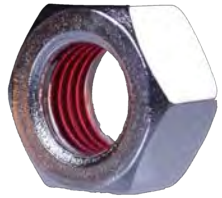
NYLOK

INNOVATIVE FASTENING SOLUTIONS SINCE 1942

NySeal®2.0 Product Overview

NySeal® 2.0

The King of Under Head Sealants



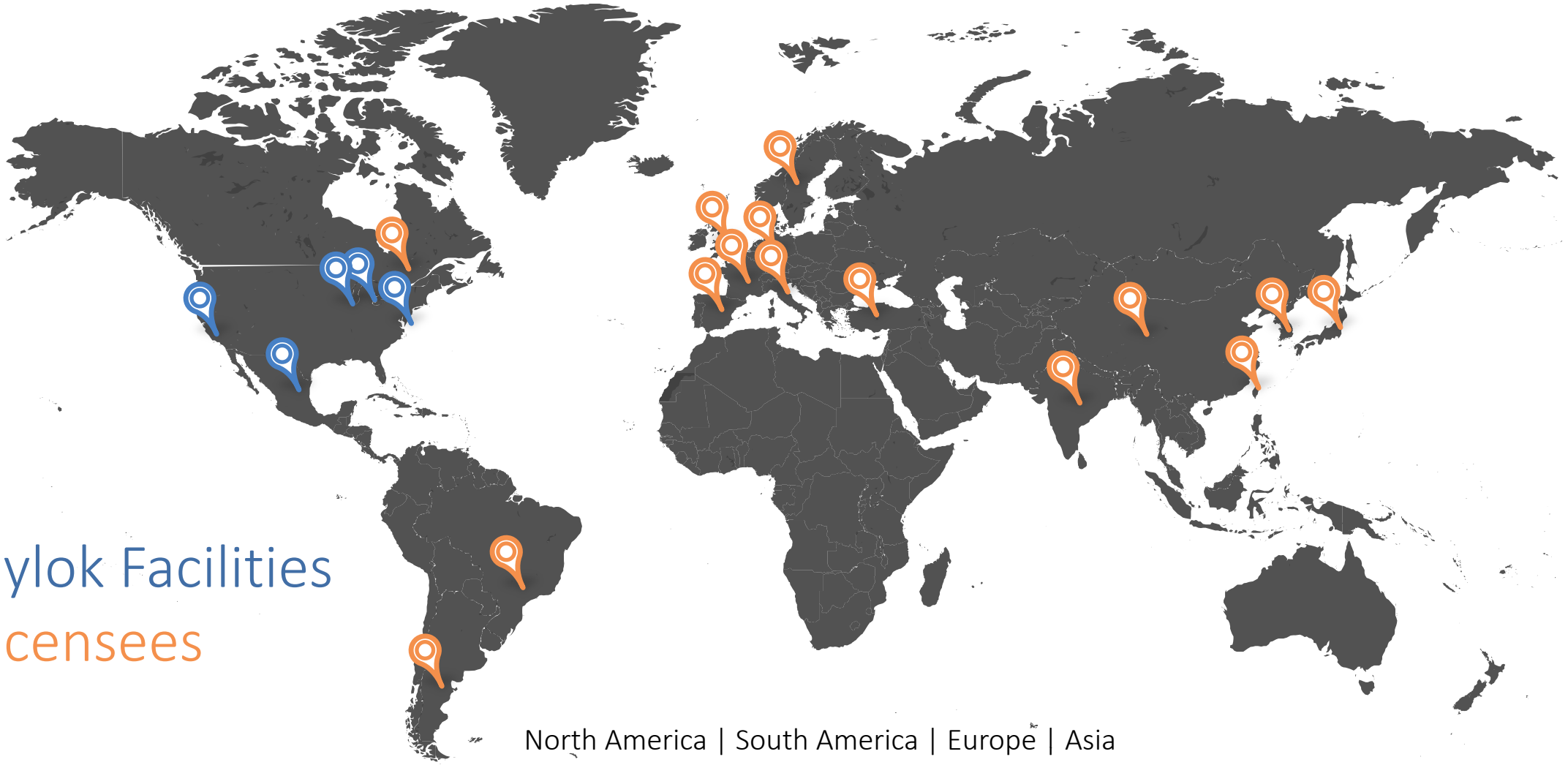
A Marmon/Berkshire Hathaway Company

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



Nylok Facilities

Licensees

North America | South America | Europe | Asia

Who We Are & The Role We Play

- *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

Product Overview

LOCKING

Mechanical
Reusable

precote®

ND INDUSTRIES

SEALING

NySeal® 2.0
The King of Under Head Sealants

NEW
Reusable

ASSEMBLY AIDS

PROTECTION

NYSHIELD®

NEW

A Marmon/Berkshire Hathaway Company

NYLOK

INNOVATIVE FASTENING SOLUTIONS SINCE 1942

Next Level Durability Under Head Sealant

NySeal® 2.0

The King of Under Head Sealants

A Marmon/Berkshire Hathaway Company

NySeal® 2.0

- NySeal®2.0 takes a fresh look at under head sealing:
  - Does not squeeze out of the joint upon compression
  - Enhanced physical properties – eliminates tearing
  - Has strong adhesion to the fastener substrate adding to its robustness
  - Allows for tightening to a torque instead of a % compression
  - Can be used in direct contact with other plastics (no plasticizers which cause crazing/cracking)

NySeal®2.0 is durable and provides for multiuse installations

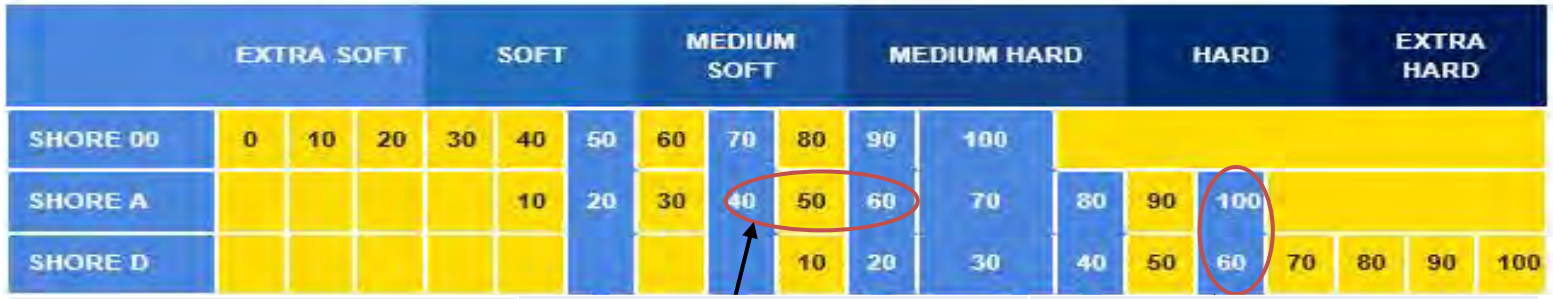
NySeal® 2.0 is a Durable Under Head Sealant

- Each of these M6 fasteners were tightened once to 9.5 Nm

Standard Silicone Sealant

Notice:
No Tearing
or Debris!

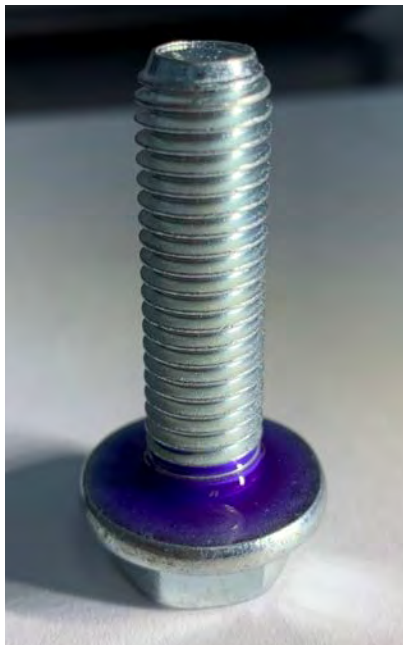
Why NySeal® 2.0 is More Durable than Standard Sealants?



	Competitive Under Head Sealants	NySeal®2.0
Hardness	45-65 Shore A	62 Shore D*
Tensile Strength	145 PSI (1 MPa)	2300 PSI (15.9 MPa)
Elongation	400%	40%
Modulus	145 PSI (1 MPa)	31,000 PSI (214 MPa)

