

TEXTRON Fastening Systems

High Strength HEXSERT®

- Suitable for use with metric bolts and screws up to Property Class 12.9
- High torque capability for maximum clamp force
- Ideal for structural joints into tubes, extrusions and hydro-formed members
- Wide choice of installation tools

Avdel®

High Strength HEXSERT®

Introduction

High strength Hexsert® inserts are a new range of superior strength threaded inserts based on the current euro Hexsert® large flange range (the 9498 series). The new insert offers exceptional mechanical performance making it compatible with the full strength capacity of high-tensile screws and bolts and therefore capable of carrying joint clamp loads typically 70% higher than for the Avdel® 9498 series inserts.

Features and Benefits versus Conventional Inserts

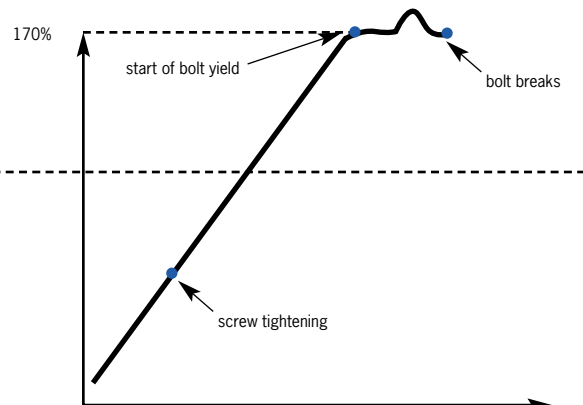
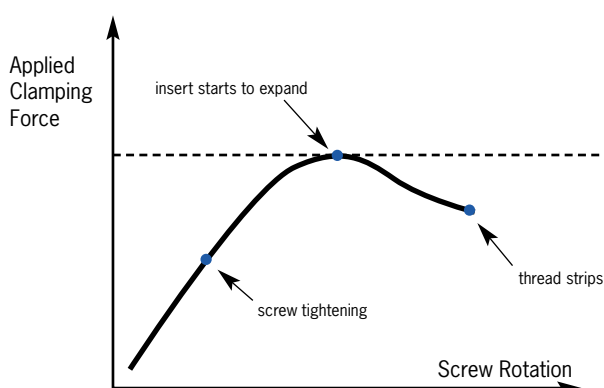
The exceptional strength of the thread achieved by the cold working of the high strength Hexsert® inserts is the key differentiator against standard blind threaded inserts. The resulting benefits are highlighted below and manifest themselves when the bolt is over-torqued.



Standard Inserts (9498 series)
Joint Failure Mode = Thread Stripping
Insert Needs Removal & Replacement



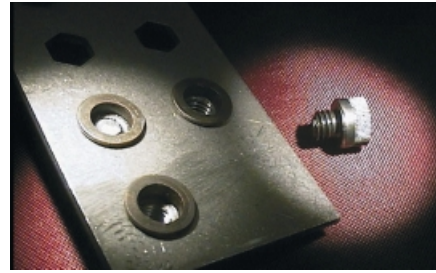
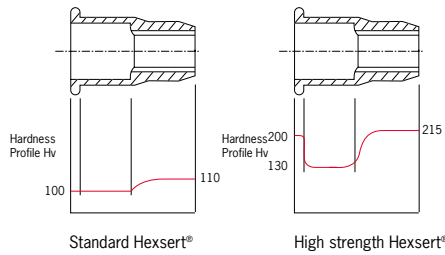
High strength Hexsert® Inserts (39301 series)
In Over Torque
Joint Failure Mode = Bolt Breakage
Insert Not Damaged



- Risk damaging workpiece & scrap
- Occurs within capability of the high tensile screw
- Insert could fail under static or dynamic service load
- May have to use larger insert than necessary

- Insert undamaged – can re-use workpiece
- Insert strength exceeds capability of bolt
- Quick repair – easy to remove broken bolt
- Opportunity to tighten bolt to yield point
- High clamp joint improved vibration resistance
- Can offer smaller size insert to meet strength requirements – saving cost and weight

