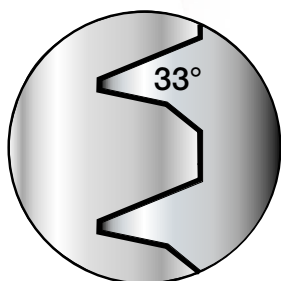
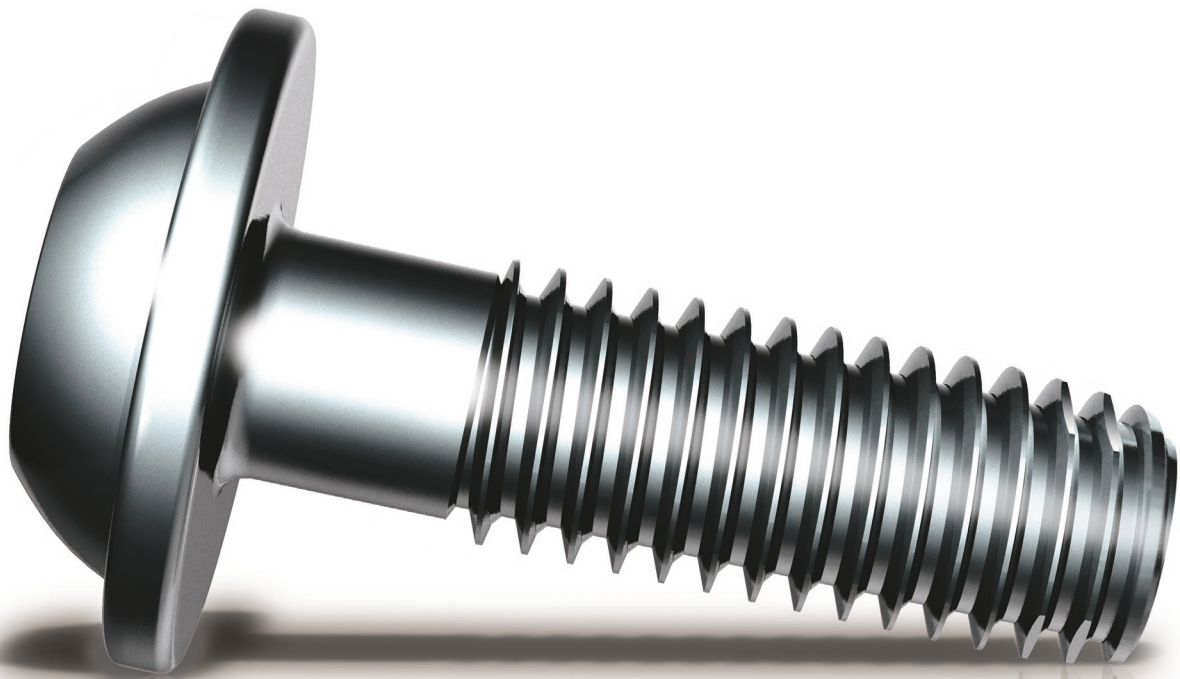


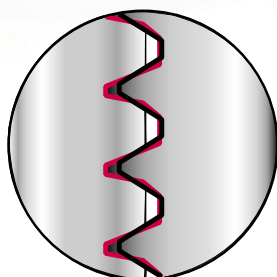


ALtracs®

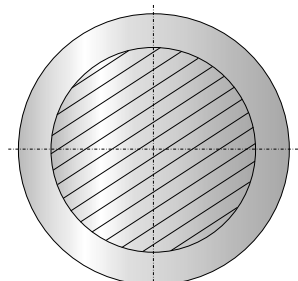
A Superior Thread-Former For Light Alloys



