The EJOT DELTA PT® Fastener

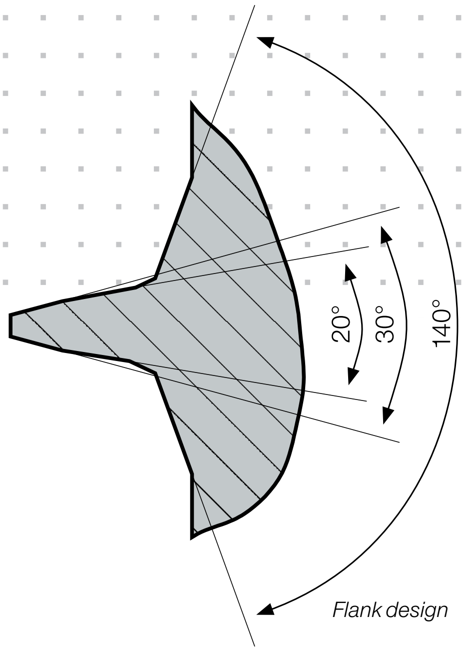
Predictable performance improvement for thermoplastics

EJOT® The Quality Connection

The product

Benefits of the EJOT DELTA PT®

- Minimal radial tension due to optimized flank angle
- High clamp loads
- High tensile and torsion strength
- Increased cycle stress stability
- High strength under vibration
- DELTA PT® prognosis programme allows a clamp load oriented engineering
- Long lifetime of the joint
- Minimization of hydrogen embrittlement by use of through hardened steel [PT10]



Flank design

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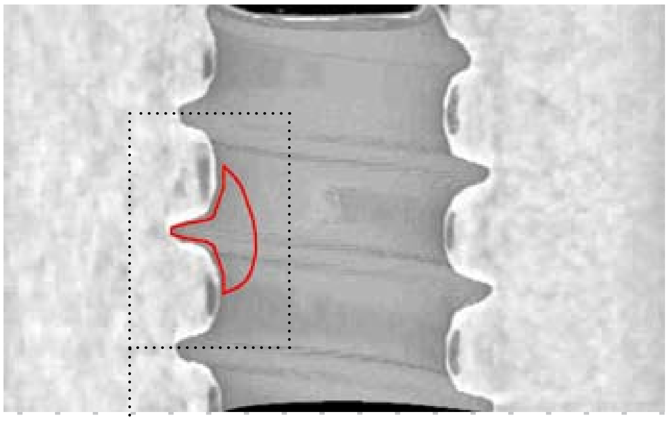
Predictable performance improvement

New possible fields of application for high-quality plastics

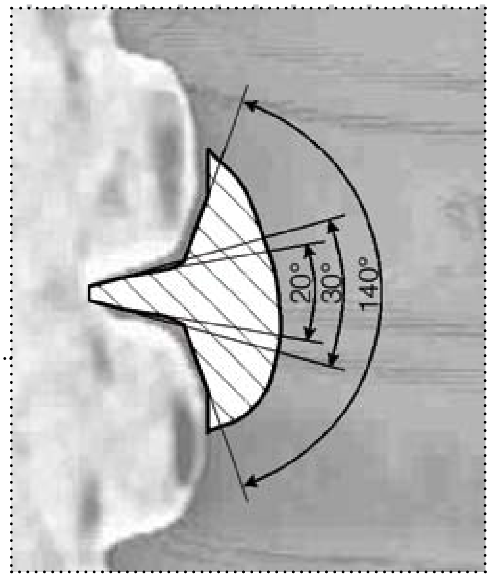
Nowadays sometimes alternative materials are considered for components that used to be made of die cast light alloys. Modern technical plastics open up new possibilities because of their improved design potential or for reasons of weight reduction or recycling. Still the question of how to securely fasten these components remains unanswered or is considered very late, even though support is available during the design process already.

When machine screws are being used a variety of existing tables and formulas for joint design are known. For self-tapping assembly in the high-class technical plastics, often no sufficient information is available. In most cases the parameters for assembly still have to be determined, whereas standard screws are often not qualified for assembly in plastics.

The material strength of modern technical plastics is nearly comparable to that of cast light metal. Furthermore the possible temperature range is very high so that high class plastics can be used in the automotive industry, where so far only cast light metal was suitable. This opens up new fields of application, thus the according fastening solution has to be available.



Macro detail

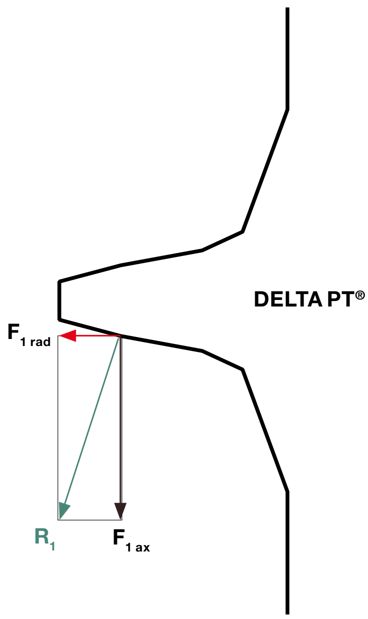


Analysis of material displacement

For the above mentioned reasons EJOT carried out fundamental tests that led to the development of the EJOT DELTA PT® screw.
The flank geometry was optimized after the consequent analysis of the material displacement during the thread grooving process. The deformation of the material takes place with minimal resistance, which guarantees damage-free flow of the material.

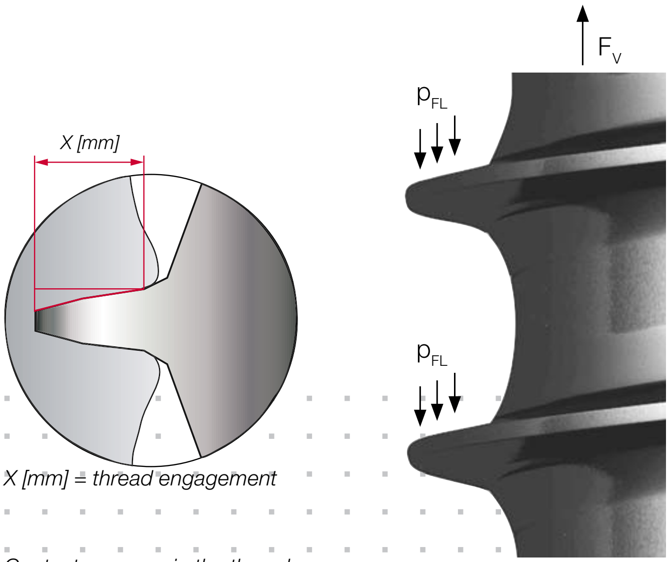
Minimal radial tension

The optimized thread flank angle of the EJOT DELTA PT® screw reduces the radial stress compared to common 60° flank angles of sheet metal screws.
The 20° respectively 30° angle creates only minor radial tension and therefore allows thin-wall design.
The bigger force in axial direction allows an optimum flow of the displaced material.

