The EJOT DELTA PT® Fastener
Predictable performance improvement for thermoplastics
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]

Imprint

Editor:
EJOT GmbH & Co. KG
Industrial Fasteners Division
D-57334 Bad Laasphe
Germany

Print:
Druckerei Hachenburg GmbH
D-57627 Hachenburg

© by EJOT GmbH & Co. KG
EJOT®, EJOMAT® und DELTA PT® are registered trademarks of EJOT GmbH & Co. KG.
TORX®, TORX PLUS® und AUTOSERT® are registered trademarks of Acument Intellectual Properties LLC.

All technical data may be subject to technical improvements.
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 selftapping 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.

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.
Predictable performance improvement

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 possibility 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.
Forces within a screw joint
Acting forces and deformations in the joint during operating conditions are described in the stress diagram.

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.

### 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

---

**EJOT® The Quality Connection**
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*
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 engagement 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.

### Ratio potential

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.

### Table

<table>
<thead>
<tr>
<th>Material: PA6 GF30</th>
<th>$A_h$</th>
<th>$P$</th>
<th>$d_h$</th>
<th>$d_i$</th>
<th>$T_t$</th>
<th>$F_c$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm²</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>Nm</td>
<td>kN</td>
</tr>
<tr>
<td>1. PT® K 50</td>
<td>35</td>
<td>2.24</td>
<td>4.0</td>
<td>13.24</td>
<td>2.9</td>
<td>1.4</td>
</tr>
<tr>
<td>2. DELTA PT® 50</td>
<td>35</td>
<td>1.80</td>
<td>4.0</td>
<td>9.88</td>
<td>2.9</td>
<td>1.8</td>
</tr>
<tr>
<td>3. DELTA PT® 40</td>
<td>35</td>
<td>1.46</td>
<td>3.2</td>
<td>11.75</td>
<td>2.9</td>
<td>2.4</td>
</tr>
</tbody>
</table>

**Key:**

- $A_h$ = thread coverage
- $P$ = pitch
- $d_i$ = installation depth
- $T_t$ = tightening torque
- $F_c$ = clamp load

**DELTA CALC® Diagram**

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.
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:

\[ d_b = 0.8 \times d_1 \pm \text{tolerance of screw diameter} \]

(see tolerance page 16)

For higher filled materials or materials with a bigger strength the hole diameter can be increased up to

\[ d_b = 0.88 \times d_1 \]

**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.

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

Tightening 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

Example graph: Installation of DELTA PT®

Material: ABS
Screw: EJOT DELTA PT® 80
Hole-Ø: 5.80 – 6.30 mm, conical

Course of torque (T_t)

Creation of clamp load

Destruction of joint

Head contact

Assembly start

Example graph: Installation of DELTA PT®
EJOT DELTA PT® Dimensions

<table>
<thead>
<tr>
<th></th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>External thread-Ø</td>
<td>d₁</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core-Ø</td>
<td>d₂</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thread pitch</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thread run-out</td>
<td>Xmax</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WN 5411

- 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 Rmax: 0.35, 0.35, 0.40
- H-cross-recess Penetration depth t: min. 0.51, max. 0.82
- Z-cross-recess Penetration depth t: min. 0.73, max. 1.01
- C-cross-recess Penetration depth t: min. 0.56, max. 1.01
- Cross size H/Z/C: 0, 0, 0, 1, 1, 1

WN 5412

- Head-Ø D: 3.50, 3.90, 4.40
- Head height K: 1.60, 1.60, 1.90
- Radius Rmax: 0.35, 0.35, 0.40
- H-cross-recess Penetration depth t: min. 0.64, max. 0.92
- Z-cross-recess Penetration depth t: min. 0.82, max. 1.08
- C-cross-recess Penetration depth t: min. 0.84, max. 1.31
- Cross size H/Z/C: 1, 1, 1

WN 5413

- Head-Ø D: 2.00, 2.30, 2.60, 3.00, 3.30, 3.50, 3.90, 4.40
- Head height K: 0.80, 0.95, 1.05, 1.20, 1.30, 1.60, 1.60, 1.90
- Radius Rmax: 0.20, 0.20, 0.25, 0.25, 0.25, 0.35, 0.35, 0.40
- Torx® Autosert® PENetration depth t: min. 0.40, max. 0.65
- Head height K: 1.20, 1.45, 1.75, 1.75, 1.75, 2.40
- Penetration depth t: min. 0.40, max. 0.65
- Max. 0.55, 0.65, 0.65, 0.85, 0.85, 1.00

WN 5414

- Head-Ø D: 4.00, 4.40, 5.00
- Head height K: 0.35, 0.35, 0.55
- Calotte height c: 0.40, 0.40, 0.50
- Radius Rmax: 0.80, 0.80, 1.00
- Torx® Autosert® PENetration depth t: min. 0.65, max. 0.85
- Head height K: 1.75, 1.75, 2.40
- Penetration depth t: min. 0.65, max. 0.85
- Max. 0.85, 1.00

