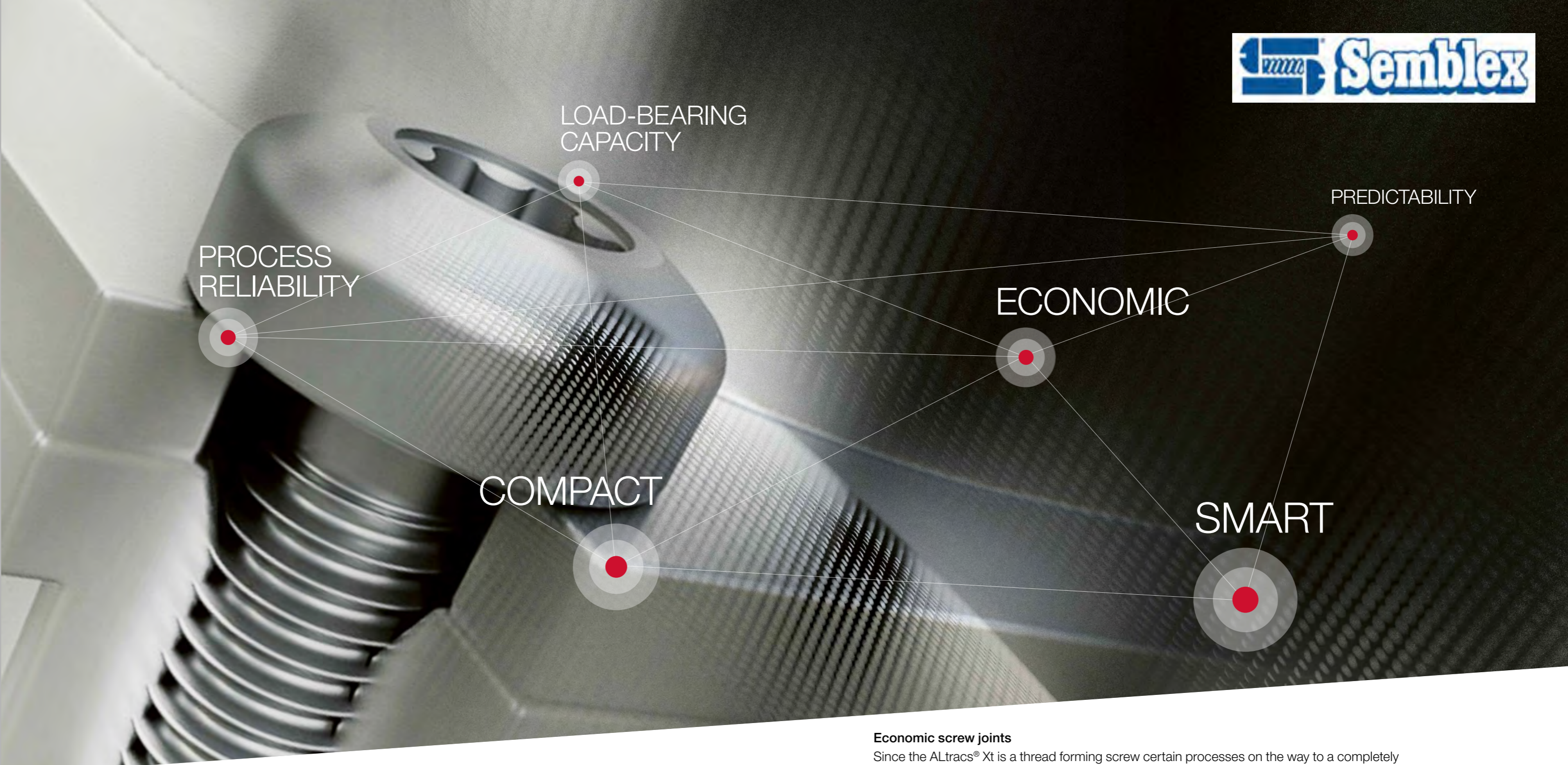


ALtracs[®] Xt

Thread forming
into light alloy
without compromise





ALtracs[®] Xt: Optimized for light alloys

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

Economic screw joints

Since the ALtracs[®] Xt is a thread forming screw certain processes on the way to a completely assembled screw joint can be omitted. This brings the potential for more cost-effective screw joints.