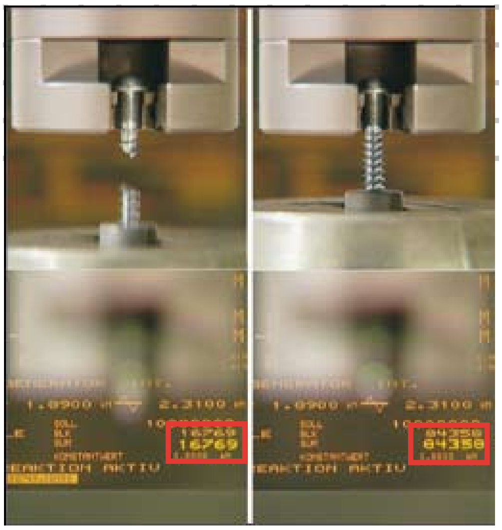


Forces at the thread flank

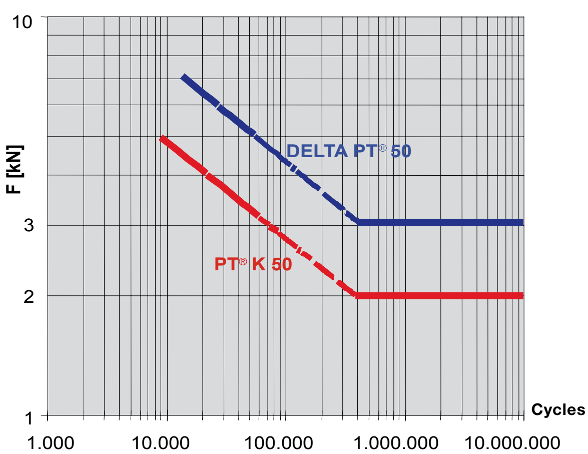
Predictable performance improvement



Contact pressure in the thread



PT® *DELTA PT®*
Fatigue strength comparison;
Breakage of the thinner fastener cross section (PT®) at lower cycle rate



„Wöhler" graph of PT® and DELTA PT® screw, tensile stress oscillatory;
Increased fatigue strength of DELTA PT® by 50% compared to PT®

High clamp loads

According to general valid construction guidelines the existing contact pressure has to be smaller than the permissible contact pressure. If the existing contact pressure is too high, it may lead to damages of thermoplastic components.

A major influence is executed by thread coverage and thus the thread pitch. The optimum helix angle of the pitch was developed by optimizing the relation between the highest possible clamp load and low contact pressure in the plastic material. Thus a higher flank coverage at equal installation depth can be achieved. This leads to the possibilty of cost reduction.

High tensile and torsion strength

The enlarged core diameter increases the tensile and torsion strength. As a result of this, even in high-filled thermoplastics higher tightening torques and better clamp loads are being achieved.

Increased fatigue durability

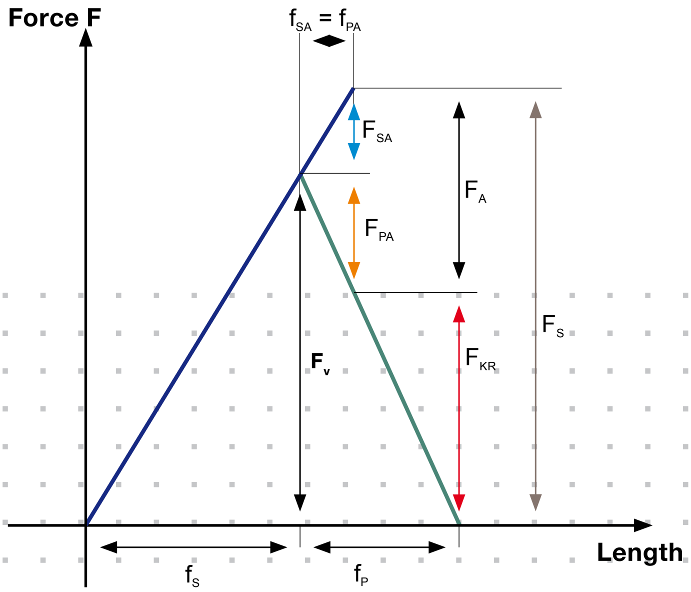
The fatigue durability is essentially improved by an extended core diameter and an optimum thread design.

The reinforced thread root improves the safety against flank breakage. The optimized pitch allows a better flank engagement and, therefore, provides better conditions against stress fracture of the thread flank.

The comparison between the „Wöhler" graph of the PT® and the DELTA PT® screw in the dimension 50 (= 5.0 mm diameter) shows an increase of the fatigue strength by factor 1.5.


$M_Ü$
Drehmoment
Zerstörung des Kunststoffgewindes
3
Aufbringen einer Vorspannkraft
Aufliegen des Schraubenkopfes
2
M_E
M_{Reib}
$M_E = M_{Form} + M_{Re}$
M_{Form}
1
M_E = Einschraubmoment
$M_Ü$ = Überdrehmoment

Predictable performance improvement



Stress diagramm

- F_v clamp load
- F_{SA} additional axial screw deformation force
- F_{PA} force to unload component
- F_A operating load
- F_{KR} remaining clamp load
- F_S force of the fastener
- f_S elastic elongation of fastener
- f_P shortening of the clamped part
- f_{SA} screw elongation under dynamic pressure
- f_{PA} shortening of the clamped part

