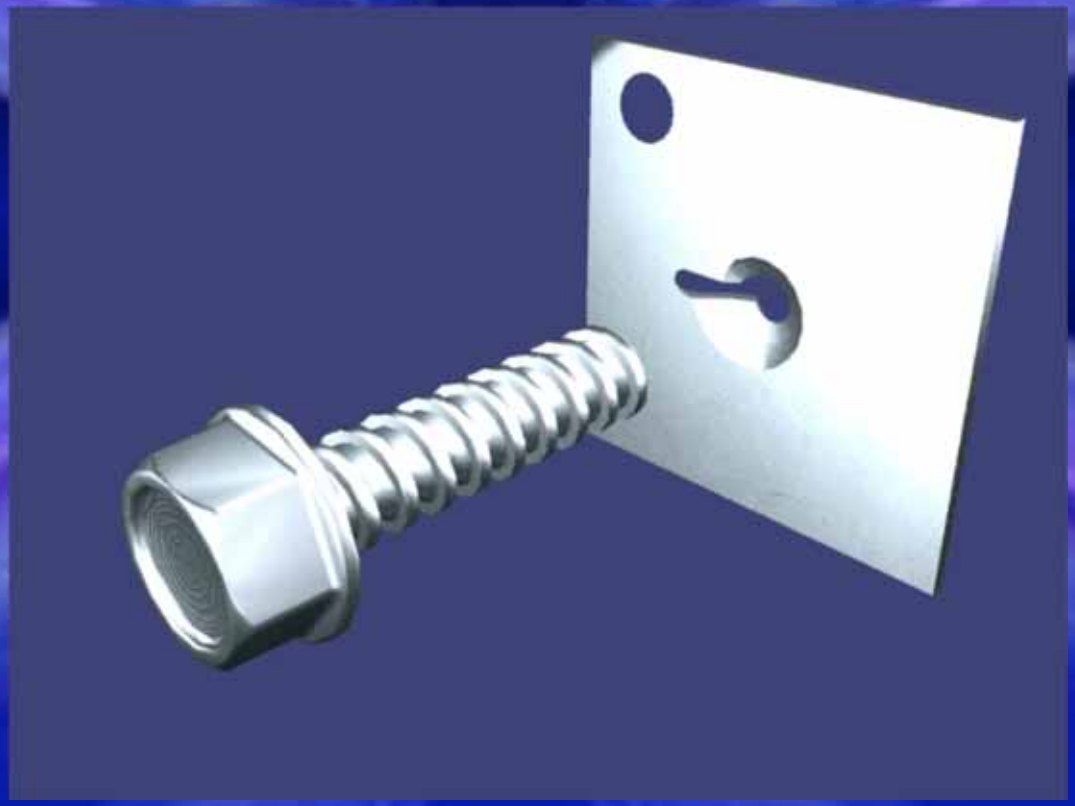
HIGH TORQUE FASTENING SYSTEM

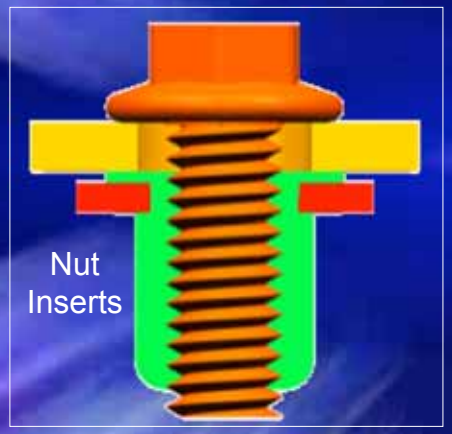
The total sheet metal fastener solution

LOTU



Existing Fasteners

Cheap but limited performance



Costly and over-engineered

Everything must evolve or die, including fasteners.
Is there a better way?

Current Fastener Issues

1. Machine, thread forming and thread tapping screws

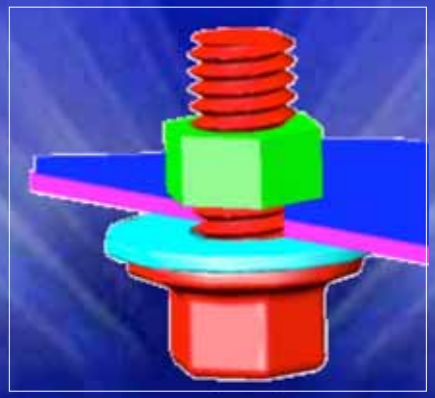
Minimal thread engagement with conventional sheet metal screws which can cause the thread to strip

Not designed to accept thick gauge material

Not designed as a re-usable fastener

Malformed thread underneath the head

Insertion torque can lead to RSI



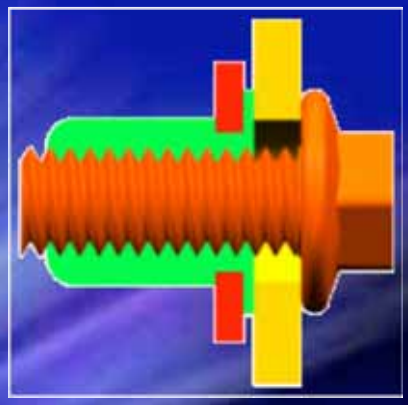
2. Nut & Bolt

For assembly, access to both sides of joint required

May require ‘patching’ technology or anti vibration spring washers

Spiked earthing washers will be required for earth continuity

A minimum of two parts solution



3. Nut Inserts

“Nut inserts” are only as strong as the sheet metal material

Special insertion equipment or welding required and can be costly to maintain

Insertion equipment if not correctly set up can cause assembly problems, by allowing the insert to spin and not grip the panel

Design Inspiration

ANCIENT EGYPT
4,300 YEARS AGO

EIFEL TOWER
1889

FIRST POWERED
FLIGHT 1906

AVIATION TODAY

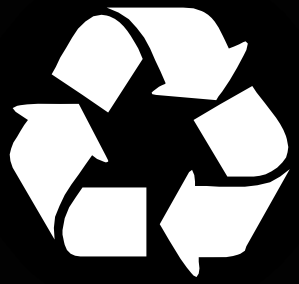
Advanced Geometrical Design Provided a Development Path

STONE BRIDGE
EARLY 19th CENTURY

SEVERN BRIDGE
1996

COLISEUM
ANCIENT ROME

MILLENNIUM STADIUM



Protecting our Environment

Just some of the issues

Global Warming

Recycling

Energy conservation

Limited resources

Landfill pollution

Waste Electrical and Electronic Equipment Directive (WEEE)

Restriction of use of Certain Hazardous Substances Directive (RoHS)

End of Life Vehicle Directive (ELV)

ANY SOLUTION NEEDS TO:

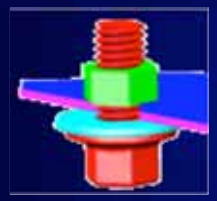
BE REUSABLE

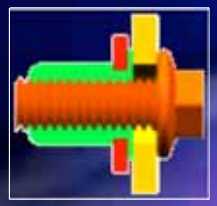
LOWER MATERIAL INVENTORY

REMOVE MANY MANUFACTURING PROCESSES

AS A MINIMUM REQUIREMENT

A DIFFERENT APPROACH

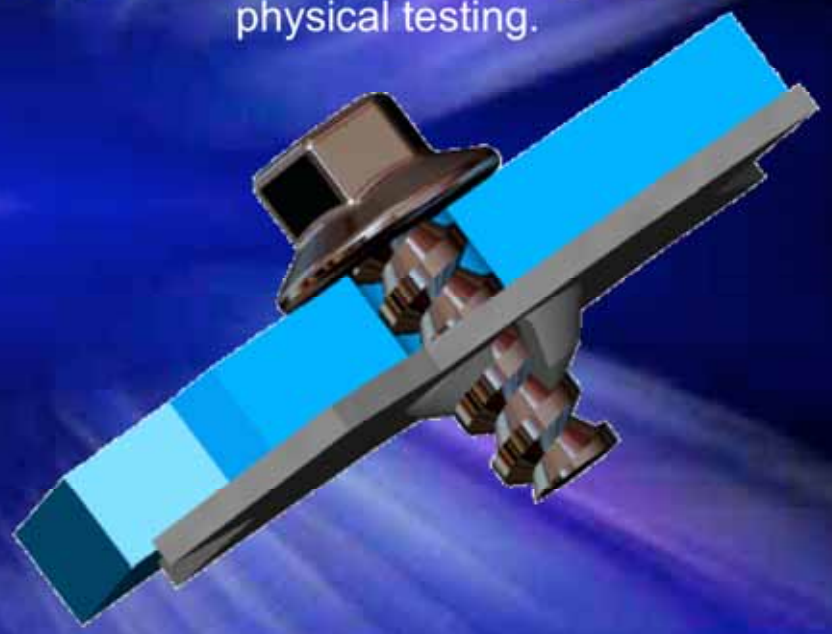




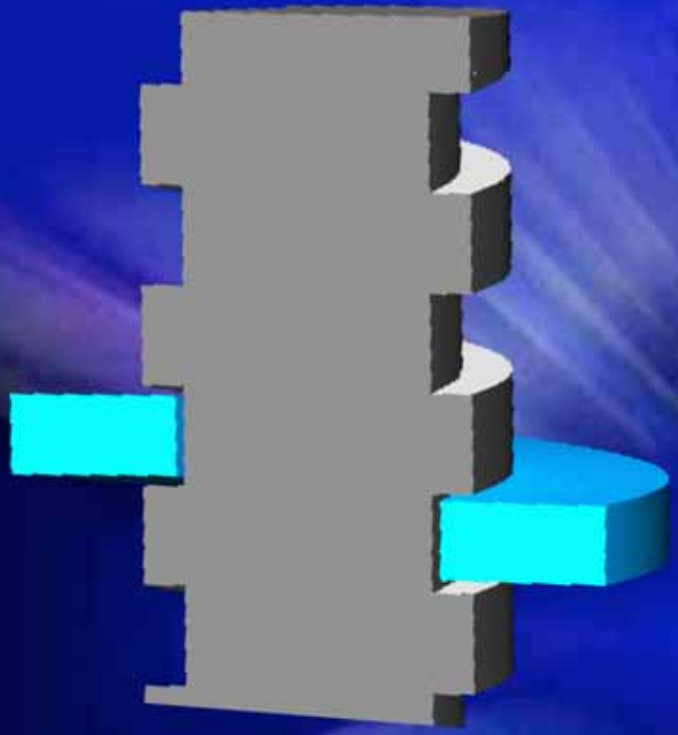
Positive attributes
Self Tapping Screws
Cost effective
Single part design
Many head styles and drives

Positive attributes
Nut & bolt / Insert
Reusable
Can be inserted in many ways, heat, mechanical and welding
Suitable for many types of applications

The High Torque Fastener solution is capable of giving you the best of both worlds, with the added support of the latest geometric technology backed by digital and physical testing.