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 component design

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

Castable tolerances

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

Further information at: <https://www.semblex.com>

Phone: 630-833-2880, email: sales@semblex.com

Semblex[®] Corporation, 900 North Church Road, Elmhurst, Illinois 60126

ALtracs® Xt – thread geometry for high joint strengths

For light alloys:
max. hardness
140 HB/R_m max.
470 MPa

Mechanical
properties of the
screw analog
FK 10.9

Metric
compatibility

The ALtracs® Xt is a thread forming screw in accordance with DIN 267-30 for the 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 alloys usually is said weak link. The strength ratio between a steel screw (property class 10.9 with R_m ≥ 1040 MPa) and a typical light metal alloy (R_m approx. 330 MPa) is 3:1.

By compensating for this difference in strength via the specialized thread flank geometry of ALtracs® Xt, the risk of premature failure of the female thread is considerably lower. Thanks to this, high clamp loads can already be realized at low installation depths.

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

Economic screw joints thanks to ALtracs® Xt

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

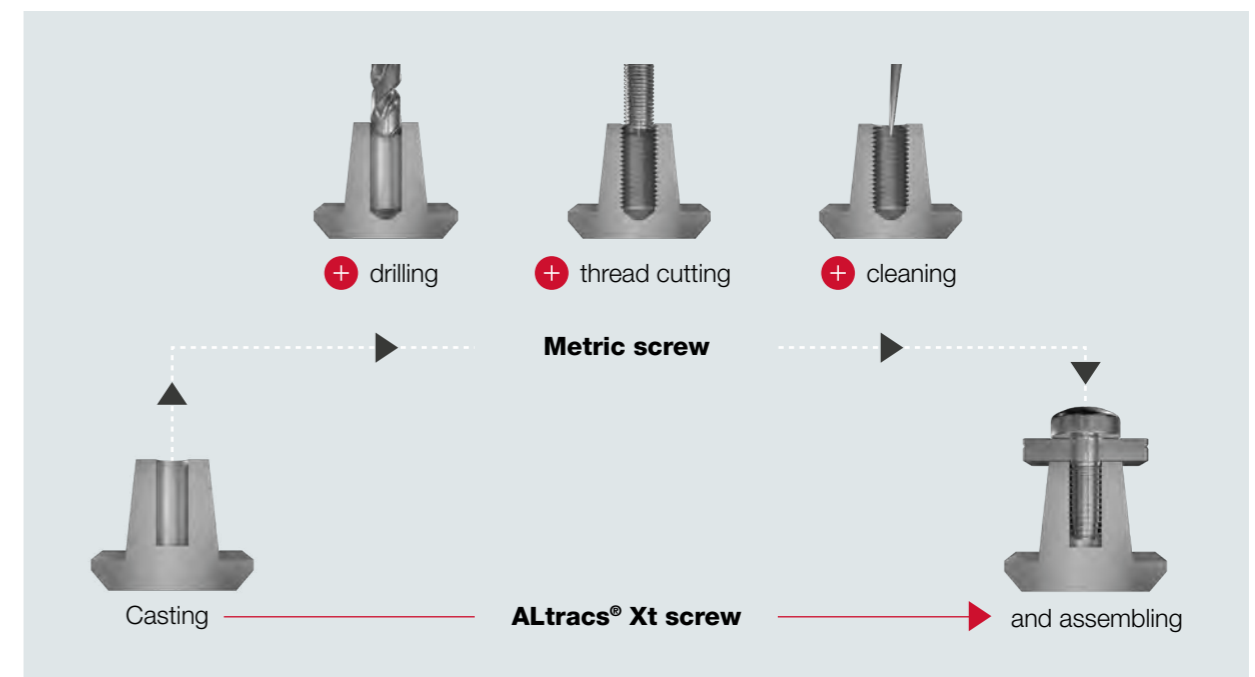
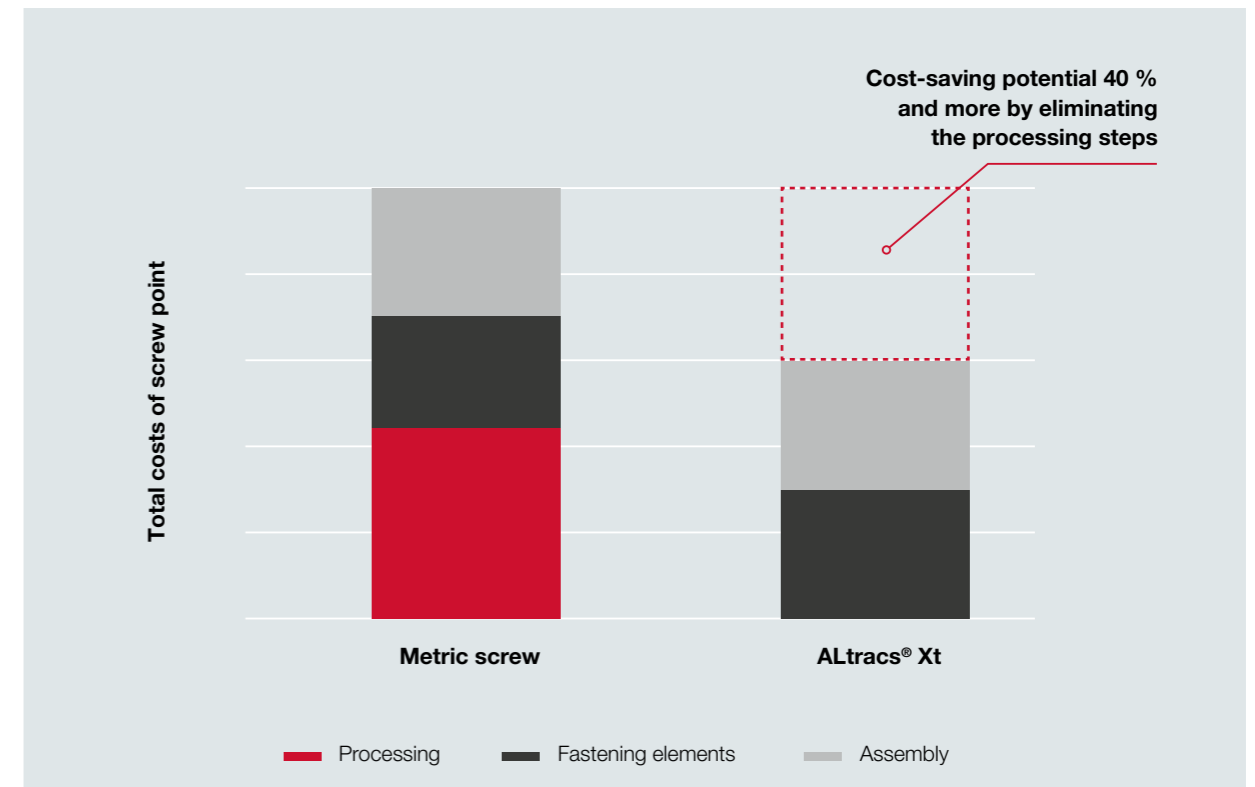
When using machine screws in cast parts additional machining processes like drilling, thread cutting (plus cleaning) are required. Each of these process steps costs time and money, long before the assembly of the screw joint.

