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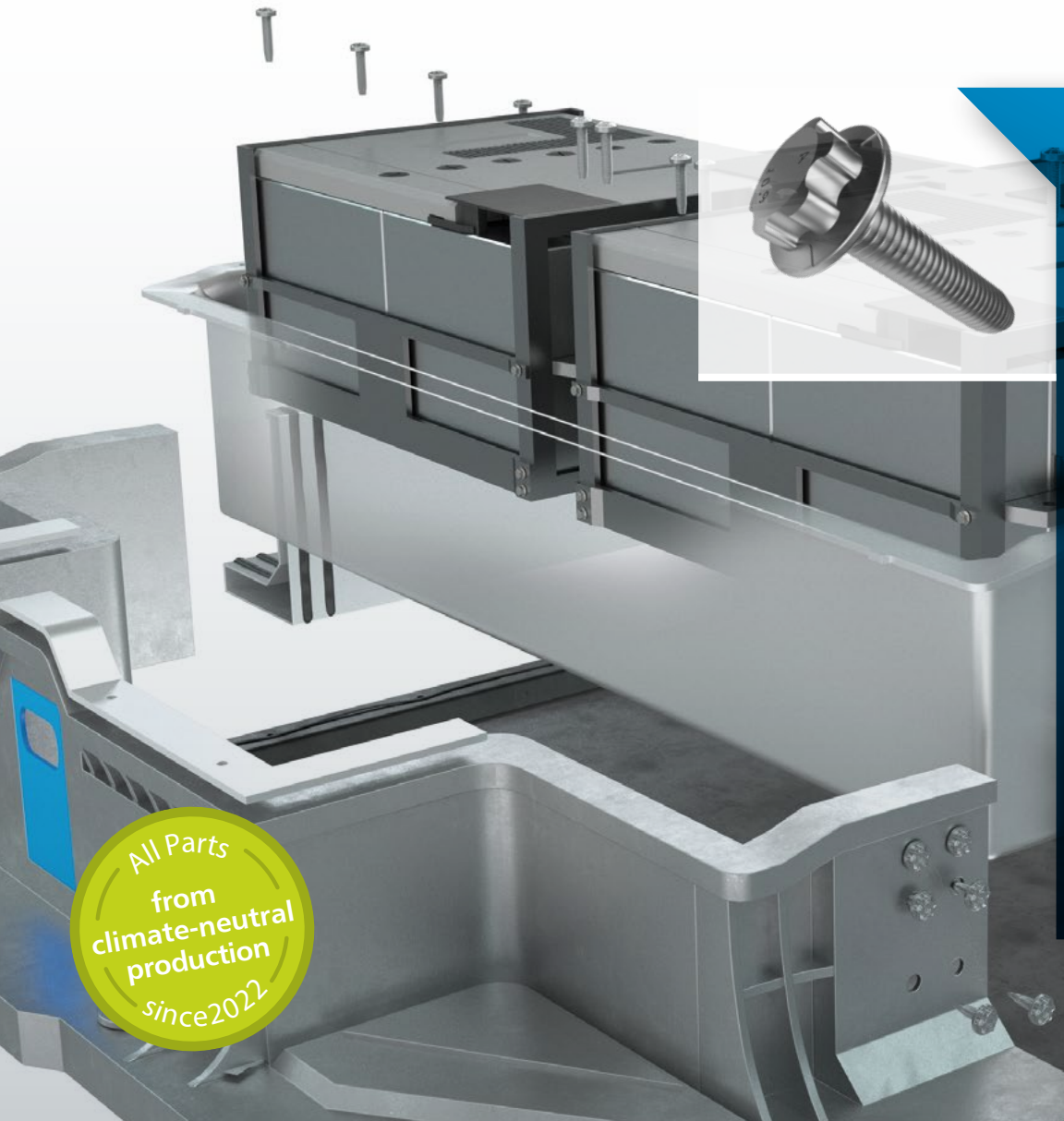
ARNOLD®
BlueFastening Systems



Powertite®

Next generation thread tapping – optimized for load capacity and climate-friendly

- High load capacity over the entire screw fastening
- High pre-load forces
- Die-cast tolerance can be expanded
- Reducing size
- Reduces overall fastening costs by up to 85%
- High assembly reliability
- CO_2 reduced over the entire screw fastening

20 %
more load capacity

For over 40 years the manufacturing industry has implemented trilobular thread-forming screws. Such screws are distinctive for low tapping torques and excellent process reliability. And for many years thread-forming screws with round cross section have likewise been used. These screws generate higher load capacities. But when it comes to thread tapping they offer less process reliability.