HTFS Concept Development



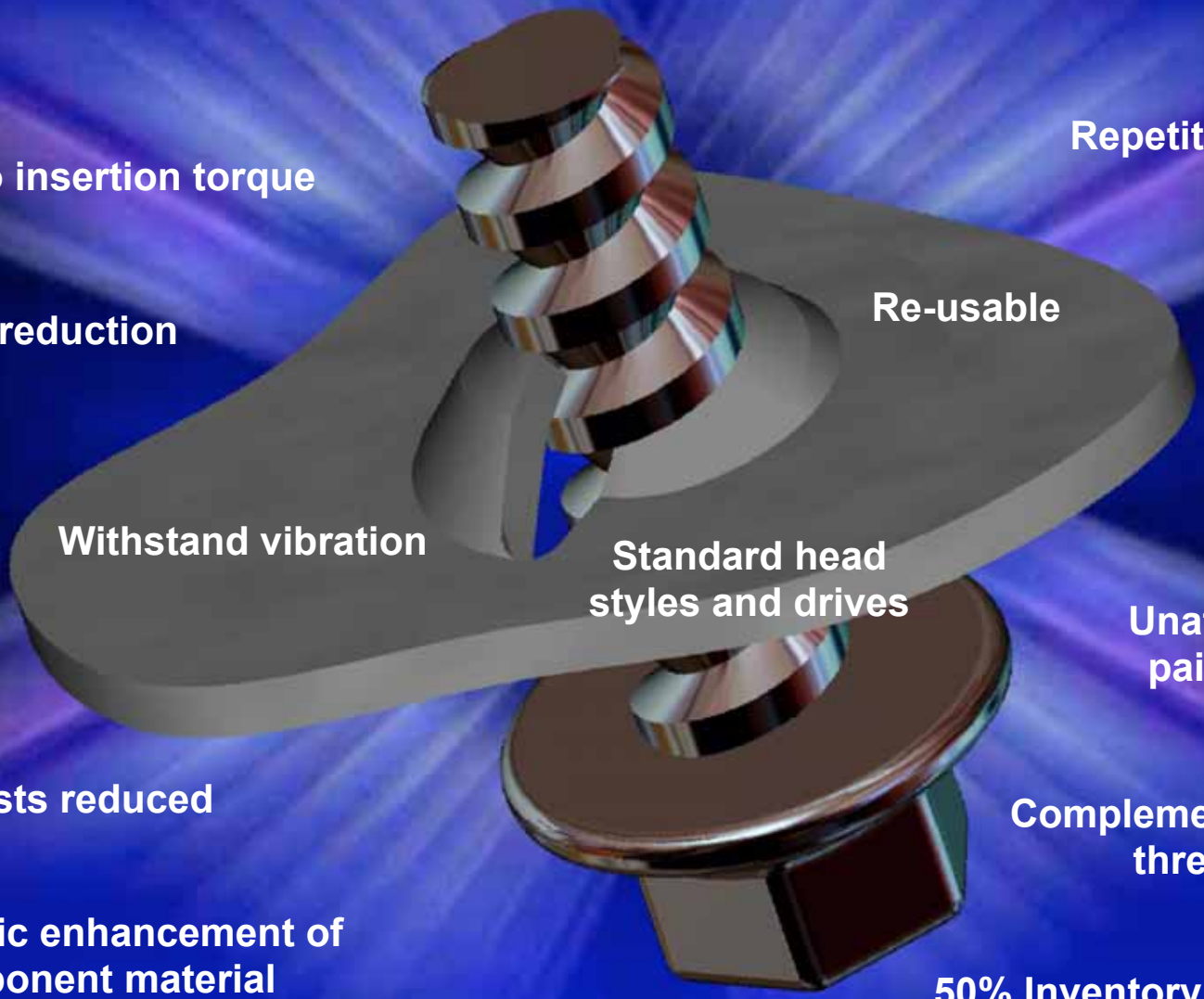
Geometry Enhancement

Direct relationship between panel thickness and thread profile

Designed to achieve maximum thread engagement

Geometry enhancing existing strength of a component

This is the way forward
The High Torque Fastening System



Electrical Earth continuity and EMC compatibility

Zero insertion torque

Process reduction

Withstand vibration

Labour costs reduced

Geometric enhancement of component material

Repetitive Strain Injury reduced

Re-usable

Standard head styles and drives

Unaffected by post painting process

Complementary buttress thread form

50% Inventory reduction

ELECTRICAL EARTH CONTINUITY
(Report Conclusion)

The results of these initial experiments suggest that the contact resistance (a measure of continuity) between the components is undetectable by the industry-standard Megger measuring device.

For scientific evaluation, the high precision Fluke meter indicates that the largest observed resistance value is typically 0.03Ω, an order of magnitude smaller than the Megger can detect.

The above conclusions remain valid for repeated slackening and retightening.

Swansea Metropolitan University
Prifysgol Fetropolitan Abertawe

* Please refer to test report for full test procedure

Developing New Products for Customers

Test Report

Report No: 14286 b **Project Name:** P38a Diesel Auto

Customer: Rover 4x4 **Sample Name:** Cooling Package.

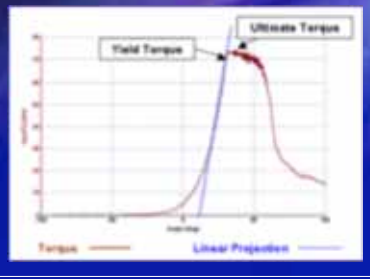
Design Level: Production **Sample Part No:** BTP5706

Introduction:
This report covers the mechanical durability testing of the above cooling package, to ensure that the high torque fastening system, which is used to hold the CAC and oil cooler to the cooling pack mounting frame meets the required test specifications.

Scope:
Four samples of the above part N° were subjected to the "Rover Engineering Standards" (RES) Mechanical Durability tests, as listed in the summary of results.

Cooling Package Dimensions:
Radiator - single pass 58AY 14fpi 499.5 BP x 560 O/C.
Charge Air Cooler – BTP5031.
Oil cooler - 10 row (WTP6855).
Condenser – standard production.

RS TECHNOLOGIES



Test 1 : Torque to 40 Nm and audit
Torque 12 fasteners to 40Nm. Audit 6 joints in the tightening direction after 24 hours and 6 joints after 48 hours. Measure the input torque and the residual torque to determine relaxation.

2: Torque to failure testing
Torque 12 fasteners to failure (6 at 300 RPM and 6 at 350 RPM) measuring the max drive/prevailing, yield, and ultimate torque, and noting the failure mode.

Mean Audit Data				
Audit	Installation Torque (Nm)	Residual Torque After 24 Hours (Nm)	Torque Relaxation (Nm)	(%)
24 Hr	40.2	33.4	6.9	17.0
48 Hr	40.3	33.5	6.7	16.8

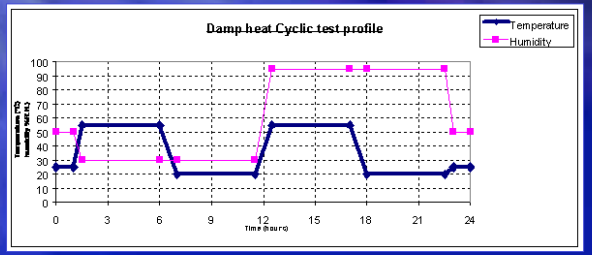
3com

3.0 Climatic Tests: St
Transportation
The equipment will be exposed to the following temperatures and tested to ensure that it is operational after power-up at normal room temperature.

4.1 Vibration (Random)

The equipment will be subjected to the following vibration level and tested to ensure that it is operational after power-up at normal room temperature.
For this test, the equipment will be packaged in its normal shipping container.

Duration of the test is 60 minutes per all 3 axis.



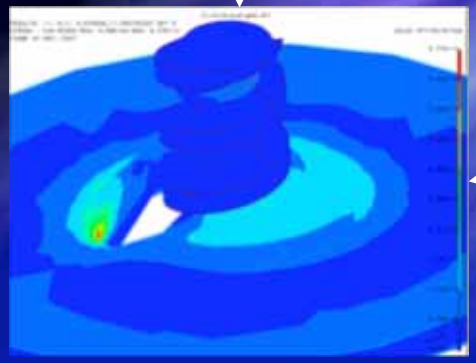
Realisation

CO-OPERATION & PARTNERSHIPS BETWEEN MANY DIFFERENT ENGINEERING DISCIPLINES

COLD FORMING ENGINEERS

PRESS TOOL ENGINEERS

HIGH TORQUE MANUFACTURING



SIMULATION ENGINEERS

TECHNICAL ENGINEERS

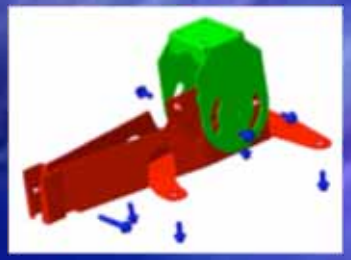
Realisation

COMPLETE ENGINEERING SERVICE

1. PRODUCT TEARDOWN

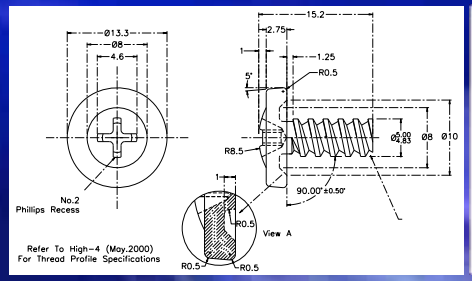


2. 3D CAD MODELLING / DESIGN



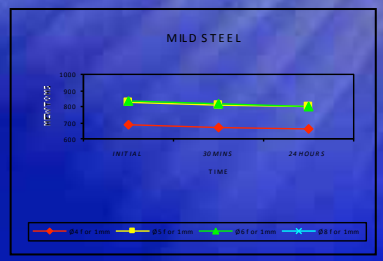

3. PRESS TOOL DESIGN

4. FASTENER SPECIFICATION DRAWINGS



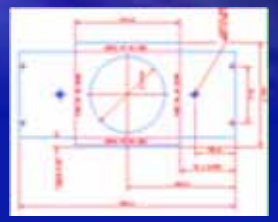
5. INDEPENDENT EVALUATION / TESTING

Swansea Metropolitan University
Prifysgol Fetropolitan Abertawe



6. PROTOTYPING ASSISTANCE





High Torque Fastener Systems – Europe

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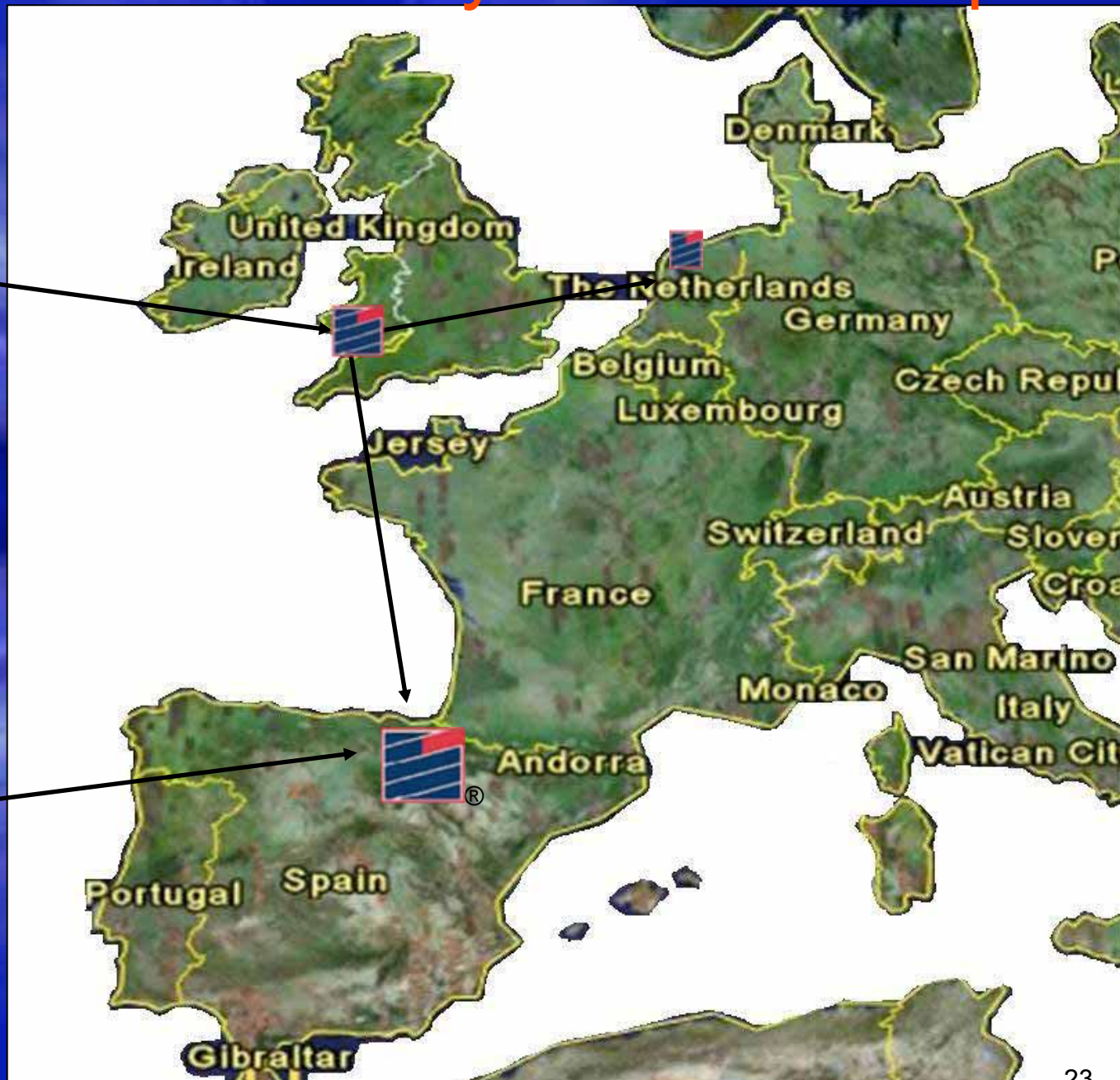
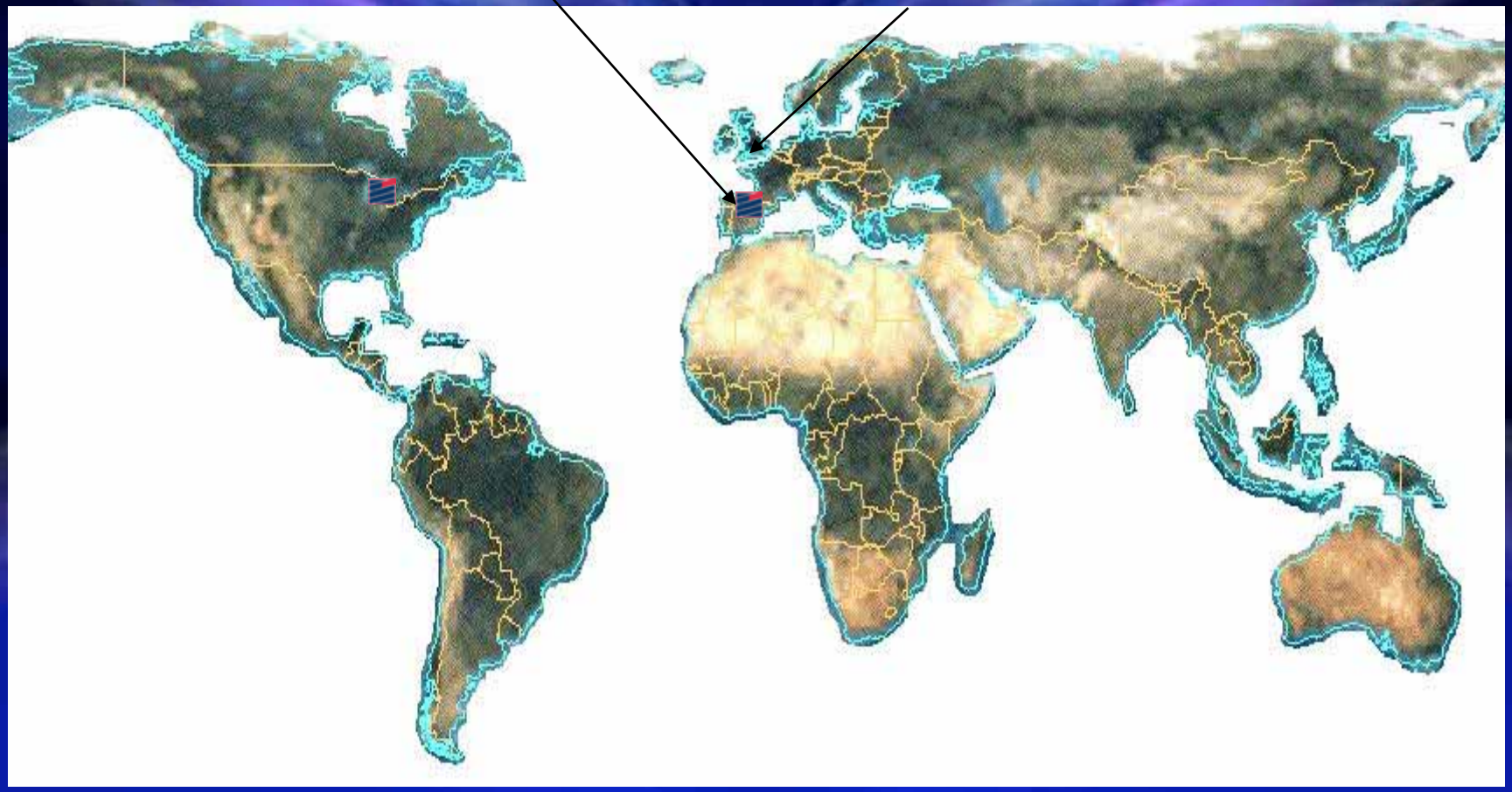


