EJOT®

EJOT FDS®

The self piercing and extruding screw for high-strength sheet joints

FDS®

EJOT® The Quality Connection

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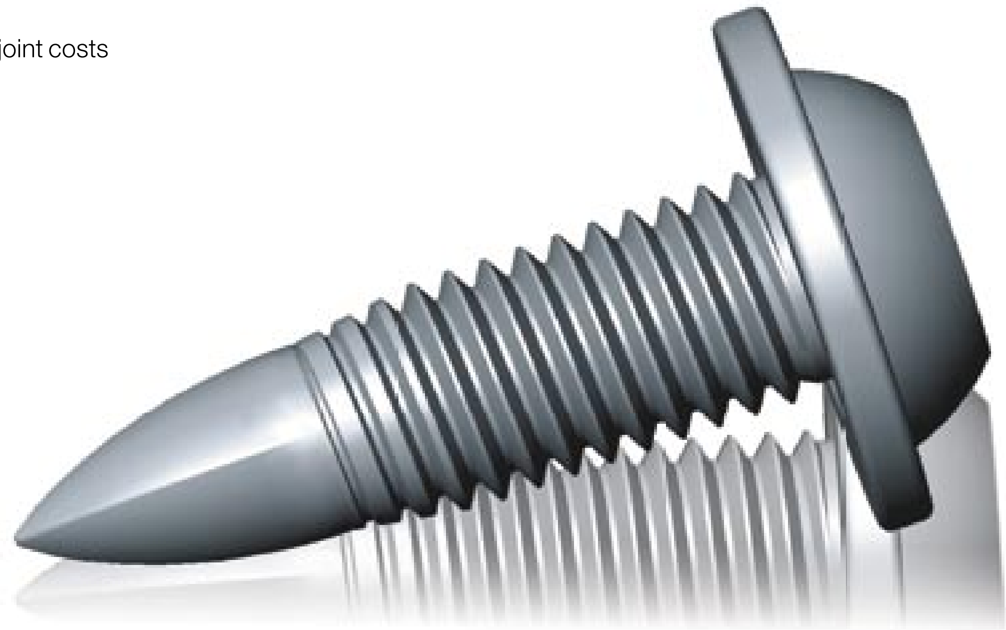
All technical data may be subject to technical improvements.

Convincing facts about the EJOT FDS® joint

- removable and highstrength screw joint, without part preparations like punching or drilling
- no problems regarding hole overlapping of clearance and pilot hole
- no material waste while forming the through draught / no chips during thread forming
- several metric threads are engaged
- safety margine concerning a large distance between installation and stripping torque
- high shearing strength and pull-out force
- assembly in different sheet surfaces is possible
- high break loose torque and vibration resistance
- repeat assemblies also possible by using standard maschine screws (ordinary)
- earthing assemblies (e.g. to DIN VDE 0700 or UL) are practical
- easy to disassemble and recyclable
- low overall joint costs



example in practice: white-good industry

example in practice: automotive industry

Secure screw joints for steel and aluminium sheets

Steel is still the most dominating material for designs within the sheet metal industry due to its advantageous characteristics in terms of processing and application. But steel is increasingly in competition to specific lighter materials i.e. aluminium. Knowing this, the steel industry has developed a number of new steel sheet materials in recent years, which are showing higher strength by equal good deformation qualities. Besides the common cold-rolled soft steels DC01-DC06 (according DIN EN 10130) as the typical steel for deep-drawing, micro alloyed thin sheets with higher yield strength H240M (ZStE 260) – H400M (ZStE 420) according DIN EN 10268 (SEW093) and Dual-Phase steels type DP according SEW 097 part 2 are worth mentioning. Both materials play a significant roll in the field of high strength steel sheet assemblies.

In the automotive industry, not hardenable AlMg and AlMgMn alloys from the 5000er group and thermic hardenable AlMgSi alloys from the 6000er group, in strength grade T4 up to T6, are being used mainly - grades T4 / T5 for sheet materials and grade T6 preferably for extrusions.

The maximum exploitation of the respective properties for those steel and aluminium materials requires often reconsidering of the common assembly technique, in particular by joining together different materials.

The flow drilling EJOT FDS® Screw opens up new possibilities for high strength screw joints, due to the increase of thread engagement in the formed trough draught.

The female metric thread, formed without chips during insertion process, is to DIN and therefore enables a standard machine screw being used for repair purposes.

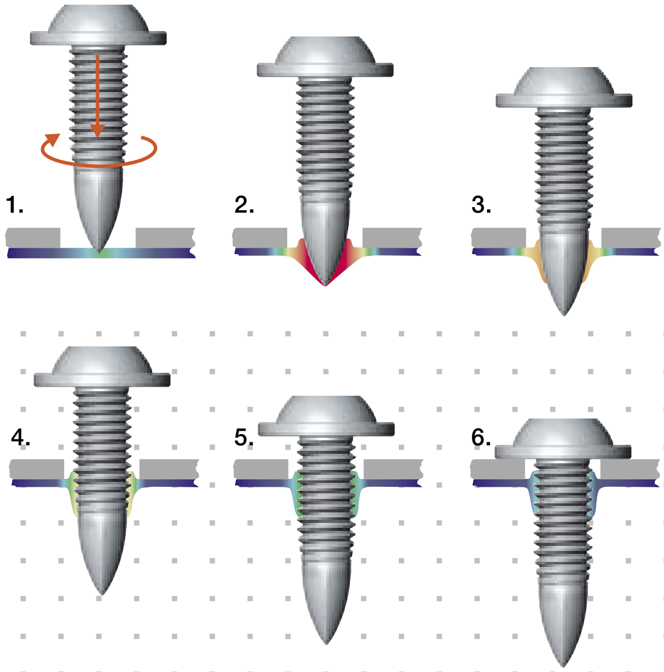
Due to the backlash-free thread engagement of several metric threads, the screw joint is waterproof and gastight and withstands also high pull out and shear forces. The created heat during the through draught forming process is below the needed temperature for the recrystallization of assembly materials and therefore harmless. The FDS® assembly is regarded as a heat poor assembly method. Due to the remaining temperature in the joint after the initial assembly, shrinking of the through draught onto the screw thread takes place. High dynamic safety of the screw joint is achieved with this effect.

Therefore additional safety elements like locking patches can be eliminated.

Due to the lack of component preparation like drilling or punching, known tolerance issues and lining up of clearance holes are things of the past. The possibility of one sided assembly with FDS® makes an installation into hollow profiles or extrusions possible without holding-up.