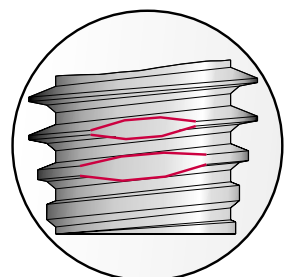
joint stability



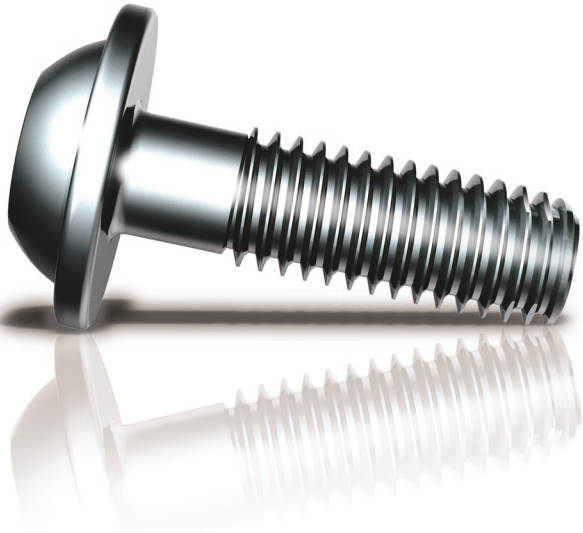
machine screw compatibility



high strength



ease of insertion

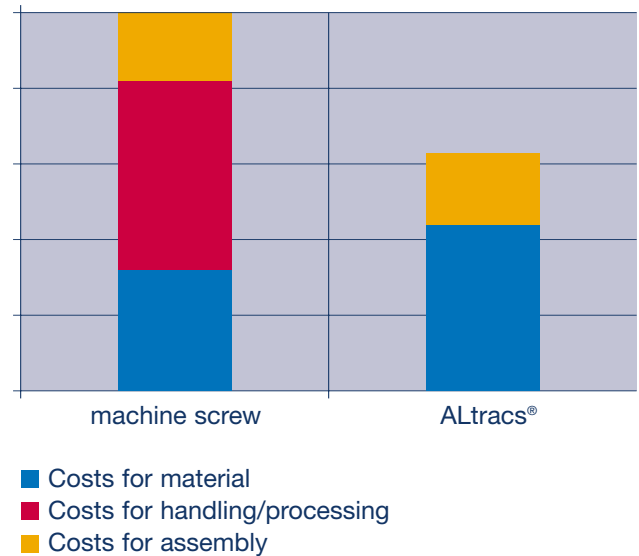


ALtracs® is a thread-forming fastener specifically designed for superior performance in aluminum and magnesium castings. It eliminates costly drilling and tapping operations and the quality problems associated with them.

Low In-Place Cost

In-place cost savings of the joint can be realized through the elimination of all costs associated with the pre-tapping operation, as follows:

- **No Tapping Operation**
- **No Tapping Related Costs**
 - Direct Labor (Set-up & Inspection Time)
 - Thread Taps, Fixtures, Gages
 - In-process Moving and Storage (WIP)
 - Cleaning Of The Tapped Hole (Oil & Chips)
 - Required Capital

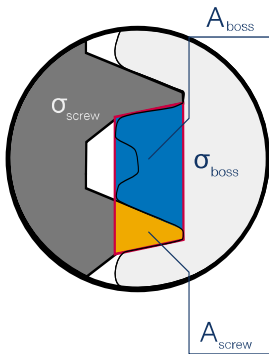


Quality Improvements

Utilizing an ALtracs® fastener improves supply-chain quality by eliminating secondary tapping operations and all associated quality issues that may be eliminated include the following:

- **Cross Threading And Assembly Problems**
- **Oil & Chip Contamination**
- **Missing Or Improperly Tapped Holes**

Asymmetrical 33° Flank Angle

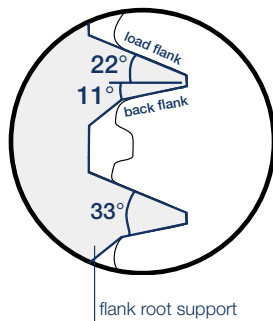
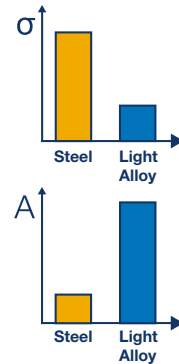


The ALtracs® features a unique 33° asymmetrical flank angle which equalizes the strength ratio between the steel screw and mating light alloy boss. This is achieved through balancing the cross sectional area of the thread with each material's strength characteristics.

$$\text{Material Strength Ratio: } \frac{\sigma_{\text{screw}}}{\sigma_{\text{boss}}} \approx \frac{3}{1}$$

$$\text{Cross-Sectional Area Ratio using 33° Flank Angle Design: } \frac{A_{\text{screw}}}{A_{\text{boss}}} \approx \frac{1}{3}$$

Overall Strength Ratio = 1 : 1

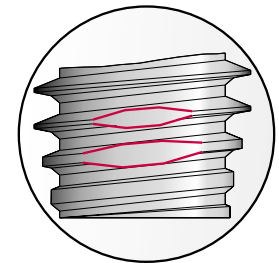


The balanced strength ratio leads to a more robust joint, increasing pull-out strength and improving clamp load retention over time and through temperature variations.

