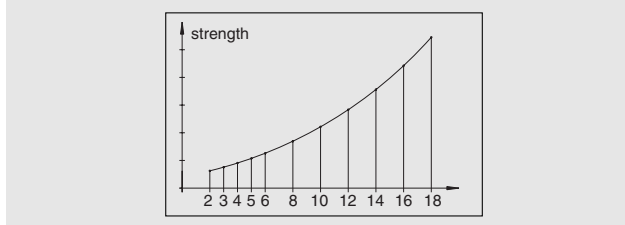


Overview of the TOX®-Clinching Technology

TOX® Round Joint tool selection list

Selection of the various diameters of the TOX® joining points and of the point strength values.
The way to a quick TOX® application".

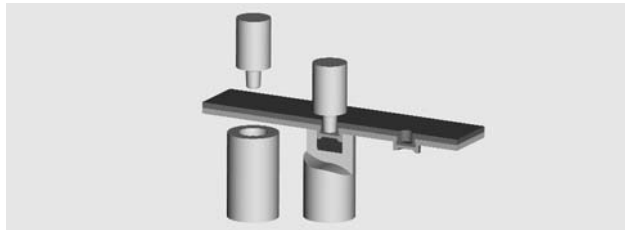
See page 2 – 5



TOX® Round Joint tool sets

Flanged tools; side mount tools
flat die plate, offset die plate
"Extremely small flange widths, TOX® in tight corners"

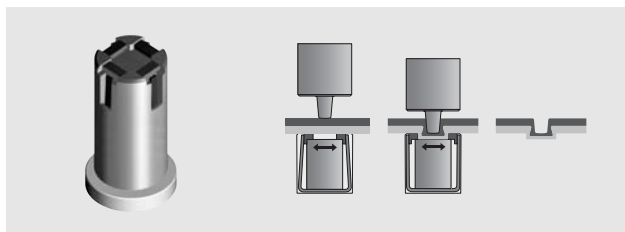
See page 6 – 9



TOX® SKB die for complex joining requirements

Punch and die shapes

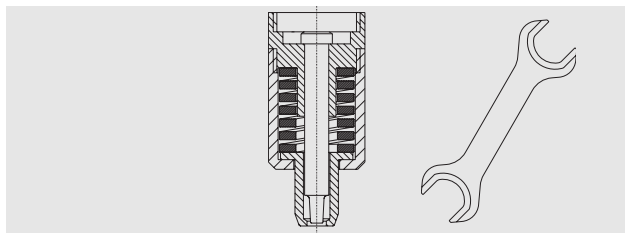
See page 10 – 12



TOX® stripper for punch and dies

TOX® accessories

See page 13 – 16



TOX® single point frame

You will find a further selection of complete hand and robot tongs in our TOX® tong brochure.

See page 17



TOX® measuring equipment TOX® process monitoring system

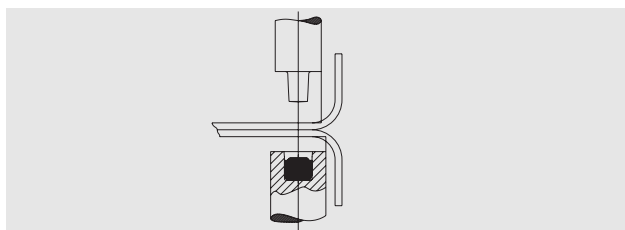
See page 17 – 18



TOX® mounting guidelines TOX® design guidelines

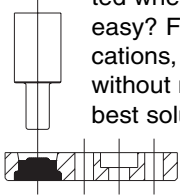
TOX® tool life service information

See page 19 – 22



TOX® Round Joint tool selection list

TOX® - Why make things complicated when they can be so easy? For almost all applications, the rigid TOX® die without moving parts is the best solution.

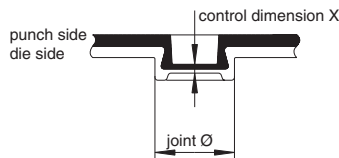


It provides a unique consistency, service life and reliability of the TOX® joints in mass production. TOX® offers considerable advantages in terms of production and process safety.

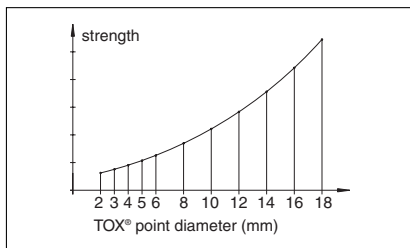
TOX® will supply specially adapted **process monitoring systems**.

The TOX® process monitoring system helps you to test and document continuously the competitive factor of quality.

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



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



*Joint strength (shear and pull)

TOX® tool preferred series

The data shown in the table below for diameters 6, 8 and 10 mm represent guideline values and are based on steel DC01/DC04. You will receive a TOX® test report in each case. Available are the TOX® point diameters 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18 up to 26 mm. The tool dimensions and shapes are standardized at TOX®, 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® tools to the required applications and loads. For example, reduced press force, greater shear or tensile forces.

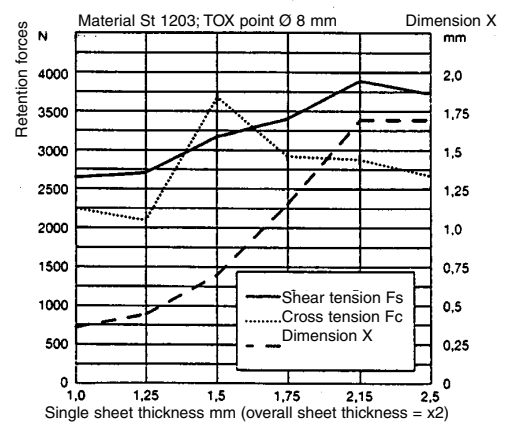
TOX® - point diameter

	6 mm	8 mm	10 mm
Single sheet thicknesses Range (mm) Steel	0.5-1.75	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
Pressing force (kN)	20-45	35-50	60-80
Stripping force punch side (N)	500 - 3500	1000 - 6000	2000 - 8000

Reference values for TOX®-Joints

Changes in TOX® material thickness:

This picture shows the joint strength depending on the total sheet thickness of the TOX® joint, made with the same TOX® tool combination. Only the pressing force and the control dimension "X" (remaining bottom thickness) are changed. Performed with a tool set, point diameter 8 mm, for all thicknesses.



TOX® Round Joint tool selection list

Selection of TOX® joining point diameter and strength values, to be taken directly from the list or determined by TOX® test.

Two ways for the reliable and quick TOX® application:

Method A:

Basis: Existing test reports as per this list.

1. Define TOX® point diameter based on your total sheet thickness.
2. Compare your load requirements with data of this list, page 4 – 5.
3. With TOX® test report number, ask TOX® PRESSOTECHNIK for complete test report with all data. Free of charge.

For an easy material selection, please see the table below with examples of material designations.

Material designation

Previous Designation	New Designation
AlMg3 W19	ENAW-5754 H111
AlMg3F22	ENAW-5754 H12
AlMg5Mn	ENAW-5182
AlMg5Mn W27 bonazinc	ENAW-5182
FePo4	DC04
QSt 52-3	S355
QStE 300	S315
QStE 380	S380
QStE 420	S420
QStE 500	S500
RRSt 13	DC03
St 02	DX51D
St 03 Z 275 SB	DX52 (Z)
St 05	DX53
ST 05 Z140 NA	DX53D (Z)
St 06Z	DX54D
St 12	DC01
St 1203	DC01
St 14	DC04
St 1403	DC04
St 2k 60	DC01
St 3	DX52
ST 37	S235
St 52	S355
St14 ZE75	DC04 (Z)
ZStE 220	H220BD
ZStE 340	H340LAD
ZStE 420	H420LAD

Method B:

Basis: No test report suitable for your material included in this list, or you want a test report for your original material or component part.

For the test we need the data as per page 23 of this leaflet.

1. Copy the test order form on page 23.
2. Enter the complete data in the test form.
3. Make the test material available.
4. Send the test form and material to TOX® PRESSOTECHNIK.

You will receive a TOX® test report with photograph and all relevant application data like tool denomination, control dimension X, shear and tensile strength, stripping and pressing forces etc. determined with your material.

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.

1. **Test Report** containing all relevant data of the TOX® application, including guaranteed performance values of the TOX® joint.

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

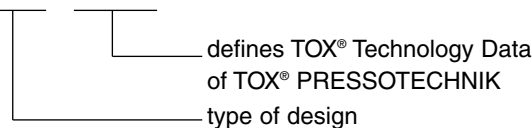
3. **TOX® Data Sheet**, internal follow-up system which stores all application and tool data used and allows rapid consultation with our internal and external servicing departments.

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 along with you.