Spring line screw
Spring line clamped part

Forces within a screw joint

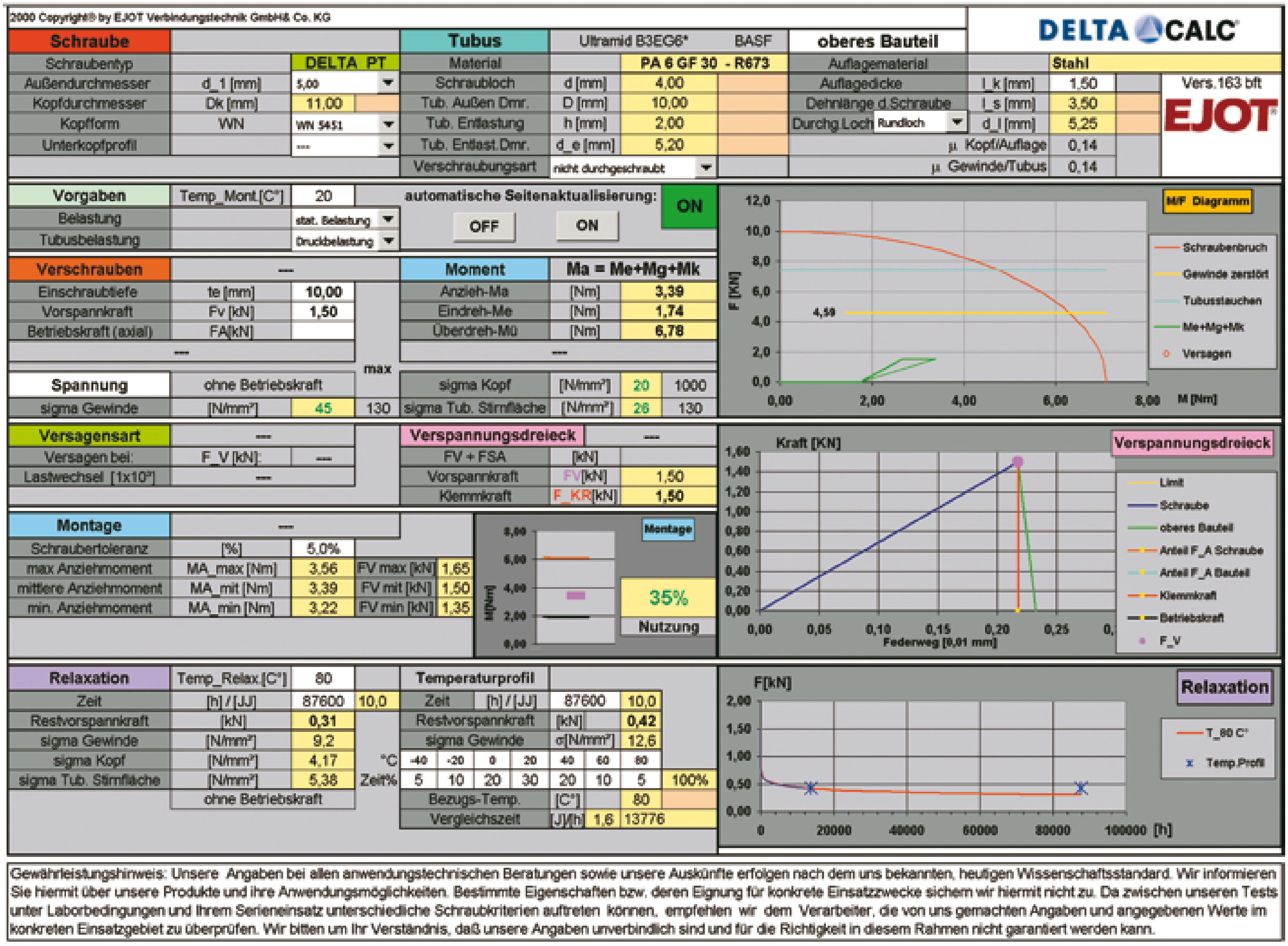
Acting forces and deformations in the joint during operating conditions are described in the stress diagramm.
By applying an appropriate tightening torque during assembly, a relating clamp load is being created in the screw joint. Its reacting force clamps the components together.

This process creates a surface pressure, which has to be sustained by the materials involved over lifetime even under thermal stress.

The material of the mating component as well as the boss material have to resist the resulting contact pressure.

The optimized thread geometry of the DELTA PT® screw ensures adequate stress distribution within the plastic female thread. By using large head diameters, surface pressure under the head can be minimized.

Please derive more information from further literature or the EJOT Forum 6.



Clamp load oriented design

In addition to the improved engineering features of the screw, the prognosis program DELTA CALC® was developed for DELTA PT®. The prognosis program supports the dimensioning of the fastener and also assists in determining the load carrying ability.

In accordance with VDI 2230, a clamp load oriented design is possible, whereas lifetime and durability of the screw joint under temperature stress can now be forecasted.

This allows qualitative allegations about the function of the screw joint under static stress.

For further information about the EJOT prognosis program, please contact our sales force or our hotline.

EJOT Hotline
Phone: +49 2752 109-123
Fax: +49 2752 109-268
E-Mail: hotline@ejot.de

The EJOT prognosis program enables dimensioning of screw joints for the future. That adds safety during the design stage.
A practical test with off-tool components can be done in the EJOT APPLITEC.

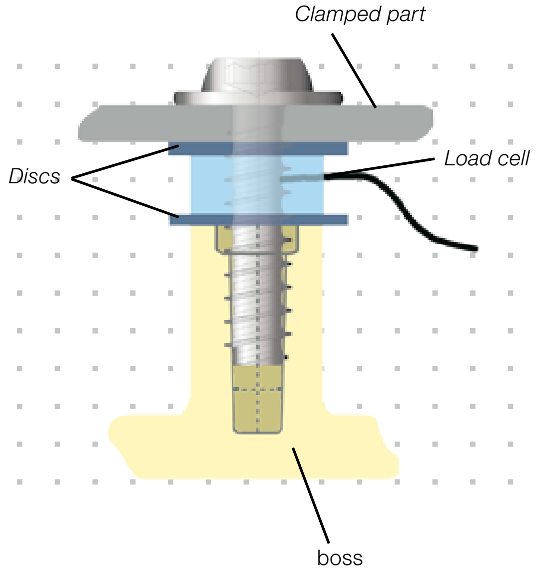
Calculated for improved performance

High strength under vibration

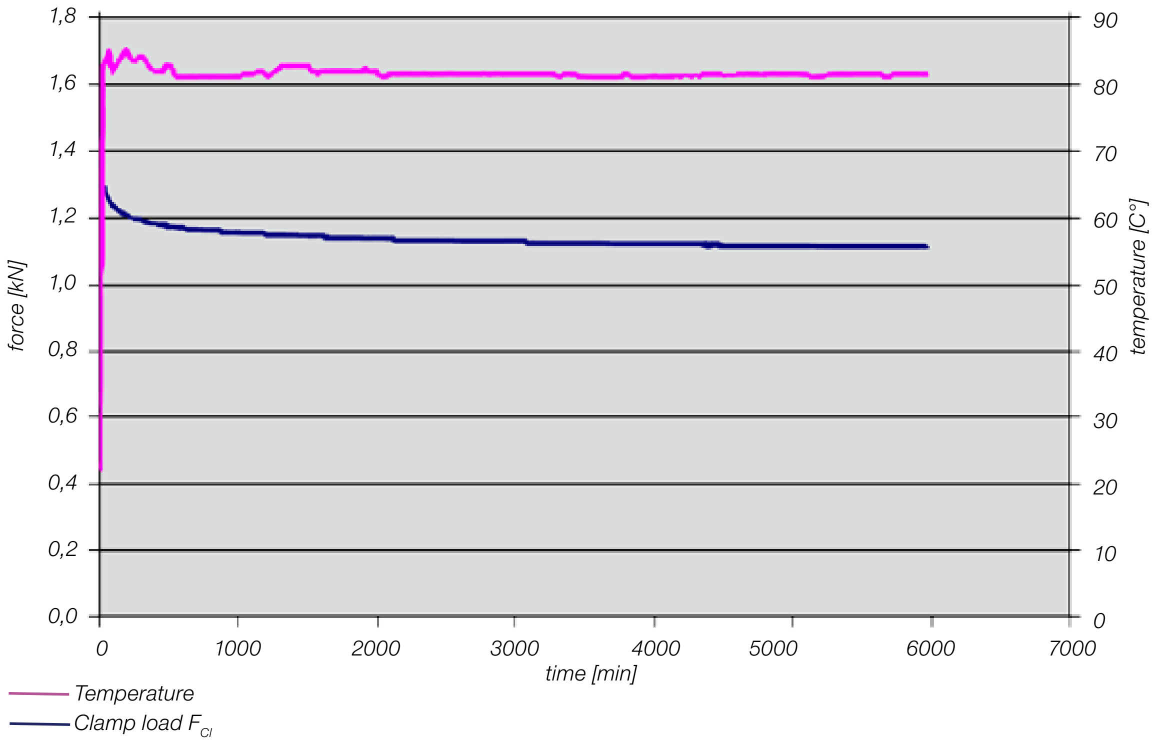
The special combination of thread pitch and flank geometry of the EJOT DELTA PT® allows high vibration safety. This safety results from the retarding effort between plastic and thread flank on the one hand and the thread pitch which is smaller than the friction angle on the other hand.
Thus better conditions against self loosening of the fastener are being achieved.

