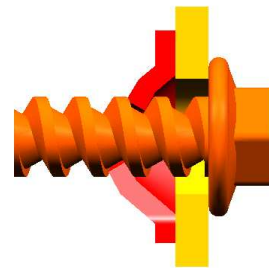


Introduction

Swansea Metropolitan University is helping manufacturing industry to acquire innovative high technology. The University has established itself in providing a local research and development resource to support companies in product and process development. Although this initiative was originally intended to support the automotive sector, it has proven attractive to a much wider spectrum of companies. A particularly successful example of this collaborative industrial research is the relationship that has developed with High Torque Fastener Systems. The University provides Finite Element Analysis and physical laboratory testing which underpins the development of their sheet metal fastener system, enabling the company to break into new markets including white goods, domestic appliances and information technology in addition to high profile automotive applications. Customers involved in previous development which are now in production include Land Rover, Panasonic, Ford, and Caterpillar. The table below shows a range of High Torque thread diameters that have been tested for a given material gauge.

Material Thickness	Thread Diameters
0.5-0.6mm	Ø3.0 to Ø4.0
0.7-0.8mm	Ø3.5 to Ø6.0
0.9-1.0mm	Ø4.0 to Ø8.0
1.1-1.2mm	Ø5.0 to Ø6.0
1.5-1.6mm	Ø6.0 to Ø8.0
1.9-2.0mm	Ø8.0 to Ø10.0



The fastener material used for all tests was BS3111/9/2 (Boron), Heat Treatment harden & temper grade 8.8. The sheet material containing the High Torque helix form used was Bright Cold Rolled Mild Steel BS EN 10140 1997. This is consistent with fasteners and sheet metal material being used out in the field by customers of High Torque Fastener Systems. A number of tests have been conducted on samples of the High Torque Fastener System product, with a view to assessing the performance of the fastened joint under specific conditions.

This report contains the following tests which have been carried out to date:

1	Pull-out Load
2	Torque Investigation
3	Static Clamp Load
4	Vibration Testing
5	Environmental Testing
6	Finite Element Analysis
7	Electrical Continuity

In addition to the test conducted at Swansea Metropolitan University, this report contains a section at the rear showing various testing which has been completed by High Torque Fastener Systems customers.