The 33° flank angle design generates low driving torques by minimizing the volume of material displaced. The flank root support gives stability to the thread in high clamp load conditions without hindering material flow during the thread-forming process.

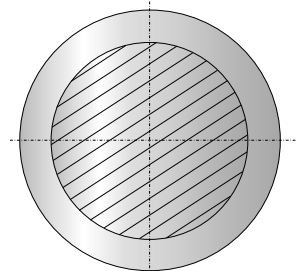
Non-circular Thread-forming Zone

The thread-forming zone consists of a **tapered**, non-circular point with thread-forming **relief flats**. The taper eases alignment for easy insertion into the hole without the addition of an expensive point, and decreases the amount of end load and torque it takes to start the thread-forming process. The flat areas in the zone provide relief during thread-forming, reducing the driving torque by approximately 30%.



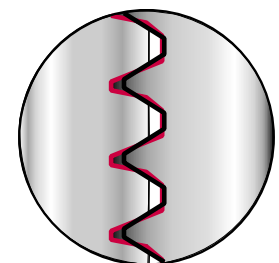
Circular Cross Section

The circular cross section maximizes thread engagement compared to trilobular designs, providing high stripping torques, consistent vibration resistance and superior clamp load generation.

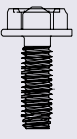



Metric Machine Screw Compatibility


The ALtracs® enables complete serviceability of the joint by maintaining performance after many repeat assemblies with the same diameter ALtracs® or even a standard metric machine screw. The fine pitch also allows the use of shorter fasteners and smaller bosses by requiring less thread engagement than most competitive designs.





ALtracs® Nominal-Ø		16	18	20	22	25	30	35	40	50	60	80	100
External thread Ø (mm)	d ₁	1.6	1.8	2.0	2.2	2.5	3.0	3.5	4.0	5.0	6.0	8.0	10.0
Core Ø	d ₂	1.12	1.32	1.45	1.61	1.88	2.30	2.66	3.02	3.87	4.59	6.23	7.86
Thread pitch	P	0.35	0.35	0.40	0.45	0.45	0.50	0.60	0.70	0.80	1.00	1.25	1.50
Thread run-out	X _{max.}	0.8	0.9	1.0	1.1	1.3	1.5	1.8	2.0	2.5	3.0	4.0	5.0

WN 5147 	Flange Ø	D	no manufacturing at present	8.0	9.0	11.0	13.0	17.0	on request
	Width across flats	SW		6.0	7.0	8.0	10.0	13.0	
	Head height	K		3.0	3.4	4.3	5.0	6.6	
	Washer thickness	s		0.9	0.9	1.1	1.1	1.1	
	Radius	R _{max.}		0.4	0.5	0.5	0.6	0.8	

WN 5151 	Head diameter	D	on request	5.00	5.50	6.00	7.50	9.00	10.00	11.50	14.50	19.00	on request
	Head height	K		1.50	1.60	2.00	2.25	2.50	2.90	3.40	4.40	5.70	
	Washer thickness	s		0.6	0.6	0.6	0.7	0.8	1.0	1.2	1.6	2.0	
	Radius	R _{max.}		0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.8	
	TORX PLUS®			6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	25 IP	30 IP	40 IP	
	A Ref.			1.75	1.75	2.40	2.80	3.35	3.95	4.50	5.60	6.75	
penetration depth	min.	t	0.65	0.65	0.90	1.00	1.10	1.30	1.50	1.90	2.60		
	max.	t	0.85	0.85	1.10	1.30	1.40	1.65	1.85	2.30	3.10		

WN 5152 	Head diameter	D	on request	4.00	4.40	5.00	6.00	7.00	8.00	10.00	12.00	16.00	on request
	Head height	K		1.50	1.60	2.00	2.40	2.70	3.10	3.80	4.60	6.00	
	Radius	R _{max.}		0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.8	
	TORX PLUS®			6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	25 IP	30 IP	40 IP	
	A Ref.			1.75	1.75	2.40	2.80	3.35	3.95	4.50	5.60	6.75	
	penetration depth	min.			0.65	0.65	0.90	1.10	1.10	1.50	1.75	2.20	
max.			0.85	0.85	1.10	1.30	1.40	1.80	1.90	2.60	3.10		

