









Nylok | Marmon | Berkshire Hathaway



- Fortune 500 Company
 - Financially Stable
- Aggressive Investment Strategy
 - Seeking Growth Partners
- Decentralized Culture
 - Close to Customer



- Warren Buffett Chairman and CEO Berkshire Hathaway

Global Support Network







- First and largest fully dedicated processer of self locking products in the world
 - Proven history of solving customer fastener issues for over 75 years



Mission & Vision:

Developing Innovative Fastening Solutions Globally by Engineering Processes and Formulating Products





NAS





Product Overview







New Options for Fastening Dissimilar Materials



Nylok's NyShield[®] coating prevents galvanic corrosion

Toughest Materials To Join

- NyShield[®] protects steel fasteners from galvanic corrosion in high-risk material combinations
 - Carbon Fiber

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- Stainless Steel
- Aluminum
- Magnesium
- Carbon fiber and magnesium are at the extreme ends of the anodic index
 - Resulting in severe reaction with steel and accelerated corrosion

Nylok[®] used the toughest materials for galvanic corrosion prevention for all tests (Mg and C-Fiber)





Nylok[®] Corrosion Chamber







Replicates GM proving grounds chambers – meets GMW17026 requirements

Accelerated Corrosion Test



Accelerated Corrosion Laboratory Test for Galvanic Corrosion Mechanisms



Control – pre test

Control – post test

Uncoated steel coupon are used as a control to monitor the average general bare steel corrosion produced by the test environment per GMW17026

Accelerated Corrosion Test





Coupon mass loss chart – correlation to number of years exposure in field

NyShield[®] Performance Against Carbon Fiber

Control



Start of Test



NyShield®





NyShield[®]





Control

NyShield[®]





Control

NyShield®

NyShield[®] Performance Against Magnesium



Start of Test



Control



NyShield®

NyShield[®] Performance Against Magnesium



5 Years Simulated Outdoor Exposure







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NyShield[®] Performance Against Magnesium



15 Years Simulated Outdoor Exposure



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COF Test & Results

- M10 X 1.5 X 40 Wilson Garner 9.8 plain test bolt
- Zinc plated washer
- Rundown: 30 RPM / tightening: 30 RPM
- Shut off value: 50 NM
- NyShield[®] with torque modifier applied

COF testing performed on RS torque tension equipment



Coefficient of friction values are able to be adjusted as necessary (typical range of +/- 0.03).

Total COF Values for 30 Samples



Clamp Load Loss Test & Results

Test Conditions

- M10X1.5 fastener tightened to 36kN
- ZN electroplate finish on bolts
- NyShield[®] thickness 50-75 microns

Average % Load Loss after 24 hrs*		
Temperature	Control Bolts	NyShield [®] Coated Bolts
22 °C	0.97%	1.02%
100 °C	1.57%	1.71%
125 °C	1.76%	2.45%

*Average of 6 samples reported at each condition No significant difference was found for NyShield[®] coated and control bolts at 22°C, 100°C, & 125°C



Control Bolts NyShield[®] Coated Bolts

Coating Uniformity



- Typical thickness is 50-75 microns (adjustable on smaller fasteners)
- No interference with internal/external drives
- Responsive magnetic properties







NyShield[®] coating is very uniform. Even in fastener recesses, such as an internal Torx drive, it doesn't interfere with the tool used in driving.

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NYSHIELD[®] OVER ELECTROPLATE ZN FINISH

Tape Adhesion

Tape Adhesion Test Parameter*

- 10 day @ 40°C in 100% RH chamber ۲
- Cross hatch cut through coating •
- Scotch tape #898 used •
- Tape pull 1 hr after removal ulletResults
- No removal of coating •
- NyShield[®] has excellent adhesion to • the fastener substrate

CHAMBER

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Chemical Resistance Test

Test Conditions

- 24hr soak @ room temperature
 - Engine oil (also 2hr elevated 82°C)
 - Coolant
 - Transmission fluid
 - Power steering fluid
 - Windshield washer fluid
- 2hr soak at room temperature
 - E10 & E85 fuel
 - Diesel fuel

Results

- No visual change in coating appearance
- No noticeable softening of coating
- NyShield[®] coating has very good chemical resistance to typical automotive fluids





Chemical Resistance Test Continued



Test Conditions

- 24hr soak @ room temperature
 - Vehicle cleaning agent
 - Transit coating / protective wax
 - Car shampoo
 - Paintwork cleaning product
- 2hr soak at room temperature
 - Windex
 - Rain-X 2-In-1 glass cleaner
 - Remover for transit coating
 - Washer fluid
- 10 Min soak at room temperature
 - Tar and road oil cleaner
 - Chrome cleaner

Results

- No visual change in coating appearance
- No noticeable softening of coating
- NyShield[®] coating has very good chemical resistance to typical automotive cleaners