When using ALtracs® Xt those additional process steps are not necessary. ALtracs® Xt can be assembled directly into the conical pre-hole that comes out of the casting process without the need for further machining.

Thus the total costs per screw joint are significantly reduced.

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Comparison of total costs



Thread forming into light alloy without compromise

So far there were two established concepts for thread forming screws.

Circular cross-section

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

Non-circular cross-section

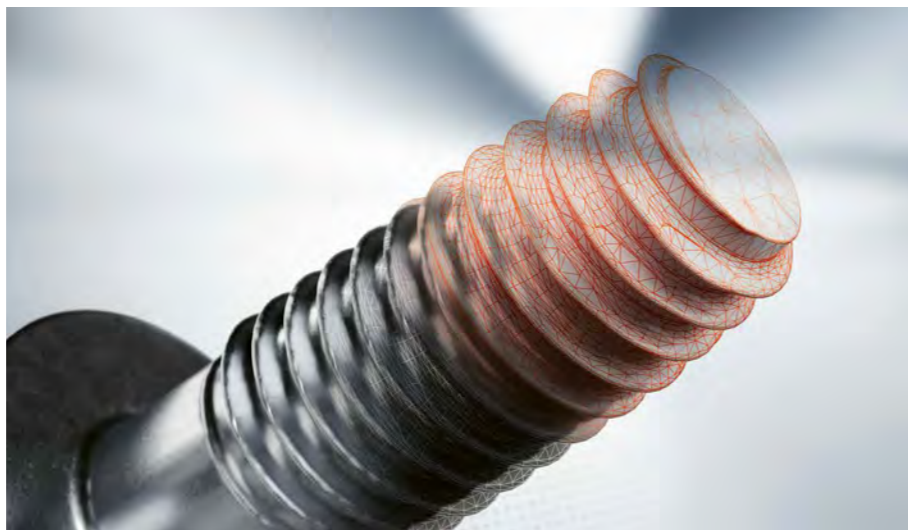
A non-circular cross-section has some void areas in the thread. The engagement doesn't happen around the complete circumference. The advantage is low friction – especially during thread forming. Due the smaller thread engagement there is a risk of premature stripping of the female thread.



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



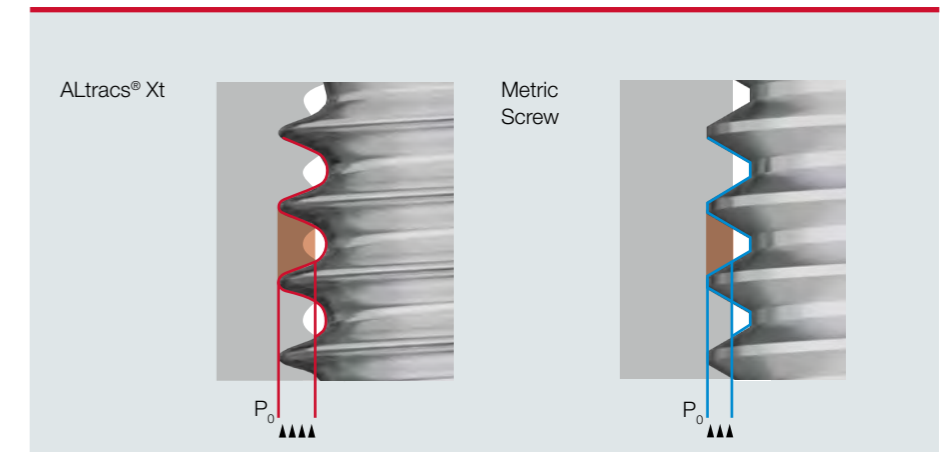
ALtracs® Xt – the best of two worlds

The optimization of the thread contour was inspired by nature. Compared to older thread designs the contour now is a lot rounder leaving out areas that do not improve the joint strength but instead only cause friction. Additionally the new Progressive Forming Profile (PFP) is the result of 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 larger. In combination with the cold-work hardening of the female thread 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.