High Torque Customer Global Support Network

High Torque Manufacturing Centre
Pamplona Spain

High Torque
Fastening
System ®



Some High Torque Production Tooling

FIXED TOOLING (Transfer)

CNC TURRET (Generic), ask your supplier to contact us.

TOOLING INSERTS

Pierce punches, dies and one stroke pierce and up form

FIXED TOOLING (Progression)

BIHLER TOOLING

Working with your Local Tooling Supplier

CNC TURRET

www.wilsontool.com

MATE

www.matept.com

www.amada.com

AMADA

Alpunch

www.alpunch.co.uk

FIXED TOOLING

www.awprecision.co.uk

AW PRECISION LTD

Just some of the companies that work with us

High Torque Fastener Systems assisting worldwide manufacturing

Amana

America

MAYTAG

Increase in production efficiency by removing nut inserts, tapping screws into formed extrusions and spring steel clips, by using various High Torque sizes.

The Netherlands

batenburg bevestigingstechniek

Daalderop

GoudaHolland

CATERPILLAR®

ADVANCED DESIGN GROUP
SPECIFICATION FOR 'IDEAL' FASTENER

1. Ideally the fastener shouldn't need additional components like hexserts, nutserts, washers or nuts

2. Installation without using special equipment

3. The fastener should be standardised to one size as much as possible

4. The fastener and sheet material should be compatible and not pose a galvanic corrosion concern

5. The fastener should resist vibration

6. The fastener should be reusable for ease of servicing and not effected by additional processes like painting

7. For ease of assembly, the fasteners has to be able to deal with misalignment of parts

8. For site work, the fastener should be easily removable using conventional spanners, screw drivers or allen keys, "NOT SPECIAL TOOLS"

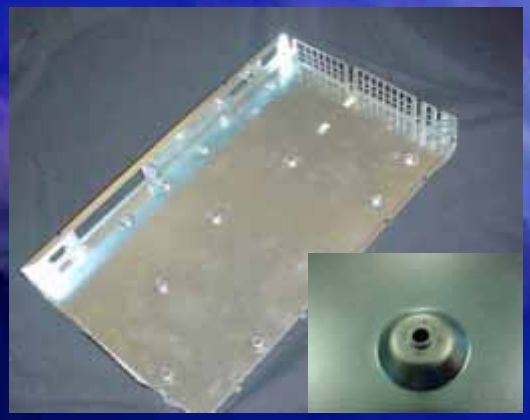
Power Generators

Cost savings in excess off £400,000 per annum achieved by replacing 2.5 million M6 x 16 screws and nut inserts with the high torque thread and helix.

Information Technology

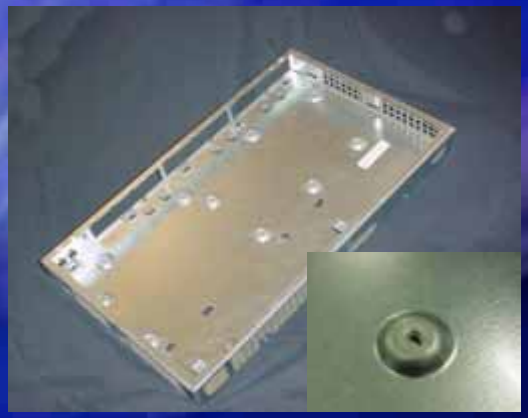
PRE - HIGH TORQUE

High Percentage Strip Rate



HIGH TORQUE

0% STRIP RATE

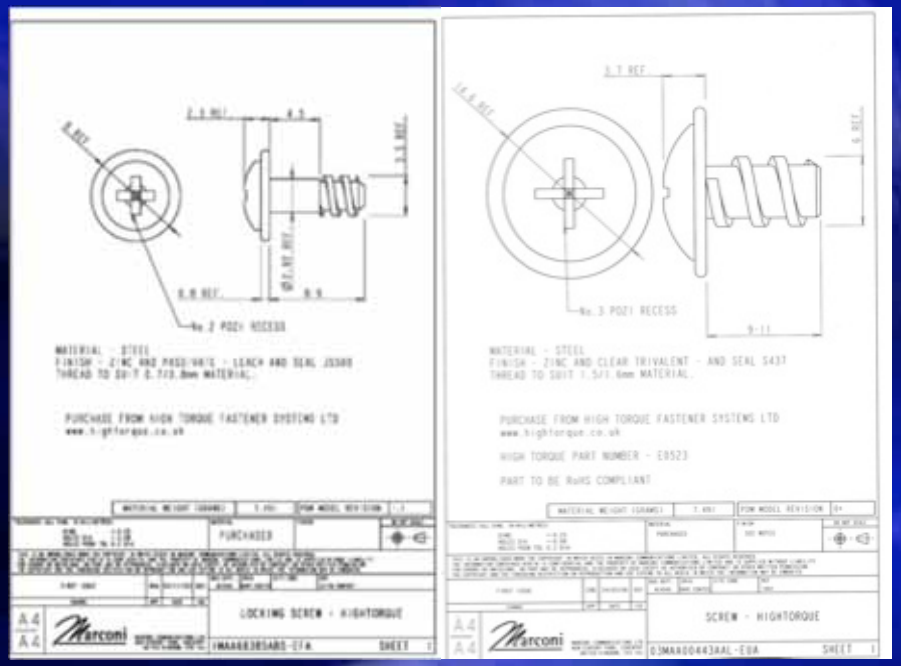


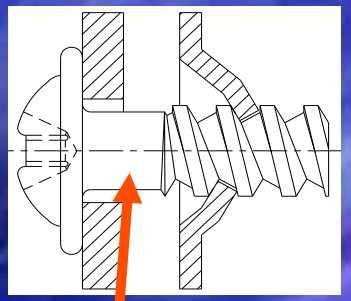
Current projects include the Marlin, Mustang and Wahoo programmes. There is also the Dragonfly project which is in development.

Production quantities in excess 6 million fasteners supplied globally (Dublin & Singapore)

Racking Equipment

KLM, MARCONI





Clear shank to allow for captive washer and EMC gasket to be fitted

High Torque screws are used to retain the slide in units into the chassis.

UK Box

Companies eliminating the use of Cage nuts across there product range.

Power Tool & Site Transformers

CARROLL & MEYNELL, JMS TRANSFORMERS

Increase assembly efficiency and reduce costs.

Eliminating the use of nut Inserts and Cage nuts.

Electrical Enclosures

ALAN ELECTRICAL, MK ELECTRIC HAGER, U SYSTEMS

Decrease assembly lead time.

A range of applications which reduce production time and costs

HIGH TORQUE STAINLESS STEEL

ACO ELECTRONICS (Security Detection Equipment)

Electronic Security Boxes

Cost reduction and production enhancements by removal of (Pem style) nut inserts and reduction in material gauge thickness

COOPER Crouse-Hinds

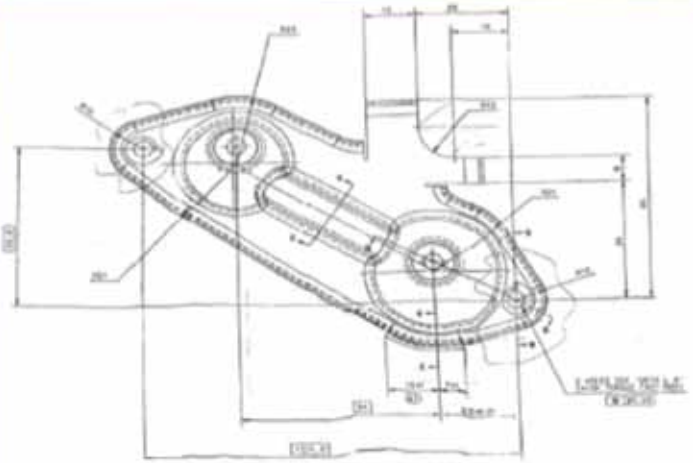
Stainless Steel enclosures designed to protect electrical systems in demanding environments. The system assisted in obtaining IP66 certification (Ingress Protection).

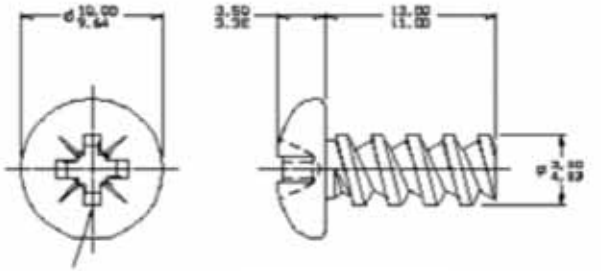
Eliminating the use of nut Inserts

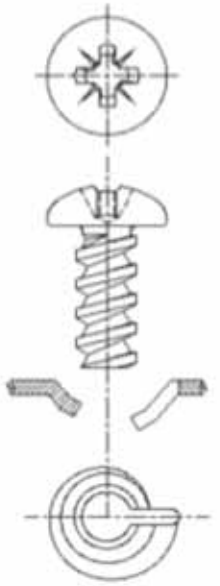
Automotive

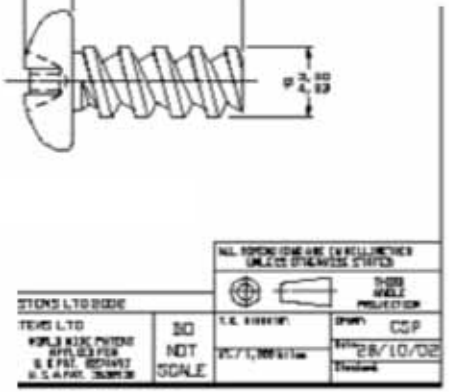
FORD MOTOR COMPANY – LEAR CORP

High Torque being utilised in automotive seat bracket

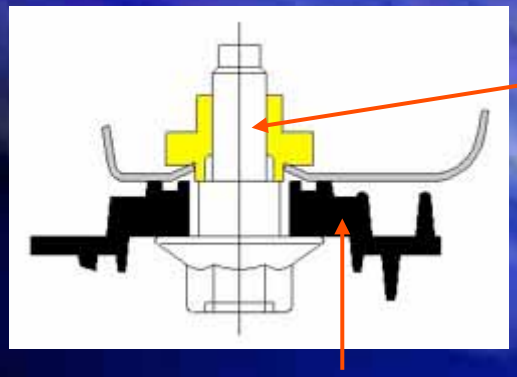








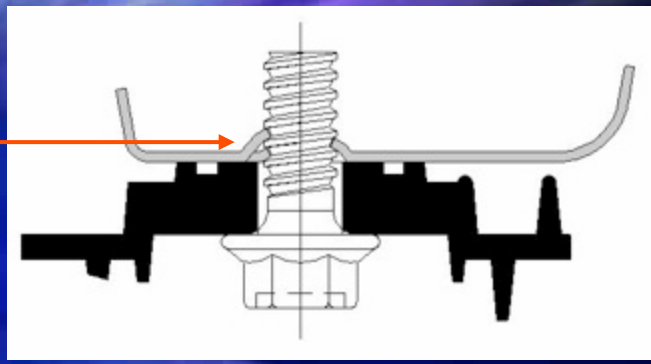
Developing with Ford

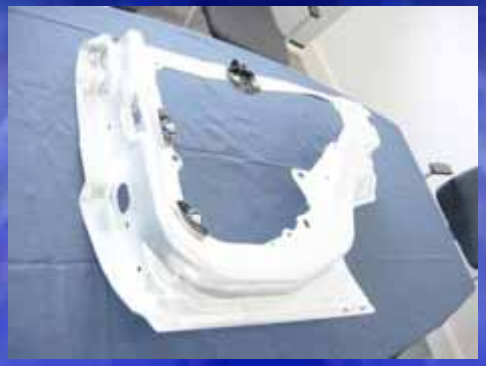


Shoulder bolt and nut insert used to clamp on plastic door liner

Torque setting required to stop bolt coming lose due to vibration is high, thus shoulder bolt has to be used to prevent plastic to fracture