The recently developed Powertite® screw combines the individual strengths of trilobular and round screws to create a high load-bearing, process reliable unit.

The Powertite® effect

High load capacity in the tapped nut thread

↘ Screw fastenings made with Powertite® screws have 20% more load-bearing capacity than conventional thread tapping screw fastenings with TRILOBULAR® screws.

Can achieve clamping force levels similar to metric screws

↘ When combined with an optimized low-friction coating, it is possible to introduce much higher clamping forces with Powertite® screws. This innovative family of screw fastenings can achieve clamping forces to the level of metric screw fastenings.

Greater core hole tolerances optimize the casting process in lightweight metals

↘ The greater the core hole tolerance the greater the productivity in the casting process for lightweight metal components. With fewer strict clamp load requirements, Powertite® screws enable an increase in core hole tolerances by a significant margin, thus speeding up the casting process.

High assembly reliability

↘ Powertite® screws generate a large delta between the screw-in torque and overturn torque. One effect of this is high assembly reliability. Another is that less energy is required to drive them in.

Powertite®
proven quality with new fields of application

The best of two worlds

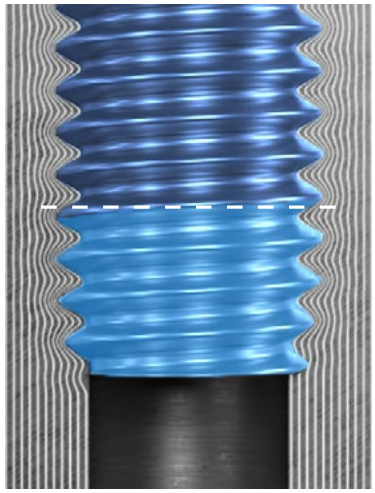
Powertite® screws achieve the proven quality characteristics of thread-tapping screws such as low tapping torques, high assembly reliability, and vibration resistance.
However, Powertite® offers an abundance of other features, opening up new fields of application for thread-tapping technology.

Round load cross-section

- The overlap of the external diameter of the thread is defined. This gives better engagement between screw and the nut thread
- Powertite® makes better use of the nut material
- The tension cross section is defined
- The pre-clamp load level is the same as that of metric screw fastenings
- The round geometry simplifies the casting process in lightweight metals

TRILOBULARE® tapping zone

- Metric threads can be formed chiplessly
- The tapping torque is low
- Ensures a high level of process reliability
- during assembly



