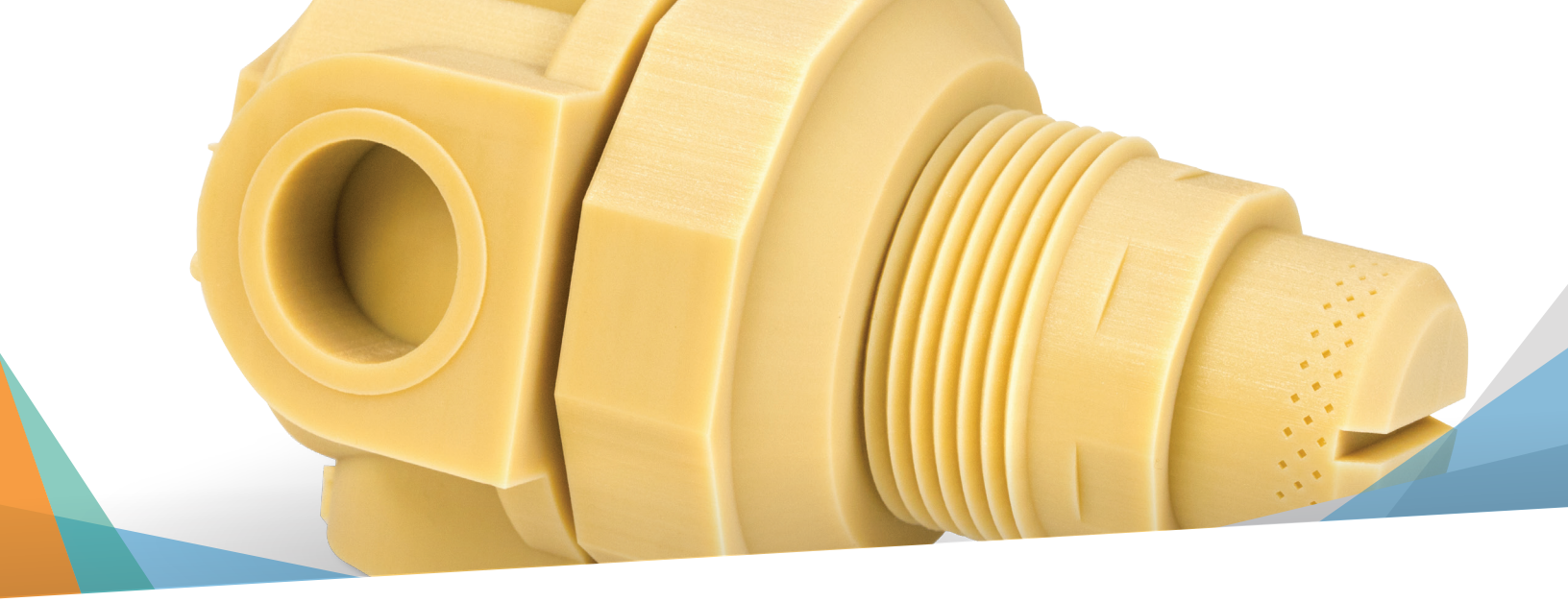


# VisiJet® M2R-TN

## Production Rigid

ProJet MJP 2500

Rigid general-purpose plastic with opaque, high visual contrast, tan-colored finish delivering a balance of strength and elongation with a moderate to high HDT

Similar to the VisiJet M2R-BK (black), the VisiJet M2R-TN has a higher tensile strength and modulus properties over standard VisiJet M2 materials. It is a stronger and stiffer plastic that is good for a broad range of concept models and functional prototypes. It has high feature fidelity, sharp corners and edges, and smooth surface finish. It is a general-purpose material with high accuracy and high visual contrast color suitable for general prototyping, dental mockups, and dental castings.

