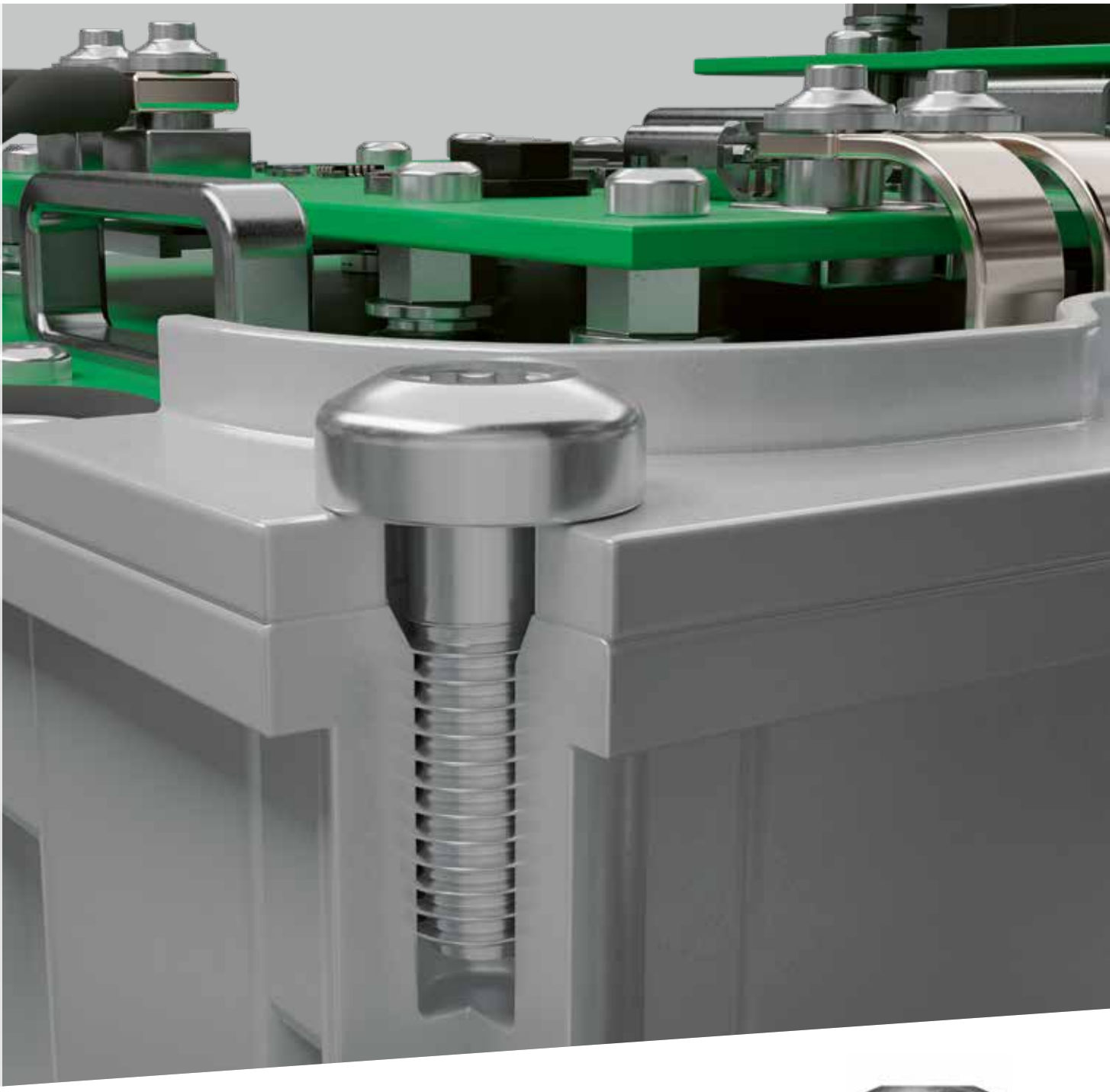
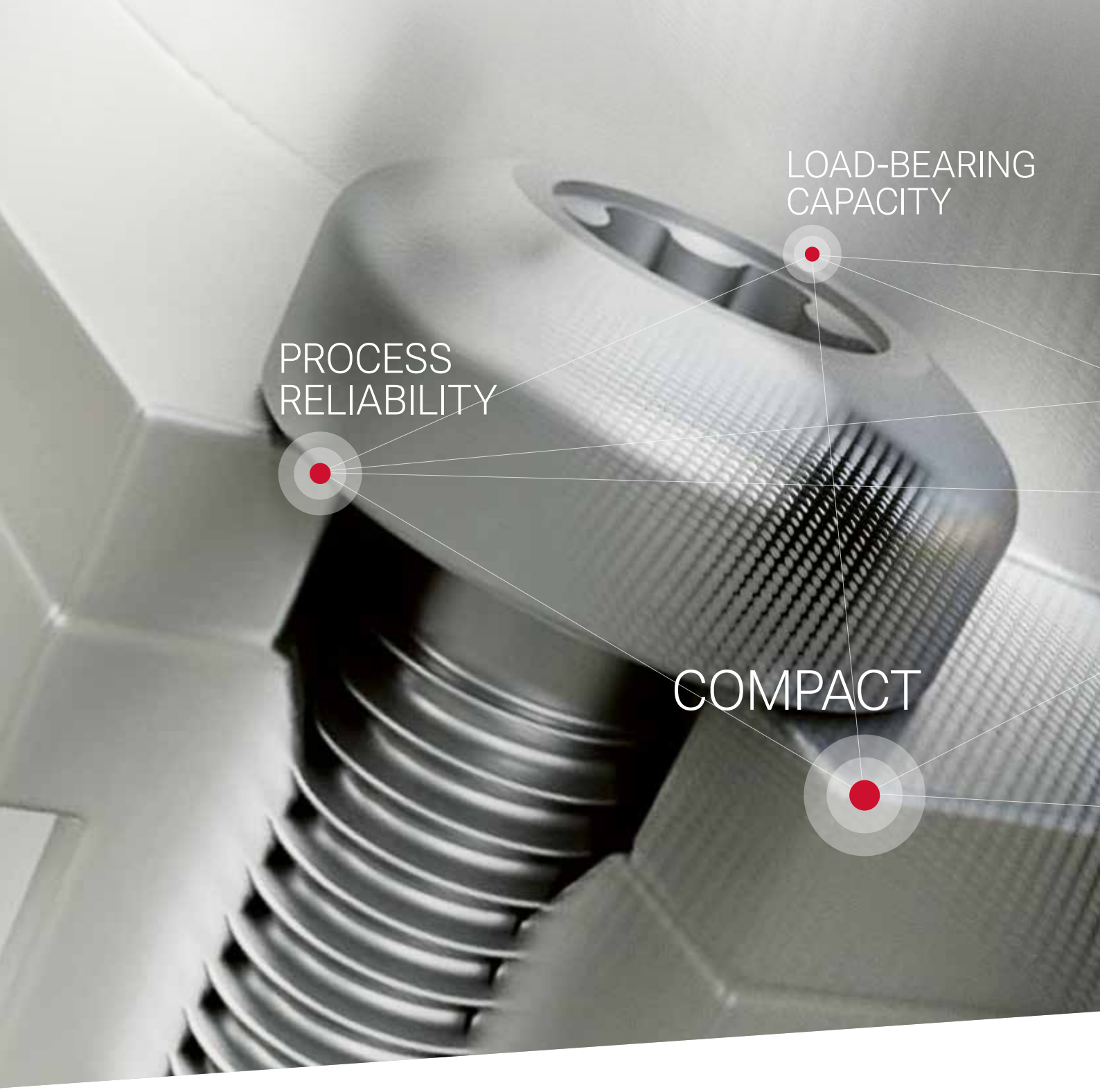
ECONOMIC – SMART – COMPACT – CASTABLE