Hardness Profile



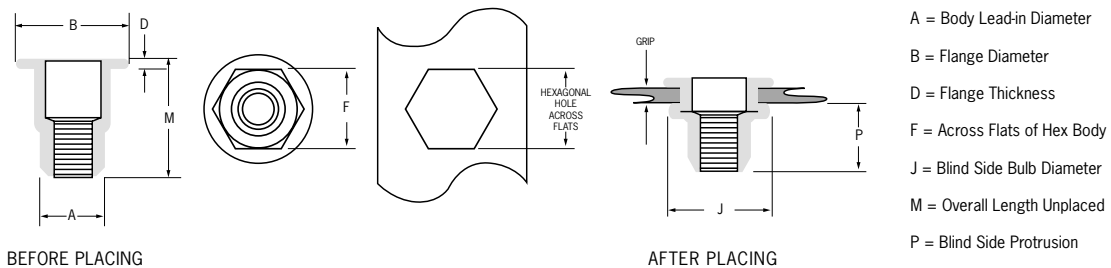
Destructive tests, Class 12.9 M8 screw fails at max torque before the thread in High Strength Hexsert® inserts

Technical Data

Material	Finish
Low carbon steel to BS 3111 Type O SAE 1008 DIN 1654 Qst 34-3	Zinc plated to BS 3382 and clear passivated to achieve 240 hours resistance to red corrosion (ASTM B117) Hexavalent Chromium-free



Other sizes (eg. M12), finishes and second grips available on request



Dimensions in millimetres

Thread Size	Grip Range		Hole Size across flats +0.1 - 0	Part Number Zinc plated, Clear passivated	A +/-0.08	B		D +/-0.13	F across flats +/-0.08		J		M nom.	P max.
	min.	max.				min.	max.		min.	max.	min.	max.		
M6 x 1.0	0.50	3.00	9.0	39301-26030	8.89	12.80	13.20	1.50	8.89	12.00	13.50	18.80	11.60	
M8 x 1.25	0.50	3.00	11.0	39301-28030	10.89	15.68	16.28	1.50	10.89	14.00	16.20	20.40	13.80	
M10 x 1.5	1.00	3.50	13.0	39301-20035	12.89	18.70	19.30	2.00	12.89	16.20	19.30	26.00	17.80	

Performance Data

	Thread Size	Recommended Maximum Torque Nm	Pull-Out Max-Grip kN	Torque-To-Turn		Push-Out Max-Grip kN
				Max-Grip Nm	Min-Grip Nm	
High strength Hexsert®	M6 x 1.0	17.0	20.6	24.7	14.4	7.1
Standard LF Hexsert®	M6 x 1.0	12.4	17.9	15.9	12.1	7.4
High strength Hexsert®	M8 x 1.25	60.0	28.1	34.6	15.6	10.7
Standard LF Hexsert®	M8 x 1.25	32.0	26.5	28.0	14.5	8.2
High strength Hexsert®	M10 x 1.5	100.0	34.2	62.0	60.8	12.5
Standard LF Hexsert®	M10 x 1.5	45.0	33.0	49.1	36.2	10.4

1. Recommended maximum torque as applied to a joint with a static top plate. Thread of insert will not be damaged. However this torque value may exceed the strength of the screw or bolt in question. Always refer to the recommended tightening torque limits for the screw or bolt also.
2. All threaded inserts tested in mild steel test plates
3. Tested in 1.0mm thick plate

Installation Tools

Tool Model	74200	Autosert®
Threaded Sizes	M6-M10	M6-M10

High strength Hexsert® inserts can be placed with the standard Avdel® 742 power tool as well as multi-head and fully automated systems. Please refer to the Avdel® Threaded Insert brochure for further information on the range of installation tools.

Target Customer Applications

The list below highlights just a few examples of target applications in Automotive and Ground Transportation as well as General Industrial applications.