*Note: Not all products and materials are available in all countries — please consult your local sales representative for availability.*

### APPLICATIONS

- Simultaneous printing of dental mockups and flask casting patterns
- Ideal material for standard and Digital Silicone Tooling using the EggShell method
- Opaque functional prototypes and some end-use parts
- Rapid prototyping of plastic injection molded thermoplastic parts
- Able to be drilled, tapped, and machined
- Functional printed assemblies and injection molded screw bosses
- Functional printed screw-threads and thin walls
- Painted business/marketing collateral, prototypes, and mockups

### BENEFITS

- High fidelity fine features, sharp edges, and high accuracy
- Exceptional smooth and consistent surface finish
- High contrast tan color for easy visualization of surface detail
- No surface cure inhibition of paints or silicones. No sanding required.
- Excellent for painting. Ideal for eggshell molding applications.

### FEATURES

- Moderate/high strength and stiffness, 6-12% elongation
- Able to make extremely small and complex structures
- High accuracy and watertight
- Biocompatible USP Class VI

## MATERIAL PROPERTIES

The full suite of mechanical properties is given per ASTM and ISO standards where applicable. Properties like flammability, dielectric properties, and 24-hour water absorption are also provided for better understanding of material capabilities to help design decisions using the material. All parts are conditioned per ASTM recommended standards for a minimum of 40 hrs at 23°C, 50% RH.

Solid material properties reported were printed along the vertical axis (ZX-orientation). As detailed in the Isotropic Properties section, MultiJet Printing (MJP) material properties are relatively uniform across print orientations. Parts do not need to be oriented in a particular direction to exhibit these properties.

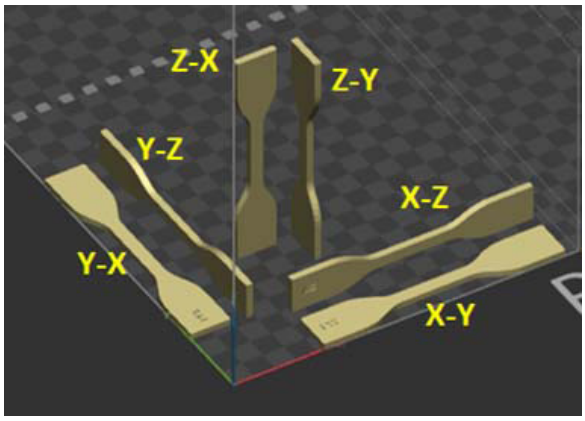
| LIQUID MATERIAL | | | |
|---|---|---|---|
| **MEASUREMENT** | **CONDITION/METHOD** | **METRIC** | **ENGLISH** |
| Color | | Tan | |