ALtracs® Xt

Thread forming into light alloy without compromise

EJOT. Bringing it together.

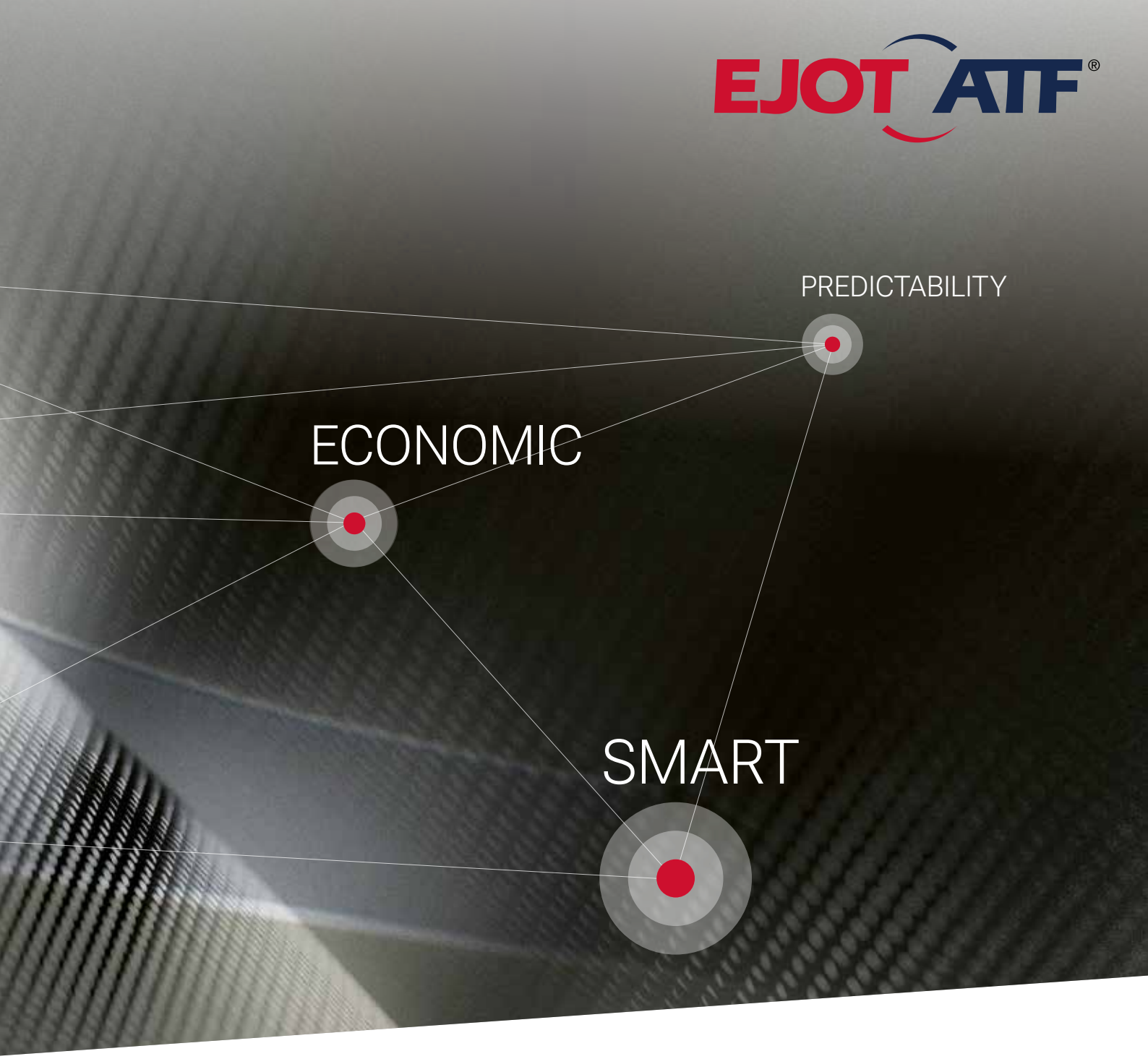


ALtracs® Xt:
Specialist for light alloy

Components made from light alloy are ever-present in the industry, especially in the automotive sector. For this purpose, EJOT presents the ALtracs® Xt – a thread forming screw optimized for use in light alloys.

Thread forming with ALtracs® Xt

Learn more!



Economic screw joints
Since the ALtracs® Xt is a thread forming screw, specific processes on the way to a completely assembled screw joint can be omitted. This brings the potential to reduce time and costs.

Smart design support
With the specifically developed prognosis software Xt CALC®, all relevant process parameters, as well as screw joint properties, can be reliably precalculated already during the developmental stages of projects.

Compact design
The thread geometry is specialized for use in light alloys. This allows to generate high clamp loads with minimum space requirements for the screw joint.

Castable component tolerances
Thanks to its forgiveness to hole tolerances – regarding diameter and draft angle – ALtracs® Xt is the ideal screw for cast pre-holes.

ALtracs® Xt – Thread geometry for high joint strengths

For light alloys: $R_{m\ max.}$ 470 MPa / max. hardness 140 HB

The ALtracs® Xt is a thread forming screw in accordance with DIN 267-30 for use in light alloy (as well as other nonferrous metals) with a maximum tensile strength of 470 MPa as well as a hardness of up to 140 HB.