Sample order:

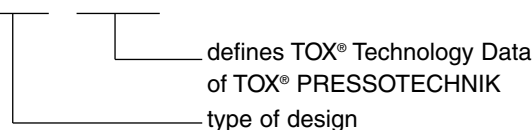
Punch designation

TOX® 10.25. 149012



Die designation

TOX® 10.25. 148917



In addition to this data we need the TOX® test report number which you will find as follows:

1. From selection on pages 4 and 5
2. From results of free Test Order, page 23.

TOX® Round Joint tool selection list

TOX® point Ø 12 mm

total sheet thickness 4,0 - 11,0 mm

sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
steel uncoated							
3,00	2,00	DC01	DC01	7800	6100	98	662006.1
steel coated/enamelled							
3,00	2,50	DX53D (Z)	DX53D (Z)	6300	4300	62	370016.1
3,00	3,00	S235JR	S235JR	7000	6000	120	562025.0
3,30	3,30	S355JOC	S355JOC	7200	6200	100	661004.1
4,00	4,00	powder-coat. S235JR.	powder-coat. S235JR	7500	7500	120	562025.1
combined joining							
4,00	1,25	S420MC	DC04	10000	5400	125	368000.0
5,00	1,25	S355J2G4	DC04	10000	6000	115	368000.1
aluminium							
3,00	3,00	ENAW-5754	ENAW-5754	3000	2850	61	570016.0
5,20	2,80	ENAW-5019	ENAW-5019	3700	3500	66	462009.0
5,80	5,70	ali. profile	ali. profile	2700	1100	64	472019.0
6,00	3,90	ali. profile	ali. profile	3100	2300	64	472019.1
copper							
6,00	5,00	Cu	Cu	6200	4200	101	571017.0

TOX® point Ø 10 mm

total sheet thickness 1,75 - 7,0 mm

sheet thickness (mm) punch side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
steel uncoated							
0,75	1,00	DC01	DC01	3000	1600	82	1.0003.00
1,00	0,75	DC01	DC01	3400	1100	82	1.0006.00
1,00	1,00	DC01	DC01	3500	1700	72	1.0009.00
1,00	1,50	DC01	DC01	3100	2500	86	1.0018.00
1,50	1,00	DC01	DC01	5400	2200	89	1.0021.00
2,00	0,90	DC01	DC01	4700	2100	57	561024.7
2,00	2,00	S420MC	S420MC	4800	4000	70	364015.4
2,00	2,75	S315	S315	3900	3300	68	467013.1
2,50	2,50	DC01	DC 01	5000	5300	76	467020.0
3,00	3,00	DC01	DC 01	6500	5800	95	370028.1
steel coated/enamelled							
1,45	1,70	DC01 (Z) SB	DC01 (Z) SB	3750	3400	62	563018.0
1,50	2,00	DC01 zinc-coated	DC01 zinc-coated	3500	2600	65	470006.0
2,00	2,00	DC01 enamelled	DC01 enamelled	3900	3800	65	562001.0
3,00	3,00	DC01 zinc-coated	DC01 zinc-coated	6100	5300	70	563029.1
4,00	2,50	steel enam.	steel enam.	6250	6200	78	561012.1
special steel							
2,50	1,25	1.4401	1.4401	8500	4400	105	464026.1
combined joining							
1,50	1,30	steel zinccoat.	ENAW-6082 anodized	2200	1400	50	464011.0
1,80	1,60	ali. profile enamelled	steel enam.	2200	1900	54	365019.1
3,00	2,50	S500MC	DX52D	7500	4450	78	561013.0
3,10	1,20	ali. profile anodized	steel enam.	3300	3200	52	365019.5
aluminium							
1,00	1,00	ENAW-5754	ENAW-5754	1600	1100	58	2.0003.00
1,00	1,20	ENAW-5754	ENAW-5754	2100	1500	45	2.0006.0
1,00	1,50	ENAW-5754	ENAW-5754	1700	1800	45	2.0012.00
1,20	1,50	ENAW-5754	ENAW-5083	1600	1150	36	563013.1
2,00	1,00	ENAW-5754	ENAW-5754	3200	800	52	2.0021.00
2,00	2,50	ENAW-5556A	ENAW-6082	1800	1550	44	470000.0
2,50	2,50	ENAW-5556A	ENAW-6082	2100	1950	44	470000.1

TOX® point Ø 8 mm

total sheet thickness 1,6 - 6,0 mm

sheet thickness (mm) punch-side	die side	material/coating punch side	die side	shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
steel uncoated							
0,75	1,00	DC01	DC01	2000	1200	51	1.0002.00
0,75	1,25	H220BD	H220BD	1850	1600	45	465019.0
1,00	1,00	H420LAD	H420LAD	4000	2200	52	570021.0
1,00	1,00	DC01	DC01	2700	1400	49	1.0008.00
1,00	1,50	DC01	DC01	2400	2700	54	1.0017.00
1,00	2,00	DC01	DC01	2500	2400	55	469603.0
1,50	1,50	H340LAD	H340LAD	3600	2000	50	562607.5
1,50	1,00	DC01	DC01	3800	1900	60	1.0020.00
2,00	2,00	S420MC	S420MC	3600	2600	55	364015.01
3,00	1,50	S420MC	S420MC	6200	4400	50	370024.2
steel coated/enamelled							
0,40	2,00	DX51D	DX51D	510	290	44	571004.0
0,70	1,20	DX54D hot galvanized	DX54D hot galvanized	1800	1000	50	564011.6
0,75	1,25	DC04 zinc-coated	DC04 zinc-coated	2000	1400	38	369026.2
0,90	0,90	DX53D enam.	DX53D enam.	2050	1500	62	471023.3
0,90	0,90	DC01 enam. on one side	DC01 enam. on one side	1900	1100	45	3.0002.00
1,00	1,00	DX51D	DX51D	3500	2400	45	472026.0
1,00	1,00	S235JR	S235JR	2500	1500	40	366016.0
1,00	1,25	DX52D Z275 SB enamelled	DX52D Z275 SB	2100	1550	45	369022.4
1,00	1,50	DX52D Z275 SB enamelled	DX52D Z275 SB enamelled	1950	1700	38	369022.7
1,25	1,25	steel powder-coated	steel powder-coated	2100	1300	37	563027.0
1,50	0,80	DX51D	DC01	3300	2000	42	472617.0
1,70	1,20	DC01 KTL-enam.	DC01 KTL-enam.	2800	1600	43	570017.1
1,75	1,75	S380MC pickled	S380MC pickled	3350	2800	51	570001.0
2,20	2,20	steel enam.	steel enam.	2900	2400	50	470023.0
2,50	2,50	steel enam.	steel enam.	3350	2800	50	561012.0
special steel							
0,60	2,00	1.4016	1.4016	1600	1300	67	469077.2
combined joining							
0,80	1,00	DC04	H340LAD	1900	1400	50	564043.2
0,80	1,20	DC04 (ZE75)	ENAW-5182 bonazinc	2000	1500	40	464005.4
1,00	0,80	H340LAD	DC04	3100	1000	50	564043.5
1,20	0,80	ENAW-5182	DC04 (ZE75)	1750	1000	40	464005.2
1,25	1,00	H340LAD	DC04	3600	2300	46	464612.2
1,30	1,00	ENAW-6082	DC04 enamelled	1300	1200	40	569028.1
2,50	1,20	ENAW-5754	1.4016	2550	1400	47	466027.2
aluminium							
0,80	0,80	ENAW-5556A	ENAW-5556A	1100	800	28	461016.0
1,00	1,00	ENAW-5754	ENAW-5754	1000	900	30	2.0002.00
1,00	1,50	ENAW-5754	ENAW-5754	1100	1200	32	2.0011.00
1,00	2,00	ENAW-5754	ENAW-5754	1000	1200	37	2.0017.00
1,00	2,00	ENAW-5005	ENAW-5005	560	580	18	461001.12
1,20	1,20	ENAW-6082	ENAW-5556A	1700	1400	27	569017.1
1,50	1,00	ENAW-5754	ENAW-5754	2000	1200	40	2.0014.00
2,00	1,00	ENAW-5754	ENAW-5754	2500	1300	40	2.0020.00
aluminium, surface treated							
1,20	1,20	alu anodized	Al 99,5	1600	1100	28	371019.0
1,40	1,20	ENAW-5754 anodized	ENAW-5556A KTL-enam.	1750	1650	36	570022.0
1,70	1,30	ENAW-6082 anodized	ENAW-6082 anodized	2100	1900	37	469601.0
4,00	2,00	aluminium profile	ali. sheet enamelled	3400	2400	51	272018.0

