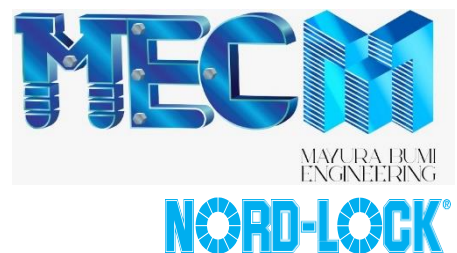


The Nord-Lock wheel nut

Product information



Mayura Engineering & Consultancy Sdn Bhd

A-9-1, 9th Floor, BBT One The Towers (South Tower), Lebuhraya Batu Nilam 1, Bandar Bukit, 41200 Klang, Selangor, Malaysia

T: +60 (3) 33223717 F: +60 (3) 3322 3601 H/P: 012-495 4823 Email: sales@mayuraengineering.com

Mayura Bumi Engineering Sdn Bhd

Tb 7-1A, Suite 2, The Landmark, Jalan Batu Nilam 16, Bandar Bukit Tinggi 2, Klang, Selangor, Malaysia

T: +60 (3)-33191889-102 H/P: 012-495 4823 Email: sales@bumi.mayuraengineering.com





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?

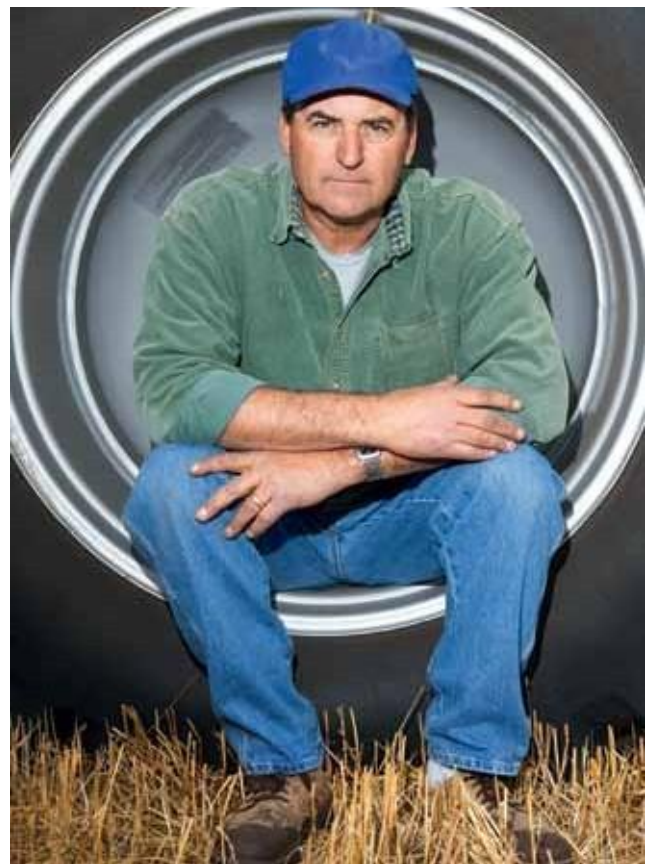
The blame is normally placed on the driver when a wheel falls off its axle, even though conventional wheel nuts lack a locking function. While many drivers and firms have not experienced wheel detachment in the course of their work, unbalanced wheels due to loosening wheel nuts are a common occurrence. 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 nuts safely secure wheels on heavy vehicles.