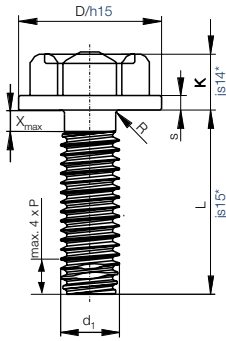
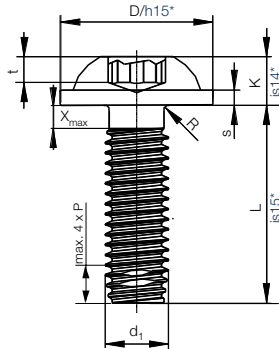
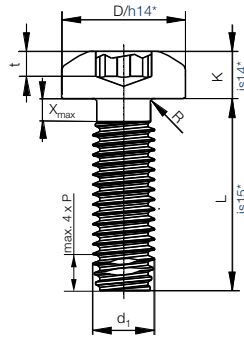
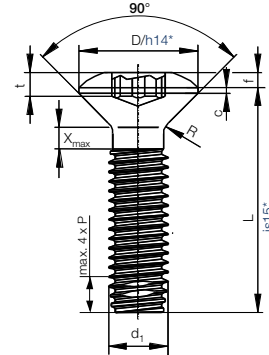
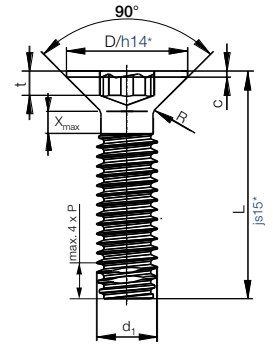
WN 5153 	Head diameter	D	on request	3.80	4.20	4.70	5.60	6.50	7.50	9.20	11.00	14.50	on request
	cyl. head height	C _{max.}		0.35	0.45	0.55	0.55	0.55	0.65	0.75	0.85	0.90	
	calotte height	≈ f		0.50	0.60	0.60	0.75	0.90	1.00	1.25	1.00	2.00	
	Radius	R _{max.}		0.50	0.60	0.70	0.80	1.00	1.00	1.30	1.60	2.00	
	TORX PLUS®			6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	25 IP	30 IP	40 IP	
	A Ref.			1.75	1.75	2.40	2.80	3.35	3.95	4.50	5.60	6.75	
penetration depth	min.		0.65	0.65	0.90	1.10	1.10	1.50	1.50	1.90	2.60		
	max.		0.85	0.85	1.15	1.30	1.40	1.80	1.85	2.30	3.10		

WN 5154 	Head diameter	D	on request	3.80	4.20	4.70	5.50	7.30	8.40	9.30	11.30	15.80	on request
	cyl. head height	C _{max.}		0.35	0.45	0.55	0.55	0.65	0.70	0.75	0.85	0.95	
	Radius	R _{max.}		0.50	0.6	0.70	0.80	0.95	1.00	1.30	1.60	2.00	
	TORX PLUS®			6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	25 IP	30 IP	40 IP	
	A Ref.			1.75	1.75	2.40	2.80	3.35	3.95	4.50	5.60	6.75	
	penetration depth	min.			0.50	0.50	0.70	0.80	0.95	1.10	1.25	1.55	
max.			0.65	0.65	0.90	1.05	1.20	1.45	1.60	2.00	2.40		

Material:

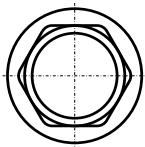
Through hardened steel AT10
(according WN5161, part 2)

Different materials, platings and
special design upon request.

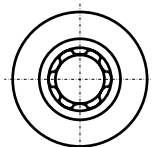
WN 5147

WN 5151

WN 5152

WN 5153

WN 5154

Nominal value [mm]

Tolerance	Nominal value [mm]							
	to 3	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30	over 30 to 50	over 50 to 80	over 80 to 120
h 14	0	0	0	0	0			
h 15	0	0	0	0	0			
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

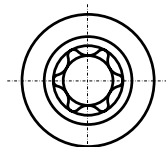
Drives



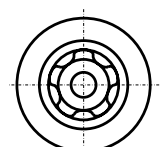
**Hex
Washer Head**



**TORX PLUS®/
AUTOSERT®**



TORX®

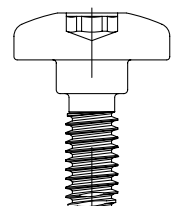
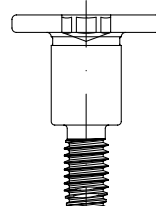
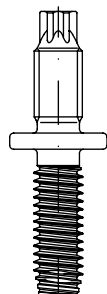
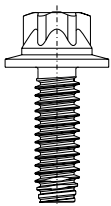


**Tamper Resistant
TORX PLUS®**

- TORX PLUS® is used as a standard recess.
- All TORX PLUS®/Autosert® and TORX® recesses are available.