Every screw joint is only as strong as its weakest link. When using a hardened steel screw (with properties acc. property class 10.9) in light alloy, the light alloy component usually is said weak link. The strength ratio between a steel screw (property class 10.9 with $R_m \geq 1040$ MPa) and a typical light metal alloy (R_m approx. 330 MPa) is 3:1.

Mechanical properties of the screw acc. property class 10.9

The specialized thread flank geometry of ALtracs® Xt compensates for this difference in strength, considerably lowering the risk of premature failure of the female thread. This allows high clamp loads to be realized at low installation depths.

At the same time all the the advantages of a thread forming screw can be used.

Metric compatibility

Economic screw joints thanks to ALtracs® Xt

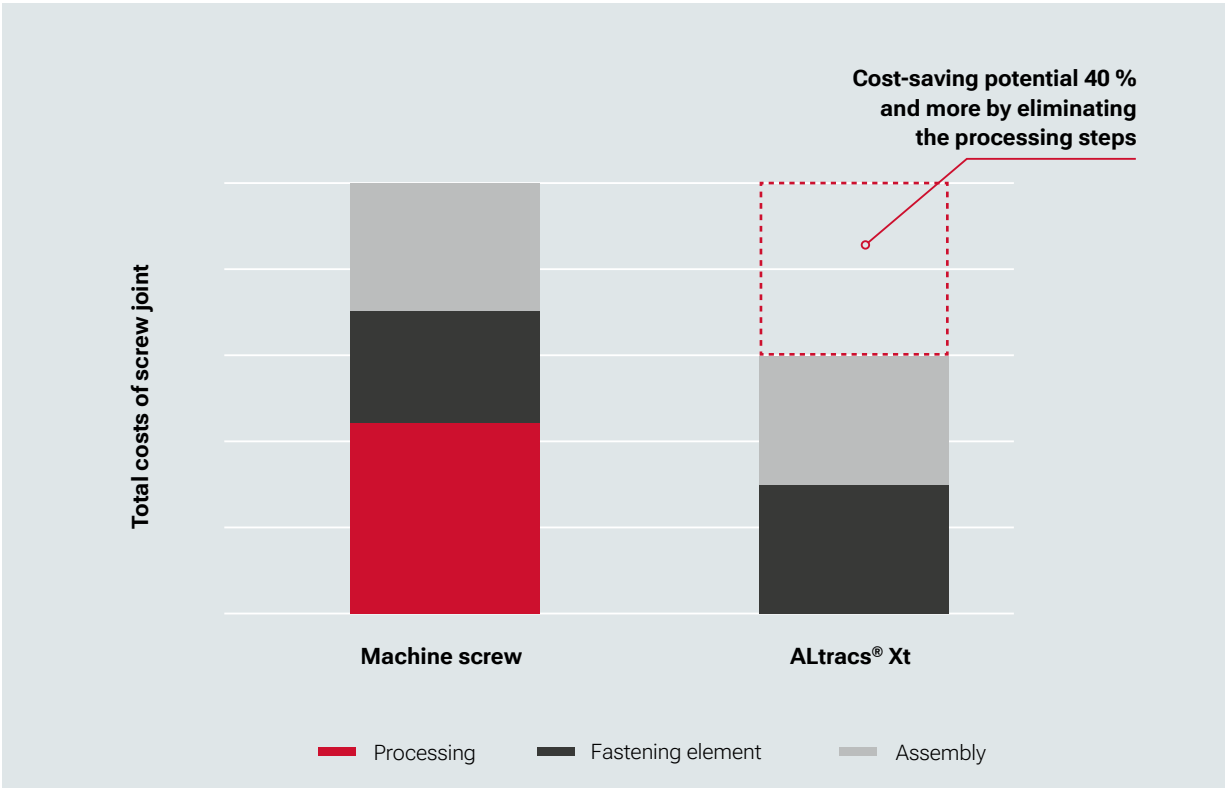
Thread forming screws in general bring considerable economic saving potential compared to conventional machine screws.

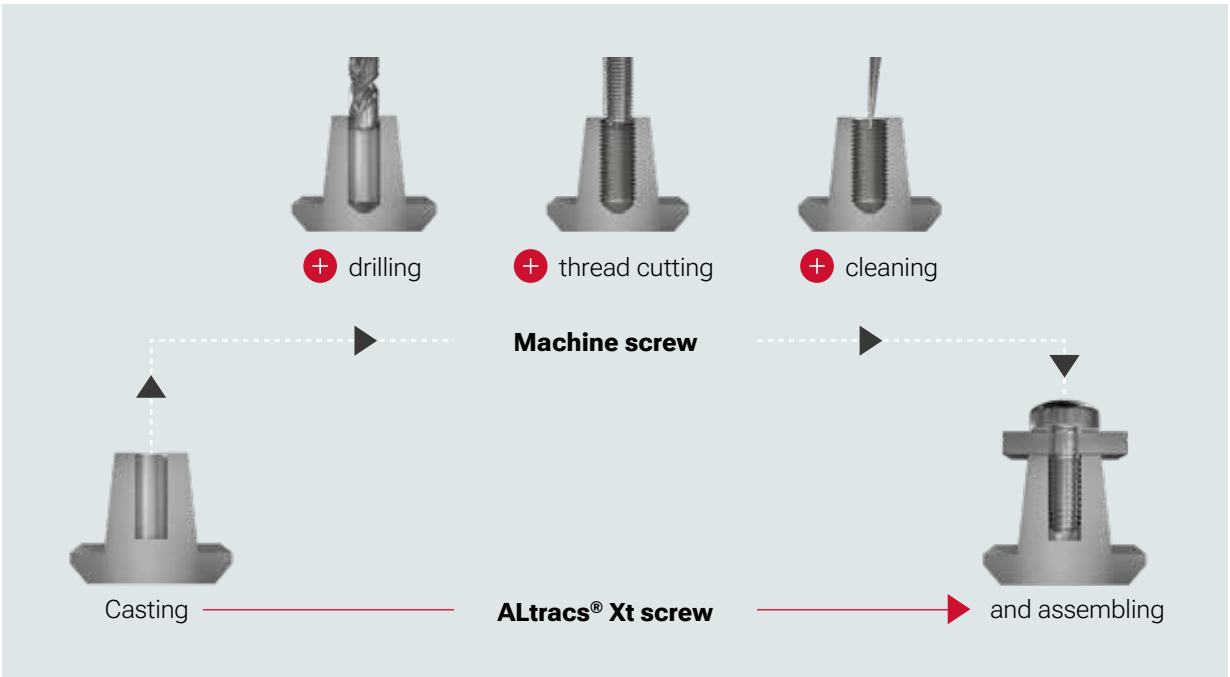
When using machine screws in cast parts, additional machining processes like drilling and thread cutting (plus cleaning) are required. Each of these process steps costs time and money long before the assembly of the screw joint even starts.