The technical benefits of Powertite®

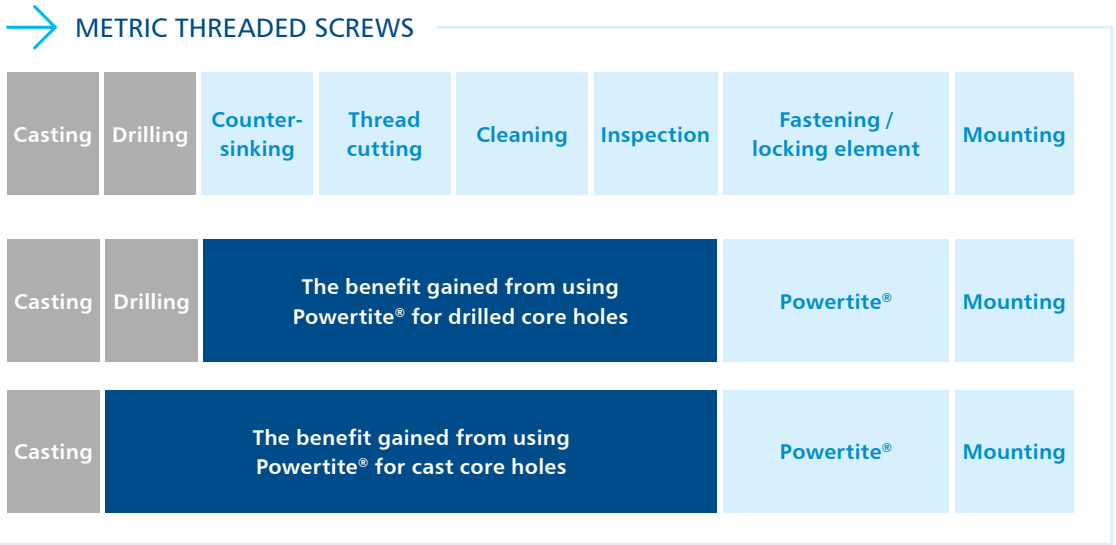
Powertite®

The advantages over purely trilobular screws

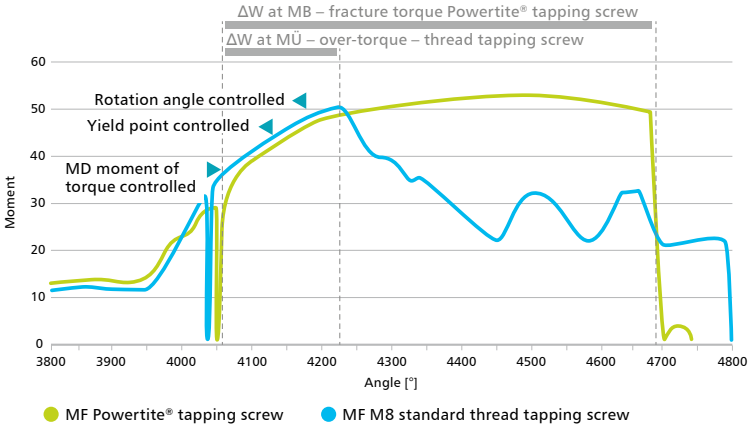
- Die-cast tolerance can be expanded
- High pre-load forces
- The tapped nut thread has high load-bearing capacity

Just a few steps to reach the goal – a comparison of mounting steps in aluminum cast components

When you use Powertite® screws, you save processing time and tooling and machinery costs. For example, you can miss out the machining center and the washing unit for the screw locations, which would be necessary for threaded screws. There's no need to purchase measuring instruments to check gauge sizes, and no additional locking elements are needed either.

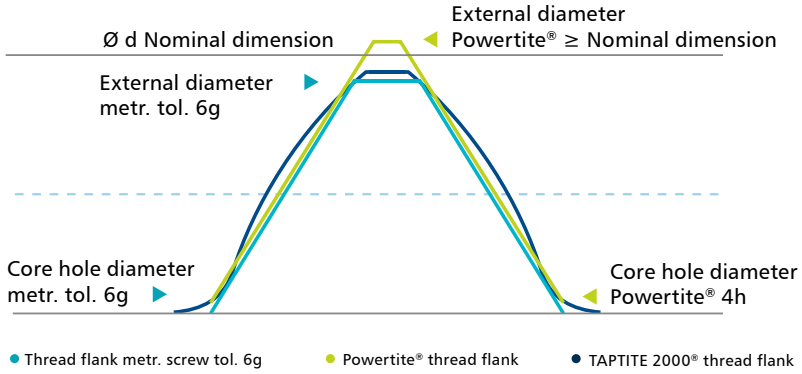


Powertite® optimizes load capacity and tapping torque



Load capacity optimized at more demanding clamping forces

The illustration shows a comparative overturn trial in aluminum die-cast in pre-cast core holes. The comparison is between an established thread-tapping screw and a Powertite® M8 screw.
It demonstrates that with the established trilobular screw, the maximum torque after around 100 degrees of angle suddenly shears off once the yield strength is exceeded. This is typical shear-off behavior in a formed nut thread.
Therefore, where trilobular screws are used, there is a risk that the nut thread will be predamaged. Thus, established trilobular screws are generally not suitable for plastically stressed mounting in such applications.



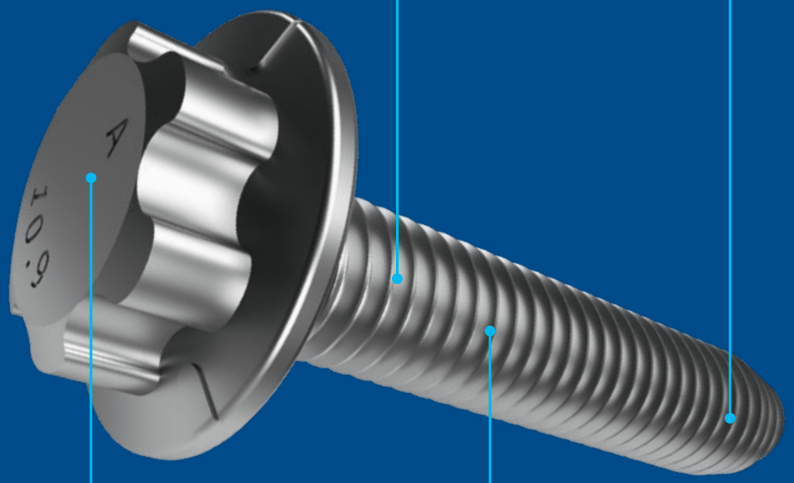
Lower driving torque

Due to the Powertite® screw's trilobular thread tapping zone the screw-in torque is significantly reduced.
This allows thread-tapping torques compliant to DIN267-30 and DIN7500-1.