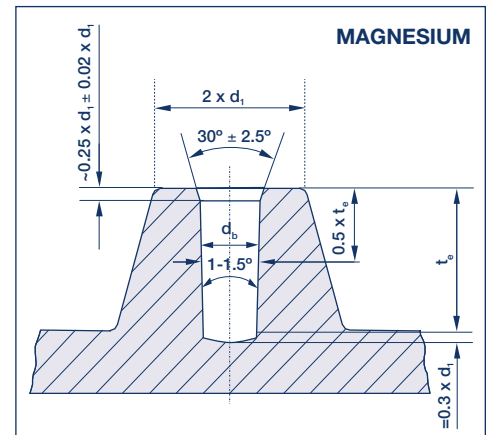
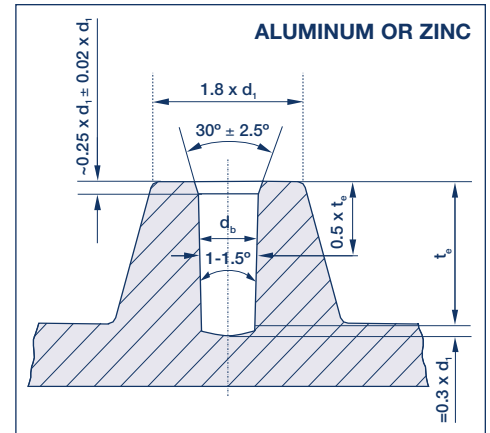
- ALtracs® 16-50 can also be supplied with a cross recess.
- All TORX® recesses from size 8 are available with a combi recess.

Possible Configurations

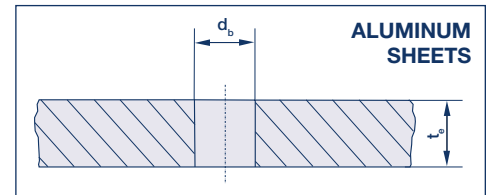


ALUMINUM OR ZINC		
Screw Diameter (d_1)	d_b - HOLE DIAMETER	
	$t_e = 2 \times d_1$ Thread Engagement	$t_e = 1.5 \times d_1$
1.6	$t_e \text{ max} = 1.5 \times d_1$	1.48 ± 0.03
1.8	$t_e \text{ max} = 1.5 \times d_1$	1.65 ± 0.03
2.0	$t_e \text{ max} = 1.5 \times d_1$	1.85 ± 0.03
2.2	2.05 ± 0.04	2.03 ± 0.04
2.5	2.35 ± 0.04	2.30 ± 0.04
3.0	2.80 ± 0.04	2.75 ± 0.04
3.5	3.25 ± 0.04	3.20 ± 0.04
4.0	3.70 ± 0.05	3.65 ± 0.05
5.0	4.70 ± 0.05	4.60 ± 0.05
6.0	5.60 ± 0.07	5.50 ± 0.07
7.0	6.60 ± 0.07	6.50 ± 0.07
8.0	7.55 ± 0.10	7.40 ± 0.10
10.0	9.40 ± 0.10	9.20 ± 0.10

(max. strength 140 HB/470MPa)



MAGNESIUM		
Screw Diameter (d_1)	d_b - HOLE DIAMETER	
	$t_e = 2 \times d_1$ Thread Engagement	$t_e = 1.5 \times d_1$
1.6	$t_e \text{ max} = 1.5 \times d_1$	1.48 ± 0.03
1.8	$t_e \text{ max} = 1.5 \times d_1$	1.65 ± 0.03
2.0	$t_e \text{ max} = 1.5 \times d_1$	1.85 ± 0.03
2.2	2.00 ± 0.04	2.00 ± 0.04
2.5	2.30 ± 0.04	2.25 ± 0.04
3.0	2.75 ± 0.04	2.70 ± 0.04
3.5	3.20 ± 0.04	3.15 ± 0.04
4.0	3.65 ± 0.05	3.60 ± 0.05
5.0	4.60 ± 0.05	4.50 ± 0.05
6.0	5.50 ± 0.07	5.40 ± 0.07
7.0	6.55 ± 0.07	6.40 ± 0.07
8.0	7.40 ± 0.10	7.20 ± 0.10
10.0	9.20 ± 0.10	9.00 ± 0.10