* 62 Shore D is 100+ on Shore A Hardness Scale

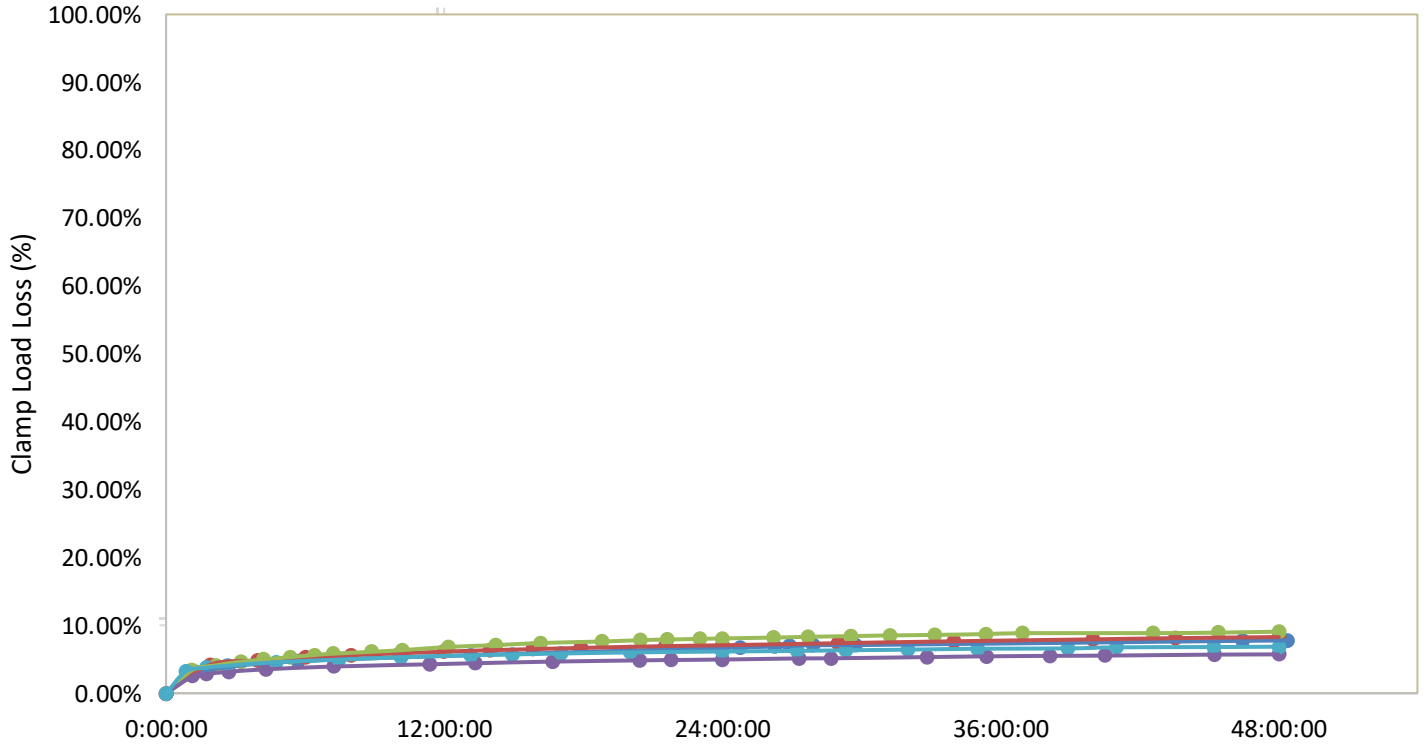
Enhanced Physical Strength of Polymer Formulation + Exceptional Adhesion to Fastener = Durable, Multi-Use Under Head Sealant



M10 Fastener

Low Clamp Load Loss

- Average Clamp Load Loss over 48 Hours for M6 Fastener: 7.5% (same fastener w/o any sealant had 5.1% clamp load loss over same time frame)

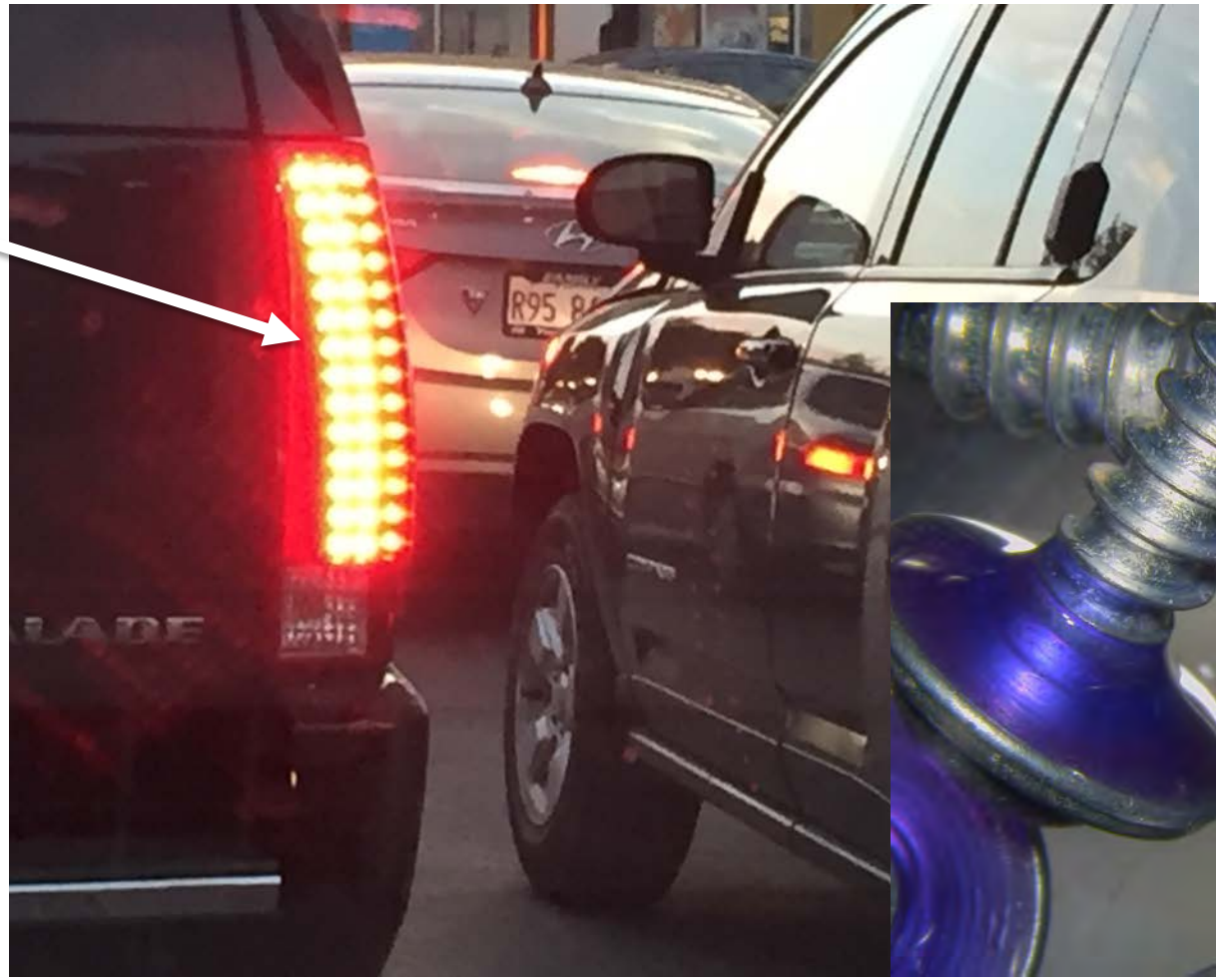


Taillights Need a Better Sealant

LED taillights need a better performing sealant

- One that doesn't squeeze out of the joint
- Will not distort or move upon installation
- No outgassing
- Reusable

LED's are more sensitive to moisture than halogen lighting.



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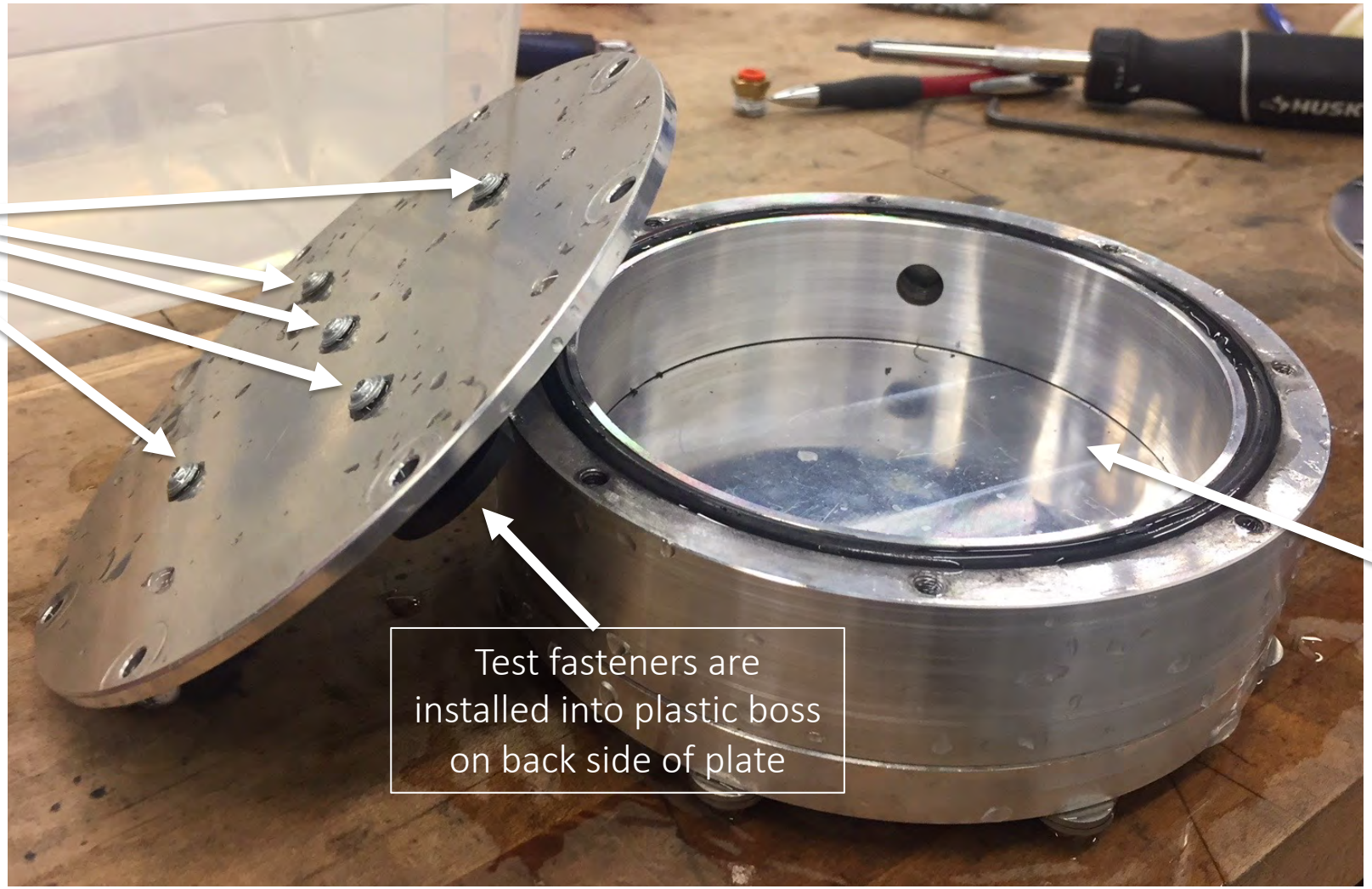
The King of Under Head Sealants