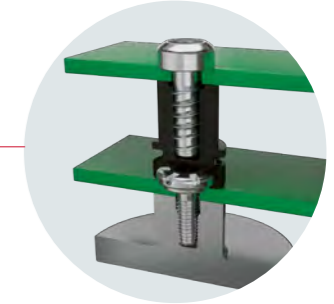
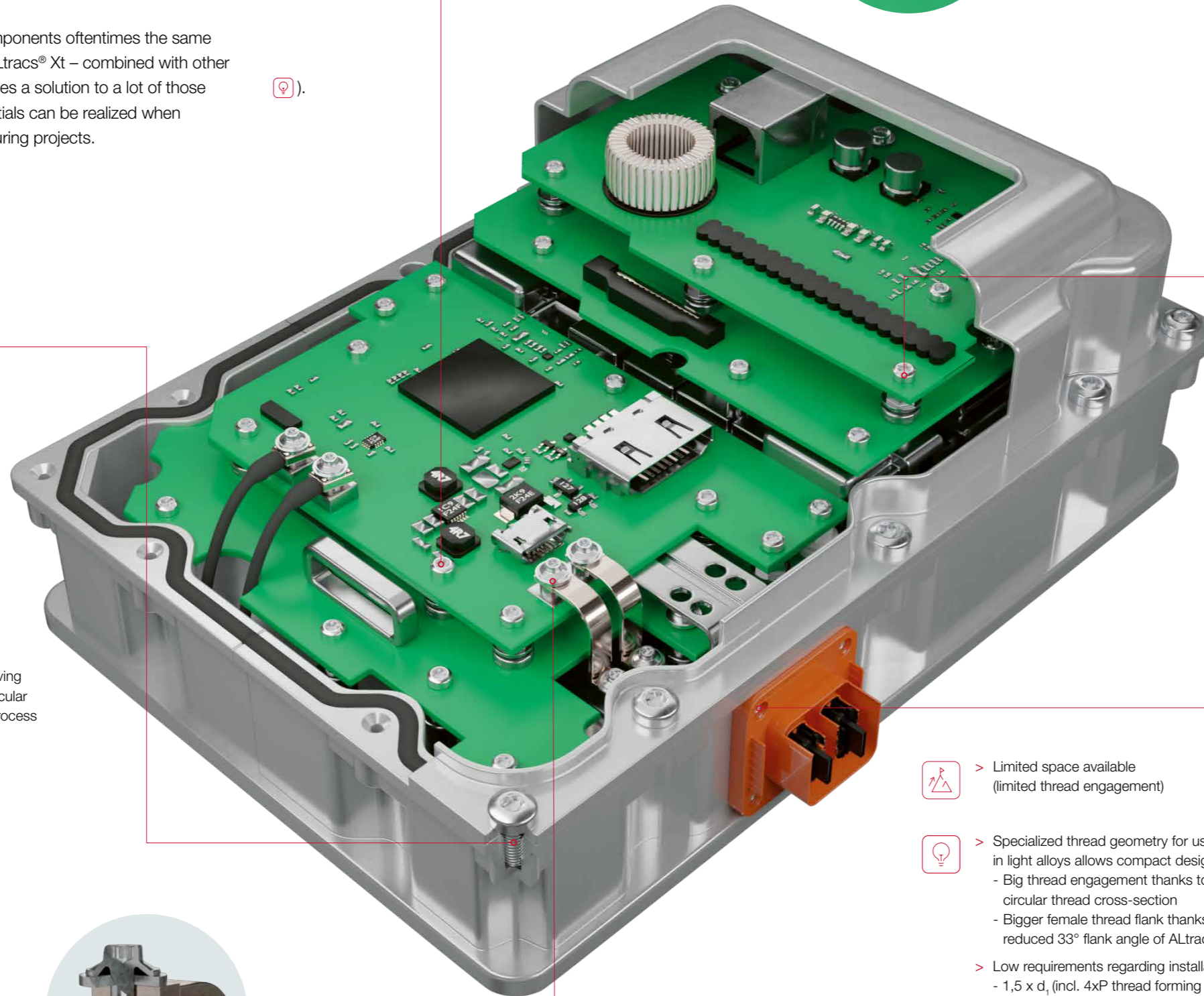
Metallographic cut of the play-free engagement between male and formed female thread



Thread forming with ALtracs® Xt generates a play-free thread engagement between screw and light alloy component. The large contact area between male and female thread provides high thread friction. This ensures a high dynamic safety without 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 Semblex technologies and services – provides a solution to a lot of those challenges (💡). Oftentimes further saving potentials can be realized when incorporating your Semblex contact early during projects.

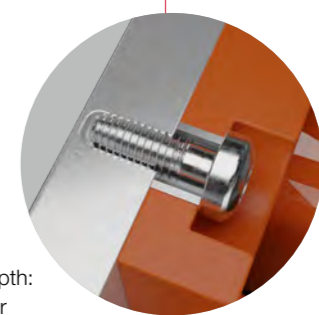


- ⚠️ > Maximum economic efficiency as well as high process capability when joining housing and cover
- 💡 > Use of ALtracs® Xt
- 💡 > Thread forming directly into cast holes:
 - High forgiveness towards tolerances of casting process
 - Saving potential of up to 60 %
- > Up to 50 % lower drive torques while 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 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*



- ⚠️ > Space requirements of stacked PCBs that need to be isolated from each other
- > 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 thread engagement)
- 💡 > 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 d₁ (incl. 4xP thread forming zone) for ALtracs® Xt vs. 2,0 x d₁ (excl. thread forming zone) for non-circular thread forming zone