The values shown are by way of example. The actual values required must be investigated on the original component.
The Fastener Testing Centre offers support here by defining the parameters of the screw fastening and through to series production.

Round load cross-section with defined overlap of thread's external diameter.

TRILOBULAR®
Tapping zone



Load capacity significantly increased

with the 60° thread flank and defined overlap contrasted with the defined nominal dimension.

Low Profile Head or countersunk head

Customized solutions can also be supplied

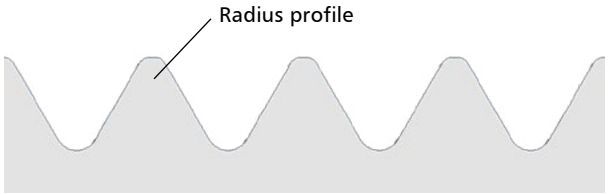
The geometry of Powertite®

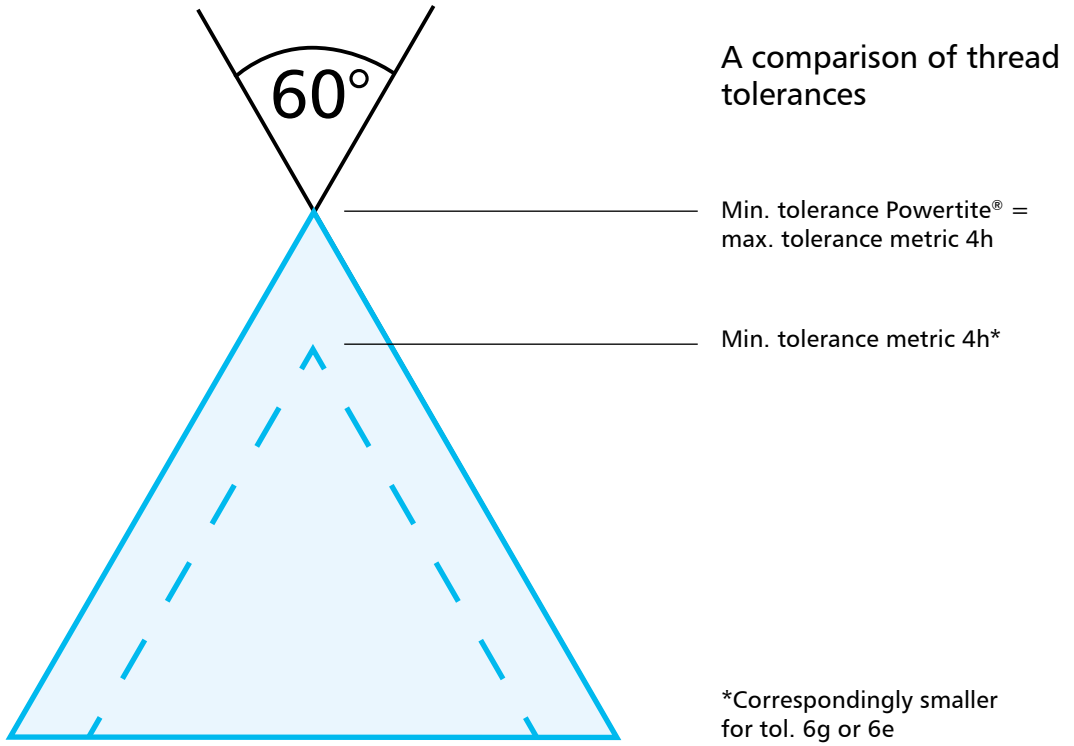
Powertite® combines the strengths of round and purely trilobular screws. The head and the load cross-section are of a round design. This ensures that Powertite® screws have a high level of load capacity. Compared with purely trilobular screws the defined overlap of the thread's external diameter ensures good engagement between screw and nut thread.