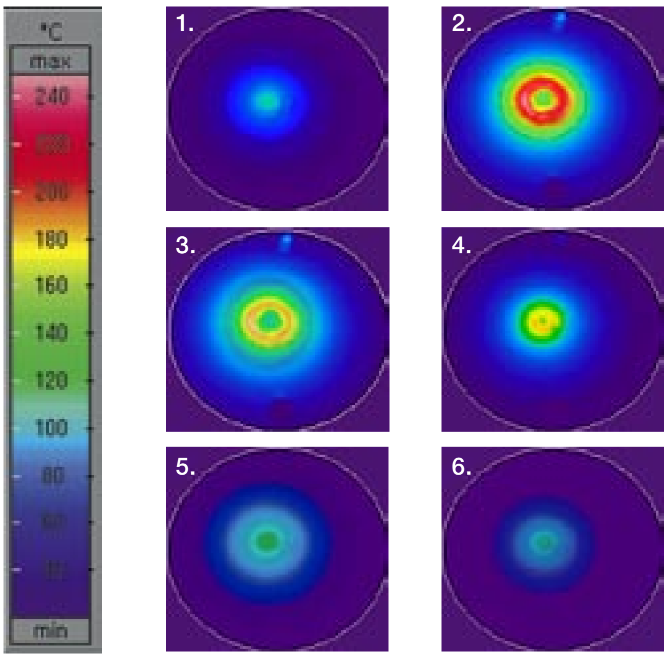
Stages of the FDS® assembly

1. Warming up the sheet metal by end load and high speedl
2. Penetration into the material
3. Forming of the through draught
4. Chipless forming of female machine thread
5. Engagement of full threads
6. Tightening with the pre-set torque



Temperature pictures of a FDS® joint

1. Heating
2. Penetrating
3. Through draught forming
4. Thread forming
5. Engangement of full threads
6. Tightening



Fastening parameter

Material:	0,8 mm steel plate DC 04 (without pilot hole)
Screw:	EJOT FDS® M 3,5
Driver speed:	2300 rpm

Designs

Due to the multipurpose application structure of sheet assemblies, several types of the EJOT FDS® fastener have been developed.

The type Standard is usually prefered for full automatic assembly without pilot hole.

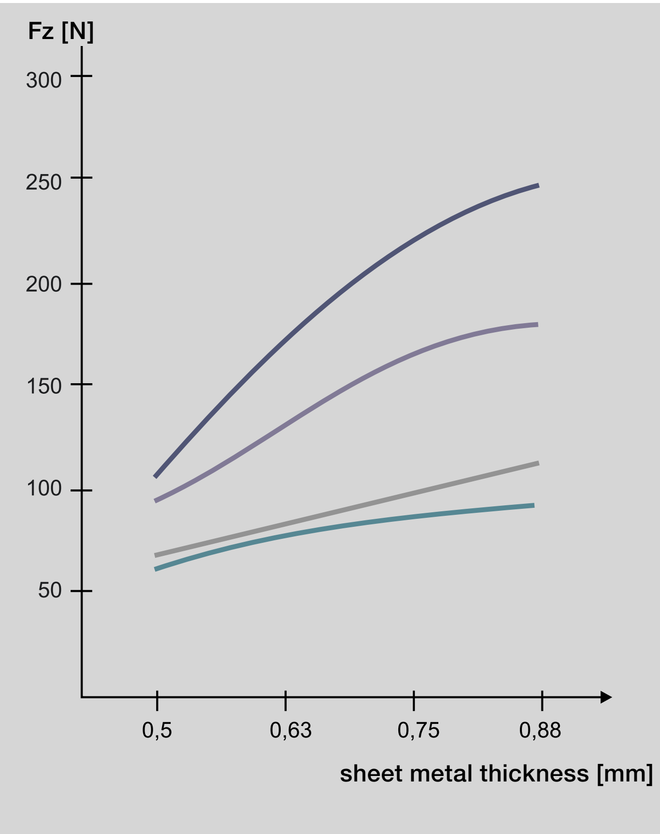
For simple manual assembly a pilot hole in combination with the type PKS is useful.

For manual assembly without a pilot hole, the type BS is recommended. Only in this case please consider the swarf (chips) during the drilling process.

Concerning the types PKS and BS the process of prepunching respectively drilling facilitates the penetration into the sheet metal. The necessary end load for the assembly can be reduced by about 50 %. As the diameter of the pilot hole or of the drill point is smaller than the core diameter of the screw, a through draught is formed of the remaining sheet metal as well.

The bottom diagram on page 11 shows corresponding diameters for prepunched holes.

End load as a function of the screw point type and prepunching at constant assembly times

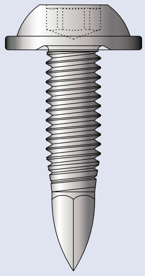
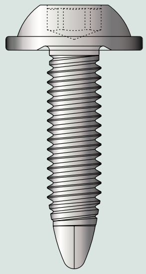
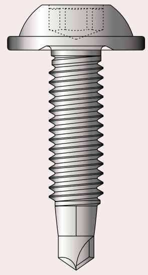


type standard without prepunching

type standard with punch mark 60°

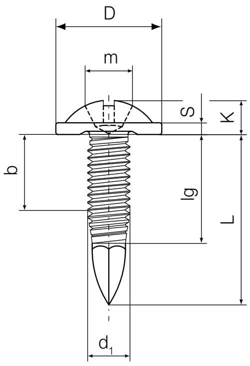
type PKS with prepunching
at 0,50 mm sheet metal thickness Ø 2,2 mm
at 0,63 mm sheet metal thickness Ø 2,4 mm
at 0,75 mm sheet metal thickness Ø 2,6 mm
at 0,88 mm sheet metal thickness Ø 2,8 mm

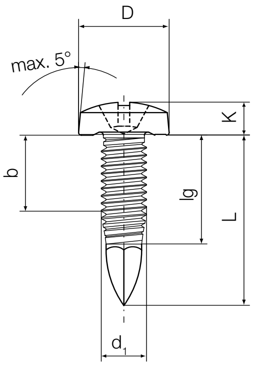
type BS with drill point Ø 2,4 mm

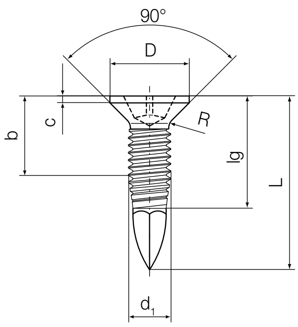
Type	Standard	PKS	BS
FDS®			
Screw material	case hardened mild steel	case hardened mild steel, stainless steel	case hardened mild steel
Surfaces	Chrom VI-free surfaces: zinc clear / blue passivated zinc clear / blue passivated + EJOSEAL (240h resistance to Zn-corrosion) ZnFe or ZnNi, transparent passivated (with or without black top coats) zinc flake coatings (with or without black top coats) ZnNi / black passivated Different plating upon request!		
Application	fastening without prepunching	fastening with prepunching	fastening without prepunching
Installation material	steel 0,3 - 2,0 mm aluminium 0,3 - 3,5 mm magnesium 1,0 - 3,5 mm	steel 0,4 - 2,0 mm aluminium 0,4 - 3,0 mm magnesium 1,0 - 3,5 mm stainless steel 0,4 - 1,5 mm	steel 0,4 - 2,0 mm aluminium 0,4 - 3,0 mm magnesium 1,0 - 3,5 mm
Characteristics	fastening without prepunching tolerance-free assembly, because of no misalignment with clearence hole suited espacially for automated assembly extremly high joint strength onesided assembly ideal screw for safe assembly and dynamic loads the through draught is about 3 times as high as the original sheet metal thickness	pilot hole diameter about half the nominal screw diameter due to the bigger clearance hole compare to the smaller pilot hole, some tolerances can be compensated (S. 11) preferable for manual assembly low end load onesided assembly despite the pilot hole there is high process safety and joint strength the through draught is about twice as high as the original sheet metal thickness	fixing into unpunched sheet metals tolerance-free assembly, because of no misalignment with clearence hole suited for automated and manual assembly low end load onesided assembly high joint strength the through draught is about twice as high as the original sheet metal thickness