| SOLID MATERIAL | | | | | | |
|---|---|---|---|---|---|---|
| **METRIC** | **ASTM METHOD** | **METRIC** | **ENGLISH** | **ISO METHOD** | **METRIC** | **ENGLISH** |
| | **PHYSICAL** | | | | **PHYSICAL** | |
| Solid Density | ASTM D792 | 1.16 g/cm³ | 0.04 lb/in³ | ISO 1183 | 1.16 g/cm³ | 0.04 lb/in³ |
| 24 Hour Water Absorption | ASTM D570 | ≤0.5 % | ≤0.5 % | ISO 62 | ≤0.5 % | ≤0.5 % |
| | **MECHANICAL** | | | | **MECHANICAL** | |
| Tensile Strength Ultimate | ASTM D638 | 67 MPa | 9700 psi | ISO 527 -1/2 | 60 MPa | 8700 psi |
| Tensile Strength at Yield | ASTM D638 | 67 MPa | 9700 psi | ISO 527 -1/2 | N/A | N/A |
| Tensile Modulus | ASTM D638 | 3000 MPa | 440 ksi | ISO 527 -1/2 | 2700 MPa | 386 ksi |
| Elongation at Break | ASTM D638 | 4.0 % | 4.0 % | ISO 527 -1/2 | 3.1 % | 3.1 % |
| Elongation at Yield | ASTM D638 | 3.6 % | 3.6 % | ISO 527 -1/2 | N/A | N/A |
| Flex Strength | ASTM D790 | 100 MPa | 14700 psi | ISO 178 | 100 MPa | 13900 psi |
| Flex Modulus | ASTM D790 | 3100 MPa | 450 ksi | ISO 178 | 3300 MPa | 473 ksi |
| Izod Notched Impact | ASTM D256 | 14 J/m | 0.3 ft-lb/in | ISO 180-A | 1.9 J/m² | 0.9 ft-lb/in² |
| Izod Unnotched Impact | ASTM D4812 | 120 J/m | 2 ft-lb/in | ISO 180-U | | |
| Shore Hardness | ASTM D2240 | 83 D | 83 D | ISO 7619 | 83 D | 83 D |
| | **THERMAL** | | | | **THERMAL** | |
| Tg (DMA, E") | ASTM E1640 (E"at 1C/min) | 58 °C | 136 °F | ISO 6721-1/11 (E"at 1C/min) | 58 °C | 136 °F |
| HDT @ 0.455 MPa/66 PSI | ASTM D648 | 70 °C | 158 °F | ISO 75- 1/2 B | 65 °C | 149 °F |
| HDT @ 1.82 MPa/264 PSI | ASTM D648 | 58 °C | 136 °F | ISO 75-1/2 A | 53 °C | 127 °F |
| CTE below Tg | ASTM E831 | 74 ppm/°C | 41ppm/°F | ISO 11359-2 | 74 ppm/K | 41 ppm/F |
| CTE above Tg | ASTM E831 | 170 ppm/°C | 95 ppm/°F | ISO 11359-2 | 170 ppm/K | 95 ppm/F |
| UL Flammability | UL94 | HB | HB | | | |
| | **ELECTRICAL** | | | | **ELECTRICAL** | |
| Dielectric Strength (kV/mm) @ 3.0 mm thickness | ASTM D149 | 15.1 | | | | |
| Dielectric Constant @ 1 MHz | ASTM D150 | 3.14 | | | | |
| Dissipation Factor @ 1 MHz | ASTM D150 | 0.018 | | | | |
| Volume Resistivity (ohm-cm) | ASTM D257 | 7.16E+15 | | | | |

## ISOTROPIC PROPERTIES

MJP technology prints parts that are generally isotropic in mechanical properties meaning the parts printed along either the XYZ axis will give similar results.

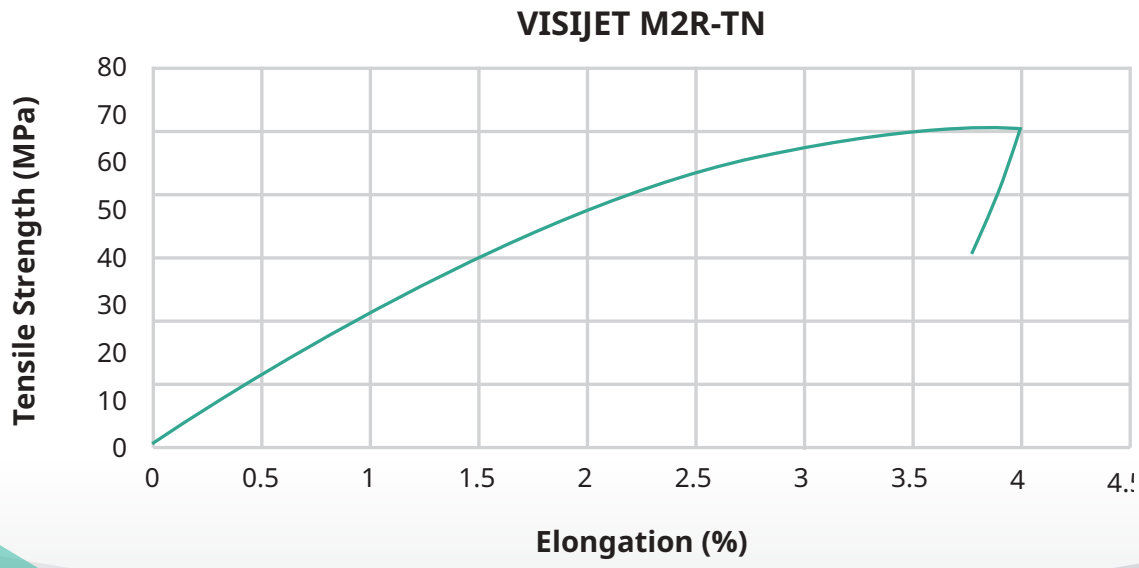
Parts do not need to be oriented to get the highest mechanical properties, further improving the degree of freedom for part orientation for mechanical properties.