* necessary to state when ordering

TOX® point Ø 6 mm

total sheet thickness 1,0 - 3,0 mm

sheet thickness (mm)		material/coating		shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
punch side	die side	punch side	die side				
steel uncoated							
0,60	0,60	H180BD	H180BD	1300	650	27	570021.2
0,75	1,00	DC01	DC01	1400	1200	36	1.0001.00
1,00	0,75	DC01	DC01	2000	1000	36	1.0004.00
1,00	1,00	DC01	DC01	1800	1400	33	1.0007.00
1,00	1,50	DC01	DC01	1500	2100	40	1.0016.00
1,50	1,00	DC01	DC01	2100	1800	28	1.0019.00
steel coated/enamelled							
0,50	0,80	DC01 enamelled	DC01 bright	800	500	36	571016.0
0,50	0,90	S235JR (Z)	S235JR (Z)	950	530	30	568017.0
0,70	0,70	steel F30 100 µ zinc	steel F30 100 µ zinc	1500	1100	32	566601.0
0,75	0,75	DC01 enamelled	DC01 enamelled	1040	730	30	369029.1
0,75	0,75	DX51D zinc-coated	DX51D zinc-coated	1500	1300	30	472001.0
0,80	0,80	AP04ZM	AP04ZM	1600	1150	33	569016.0
0,80	0,80	DC01 zinc-coated + enamelled	DC01 zinc-coated + enamelled	1200	1000	30	469001.0
0,80	1,00	DC03 white/gold	DX51D (Z) zinc-coat.	1200	1150	33	469031.5
0,90	0,90	DC01 enamelled on one side	DC01 enamelled on one side	1300	1000	32	3.0001.00
1,00	1,00	DC04 hot aluminized	DC04 hot aluminized	2400	1800	35	466605.0
1,00	0,80	DC03 enamelled	DC03 enamelled on one side	1600	1100	33	469031.3
1,20	1,20	steel PVC-enam.	steel PVC-enam.	1300	1100	33	362013.0
1,50	0,90	DX53D zinc-enam.	DX51D enam.	2400	1250	25	471023.0
aluminium							
1,00	1,00	ENAW-5754	ENAW-5754	1000	900	30	2.0001.00
1,00	1,50	ENAW-5754	ENAW-5754	800	1000	23	2.0010.00
1,50	1,00	ENAW-5754	ENAW-5754	1100	1100	20	2.0013.00
2,00	1,00	ENAW-5754	ENAW-5754	1600	1200	37	2.0019.00
aluminium surface treated							
0,50	0,50	aluminium enamelled	aluminium enamelled	530	400	12	571006.0
Combined joining							
0,50	1,00	1.4301 with plastic foil	DC01 zinc-coated	1050	600	30	370039.8
0,60	1,20	DC01	H340LAD	950	720	35	661615.0
0,80	1,25	1.4301	ENAW-6082	1400	500	40	363022.0
1,00	1,00	aluminium	DC01 zinc-coated	720	450	28	370039.6
1,00	1,00	aluminium anodized	DC01 electro galvanized	1100	700	31	370039.0
1,00	2,00	ENAW-5556A	zinc die-casting	560	300	22	366033.0
1,40	1,20	ENAW-6082	DC04 enamelled	1080	800	30	569028.4
special steel							
0,50	0,50	1.4510	1.4510	1700	650	37	661002.0
0,60	1,00	1.4016	1.4016	1800	1300	35	461001.14
0,70	0,70	1.4016	1.4016	2000	1100	40	272010.1
0,75	1,00	V2A	V2A	2000	1500	45	363011.0
0,80	0,75	1.4301	1.4316	1700	950	40	464019.0
0,90	0,90	1.4301 plastic foil	1.4301 plastic foil	2100	1050	42	563022.2
1,00	1,00	1.4512	1.4512	2400	2200	40	368017.0
1,00	1,00	1.4571	1.4571	2800	1650	37	467016.0
1,00	1,00	1.4016	1.4016	2600	2100	47	568008.0
1,25	0,60	1.4016	1.4016	3400	1400	32	461001.5
others							
0,30	0,60	tin plate	tin plate	560	320	30	568024.1
1,00	1,00	Cu	Cu	1300	900	26	465008.13
1,00	1,50	CW409J	CW409J	1600	1250	40	569015.1

TOX® point Ø 5 mm

total sheet thickness 1,0 - 2,5 mm

sheet thickness (mm)		material/coating		shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
punch side	die side	punch side	die side				
steel uncoated							
1,50	0,63	DC01	DC01	1700	800	17	461007.0
steel coated							
0,44	0,44	steel aluminized	steel aluminized	930	390	15	367003.0
steel coated/enamelled							
0,50	0,50	steel aluminized DC01	steel aluminized DC01	1000	550	20	566027.1
0,55	0,55	enamelled S235JR hot aluminized	enamelled S235JR hot aluminized	1000	730	22	568000.0
0,60	0,40	DC04 hot galvanized	DC04 hot galvanized	1100	400	20	472604.0
0,60	1,00	DX51D zinc-coated	DX51D zinc-coated	750	600	30	468037.2
0,75	1,00	DX51D zinc-coated	DX51D zinc-coated	1000	700	22	565021.0
0,80	0,80	steel enamelled with plastic foil	steel enamelled with plastic foil	1000	800	20	564002.0
special steel							
0,60	0,60	1.4016 special steel one side enamelled	1.4016 special steel one side enamelled	1700	1000	30	461001.24
0,70	0,70	1.4301	1.4301	1500	770	32	566014.0
0,80	0,80	1.4301	1.4301	2000	930	30	563017.0
aluminium							
1,00	0,80	ENAW-5182 bonazinc	ENAW-5182 bonazinc	950	600	20	364605.0
combined joining							
1,00	0,40	DC01 zinc-coated	1.4301	1550	400	26	463013.0
1,00	1,50	DC01 (ZE75)	zinc die-casting	1030	200	23	569030.0
others							
0,50	0,50	tin plate	tin plate	770	400	20	361011.0

TOX® point Ø 4 mm

total sheet thickness 0,6 - 2,0 mm

sheet thickness (mm)		material/coating		shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
punch side	die side	punch side	die side				
steel uncoated							
1,00	1,00	DC01	DC01	1300	850	15	468606.0
steel coated/enamelled							
0,30	0,30	DC04 zinc-coat	DC04 zinc-coat	380	120	13	462013.0
0,50	0,80	steel enam.	steel enam.	940	700	28	462019.1
0,60	0,60	DC04 aluminized	DC04 aluminized	710	470	17	468037.0
0,85	0,85	DC01 electrogalvanized	DC01 hot galvanized	1130	790	20	564015.1
special steel							
0,80	0,80	1.4301	1.4301	1100	500	21	462017.0
others							
0,70	0,80	brass, chromated	brass, chromated	930	500	14	365008.0
0,75	0,50	CW505L	CW505L	730	350	13	366007.1
1,00	0,60	Ms63 nicked	CW508L	1000	480	16	463009.0

TOX® point Ø 3 mm

total sheet thickness 0,5 - 1,5 mm

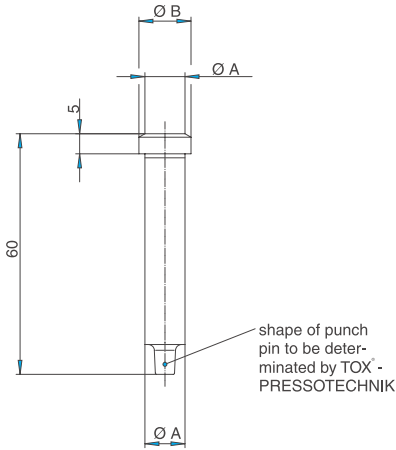
sheet thickness (mm)		material/coating		shear strength (N)	tensile strength (N)	pressing force (kN)	TOX® test report number *
punch side	die side	punch side	die side				
steel uncoated							
0,25	0,25	steel	steel	260	130	11	471001.0
steel coated/enamelled							
0,60	0,60	steel zinc-coat.	steel zinc-coat.	400	270	8	471605.0
0,70	0,70	steel zinc-enam.	steel zinc-enam.	610	360	15	370022.0
combined joining							
0,80	0,60	DC01 zinc.coat	CW452K	520	310	11	567024.0
aluminium							
0,50	0,50	ENAW-5556A	ENAW-5556A	210	180	7	470028.0
others							
0,40	0,75	CW409J Zn20	CW409J Zn20	240	110	10	366032.0
0,80	0,30	new silver	new silver	450	210	9	561033.0

* necessary to state when ordering

Subject to alterations

TOX® Flanged Tools

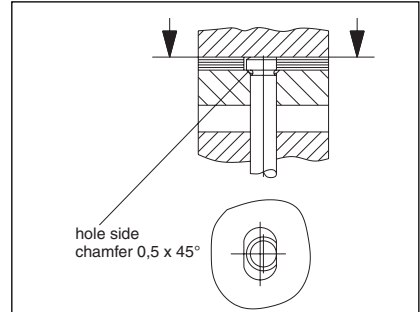
Punch



Order number Part 1 = design	Location hole + 0.018 + 0 A		B	for TOX® point Ø mm	Press force kN per point accor- ding TOX® test report
TOX® 10.25	10	13	3-12	< 70	
TOX® 14.25	14	17	6-12	> 70	

Dimensions in mm

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

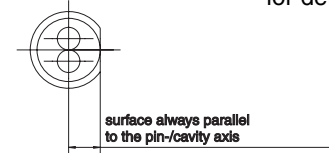


TOX® Round Joint

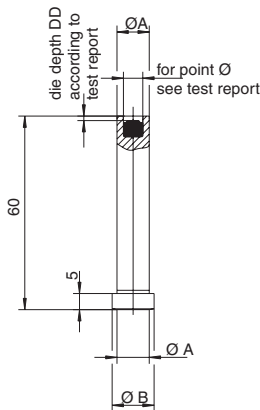
Optional Anti-Rotation: To obtain closely spaced points, punch and die heads may be flattened as shown. This method can be adopted for tight spacing on double point assemblies. Additionally a rotation of the tool becomes impossible.

TOX®-TWINpoint Anti-Rotation

Flanged tools (punch, die) always need an anti-rotation fixture. The heads are always flattened as shown. Attention must be paid to the thorough passing of the anti-rotation fixture. Standard strippers cannot be used here. Please call us for details.