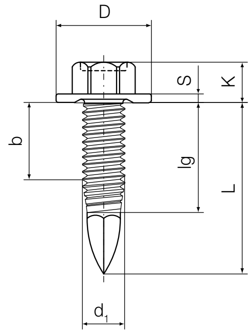
Designs

WN 2141	WN 2142	WN 2143	WN 2147

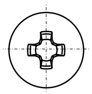




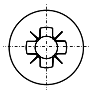




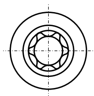
H-cross recess



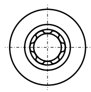
Z-cross recess



TORX®



TORXplus® / AUTOSERT®

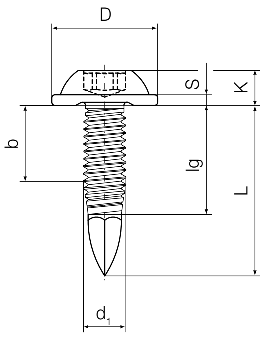


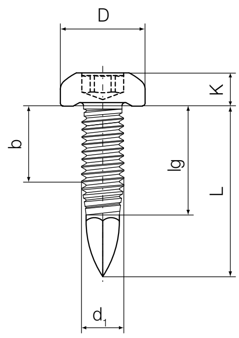
In case of manual assembly with TORX® it is recommended to use a TORXALIGN® bit, e.g. STICK FIT bits by TORX PLUS® drives.

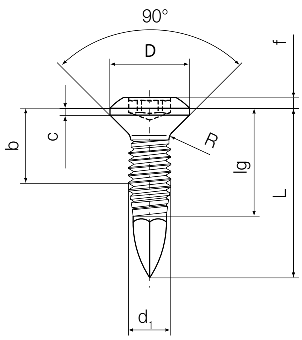
All cross recess and TORX® drives are also available as combi drives.

EJOT FDS®	Nominal-Ø			M 3	M 3,5	M 4	M 5	M 6
	External thread-Ø		d_1	3,0	3,5	4,0	5,0	6,0
WN 2141	Head-Ø		D	7,50	8,50	10,00	12,00	14,00
	Head height		K	2,40	2,50	3,20	4,00	4,60
	Washer thickness		s	0,80	0,90	1,10	1,30	1,50
	H-cross-recess	penetration depth	t min.	1,07	1,33	1,98	2,24	2,84
			max.	1,70	1,96	2,61	2,90	3,50
	Z-cross-recess	penetration depth	t min.	1,08	1,40	2,01	2,27	2,91
			max.	1,54	1,86	2,47	2,73	3,37
	Cross size H/Z			1	2	2	3	3
WN 2142	Head-Ø		D	6,00	7,00	8,00	10,00	12,00
	Head height		K	2,40	2,70	3,10	3,80	4,60
	H-cross-recess	penetration depth	t min.	1,70	1,74	2,04	2,77	3,03
			max.	2,00	2,24	2,54	3,27	3,53
	Z-cross-recess	penetration depth	t min.	1,68	1,65	1,90	2,64	3,02
			max.	1,93	2,11	2,36	3,10	3,48
	Cross size H/Z			1	2	2	2	3
WN 2143	Head-Ø		D	5,60	6,50	7,50	9,20	11,00
	Cyl. head height		c_{max}	0,55	0,55	0,65	0,75	0,85
	Radius		R_{max}	0,80	0,95	1,00	1,30	1,60
	H-cross-recess	penetration depth	t min.	1,50	1,40	1,90	2,10	2,80
			max.	1,80	1,90	2,40	2,60	3,30
	Z-cross-recess	penetration depth	t min.	1,48	1,34	1,60	2,05	2,46
			max.	1,73	1,80	2,06	2,51	2,92
	Cross size H/Z			1	2	2	2	3
WN 2147	Washer-Ø		D	7,50	8,30	9,00	11,00	13,00
	Head height		K	3,00	3,40	3,80	4,30	5,00
	Washer thickness		s	0,60	0,80	0,80	1,00	1,20
	Width across flats		SW	5,00	5,50	5,50	7,00	8,00

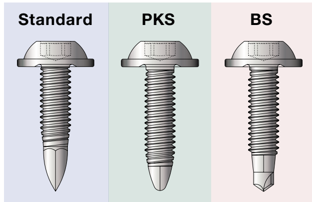
WN 2151	WN 2152	WN 2153	ambit







All WN-specifications according to types:



Example of ordering:

Description of EJOT FDS® screw Ø 4 mm and length 20 mm

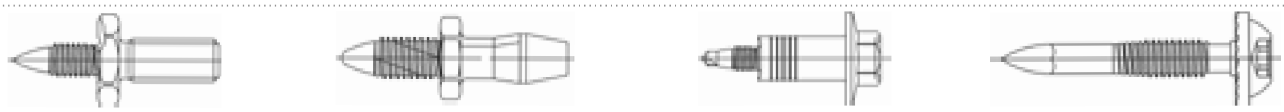
a) type Standard with Z-cross recess according to WN 2141: **EJOT FDS® screw M4 x 20 WN2141-Z**

b) type PKS with TORX® recess according to WN 2152: **EJOT FDS® screw M4 x 20 PKS WN2152**

c) type BS with hexagonal heat according toWN 2147: **EJOT FDS® screw M4 x 20 BS WN2147**

EJOT FDS®	Nominal-Ø		M 3	M 3,5	M 4	M 5	M 6
	External thread-Ø	d_1	3,0	3,5	4,0	5,0	6,0
WN 2151	Head-Ø	D	7,50	8,50	10,00	12,00	14,00
	Head height	K	2,40	2,60	3,30	3,60	4,20
	Washer thickness	s	0,70	0,80	1,00	1,20	1,40
	TORX®		T10	T15	T20	T25	T30
		$A_{max.}$	2,80	3,35	3,95	4,50	5,60
	Penetration depth	t min.	1,00	1,20	1,40	1,60	2,00
		t max.	1,30	1,50	1,80	2,00	2,40
WN 2152	Head-Ø	D	6,00	7,00	8,00	10,00	12,00
	Head height	K	2,40	2,70	3,10	3,80	4,60
	TORX®		T10	T15	T20	T25	T30
		$A_{max.}$	2,80	3,35	3,95	4,50	5,60
	Penetration depth	t min.	1,00	1,20	1,40	1,60	2,00
		t max.	1,30	1,50	1,80	2,00	2,40
WN 2153	Head-Ø	D	5,60	6,50	7,50	9,20	11,00
		» f	0,75	0,90	1,00	1,25	1,00
	Cyl. Head height	c_{max}	0,55	0,55	0,65	0,75	0,85
	Radius	R_{max}	0,80	0,95	1,00	1,30	1,60
	TORX®		T10	T15	T20	T25	T30
		$A_{max.}$	2,80	3,35	3,95	4,50	5,60
	Penetration depth	t min.	1,00	1,20	1,40	1,60	2,00
		t max.	1,30	1,50	1,80	2,00	2,40

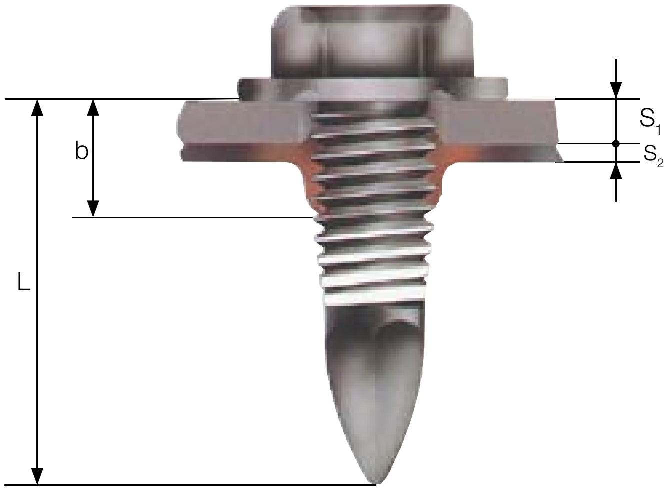
Special variations / Examples



Special variations are available.
Please contact the EJOT application engineers to realize your multifunctinal design.