| SOLID MATERIAL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| METRIC | METHOD | METRIC | | | | | | |
| | | MECHANICAL | | | | | | |
| | | XY | XZ | YX | YZ | Z45 | ZX | ZY |
| Tensile Strength Ultimate | ASTM D638 Type IV | 67 MPa | 64 MPa | 65 MPa | 61 MPa | 65 MPa | 25 MPa | 34 MPa |
| Tensile Strength at Yield | ASTM D638 Type IV | 67 MPa | 64 MPa | N/A | 63 MPa | 65 MPa | N/A | N/A |
| Tensile Modulus | ASTM D638 Type IV | 3000 MPa | 2800 MPa | 2900 MPa | 2800 MPa | 2600 MPa | 2800 MPa | 2700 MPa |
| Elongation at Break | ASTM D638 Type IV | 4 % | 5.8 % | 4.2 % | 4.5 % | 4.3 % | 1 % | 1.4 % |
| Elongation at Yield | ASTM D638 Type IV | 3.6 % | 4.1 % | N/A | 4 % | 4.1 % | N/A | N/A |
| Flex Strength | ASTM D790 | 100 MPa | 87 MPa | 99 MPa | 80 MPa | 86 MPa | 56 MPa | 44 MPa |
| Flex Modulus | ASTM D790 | 3100 MPa | 2400 MPa | 2900 MPa | 2300 MPa | 2600 MPa | 2400 MPa | 2200 MPa |
| Izod Notched Impact | ASTM D256 | 14 J/m | 14 J/m | 14 J/m | 15 J/m | 13 J/m | 14 J/m | 13 J/m |
| Shore Hardness | ASTM D2240 | 83 D | 80 D | 80 D | 81 D | 81 D | 83 D | 81 D |

## STRESS-STRAIN CURVE

The graph represents the Stress-Strain curve for VisiJet M2R-TN per ASTM D638 testing.

