

# The Nord-Lock wheel nut

Product information



**Safe  
Wheels**  
Secured by Nord-Lock

**NORD-LOCK®**





# Loose wheel nuts cause more than loose wheels

Loose wheel nuts on heavy vehicles is a costly, dangerous and unsolved problem. Fortunately, a solution to loose wheel nuts is available.

## A widespread and dangerous problem

You might be surprised how often wheels fall off heavy vehicles. In the United Kingdom alone, there are up to 400 wheel detachments from trucks every year. Of those there are, on average, 134 accidents involving vehicle/property damage, 27 injury accidents and up to seven fatalities. So states a 2006 report commissioned by the United Kingdom Department of Transport entitled *Heavy Vehicle Wheel Detachment*. In the United States of America, the National Transportation Safety Board states that wheel detachments occur at an estimated rate of 1,000 per year – almost three a day – resulting in about 20 reported accidents per week. In other countries, wheel loss occurs at a comparable rate.

Available statistics for off-road vehicles tell a similar story. According to a 2008 U.S. Bureau of Labor Statistics report entitled *Census of Fatal Occupational Injuries*, 2,053 workers died in vehicle-related crashes and transportation incidents.

According to their earlier reports, wheels and tyre rims caused fatalities to 85 workers from 1992 to 2002, an average of 8.5 such fatalities per year over that period. Wheel detachment is one of the possible causes of such accidents. Loosening wheel nuts is the main reason for wheel detachment.

Accidents related to loose wheel nuts can easily be avoided with the Nord-Lock wheel nut.

## The consequences of loose wheel nuts

Risk of accidents, personal injury and property damage due to dislodged wheels is not the only consequence of loose wheel nuts. Other costly aspects are:

- Jeopardised productivity and delivery efficiency due to
  - Greater risk of unplanned stops
  - Greater retightening demands
- Increased costs due to the effects of unbalanced wheels
  - Higher fuel consumption
  - Increased tyre wear
- Higher spare parts costs, due to increased wear of wheel assembly
- Increased operational costs from damage repair and possible fines or insurance claims
- Negative company publicity resulting from poor safety record



*The Nord-Lock wheel nut offers a complete and reliable solution to wheel nut loosening.*





# What makes wheel nuts come loose?

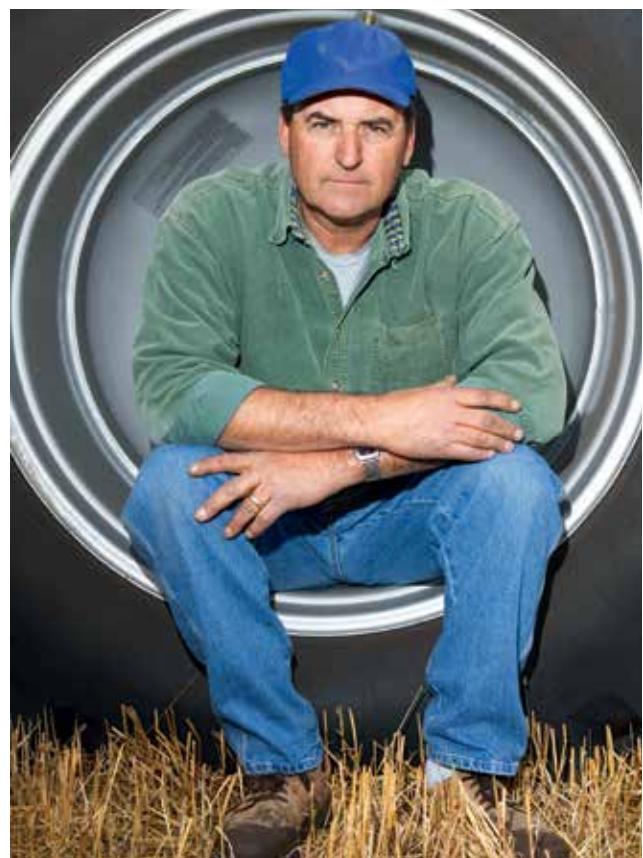
The blame is normally placed on the driver when a wheel falls off its axle, even though conventional wheel nuts lack a locking function. While many drivers and firms have not experienced wheel detachment in the course of their work, unbalanced wheels due to loosening wheel nuts are a common occurrence. The result is not only increased costs but also unstable driving, which can contribute to driver fatigue.