EJOT FDS®

Design recommendations



In many applications the EJOT FDS® can be used with existing products.

The following notes are for the design of existing and new products.

The **usable thread length b** of EJOT FDS® screws is depending on the part's thickness S_1 and the metal sheet thickness S_2.

It is given by:

b = S_1 + 3 x S_2 without prepunching (type Standard)
b = S_1 + 2 x S_2 with prepunching (type PKS and BS)

The corresponding nominal screw length L can be taken from the accompanying table below.

Example
S_1 = 4,50 mm, S_2 = 0,75 mm:

without prepunching
b = (4,50 + 3 x 0,75) mm = 6,75 mm

with prepunching
b = (4,50 + 2 x 0,75) mm = 6,00 mm

For an FDS® M5 Standard (unpuched) the accompanying table provides a usable thread length of b = 6,90 mm according to a nominal length of L = 18 mm.

For assembly with prepunching therefore a FDS® M5 x 14 PKS with usable thread length of b = 6,20 mm according to a nominal length of L = 14 mm.

Manufacturing range

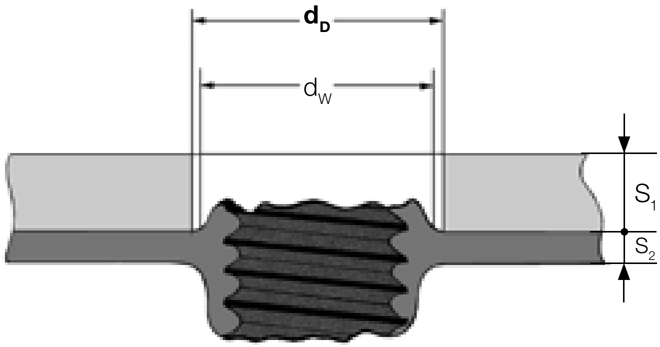
EJOT FDS® screw	M3			M3,5			M4			M5			M6		
	Standard	PKS	BS	Standard	PKS	BS	Standard	PKS	BS	Standard	PKS	BS	Standard	PKS	BS
Length L [mm]	Usable thread length b [mm]														
9 + 0,4	2,40	4,70													
10 + 0,8	3,40	5,70		2,40	4,90	4,60									
12 + 0,8	5,40	7,70		4,40	6,90	6,60	3,10	5,70	5,40						
14 + 0,8	7,40	9,70		6,40	8,90	8,60	5,10	7,70	7,40	2,90	6,20	6,10			
16 + 0,8	9,40	11,70		8,40	10,90	10,60	7,10	9,70	9,40	4,90	8,20	8,10	2,90	6,60	5,90
18 + 0,8	11,40	13,90		10,40	12,90	12,60	9,10	11,70	11,40	6,90	10,20	10,10	4,90	8,60	7,90
20 + 0,8	13,40	15,70		12,40	14,90	14,60	11,10	13,70	13,40	8,90	12,20	12,10	6,90	10,60	9,90
25 + 0,8				17,40	19,90	19,60	16,10	18,70	18,40	13,90	17,20	17,10	11,90	15,60	14,90
30 + 0,8				22,40	24,90	24,60	21,10	23,70	23,40	18,90	22,20	22,10	16,90	20,60	19,90
35 + 1,0							26,10	28,70	28,40	23,90	27,20	27,10	21,90	25,60	24,90
40 + 1,0							31,10	33,70	33,40	28,90	32,20	32,10	26,90	30,60	29,90
45 + 1,0										33,90	37,20	37,10	31,90	35,60	34,90
50 + 10										38,90	42,20	42,10	36,90	40,60	39,90
55 + 1,0										43,90	47,20	47,10	41,90	45,60	44,90
60 + 1,0													46,90	50,60	49,90
70 + 1,0													56,90	60,60	59,90

Special lengths upon request.

– – – – = minimal length for WN2143 und 2153

Recommended clearance hole d_D [mm]
By flowdrilling, a small portion of the formed part is flowing opposite to the fastening direction and creating a bulge that has to be accommodated by the upper part's clearance-hole. Therefore we recommend the following hole diameter.

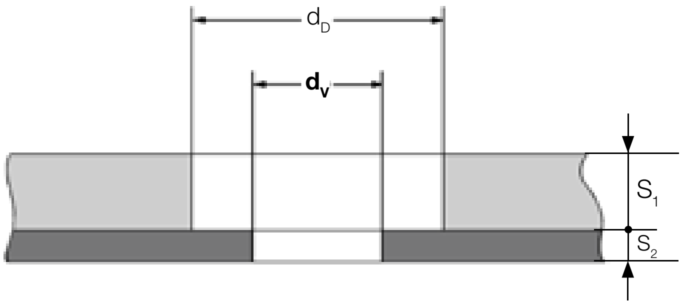
FDS®	M3	M3,5	M4	M5	M6
d_D	3,6 - 4,0	4,3 - 4,8	5,1 - 5,7	6,7 - 7,4	8,2 - 9,1



Clearance hole d_D for clamped material
d_W : bulge diameter
d_D : clearance hole

Recommendation hole diameter d_V [mm] for type PKS
The optimum hole diameter depends on the respective requirement and is stipulated in an application specific way.

FDS®		M3	M3,5	M4	M5	M6
sheet thickness S_2 in mm	0,5	1,0 - 1,5	1,2 - 1,7	1,5 - 2,0	1,8 - 2,5	-
	0,63	1,2 - 1,6	1,4 - 1,8	1,5 - 2,2	1,8 - 2,5	2,0 - 3,0
	0,75	1,4 - 1,8	1,5 - 2,0	1,5 - 2,5	2,0 - 2,8	2,0 - 3,2
	0,88	1,6 - 2,0	1,6 - 2,2	1,8 - 2,5	2,0 - 3,0	2,5 - 3,5
	1,00	-	1,8 - 2,4	2,0 - 2,8	2,5 - 3,5	2,5 - 3,8
	1,25	-	2,2 - 2,6	2,2 - 2,8	2,8 - 3,8	3,0 - 4,5
	1,50	-	-	2,6 - 3,2	3,2 - 3,8	3,6 - 4,8
	1,75	-	-	-	3,4 - 4,0	3,8 - 5,0
	2,00	-	-	-	3,7 - 4,2	3,8 - 5,0



Pilot hole d_V for the installation part (type PKS)

d_V : pilot hole diameter
d_D : clearance hole

Note for manual assembly
For manual assembly into sheet metal thicker than: steel > 0,80 mm; Aluminium > 1,25 mm a higher end load is necessary. As a result we recommend the use of either a pilot hole or our FDS® type BS.