Long lifetime

If a force is applied to polymer materials, a reduction of tension by creeping and relaxation can be observed over a certain period of time. With the development of the EJOT DELTA PT® screw a lot of attention was given to this phenomenon. Due to the optimized thread geometry and high thread flank engagement a low surface pressure and thus a maximized clamp load over life time can be observed.



Test setup for detection of clamp force F_{Cl}

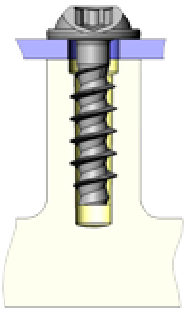


Example diagram: course of clamp load over time

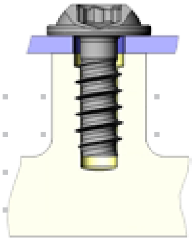

DELTA CALC
EJOT
customer
screw type
thread diameter
head diameter
head style
inputs
fastening
assembly
driver tool tol. [%]
max tightening torque
min tightening torque
clamp load
relaxation
time
tension thread
remaining clamp load
reference temp.
time of comparison

DELTA PT

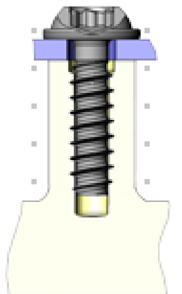
Ratio potential



1. *Initial situation*
EJOT PT® K 50x16



2. *Alternative A*
EJOT DELTA PT® 50x12



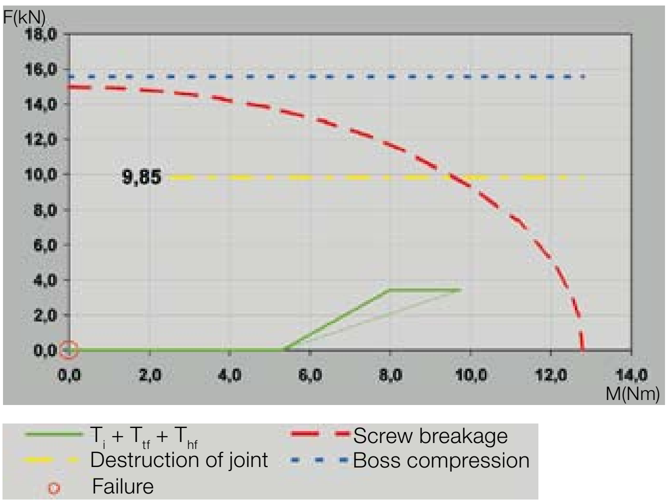
3. *Alternative B*
EJOT DELTA PT® 40x16

	Material:	A_{th}	P	d_h	d_i	T_t	F_c
	PA6 GF30	mm²	mm	mm	mm	Nm	kN
1.	PT®K 50	35	2,24	4,0	13,24	2,9	1,4
2.	DELTA PT® 50	35	1,80	4,0	9,88	2,9	1,8
3.	DELTA PT® 40	35	1,46	3,2	11,75	2,9	2,4

Key:

A_{th} = thread coverage
P = pitch
d_h = hole diameter
d_i = installation depth
T_t = tightening torque
F_c = clamp load

If an existing PT® screw is being replaced by a DELTA PT® screw, screw diameter and/or screw length can be reduced with a consistent thread coverage



DELTA CALC® Diagram

Reduction of fastener length and/or diameter:
An example is supposed to demonstrate, how the screw length or the screw diameter can be reduced by using DELTA PT® screws. A PT® screw with a 30° profile angle and core recess is compared to a DELTA PT® screw. Assuming the same thread engagement, which depends on pitch, insertion depth and flank geometry, possibilities as shown in the chart will result. (Pictures 1., 2., 3.)
The thread enagagement resulting from conventional 30° screws can be achieved by using DELTA PT® with a lower insertion depth or a smaller nominal diameter. As an alternative, a DELTA PT® screw with the same dimensions can be used in order to reach a higher clamp load.

Application example
Using the example of a new generation of valves, the practicability of the ratio potential can be demonstrated. The previous construction solution was analyzed for savings potential. In the existing solution so far a 6 mm screw had been used. The joint was recalculated with the EJOT prognosis programme DELTA CALC® (see also p. 7) and the results indicated an over-dimensioned thread diameter.

Thus for the first prototypes the new design of the valves was then dimensioned for a 5 mm DELTA PT® screw. The tests produced the following results:

T_i: 2,45 Nm
T_s: 8,44 Nm
T_t: 4,5 Nm

The valves were then put into the life cycle test with these assembly parameters. Here, no leak problems emerged. The assembly with the new construction design is running since quite some time without any failures now.
For the valve producer the reduction of the screw diameter due to the use of the DELTA PT® screw resulted in the minimization of the component's wall thicknesses. The component could thus be produced with less material employment, which also led to reduced cycle times in production. The smaller thread diameter led to considerable cost savings and a general weight reduction of the component.

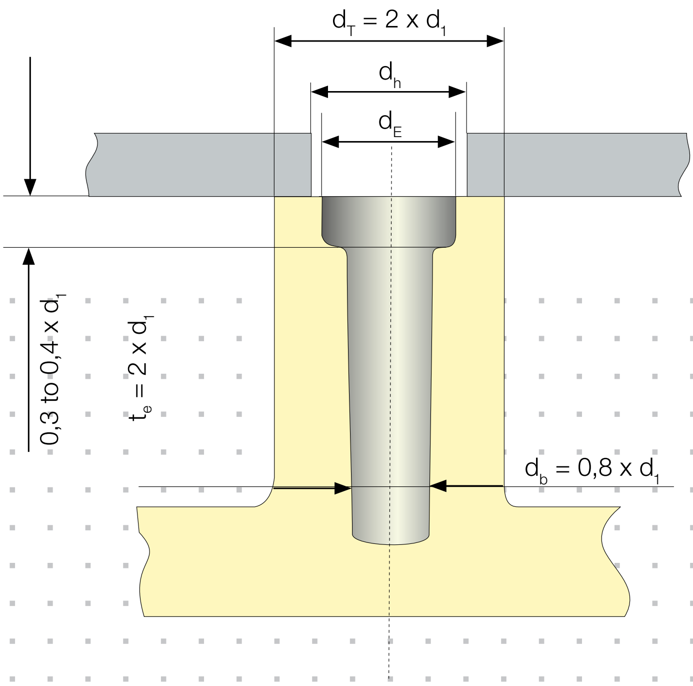
The precondition for a safe screw joint is the functional design of the components.
In principle, the boss design should correspond to the illustrated design recommendation.