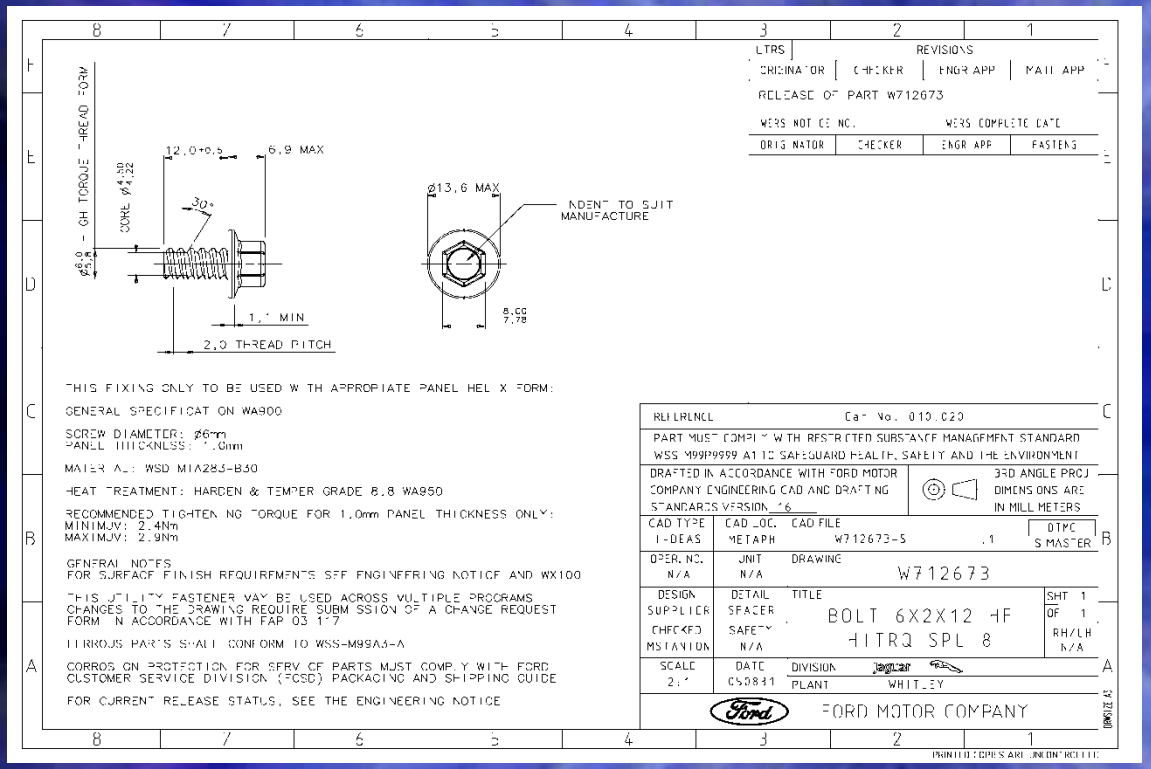
High Torque solution
Entire removal of nut insert and shoulder bolt

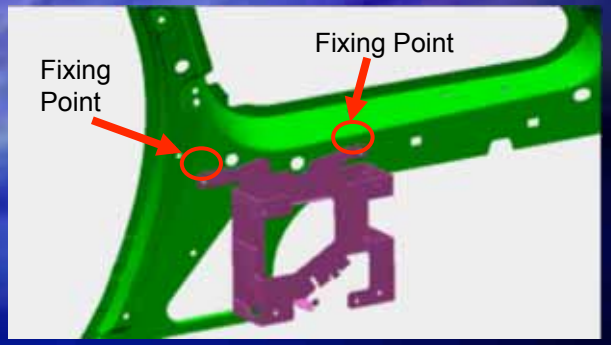




High torque fasteners systems technology does not require the high forces need to achieve lock down as conventional nut/bolts require

Cost reduction achieved by removing inserts and fixing directly onto the vehicle body.





High Security Vans

JOHNSON SECURITY

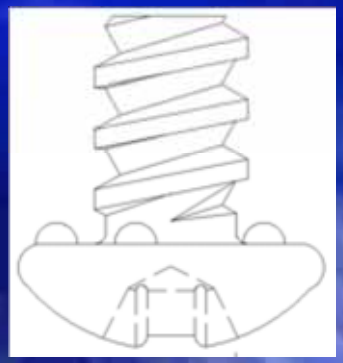
High Torque being utilised in a range of high security vehicles

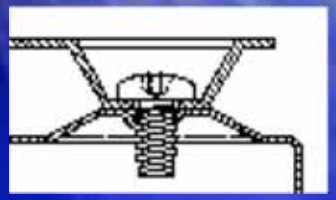
Lighting

PJH ENGINEERING, FITZGERALD, MARTECH, HILCLARE

Previously using standard nuts & bolts

Earthing and grounding compliance had to be achieved





High Torque fastener being used on their assembly lines using auto-feed guns

Also being formed into a boss to overcome design issues

Domestic Cookers

RANGEMASTER

Utilising the High Torque system on an oven liner coated with vitreous enamel

Cost reduction required and quality concerns during manufacture with hex inserts

Utilising the High Torque system for a cost effective solution on adjusting feet

OTHER CATERING CUSTOMERS:

WJ PARRY – Kitchen Worktops

MANSFIELD POLLARD – Commercial Cookers

DESIGN PLAN – Kitchen Cabinets

CATERING EQUIPMENT

BAKERY EQUIPMENT

Leisure Equipment

Heating & Cooking appliances
for motor homes / caravans

Microwaves PANASONIC

High Torque utilised in various applications within the microwave

Narrow gauge material caused major quality concerns

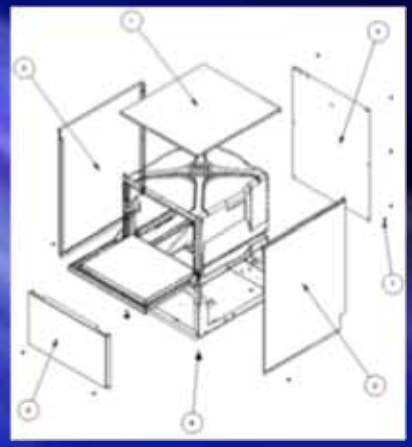
Scrap rates reduced dramatically

Previously using pierce and plunge

Glass Washers

HOBART

High Torque stainless steel screws utilised throughout the application



Previously using stainless steel nut inserts

Vending Machines

IMI CORNELIUS,

BOOTH DISPENSERS,

DARENTH MJS

Same fastener used in many applications

Air Conditioning & Heating systems

ENVIROTEC

High Torque passed a rigorous vibration test programme

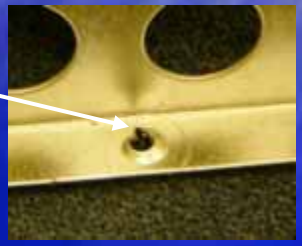
AMBIRAD

Overhead heating systems for warehouses, supermarkets etc.

Domestic & Industrial Gas Boilers

CARADON IDEAL, BAXI BOILERS FIREBIRD, WORCESTER HEAT

30% cost saving!



Tool-room Cabinets

BOTT / KENNEDY, PINDER VERSATOOL

Custom designed head to meet customer requirements

Armoured Cables

FTL

Converted to a small pressed component with savings of up to 80%

Coffee Pot

Previously using a crimp compression hex insert

Up to 90% cost saving as well as a speed increase in assembly time

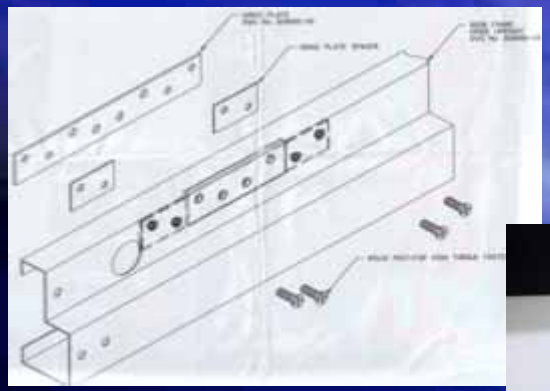
Greenhouses **LOWFIELD**

The High Torque helix being formed into both mild steel and aluminium frames

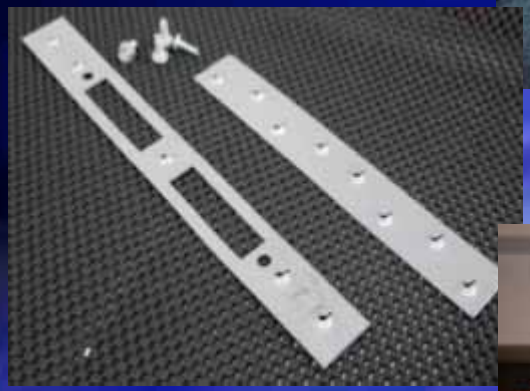
Shop Fittings / Shelving **PPE**

High Torque being utilised in a range of panel thicknesses

Office Interiors / Furniture



APTON, KOMFORT, MAINE FLEXIFORM, NORWOOD



High Torque Assists Advanced Military Design

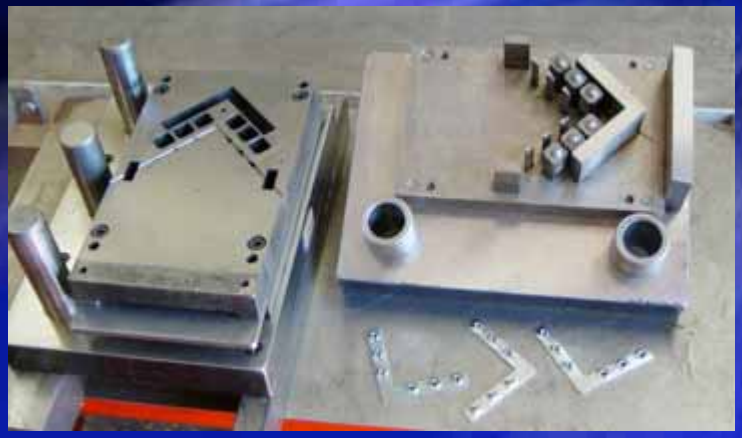
STRONGBOX

The versatility of the High Torque system, being used on lockers, desks and cabinets

Press Tool Design

CORUS PANELS & PROFILES

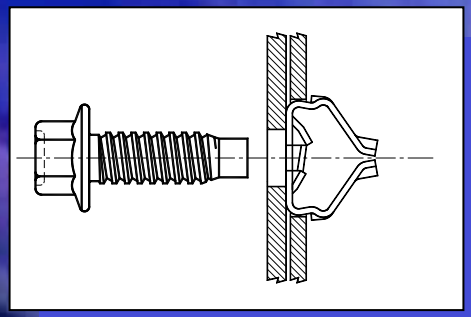
High Torque helix used to replace nut inserts on an ‘L’ bracket



Electronic Equipment

Control units for Nissan forklift trucks manufactured in UK and Poland. Multi-impression strip supplied to reduce inventory and decrease assembly time.