When using ALtracs® Xt, those additional process steps are not necessary. ALtracs® Xt can be assembled directly into the conical pre-hole from the casting process without further machining.

Thus the total costs per screw joint are significantly reduced.

Comparison of total costs





Thread forming into light alloy without compromise

So far there have been two established concepts for thread forming screws.

Circular cross-section
A circular cross-section increases the engagement between male and female thread. Thus, maximal joint strengths can be realized.

Non-circular cross-section
A non-circular cross-section has some void areas in the thread. Thus there will be no thread engagement around the complete circumference. The advantage is low friction – especially during thread forming. Due the smaller thread engagement, there is a risk of premature stripping of the female thread.

Circular cross-section (full-body screw) for maximum thread engagement

Progressive Forming Profile for minimizing friction during thread forming

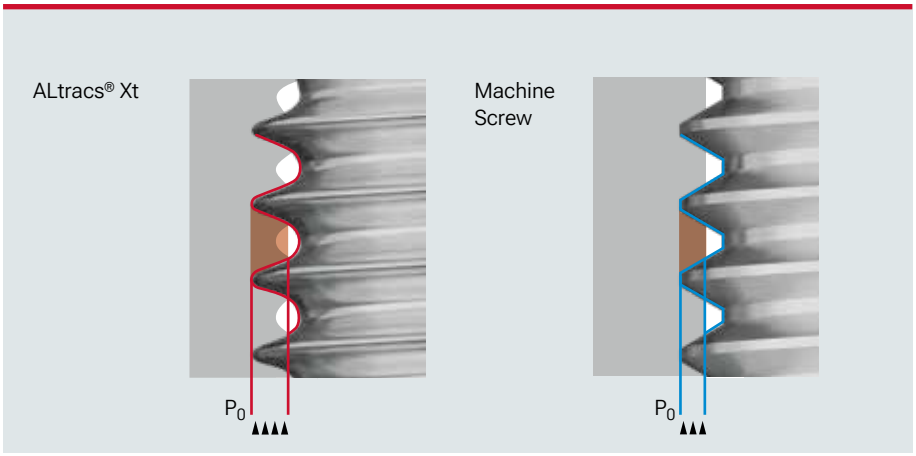
33° flank angle for high load-bearing capacity of the female thread

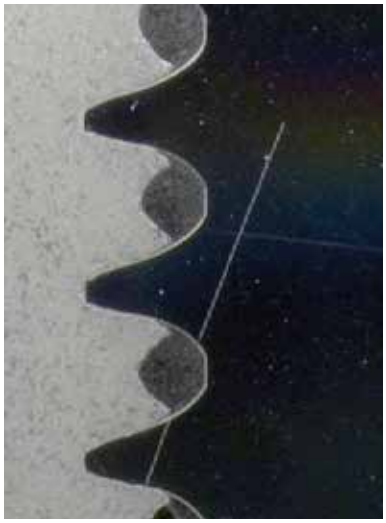
ALtracs® Xt – the best of two worlds
The optimization of the thread contour was inspired by nature. Compared to older thread designs, the contour now is more rounded, leaving out areas that do not improve the joint strength but only cause friction. The new Progressive Forming Profile (PFP™) also results from that development. With the friction-optimized thread contour at the tip (in the first four threads) of the screw thread forming torques can be drastically reduced, while the circular cross-section of the screw ensures that load-bearing capacity is high.

Thus, the innovative ALtracs® Xt combines the advantages of both concepts – **without** compromise!

Resilient in a multitude of ways

Compared to a conventional machine screw, ALtracs® Xt has a reduced flank angle of 33° instead of 60°. By reducing the flank angle of the screw, the thread tooth of the formed female thread will become more prominent. Combined with the female thread's cold-work hardening, this ensures a high load-bearing capacity of each thread pitch – even when faced with thermal stress. As such, the ALtracs® Xt offers further saving potential by reducing the space requirements for screw joints. This makes ALtracs® Xt the ideal fastener for lean designs in light alloy components.