## Loosening factors of wheel nuts

Safe wheel assemblies rely on high clamp load. Loss of clamp load leads to movement between the clamped parts in the joint, and causes rotation of the wheel nut. The phenomena of loosening wheel nuts is a normal part of the everyday operation of heavy vehicles – caused by one or more of the following reasons.

- Poor road conditions
- Vibration
- Poor tightening technique or tools
- Joint relaxation
- Braking and acceleration
- Human errors during assembly
- Thermal expansion and contraction of wheel bolts
- Unbalanced wheels
- Increased vehicle speed
- Oil leakage from axle onto wheel nuts without locking function

Regular wheel nuts do not have a locking feature and may therefore rotate loose. The Nord-Lock wheel nut safely secures wheels on heavy vehicles.



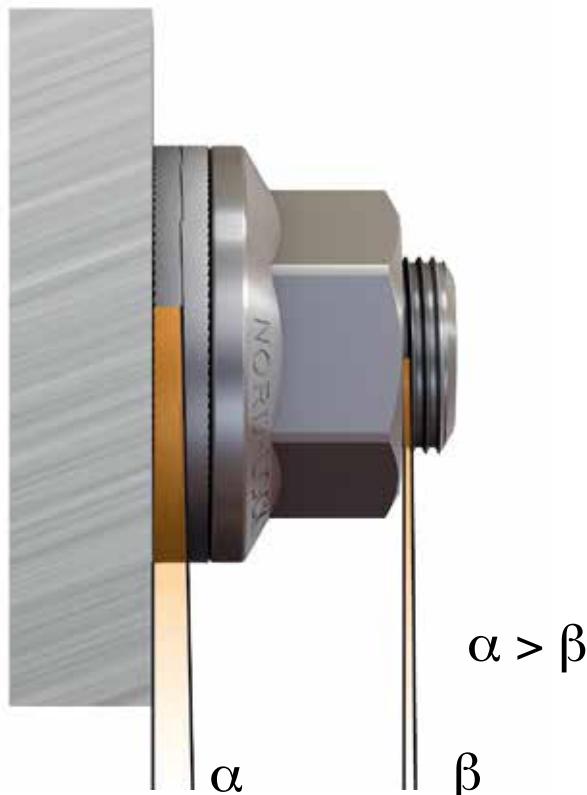
*Unsecured wheel nuts affect the efficiency of both the driver and the vehicle.*

# The solution to loosening wheel nuts



The Nord-Lock wheel nut safely secures wheels on both on road as well as off road heavy vehicles. The product is based on the same principle as the Nord-Lock bolt securing system, and maintains high clamping force even under extreme operating conditions. Each nut incorporates a pair of captivated washers with cam faces on one side, where a cam angle ' $\alpha$ ' is greater than the thread pitch ' $\beta$ '. On the opposite side there are radial teeth. When the wheel nut is tightened, the teeth of the Nord-Lock washers grip and lock the mating surfaces, allowing movement only across the cam faces. Any rotation of the wheel nut is blocked by the wedge effect of the cams.

*The Nord-Lock wheel nut is based on our unique wedge-locking technology, which uses tension instead of friction to secure bolted joints. The system has been used for 30 years to ensure the structural security of bolted applications exposed to strong vibrations and high dynamic loads.*



## For flat-faced rims

The Nord-Lock wheel nut is designed for use on flat-faced rims. Sliding always occurs between the nut and the upper washer during tightening, and between the cam faces during untightening. In this way, clear impression marks are created without scoring the contact surface. Upon reuse, the serrations find their way back into the previously created impressions. The Nord-Lock wheel nut can be used on both steel and aluminium rims. For use on aluminium, please contact us for guidance and support.



# Scientific proof of the wedge-locking function



The performance of the Nord-Lock wheel nut has been proven in a rigorous three step test program:

- Laboratory testing
- Controlled real-life testing, extreme conditions
- Live real-life testing, normal conditions

Results prove that the Nord-Lock wheel nut does not rotate loose and will safely secure the wheel even under the most extreme operating conditions. More information on all testing is available at [www.safe-wheels.com](http://www.safe-wheels.com).