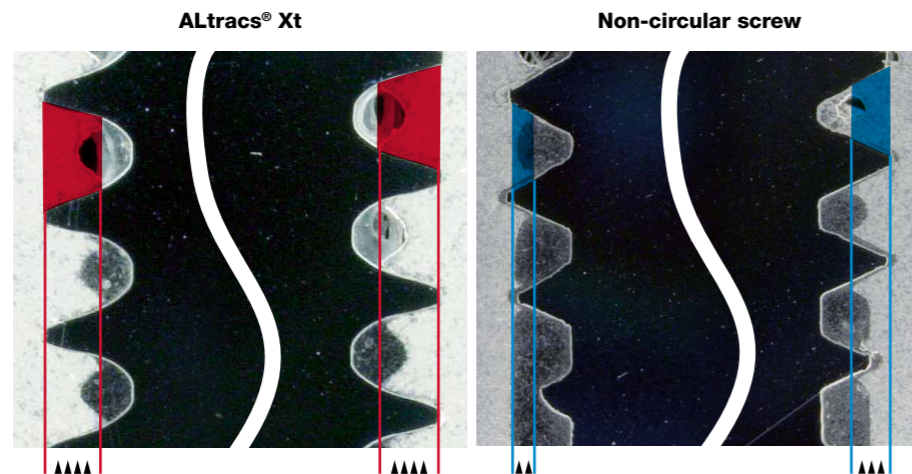


* Screw joint: PCB on aluminum plate – after assembly 45h storage in temperature chamber (with temperatures alternating between -40°C up to 80°C)

High joint strengths and compact design

When compared to other thread forming fasteners with 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 the better flank engagement ALtracs® Xt generates additional advantages:

Low space requirements

Already at rather short installation depths of $\sim 2.0 \times d_1$ 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.

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 as well as draft angle (in 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 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

Semblex Engineering services offer the potential to already save time / resources during 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 Semblex provides the specifically developed prognosis program Xt CALC®. This software allows designing of screw joints with ALtracs® Xt along the guidelines of VDI 2230.



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 at Semblex this allows us to cover a wide range of aspects around joining technology.

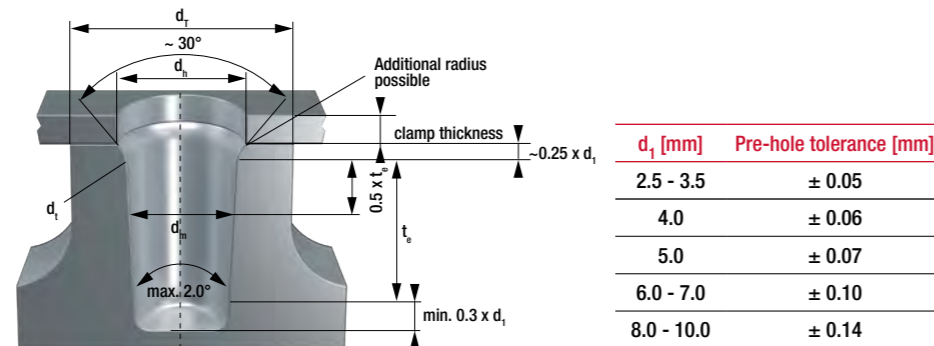
Full focus on your application:

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Design recommendations for the ALtracs® Xt

The hole diameter recommendations given 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 Semblex Engineering provides the required application technology for this.



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		
	$1.0 \times d_1$ [mm]	$1.5 \times d_1$ [mm]	$2.0 \times d_1$ [mm]	$0.5 \times d_1$ [mm]	$1.0 \times d_1$ [mm]	$1.5 \times d_1$ [mm]	$2.0 \times d_1$ [mm]	$0.5 \times d_1$ [mm]	$1.0 \times d_1$ [mm]	$1.5 \times d_1$ [mm]
t_e [mm]	d_m	d_m [d_1]*	d_m [d_1]*	d_m	d_m	d_m [d_1]*	d_m [d_1]*	d_m	d_m	d_m [d_1]*
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]
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]

ALtracs® Xt 100 upon request.