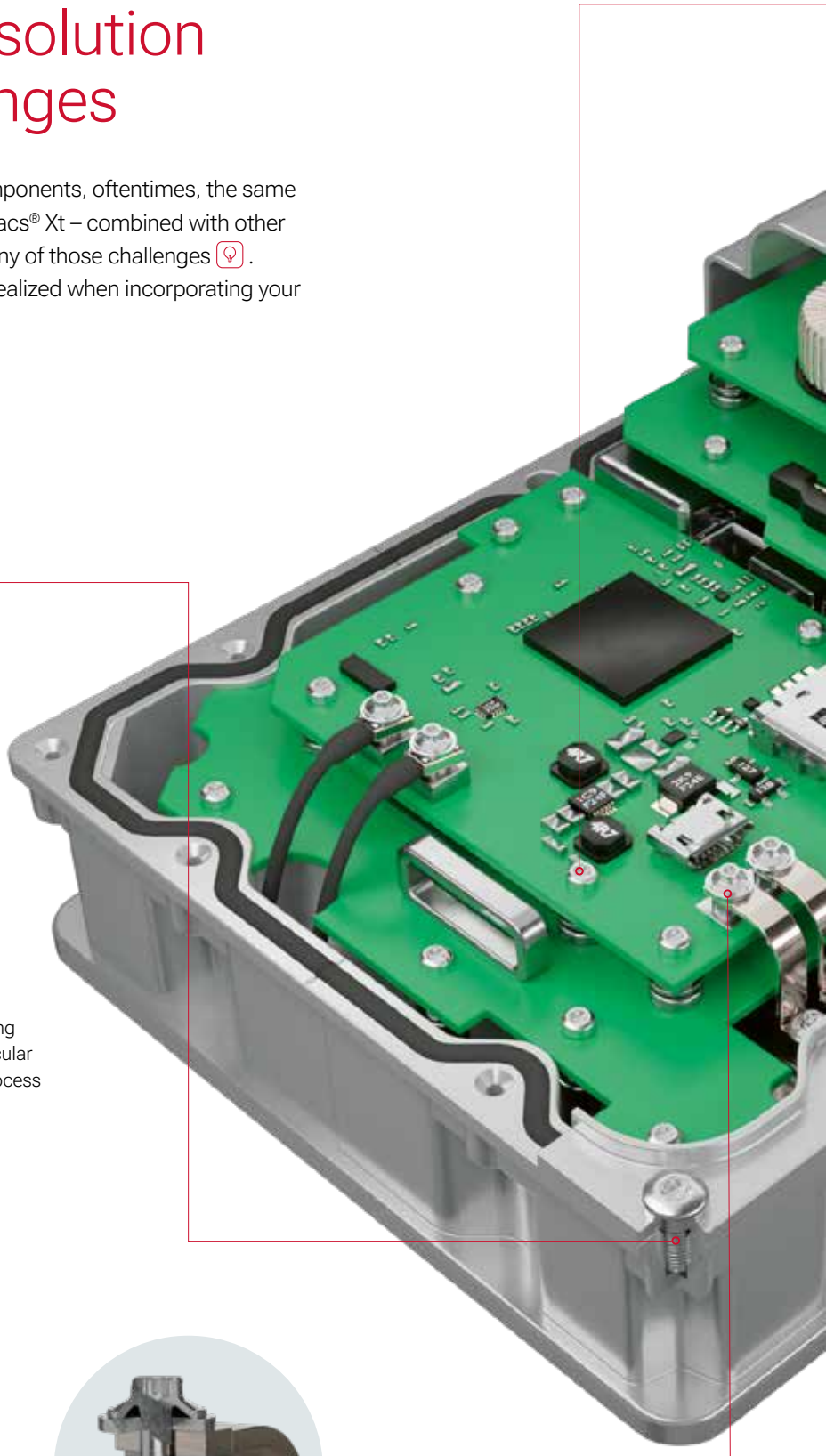


Metallographic cut of the play-free engagement between male and formed female thread

Thread forming with ALtracs® Xt generates a play-free thread engagement between the screw and light alloy components. The large contact area between male and female thread provides high dynamic safety. Subsequently, this eliminates the need for further thread lockers like locking patches or underhead serrations.

ALtracs® Xt – A solution for many challenges

When designing screw joints for various components, oftentimes, the same questions and challenges come up . ALtracs® Xt – combined with other EJOT technologies and services – solves many of those challenges . Oftentimes, further saving potential can be realized when incorporating your EJOT contact early during projects.



> Maximum economic efficiency as well as high process capability when joining housing and cover

> Use of ALtracs® Xt

> Thread forming directly into cast holes:
- High forgiveness towards tolerances of the casting process
- Saving potential of up to 60 %

> Up to 50 % lower drive torques while having similar failure torques as conventional circular thread forming screws ensure that the process capability is vastly improved

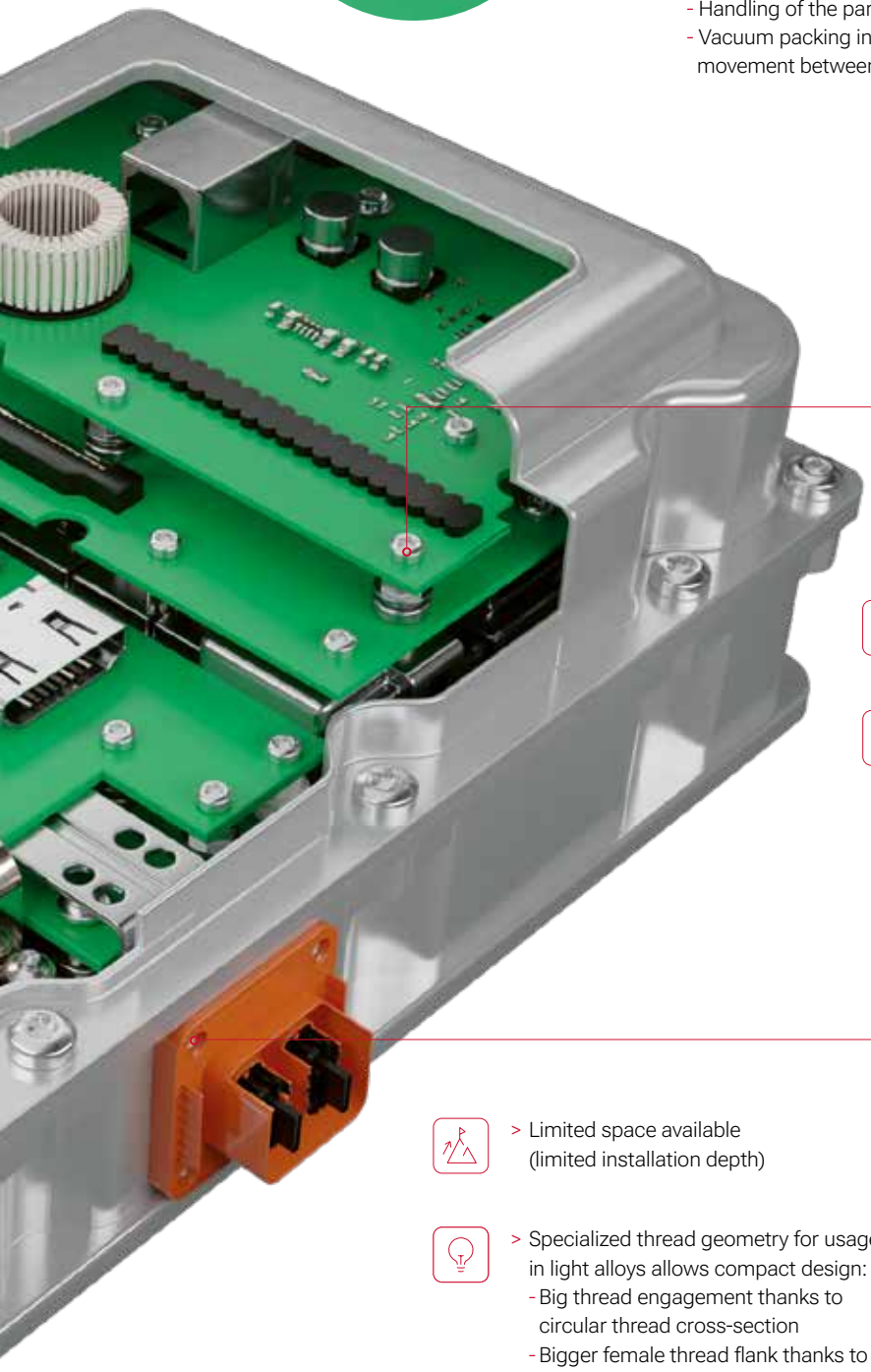
> Embedment / Relaxation cause loss of clamp load

> Higher elasticity in the screw joint with EJOT SpringHead®:
- Compensates embedment / relaxation
- Keeps clamp load at a stable level even when faced with thermal stress