Powertite® screws' tapping zone is limited locally. It utilizes TRILOBULARITY® only where it is truly needed - in the area of the screw where the thread is formed - the tapping zone. This local limitation of the trilobular area is made possible with a new and innovative manufacturing technique which moves away from the established method of making fully trilobular screws.

The transition from round load cross-section to the trilobular tapping zone is fluid. Powertite® screws are reliable, and are impressive for their low tapping torques while at the same time maintaining a high level of pre-clamp load and they form metric threads chiplessly.

Thread profile and cross-section ensure better values



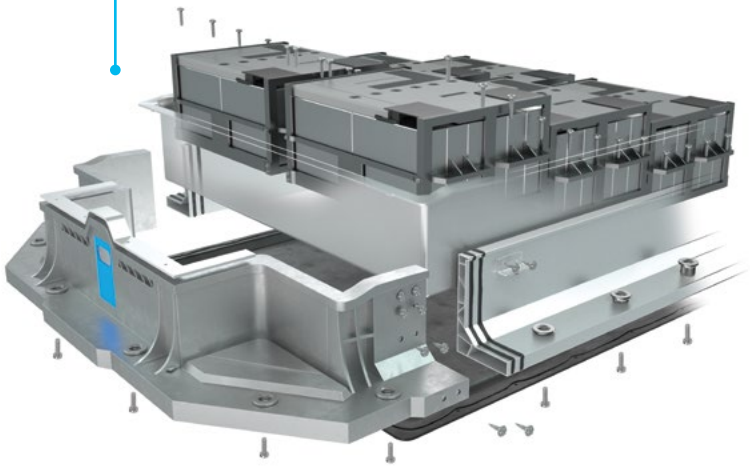


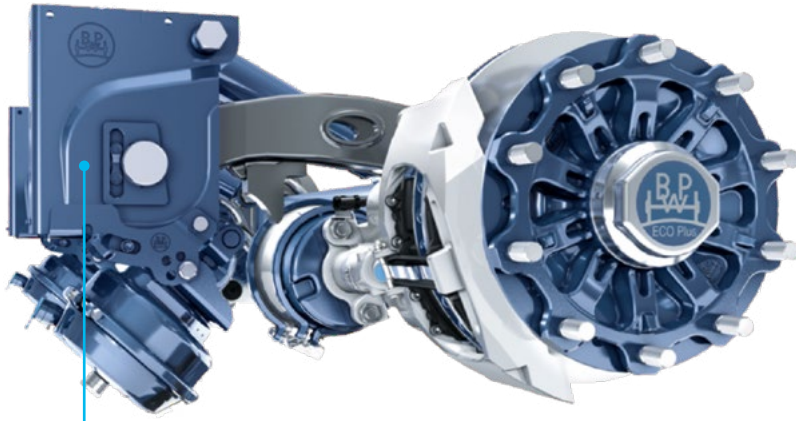
Powertite® screws have a 60° thread flank with a defined overlap compared with the defined nominal dimension and a round cross-sectional area in the load area. It therefore increases the load capacity of the formed nut thread by up to 100% compared with established trilobular thread tapping screws.
The 60° thread flank is fully compatible with metric screws. In the event of a repair being needed, the thread formed with Powertite® can accept a standard metric screw. The defined overlap ensures that metric screws can be fitted at a low driving torque. But in the event of a repair the Powertite® can be used multiple times, provided that the first screw connection was not made under plastic stress.

Applications using different materials – completely secure with Powertite®

Application in cast aluminum

For example, Powertite® is used in cast aluminum to fasten battery modules into high voltage batteries. Here M8 diameter Powertite® screws are used. This makes it possible to connect the cells to the frame, with screw fastenings made into both pre-cast and pre-drilled core holes.



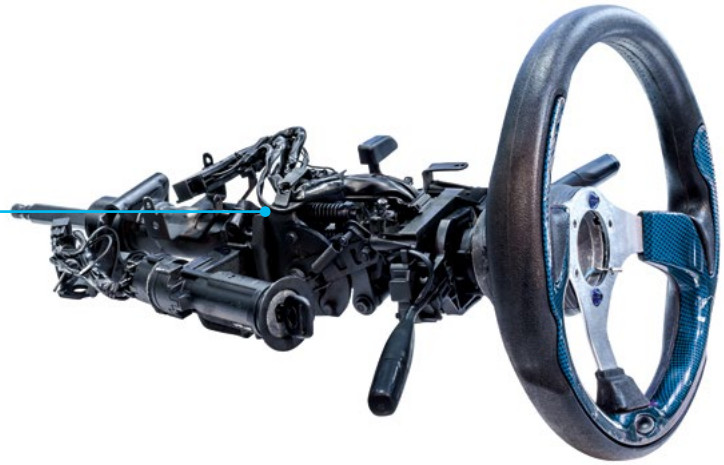


Application in solid steel

Another potential application is making screw connections into solid steel such as trailer axles, where a sensor is attached to a stub axle.
A Powertite® with inductively hardened tip is suitable here, because the material for the nut thread is relatively hard.