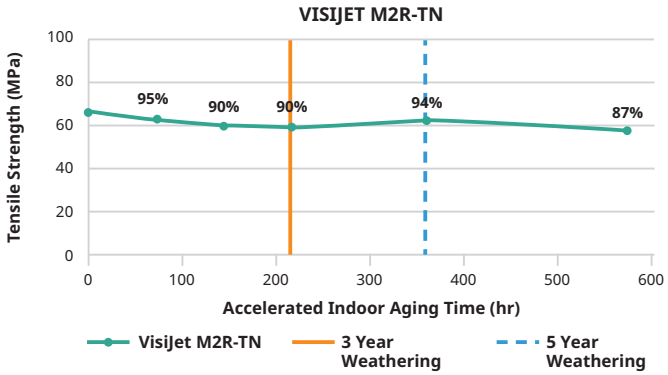


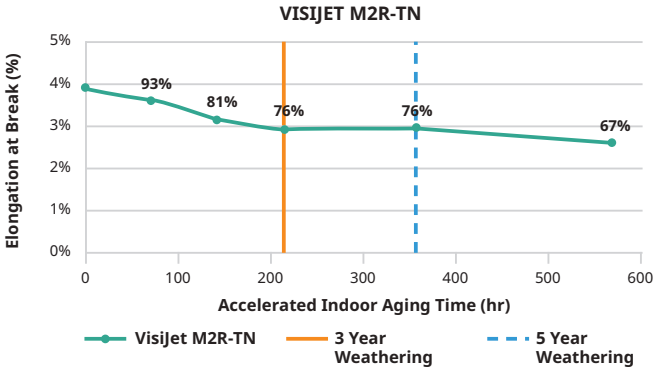
## LONG TERM ENVIRONMENTAL STABILITY

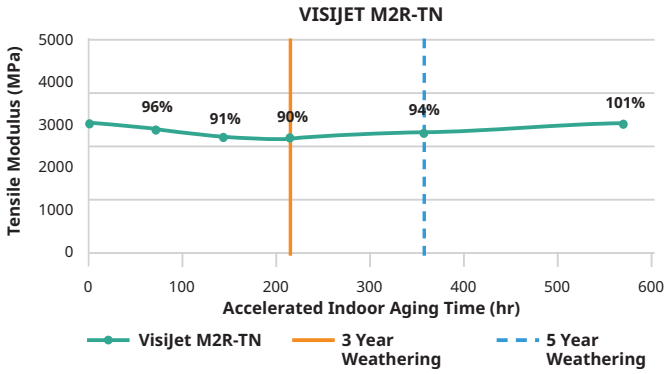
VisiJet M2R-TN is engineered to give long term environmental UV and humidity stability. This means the material is tested for the ability to retain a high percent of the initial mechanical properties over a given period of time. **Actual data value is on Y-axis, and data points are % of initial value.**