Another possibility is employing the use of a pneumatic end load initiated drive tool, which allows a manual assembly in sheet metal thicknesses up to 1,50 mm (steel) and 2,00 mm (aluminium) without installation part preparation.

When fastening into sheet metal steel > 2,0 mm we recommended the use of the EJOT Spiralform® screws or EJOT drill screws, for aluminium > 3,5 mm the use of the EJOT ALtracs® screws.

For more informations about the design and design or assembly recommendations please contact:
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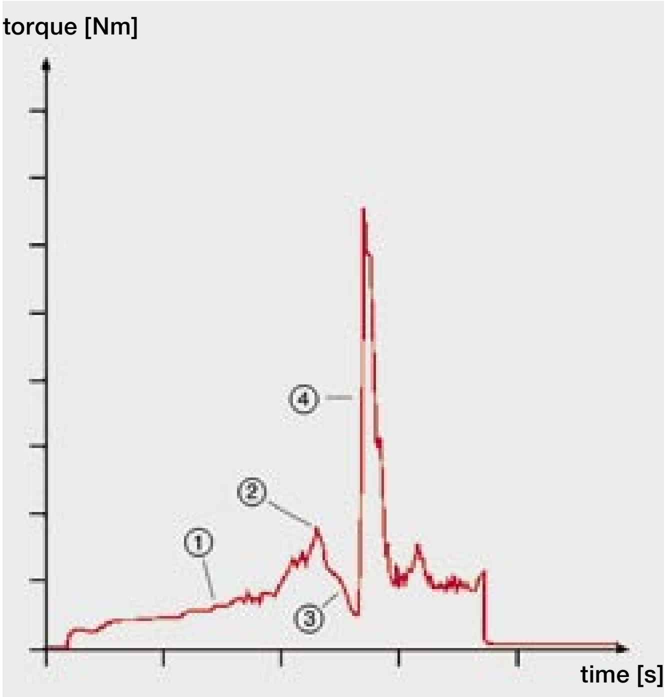
fax +49 2752 109-268
e-mail: hotline@ejot.de



Fastening

During the fastening process the following graph of the installation torque can be observed over time.

① Through draught forming

② Thread forming

③ Engagements of full threads

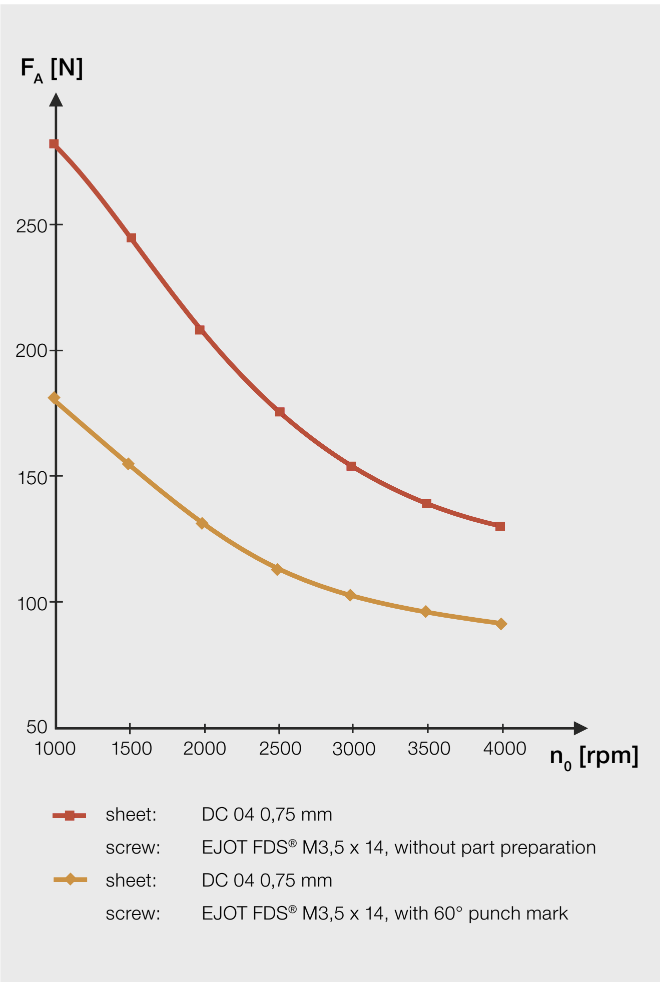
④ Tightening

The fastening time which is necesarry for EJOT FDS® mainly depends upon the flowdrilling process.

Parameters are:

- Screw diameter
- Type of screw point
- driver tool speed
- sheet thickness
- sheet quality / material specification
- end load
- part preparation yes / no

Corresponding data for your application purpose will be established for you.



Driver Tool Selection

For the flowdrilling process a certain end load and a high driver speed are necessary as well as a certain driver torque for thread forming and tightening. This combination of high speed and torque requires powerful driver tools, which have been developed in cooperation with several tool manufacturers.

Generally all well-known manufacturers of manually and automatically operating driver tools are offering corresponding devices in their programmes. Driver tools should basically be used with a speed of 2000 to 5000 rpm.

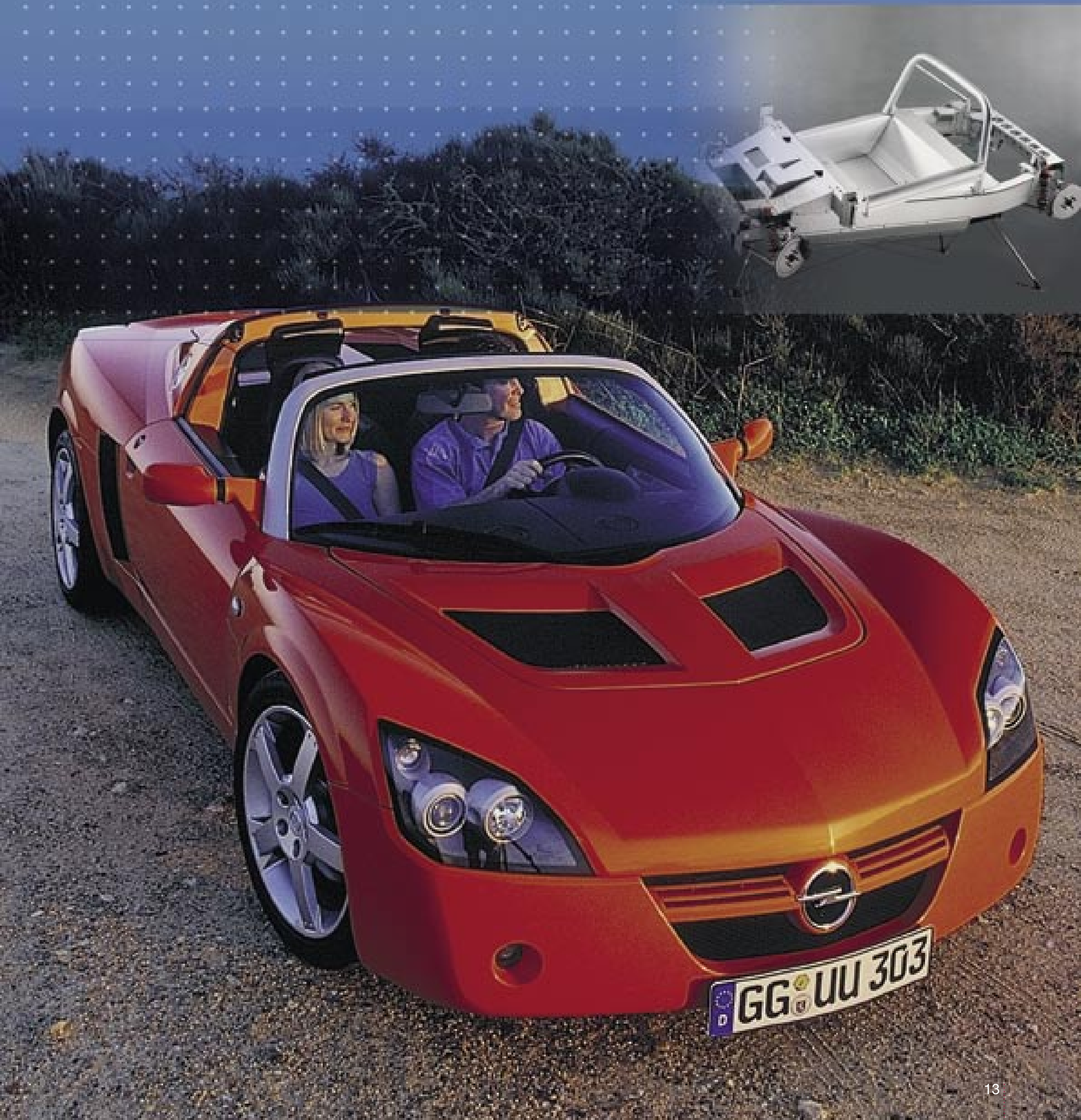
The necessary assembly data like driver speed and tightening torque are depending on