The counterbore is of special importance, as it ensures a favourable edge stress reduction, thus preventing boss cracking. In addition, the counterbore acts as a lead-in and guidance during initial thread forming.

Boss design
The most favourable hole diameter has in most cases proven to be:

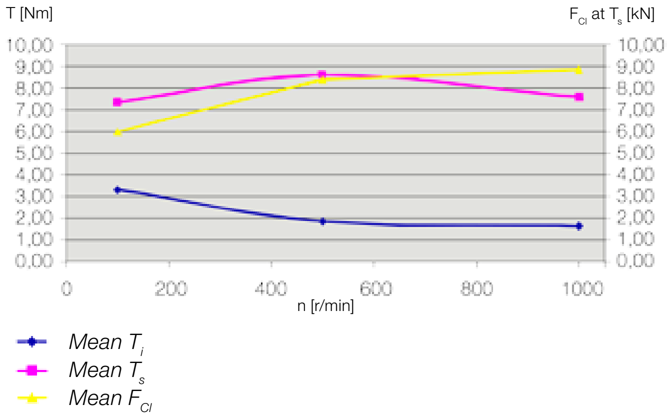
$d_h = 0{,}8 \times d_1$

For higher filled materials or materials with a bigger strength the hole diameter can be increased up to $d_h = 0{,}88 \times d_1$.



d_1 = Nominal-Ø of the screw
$d_E = d_1 + 0{,}2$ mm

Revolution speed
With the use of a DELTA PT® screw the default recommendation of 500 r/min can easily be increased to 1000 r/min in many plastics - without significant slumps in achievable clamp load or stripping torque.



Material: fibre-glass-reinforced polyamide

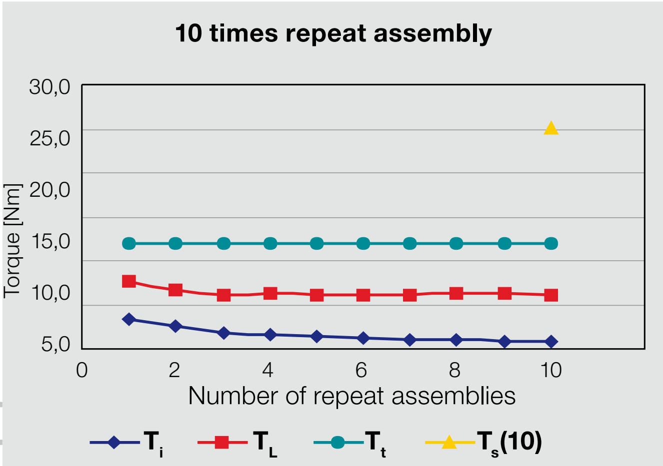
The graph shows that an increased revolution speed is possible with constant F_{Cl} and T_s when a DELTA PT® screw is used

Design recommendations have been worked out on the basis of extensive laboratory tests. In practical operations, deviations of these recommendations may occur due to:

- processing conditions of the material
- design of the injection tool
- distance from the injection point
- the formation of welding lines
- local textures caused by additives and fillings
- materials often variate in the percentage of the composition

Thus, fastening tests should be carried out with initial samples. For this purpose, EJOT operates its own application laboratory, the EJOT APPLITEC.

Assembly technique



Material: ABS
Screw: EJOT DELTA PT® 80
Hole-Ø: 5,80 – 6,30 mm, conical
Penetration depth: 17 mm

T_i: Installation Torque
T_t: Tightening Torque
T_S: Stripping Torque
T_l: Loosening Torque

Tigthening torques and repeat accuracy

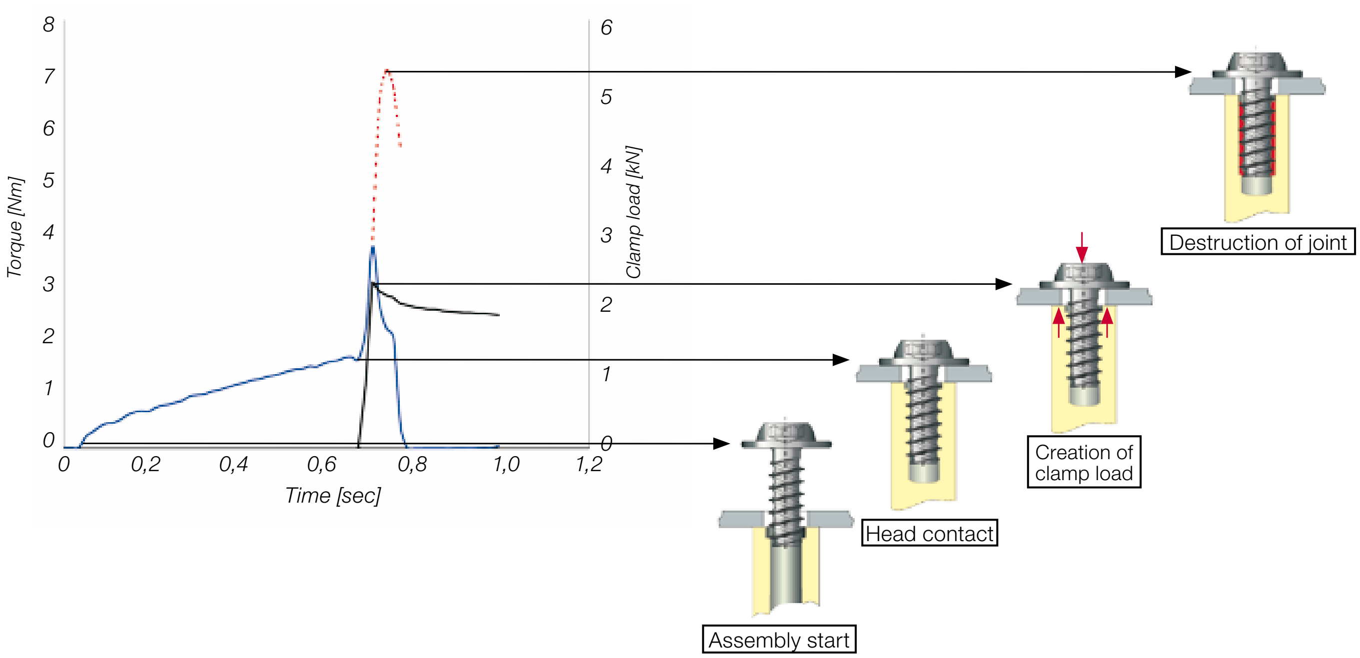
In order to ensure safe screw joints and smooth assemblies, many influencing factors have to be considered. A sufficiently high distance between installation and stripping torque is as important as the use of an appropriate drive tool featuring torque and/or torque angle shut off.