ALUMINUM PROFILES & SHEETS					
Screw Diameter (d_1)	d_b - HOLE DIAMETER				
	$t_e < 2.5$	$t_e = 2.5 - 4.0$	$t_e = 2.5 - 4.1$	$t_e = 2.5 - 4.2$	$t_e = 2.5 - 4.3$
1.6	1.48 ± 0.03	NR	NR	NR	NR
1.8	1.65 ± 0.03	NR	NR	NR	NR
2.0	1.85 ± 0.03	1.85 ± 0.03	NR	NR	NR
2.2	2.00 ± 0.04	2.05 ± 0.04	NR	NR	NR
2.5	2.30 ± 0.04	2.30 ± 0.04	2.35 ± 0.04	NR	NR
3.0	2.75 ± 0.04	2.75 ± 0.04	2.80 ± 0.04	NR	NR
3.5	3.20 ± 0.04	3.20 ± 0.04	3.25 ± 0.04	3.25 ± 0.04	NR
4.0	3.50 ± 0.05	3.50 ± 0.05	3.60 ± 0.05	3.70 ± 0.05	NR
5.0	4.50 ± 0.05	4.50 ± 0.05	4.60 ± 0.05	4.70 ± 0.05	NR
6.0	5.30 ± 0.05	5.40 ± 0.05	5.40 ± 0.05	5.40 ± 0.05	5.50 ± 0.07
7.0	NR	6.30 ± 0.05	6.40 ± 0.05	6.50 ± 0.05	6.60 ± 0.05
8.0	NR	7.10 ± 0.10	7.20 ± 0.10	7.30 ± 0.10	7.40 ± 0.10
10.0	NR	NR	NR	9.20 ± 0.10	9.20 ± 0.10

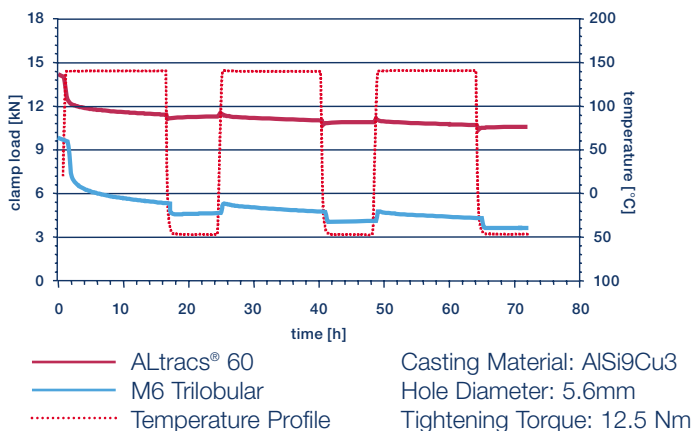
In case of drilled holes please use d_b

NR = Not Recommended

The ALtracs® fastener not only offers an economical solution for light alloy joints, but also delivers many performance benefits when compared to common competitive designs. The key advantages include improvements in:

- Stripping torque
- Clamp load retention over time
- Stability under extreme temperature variations

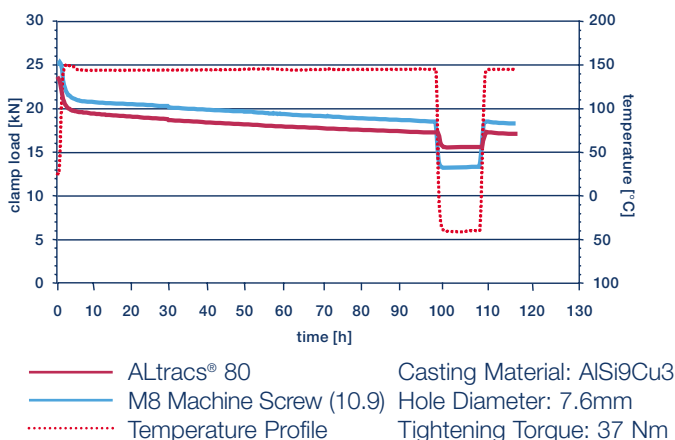
Load Retention of ALtracs® vs. Trilobular Threads