- sheet thickness
- material strength
- surface treatment
- material of the clamped part
- requirements of the screw joint.

For manual assembly pneumatic screw drivers with adjustable shut-off clutch are most common.

For fully automated assembly both pneumatic and electric spindels (brushless DC or AC motor) are suitable.

To check the influence of these parameters, often an assembly test is recommended, which could be carried out in the laboratory EJOT APPLITEC.


GG UU 303

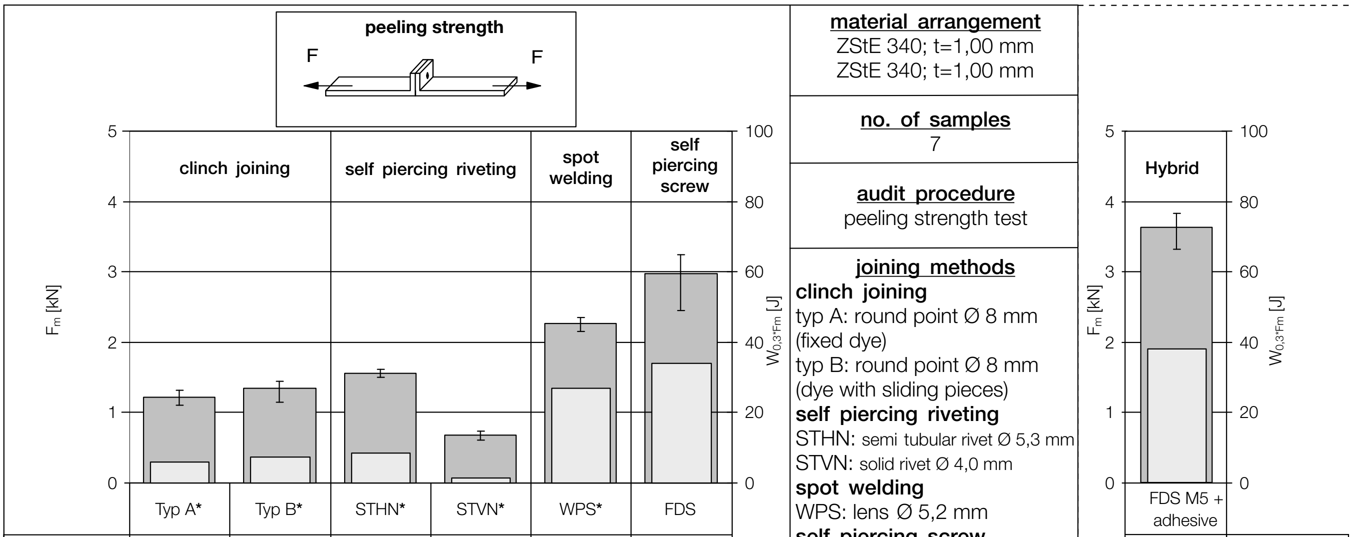
EJOT FDS®

Properties in use

In comparison with mechanical joining methods and spot welding the University at Paderborn (Germany), has tested the FDS® assembly regarding peeling and shearing strengthness.

Shown are the results of the FDS® joining, the mechanical methods of clinch joining and self piercing riveting and spot welding.

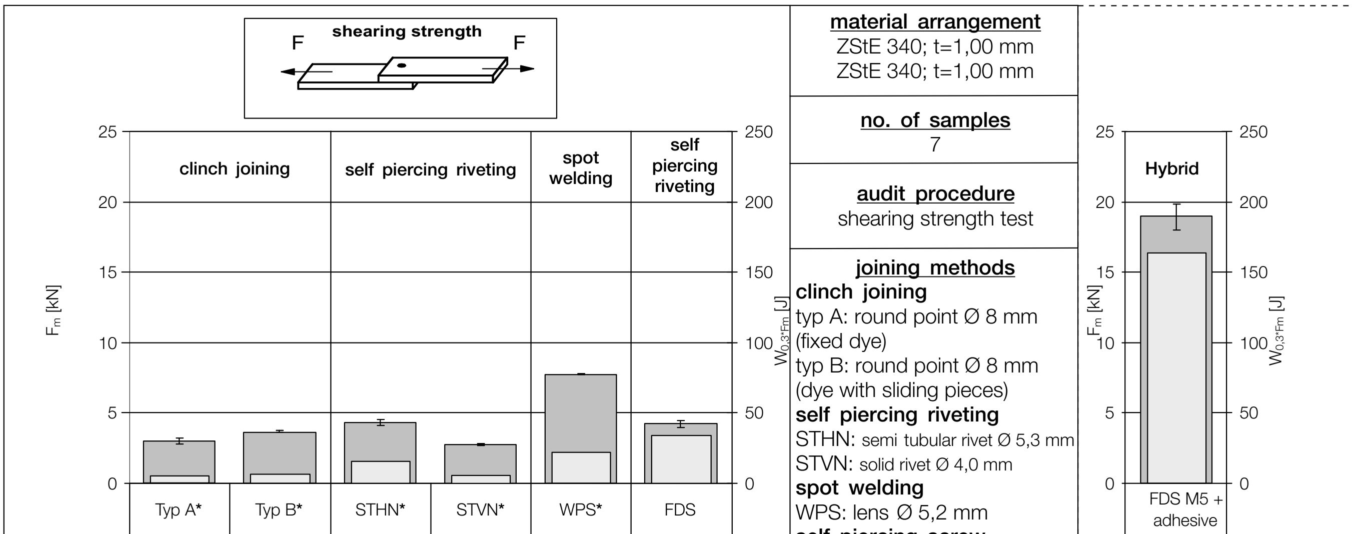
Beside the two diagrams an additional figure shows the strengthness of an FDS® joint with adhesive bonding (Hybrid).