M3 Fasteners

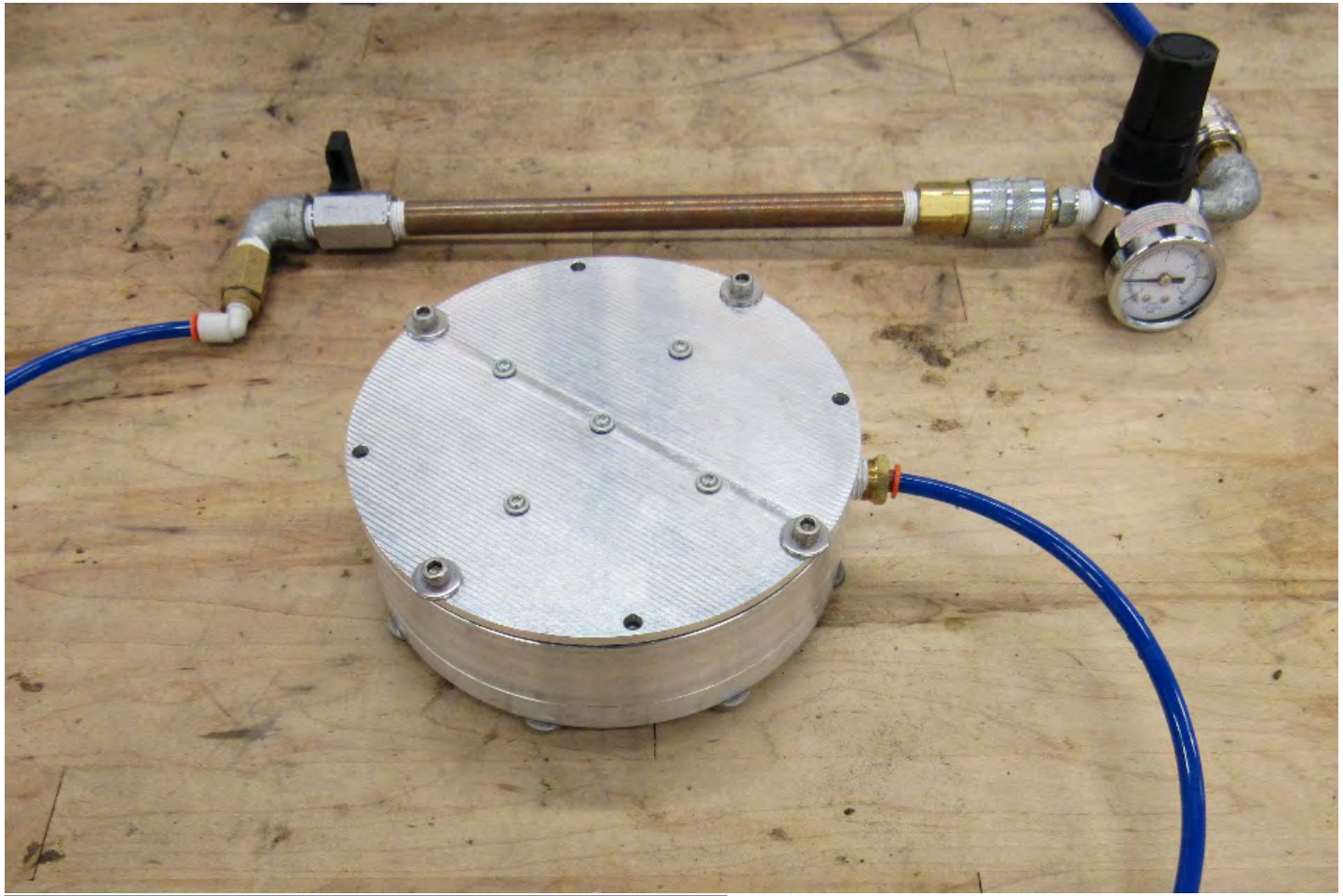
Other Sealant Solutions

These real-world sealing configurations demonstrate multiple issues and point to the need for a better solution.

Sealing Tests – Apparatus for M3's



Sealing Tests – Apparatus for M3's



Tested at 68.9 kPa (10 PSI) typical

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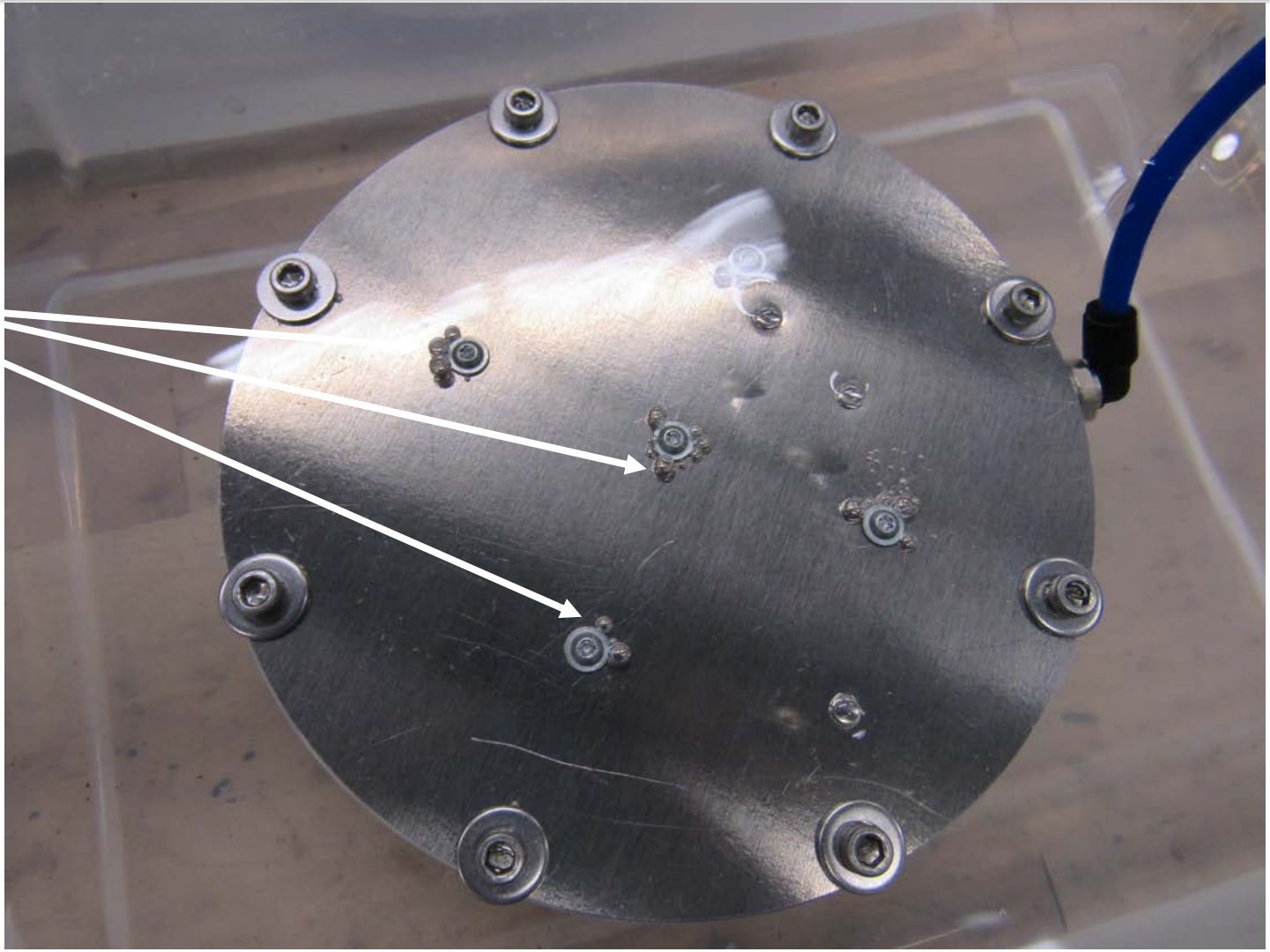
M3 Fasteners

Sealing Tests for M3 Taillight Fasteners

Bubbles near the screw heads demonstrate failure on control samples (no sealant)