The tightening torque is calculated as a function of the required clamp force. The driver tool is to be adjusted accordingly. Component tests should be carried out to establish the repeat accuracy as well as the real clamp load in order to consider all influences which have not yet been determined.

Under common design circumstances a several time repeat assembly is possible. In accordance with VDE 0700 the general requirements can be achieved.

Torque test

Course of torque (T_t)
Course of torque (T_s)
Clamp load



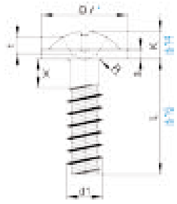
Example graph: Installation of DELTA PT®


Ø6 -0,5 | 100%
Ø1,7 +0,3
R0,15
Reduziergeometrie
optional
Gewinde
vorhanden | 100%
ja/nein
max. 2,5
0,6 ±0,1
8 ±0,45
0,85
Ø1,5
Ø2,2 +0,08
2,4

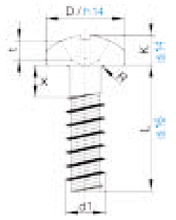

HH PK 156

Design

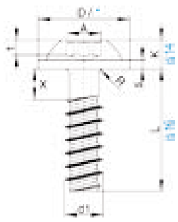
EJOT DELTA PT® Dimensions			10	12	14	16	18	20	22	25
External thread-Ø		d_1	1,00	1,20	1,40	1,60	1,80	2,00	2,20	2,50
Core-Ø		d_2	0,64	0,78	0,93	1,07	1,22	1,36	1,51	1,72
Thread pitch		P	0,44	0,51	0,57	0,64	0,71	0,78	0,85	0,95
Thread run-out		$X_{max.}$	0,50	0,60	0,70	0,80	0,90	1,00	1,10	1,30



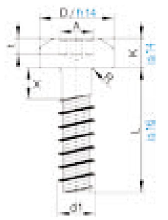
WN 5411			10	12	14	16	18	20	22	25
Head-Ø		D			3,20	3,60	4,00	4,50	5,00	5,50
Head height		K			1,15	1,20	1,35	1,40	1,60	1,80
Washer thickness		s			0,50	0,60	0,60	0,60	0,60	0,70
Radius		R_{max}						0,35	0,35	0,40
H-cross-recess	Penetration depth t	min.						0,51	0,68	0,82
		max.						0,97	1,14	1,28
Z-cross-recess	Penetration depth t	min.						0,73	0,86	1,01
		max.						0,98	1,11	1,26
C-cross-recess	Penetration depth t	min.			0,56	0,81	1,01			
		max.			0,84	1,10	1,31			
Cross size H/Z/C					0	0	0	1	1	1



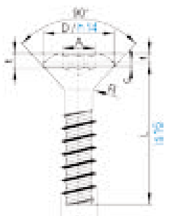
WN 5412			10	12	14	16	18	20	22	25
Head-Ø		D						3,50	3,90	4,40
Head height		K						1,60	1,60	1,90
Radius		R_{max}						0,35	0,35	0,40
H-cross-recess	Penetration depth t	min.						0,64	0,74	0,92
		max.						1,10	1,20	1,38
Z-cross-recess	Penetration depth t	min.						0,82	0,92	1,08
		max.						1,07	1,17	1,33
C-cross-recess	Penetration depth t	min.								
		max.								
Cross size H/Z/C								1	1	1



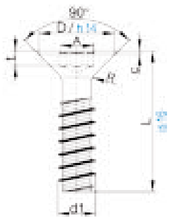
WN 5451			10	12	14	16	18	20	22	25
Head-Ø		D			3,20	3,60	4,00	4,50	5,00	5,50
Head height		K			1,15	1,20	1,35	1,60	1,60	1,90
Washer thickness		s			0,50	0,60	0,60	0,60	0,60	0,70
Radius		R_{max}			0,20	0,25	0,25	0,35	0,35	0,40
TORXplus® / AUTOSERT®					3IP	5IP	6IP	6IP	6IP	8IP
		$A_{Ref.}$			1,20	1,45	1,75	1,75	1,75	2,40
Penetration depth	t	min.			0,40	0,50	0,50	0,65	0,65	0,80
		max.			0,55	0,65	0,65	0,85	0,85	1,00



WN 5452			10	12	14	16	18	20	22	25
Head-Ø		D						3,50	3,90	4,40
Head height		K						1,60	1,60	1,90
Radius		R_{max}						0,35	0,35	0,40
TORXplus® / AUTOSERT®								6IP	6IP	8IP
		$A_{Ref.}$						1,75	1,75	2,40
Penetration depth	t	min.						0,65	0,65	0,80
		max.						0,85	0,85	1,00



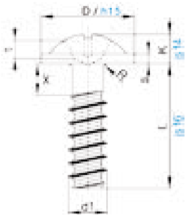
WN 5453			10	12	14	16	18	20	22	25
Head-Ø		D						4,00	4,40	5,00
Cyl. head height		c_{max}						0,35	0,35	0,55
Calotte height		≈ f						0,40	0,40	0,50
Radius		R_{max}						0,80	0,80	1,00
TORXplus® / AUTOSERT®								6IP	6IP	8IP
		$A_{Ref.}$						1,75	1,75	2,40
Penetration depth	t	min.						0,65	0,65	0,80
		max.						0,85	0,85	1,00



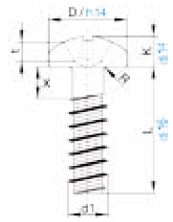
WN 5454			10	12	14	16	18	20	22	25
Head-Ø		D						4,00	4,40	5,00
Cyl. head height		c_{max}						0,35	0,35	0,55
Radius		R_{max}						0,80	0,80	1,00
TORXplus® / AUTOSERT®								6IP	6IP	8IP
		$A_{Ref.}$						1,75	1,75	2,40
Penetration depth	t	min.						0,50	0,50	0,70
		max.						0,65	0,65	0,90

**DELTA PT® 14-18: h14*
from DELTA PT® 20: h15

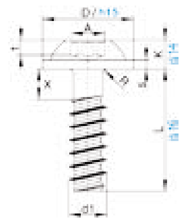
EJOT DELTA PT® Dimensions				30	35	40	45	50	60	70	80	100
	External thread-Ø		d_1	3,00	3,50	4,00	4,50	5,00	6,00	7,00	8,00	10,00
	Core-Ø		d_2	2,09	2,45	2,81	3,17	3,53	4,26	4,98	5,70	7,15
	Thread pitch		P	1,12	1,29	1,46	1,63	1,80	2,14	2,48	2,82	3,50
	Thread run-out		$X_{max.}$	1,50	1,80	2,00	2,30	2,50	3,00	3,50	4,00	5,00