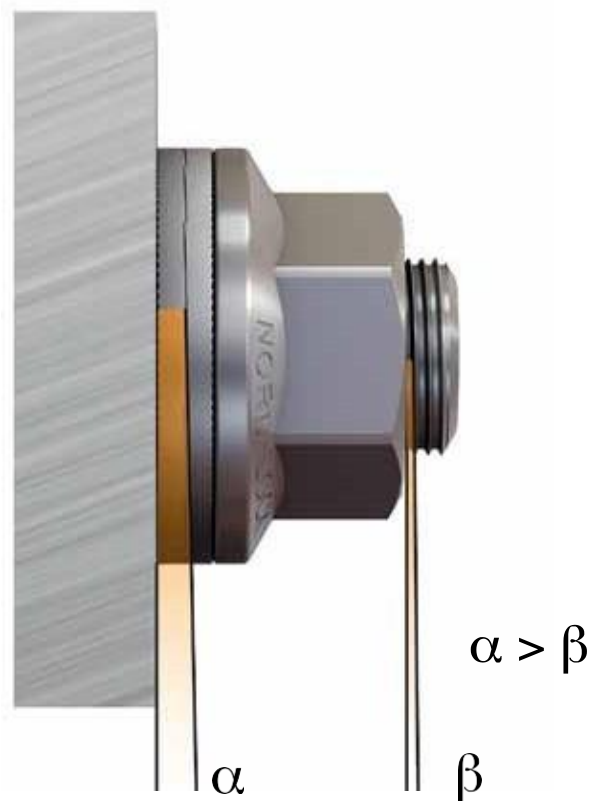
Unsecured wheel nuts affect the efficiency of both the driver and the vehicle.

The solution to loosening wheel nuts



The Nord-Lock wheel nut safely secures wheels on both on roads 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 ' α ' is greater than the thread pitch ' β '. 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.

Laboratory testing

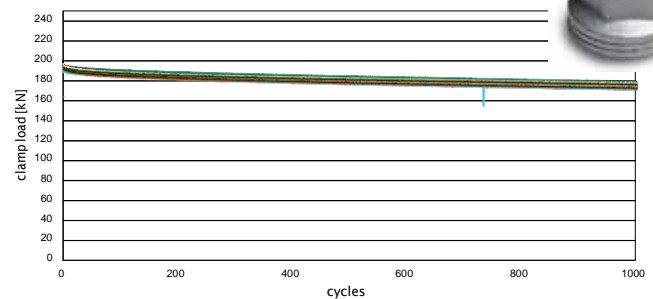
At the IMA independent facility for engineering services in Dresden, Germany, the Nord-Lock wheel nut was subjected to severe vibration testing according to the DIN65151 standard (Junkers test). The testing also compared the function of the Nord-Lock wheel nut against other wheel nut products. The test 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 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.

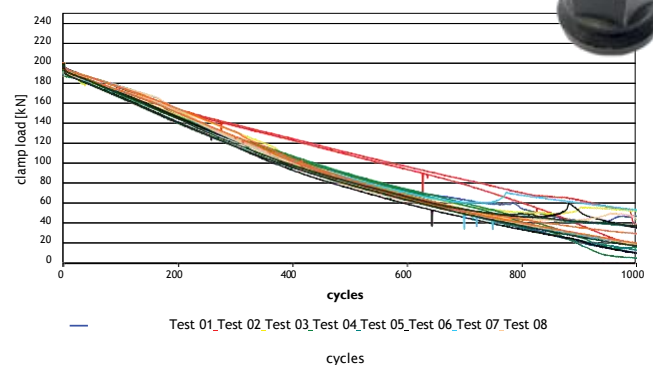
In the first step, extensive fatigue testing of the Nord-Lock wheel nut, at frequencies of 8 - 15Hz, showed no reduction of clamp load in the joint. Furthermore, the long-term product test, consisting of 17.5 million oscillations, confirms that the Nord-Lock wheel nut would last the entire lifetime of 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 μ	
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 MANTGS 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