Round joint die (solid die cavity)



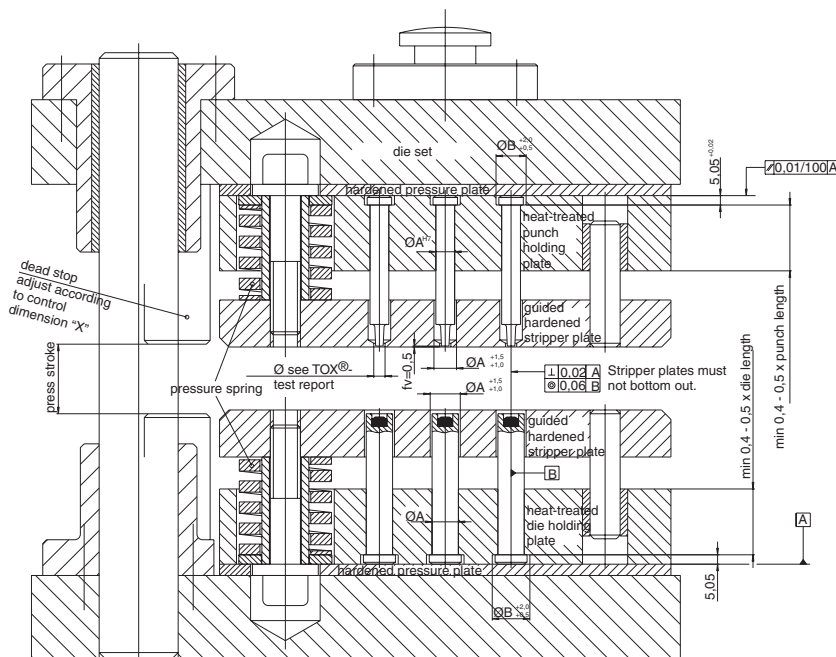
Order number Part 1 = design	Location hole + 0.018 + 0 A		B	for TOX® point Ø mm
TOX® 10.25	10	13	3, 4, 5, (6)*	
TOX® 14.25	14	17	6, 8	
TOX® 16.25	16	19	10	
TOX® 20.25	20	23	12	

Dimensions in mm

* only after consulting TOX® PRESSOTECHNIK.

Die with insert features an integrated oil drainage system.

Type of installation for column-mounted die-set tool



fv = 0.5 = recessed punch tip (see page 13).

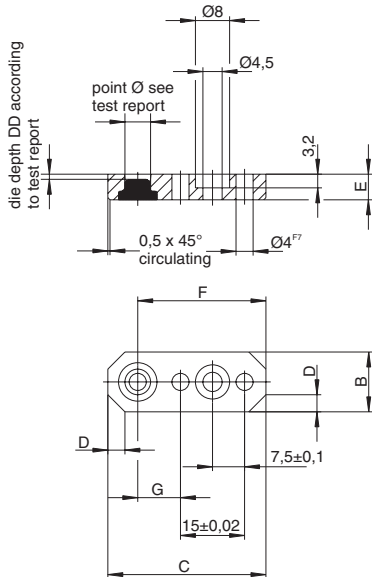
Attention: observe installation guidelines and TOX® test report (see page 19 ff)

Flat die plate (solid die cavity)

Reaches almost every corner of the component; allows narrow edges;

extremely small design; Single tool, quick and easy to replace.

Tool can be used for single and multiple points.



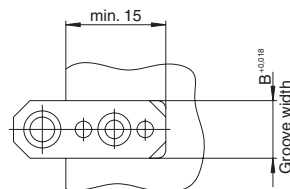
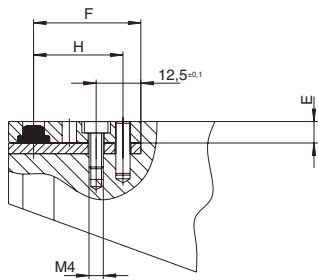
Order number Part 1 = design	B	C	D	E	F±0,02	G±0,02	H±0,02	for TOX® point Ø mm
TOX® 40.25	10	35	3x45°	6	30	10	25	3, 4, 5, (6)*
TOX® 41.25	14	37	4x45°	6	30	10	25	6, 8
TOX® 43.25	16	38	4,5x45°	10	30	10	25	10
TOX® 44.25	20	45	4,5x45°	10	35	15	30	12

* only after consulting TOX® PRESSOTECHNIK.

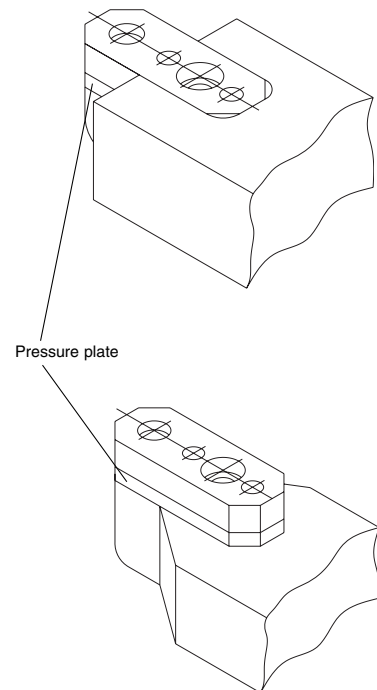
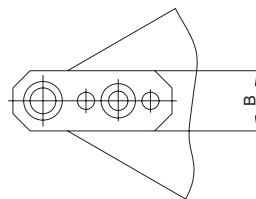
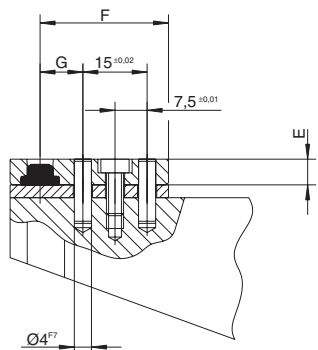
Dimensions in mm

Die with insert features an integrated oil drainage system.

Installation with groove



Installation with dowel pin



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

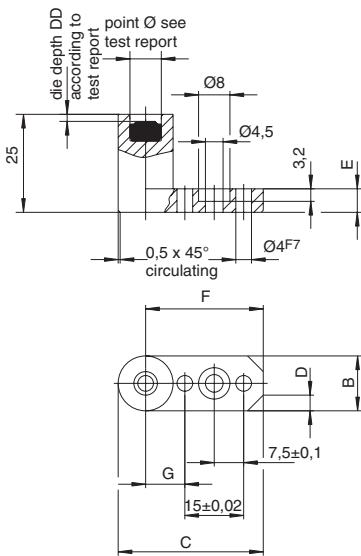
Attention: observe installation guidelines and TOX® test report

Flat die plate, offset (solid die cavity)

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 possible on request.



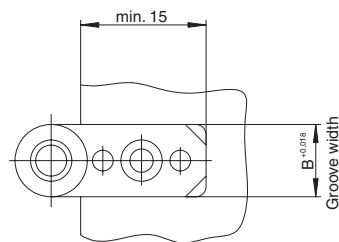
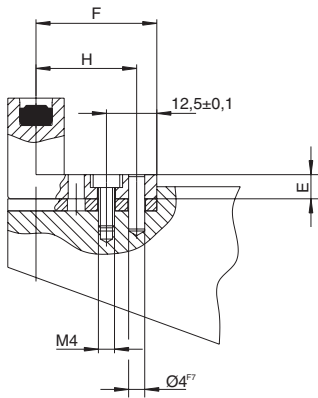
Order number Part 1 = design	B	C	D	E	F±0,02	G±0,02	H±0,02	for TOX® point Ø mm
TOX® 50.25	10	35	3x45°	6	30	10	25	3, 4, 5, (6)*
TOX® 51.25	14	37	4x45°	6	30	10	25	6, 8
TOX® 53.25	16	38	4,5x45°	10	30	10	25	10
TOX® 54.25	20	45	4,5x45°	10	35	15	30	12

* only after consulting TOX® PRESSOTECHNIK.

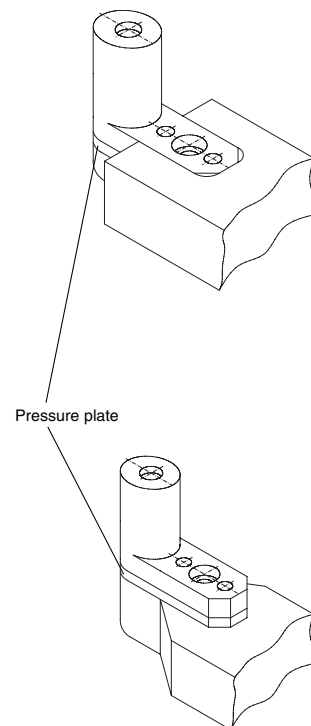
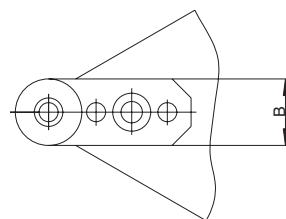
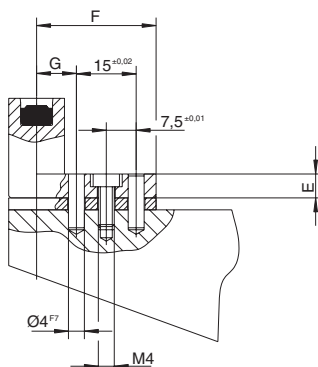
Dimensions in mm

Die with insert features an integrated oil drainage system.