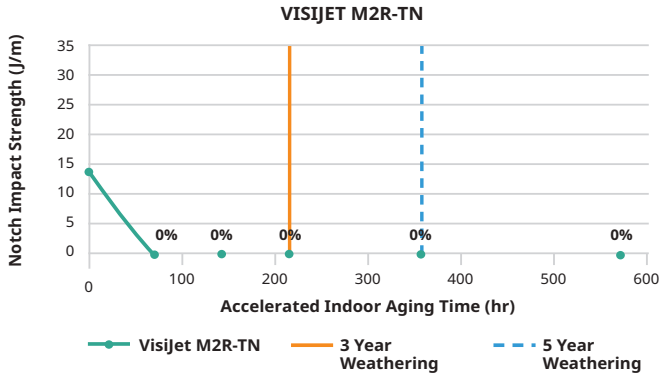
### INDOOR STABILITY

**INDOOR STABILITY:** Tested per ASTM D4329 standard method.



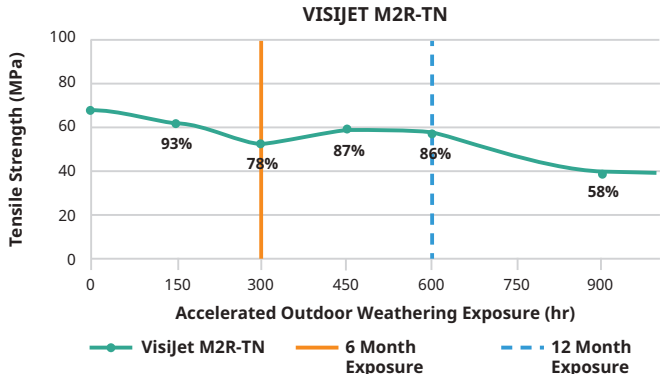



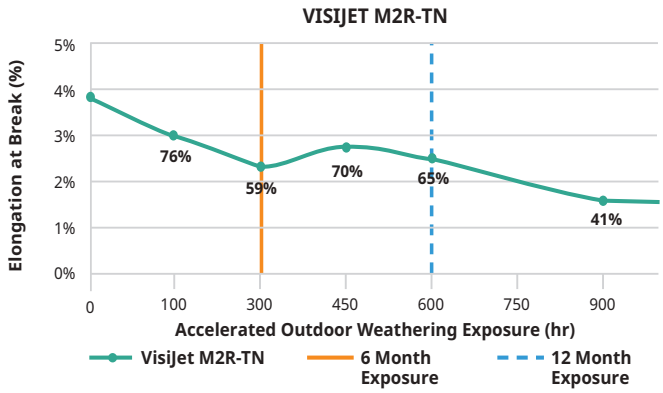



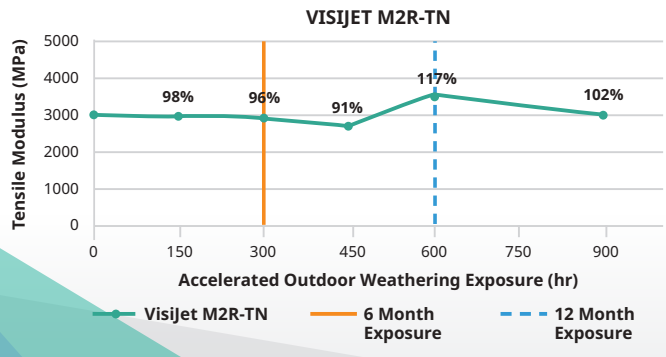



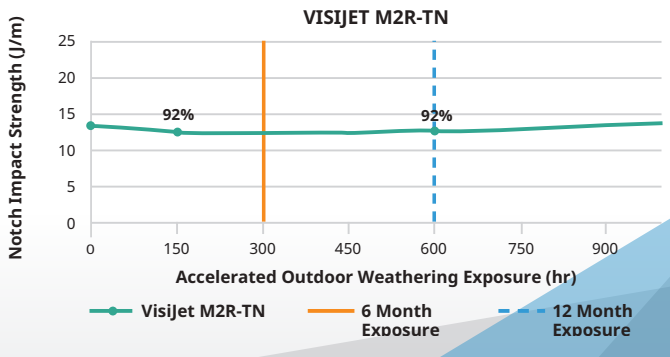

### OUTDOOR STABILITY

**OUTDOOR STABILITY:** Tested per ASTM G154 standard method.



## AUTOMOTIVE FLUID COMPATIBILITY

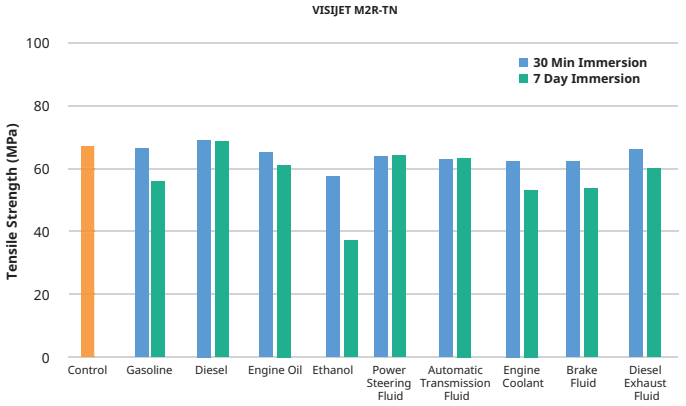
The compatibility of a material with hydrocarbons and cleaning chemicals is critical to part application. VisiJet M2R-TN parts were tested for sealed and surface contact compatibility per USCAR2 test conditions. The fluids below were tested in two different ways per the specs:

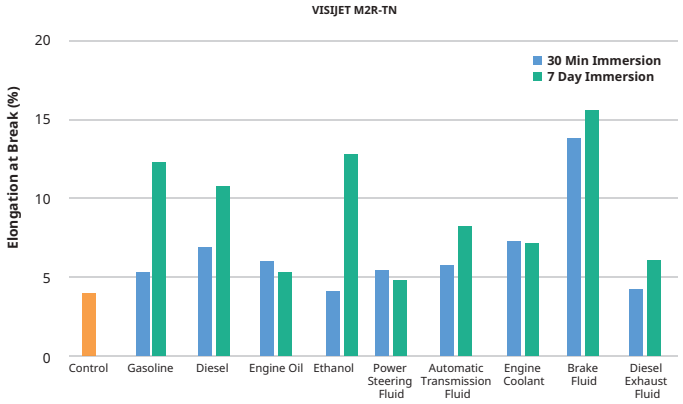
- Immersed for 7-days, followed by mechanical property comparison.
- Immersed for 30-minutes, followed by mechanical property comparison to 7-day data.