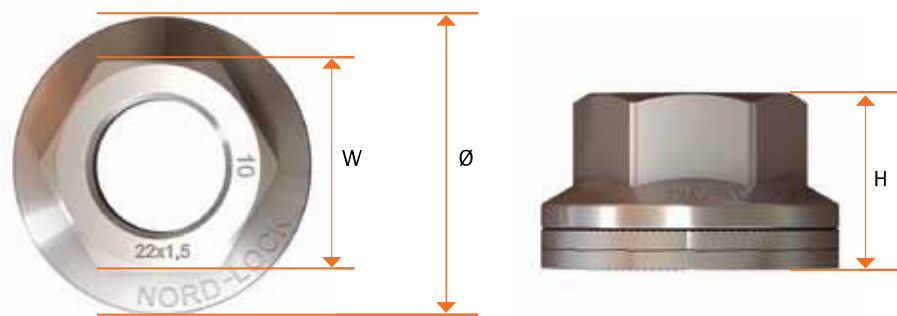
The Nord-Lock wheel nut is a Swedish product manufactured from high-quality steel. The product is prelubricated to ensure uniform friction and thereby accurate preload during tightening. The lubrication also inhibits corrosion which facilitates disassembly and helps prolong the life of wheel studs. The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

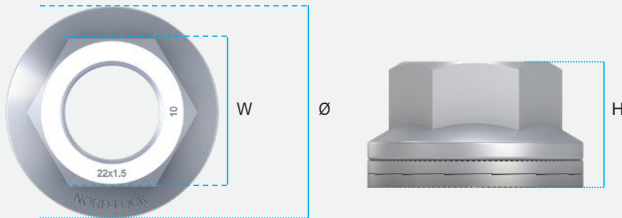
Surface coating:	Basecoat Delta Protekt KL 100, Topcoat VH 302 GZ
Corrosion resistance:	600 hours according to ISO 9227
Thread tolerance after coating:	6H
Lubrication:	Anti-corrosive wax
Property class:	Grade 10



Thread	Key width W	Diameter Ø	Height H	Tightening torque	Clamp load
M22x1.5	32 mm	46 mm	27 mm	600-650 Nm	~ 200 kN

TECHNICAL SPECIFICATIONS

Surface coating	Basecoat Delta Protekt® KL100, Topcoat VH 302 GZ
Corrosion resistance	600 hours according to ISO 9227
Lubrication	Dry film lubricant/lubricating paste
Property class	Class 10



Thread	Key width W	Diameter Ø	Height H	Tightening torque	Clamp load
M16x1.5	24.0 mm	34.5 mm	23.0 mm	280 Nm (205 ftlb)	~ 100kN (~22500 lb)
M18x1.5	27.0 mm	40.0 mm	24.0 mm	400Nm (295 ftlb)	~ 130kN (~29200 lb)
M20x1.5	30.0 mm	45.0 mm	26.0 mm	550 Nm (405 ftlb)	~ 160kN (~36000 lb)
M22x1.5	32.0 mm	46.0 mm	27.0 mm	650 Nm (480 ftlb)	~ 180kN (~40500 lb)
7/8"-11 BSF	32.0 mm	46.0 mm	27.0 mm	650 Nm (480 ftlb)	~ 170kN (~38200 lb)
M24x1.5	36.0 mm	48.0 mm	33.0 mm	950 Nm (700 ftlb)	~ 240kN (~54000 lb)

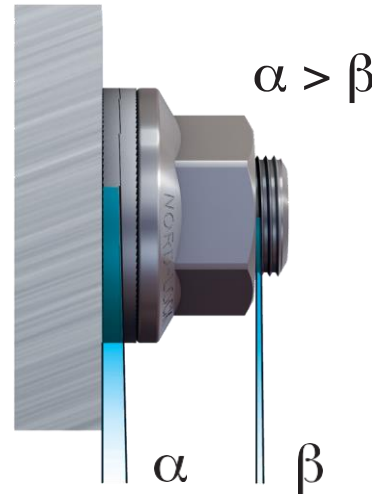
*BSF = British standard fine thread, normal class.

CERTIFICATES & APPROVALS ISO 9001 AND ISO 14001



All Nord-Lock wheel nuts are certified by TÜV. To learn more about TÜV approval, please contact your Nord-Lock Office.

THE PRINCIPLE



Each wheel nut is permanently attached to a pair of Nord-Lock washers. The washers have cam faces on one side and serrations on the other. When the wheel nut is tightened, the serrations on the lower washer are embedded into the mating surface.