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

Technical specifications

Manufacturing range

ALtracs® Xt	25	30	35	40	50	60	70	80	100
$\varnothing d_1$ [mm]	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	10.0
Length L [mm]	Thread length L_T [mm]								
5	4								
6	5	5							
7	5	5							
8	7	7	7	6.5					
9	8	7	9	6.5					
10	8	9	9	8.5	8				
11	8	9	11	8.5	8				
12	8	9	11	10	10	10			
13	8	9	11	10	10	11			
14	8	9	11	12	12	11	12		
15	8	9	11	12	12	11	13		
16	8	9	11	12	12	14	13	13.5	
18	8	9	11	12	12	14	16	15	
20	8	9	11	12	15	18	16	15	17
22	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 + $0.6 \times d_1$

Screw material

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

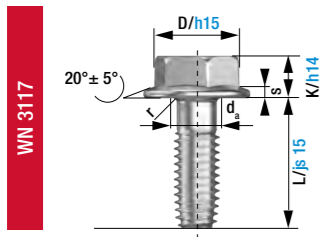
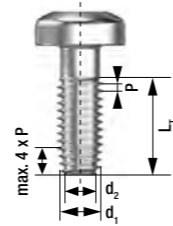


- The high-performance screw drive concept
- > Simplified assembly process due to more compact feedability and axial alignment of the screw
 - > Self-holding effect, ideal for non-magnetic screws
 - > Increased contact area leads to 60 % higher torsional strength and tool life

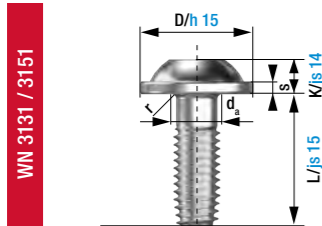
Technical specifications

Designs*

ALtracs® Xt		25	30	35	40	50	60	70	80	100
Thread external \varnothing	d_1	2.50	3.00	3.50	4.00	5.00	6.00	7.00	8.00	10.00
Thread external \varnothing tolerance	d_1	± 0.03	± 0.05	± 0.05	± 0.06	± 0.06	± 0.07	± 0.07	± 0.07	± 0.09
Thread core \varnothing	d_2	2.00	2.40	2.74	3.12	4.00	4.70	5.70	6.37	8.04
Thread pitch	P	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								auf Anfrage
	TORX PLUS® / AUTOSERT®	8	10	15	20	25	30	40	50	
	TORX®	T								



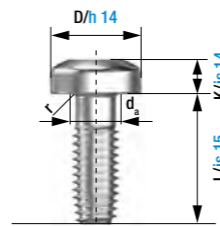
ALtracs® Xt		25	30	35	40	50	60	70	80	100
Head \varnothing	D	not produceable			11.50	14.00			18.00	
Width across flats	SW	not produceable			8.00	10.00		13.00		
Head height	K	not produceable		upon request	4.80	5.50		7.50		upon request
Washer thickness	s	not produceable		upon request	1.00	1.10		1.20		upon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



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

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

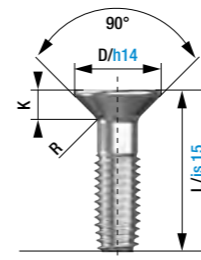
WN 3132 / 3152



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

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

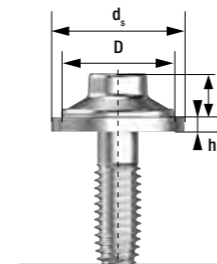
WN 3134 / 3154



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

ALtracs® Xt		25	30	35	40	50	60	70	80	100
Head \varnothing	D	4.00	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	upon request	4.67	upon request
Radius	R_{max}	0.70	0.80	0.95	1.00	1.30	1.60	upon request	2.00	upon request

WN 6200-ELOT SpringHead®



ALtracs® Xt		25	30	35	40	50	60	70	80	100
Head \varnothing	D	6.10	7.60	8.60	9.90	12.10	14.60		19.60	
Head height K_{max}	SH soft	2.20	2.65	3.10	3.60	4.40	5.30	upon request	7.20	upon request
	SH hard	2.25	2.70	3.30	3.80	4.75	5.75	upon request	7.85	upon request
Washer \varnothing	d_s	7.10	9.10	10.10	11.60	13.60	16.10	upon request	21.10	upon request
Washer height	h	0.86	0.95	1.16	1.42	1.62	1.82		2.22	

Tolerances

Tolerance ranges	Nominal size ranges [mm]							
	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

* All dimensional data in mm