	Typ A*	Typ B*	STHN*	STVN*	WPS*	FDS	FDS M5 + adhesive
Fm [kN]	1,21	1,35	1,56	0,68	2,27	2,98	3,63
W0,3Fmax [J]	5,86	7,35	8,58	1,29	26,94	33,92	37,87

* *Hahn, O.; Schulte, A.: Ergebnisse aus P 283 "Eignung des Durchsetzfügens und des Stanznietens zum Fügen höherfester Stahlbleche", Studiengesellschaft Stahlanwendung e.V., 1995*

peeling strength F_m and energy absorption $W_{0,3*Fm}$ of different joining methods in steel (ZStE 340)



	Typ A*	Typ B*	STHN*	STVN*	WPS*	FDS	FDS M5 + adhesive
Fm [kN]	2,96	3,64	4,29	2,75	7,74	4,23	18,96
W0,3Fmax [J]	4,61	6,23	15,41	5,72	22,23	33,69	163,78

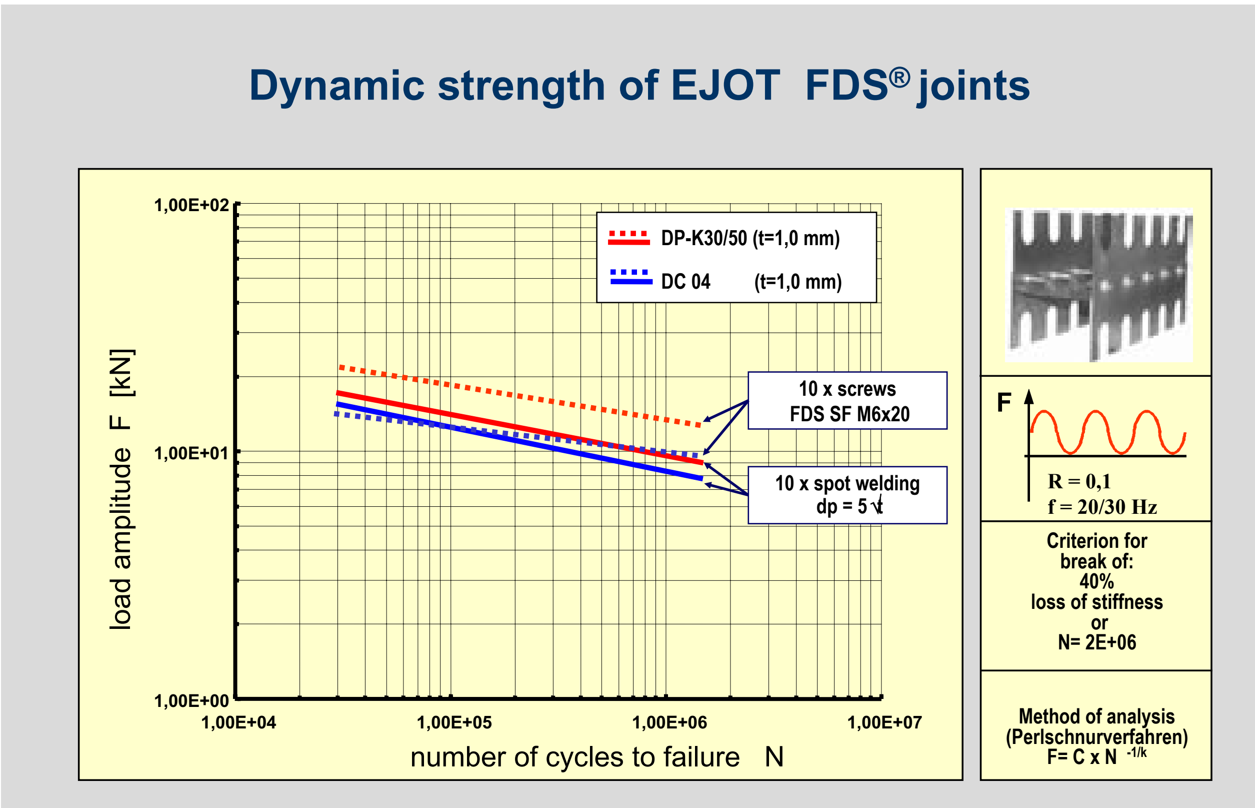
* *Hahn, O.; Schulte, A.: Ergebnisse aus P 283 "Eignung des Durchsetzfügens und des Stanznietens zum Fügen höherfester Stahlbleche", Studiengesellschaft Stahlanwendung e.V., 1995*

shearing strength F_m and energy absorption $W_{0,3*Fm}$ of different joining methods in steel (ZStE 340)

To be able to take full advantage of the high-strength steels'material properties, it is necessary to choose suitable joining methods.

Spot welded samples, e.g. of dual-phase steel DP-K30/50 and soft unalloyed steel DC 04, show a 2 up to 3 times higher fatigue behaviour under cyclic load.

When choosening the joining method of EJOT FDS® ,the fatigue behaviour of component samples of dual-phase steel is strongly improved by factor 10 again, compared to the soft unalloyed steel.



A company of ThyssenKrupp Steel ThyssenKrupp Stahl

Influence of joining method and sheet steel grade of fatigue strength

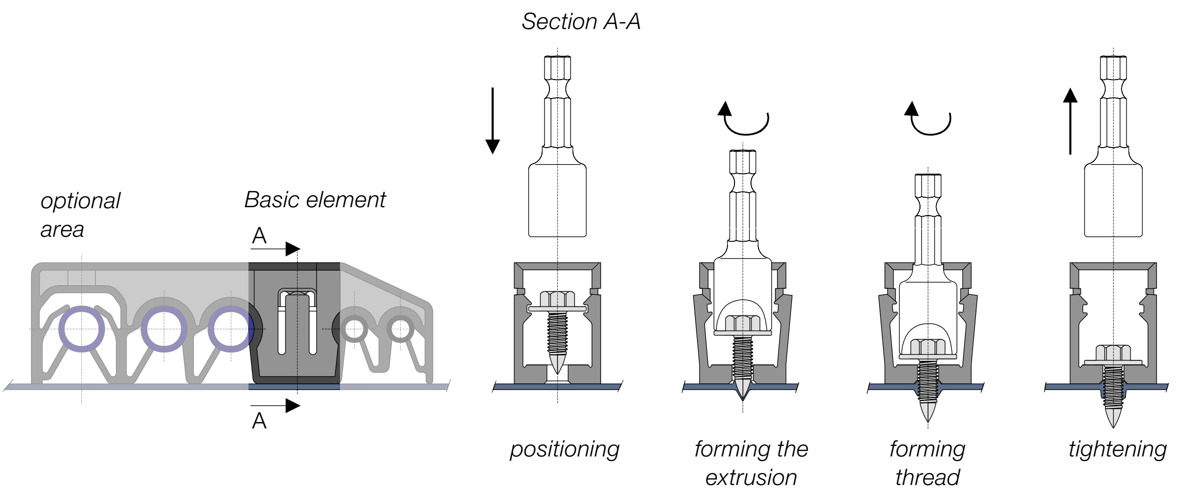
Types of the basic element (examples)

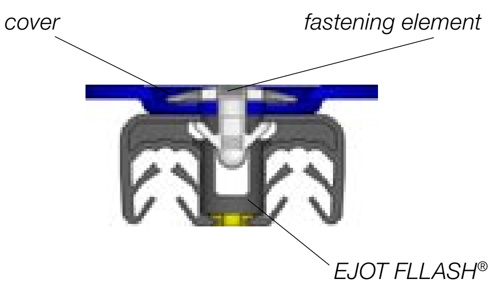
Example:
EJOT FLLASH®
The innovative fastening system not only for tube and fluid lines.