As the cam angle “α” is greater than the thread pitch “β”, a wedge-effect is created, allowing movement only across the cam faces. Any rotation of the wheel nut is blocked by the wedge effect of the cams.

In an independent comparative test, Nord-Lock wheel nuts proved their outstanding performance compared to conventional wheel nuts*.

*Laboratory test by IMA Germany. Comparison in Junker vibration test DIN 65151.

Nord-Lock Group
www.nord-lock.com
Tel: +46 40 602 46 00
Email: info@nord-lock.com

NORD-LOCK
GROUP

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NORD-LOCK
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MECM
MAZURZKA
ENGINEERING

NORD-LOCK WHEEL NUTS

SAFE WHEELS SAVE LIVES



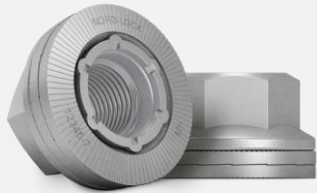
Safe
Wheels
powered by Nord-Lock

NORD-LOCK®

WHEREVER YOU DO BUSINESS WE HELP YOU STAY SAFE



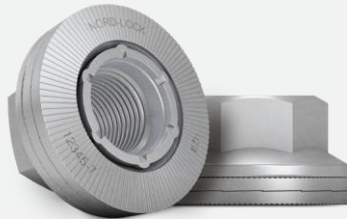
**NLWN
M16**



**NLWN
M22**



**NLWN
M18**



**NLWN
7/8"-11 BSF**



**NLWN
M20**



**NLWN
M24**



APPLICATIONS ON AND OFF ROAD

TRANSPORTATION



FORESTRY



AGRICULTURE



NORD-LOCK WHEEL NUTS

The wheel nuts use Nord-Lock wedge-locking technology to secure wheels by maintaining a high clamp force, even under severe operating conditions. A tightened Nord-Lock wheel nut cannot loosen by itself.

Nord-Lock wheel nuts are used on heavy on-road vehicles (buses, trucks, trailers, etc.) and off-road vehicles (tractors, farming equipment, mining equipment, forestry machinery, military vehicles, etc.).

ADVANTAGES

- Prevents loosening caused by vibration and dynamic loads
- Quick and easy to install and remove with standard tools
- Improves driver productivity while reducing operating and service costs
- Minimizes risk of accidents and injury
- Suits flat faced steel rims and regular tools
- Reusable and durable
- Prelubricated
- Predictable preload thanks to defined and uniform friction conditions of the washers' mating surfaces

NORD-LOCK ORIGINAL WASHERS

Additionally, Nord-Lock original washers have been used for many years to secure critical vehicle applications exposed to extreme vibrations and dynamic loads.