## Laboratory testing

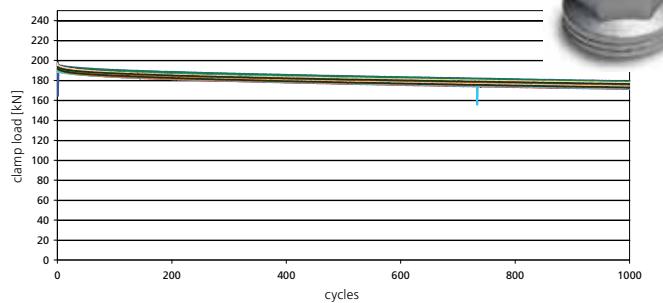
At the IMA independent facility for engineering services in Dresden, Germany, the Nord-Lock wheel nut was subjected to severe vibration testing according to the DIN 651 51 standard (Junkers test). The testing also compared the function of the Nord-Lock wheel nut against other wheel nut products. The test results clearly show its superior safety. The Nord-Lock wheel nut performed flawlessly, even after being reused multiple times.

## Tested and approved by TÜV - for your safety

The Nord-Lock M22 wheel nut has been certified for safety and quality by TÜV, a leading international institute in quality and safety certification. In a two-step process, both the wheel nut and its production were approved.

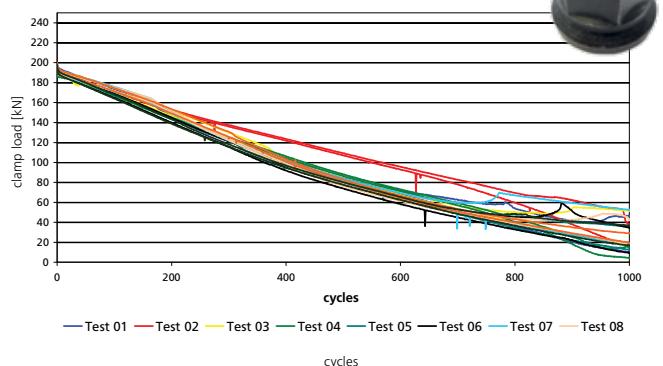
In the first step, extensive fatigue testing of the Nord-Lock wheel nut, at frequencies of 8 – 15 Hz, showed no reduction of clamp load in the joint. Furthermore, the long-term product test, consisting of 17.5 million oscillations, confirms that the Nord-Lock wheel nut would last the entire lifetime of a truck. In the second step, TÜV also monitored and approved Nord-Lock's production facilities, encompassing everything from raw materials used to the processes in the manufacturing line.

## The Nord-Lock wheel nut



The graphs display the products tightened to 200 kN and the change in clamp load during 1000 load cycles. The conventional wheel nut rotated and lost most of its initial clamp load in the joint. The Nord-Lock wheel nut safely secured the wheel joint and maintained the clamp load. Only initial settlements are indicated in the graph.

## Conventional wheel nut



# Extreme operating conditions test, on-road

On-road track testing was performed at RDW's Test Center in Lelystad, The Netherlands. The wheel joints of a 3-axle extended trailer were secured with the Nord-Lock wheel nut marked in order to detect any rotation. The truck was then driven in both directions on an oval track with concave, banked curves in order to exert the same stress on all wheel joints. The wheel nuts were not retightened after 100 km of driving in order to simulate human error in combination with a worst case driving scenario.

## Result

There were no signs of wheel nut loosening. The Nord-Lock wheel nut safely secured the wheel joints even under severe on-road conditions.



## Test vehicle data:

Trailer:	NBT, 3-axle bogie by BPW, (adapted for forklift)
Truck:	Scania R380
Vehicle total weight:	45 000 kg
Tyres:	Michelin
Rims:	Michelin steel rims
Corner speed at test:	86 km/h

## Track specifications:

Length of test track:	2850 m	71/320/EEC
Curve radius:	160 m	ECE R13/R13H
Curve gradients:	5%, 30% and 60%	ECE R39
Maximum axle load:	15 000 kg	ECE R78
Friction coefficient:	0,6 $\mu$	
Longitudinal gradient:	0%	

# Extreme operating conditions test, off-road

Off-road track testing was performed by the 2009 European truck trial champion. The wheel joints of a MAN TGS 8-wheeled truck were secured and marked with the Nord-Lock wheel nut. The test was performed in winter conditions in a stone quarry. Inspection of the marked wheel nuts showed that they had not rotated. During the tests, these maneuvers were performed to maximize the load on the axles and wheel joints:

- Driving at accelerated speeds over uneven surfaces
- Entire vehicle weight was carried by: the rear axle only, the front axle only, and each side
- Vehicle slid down the hill repeatedly

## Result

There were no signs of wheel nut loosening. The Nord-Lock wheel nut safely secured the wheel joints even under severe off-road conditions.