Installation with groove



Installation with dowel pin



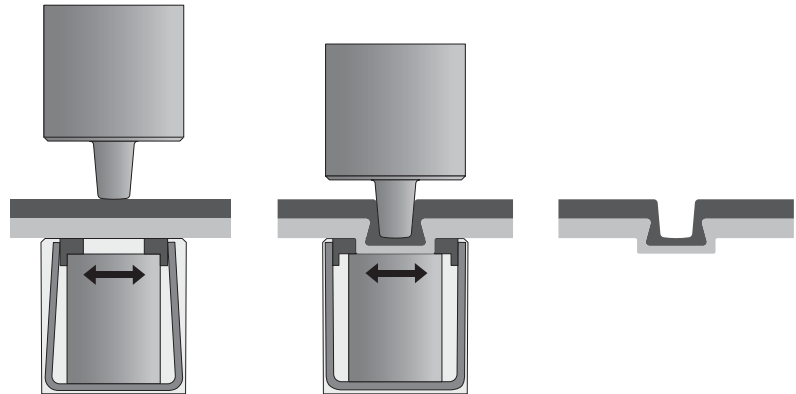
The die should always be supported by a pressure plate or hardened shim plate.

Attention: observe installation guidelines and TOX® test report

TOX® SKB die for complex clinching applications



Process sequence



This 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.

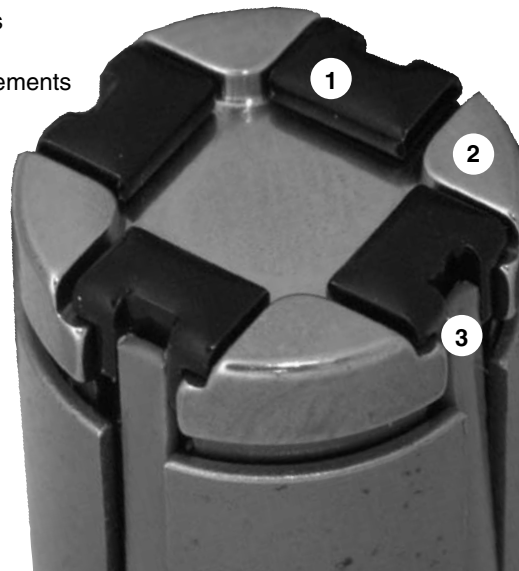
This die offers the advantages of a solid die, but at the same time eliminates the disadvantages of a die with only moving segments.

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 improved crash behaviour
- + multiple sheet joints are possible
- + can be used with all our appliances (hand-/robot tongs/presses) due to lamella protection and centering by firm parts
- + little height of joining point
- + strippers only required in special cases

SKB die

- ① lamella
- ② firm parts
- ③ spring elements

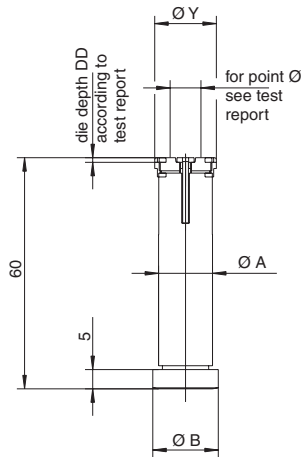


- + automatic oil drainage system. Important in case of strongly oiled metal sheets
- + **Even in the case of missing moving segments, the SKB-Die produces a very strong joint. The process reliability is immensely increased compared to a die with only moving segments.**

TOX® SKB dies

Punch shapes for flanged and side mount tools can be found under TOX® Round Joint tools (pages 6 and 7).

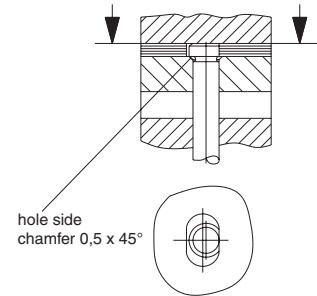
SKB flanged die



Order number Part 1 = design	Location hole		for TOX®-point Ø mm	Y**
	+ 0,018 + 0 A	B		
SKB 10.25	10	13	6,0 - 7,0	14,0
SKB 14.25	14	17	6,0 - 7,0	14,0
			8,0 - 9,0	16,0
SKB 16.25*	16	19	8,0 - 10,0	17,5

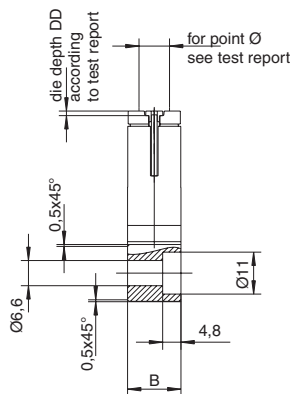
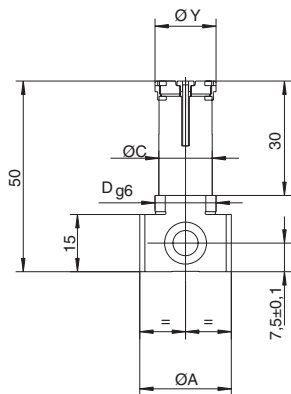
* Joining with intermediate layer (e.g. glue/textiles ..)

Y** = with max. opened die



Optional: Non-rotating die provided by flat section on the head. The tools can be mounted closer together, thereby minimizing required flange widths. Flats can be ground subsequently as needed.

SKB side mount die



Order number 1. Part = design	A	B	C _{0,1}	D	for TOX® point Ø mm	Y**
SKB 31.25	24	14	14	16	6,0 - 7,0	14,0
					8,0 - 9,0	16,0
SKB 32.25*	26	16	16	18	8,0 - 10,0	17,5

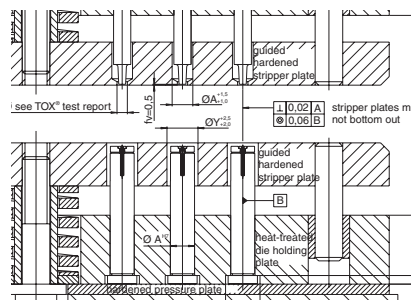
* Joining with intermediate layer (e.g. glue/textiles ..)

Y** = with max. opened die

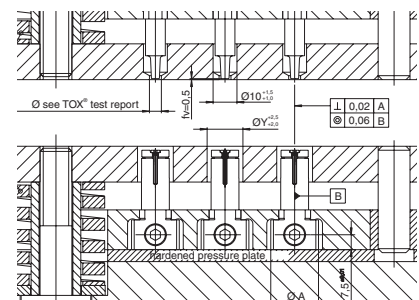
Type of installation in column-mounted die-set tool

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

Attention: observe installation guidelines and TOX® test report (see page 19 ff)



Flanged tool



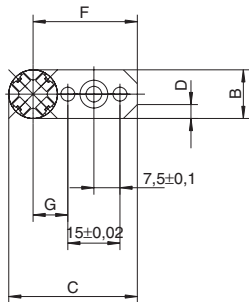
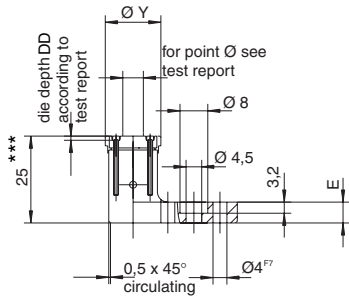
Side mount tool

SKB flat die plate, offset

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 possible on request.



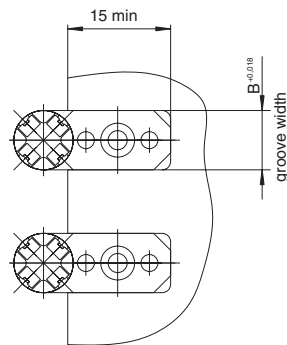
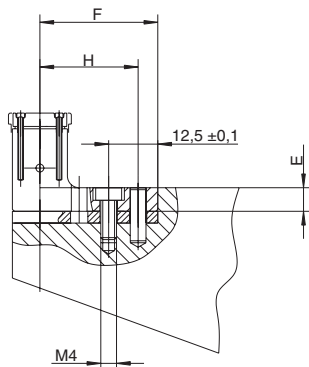
Order number 1. Part = design	B	C	D	E	F±0,02	G±0,02	H±0,02	for TOX® point	
								Ø mm	Y**
SKB 50.25	10	35	3x45°	6	30	10	25	6,0 - 7,0	14,0
SKB 51.25	14	37	4x45°	6	30	10	25	6,0 - 7,0	14,0
								8,0 - 9,0	16,0
SKB 53.25*	16	38	4,5x45°	10	30	10	25	8,0 - 10,0	17,5

* joining with intermediate layer (e.g. glue/textiles ..)