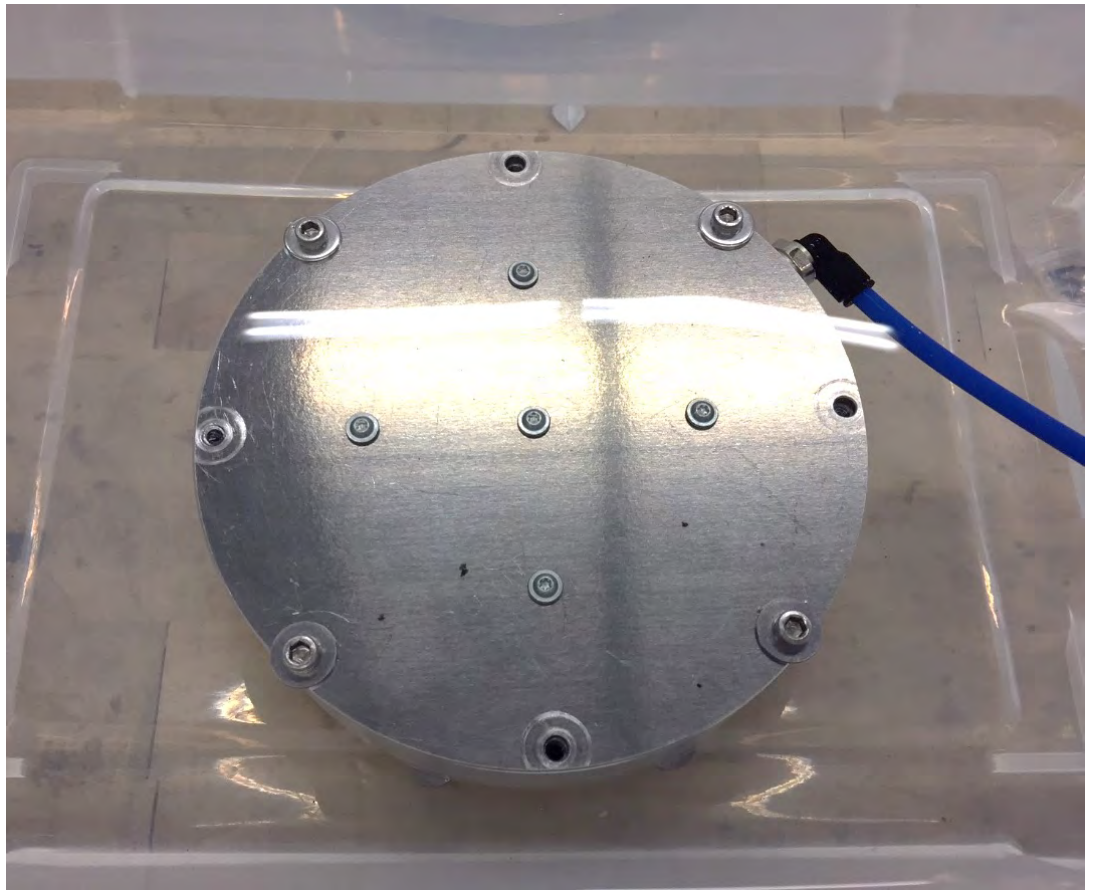
Sealing Tests for M3 Taillight Fasteners

TESTING PERFORMED IN NYLOK LAB

- **FCA PF.90078 5.2.1** Sealing Requirement – Submergence (5.2 kPa (0.75 PSI) at RT for 60 sec) ✔ PASS
- **GMW14906 4.5.4.3** Pressurization Seal Test (Under 2.5cm water, pressurize to 7 kPa (1 PSI) for 5 min) ✔ PASS
- **FCA PF.90078 5.22** Sealant pressure test to failure (passes at pressures up to 68.9 kPa (10 PSI) following GMW14906 4.5.4.3 protocol) ✔ PASS
- **GMW14906 4.5.4.1** Vacuum Seal Test (-21.0 kPa (-3 PSI), under water for 15 sec) ✔ PASS
- **GMW 14906 4.9.2.12** Storage (must pass above pressure and vacuum tests after exposure below): ✔ PASS

Cycle	Temperature	Duration
1	80°C ± 3°C	48 h
	Ambient 23°C ± 3°C	≥ 15 min
2	–40°C ± 3°C	24 h
	Ambient 23°C ± 3°C	≥ 15 min

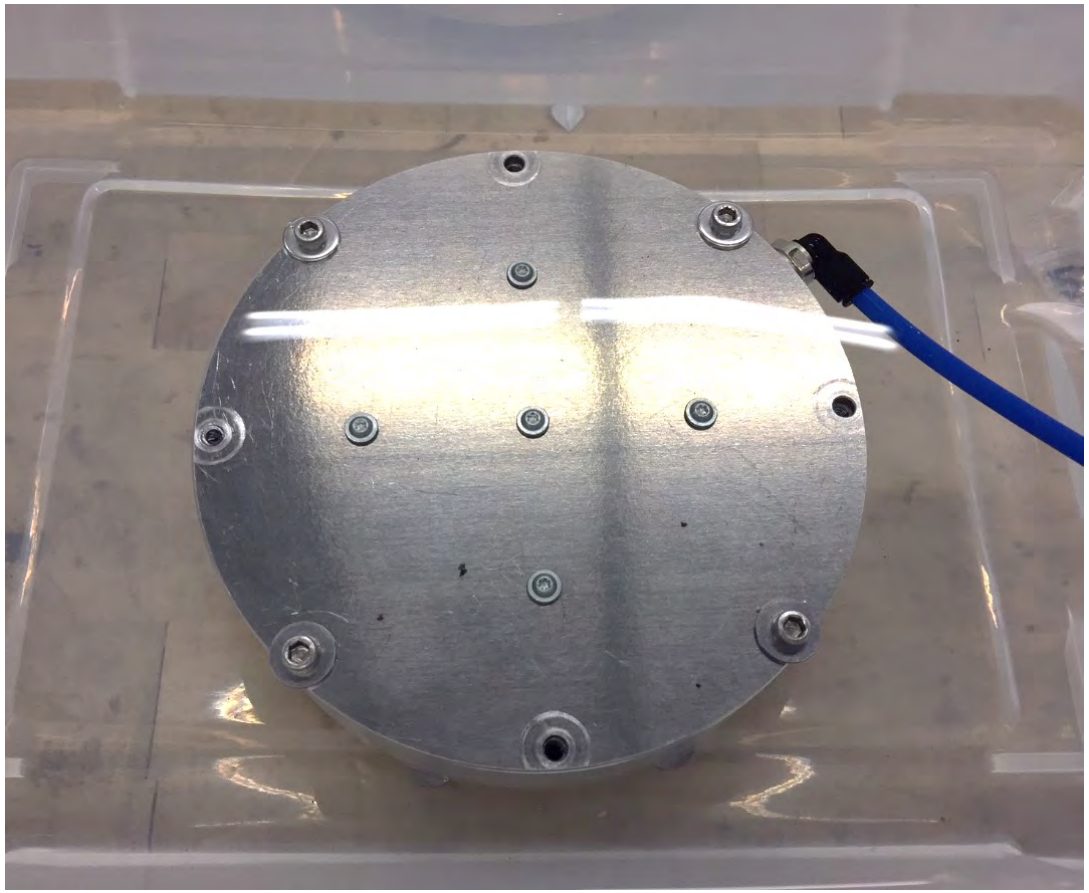
- **GMW 14906 4.8.2.1.9.2** Rapid Thermal Transition (must pass above pressure and vacuum tests after exposure to rapid transition between -60°C and 85°C) ✔ PASS



Submerged Pressurization Test – Demonstrates a “Passing” Test

Sealing Tests for M3 Taillight Fasteners-After 5 Installs

- Passes submerged pressure testing after being subjected to 5 installations and removals.
  - 7 kPa (1PSI) pressure for 5 minutes ✓PASS