## Test vehicle data:

Truck:	MAN TGS 35.480
Power output:	600 bhp
Gears:	32 gears
Drive chain:	8-wheel drive with all axles lockable



# Technical specifications & assembly instructions



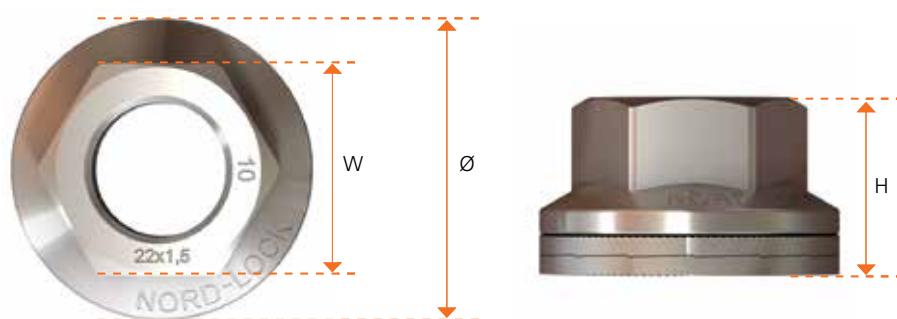
The Nord-Lock wheel nut is a Swedish product manufactured from high-quality steel. The product is pre-lubricated to ensure uniform friction and thereby accurate preload during tightening. The lubrication also inhibits corrosion which facilitates disassembly and helps prolong the life of wheel studs. The Nord-Lock wheel nut is reusable and durable.

## Full traceability and environmental compliance

Each Nord-Lock product is supplied with a control number, enabling full traceability. Nord-Lock is also a proud holder of the ISO 9001 and ISO 14001 certifications. The Nord-Lock wheel nut is in full compliance with EU directive 2000/53/EC on End of Life Vehicles (ELV) and EU directive 2002/95/EC on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).

## Technical specifications

<b>Surface coating:</b>	Basecoat Delta Protekt KL 100, Topcoat VH 302 GZ
<b>Corrosion resistance:</b>	600 hours according to ISO 9227
<b>Lubrication:</b>	Anti-corrosive wax
<b>Property class:</b>	Grade 10



Thread	Key width W	Diameter Ø	Height H	Tightening	Clamp load
<b>M22x1.5</b>	32 mm	46 mm	27 mm	600-650 Nm	~ 200 kN
<b>7/8"-11 BSF</b>	32 mm	46 mm	27 mm	600-650 Nm	~ 180 kN