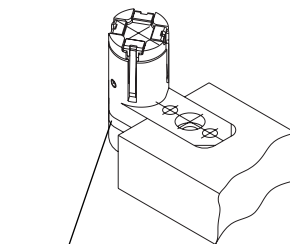
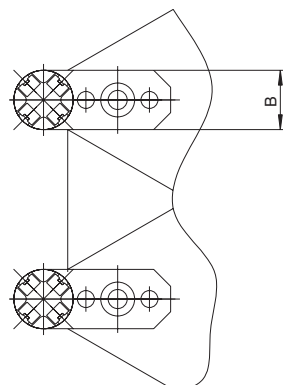
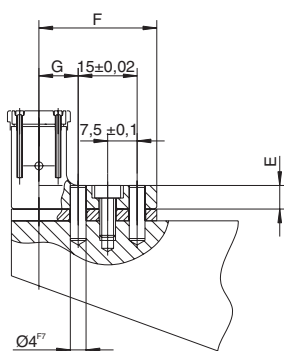
Y** = with max. opened die

*** minimum dimension 16 mm, deliverable upon request.

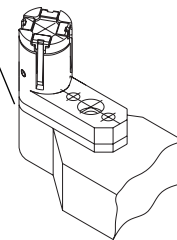
Installation with groove



Installation with dowel pin



Pressure plate

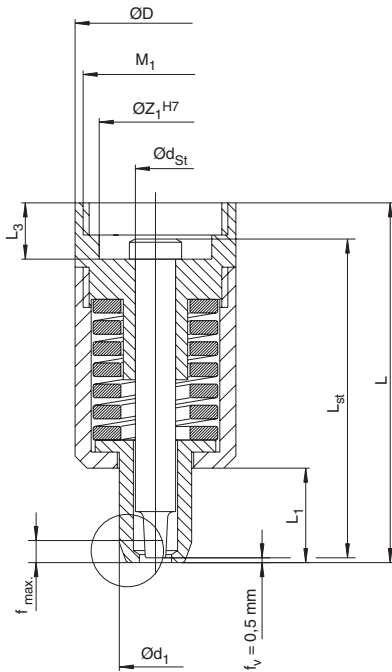


The die should always be supported by a pressure plate or hardened shim plate.

Attention: observe installation guidelines and TOX® test report (see page 19 ff)

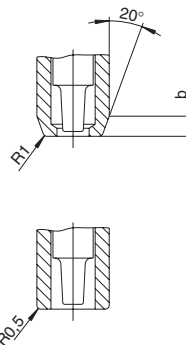
Accessories

TOX® punch stripper, round



Type: CSR

punch holder, for single and multi-point work, with punch holder installed directly on plate with holding flanges type CZE and CZW or for mounting to TOX®-Powerpackage with holding flange type CZP. TOX® tool and spring can be exchanged separately.



Standard shape

Special shape in exceptional cases

From point-Ø 10 please consult TOX® PRESSOTECHNIK.

Other special shapes available on request.

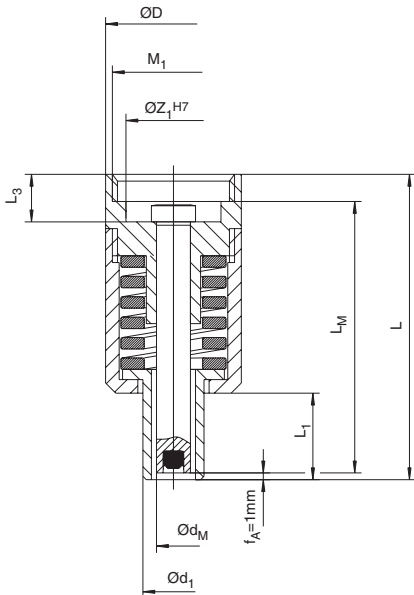
- L_{st} = length of punch
- d_{st} = diameter of punch
- F_v = pre-stressing force
- F_{max} = max. stripping force
- f_{max} = max. spring travel
- f_v = punch recessed

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

Type	L_{st}	d_{st}	$F_v(N)$	Rate of spring (N/mm)	f_{max} (mm)	F_{max} (N)	$\varnothing D$	L	$\varnothing d_1$	b	$\varnothing Z_1^{H7}$	M_1	L_1	L_3	Spring type	Recommended die stripper
CSR 25.10.060	60	10	925	370	5	2775	32	67,5	15	2,5	22	M24x1,5	11	12	CZF25	CMR 24...
CSR 25.10.080	80	10	925	370	5	2775	32	87,5	15	2,5	22	M24x1,5	31	12	CZF25	CMR 24...
CSR 25.10.100	100	10	925	370	5	2775	32	107,5	15	2,5	22	M24x1,5	51	12	CZF25	CMR 24...
CSR 32.10.080	80	10	970	485	6,3	4025	40	88,5	18	5	28	M32x1,5	23,5	13	CZF32	CMR 24...
CSR 32.10.100	100	10	970	485	6,3	4025	40	108,5	18	5	28	M32x1,5	43,5	13	CZF32	CMR 31...
CSR 38.10.080	80	10	2610	580	8,3	7425	50	90,5	22	7	28	M42x1,5	12,5	15	CZF38	CMR 24.../31...
CSR 38.10.100	100	10	2610	580	8,3	7425	50	110,5	22	7	28	M42x1,5	32,5	15	CZF38	32.../37...
CSR 51.10.100	100	10	4020	670	8,3	9580	65	110,5	24	7	40	M56x1,5	19,5	15	CZF51	all CMR

Dimensions in mm

TOX® die stripper, round



Type: CMR

die holder, for single and multi-point work, with die holder installed directly on plate with holding flanges type CZE and CZW or 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 = pre-stressing force
- F = stripping force
- f_A = stripping travel

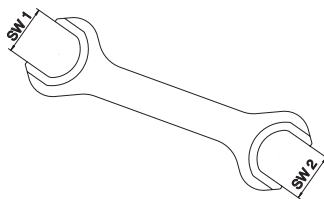
By means of the length of the TOX® tools it is possible to vary the tool space L_1 and hence the interference contour.

Type	L_M	d_M	$F_v(N)$	Rate of spring R (N/mm)	F (N)	L	$\varnothing D$	L_1	$\varnothing d_1$	$\varnothing Z_1^{H7}$	M_1	L_3	Spring type
CMR 24.14.060	60	14	900	95	995	68	32	11,5	19	22	M24x1,5	12	CZF24
CMR 24.14.080	80	14	900	95	995	88	32	31,5	19	22	M24x1,5	12	CZF24
CMR 24.14.100	100	14	900	95	995	108	32	51,5	19	22	M24x1,5	12	CZF24
CMR 25.10.060	60	10	2035	370	2405	68	32	11,5	15	22	M24x1,5	12	CZF25
CMR 25.10.080	80	10	2035	370	2405	88	32	31,5	15	22	M24x1,5	12	CZF25
CMR 25.10.100	100	10	2035	370	2405	108	32	51,5	15	22	M24x1,5	12	CZF25
CMR 31.14.080	80	14	2275	350	2625	89	40	20	18	28	M32x1,5	13	CZF31
CMR 31.14.100	100	14	2275	350	2625	109	40	40	18	28	M32x1,5	13	CZF31
CMR 32.14.080	80	14	3150	485	3635	89	40	20	18	28	M32x1,5	13	CZF32
CMR 32.14.100	100	14	3150	485	3635	109	40	40	18	28	M32x1,5	13	CZF32
CMR 37.14.080	80	14	3410	325	3735	91	50	9	22	28	M42x1,5	15	CZF37
CMR 37.14.100	100	14	3410	325	3735	111	50	29	22	28	M42x1,5	15	CZF37
CMR 38.14.080	80	14	6090	580	6670	91	50	9	22	28	M42x1,5	15	CZF38
CMR 38.14.100	100	14	6090	580	6670	111	50	29	22	28	M42x1,5	15	CZF38

Dimensions in mm

Assembly tools

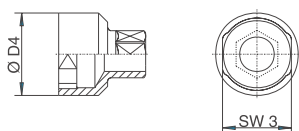
Open end wrench CZG



Fork wrench 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
CZG 36-38.00	36		CSR/CMR 25/CMR 24
CZG 46-60.00	46	38	CZP/CZW/CZE 32
		60	CSR/CMR 32/CMR 31
			CSR/CMR/CZP/CZW/CZE 38/CMR 37
			CSR/CMR/CZP/CZW/CZE 51

Special hexagon socket spanner CZN

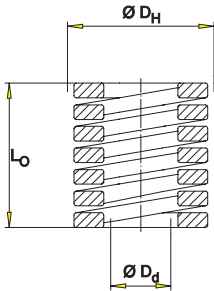


Type	SW 3	D4	appropriate for
CZN 25	30	36,5	CSR/CMR 25 CMR 24
CZN 32	38	45,5	CSR/CMR 32 CMR 31
CZN 38	46	55,5	CSR/CMR 38 CMR 37
CZN 51	60	69,5	CSR 51