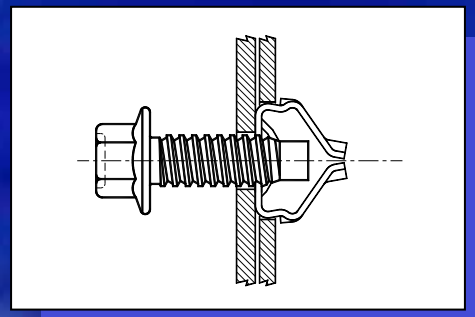
High Torque Product Development



THE EXPANSION CLIP

Suitable Applications from 2-3mm panel thickness

Incorporating the High Torque Fastener Systems enhanced geometric thread design.



Easy Insertion

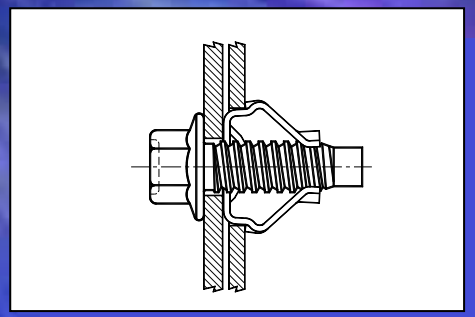
High Pull Out Load

Prevailing Torque

Extreme Strength

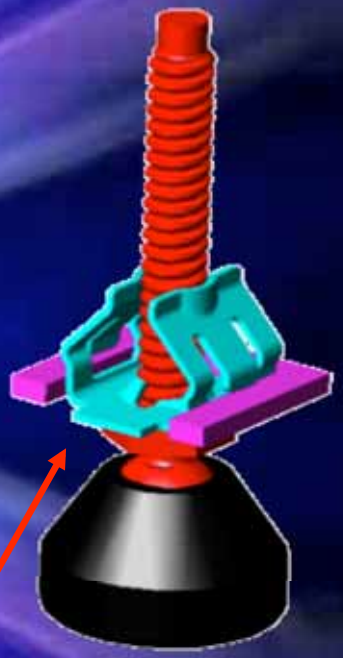
Vibration Resistant

No Special Insertion Equipment Required



The next evolution of the High Torque concept.

- **Hardened carbon steel front loading clip, designed for insertion into heavy gauge material**
- **Can be utilised as part of a levelling foot assembly or used to simply clamp heavy gauge panels together.**
- **Spring steel is capable of being heat treated so high torque and strength levels can be achieved.**
- **The system provides approximately double the torque performance of traditional single helix thread forms and around 95% of the performance of deep tapped systems.**



View showing inserted front loading clip prior to engagement of levelling foot or fastener.

Once the levelling foot is engaged the arms expand engaging the prevailing torque feature of the High Torque front loading clip, eliminating the need for a separate lock nut.

Outside Opinion

THE FASTENER ENGINEERING AND RESEARCH ASSOCIATION

EUROPE'S LARGEST ASSOCIATION FOR ENGINEERS INVOLVED IN THE SPECIFYING OF MECHANICAL FASTENERS AND FIXINGS

"This High Torque product emphasises the on-going innovation within the fastener community; there are always new ways to increase fastener and fixing efficiency and achieve cost savings".

John M Fletcher – General Secretary

FASTENER ENGINEERING WITH AUTOMOTIVE IN DETROIT - CHRYSLER

"A Revolutionary Fastener System suitable for replacing a wide range of inserts. It also solves a major industry problem with thin metal attachments".

Dr Thomas S. Doppke – Senior Fastener Engineer with more than 25 years Fastener experience with Automotive in Detroit.

Swansea Metropolitan University
Prifysgol Fetropolitan Abertawe

Faculty of Applied Design & Engineering

"Swansea Institute of Higher Education has formed a successful collaboration with High Torque Fastener Systems. We have helped this innovative company develop its products with physical testing and finite element analysis".

Dr Kelvin Donne –Faculty Dean

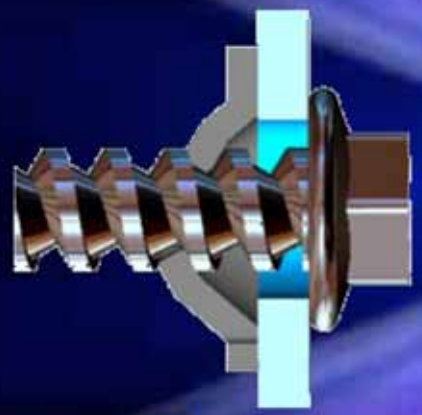
PPE

"We converted to HTFS and the results have been superb, we managed to remove significant numbers of inserts that we traditionally would have used.

HTFS is reliable and easy to use, cost savings have been achieved by increased throughput and removing process bottlenecks and reducing failures.

It has worked well, and has been a low financial investment for the return."

Just some of the Options Available

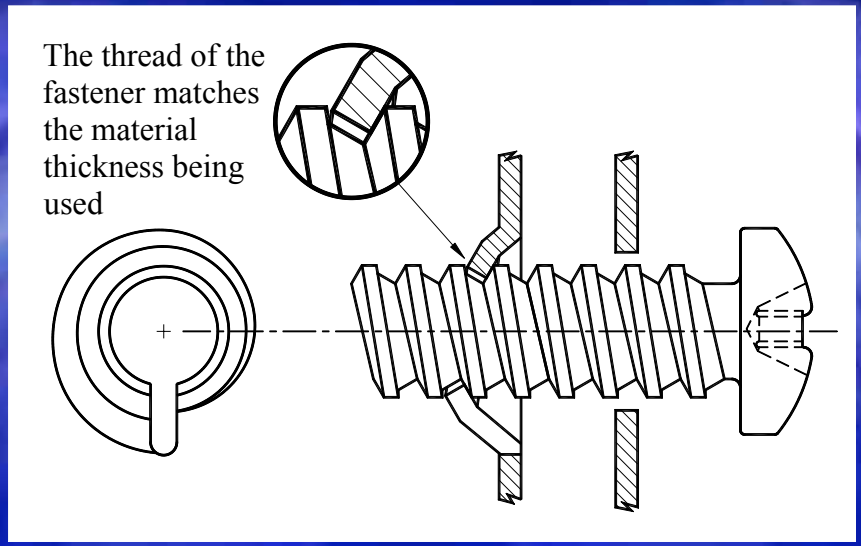


Material Thickness			Thread Diameters Available									
Imperial	Wire	Metric	Ø2.5	Ø3.0	Ø3.5	Ø4.0	Ø5.0	Ø6.0	Ø8.0	Ø10.0	Ø12.0	Ø14.0
0.020/0.024	25	0.5/0.6	X	X	X	X	X	X				
0.028/0.032	22/21	0.7/0.8		X	X	X	X	X	X			
0.036/0.040	20/19	0.9/1.0			X	X	X	X	X	X		
0.043/0.047	18	1.1/1.2				X	X	X	X	X	X	
0.051/0.055	17	1.3/1.4					X	X	X	X	X	
0.059/0.063	16	1.5/1.6					X	X	X	X	X	X
0.074/0.078	14	1.9/2.0							X	X	X	X
0.093/0.099	13	2.4/2.5								X	X	X

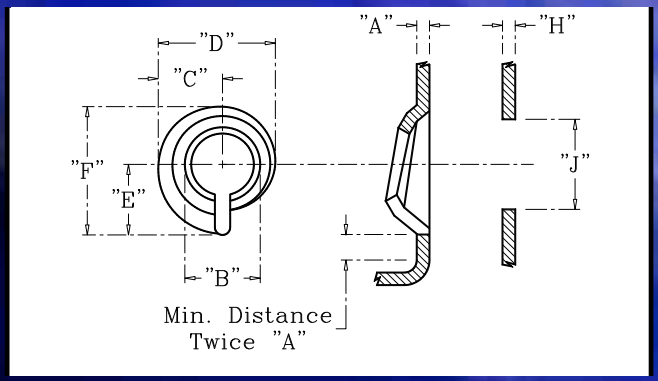
The High Torque Fastener System is designed to achieve maximum engagement between the screw thread and the formed helix. This is achieved by matching material thickness to the screw buttress thread form.

	Thread Diameters									
	Ø2.5	Ø3.0	Ø3.5	Ø4.0	Ø5.0	Ø6.0	Ø8.0	Ø10.0	Ø12.0	Ø14.0
Minimum Thread Length's	4.5	5	6	7	8.5	10	14	18	21	25

General Fastener Specification



Will it fit my Application



Material Thickness "A"			Screw Diameter	Dimensions				Support Plate Thickness "H"	Clearance Hole Ø"J"
Imperial	Wire	Metric	"B"	"C"	"D"	"E"	"F"	Min.	Min. - Max.
0.020/0.024	25	0.5/0.6	Ø2.5	3.0	5.2	3.3	5.8	0.4	Ø2.7 - 3.7
			Ø3.0	3.2	5.7	3.5	6.3		Ø3.2 - 4.1
			Ø3.5	3.4	6.2	3.7	6.8		Ø3.7 - 4.6
			Ø4.0	3.7	6.7	4.0	7.3		Ø4.3 - 5.1
			Ø5.0	4.2	7.7	4.5	8.3		Ø5.3 - 6.1
			Ø6.0	4.7	8.7	5.0	9.3		Ø6.4 - 7.1
0.028/0.032	22/21	0.7/0.8	Ø3.5	3.2	5.2	3.6	6.3	0.7	Ø3.7 - 5.2
			Ø4.0	3.5	6.3	3.9	7.1		Ø4.3 - 5.6
			Ø5.0	4.0	7.3	4.4	8.1		Ø5.3 - 6.5
			Ø6.0	4.5	8.3	4.9	9.1		Ø6.4 - 7.3
0.036/0.040	20/19	0.9/1.0	Ø4.0	4.4	7.7	5.0	8.9	0.7	Ø4.3 - 6.1
			Ø5.0	4.9	8.7	5.5	9.9		Ø5.3 - 7.0
			Ø6.0	5.4	9.7	6.0	10.9		Ø6.4 - 7.9
			Ø8.0	6.4	11.7	7.0	12.9		Ø8.4 - 9.6
			Ø10.0	7.4	13.7	8.0	14.9		Ø10.5 - 11.3
0.043/0.047	18	1.1/1.2	Ø5.0	5.0	9.0	5.6	10.3	1.0	Ø5.3 - 7.7
			Ø6.0	5.5	10.0	6.1	11.3		Ø6.4 - 8.5
			Ø8.0	6.5	12.0	7.1	13.3		Ø8.4 - 10.2
0.051/0.055	17	1.3/1.4	Ø6.0	5.8	10.6	6.3	11.6	1.0	Ø6.4 - 9.0
			Ø8.0	6.8	12.6	7.3	13.6		Ø8.4 - 10.7
0.059/0.063	16	1.5/1.6	Ø6.0	6.2	11.3	6.8	12.6	1.0	Ø6.4 - 9.5
			Ø8.0	7.3	13.3	8.0	14.6		Ø8.4 - 11.2
			Ø10.0	8.3	15.3	9.0	16.6		Ø10.5 - 13.0
			Ø12.0	9.3	17.3	10.0	18.6		Ø13.0 - 14.6
0.074/0.078	14	1.9/2.0	Ø8.0	7.9	13.9	9.0	15.6	1.3	Ø8.4 - 12.3
			Ø10.0	8.9	15.9	10.0	17.6		Ø10.5 - 14.0
			Ø12.0	9.9	17.9	11.0	19.6		Ø13.0 - 15.7
0.093/0.099	13	2.4/2.5	Ø10.0	9.9	17.4	11.0	19.7	2.0	Ø10.5 - 15.0

Important

Helix dimensions (C, D, E and F) have been verified using mild steel, variations may occur with the use of different materials.

Refer to "Page 5" for Production Gauging.

Maximum recommended material gauge thickness variations to BS 1449-1.1:1991

The information above is meant as a guide, High Torque Fastener Systems reserves the right to alter the above information at any time. Above dimensions B, C, D, E, F, H and J are in millimetres.

Above helix details can be transferred to your Computer Aided Design systems, various file formats are available. General 2-D translator - DXF & Autocad 2000i DWG, 3-D models can be transferred by IGES, STEP, or direct IDEAS or Mechanical Desktop model files. As a general viewer, details can also be exported as PDF files

Installation and Assembly Guidelines

The information below is provided from independent tests conducted by Swansea Institute of Higher Education-Faculty of Applied Design and Engineering, (www.sihe.ac.uk). Copies of the independent test reports are available on request for a variety of sizes. Note. Pre-coated material thickness includes coating and material substrate. Tightening torque values indicated below, are guidelines when used in automated assembly systems. Non automated assembly methods (hand held drivers) can be used to achieve system lockdown.