This experiment shows that the performance of the ALtracs® is superior to the trilobular design:

- **Higher clamp loads** due to reinforced thread flank, more thread flank engagement, and circular cross-section
- **Reduced creep** due to balanced material strength ratio between the male and female thread

Load Retention of ALtracs® vs. Machine Screw Threads:



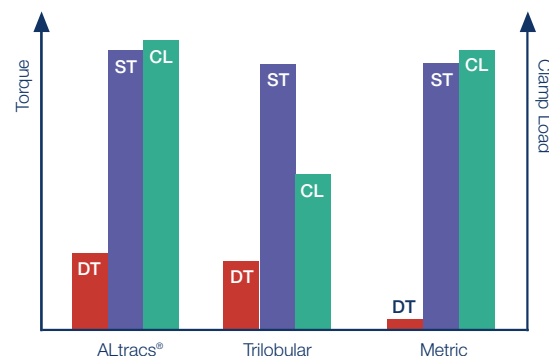
The ALtracs® fastener provides a much lower cost joint than a machine screw into a pre-tapped hole...with no sacrifice in performance!! Testing shows that the two designs provide:

- **Comparable clamp loads**
- **Comparable creep minimization**

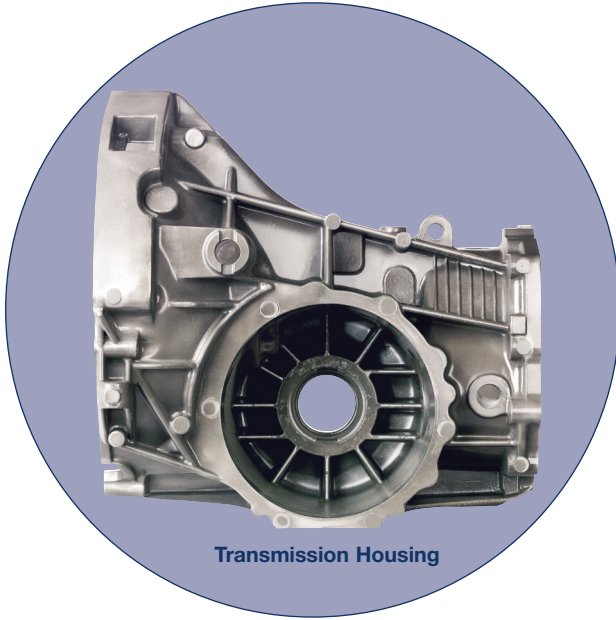
Safety in Assembly & Load Capability:

The ALtracs® provides the highest possible stripping torques and clamp loads.

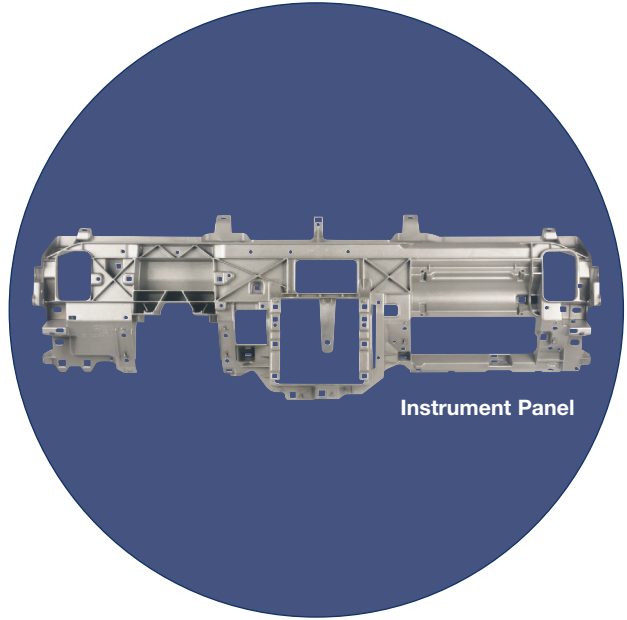
- Driving Torque
- Stripping Torque
- Clamp Load



Some typical applications for ALtracs® might include:



Transmission Housing



Instrument Panel



Steering Column
Lock Housing



Shift Tower

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