

# **THE DISC-LOCK SAFETY WHEEL NUT?**

## **PROBABLY THE WORLD'S SAFEST WHEEL NUT**



**TEST  
REPORT**

**DISC-LOCK™**  
EUROPE  
LEADING INNOVATORS IN FASTENER TECHNOLOGY

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# TEST PROVES THE ***DISC-LOCK*** SAFETY WHEEL NUT MAINTAINS WHEELS SECURE ON THEIR AXLES

On December 6 & 7, 2004 **Disc-Lock Europe** tested the **Disc-Lock** Safety Wheel Nut at the Motor Industrial Research Association (MIRA) Proving Ground, Nuneaton, Warwickshire. The test was designed by:

**Eur Ing Don H Wright, BSc(Eng), CEng, FIMechE**

and was attended and witnessed by:

Dave Allton      Engineer, **MIRA**

Keith Wileman      Engineer, **MIRA**

Barry O'Connor      **Trailer Resources Limited**  
(Tuesday 7th only)

Dave Pyman      Engineering Manager, **Crane Fruehauf**

John Hope      Engineer, **Crane Fruehauf**

Bob Hope      Managing Director, **Disc-Lock Europe**

Jean Harvey      Sales Manager, **Disc-Lock Europe**

Ivan Ingram      Technical Support, **Disc-Lock Europe**

Anthony Halley      Driver, **Ford Europe Limited**

## Background

Following a request by Trailer Resources Limited, **Disc-Lock Europe** commissioned a test at MIRA to establish whether **Disc-Lock** Safety Wheel nuts (M22 x 1.5) were suitable for use on a Fruehauf tri-axle semi-trailer fitted with Meritor axles, 445/45 R19.5 tyres and eight stud fixing.

## Test Programme

Designed by Eur Ing Don H Wright, BSc(Eng), CEng, FIMechE

The programme involved driving a fully-laden semi-trailer/tractor-unit combination (supplied by Ford Europe and loaded by Ford Europe as they would for normal operational use) as follows:

- a. Repeated figure of eight manoeuvres which applied lateral bending-movements to the wheels.
- b. Repeated forward and rearward emergency braking at 15mph approximately to induce torsional, slipping forces to the wheels. (Rearward braking at as great a speed as would allow.)

Figure of eight manoeuvres of the front and rear axles were subjected to the most severe cornering forces.

The semi-trailer was uniformly distributed, maximum load.

The driver, tractor unit and trailer were all insured and supplied by Ford Europe.

## The Test

On Monday December 6, at approximately 09:00am the Ford Volvo FM12 registration KX04 BUE and trailer numbered MT1106 arrived at the Motor Industry Research Association Proving Ground, loaded with 17 ton of uniformly loaded materials, with an overall tractor/trailer combined weight of 35 ton.



The left-hand three wheels of the trailer had been fitted with **Disc-Lock** Safety Wheel Nuts, all clearly marked across the stud and nut face with a white line to indicate movement of the nut.

The right-hand three wheels of the trailer were fitted with conventional flat-faced wheel nuts. None of these nuts was marked in any way.

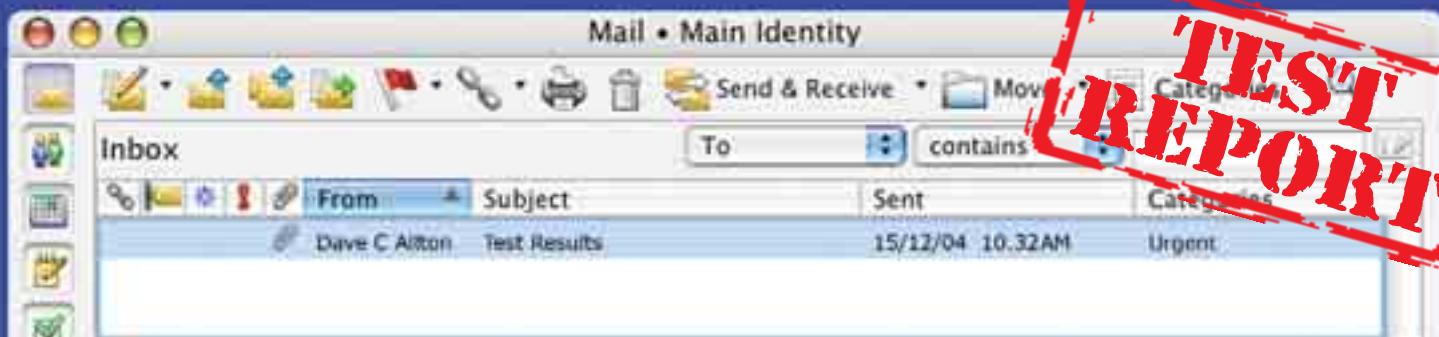
A visual inspection of the **Disc-Lock** Safety Wheel Nut showed no movement. However, the nuts were loosened and re-torqued to **Disc-Lock Europe**'s recommended torque of 700 Nm using a Torqueleader Dial Measuring Torque Wrench (model no EDS 1400S) calibrated and certificated on November 8, 2004.