Material used during the testing process (CS1 Mild Steel). High Torque Fastener Systems, recommends that due to variations in material specification, and in concert with the application design the values noted may vary and should be confirmed

Material Thickness			Screw Diameter	Recommended Tightening Torque			
				Minimum		Maximum	
Imperial	Wire	Metric		Nm	Lbs.Inch	Nm	Lbs.Inch
0.020/0.024	25	0.5/0.6	Ø2.5	0.6	5.3	0.8	7.1
			Ø3.0	0.6	5.3	0.8	7.1
			Ø3.5	0.8	7.1	1.0	8.8
			Ø4.0	0.8	7.1	1.0	8.8
			Ø5.0	0.8	7.1	1.0	8.8
0.028/0.032	22/21	0.7/0.8	Ø3.5	1.0	8.8	1.2	10.6
			Ø4.0	1.0	8.8	1.2	10.6
			Ø5.0	1.2	10.6	1.4	12.4
			Ø6.0	1.2	10.6	1.4	12.4
0.036/0.040	20/19	0.9/1.0	Ø4.0	2.0	17.7	2.4	21.2
			Ø5.0	2.2	19.4	2.6	23.0
			Ø6.0	2.4	21.2	2.8	24.7
			Ø8.0	2.6	23.0	3.0	26.5
			Ø10.0	2.8	24.7	3.2	28.3
0.043/0.047	18	1.1/1.2	Ø5.0	2.2	19.4	3.0	26.5
			Ø6.0	2.6	23.0	3.4	30.0
			Ø8.0	3.0	26.5	4.0	35.4
0.051/0.055	17	1.3/1.4	Ø6.0	3.2	28.3	5.0	44.3
0.059/0.063	16	1.5/1.6	Ø6.0	4.0	35.4	8.0	70.8
			Ø8.0	6.0	53.1	12.0	106.2
			Ø10.0	8.0	70.8	14.0	123.9
0.074/0.078	14	1.9/2.0	Ø8.0	14.0	123.9	16.0	141.6
			Ø10.0	14.0	123.9	16.0	141.6
			Ø12.0	14.0	123.9	16.0	141.6
0.093/0.099	13	2.4/2.5	Ø10.0	40.0	354.0	55.0	486.0

SWANSEA METROPOLITAN UNIVERSITY
PRIFYSGOL FETROPOLITAN ABERTAWE

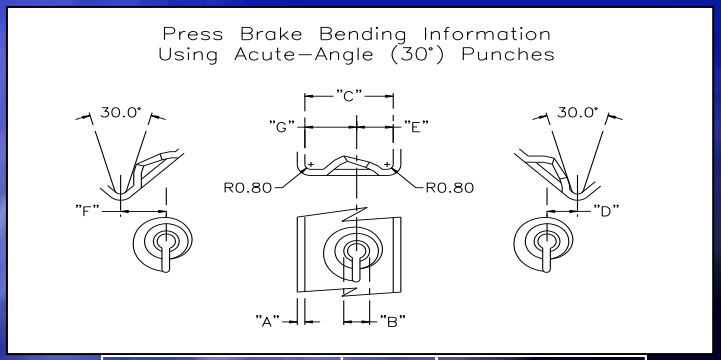
CNC Turret and Press Brake Tooling

The High Torque System is very versatile and can be incorporated into punch press tooling systems including Thick and Thin Turret and Trumpf.

Most major tooling contractors are aware of our system and they will assist you in evaluating your tooling needs, tailored towards your production requirements and the machine you are using.

If you have a tooling contractor who is unaware of the system, then we will be happy to work with them to meet your requirements.

The table below indicates how close to the formed helix, a bend line can be formed using acute angle press brake tooling

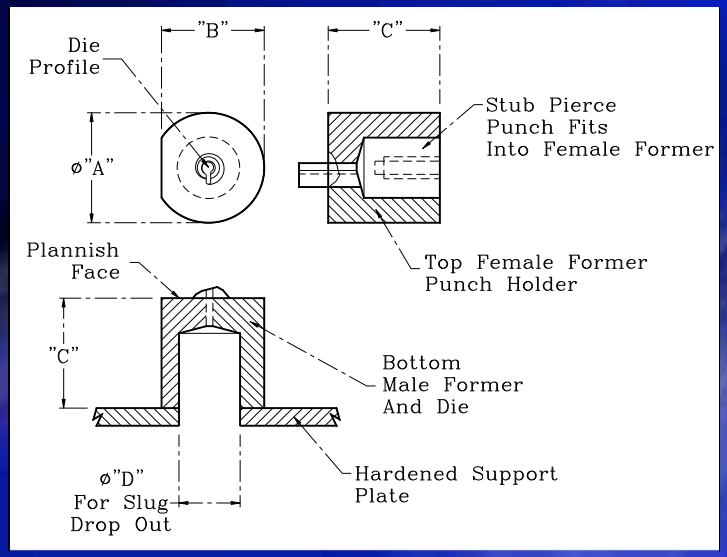


Material Thickness "A"			Screw Diameter	Dimensions				
Imperial	Wire	Metric	"B"	"C"	"D"	"E"	"F"	"G"
0.020/0.024	25	0.5/0.6	Ø2.5	8.9	3.0	3.8	4.3	5.1
			Ø3.0	8.9	3.0	3.8	4.3	5.1
			Ø3.5	9.9	3.5	4.3	4.8	5.6
			Ø4.0	9.9	3.5	4.3	4.8	5.6
			Ø5.0	10.9	4.0	4.8	5.3	6.1
			Ø6.0	11.9	4.5	5.3	5.8	6.6
0.028/0.032	22/2	0.7/0.8	Ø3.5	10.1	3.5	4.3	5.0	5.8
			Ø4.0	10.1	3.5	4.3	5.0	5.8
			Ø5.0	11.1	4.0	4.8	5.5	6.3
			Ø6.0	12.1	4.5	5.3	6.0	6.8
0.036/0.040	20/1	0.9/1.0	Ø4.0	11.6	4.0	4.8	6.0	6.8
			Ø5.0	12.6	4.5	5.3	6.5	7.3
			Ø6.0	13.6	5.0	5.8	7.0	7.8
			Ø8.0	15.6	6.0	6.8	8.0	8.8
			Ø10.0	17.6	7.0	7.8	9.0	9.8
0.043/0.047	18	1.1/1.2	Ø5.0	13.2	4.8	5.6	6.8	7.6
			Ø6.0	14.2	5.3	6.1	7.3	8.1
			Ø8.0	16.2	6.3	7.1	8.3	9.1
0.051/0.055	17	1.3/1.4	Ø6.0	16.1	6.0	6.8	8.5	9.3
			Ø8.0	18.1	7.0	7.8	9.5	10.3
0.059/0.063	16	1.5/1.6	Ø6.0	17.6	6.5	7.3	9.5	10.3
			Ø8.0	19.6	7.5	8.3	10.5	11.3
			Ø10.0	21.6	8.5	9.3	11.5	12.3
			Ø12.0	23.6	9.5	10.3	12.5	13.3
0.074/0.078	14	1.9/2.0	Ø8.0	20.1	7.5	8.3	11.0	11.8
			Ø10.0	22.1	8.5	9.3	12.0	12.8
			Ø12.0	24.1	9.5	10.3	13.0	13.8
0.093/0.099	13	2.4/2.5	Ø10.0	25.6	9.8	10.6	14.2	15.0

One Stroke Pierce & Form Unit

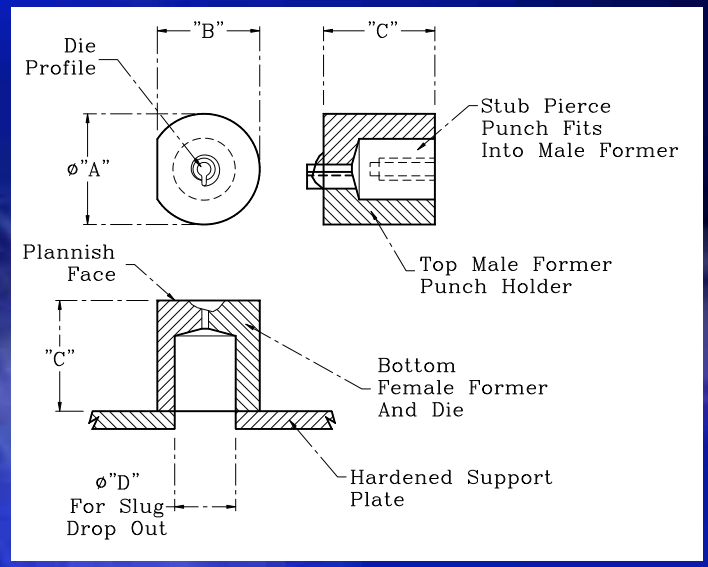
Tooling Inserts to allow “UP” forming

Material Thickness			Screw Diameter	Dimension's			
Imperial	Wire	Metric	Ø	Ø"A"	"B"	"C"	Ø"D"
0.020/0.024	25	0.5/0.6	4,5,6	25	23	25	14.0
0.028/0.032	22/21	0.7/0.8	4,5,6				
0.036/0.040	20/19	0.9/1.0	4,5,6,8				
0.043/0.047	18	1.1/1.2	5,6,8				
0.051/0.055	17	1.3/1.4	6				
0.059/0.063	16	1.5/1.6	6,8				16.0
			10	32	30		20.0
0.074/0.078	14	1.9/2.0	10				



Tooling Inserts to allow “DOWN” forming

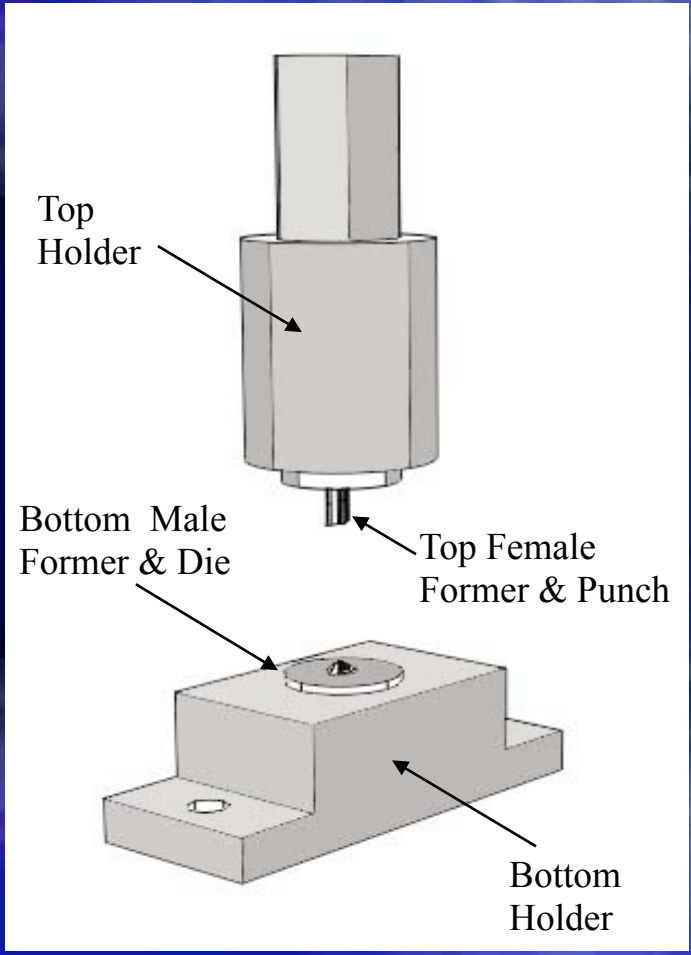
Material Thickness			Screw Diameter	Dimension's			
Imperial	Wire	Metric	Ø	Ø"A"	"B"	"C"	Ø"D"
0.020/0.024	25	0.5/0.6	4,5,6	25	23	25	14.0
0.028/0.032	22/21	0.7/0.8	4,5,6				
0.036/0.040	20/19	0.9/1.0	4,5,6,8				
0.043/0.047	18	1.1/1.2	6,8				



Variations of this option are available for both CNC Turret and Fixed tooling for the sizes listed above.

One Stroke Pierce & Up Form Unit for Prototyping

One Stroke Pierce and Form Prototyping
General Assembly



1. This option is available for "UP and DOWN" forming of the helix in the sheet material.

2. Forming inserts to be set on hardened support plates to eliminate the possibility of bedding down during production.

3. To reduce the possibility of material build-up beneath the bottom former/die insert and to achieve maximum support, it is recommended that the hole clearance in the hardened support plate be (Ø"D" –0, +2mm).

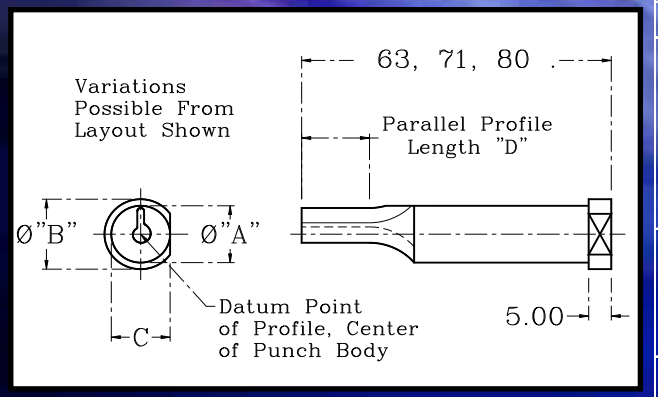
4. The drawing layout above does not show any stripping requirements which need to be evaluated with each machine type and product variation.