> Example: Screw joint with PCB as clamping part:
- Pan head with washer – keeps 45 % of assembly clamp load*
- EJOT SpringHead® – keeps 79 % of assembly clamp load*

> Contamination of sensible areas with particles

> Technical cleanliness acc. to VDA 19 with the EJOCLEAN® concept:
- Ultra-fine cleaning of the fasteners as ultimate step in production process
- Handling of the parts in a cleanroom
- Vacuum packing in ESD aluminum bags to avoid relative movement between the screws



> Space requirements of stacked PCBs that need to be isolated from each other

> Stacking of PCBs via EJOSYST® distance holder (ALtracs® Xt with overmolding)

> Mounting of lower PCB to aluminum housing via ALtracs® Xt

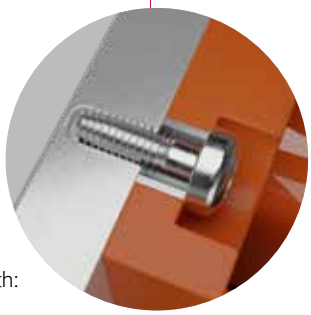
> Mounting of upper PCB to distance holder via EVO PT®

> Dielectric strength: 4 KV

> Limited space available (limited installation depth)

> Specialized thread geometry for usage in light alloys allows compact design:
- Big thread engagement thanks to circular thread cross-section
- Bigger female thread flank thanks to reduced 33° flank angle of ALtracs® Xt

> Low requirements regarding installation depth:
- 1.5 x d_1 (incl. 4 x P thread forming zone) for ALtracs® Xt vs. 2 x d_1 (excl. thread forming zone) for non-circular thread forming fastener

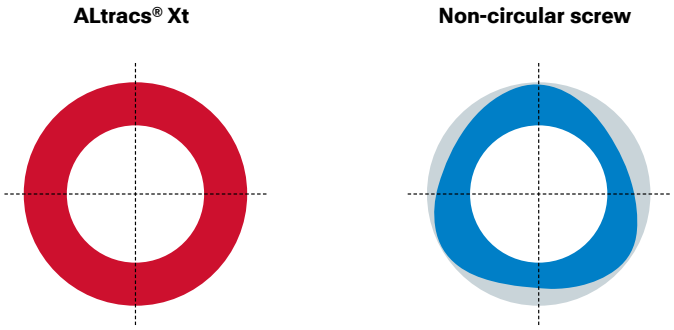


* Screw joint: PCB on aluminum plate – after assembly 45 h storage in temperature chamber (with temperatures alternating between -40° C up to 80° C)

High joint strengths and compact design

Compared to other thread-forming fasteners with a non-circular (polygonal) cross-section, ALtracs® Xt achieves maximum thread engagement thanks to its circular cross-section.

The available space will be used optimally.



With better flank engagement, ALtracs® Xt generates additional advantages:

Recommended installation depths ≤ 2.0 x d_1

Low space requirements

Already at relatively short installation depths of ~ 2.0 x d_1, ALtracs® Xt can generate clamp loads comparable to a property class 10.9 machine screw without damaging the female thread. Additionally, this high clamp load is also retained in the screw joint – even under the influence of thermic / dynamic stress – thanks to the more homogeneous load distribution.

Permissible draft angle 2.0°

Bigger allowable tolerances

The maximum thread engagement of the circular cross-section helps to better compensate tolerances in the pre-hole, especially regarding pre-hole diameter and draft angle (in the case of a cast part). This is especially valuable when joining components produced in a die-cast process. ALtracs® Xt ensures a castable component design and thus allows for more economic cast parts.

Potential for miniaturization

Each thread pitch in a screw joint with ALtracs® Xt can bear a higher clamp load than what would be the case with other thread-forming fasteners. This allows a reduction of installation depth (or, ideally, even the reduction of the screw diameter) without impacting the integrity of the screw joint.

Tailor-made support for your screw joint design

EJOT Engineering Services offer the potential to save time / resources during the development stages of projects.

Analytical design with Xt CALC®

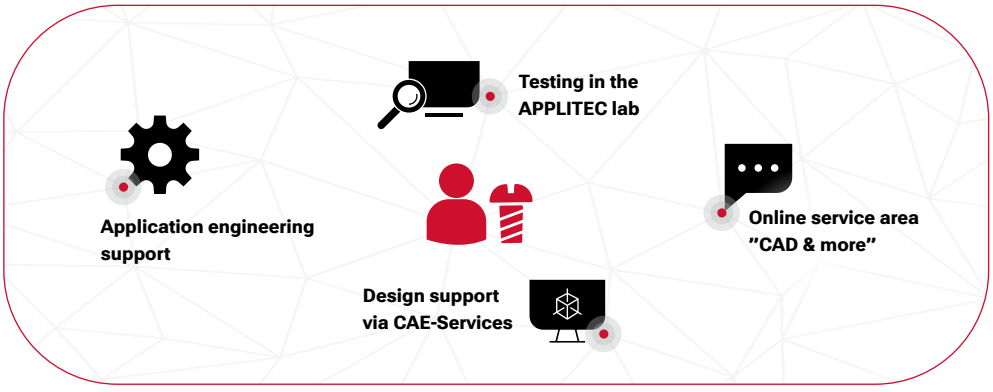
The reliable prognosis of design and process parameters like clamp load, torque values or failure methods is essential for thread-forming assemblies. Therefore EJOT provides the specifically developed prognosis program Xt CALC®. This software allows designing of screw joints with ALtracs® Xt along the guidelines of VDI 2230.

Online service area

Services for maximum efficiency

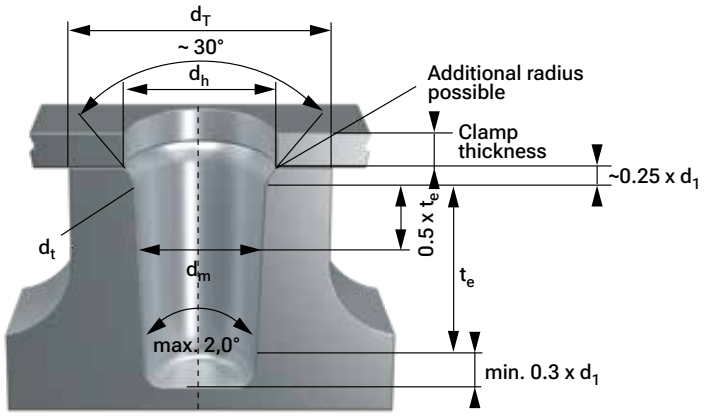
State-of-the-art simulation tools and high-quality material models allow for a realistic simulation of the fastener's influence on the complete component. Together with the testing capabilities of the EJOT APPLITEC this will enable us to cover a wide range of aspects of joining technology.