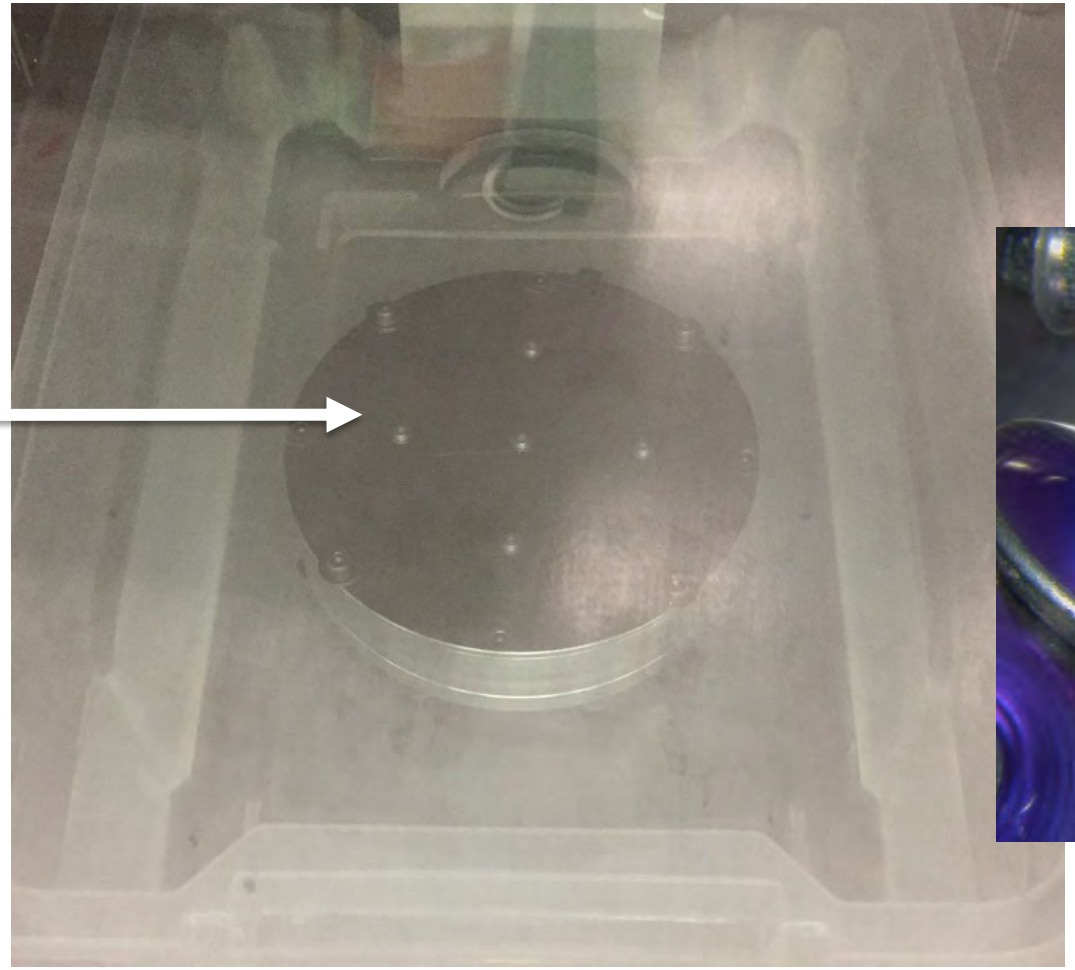


Submerged Pressurization Test – Demonstrates a "Passing" Test

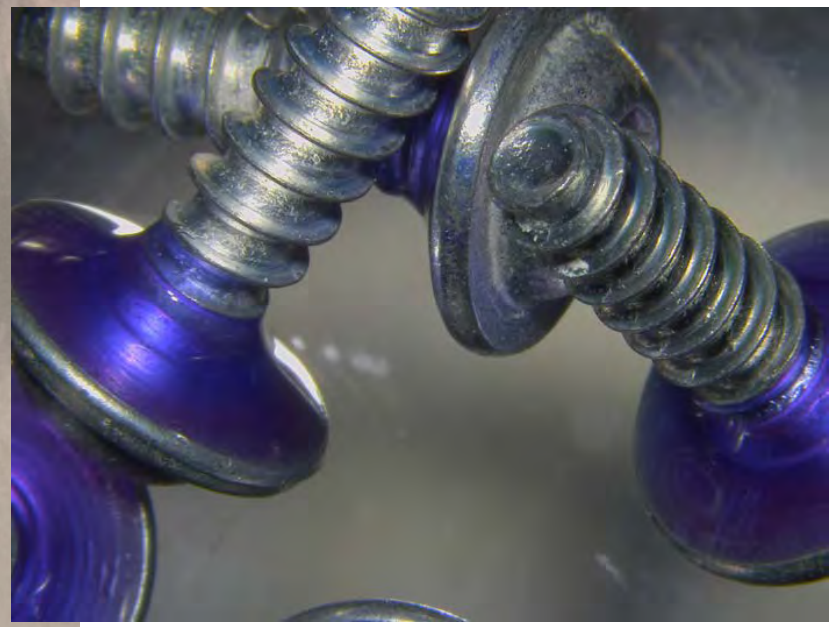
Sealing Tests – Vacuum

Submerged Vacuum Test

- Vacuum test at -21 kPa (-3.0 PSI) vacuum for 15 seconds ✓PASS



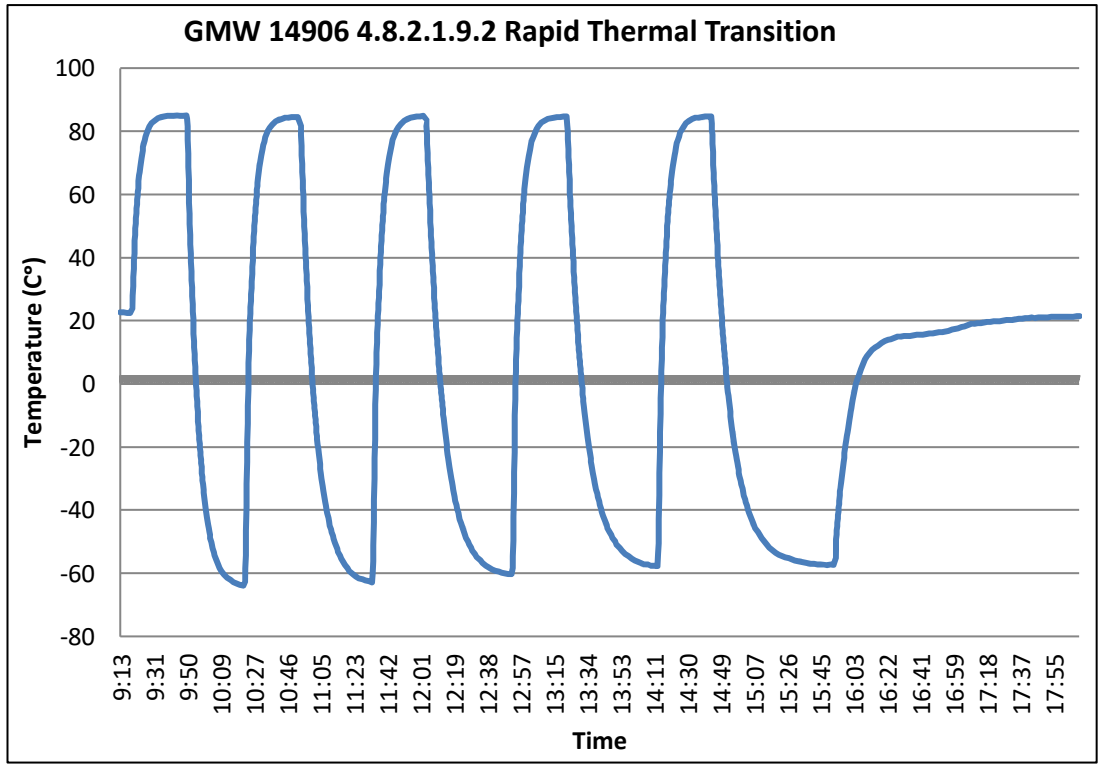
Vacuum Chamber Test



M3 Fasteners

Sealing Tests – Rapid Thermal Transition

- Samples must pass both pressurization and vacuum tests before and after rapid thermal cycling
  - NySeal®2.0 ✓PASS

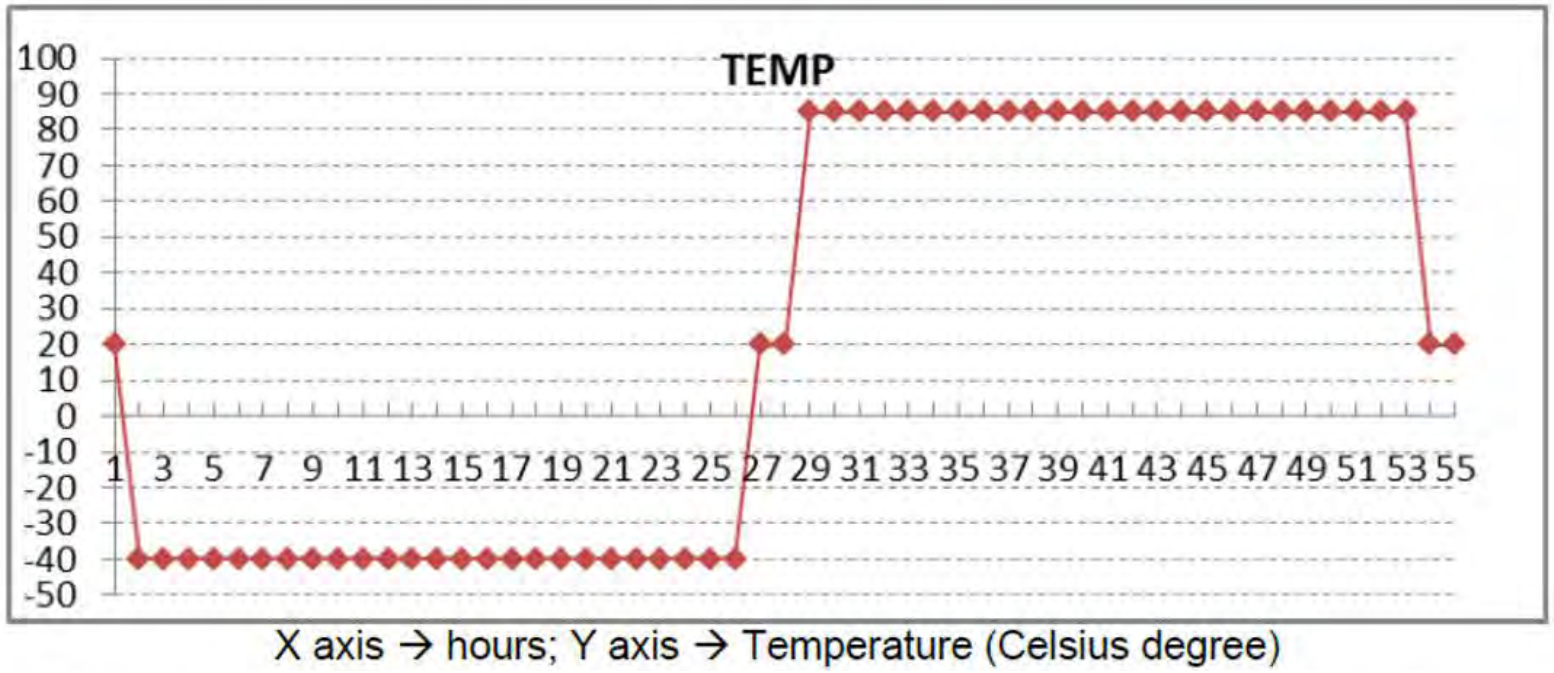


Temperature Cycling Profile

Fastener/test plate assembly at -60C

Shipping / Storage Temperature Cycling Test

- M3 samples must pass submergence test before and after thermal cycling
  - NySeal®2.0 ✓PASS



X axis → hours; Y axis → Temperature (Celsius degree)