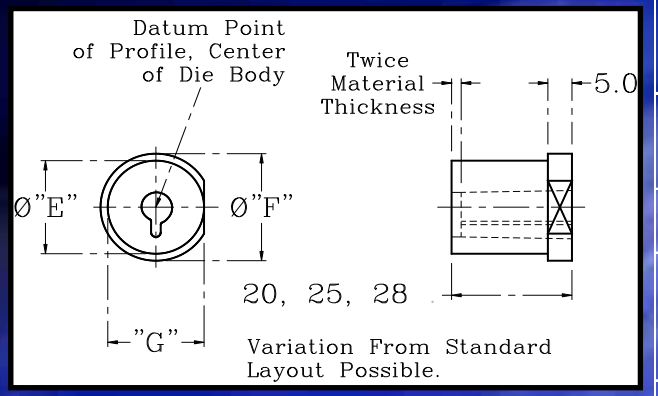
5. This option can also be used for prototyping or engineering feasibility prior to full scale production.

Standard Pierce Punch & Die Layout for Fixed Tooling

AW PRECISION LTD
Cosford Lane
Rugby
Warwickshire
CV21 1QN

Tel +44 (0) 1788 542271
Fax +44 (0) 1788 561256
www.awprecision.co.uk

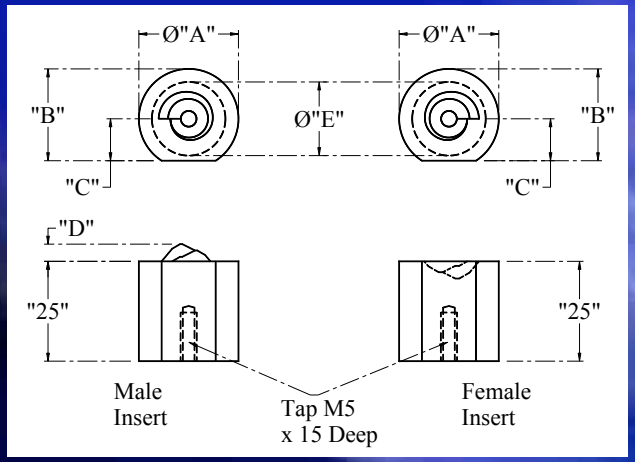




Preferred sizes to ISO standards, variations from above available on request. Above dimensions are in millimetres.

Material Thickness			Screw Diameter	Ø"A"	Ø"B"	"C"	"D"	Ø "E"	Ø "F"	"G"
Imperial	Wire	Metric								
0.020/0.024	25	0.5/0.6	Ø2.5	6	9	6	8	10	13	10
			Ø3.0	6	9	6	10	10	13	10
			Ø3.5	8	11	8	10	13	16	13
			Ø4.0	8	11	8	10	13	16	13
			Ø5.0	8	11	8	15	13	16	13
			Ø6.0	10	13	10	15	16	19	16
0.028/0.032	22/21	0.7/0.8	Ø3.5	8	11	8	10	13	16	13
			Ø4.0	8	11	8	10	13	16	13
			Ø5.0	10	13	10	15	16	19	16
			Ø6.0	10	13	10	15	16	19	16
0.036/0.040	20/19	0.9/1.0	Ø4.0	10	13	10	15	13	16	13
			Ø5.0	10	13	10	15	16	19	16
			Ø6.0	13	16	13	15	16	19	16
			Ø8.0	13	16	13	20	20	23	20
			Ø10.0	16	19	16	20	25	28	25
0.043/0.047	18	1.1/1.2	Ø5.0	13	16	13	15	16	19	16
			Ø6.0	13	16	13	15	20	23	20
			Ø8.0	16	19	16	20	20	23	20
0.051/0.055	17	1.3/1.4	Ø6.0	13	16	13	15	20	23	20
			Ø8.0	16	19	16	20	20	23	20
0.059/0.063	16	1.5/1.6	Ø6.0	16	19	16	15	20	23	20
			Ø8.0	16	19	16	15	25	28	25
			Ø10.0	20	23	20	20	25	28	25
			Ø12.0	20	23	20	20	32	35	32
0.074/0.078	14	1.9/2.0	Ø8.0	20	23	20	20	25	28	25
			Ø10.0	20	23	20	20	25	28	25
			Ø12.0	25	28	25	20	32	35	32
			Ø14.0	25	28	25	20	32	35	32
0.093/0.099	13	2.4/2.5	Ø10.0	25	28	25	20	32	35	32
		General Tolerance:		+0.01 -0	+0 -0.5	+0.01 -0		+0.01 -0	+0 -0.5	+0.01 -0

Standard Helix Forming Inserts



Material Thickness			Screw Ø	Dimensions			Reference	Minimum Diameter
Imperial	Wire	Metric		Ø"A"	"B"	"C"	"D"	"E"
0.020/0.024	25	0.5/0.6	3	13	11.5	// 0.05	2.0	8.5
			3.5	13	11.5			9
			4	13	11.5			9.5
			5	16	14			10.5
			6	16	14			11.5
0.028/0.032	22/21	0.7/0.8	3	13	11.5	// 0.05	2.5	10.5
			3.5	13	11.5			10.5
			4	13	11.5			11
			5	16	14			12
			6	16	14			13
0.036/0.040	20/19	0.9/1.0	4	13	11.5	// 0.05	3.0	12.8
			5	16	14			14
			6	16	14			14.8
			8	16	14			16
			10	25	23			18.8
0.043/0.047	18	1.1/1.2	5	16	14	// 0.05	3.8	16
			6	16	14			16
			8	25	23			19
0.051/0.055	17	1.3/1.4	6	16	14	// 0.05	4.5	16
			8	25	23			20.5
0.059/0.063	16	1.5/1.6	6	20	18	// 0.05	5.0	20
			8	25	23			22
			10	25	23			24
			12	25	23			25
0.074/0.078	14	1.9/2.0	8	25	23	// 0.05	6.0	21.6
			10	25	23			23.6
			12	25	23			25
0.093/0.099	13	2.4/2.5	10	32	30	// 0.05	7.2	27

General Tol.
+0 -0.05

High Torque Fastener Systems

UK Customers, Please Contact

High Torque Engineering Ltd
Unit 7, S.I.C Trade Park
66/70 Morfa Road
Swansea ,
SA1 2EF

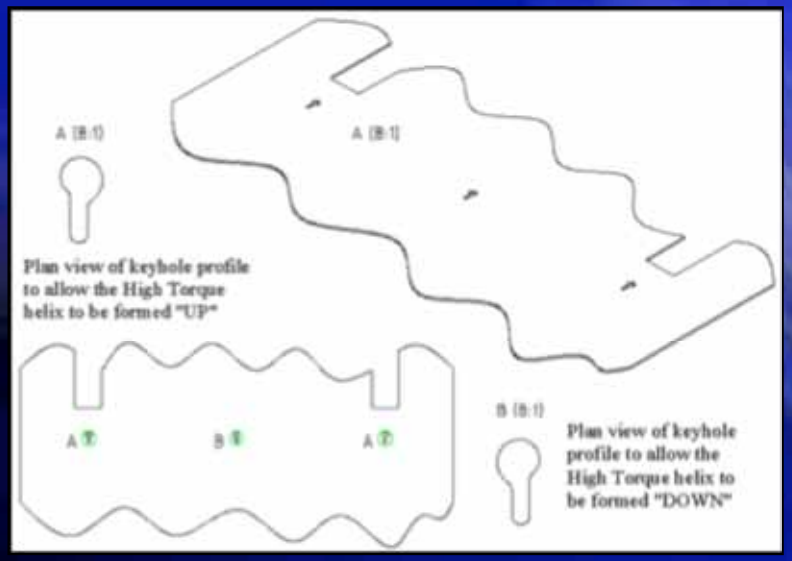
www.hightorque.co.uk
info@hightorque.co.uk

For C.N.C Turret Tooling

Contact Your Local Supplier

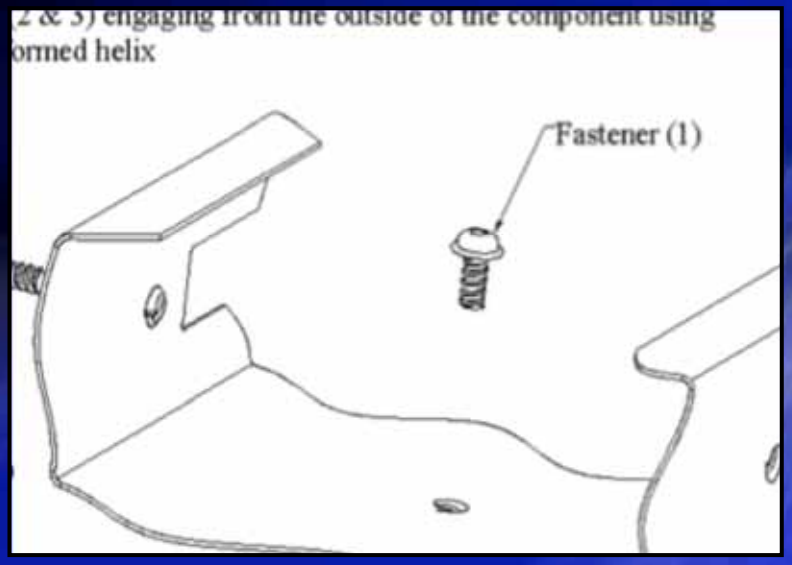
The information above is meant as a guide, High Torque Fastener Systems reserves the right to alter the above information at any time. Above dimensions A, B, C, D, E, F and G are in millimetres.

Up or Down Forming in Relation to Bending



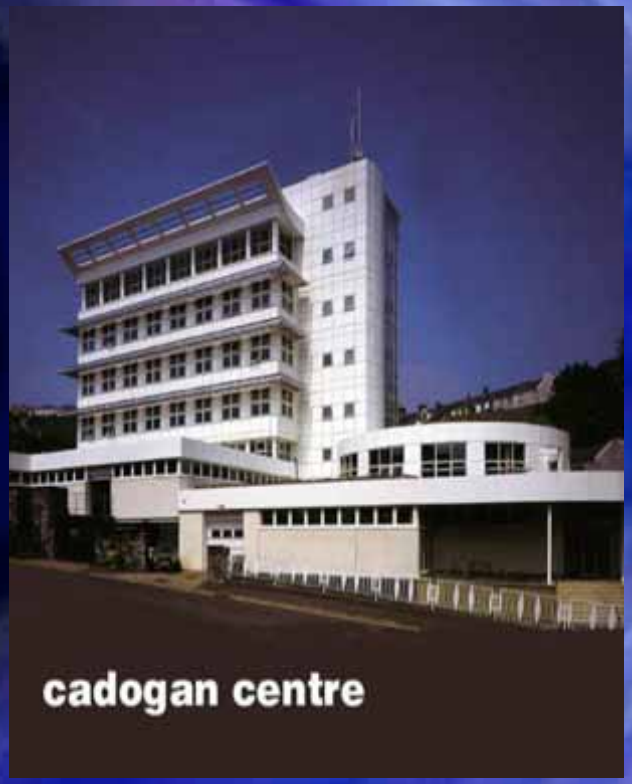
View showing pierce profile in panel during the manufacturing process, shape of keyhole aperture is relevant to the direction of the formed helix.

View showing helix formed in panel (UP and DOWN) during next manufacturing stage.



View showing fasteners being inserted during the assembly operation from different directions. Allowing for internal or external components to be fitted to the application.