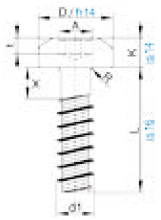
WN 5411												
	Head-Ø		D	6,50	7,50	9,00	10,00	11,00	13,50	15,50		
	Head height		K	2,10	2,40	2,50	2,50	3,20	4,00	4,60		
	Washer thickness		s	0,80	0,90	1,00	1,00	1,20	1,40	1,60		
	Radius		R_{max}	0,50	0,50	0,60	0,60	0,70	0,80	0,90		
	H-cross-recess	Penetration depth	t min.	1,15	1,07	1,33	1,33	1,98	2,24	2,84		
			max.	1,61	1,70	1,96	1,96	2,61	2,90	3,50		
	Z-cross-recess	Penetration depth	t min.	1,26	1,08	1,40	1,40	2,01	2,27	2,91		
			max.	1,51	1,54	1,86	1,86	2,47	2,73	3,37		
	C-cross-recess	Penetration depth	t min.									
			max.									
	Cross size H/Z/C			1	2	2	2	2	3	3		



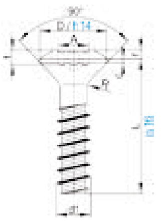
WN 5412												
	Head-Ø		D	5,30	6,10	7,00	7,50	8,80	10,50	12,30		
	Head height		K	2,30	2,70	3,10	3,20	3,50	4,20	5,10		
	Radius		R_{max}	0,50	0,50	0,60	0,60	0,70	0,80	0,90		
	H-cross-recess	Penetration depth	t min.	1,19	1,23	1,51	1,51	2,12	2,44	3,00		
			max.	1,65	1,86	2,14	2,14	2,75	3,10	3,66		
	Z-cross-recess	Penetration depth	t min.	1,36	1,26	1,62	1,62	2,23	2,57	3,14		
			max.	1,61	1,72	2,08	2,08	2,67	3,03	3,61		
	C-Kreuz-schlitz	Penetration depth	t min.									
			max.									
	Cross size H/Z/C			1	2	2	2	2	3	3		



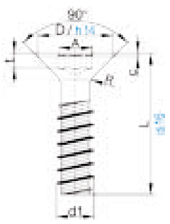
WN 5451												
	Head-Ø		D	6,50	7,50	9,00	10,00	11,00	13,50	15,50	18,00	
	Head-height		K	2,30	2,70	3,10	3,20	3,50	4,20	4,90	5,60	
	Washer thickness		s	0,80	0,90	1,00	1,10	1,20	1,40	1,60	1,80	
	Radius		R_{max}	0,50	0,50	0,60	0,60	0,70	0,80	0,90	1,00	
	TORXplus®	/ AUTOSERT®		10IP	15IP	20IP	20IP	25IP	30IP	30IP	40IP	
			$A_{Ref.}$	2,80	3,35	3,95	3,95	4,50	5,60	5,60	6,75	
	Penetration depth		t min.	1,00	1,10	1,40	1,40	1,50	1,90	2,30	2,60	
			max.	1,30	1,50	1,80	1,80	1,90	2,40	2,90	3,20	



WN 5452												
	Head-Ø		D	5,30	6,10	7,00	7,50	8,80	10,50	12,30	14,10	17,00
	Head height		K	2,30	2,70	3,10	3,20	3,50	4,20	4,90	5,60	6,60
	Radius		R_{max}	0,50	0,50	0,60	0,60	0,70	0,80	0,90	1,00	1,10
	TORXplus®	/ AUTOSERT®		10IP	15IP	20IP	20IP	25IP	30IP	30IP	40IP	50IP
			$A_{Ref.}$	2,80	3,35	3,95	3,95	4,50	5,60	5,60	6,75	8,95
	Penetration depth		t min.	1,00	1,10	1,40	1,40	1,50	1,90	2,30	2,60	3,00
			max.	1,30	1,50	1,80	1,80	1,90	2,40	2,90	3,20	3,50



WN 5453												
	Head-Ø		D	6,00	7,00	8,00	9,00	10,00	12,00	14,00	16,00	20,00
	Cyl. head height		c_{max}	0,55	0,65	0,70	0,70	0,75	0,85	0,90	0,95	1,10
	Calotte height		≈ f	0,70	0,80	1,00	1,00	1,20	1,20	1,30	1,40	1,60
	Radius		R_{max}	1,20	1,40	1,60	1,80	2,00	2,40	2,60	3,20	4,50
	TORXplus®	/ AUTOSERT®		10IP	15IP	20IP	20IP	25IP	30IP	30IP	40IP	50IP
			$A_{Ref.}$	2,80	3,35	3,95	3,95	4,50	5,60	5,60	6,75	8,95
	Penetration depth		t min.	1,00	1,10	1,40	1,40	1,50	1,90	2,30	2,60	3,00
			max.	1,30	1,50	1,80	1,80	1,90	2,40	2,90	3,20	3,50



WN 5454												
	Head-Ø		D	6,00	7,00	8,00	9,00	10,00	12,00	14,00	16,00	20,00
	Cyl. head height		c_{max}	0,55	0,65	0,70	0,70	0,75	0,85	0,90	0,95	1,10
	Radius		R_{max}	1,20	1,40	1,60	1,80	2,00	2,40	2,60	3,20	4,50
	TORXplus®	/ AUTOSERT®		10IP	15IP	20IP	20IP	25IP	30IP	30IP	40IP	50IP
			$A_{Ref.}$	2,80	3,35	3,95	3,95	4,50	5,60	5,60	6,75	8,95
	Penetration depth		t min.	0,75	0,95	1,10	1,25	1,25	1,50	2,30	2,40	3,00
			max.	1,00	1,30	1,45	1,70	1,65	2,00	2,90	2,90	3,50

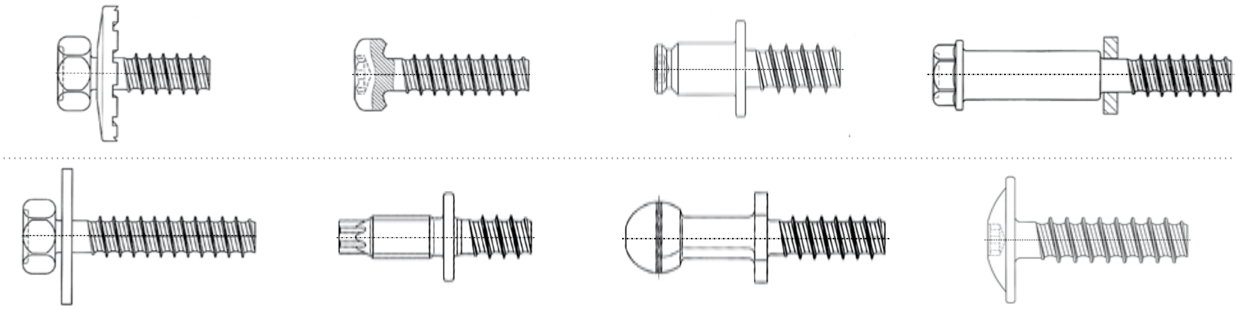
DELTA PT

Tolerances

Nominal value [mm]								
Tolerance		**over 3**	**over 6**	**over 10**	**over 18**	**over 30**	**over 50**	**over 80**
	to 3	**to 6**	**to 10**	**to 18**	**to 30**	**to 50**	**to 80**	**to 120**
h 14	0 - 0,25	0 - 0,30	0 - 0,36	0 - 0,43	0 - 0,52			
h 15	0 - 0,40	0 - 0,48	0 - 0,58	0 - 0,70	0 - 0,84			
js 14	± 0,12	± 0,15	± 0,18					
js 16	± 0,30	± 0,375	± 0,45	± 0,55	± 0,65	± 0,80	± 0,95	± 1,10