M3 Fasteners

Larger Fasteners Also Benefit From NySeal®2.0

Electroplated Zinc Nickel Finish

Sample Before Testing

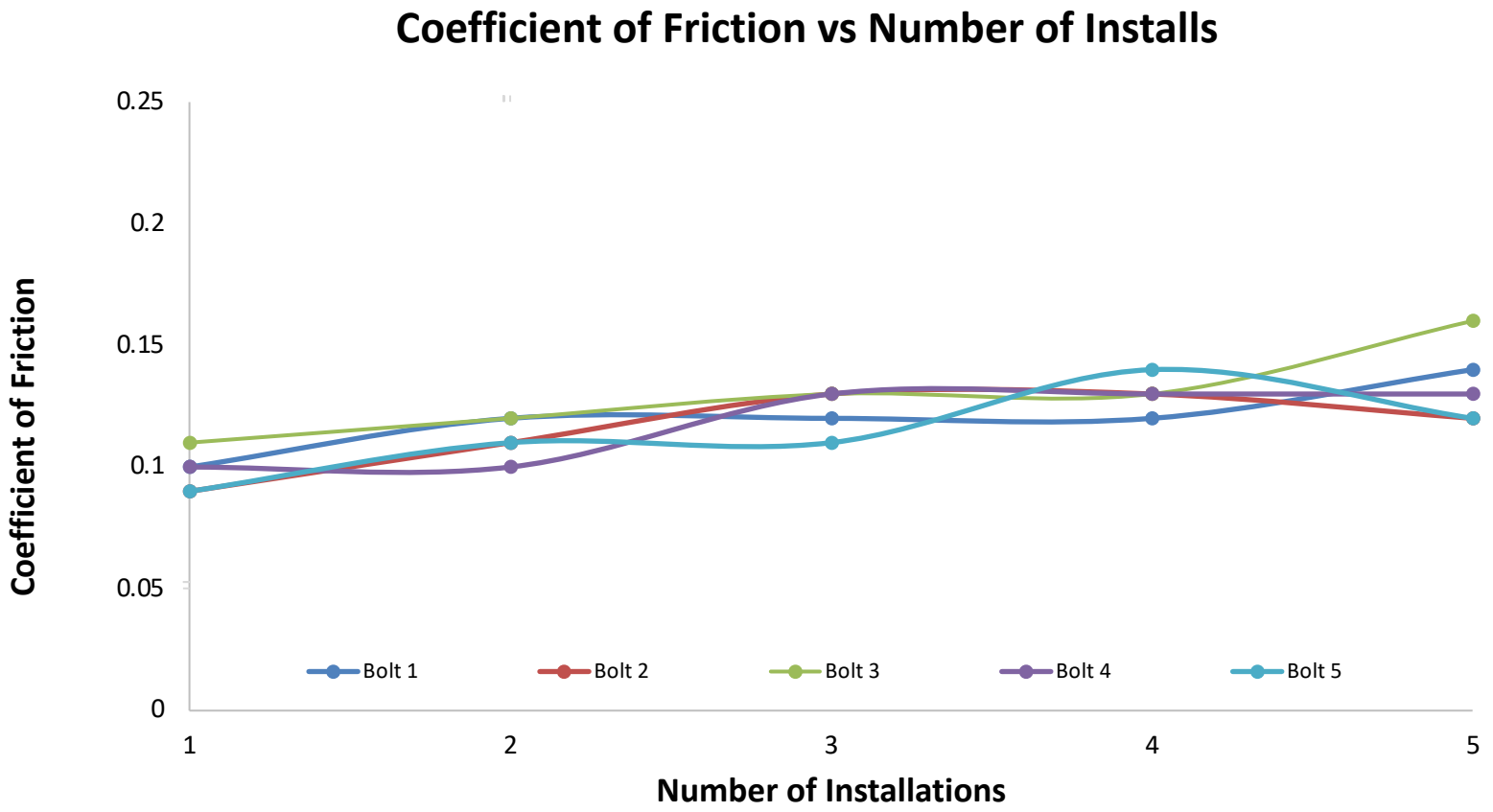
Electroplated Zinc Nickel Finish

Sample After 5 Installs

Effects of multiple installations on M10 bolt tightened 5 times at 58 Nm tightening torque.

Properties - COF

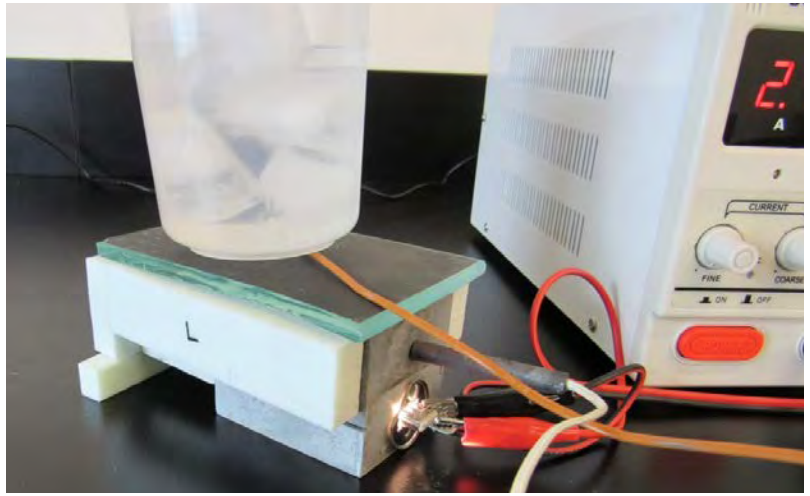
- Coefficient of friction values are controlled within normal COF specifications, even after multiple installations. COF values can be adjusted per customer needs.



- Size: M10 x 1.5mm x 45mm
- Finish: Electroplated Zn Ni
- Tightened to 55 +/9 NM against Zn Ni finish on washer

No Outgassing Per Valeo Specification*

Test Outline:
- Sealant is placed in test box
- Lighted lamp underneath box heats sample
- Any condensation is found on a cooled glass mirror that serves as a cover to the box



Test apparatus

Results:
- No condensation/outgas up to 115C

✓PASS

*Valeo ME TH 03 Specification

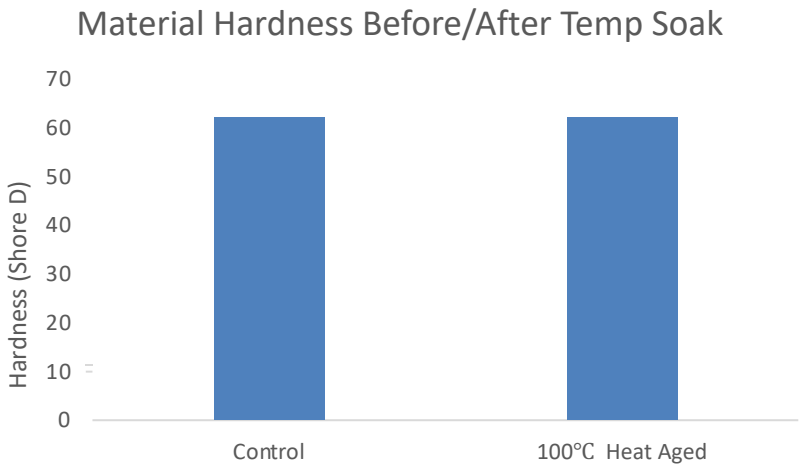
Chemical Resistance

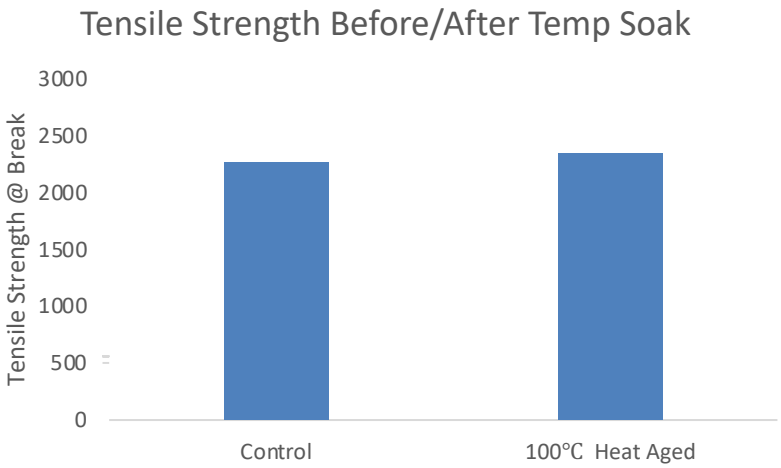
- NySeal®2.0 is unaffected and still seals in standard sealing tests after 24 hrs of room temperature exposure to the following fluids: ✓PASS
  - 50% methanol in water
  - AutoZone 50/50 antifreeze and coolant
  - AutoZone power steering fluid
  - Black Magic No Scrub All Wheel Cleaner
  - Castrol DEXRON VI Transmax Automatic Transmission Fluid
  - Commercial Car Shampoo - Meguiar's® Car Shampoo
  - Commercial Glass Treatment Agent - Rain-X 2-in-1 Glass Cleaner
  - Commercial Paintwork Cleaning Product - P21S Paintwork Cleanser
  - Commercial Tar and Road Oil Cleaner - Turtle Wax Bug and Tar Remover
  - Commercial Vehicle Cleaning Agent - Simple Green Cleaner
  - Commercial Washer Fluid - AutoZone Windshield Washer Fluid
  - Commercial Window Cleaning Agent: Windex®
  - Deionized Water from Nalco Filters
  - Water/Soap Solution (Approx. 2% soap)
  - Diesel Fuel
  - Gila Window Application
  - Ice Spray Wax
  - Mercon® ULV Auto Transmission Fluid
  - STP High Mileage Motor Oil SAE 5W-30
  - Transit Coating/Protective Wax - Turtle Wax Super Hard Shell

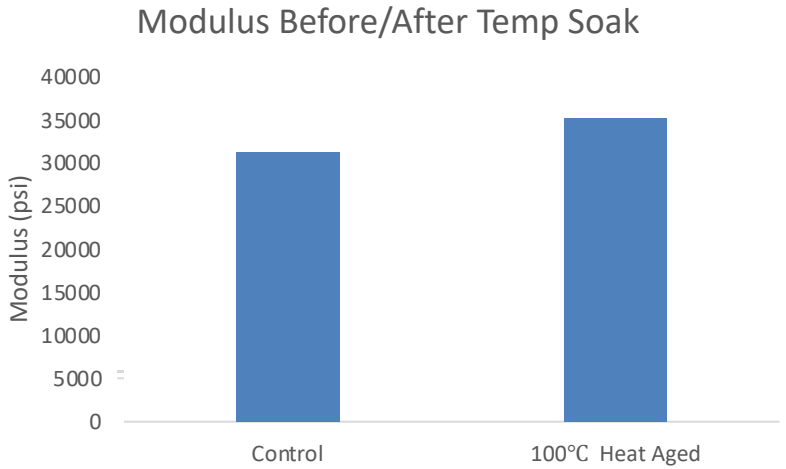
SAE J200 – NySeal®2.0 Temperature Performance

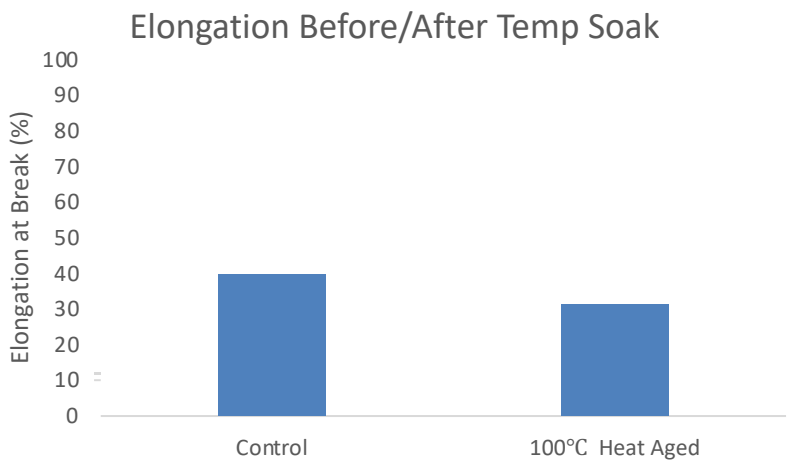
Results:

- Test samples made from NySeal®2.0 show no significant changes in physical properties, even after heat aging @100℃ for 70 hrs.