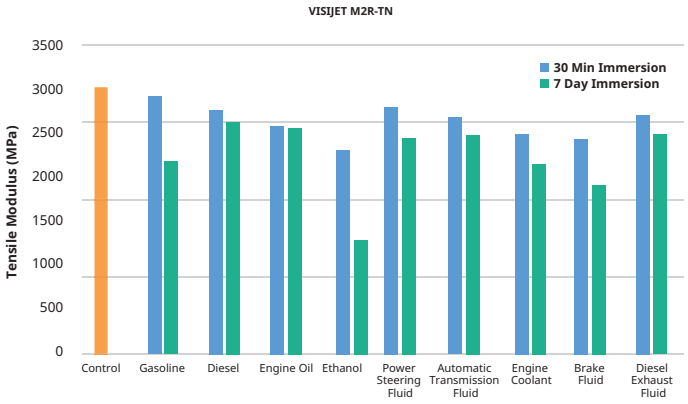
**Data reflects the measured value of properties over that period of time.**

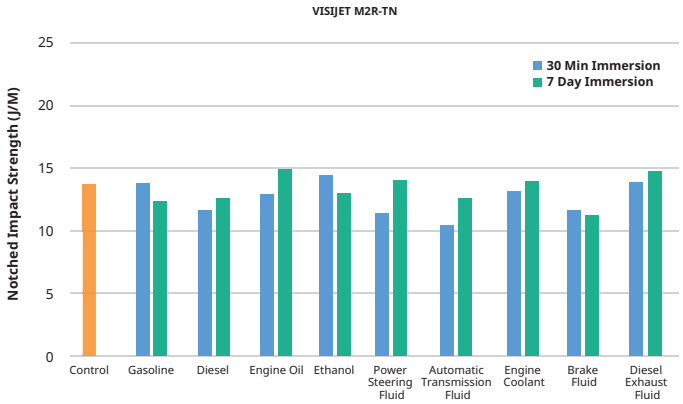
| AUTOMOTIVE FLUIDS | | |
|---|---|---|
| **FLUID** | **SPECIFICATION** | **TEST TEMP °C** |
| Gasoline | ISO 1817, liquid C | 23 ± 5 |
| Diesel Fuel | 905 ISO 1817, Oil No. 3 + 10% p-xylene* | 23 ± 5 |
| Engine Oil | ISO 1817, Oil No. 2 | 50 ± 3 |
| Ethanol | 85% Ethanol + 15% ISO 1817 liquid C* | 23 ± 5 |
| Power Steering Fluid | ISO 1917, Oil No. 3 | 50 ± 3 |
| Automative Transmission Fluid | Dexron VI (North American specific material) | 50 ± 3 |
| Engine Coolant | 50% ethylene glycol + 50% distilled water* | 50 ± 3 |
| Brake Fluid | SAE RM66xx (Use latest available fluid for xx) | 50 ± 3 |
| Diesel Exhaust Fluid (DEF) | API certified per ISO 22241 | 23 ± 5 |

*Solutions are determined as percent by volume



## CHEMICAL COMPATIBILITY

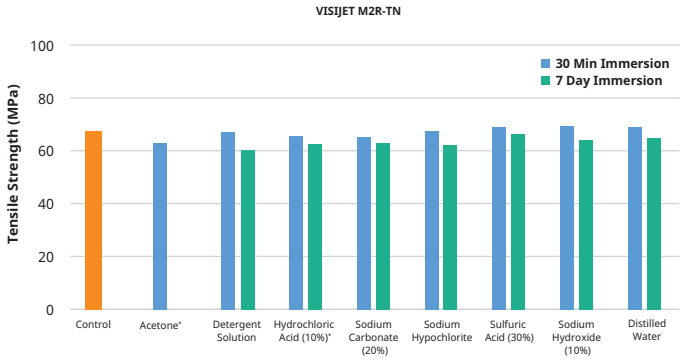
The compatibility of a material with cleaning chemicals is critical to part application. VisiJet M2R-TN parts were tested for sealed and surface contact compatibility per ASTM D543 test conditions. The fluids below were tested in two different ways per the specs:

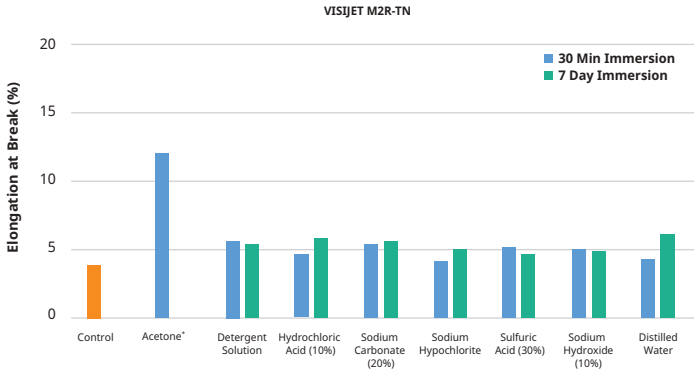
- Immersed for 7-days, followed by mechanical property comparison.
- Immersed for 30-minutes, followed by mechanical property comparison to 7-day data.

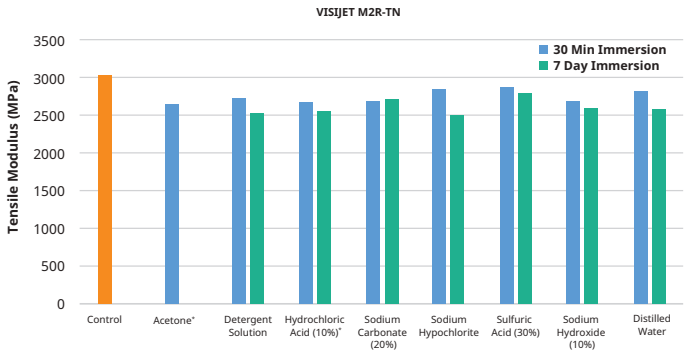
**Data reflects the measured value of properties over that period of time.**

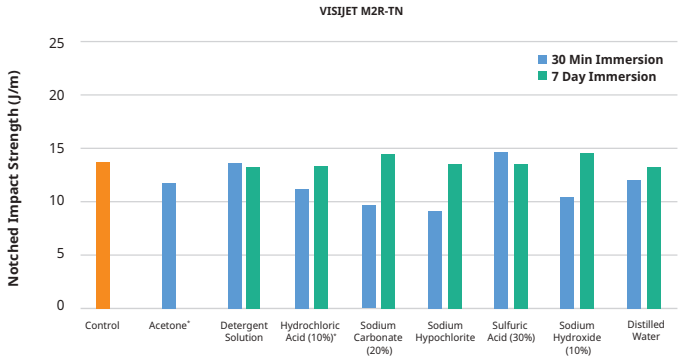
*Denotes materials did not go through 7-day soak conditioning.

| CHEMICAL COMPATIBILITY |
|---|
| 6.3.3 Acetone |
| 6.3.12 Detergent Solution, Heavy Duty |
| 6.3.23 Hydrochloric Acid (10%) |
| 6.3.38 Sodium Carbonate Solution (20%) |
| 6.3.44 Sodium Hypochlorite Solution |
| 6.3.46 Sulfuric Acid (30%) |
| 6.3.42 Sodium Hydroxide Soln (10%) |
| 6.3.15 Distilled Water |



## BIOCOMPATIBILITY STATEMENT

VisiJet M2R-TN material printed in a ProJet 2500 has met the requirements of USP Class VI testing. Based on these results, 3D Systems expects that similar articles made from this material will meet the compliance requirements of USP Class VI when the produced parts are cleaned using the methods described in the User Guide.

It is the responsibility of each customer to independently determine that use of VisiJet M2R-TN material for their specific application is safe, lawful and technically suitable. Customers should conduct their own testing to ensure compliance with any specific requirements. 3D Systems recommends that customers re-verify material suitability for applications requiring USP Class VI compliance no less frequently than every two years from the date of this publication due to potential changes in the law, regulations, material formulation or manufacturing methods.

For additional information about VisiJet M2R-TN material, please contact your local sales representative.