WN 5415

- Head-Ø D: 2.35, 2.65, 2.80, 3.35, 3.65, 4.00, 4.40, 4.90
- Cyl. head height Cmax: 0.20, 0.25, 0.30, 0.35, 0.35, 0.35, 0.35, 0.55
- Calotte height c: 0.40, 0.40, 0.50
- Radius Rmax: 0.80, 0.80, 1.00
- Torx® Autosert® PENetration depth t: min. 0.35, max. 0.55
- Head height K: 1.75, 1.75, 2.40
- Penetration depth t: min. 0.35, max. 0.55
- Max. 0.85, 1.00

*DELTA PT® 14-18: h14 from DELTA PT® 20: h15
<table>
<thead>
<tr>
<th>Design</th>
<th>EJOT DELTA PT® Dimensions</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>External thread-Ø</td>
<td>d₁</td>
<td>3,00</td>
<td>3,50</td>
<td>4,00</td>
<td>4,50</td>
<td>5,00</td>
<td>6,00</td>
<td>7,00</td>
<td>8,00</td>
<td>10,00</td>
</tr>
<tr>
<td>Core-Ø</td>
<td>d₂</td>
<td>2,09</td>
<td>2,45</td>
<td>2,81</td>
<td>3,17</td>
<td>3,53</td>
<td>4,26</td>
<td>4,98</td>
<td>5,70</td>
<td>7,15</td>
</tr>
<tr>
<td>Thread pitch</td>
<td>P</td>
<td>1,12</td>
<td>1,29</td>
<td>1,46</td>
<td>1,63</td>
<td>1,80</td>
<td>2,14</td>
<td>2,48</td>
<td>2,82</td>
<td>3,50</td>
</tr>
<tr>
<td>Thread run-out</td>
<td>X&lt;sub&gt;max&lt;/sub&gt;</td>
<td>1,50</td>
<td>1,80</td>
<td>2,00</td>
<td>2,30</td>
<td>2,50</td>
<td>3,00</td>
<td>3,50</td>
<td>4,00</td>
<td>5,00</td>
</tr>
</tbody>
</table>

**WN 5411**
- Head-Ø | D | 6,50 | 7,50 | 9,00 | 10,00 | 11,00 | 13,50 | 15,50 | 18,00 |
- Head height | K | 2,10 | 2,40 | 2,50 | 2,50 | 3,20 | 4,00 | 4,60 | 5,10 |
- Washer thickness | s | 0,80 | 0,90 | 1,00 | 1,00 | 1,20 | 1,40 | 1,60 | 1,80 |
- Radius | R<sub>max</sub> | 0,50 | 0,50 | 0,60 | 0,60 | 0,70 | 0,80 | 0,90 | 1,00 |
- H-cross-recess penetration depth | t<sub>min</sub> | 1,15 | 1,07 | 1,33 | 1,33 | 1,98 | 2,24 | 2,84 | 3,00 |
- Z-cross-recess penetration depth | t<sub>min</sub> | 1,26 | 1,08 | 1,40 | 1,40 | 2,01 | 2,27 | 2,91 | 3,14 |
- C-cross-recess penetration depth | t<sub>min</sub> | 1,51 | 1,54 | 1,86 | 1,86 | 2,47 | 2,73 | 3,37 | 3,61 |
- 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 | 18,00 |
- Head height | K | 2,30 | 2,70 | 3,10 | 3,20 | 3,50 | 4,20 | 4,90 | 5,60 |
- Radius | R<sub>max</sub> | 0,50 | 0,50 | 0,60 | 0,60 | 0,70 | 0,80 | 0,90 | 1,00 |
- H-cross-recess penetration depth | t<sub>min</sub> | 1,19 | 1,23 | 1,51 | 1,51 | 2,12 | 2,44 | 3,00 | 3,66 |
- Z-cross-recess penetration depth | t<sub>min</sub> | 1,36 | 1,26 | 1,62 | 1,62 | 2,23 | 2,57 | 3,14 | 3,61 |
- C-Kreuz-schlitz penetration depth | t<sub>min</sub> | 1,61 | 1,72 | 2,08 | 2,08 | 2,67 | 3,03 | 3,61 | 3,92 |
- Cross size H/Z/C | 1 | 2 | 2 | 2 | 2 | 3 | 3 |

**WN 5413**
- 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<sub>max</sub> | 0,55 | 0,65 | 0,70 | 0,70 | 0,75 | 0,85 | 0,90 | 0,95 | 1,10 |
- Calotte height | t<sub>max</sub> | 0,70 | 0,80 | 1,00 | 1,00 | 1,20 | 1,40 | 1,60 | 1,80 | 2,00 |
- Radius | R<sub>max</sub> | 1,20 | 1,40 | 1,60 | 1,80 | 2,00 | 2,40 | 2,60 | 3,20 | 4,50 |
- Penetration depth | t<sub>max</sub> | 2,80 | 3,35 | 3,95 | 3,95 | 4,50 | 5,60 | 6,75 | 8,95 | 9,50 |
- Cross size H/Z/C | 1 | 2 | 2 | 2 | 2 | 3 | 3 |