This torque wrench was purchased in accordance with a preference indicated by Alan Dixon, Engineer at ARVINMeritor. (Meritor declined to be present at the tests.) After a check of the torque each nut and stud was marked with an 'x' to show compliance. As all nuts were already in situ no observations could be made to the bolt consistency or quality.

Because of the extreme stress affecting the tyres, it was decided to carry out 30 minutes only of figure of eight cycles followed by the braking. At each interval the **Disc-Lock** Safety Wheel Nuts were checked for loss of torque using the same calibrated wrench.

**TEST REPORT**



**From:** Dave C Alton, MIRA  
**Subject:** Test Results

**To:** Jean Harvey, Disc-Lock Europe  
**Attachments:** Ford Europe Test Vehicle

Jean,

Please find below the test description and results for the tests carried out at MIRA on the 6th and 7th December

**Test description:**

Only the wheel nuts on the left-hand front, centre and rear wheels of the articulated trailer were replaced with the Disc-Lock safety wheel nut, as these were determined to be the most common axles on UK trailers to suffer from wheel loss. The conventional wheel nut remained fitted to the right-hand wheels of the trailer.

The Disc-Lock wheel nuts had been fitted to the trailer prior to its delivery to MIRA. Prior to the start of the test the wheel nut torques on the Disc-Lock nuts were set to 700nm and paint marked across the nut to aid in identifying any loss of torque.

The lorry and trailer were then driven in a figure of eight manoeuvre for 30 minutes, the vehicle then completed two forward ABS brake stops and two reverse ABS brake stops. This completed one test cycle.

A torque check was then carried out on each of the Disc-Lock wheel nuts to establish if any torque loss had occurred. During each 30 minute cycle the vehicle completed 51 figure of eight manoeuvres, which was approximately 8.8km.

**Results:**

**Test 1**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts.

**Test 2**

A torque check on completion of the cycle again showed no loss of torque on any of the Disc-Lock wheel nuts.

**Test 3**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts.

**Test 4**

No loss of torque was recorded on the Disc-Lock wheel nuts. A random torque check on 2 of the conventional wheel nuts was carried out and both were found to have lost torque. In light of this a re-torque was carried out on all the conventional wheel nuts. They were re-torqued to a figure of 720nm, as specified by the manufacturer. These were then paint marked across the nut to aid in identifying any loss of torque.

**Test 5**

No loss of torque was recorded on any of the Disc-Lock wheel nuts. During the torque check an inspection of the trailer was carried out by Dave Pyman of Fruehauf Trailers and it was found that there had been movement of approximately 20mm in the right-hand rear spring hanger of the rear axle. Testing continued as it was considered that it did not affect the test being carried out.

**Test 6**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts.

**Test 7**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts. Slight movement was noted on the spring hanger of the centre axle. During a random check on the conventional wheel nuts it was found that 3 wheel nuts had lost torque and required approximately a 90° turn of the torque wrench to re-establish the correct torque.

**Test 8**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts. All 24 of the conventional wheel nuts were also torque checked and it was found that 3 out of 8 had lost torque on the front axle, 5 out of 8 had lost torque on the centre axle and 6 out of 8 had lost torque on the rear axle. These were all re-torqued to 720nm.

The test vehicle was then taken to the Meritor workshop where the axles were re-aligned and the pivot bolts and "U" bolts were re-torqued to the specified torque.

**Test 9**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts. A random check was carried out on 12 of the conventional wheel nuts and it was found that 2 had lost torque. These were re-tightened to the specified torque.

**Test 10**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts.

**Test 11**

A torque check on completion of the cycle showed no loss of torque on any of the Disc-Lock wheel nuts. All 24 of the conventional wheel nuts were also torque checked and it was found that 4 out of 8 on the front axle had lost torque, 4 out of 8 on the centre axle had lost torque and 4 out of 8 on the rear axle had lost torque. These were all re-torqued to the specified torque, prior to the vehicle being returned to Ford.

Please find attached the picture of the test vehicle

Regards

Dave



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