Automotive	Hydro-formed members as cross beams, structural components, chassis applications, fixing points, handles, winches, engine mounts, airbag applications, door hinges
Trucks and Trailers	Doors, frames and fixation points, handles, engine mounts
Mining	Elevators, lifts, mining equipment, screening machines, conveyors
Construction	Steel frames, fixation points, pipelines, scaffolding
Appliances	Fixing points, handles
General Industrial	Handles, fixing points, load bearing joints joints

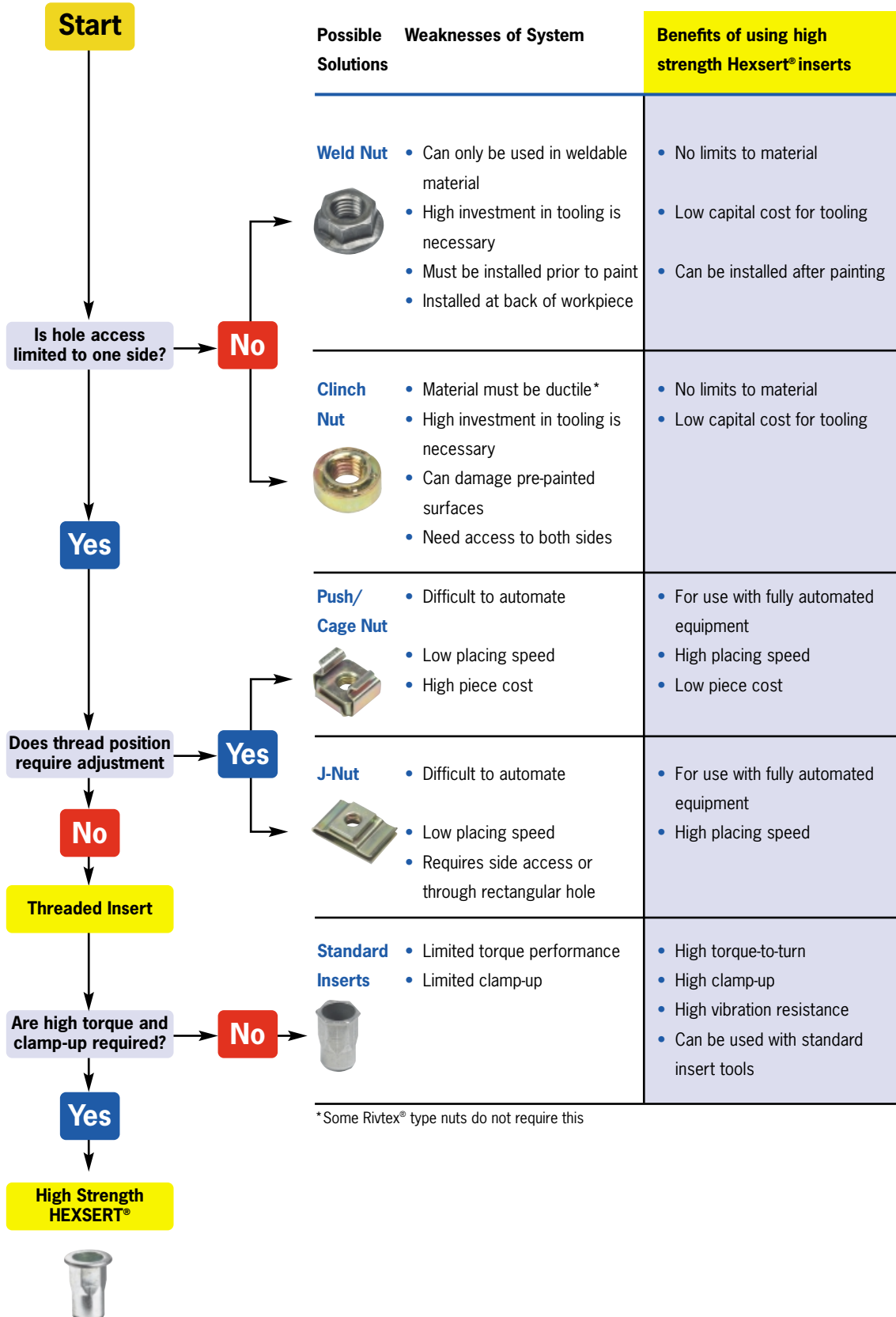
Examples of Situations for which High Strength HEXSERT® Inserts are Ideal Solutions