Application in sheet steel through-holes

For tapping threads into sheet steel through-holes thread tapping screws are generally used in a case-hardened and tempered version. Or screws in strength class 10.9 with additional inductive hardening in the tapping zone are implemented. Powertite® screws in this version can generally be implemented into steel materials up to Rm ~ 600 MPa.



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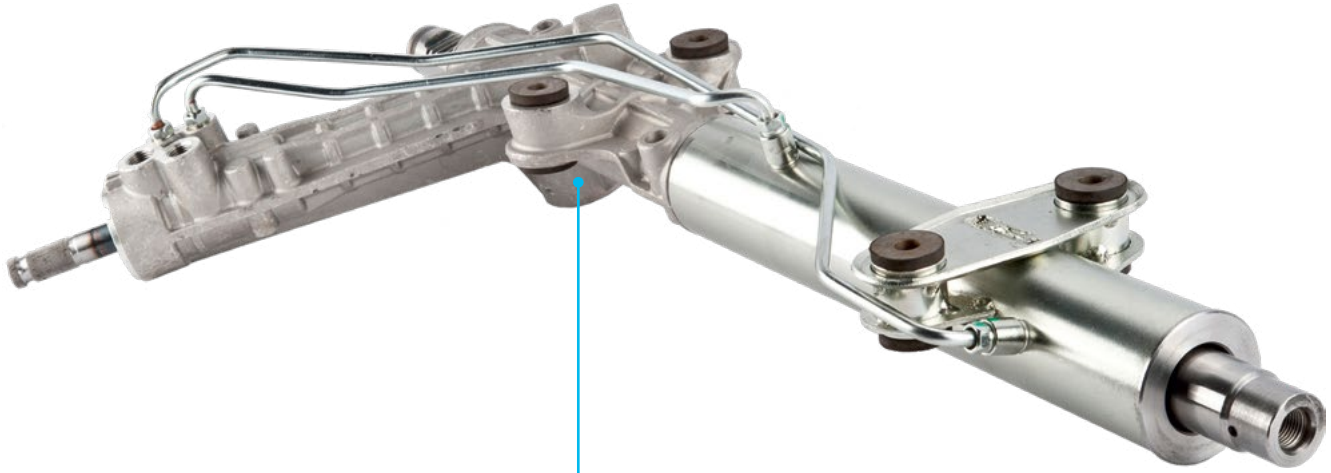

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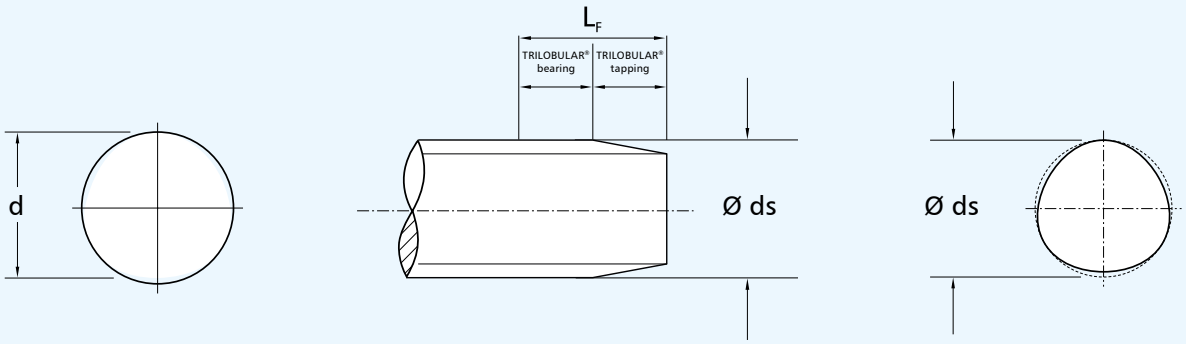
Application in cast magnesium

And for die-cast magnesium too, such as the cover fastening illustrated for the steering column application, Powertite® is very suitable because of its substantially raised load capacity. Where sheet steel through-holes need to be fastened, Powertite® can often replace conventional screw/nut fastenings. For example, this is the case as shown in the illustration of the adapter fastening on a steering gear. This application also requires the level of clamping force of a traditional screw/nut fastening.