TOX® spring and stripper selection

Special helical spring Type: CZF

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



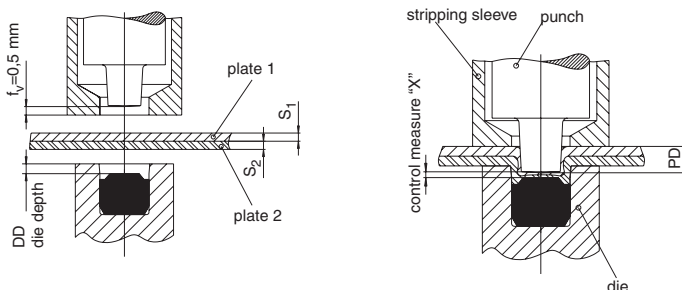
Type	Ø D _H (mm)	Ø D _d (mm)	L _o (mm)	Rate of spring R (N/mm)	Long service life 60% S _n (mm) F (N)	Average service life 80% S _n (mm) F (N)	Max. spring travel S _n (mm) F _{max.} (N)
CZF 24	25	15,2	33	93	6,3 586	8,4 781	10,5 977
CZF 25	26	12,5	31	370	4,8 1776	6,4 2368	8,0 2960
CZF 31	33	16	37	350	6,8 2394	9,1 3185	11,4 3990
CZF 32	33	16	37	485	5,7 2765	7,6 3686	9,5 4608
CZF 37	40	20	49,5	325	9,2 2984	12,2 3965	15,3 4973
CZF 38	40	20	49,5	580	7,7 4466	10,2 5239	12,8 7424
CZF 51	52	25	62	670	9,6 6432	12,8 8576	16,0 10720

Note: these springs are specially ground to avoid any side loading on the TOX® tools. Standard die springs can not be used in place of these spring

- Ø D_H = sleeve diameter
- Ø D_d = mandrel diameter
- L_o = free length
- S_n = spring travel
- F = force
- R = rate of spring ± 10 % tolerance

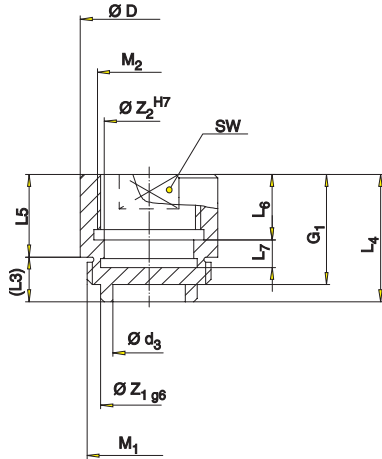
Selection of spring and stripper

1. See stripping force indicated in the test report
2. The spring is preloaded in the stripper with F_v.
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 service life 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 measure from the TOX® test report.



5. Calculation of the stripping force of stripper F
 $F = R \cdot (PD + f_v) + F_v$
 F_v = pretension 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 (see drawing item 4) in order to avoid a drawing-up of the material during the stripping process.

TOX® stripper holder

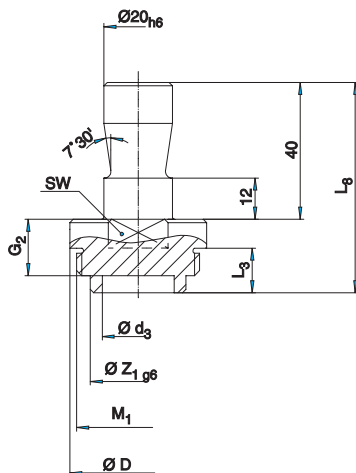


Type: CZP

Holder (hardened and ground) for stripper type CSR and CMR, for screwing onto TOX®-Powerpackage working rod.

Type	$\varnothing D_{-0,2}$	L_3	L_4	L_5	L_6	L_7	M_1	M_2	$Z_{1 g_6}$	$\varnothing Z_2^{H7}$	$\varnothing d_3$	G_1	SW	Power-package
CZP 25.01	31,8	12	38	26	14	7	M24x1,5	M22x2	22	18	18	33	27	S/K 4
CZP 25.02	39,8	12	44	32	19	8	M24x1,5	M30x2	22	26	18	39	36	S/K 8-15
CZP 32.01	39,8	13	36	23	14	7	M32x1,5	M22x2	28	18	21	31	36	S/K 4
CZP 32.02	39,8	13	45	32	19	8	M32x1,5	M30x2	28	26	21	40	36	S/K 8-15
CZP 38	49,8	15	42	27	19	8	M42x1,5	M30x2	28	26	21	37	46	S/K 8-15
CZP 51	64,8	15	44	29	19	8	M56x1,5	M30x2	40	26	25	39	60	S/K 8-15

Dimensions in mm

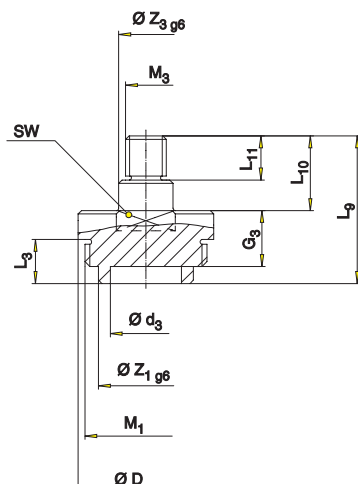


Type: CZW

Holder (hardened and ground) for stripper type CSR and CMR, adaptable on plate side.

Type	L_3	L_8	$\varnothing D_{-0,2}$	M_1	$Z_{1 g_6}$	$\varnothing d_3$	G_2	SW
CZW 25	12	60,5	31,8	M24x1,5	22	18	15,5	27
CZW 32	13	61,5	39,8	M32x1,5	28	21	16,5	36
CZW 38	15	63,5	49,8	M42x1,5	28	21	18,5	46
CZW 51	15	64,5	64,8	M56x1,5	40	25	19,5	60

Dimensions in mm



Type: CZE

Holder (hardened and ground) for stripper type CSR and CMR, for screwing into plate.

Type	$\varnothing D_{-0,2}$	L_3	L_9	L_{10}	L_{11}	M_1	M_3	$Z_{1 g_6}$	$\varnothing Z_3 g_6$	$\varnothing d_3$	G_3	SW
CZE 25	31,8	12	43	22	13	M24x1,5	M12x1,5	22	16	18	16	27
CZE 32	39,8	13	43,5	22	13	M32x1,5	M12x1,5	28	16	21	16,5	36
CZE 38	49,8	15	45,5	22	13	M42x1,5	M12x1,5	28	16	21	18,5	46
CZE 51	64,8	15	49,5	25	15	M56x1,5	M20x1,5	40	24	25	19,5	60

Dimensions in mm

TOX® Process Monitoring System

The process at a Glance

NETWORK

Please see our catalog
"TOX®-Controls" for more
detailed information.

TOX^{soft}Ware
Ethernet
Interbus/ProfiNet/Profibus
RS 232/485
PLC

1. Technical Basis

The **TOX®-Test Report** with all pertaining data for the TOX® application:

- Press force
- TOX® quality control dimension "X"
- Rivet length for TOX®-ClinchRivet applications
- Micrograph of TOX® Joint cross section

These data provide guaranteed strength values for the TOX® Joint and quality control values to ensure repeatability of your manufacturing process.

2. Logistics

The **TOX®-Tool Data Sheet** is included with each delivery of tools. Maintenance personnel can find all relevant information here:

- Tool description
- TOX® quality control dimension "X"
- TOX® Joint Visual Analysis sheet

This ensures that the process maintains a constant quality.

3. Quality Assurance in Production

TOX® process monitoring means tested and documented quality. All technological characteristics and quality criteria of the TOX® round joint also apply to the TOX®-ClinchRivet.

Monitoring parameters

- pressing force
- travel

Functional principle:

Force sensors measure the pressing force at the joining points. A position indicator monitors the attainment of control dimension "X" (quality dimension). Once the position indicator signals that control dimension "X" has been reached, the pressing forces measured by the load cells are compared with the nominal pressing forces. The TOX® point is satisfactory if the measured pressing force lies within the preset tolerance range. The remaining bottom thickness X is proportional to the head pull and shear strength of the joint, provided the joining parameter and the TOX® tool life are being observed.

The dimension and evaluation parameters differ in case of the different TOX® joining procedures. Please call us for details.

4. Service

With the **TOX®-Data Base**, TOX® PRESSOTECHNIK provides an information platform in which all relevant information about the tools and their application is stored. Customers are guaranteed to obtain current information and assistance on their specific application by TOX® PRESSOTECHNIK.

The TOX® Process Monitoring System CEP 400 / 400T, applicable for clinching and joining process



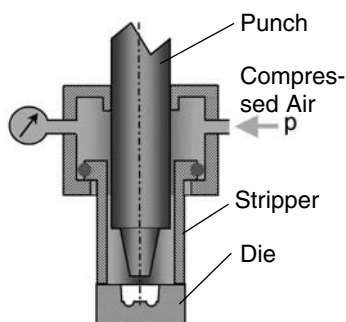
- Provides important data about process status
- Special clinching monitoring using window technique
- Up to 64 check programs can be selected
- Real names for program memory, up to 40 characters
- 64 sensor configurations per channel
- 4 password levels: operator, setup technician, integrator, end user
- 8 digital I/O's
- Status indicator menu of digital I/O ports
- Stores up to 100 values with time stamp
- Includes TOX^{soft}Ware for parameterization and data recording

- Display of TOX® Control Dimension "X" (absolute value)
- Choice of mounting style with enclosure IP 54
- Backlit display
- Membrane keyboard for up to 2 channel units
- TFT, transmissive, graphics capability, 5,7" TFT LCD VGA (640x480) at 4-/8-/12-channel units
- RS 232 for parameterization
- Ethernet interface allows for network communication unlimited

Optional Expansion:

- Profibus interface DP
- CANopen Gateway for implementation of all standard Bus systems, Interbus, ProfiNet, ...
- Process sequence control for TOX® clinching processes
- Service modules such as
 - Remote modem access
 - Test control unit to check measuring cycle
- Analog output 0 – 10 V
- Evaluation unit for bench top presses TOX®-FinePress

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 tool life quantity
- + Increase production reliability
- + Maximum tool life usage

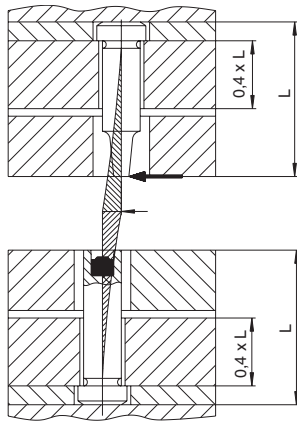
For detailed information, see TOX® Data Sheet 80.06.