EJOT FLLASH® is a combination of a thermoplastic clip and an integrated EJOT FDS® screw. The system for a safe, chipless and tolerance independent assembly. Expensive prepunching or stud welding can be omitted.

Benefits:

- no prepunching or weld stud assembly required
- process-safe and chipless assembly
- free positioning, i.e. independeny of tolerances
- captive- pre-assembly screw
- self-locking and sealing screw joint
- easy to assembly / disassemble
- suitable for automated assemblies
- low overall assembly costs
- simple integration by applying modular basic elements or application-specific solutions

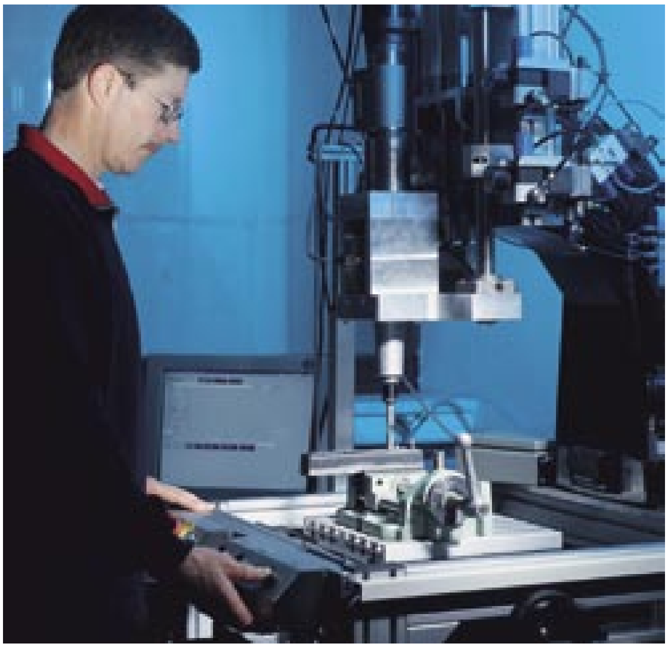




In addition to actual automotive projects many other applications in different industries are possible. Different types of the EJOT FLLASH® can be designed according to customer demands. The EJOT FLLASH® concept allows a captive integration of the screw.

In addition to the FLLASH® product group, EJOT has developed a fastening system which allows to fasten additional elements, like covers and other components.

Test rack at APPLITEC



Internal seminar

Design Consultation

A major consideration of today's product manufacture is the basic need to be cost competitive. Significant in achieving this objective is the design process. No other part of the cost structure is influenced more than by design.

Generally speaking, the development of a product, which represents about 10% of the overall costs, determines about 70% of the costs for the final product.

Often the design of the fixing is considered to be of low importance; however, it is the fastener that holds the components together to make the finished product. With this in mind the design engineer should consider which fastening method to use during the design conception stage to avoid expensive design changes late on in the design process or even when the product goes into production.

To assist our customers in this process EJOT offers support during the design stage through comprehensive application engineering services. These services provide accurate information on product performance and result in design recommendations that can be used safely on the production line.

Application Engineering Consequent

By continuously working with our customers and their application problems, EJOT has amassed a comprehensive understanding of fastener technique that has lead to a number significant of innovations. It is our goal to continually improve our products to meet the ever increasing demands of our customers.

In addition to our highly qualified Engineers and application-engineering advisers, we offer the service of our application laboratory known as the EJOT APPLITEC. In the APPLITEC we carry out test procedures on our customer's applications that enables us to thoroughly analyse the strength and capability of their parts. It is here that new fastening techniques are also developed.

The knowledge EJOT has gained over the years is passed on to our customers finding the most effective solution supporting their efforts in establishing rational fastening and assembly techniques. Detailed test reports, on site technical advice, acknowledged seminars and technical publications demonstrate our continued commitment to impart our knowledge.

Test report

Logistic and Data Exchange
It is our aim to keep procurement and warehousing costs as low as possible by simultaneously offering product availability and quality.

With respect to simplified procuring processes, EJOT offers a variety of cost reducing procedures and services. The continued analysis of our customer's demands and advanced logistics procedures are leading to high availability of our products. Skeleton contracts and delivery schedules via electronic data interchange facilitate and accelerate the processing times of our products.

Quality for Automated Assembly
Successful automated assembly means high availability of the assembly machine. A significant impact on this can be expected from the fasteners grade of purity. Historically, the standard quality in commercial fastener manufacture is not sufficient for today's high quality requirements since originally it has been designed for mainly manual assembly.

EJOT introduced the EJOMAT® Quality to ensure the most costly effective usage of our customer's automated assembly machines.

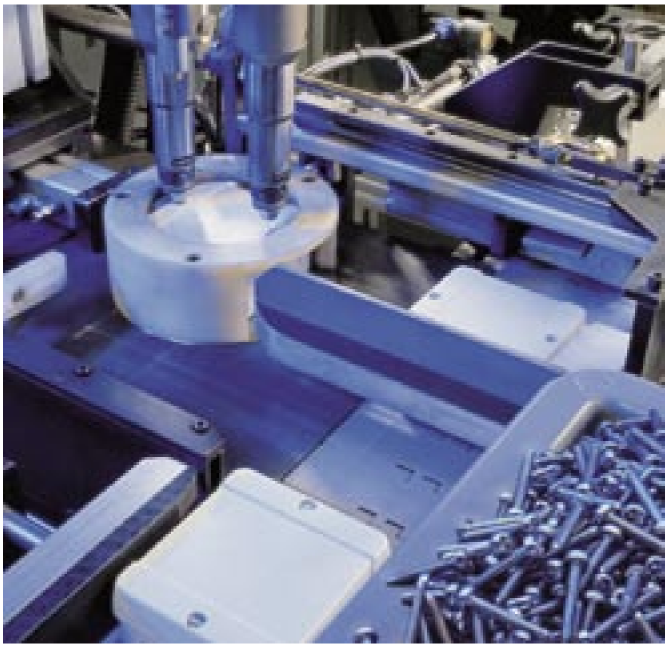
The grade of purity offered by EJOMAT® quality is 10 times higher than the usual standard quality which means increased availability of assembly machine and decreased assembly down time costs.
EJOMAT®, quality that pays for itself.

EJOT Sales Organization
In addition to EJOT companies throughout Europe a growing number of Licensees in North & South America and Asia ensures that product availability and local support is Global.

Contact details can be found on our Homepage www.ejot.de.

GFA GLOBAL FASTENER ALLIANCE

Modern PPS-systems lead to high accuracy in supplying and short through put times



EJOMAT® for fully automated assembly

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