The optimized thread geometry of Powertite®



Tapping zone length (L_F) respectively 2.5-3.5 x p

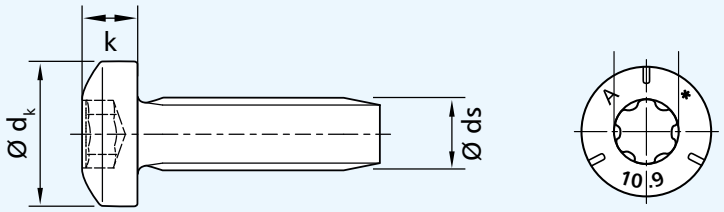
Thread cut

By optimizing the length of the tapping zone (L_F) and the permitted ds dimension, it is possible to set the screw optimally with a high number of number of bearing thread turns.

Nominal Ø thread Powertite®		M5	M6	M7	M8	M10
Tapping zone length L_F [mm]		2.40	3.00	3.00	3.75	4.50
Tolerance L_F [mm]		±0.40	±0.50	±0.50	±0.625	±0.75
Pitch p [mm]		0.80	1.00	1.00	1.25	1.50
Ø ds	max. [mm]	5.15	6.15	7.15	8.15	10.15
	min. [mm]	5.00	6.00	7.00	8.00	10.00

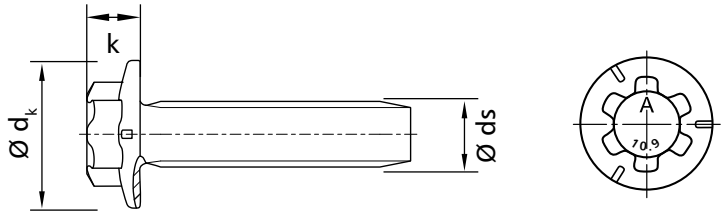
ARNOLD Factory Standards

AWN-07-01-07 flat-head screw



Nominal Ø		M5	M6	M7	M8	M10
d_k		$9.50^{-0.36}$	$12.00^{-0.43}$	$14.00^{-0.43}$	$16.00^{-0.43}$	$20.00^{-0.52}$
k		$3.70^{-0.18}$	$4.60^{-0.30}$	$5.50^{-0.30}$	$6.00^{-0.30}$	$7.50^{-0.36}$
TORX®	Size	T25	T30	T40	T45	T50
TORX PLUS AUTOSERT®	Size	IP25	IP30	IP40	IP45	IP50