\*BSF = British standard fine thread, normal class



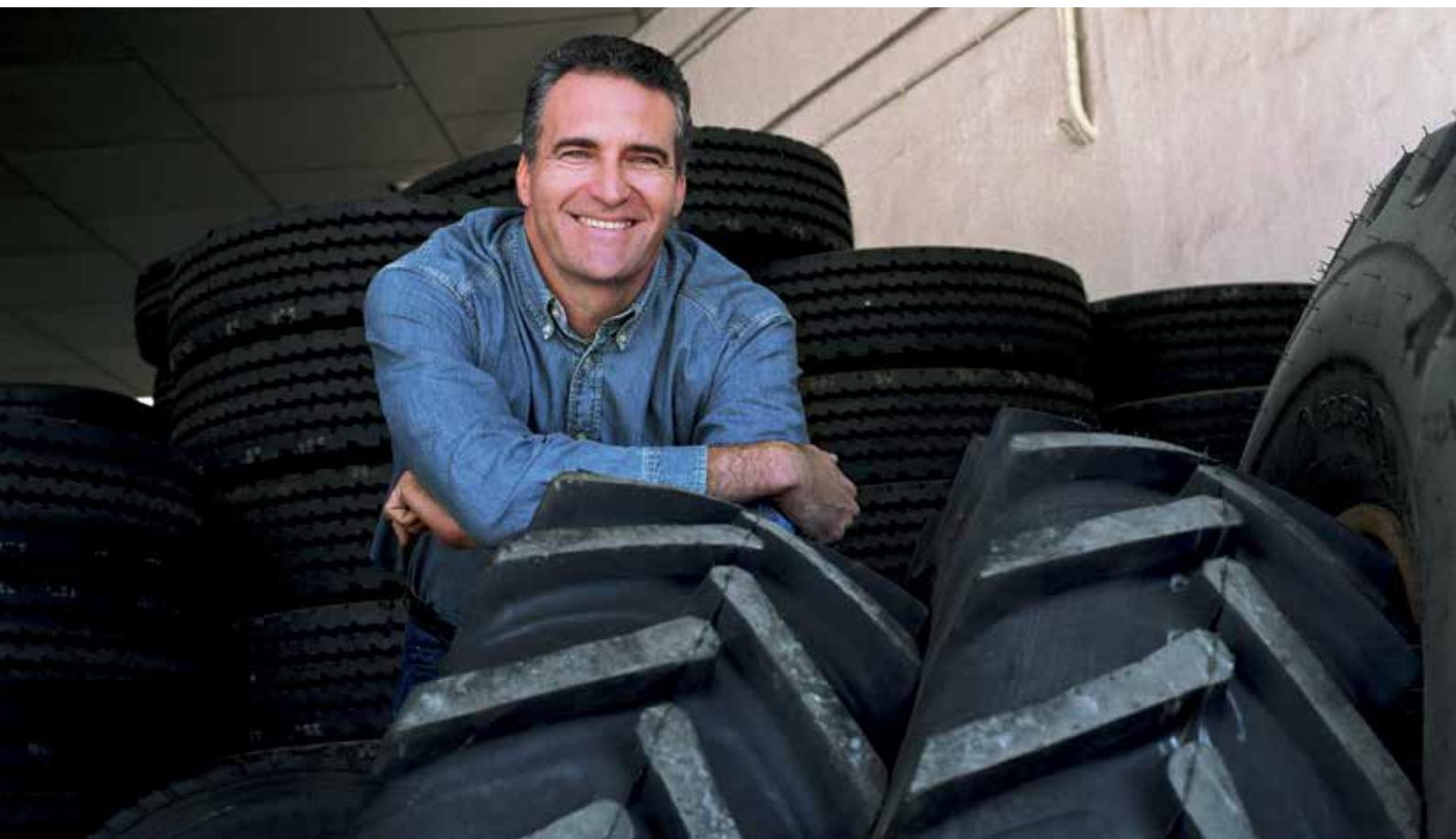
### Assembly instructions

- Place the rim over the wheel hub. Ensure the wheel studs are not damaged
- Fit and tighten the nuts with a calibrated torque wrench at the recommended torque, in the sequences illustrated here
- Retighten the nuts after the first 100 km of driving

### Maintenance

Before reuse, inspect the nuts and wheel studs to make sure that the threads are free from particles and are undamaged.

Re-lubricate the nuts before reuse.



# When **safety** really matters



Joining parts together is one of the most critical steps when delivering a product or system. The Nord-Lock Group is focused on solving the toughest bolting challenges. We offer a unique combination of bolting expertise and a wide product range, including wedge-locking technology and Superbolt tensioners — all designed and developed in-house.

Nord-Lock holds decades of documented success in every major industry, including oil and gas, energy, transportation and mining. Our Production System includes rigorous internal testing and full traceability, and our products hold several certificates from independent institutes including ABS, DIBt, DNV and TÜV.

The tools available through Nord-Lock Performance Services add value throughout a project and ensure that your bolting application pays back multiple times. We can also assist you in the design phase with joint simulation and testing. Additionally, we help you ensure successful operations over time with our onsite support and remote product training.

Our mission is to safeguard human lives and customer investments by securing the world's most demanding applications. The Nord-Lock Group looks forward to being your partner in bolting solutions.

Authorized distributor:

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