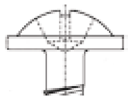
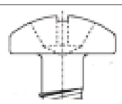
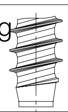
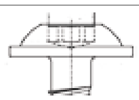
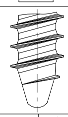
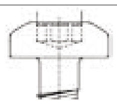
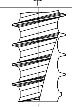
EJOT DELTA PT® screw	**14**	**16**	**18**	**20**	**22**	**25**	**30**	**35**	**40**	**45**	**50**	**60**	**70**	**80**	**100**
External-Ø d_1	1,4	1,6	1,8	2,0	2,2	2,5	3,0	3,5	4,0	4,5	5,0	6,0	7,0	8,0	10,0
Tolerance	+0,08 0	+0,08 0	+0,08 0	+0,08 0	+0,08 0	+0,10 0	+0,10 0	+0,10 0	+0,10 0	+0,10 0	+0,15 0	+0,15 0	+0,18 0	+0,18 0	+0,25 0

Special variations / Examples



Special variations are available.
Please contact the EJOT application engineers to realize your multifunctional designs.

Example of ordering

Head style	Labelling	Drive	Dia-meter	Labelling		Length	Thread-end	Labelling	Surface
	→ 11	Z H C	1,00 → 1,20 →	10 12		min. 2xd	Standard	--	Zn-blue
	→ 12	Z H C	⋮	⋮		⋮	Short dog point 	Z	DeltaTone
	→ 51	--	4,00 →	40		14	Pilot point 	R	Zn-Ni
	→ 52	--	⋮	⋮		⋮	Cutting-edge 	S	DeltaProtekt
			8,00 → 10,00 →	80 100		max. 10xd			
DELTA PT WN 54	11	H		40	x	14		R	Zn-blue

Chrom VI free surfaces:
- zinc clear / blue passivated
- zinc clear / blue passivated with EJOSEAL (240h resistance to Zn-corrosion)
- zinc clear / thick film passivation
- ZnFe or ZnNi / transparent passivated (with or without black top coats)
- ZnNi, black passivated
- zinc flake coatings (e.g. Delta Protekt)

Fastener materials:
- Through hardened steel according to DIN EN ISO 10263 T4 with material property [PT 10] (WN 5461, part 2)
- Stainless steel [A2], [A4]
- Aluminium [Alu]

More information under:
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Possible manufacturing range of EJOT DELTA PT® screws

EJOT DELTA PT® screw	14	16	18	20	22	25	30	35	40	45	50	60	70	80	100
Ø esterno d_1	1,4	1,6	1,8	2,0	2,2	2,5	3,0	3,5	4,0	4,5	5,0	6,0	7,0	8,0	10,0
Length Lunghezza L [mm]															
3,0 ± 0,300															
3,5 ± 0,375															
4,0 ± 0,375															
4,5 ± 0,375															
5,0 ± 0,375															
6,0 ± 0,375															
7,0 ± 0,45			R			S									
8,0 ± 0,45			R	R	R	S	S								
9,0 ± 0,45			R	R	R	R, S	S	S							
10,0 ± 0,45			R	R	R	R, S	S	S							
11,0 ± 0,55			R	R	R	R, S	R, S	S	S						
12,0 ± 0,55			R	R	R	R, S	R, S	R, S	S	S					
14,0 ± 0,55			R	R	R	R, S	R, S	R, S	R, S	S	S				
15,0 ± 0,55			R	R	R	R, S	R, S	R, S	R, S	S	S	S			
16,0 ± 0,55			R	R	R	R, S	R, S	R, S	R, S	R, S	S	S			
18,0 ± 0,55			R	R	R	R, S	R, S	R, S	R, S	R, S	R, S	S			
20,0 ± 0,65				R	R	R, S	R, S	R, S	R, S	R, S	R, S	S			
21,0 ± 0,65					R	R, S	R, S	R, S	R, S	R, S	R, S	R, S			
22,0 ± 0,65					R	R, S	R, S	R, S	R, S	R, S	R, S	R, S			
24,0 ± 0,65						R, S	R, S	R, S	R, S	R, S	R, S	R, S			
25,0 ± 0,65						R, S	R, S	R, S	R, S	R, S	R, S	R, S			
27,0 ± 0,65							R, S	R, S	R, S	R, S	R, S	R, S			
30,0 ± 0,65							R, S	R, S	R, S	R, S	R, S	R, S			
35,0 ± 0,80								R, S	R, S	R, S	R, S	R, S			
36,0 ± 0,80									R, S	R, S	R, S	R, S			
40,0 ± 0,80									R, S	R, S	R, S	R, S			
42,0 ± 0,80										R, S	R, S	R, S			
45,0 ± 0,80										R, S	R, S	R, S			
48,0 ± 0,80											R, S	R, S			
50,0 ± 0,80											R, S	R, S			
60,0 ± 0,95												R, S			
70,0 ± 0,95															
80,0 ± 0,95															

Upper line = minimal length (countersunk head length L_{min} = L + 2 mm)

Lower line = maximal length

S Manufacturing with cutting edge possible
R Manufacturing with pilot point possible

Length > 60 mm with partial thread only (partial thread length 4 x d_1)

Special geometries upon request!

Test rack at EJOT 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 dessign changess 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 by comprehensive application engineering services. These services provide accurate informationon product performance and result in design recommendations that can be used safely on the product line.

Consequent Application Engineering

The continous work with our customers and their application problems greatly enhances our understanding of fastener technique and opens up possibilities for innovation. Therefore, we consequently improve our products to meet customer demands and needs.

On top of our highly qualified engineers and application engineering advisors, we offer the service of our application laboratory called EJOT APPLITEC. Here we carry out a series of test procedures on our customers' applications that enable us to thoroughly analyze the strengths and capabilities of their parts. Also, new fastening techniques are being developed in in the EJOT APPLITEC.

Our knowledge is passed on to our customers and therefore supports their efforts towards more rational fastening and assembly techniques.

Detailed test reports, technical advice on site, acknowledged seminars and technical publications show 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 customers‘ demands and advanced logistics procedures lead 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

The fasteners grade of purity has a significant impact on the minimisation of failure and thus leads to a high availibility of the assembly machine. 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 cost-effective usage of our customers‘ 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 the global availibility of products and local support. Contact details can be found on our homepage www.ejot.com.

GLOBAL FASTENER ALLIANCE


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


EJOMAT® for fully automated assembly

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EJOT The Quality Connection®

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