Full focus on your application:



Design recommendations for the ALtracs® Xt

The hole diameter recommendations in the table apply to light metal and other non-ferrous metals with a strength of ≤ 470 MPa and a hardness of ≤ 140 HB. For higher material hardness, we recommend other thread geometries.



The values are based on laboratory tests, so the assembly parameters, especially the influence of the screw surface, should be checked before starting production. The EJOT APPLITEC laboratory provides the required application technology for this.

d_1	Pre-hole tolerance
2.0	± 0.03
2.5 - 3.5	± 0.05
4.0	± 0.06
5.0	± 0.07
6.0 - 7.0	± 0.10
8.0 - 10.0	± 0.14

Hole recommendations for cast and drilled holes with alloys of aluminum, magnesium, zinc and copper with different screw-in depths (t_e)

Hardness	up to 55 HB			55 - 115 HB				115 - 140 HB		
t_e	1.0 x d_1	1.5 x d_1	2.0 x d_1	0.5 x d_1	1.0 x d_1	1.5 x d_1	2.0 x d_1	0.5 x d_1	1.0 x d_1	1.5 x d_1
d_1	d_m	d_m [d_t]*	d_m [d_t]*	d_m	d_m	d_m [d_t]*	d_m [d_t]*	d_m	d_m	d_m [d_t]*
2.0	1.83	1.85 [1.90]	t_{emax} = 1.5 x d_1	1.83	1.85	1.87 [1.92]	t_{emax} = 1.5 x d_1	1.85	1.87	1.89 [1.94]
2.5	2.20	2.25 [2.32]	2.30 [2.39]	2.20	2.25	2.30 [2.37]	2.35 [2.44]	2.25	2.30	2.35 [2.42]
3.0	2.65	2.70 [2.78]	2.75 [2.85]	2.65	2.70	2.75 [2.83]	2.80 [2.90]	2.70	2.75	2.80 [2.88]
3.5	3.10	3.15 [3.24]	3.20 [3.32]	3.10	3.15	3.20 [3.29]	3.25 [3.37]	3.15	3.20	3.25 [3.34]
4.0	3.55	3.60 [3.70]	3.65 [3.79]	3.55	3.60	3.65 [3.75]	3.70 [3.84]	3.60	3.65	3.70 [3.80]
5.0	4.40	4.50 [4.63]	4.60 [4.77]	4.40	4.50	4.60 [4.73]	4.70 [4.87]	4.50	4.60	4.70 [4.83]
6.0	5.30	5.40 [5.56]	5.50 [5.71]	5.30	5.40	5.50 [5.66]	5.60 [5.81]	5.40	5.50	5.60 [5.76]
7.0	6.20	6.30 [6.48]	6.40 [6.64]	6.20	6.30	6.40 [6.58]	6.60 [6.84]	6.30	6.40	6.60 [6.78]
8.0	7.00	7.20 [7.41]	7.40 [7.68]	7.00	7.20	7.40 [7.61]	7.50 [7.78]	7.20	7.40	7.50 [7.71]
10.0	8.80	9.00 [9.26]	9.20 [9.55]	8.80	9.00	9.20 [9.46]	9.40 [9.75]	9.00	9.20	9.40 [9.66]

d_1 = nominal screw diameter **d_m** = hole diameter middle **d_t** = hole diameter top **t_e** = installation depth
d_h = diameter through hole (approx. 1.1 x d_1) **d_T** = minimum boss diameter (approx. 2 x d_1) ***d_t** calculated with 2.0°

If you have any questions regarding larger tolerances or draft angles, please contact your EJOT application engineer or the hotline.

Technical specifications

Manufacturing range

ALtracs® Xt	20	25	30	35	40	50	60	70	80	100
Ø d_1	2,0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	10.0
Length L	Thread length L_T									
4	3									
5	3	4								
6	4	5	5							
7	5	5	5							
8	6	7	7	7	6.5					
9	6	8	7	9	6.5					
10	6	8	9	9	8.5	8				
11	6	8	9	11	8.5	8				
12	6	8	9	11	10	10	10			
13	6	8	9	11	10	10	11			
14	6	8	9	11	12	12	11	12		
15	6	8	9	11	12	12	11	13		
16	6	8	9	11	12	12	14	13	13.5	
18	6	8	9	11	12	12	14	16	15	
20	6	8	9	11	12	15	18	16	15	17
22	6	8	9	11	12	15	18	21	19	18
25		8	9	11	12	15	18	21	19	23
30			9	11	12	15	18	21	24	23
35				11	12	15	18	21	24	30
40					12	15	18	21	24	30
50						15	18	21	24	30
60							18	21	24	30
70								21	24	30
80									24	30
90										30
100										30

Minimum length for versions with countersunk head + 0.6 x d_1

Screw material

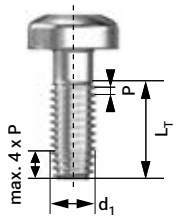
> Through hardened steel (analog property class 10.9)*
> Austenitic stainless steel A2/A4 (CrNi Stahl)
> Ferritic stainless steel (chromium steel)

* also with reduced carbon footprint available (see recarb® program).

All dimensional data in mm

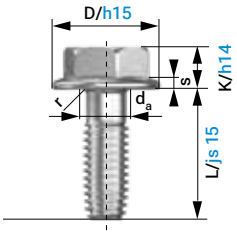
Technical specifications

Designs



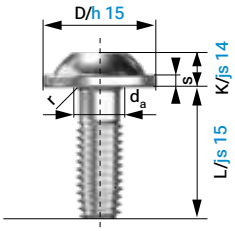
ALtracs® Xt			20	25	30	35	40	50	60	70	80	100
Thread external Ø		d_1	2.00	2.50	3.00	3.50	4.00	5.00	6.00	7.00	8.00	10.00
Thread external Ø tolerance		d_1	± 0.04	± 0.04	± 0.05	± 0.05	± 0.06	± 0.06	± 0.07	± 0.07	± 0.07	± 0.09
Thread pitch		P	0.40	0.45	0.50	0.60	0.70	0.80	1.00	1.00	1.25	1.50
Length of forming zone			max. 4P									
Drive size	TOBI®	B	6	8	10	15	20	25	30	upon request	40	50
	TORX PLUS® / AUTOSERT®	IP										
	TORX®	T										