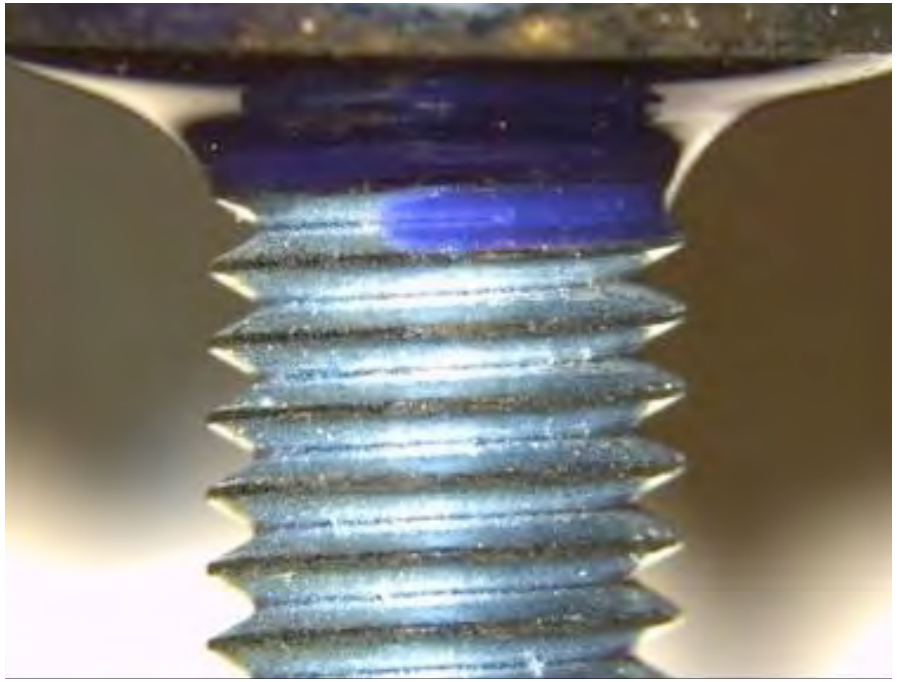




SAE J200 – NySeal®2.0 Resistance to Oil Swell

Results:

- Test samples made from NySeal®2.0 have low percentage swell (10 – 11%) when soaked in specified oil

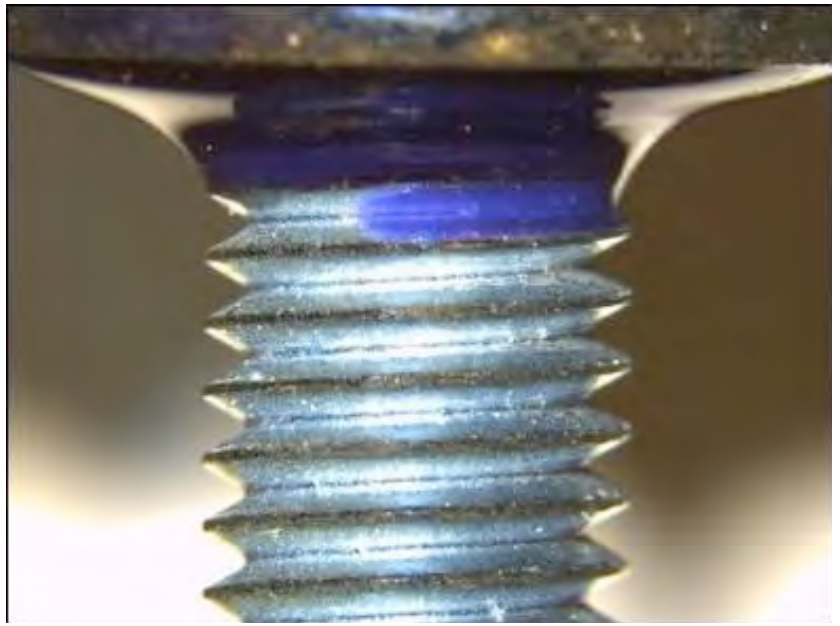


Before Oil Soak		After Oil Soak			
Dry Mass (g)	Wet Mass (g)	Dry Mass (g)	Wet Mass (g)	%Change in Mass	% Change in Volume
2.495	0.300	2.691	0.253	7.86%	11.07%
2.515	0.297	2.705	0.257	7.55%	10.37%
2.501	0.299	2.689	0.256	7.52%	10.49%
2.463	0.297	2.649	0.257	7.55%	10.43%
2.54	0.308	2.724	0.268	7.24%	10.04%

IRM 903 oil soak @ 100°C FOR 70HRS

SAE J200 – NySeal®2.0 Call Out

- SAEJ200M6BG910A14Z1Z2Z3Z4Z5Z6
  - Z1: NYLOK® NYSEAL®2.0
  - Z2: MATERIAL: POLYACRYLATE (PURPLE)
  - Z3: HARDNESS: MEDIAN HARNESS 62 SHORE D (APPROX. 95 SHORE A) PER ASTM D2240
  - Z4: VOLUME SWELL IN IRM 903 OIL AT 100℃ FOR 70HRS: <15% PER ASTM D471
  - Z5: ELONGATION: 30-50% PER ASTM D412
  - Z6: MINIMUM TENSILE STRENGTH: 14MPA PER ASTM D412



Sealing Tests – Engine Plug

Test Results*

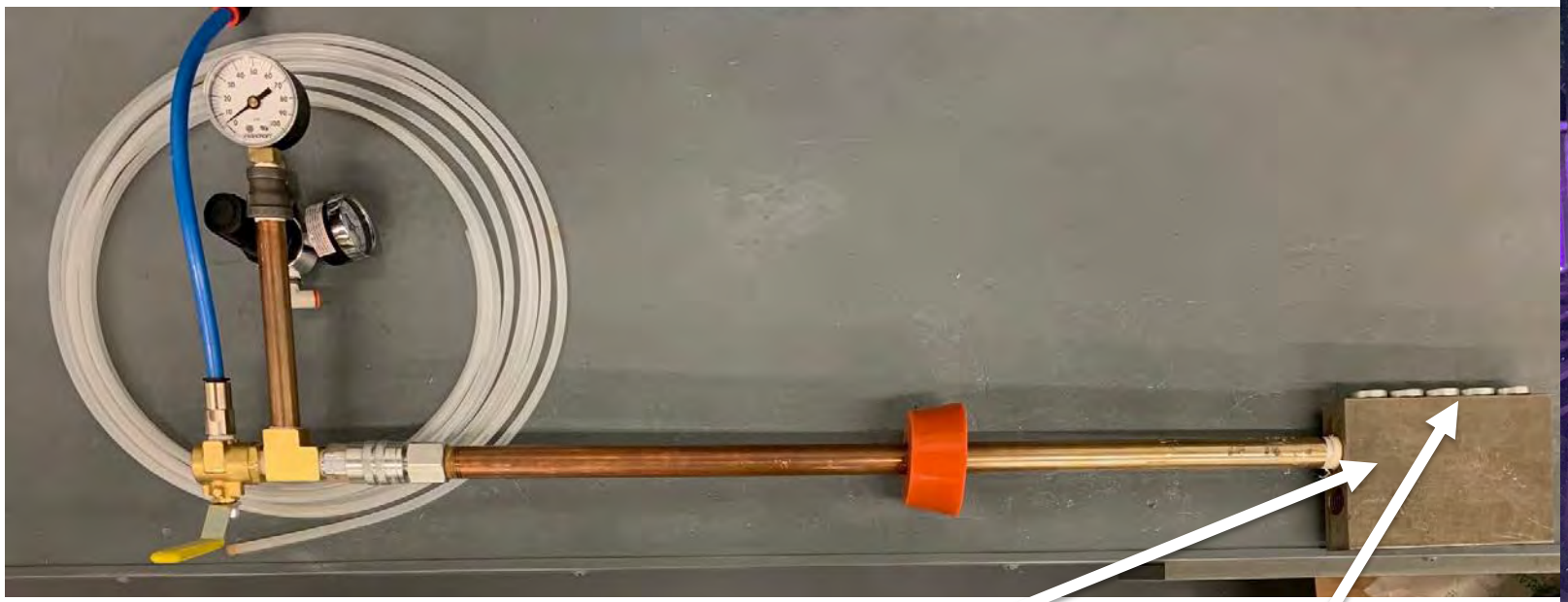
- Coolant/Antifreeze Resistance (120C for 5 hours @ 2 bar) ✓PASS
- Engine Oil Resistance (SAE 10W30 @ 160C for 5 hours @ 4 bar) ✓PASS
- Automatic Transmission Fluid Resistance (Ford ATF service fluid @ 120C for 5 hours @ 4 bar) ✓PASS
- Fuel Resistance (commercially available gasoline @ 70°C for 5 hours @ 4 bar or 58 psi) ✓PASS