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.

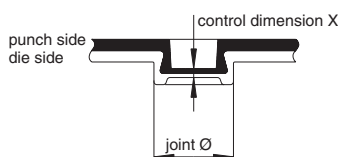
Important: the stripper should not touch the TOX® tools, otherwise there is a risk of tool breakage due to transverse forces. It is essential that the alignment tolerance should be maintained between the punch and die (see method of installation).



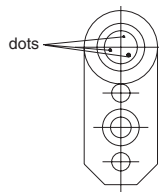
These tolerances ensure the flexible bearing which is so important for the TOX® process.

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).

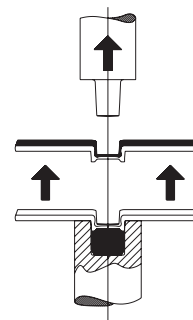
Operating safety precautions:

Tools must **not be closed without material**. Without material, the surface pressure at the 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.

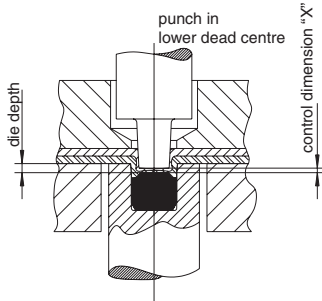
Withdrawing the punch or die violently without the stripper can cause deformation of the TOX® point and reduce its durability.

There is also a risk of breaking the TOX® tools. Excessively **high** stripping forces affect the shaping process and reduce durability.

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

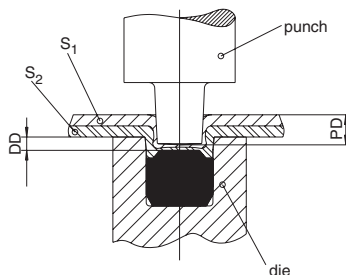


The **strength** of the holding fixtures must be able to stand up to the pressure loads of the TOX® tools in continuous operation. The press force is set according to the Test Report and the pressure area according to the tool shaft diameter or contact area.

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).



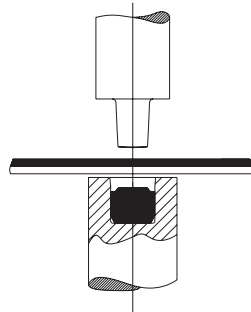
calculation of PD = penetration depth
 $PD = S_1 + S_2 + DD - X$

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

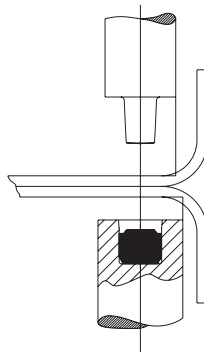
Data from TOX® test report

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.

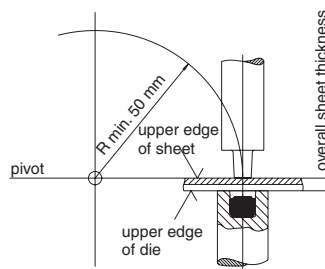


There is a risk of breakage as the tool shank hits the **bending radius**. The shoulder of the TOX® tools should, therefore, not make contact with the sheet.



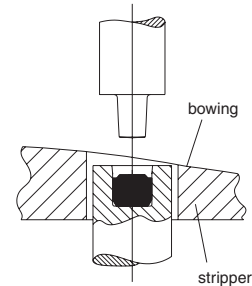
Equipment with circular tool movement, e. g. TOX®-Power-Kurver.

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:**

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

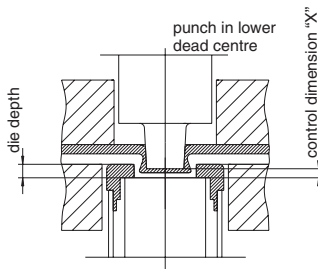
Punch and die changes are necessary in case of:

- 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 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:



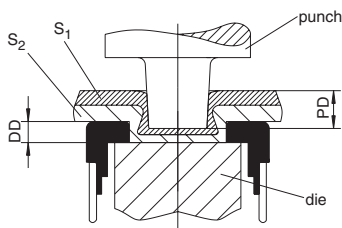
Attention:

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)

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

S₁ = thickness of material punch side

S₂ = thickness of material die side

DD = die depth

X = control dimension X

Data from TOX® test report

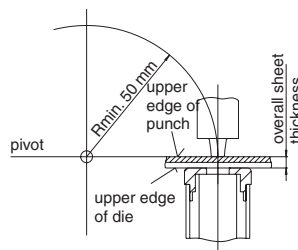
Withdrawing the punch or die violently without the stripper can cause deformation of the TOX® point and reduce its durability. There is also a risk of breaking the TOX® tools. Excessively **high** stripping forces affect the shaping process and reduce durability.

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/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.

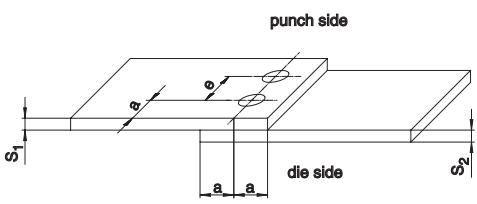
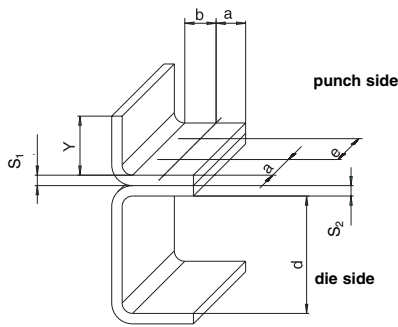
Design guidelines for TOX® users

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	8	10	12	6	8	8**	10	
Point diameter	preferred series											
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.

TOX® efficiency

Sheet material

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

Sheet thickness

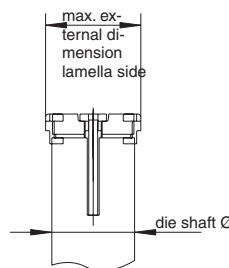
- same thickness
- thick in thin 2.5 : 1
thin in thick 1:2
- min. single thickness approx. 0.2 mm
- max. overall thickness approx. 12.0 mm

Recommendation

hard (punch side)
soft (die side)

Recommendation

thick (punch side)
thin (die side)



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

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.

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>Your name and address:</p> <p>Tel.-No.</p> <p>Fax-No.</p> <p>E-Mail</p> <p>Your TOX® PRESSOTECHNIK contact person:</p>	<p>Choose from following TOX® Test alternatives:</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 Free of charge <input type="checkbox"/></p> <p>Additional to 1.:</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>Additional to 1. or 2.:</p> <p>3. Joining of component samples. Quantity pcs. Effort required, estimated by yourself:hrs x EUR 63,- = <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: 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 26 best possible		Round joint or variant (see catalog Joining Systems):
Material (punch side):		Material (die side):
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 rd layer inbetween <input type="checkbox"/> no <input type="checkbox"/> yes, Material:		Thickness: Coating:

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

Please send more information about:			
<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, -FinePress	<input type="checkbox"/> TOX®-Punching, Coining and Press-Fitting	
<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"/>			



Our Worldwide Sales and Service Network

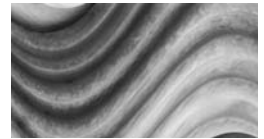
TOX® PRESSOTECHNIK GMBH & CO. KG
 Riedstrasse 4
 D-88250 Weingarten
 Tel. +49 (0) 7 51 / 50 07-0
 Fax +49 (0) 7 51 / 5 23 91
 E-Mail: info@tox-de.com
www.tox-en.com

Product Range

TOX®-Powerpackage



TOX®-PowerKurver



TOX®-ElectricDrive



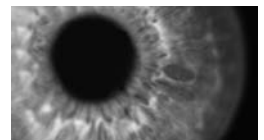
TOX®-FinePress



TOX®-Presses



TOX®-Controls
 TOX®-Monitoring



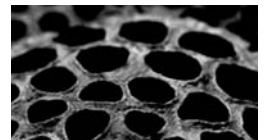
TOX®-Joining-
 Systems



TOX®-Tongs



TOX®-Punching
 TOX®-Coining



TOX®-Press-Fitting



TOX®-Production
 Systems