Swansea Metropolitan University
Prifysgol Fetropolitan Abertawe



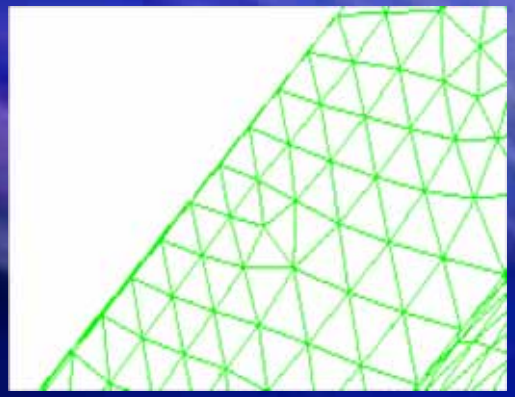
CNC Turning and Milling

Reverse Engineering

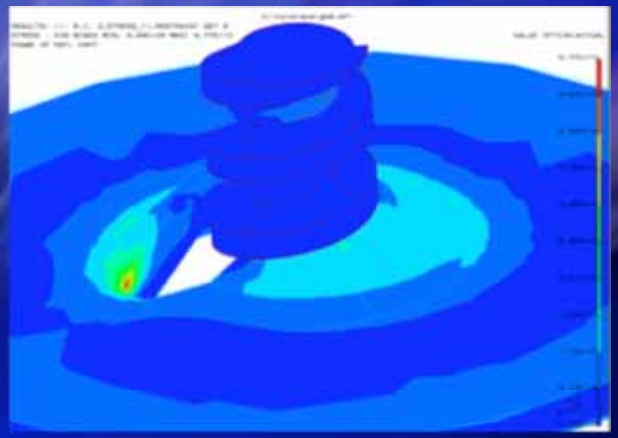
Rapid Prototyping

Finite Element Analysis

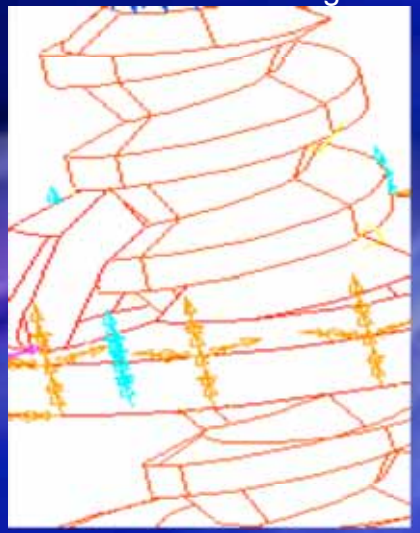
Able to run numerous simulations of a problem reducing project time scales and increasing flexibility



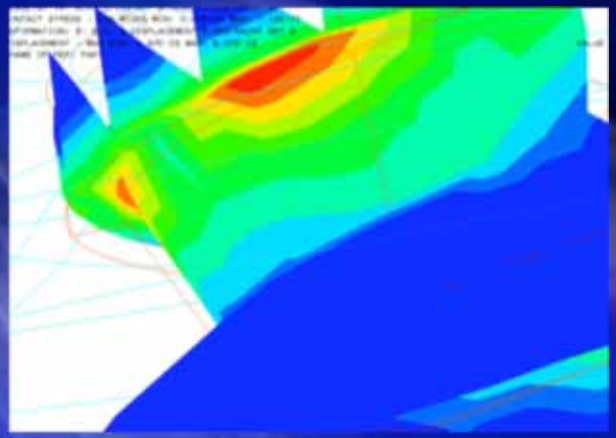
Concentration of Elements at the base of the leg



Violation of yield stress at base of helix



Boundary Conditions and Restraints



Contact stresses on screw surface during pull-out load test

VIBRATION TESTING

TW1500 amplifier to amplify the signal from the PSC

PSC Programmable Swept Sine Controller

Custom designed jig to test High Torque samples

VP30 Electromagnetic shaker

Examples of Product Testing

Power Generators

Vibration tested at a range of torque settings and frequencies

Tested up to 60Hz over a 12 hour period where the assembly torque was maintained

Earthing Clamp

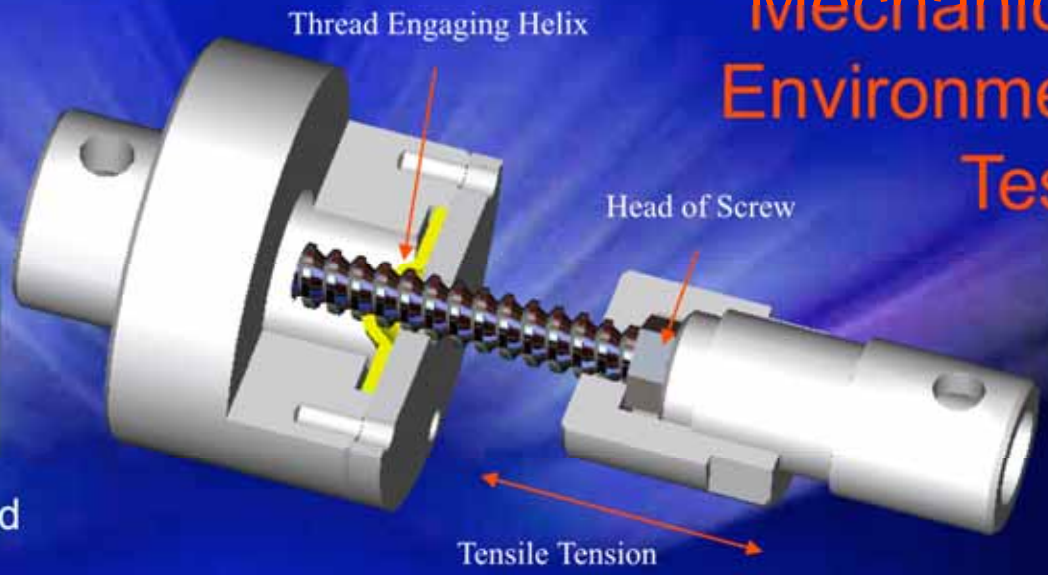
Re-design model of an earthing clamp

Tested to comply with the mechanical requirements of the British Standard

Tested at 60Hz over a 5hr period

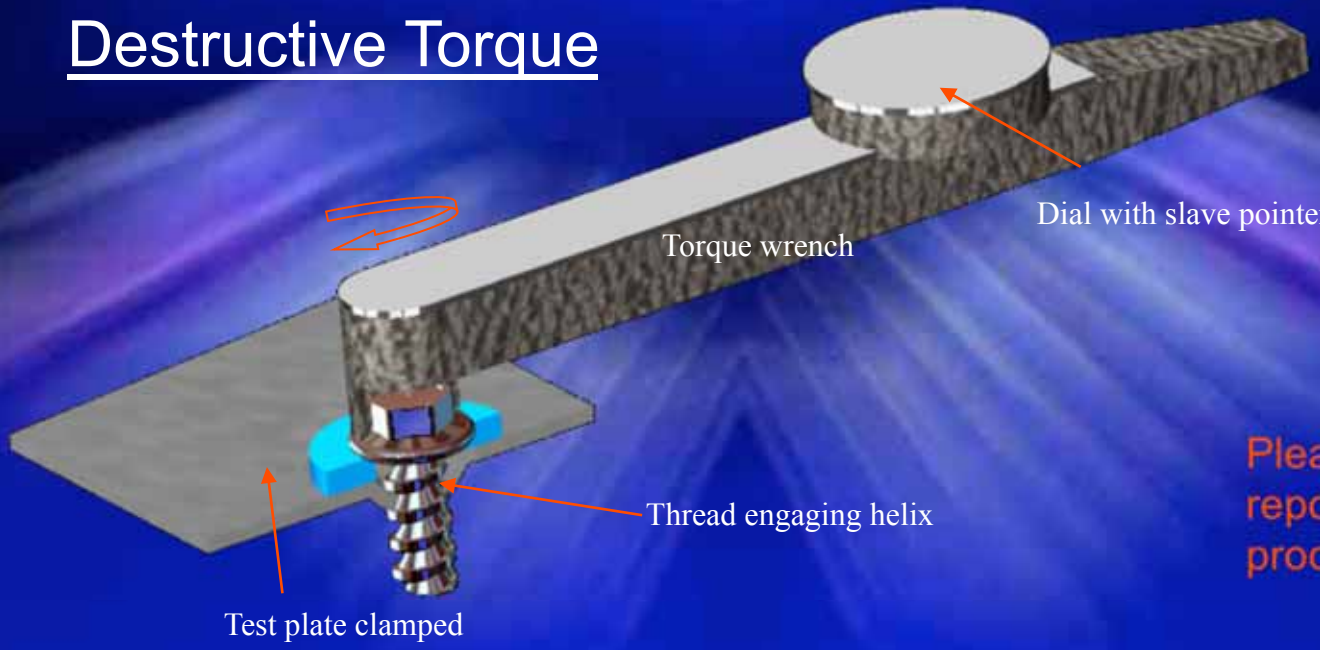
Mechanical & Environmental Testing

Pull-out Load



50 samples for each size tested
Custom jigs and fixtures used

Destructive Torque



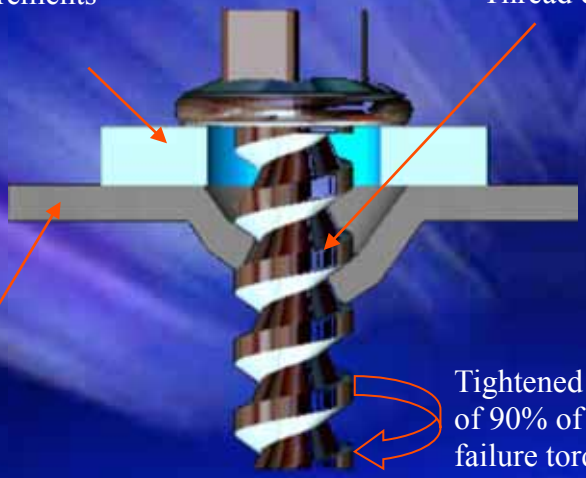
Please refer to test report for full test procedure

Mechanical & Environmental Testing

Clamp Load

Interface Force Measurements
LW1525 load washer

Thread engaging helix



Test Plate

Tightened to a value of 90% of the minimum failure torque

Environmental Test

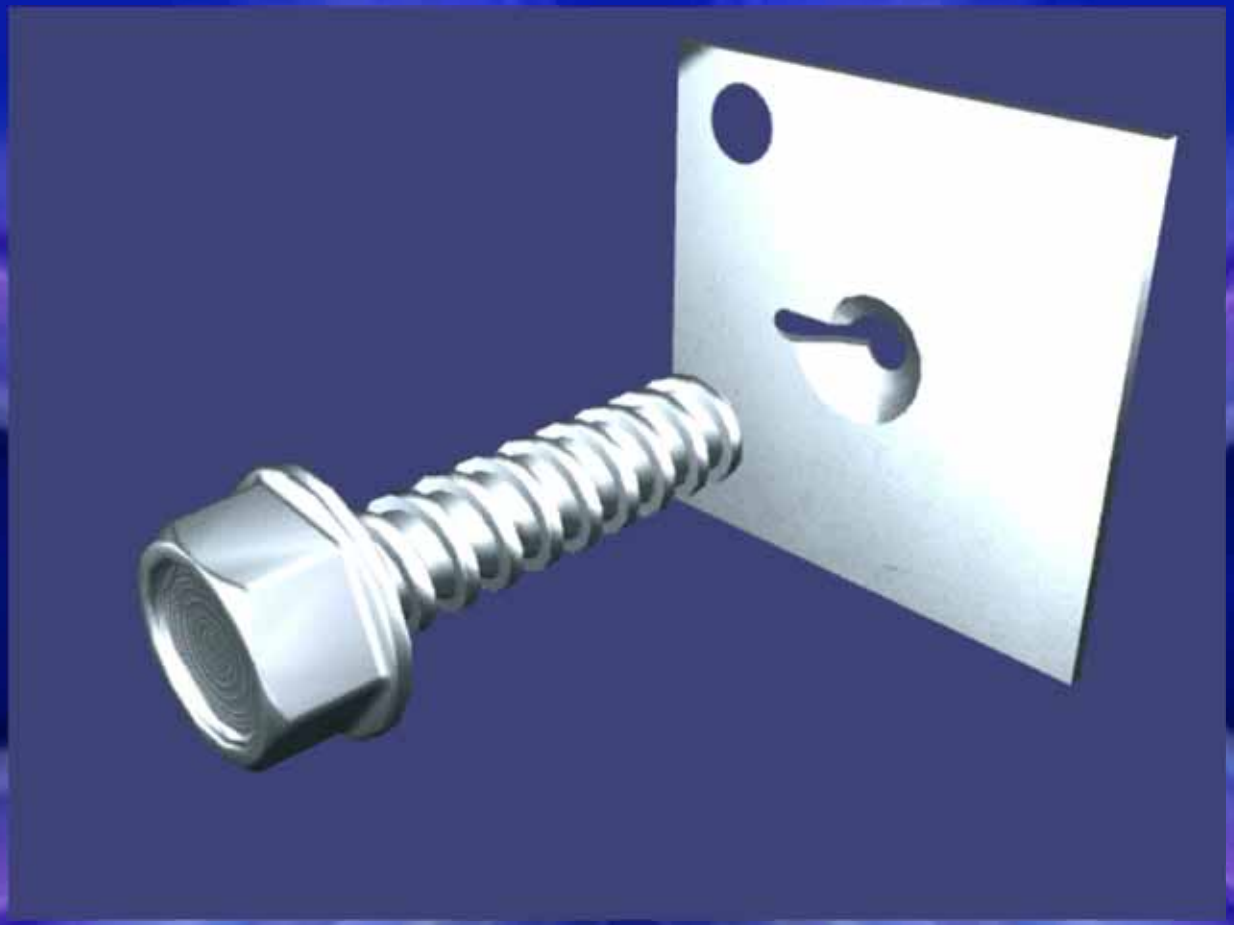
Joint integrity increased between the fastener and formed sheet material after high temperature and cyclic trials

High carburisation between fastener and sheet material after high temperature trial (1200°C)

Please refer to test report for full test procedure

Environmental test chamber

HIGH TORQUE FASTENER SYSTEMS



“It is essential to stimulate greater investment by companies in product integrity by showing the commercial benefit of applying appropriate technology and by challenging traditional methods which no longer provide an adequate business case”.

“Ford Motor Company May 2005”