M18 Fastener Used for All Testing
Zn Trivalent Finish

* Tested per Ford WSS-M21P27

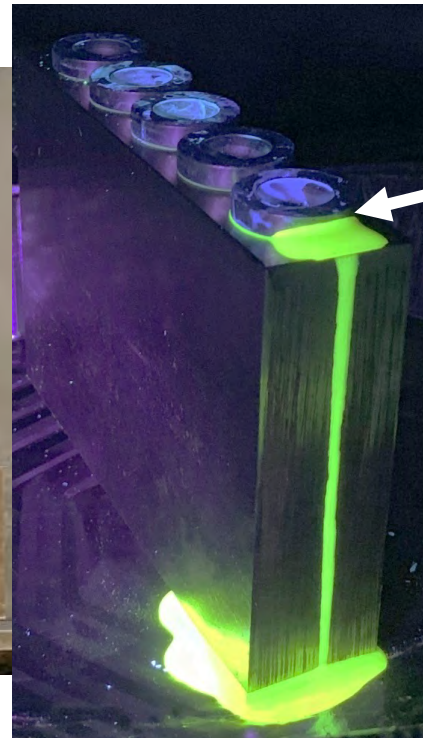
Sealing Test – Engine Plug

- Assembly is filled with an automotive fluid and then pressurized while being exposed to an elevated temperature for a 5 hour duration



Test block

Fasteners under test



- Bolt without sealant
- Shows a failed test
- Green tracer added to test fluid
- Tracer is visible under black light illumination

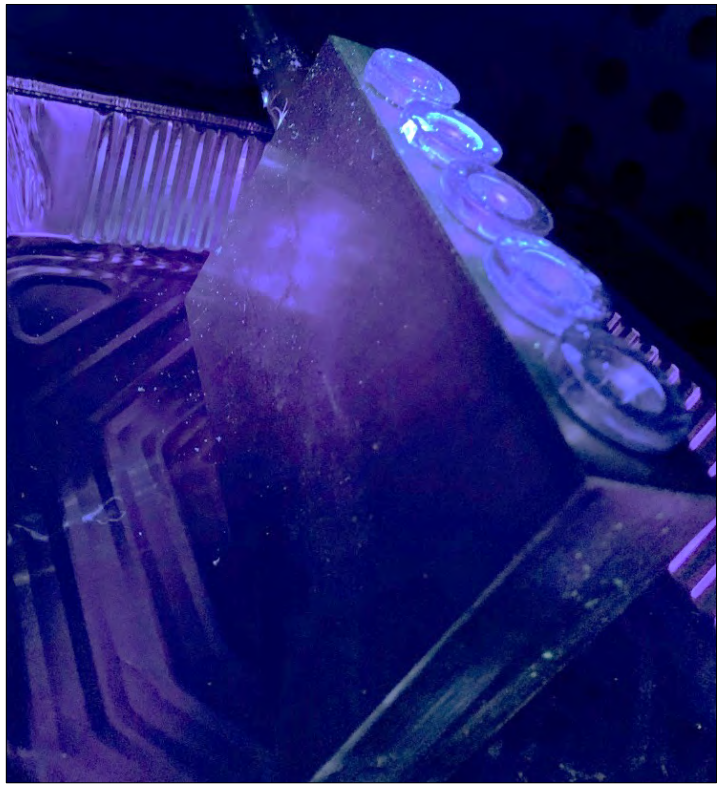
Sealing Test – Engine Plug

Mercon® ULV Auto Trans Fluid

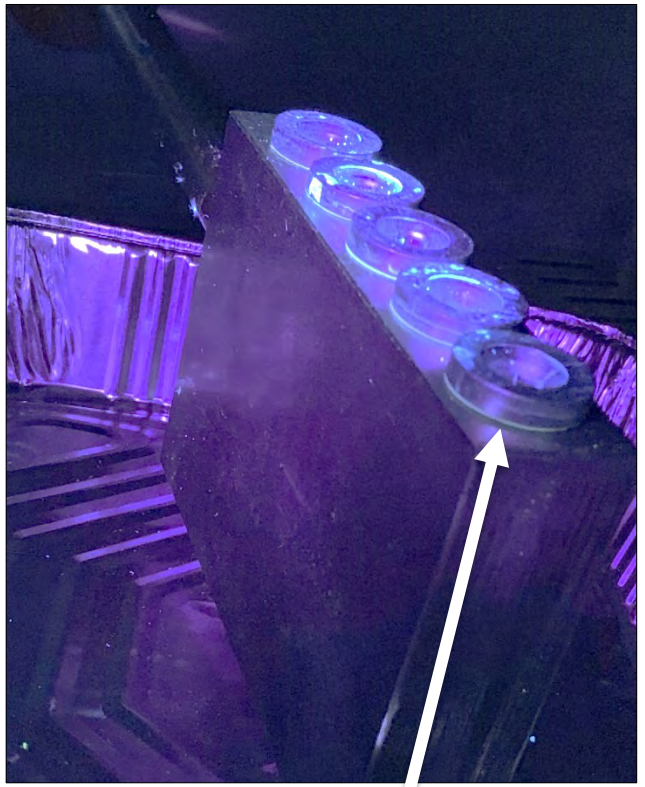
Results: ✓PASS

- Temperature: 120°C
- Time: 5 Hours
- Pressure: 4 Bar (58 psi)
- M18 Fastener

Start of Test



End of Test



PASS: No evidence of leakage under black light with Tracer

Sealing Test – Engine Plug

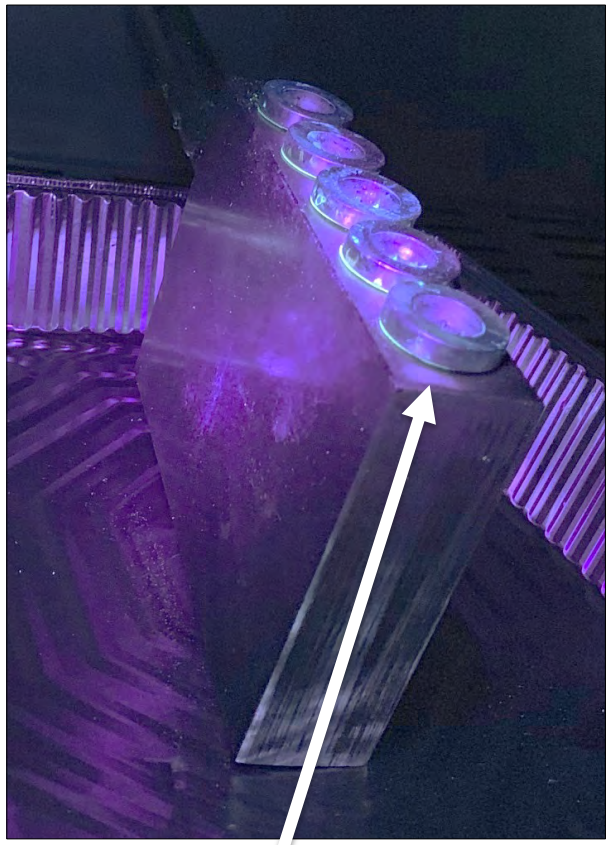
SAE 10W-30 Synthetic Blend Motor Oil

Results: ✓PASS

- Temperature: 160°C
- Time: 5 Hours
- Pressure: 4 Bar (58 psi)
- M18 Fastener

Start of Test

End of Test



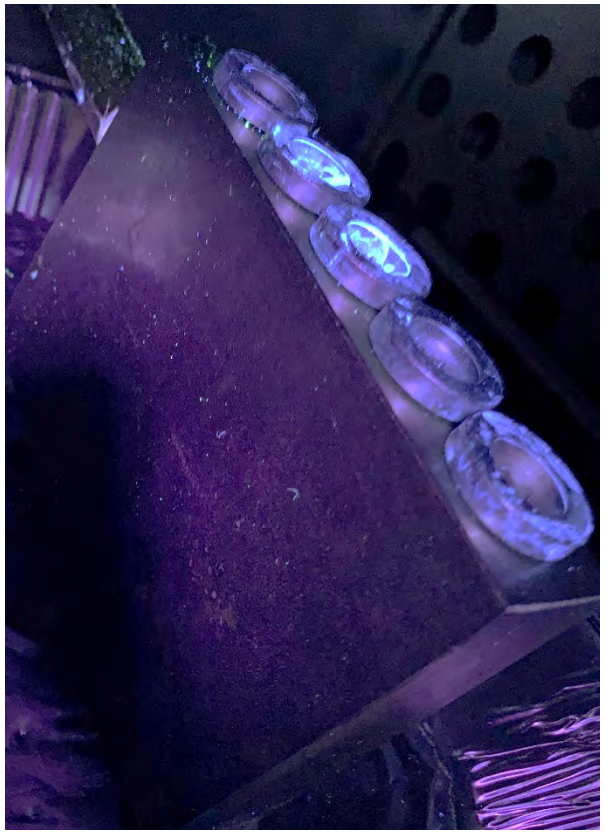
PASS: No evidence of leakage under black light with tracer

Sealing Test – Engine Plug

Pre-diluted Antifreeze & Coolant
Results: ✓PASS

- Temperature: 120°C
- Time: 5 Hours
- Pressure: 2 Bar (29 psi)
- M18 fastener

Start of Test



End of Test

PASS: No evidence of leakage
Under Black Light with Tracer

Sealing Test – Engine Plug

E10 Fuel Ethanol

Results: ✓PASS

- Temperature: 70°C
- Time: 5 Hours
- Pressure: 4 Bar (58 psi)
- M18 fastener

Start of Test

End of Test

PASS: No evidence of leakage Under Black Light with Tracer

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Questions

sales@nylok.com