- ! **Customer creating hydro-formed, tubular or closed channel sections for automotive and light construction structures – cannot find a high strength female thread solution**
 - ✓ Design in high strength Hexsert® inserts – the only high productivity system for single sided installation of high strength threads into such closed sections
- ! **Excessive capital cost of using clinching or weld nut installation systems for low to medium volume applications**
 - ✓ Design in high strength Hexsert® inserts for installation via handtools or Autosert® – can then upgrade automation in future if volumes increase. Very low initial capital and maintenance cost. (Less than \$1000 for a handtool).
- ! **Risk of untrained personnel overtightening screws during servicing and stripping insert threads**
 - ✓ Retrofit application with high strength Hexsert® inserts – bolt will break before insert
- ! **Customer using hardened steel – customer cannot use clinch nuts**
 - ✓ High strength Hexsert® inserts are installed in pre-prepared hole – do not rely on parent material being ductile and soft
- ! **Repetitive strain injuries or operator fatigue due to manual installation of push/cage nuts and J-nuts**
 - ✓ Change workpiece fastening to high strength Hexsert® insert with 742 handtool or Autosert®
- ! **Paint getting into weld nut and customer is forced to use more expensive paint-clearing screws**
 - ✓ Use high strength Hexsert® inserts and a cheaper standard screw
- ! **Open ended fasteners cannot be used for sealed systems that prevent fluid ingress**
 - ✓ High strength Hexsert® inserts can be offered in a closed-end version with seal to offer full environmental and fluid sealing
- ! **Assembly operation requires ability to install fastener in several locations on a large assembly (such as truck or trailer panels, inside of car bodies)**
 - ✓ High strength Hexsert® inserts using portable 742 spin-pull tools can be used by operator in confined spaces anywhere within limits of pneumatic line

Selection Guide

Installing Female Threads into Thin Sheet

Illustrated below is the selection process and the merits of the different fasteners when assessing methods of installing female threads into thin sheet.



Volkswagen Cross Beam

To hydro-form structural components out of aluminium or steel is a relatively new technology in the automotive industry and has only recently been applied in volume by companies such as General Motors, Daimler Chrysler and Volkswagen. The technology gives the car manufacturer the opportunity to develop lighter, more fuel-efficient vehicles with a stiffer and stronger structure.

In one instance VW decided to use a hydro-formed steel cross beam as a structural component of the car. The kinked tubular shape of the beam meant there was no access to the blind side to apply conventional fasteners such as weld nuts or clinch nuts. The only other type of nut that could feasibly be used was a spring steel J-Nut, however, this was an expensive option that could not be practically incorporated into an automated assembly process.

Hence, the manufacturer was looking for a fastening system that

could deliver a high joint performance, was robust against damage during assembly (hydro-formed components are expensive to produce) and was suitable for use with automated placing tools.

The high torque capability and the mechanical performances of the Avdel® high strength Hexsert® inserts matched the criteria and ensured that the shank of the installed 10.9 screw would break before any thread damage occurred. Therefore, should excess torque be applied during assembly, the broken screw could easily be removed from the insert and replaced without risk of damage to the beam.

High strength Hexsert® inserts have identical hole sizes to the standard Avdel® euro Hexsert® range as well as its relatively soft and ductile bulbing properties, which is critical for the use of automated placing tools.

Alternatives to high strength Hexsert® inserts which could deliver similar performances in terms of strength, are either through-hardened inserts, which need very high pulling forces, or nitride-hardened products, which are costly and not as strong.

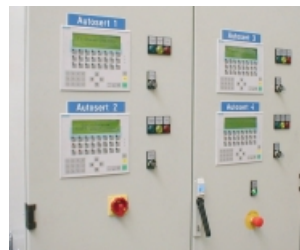
In a series of verification tests undertaken by Textron Fastening Systems (TFS) in the UK and Germany as well as the car manufacturer's own laboratories, the high strength Hexsert® inserts demonstrated excellent mechanical performances. Time consuming rework of parts due to over-tightening problems, such as thread stripping, was significantly reduced.

Four Avdel® Autosert® autofeed placing heads mounted on robotic arms install the inserts. TFS engineers worked closely with the manufacturer's beam assembly production cell to ensure the whole system was successfully integrated to place 29 x M6 and M8 high strength Hexsert® inserts per beam in a cycle time of 95 seconds.

Autosert® End Effector on robotic arms



VW Cross Beam



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