WN 3117



ALtracs® Xt		20	25	30	35	40	50	60	70	80	100
Head Ø	D	not produceable		upon request			11.50	14.00	upon request	18.00	upon request
Width across flats	SW						8.00	10.00		13.00	
Head height	K						4.80	5.50		7.50	
Washer thickness	s						1.00	1.10		1.20	
Radius	r						0.30	0.40		0.60	
Bearing Ø	d_a						5.70	6.80		9.20	

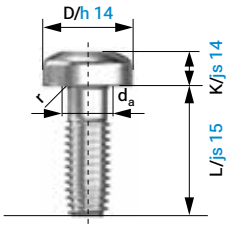
WN 3131 / 3151



WN 3131 TOBI® drive system
WN 3151 TORX® / TORX PLUS® drive

ALtracs® Xt		20	25	30	35	40	50	60	70	80	100
Head Ø	D	5.00	6.00	7.50	9.00	10.00	11.50	14.50	upon request	19.00	upon request
Head height	K	1.50	2.00	2.25	2.50	2.90	3.40	4.40		5.70	
Washer thickness	s	0.60	0.60	0.70	0.80	1.00	1.20	1.60		2.00	
Radius	r	0.10	0.10	0.20	0.20	0.30	0.30	0.40		0.60	
Bearing Ø	d_a	2.60	3.10	3.60	4.10	4.70	5.70	6.80		9.20	

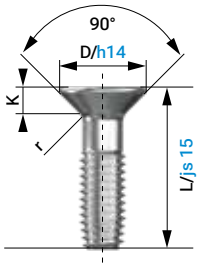
WN 3132 / 3152



WN 3132 TOBI® drive system
WN 3152 TORX® / TORX PLUS® drive

ALtracs® Xt		20	25	30	35	40	50	60	70	80	100
Head Ø	D	4.00	5.00	6.00	7.00	8.00	10.00	12.00	upon request	16.00	upon request
Head height	K	1.50	2.00	2.40	2.70	3.10	3.80	4.60		6.00	
Radius	r	0.10	0.10	0.20	0.20	0.30	0.30	0.40		0.60	
Bearing Ø	d_a	2.60	3.10	3.60	4.10	4.70	5.70	6.80		9.20	

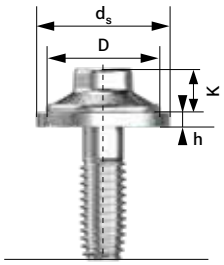
WN 3134 / 3154



WN 3134 TOBI® drive system
WN 3154 TORX® / TORX PLUS® drive

ALtracs® Xt		20	25	30	35	40	50	60	70	80	100
Head Ø	D	upon request	4.70	5.50	7.30	8.40	9.30	11.30	upon request	15.80	upon request
Head height	K_{max}		1.53	1.68	2.40	2.75	2.75	3.32		4.67	
Radius	r		0.70	0.80	0.95	1.00	1.30	1.60		2.00	

WN 6200-EJOT SpringHead®

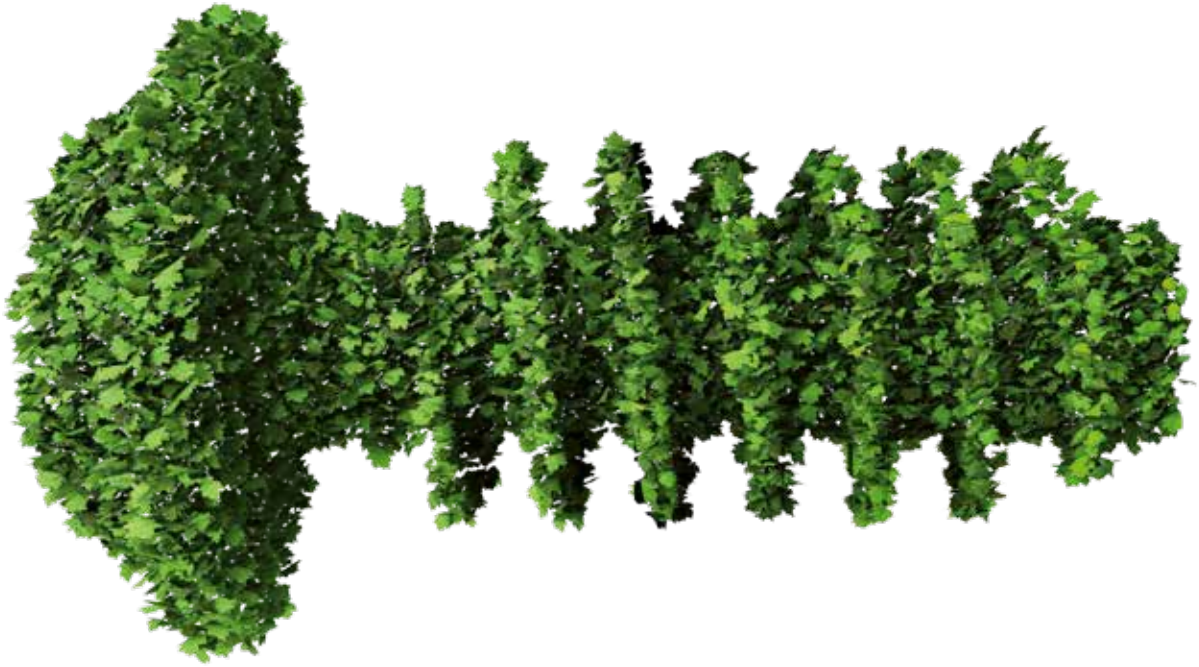


ALtracs® Xt		20	25	30	35	40	50	60	70	80	100
Head Ø	D	not produceable	6.00	7.50	8.50	9.80	12.00	14.50	upon request	19.50	upon request
Head height K_{max}	SH soft		2.20	2.65	3.10	3.60	4.40	5.30		7.20	
	SH hard		2.25	2.70	3.30	3.80	4.75	5.75		7.85	
Washer Ø	d_s		7.00	9.00	10.00	11.50	13.50	16.00		21.00	
Washer height	h		0.70	0.80	1.00	1.20	1.40	1.60		2.00	

Tolerances

Tolerance ranges	Nominal size ranges [mm]							
		more than 3	more than 6	more than 10	more than 18	more than 30	more than 50	more than 80
	up to 3	up to 6	up to 10	up to 18	up to 30	up to 50	up to 80	up 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 15	± 0.20	± 0.24	± 0.29	± 0.35	± 0.42	± 0.50	± 0.60	± 0.70

recarb®



Save CO_2. Faster.

When it comes to reducing CO_2, we start at the very beginning.
We source CO_2-reduced raw material from our partners to produce our steel fasteners.
This is how we make the supply chain sustainable and support you in manufacturing CO_2-reduced products.

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