**WN 5414**
- 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<sub>max</sub> | 0,55 | 0,65 | 0,70 | 0,70 | 0,75 | 0,85 | 0,90 | 0,95 | 1,10 |
- Radius | R<sub>max</sub> | 1,20 | 1,40 | 1,60 | 1,80 | 2,00 | 2,40 | 2,60 | 3,20 | 4,50 |
- Penetration depth | t<sub>max</sub> | 2,80 | 3,35 | 3,95 | 3,95 | 4,50 | 5,60 | 6,75 | 8,95 | 9,50 |

**WN 5415**
- 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<sub>max</sub> | 0,55 | 0,65 | 0,70 | 0,70 | 0,75 | 0,85 | 0,90 | 0,95 | 1,10 |
- Radius | R<sub>max</sub> | 1,20 | 1,40 | 1,60 | 1,80 | 2,00 | 2,40 | 2,60 | 3,20 | 4,50 |
- Penetration depth | t<sub>max</sub> | 2,80 | 3,35 | 3,95 | 3,95 | 4,50 | 5,60 | 6,75 | 8,95 | 9,50 |
Tolerances

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>over 3 to 6</th>
<th>over 10</th>
<th>over 18</th>
<th>over 30</th>
<th>over 50</th>
<th>over 80</th>
<th>over 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>h 14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-0.25</td>
<td>-0.30</td>
<td>-0.36</td>
<td>-0.43</td>
<td>-0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h 15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-0.40</td>
<td>-0.48</td>
<td>-0.58</td>
<td>-0.70</td>
<td>-0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>js 14</td>
<td>± 0,12</td>
<td>± 0,15</td>
<td>± 0,15</td>
<td>± 0,18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>js 16</td>
<td>± 0,30</td>
<td>± 0,375</td>
<td>± 0,45</td>
<td>± 0,55</td>
<td>± 0,65</td>
<td>± 0,80</td>
<td>± 0,95</td>
</tr>
<tr>
<td>js 17</td>
<td>± 0,75</td>
<td>± 0,90</td>
<td>± 1,05</td>
<td>± 1,25</td>
<td>± 1,50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Special variations / Examples**

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

**Example of ordering**

```
<table>
<thead>
<tr>
<th>Head style</th>
<th>Labelling</th>
<th>Drive</th>
<th>Diameter</th>
<th>Labelling</th>
<th>Length</th>
<th>Thread-end</th>
<th>Labelling</th>
<th>Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,00</td>
<td>10</td>
<td>min. 2xd</td>
<td>Standard</td>
<td>--</td>
<td>Zn-blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,20</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>DeltaTone</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Z</td>
<td>4,00</td>
<td>40</td>
<td>14</td>
<td>Short dog</td>
<td>Z</td>
<td>Zn-Ni</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td>point</td>
<td></td>
<td>DeltaProtekt</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>--</td>
<td>8,00</td>
<td>80</td>
<td>max. 10xd</td>
<td>Pilot point</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>10,00</td>
<td>100</td>
<td></td>
<td>formed grooves</td>
<td>DS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELTA PT WN 54</td>
<td>11</td>
<td>H</td>
<td>40</td>
<td>14</td>
<td>R</td>
<td>Zn-blue</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
### 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 (depending on Ø)
  (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:
**EJOT Hotline**
Phone  +49 2752 109-123
Fax  +49 2752 109-268
e-mail: hotline@ejot.de

### Possible manufacturing range of EJOT DELTA PT® screws

| Length [mm] | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 100 |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Ø d, [mm]   | 1.0| 1.2| 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|
| **Upper line** = minimal length | R | R | (S) | R | R | S | (S) | R | R | R | S | (S) | R | R | R | S | (S) |
| **Lower line** = maximal length | R | R | R | S | S | S | S | S | S | S | S | S | S | S | S | S | S |

- S: Manufacturing with cutting edge possible
- (S): Manufacturing with cutting edge possible (not in connection with WN 5411 and WN 5451)
- R: Manufacturing with pilot point possible (length tolerance acc. js 17)

Special geometries upon request!

Manufacturing range

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

*Lower line*: maximal length (length > 60 mm with partial thread only (partial thread length 4 x d.)

**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 (depending on Ø)
  (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:**
**EJOT Hotline**
Phone  +49 2752 109-123
Fax  +49 2752 109-268
e-mail: hotline@ejot.de

**Possible manufacturing range of EJOT DELTA PT® screws**

| Length [mm] | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 100 |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Ø d, [mm]   | 1.0| 1.2| 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|
| **Upper line** = minimal length | R | R | (S) | R | R | S | (S) | R | R | R | S | (S) | R | R | R | S | (S) |
| **Lower line** = maximal length | R | R | R | S | S | S | S | S | S | S | S | S | S | S | S | S | S |

- S: Manufacturing with cutting edge possible
- (S): Manufacturing with cutting edge possible (not in connection with WN 5411 and WN 5451)
- R: Manufacturing with pilot point possible (length tolerance acc. js 17)

Special geometries upon request!
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 by comprehensive application engineering services. These services provide accurate information on product performance and result in design recommendations that can be used safely on the product line.

Consequent Application Engineering

The continuous 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 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.
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 availability 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 availability of products and local support. Contact details can be found on our homepage www.ejot.com.