

# TORX PLUS® DRIVE OUTPERFORMS THE TORX® DRIVE

A finite element analysis (FEA) of the TORX PLUS Drive System and the TORX Drive System was conducted to analyze the amount of stress encountered by both the drive bits and recesses.

The TORX PLUS Drive System demonstrated:

- An average 25% increase in ultimate torsional strength of the driver bit.
- An average 25% increase in ultimate torsional strength of the total drive system, allowing for higher torque transfer and higher torque removal capability.
- An increase in fatigue life averaging 100% because of reduced stresses in the driver bit.
- Because of the circumferential load transfer of the TORX PLUS Drive System, the radial stresses are greatly reduced. This allows for thinner-walled recesses and demonstrates a more efficient drive system.

## Force Vectors at 40Nm



TORX PLUS Drive



TORX Drive

The TORX PLUS Drive directs the forces in a more circumferential direction than the TORX Drive. Less force is passed into the fastener head and instead is utilized directly in rotating the fastener, resulting in a more efficient transfer of torque. This also allows thinner-walled recesses to be utilized.

## Transmitted Forces at 20Nm



TORX PLUS Drive



TORX Drive

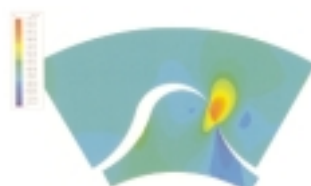
At 20Nm, the TORX PLUS Drive has a very small percentage of the drive bit under stress, and no sign of internal yielding.

The TORX Drive bit has a much higher percentage of the drive bit affected by the combined stresses (torsional, tensile, etc.) and also shows a small region that has internal yielding.

## Radial Stress at 20Nm



TORX PLUS Drive



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The TORX PLUS and TORX designs show a similar radial stress value at the point of contact. However, the radial stresses for the TORX Drive System spread farther into the fastener recess over a larger area than the TORX PLUS Drive System.

In fact, the radial stresses in the head quickly dissipate to zero for the TORX PLUS Drive System.

NOTE: The materials used for the TORX and TORX PLUS models were a typical thru hardened quench and tempered carbon steel, with properties representative of a Property Class 10.9 fastener. The material properties for the drive bit are for a modified S-2 material corresponding approximately to a hardness of Rockwell C60.