Assembly instructions

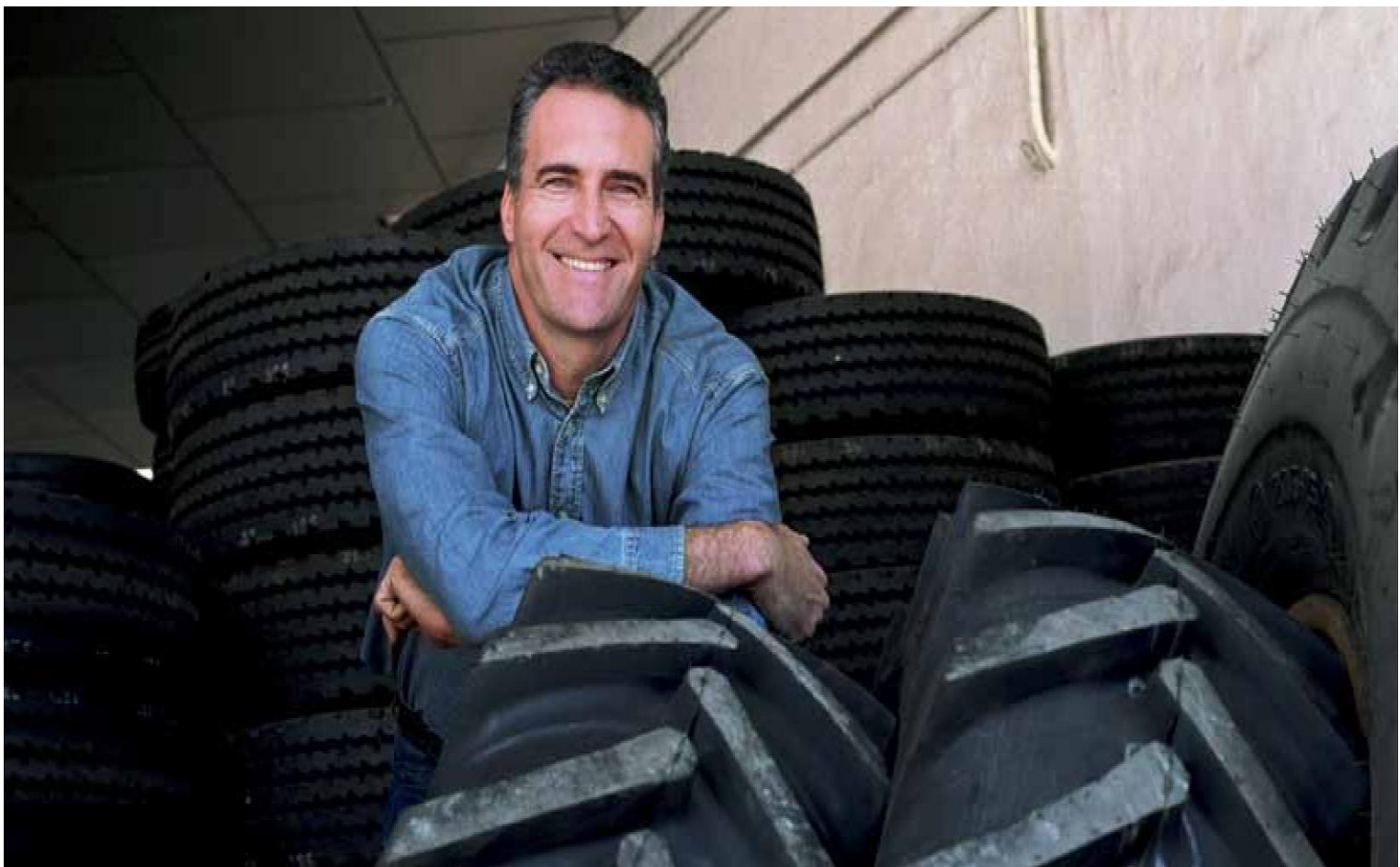
- Place the rim over the wheel hub. Ensure the wheel studs are not damaged
- Fit and tighten the nuts with a calibrated torque wrench at the recommended torque, in the sequences illustrated here
- Retighten the nuts after the first 100 km of driving



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



Nord-Lockbolt securing systems are designed to secure fasteners in extreme conditions. We have 30 years of experience in collaborating with our customers to achieve effective bolt security. We have an international team of sales engineers who visit our clients locally. We will help you optimize your bolted joints in order to minimize overall cost and maximize safety.

Our premium bolt securing systems give effective security throughout an assembly's lifetime, resulting in:

- No bolt loosening caused by vibration and dynamic loads
- Minimized cost of maintenance, repair and overhaul
- Significantly reduced risk of lost production or material damage due to bolt failure
- Increased personal safety

Authorized distributor:

Mayura Engineering & Consultancy Sdn Bhd
A-9-1,9th Floor, BBT One The Towers (South Tower),
Lebuh Batu Nilam 1, Bandar Bukit Tinggi, 41200 Klang,
Selangor, Malaysia

T: +60 (3) 3322 3717 F: +60 (3)3322 3601 H/P: 012-495 4823
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NORD-LOCK®
Bolt securing systems