AWN-07-01-08 external torx screw

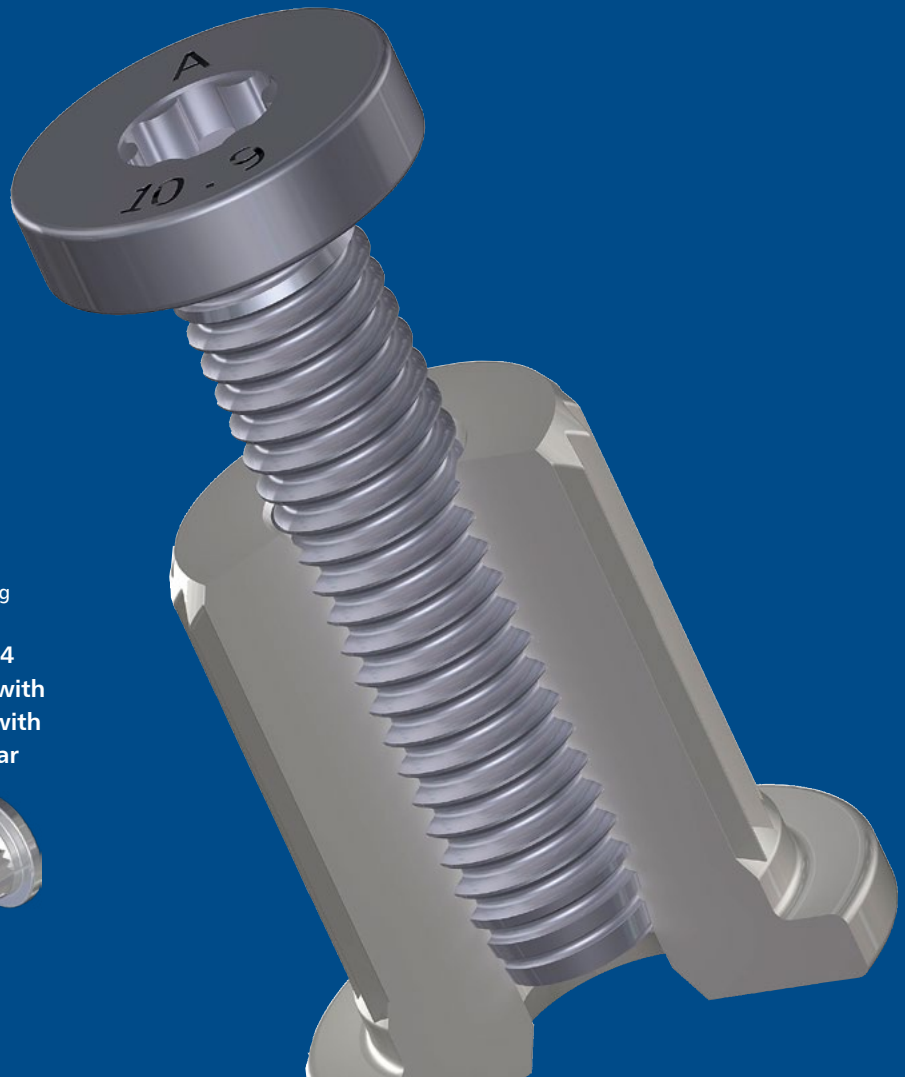


Nominal Ø		M5	M6	M7	M8	M10
d_k		$11.00^{-0.50}$	$14.50^{-0.60}$	$16.00^{-0.60}$	$18.00^{-0.80}$	$22.00^{-0.20}$
k		$4.22^{-0.30}$	$5.00^{-0.30}$	$6.00^{-0.30}$	$6.50^{-0.36}$	$7.00^{-0.50}$
TORX PLUS AUTOSERT®	Size	EP8	EP12	EP14	EP14	EP16

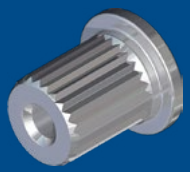
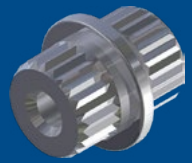
Eco-Sert® Aluminum inserts
Optimal results in conjunction with Powertite®

Aluminum inserts for challenging fastenings

In practice, aluminum inserts are mainly used for joining plastics. They are used to stiffen components (tube supports) or as the counterpart to a direct fastening. With an appropriate choice of geometry and alloy they obtain outstanding fastening results when combined with Powertite®. The benefits of aluminum inserts as metal-on-metal fastenings become evident, particularly for components that are subject to vibration stress or where operating temperatures are high.



FASTENING PLASTICS

After Molding/In Molding	After Molding/In Molding	In Molding	In Molding
Version 1 combined with standard Eco-Sert®	**Version 2 combined with Eco-Sert® with indent**	**Version 3 combined with Eco-Sert® with center collar**	**Version 4 combined with Eco-Sert® with dual collar**
			

Every Powertite® screw is a climate protector

33 tons

Of CO_2 saved

where 6 million screws are used in gear production each year.

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Sustainable and climate-protecting

Compared with conventional thread tapping screws, Powertite® screws benefit the environment. They save on resources with the option to downsize. For example, replacing an M8x40 screw with an M7x40 Powertite® in an electric motor gear unit resulted in a weight reduction. Related to the total production of 50,000 vehicles, this represented a weight saving of over 8.5 tons, and a decrease in CO_2 of more than 33 Tons.

The ARNOLD GROUP

www.arnold-fastening.com

Wherever customers need us.

ARNOLD – this name is internationally renowned for efficient and sustainable fastening systems at the highest level.

With a foundation of many years of expertise in the production of intelligent fastening systems and very complex extruded parts, the ARNOLD GROUP has developed over a number of years into a comprehensive supplier and development partner for complex fastening systems. With our positioning of "BlueFastening Systems", this development process will continue under a united and harmonised structure. Engineering, services, fasteners and functional parts, together with feeding and processing systems, all from a single source – efficient, sustainable and international.

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