifications.