



VisiJet® M2G-DUR

Durable Plastic

Polypropylene-like, semi-rigid engineering prototyping plastic with translucent clear finish delivering good strength and stiffness with high elongation and toughness

ProJet MJP 2500

While still being a rigid material, VisiJet M2G-DUR has the lowest strength and stiffness of all the MJP rigid and engineering plastics. With very high elongation and notched Izod impact strength, VisiJet M2G-DUR has properties similar to polypropylene and is able to simulate a range of low-strength and high elongation injection-molded thermoplastics. It is optically clear and has high feature fidelity, sharp corners and edges and smooth surface finish.

It was specifically designed to be used as an engineering prototype material and has the same high accuracy and smooth surfaces as the other MJP VisiJet materials. It is suitable for soft plastic engineering prototypes and can also make extremely small and complex internal structures for microfluidics and flow visualization.

FEATURES

- Low strength and stiffness, 65-75% elongation, 70-80 notched Izod impact strength
- Excellent for mechanically demanding and geometrically complex functional prototypes
- Can be substantially twisted, flexed and deformed without cracking or breaking
- Able to make extremely small and complex internal structures
- High accuracy and watertight
- Biocompatible USP Class VI

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

APPLICATIONS

- Strength/stiffness and elongation optimized for the highest flexibility engineering applications including snap-lid polypropylene containers and water-tight food packaging prototypes
- Translucent functional prototypes for soft plastics or load carrying, rotating and bearing surfaces
- Exceptional ability to be drilled, tapped and machined, and can create aggressive functional snap fits
- Functional printed assemblies and injection molded screw bosses
- Functional printed screw-threads and thin walls
- Translucent flow visualization and dye-tinted applications
- Optically clear sight windows in fixtures
- Excellent for microfluidics, capillary fluidics and lab-on-a-chip

BENEFITS

- High fidelity fine features, sharp edges and high accuracy
- Exceptional smooth and consistent surface finish
- Excellent optical clarity
- No surface cure inhibition of paints or silicones
- Smooth surface and tack-free curing allows for easy molding or painting
- Excellent for complex engineering plastic prototypes

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.

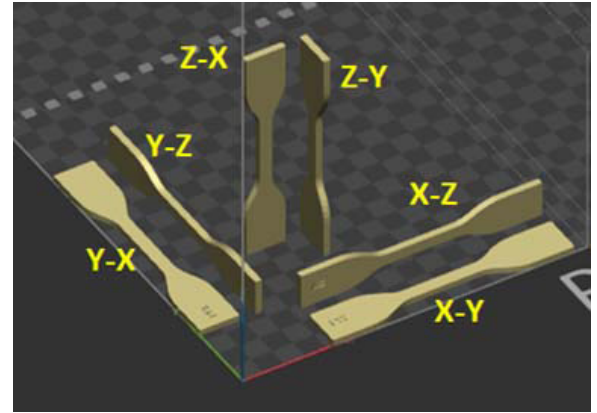
Solid material properties reported were printed along the vertical axis (ZX-orientation). As detailed in the Isotropic Properties section, Visijet material properties are relatively uniform across print orientations. Parts do not need to be oriented in a particular direction to exhibit these properties.

LIQUID MATERIAL						
Color	Clear Amber					
Package Volume	1.5 kg bottle					
SOLID MATERIAL						
METRIC	ASTM METHOD	METRIC	ENGLISH	ISO METHOD	METRIC	ENGLISH
PHYSICAL			PHYSICAL			
Solid Density	ASTM D792	1.14 g/cm ³	0.041 lb/in ³	ISO 1183	1.14 g/cm ³	0.041 lb/in ³
24 Hour Water Absorption	ASTM D570	≤0.5%	≤0.5%	ISO 62	≤0.5%	≤0.5%
MECHANICAL			MECHANICAL			
Tensile Strength Ultimate	ASTM D638 Type IV	21 MPa	3100 psi	ISO 527 -1/2	33 MPa	4800 psi
Tensile Strength at Yield	ASTM D638 Type IV	N/A	N/A	ISO 527 -1/2	32.9 MPa	4800 psi
Tensile Modulus	ASTM D638 Type IV	400 MPa	60 ksi	ISO 527 -1/2	1300 MPa	195 ksi
Elongation at Break	ASTM D638 Type IV	71 %	71 %	ISO 527 -1/2	56 %	56 %
Elongation at Yield	ASTM D638 Type IV	N/A	N/A	ISO 527 -1/2	3.9 %	3.9 %
Flex Strength	ASTM D790	4 MPa	600 psi	ISO 178	4 MPa	600 psi
Flex Modulus	ASTM D790	240 MPa	30 ksi	ISO 178	600 MPa	90 ksi
Izod Notched Impact	ASTM D256	74 J/m	1.4 ft-lb/in	ISO 180-A	6.1 kJ/m ²	2.9 ft-lb/in ²
Izod Unnotched impact	ASTM D4812	1300 J/m	25 ft-lb/in	ISO 180-U		
Shore Hardness	ASTM D2240	66 D	66 D	ISO 7619	66 D	66 D
THERMAL			THERMAL			
Tg (DMA E'')	ASTM E1640 (E''Peak)	30 °C	81 °F	ISO 6721-1/11 (E'' Peak)	30 °C	81 °F
HDT 0.455MPa/66PSI	ASTM D648	25 °C	77 °F	ISO 75- 1/2 B	25 °C	77 °F
HDT 1.82MPa/264 PSI	ASTM D648	25 °C	77 °F	ISO 75-1/2 A	25 °C	77 °F
CTE -20 to 70C	ASTM E831	114 ppm/°C	63 ppm/°F	ISO 11359-2	114 ppm/°C	63 ppm/°F
CTE 95 to 180C	ASTM E831	201 ppm/°C	112 ppm/°F	ISO 11359-2	201 ppm/°C	112 ppm/°F
UL Flammability Rating			HB			
ELECTRICAL			ELECTRICAL			
Dielectric Strength (kV/mm) @ 3.0 mm thickness	ASTM D149	359				
Dielectric Constant @ 1 MHz	ASTM D150	3.647				
Dissipation Factor @ 1 MHz	ASTM D150	0.022				
Volume Resistivity (ohm-cm)	ASTM D257	5.48E+14				

ISOTROPIC PROPERTIES

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

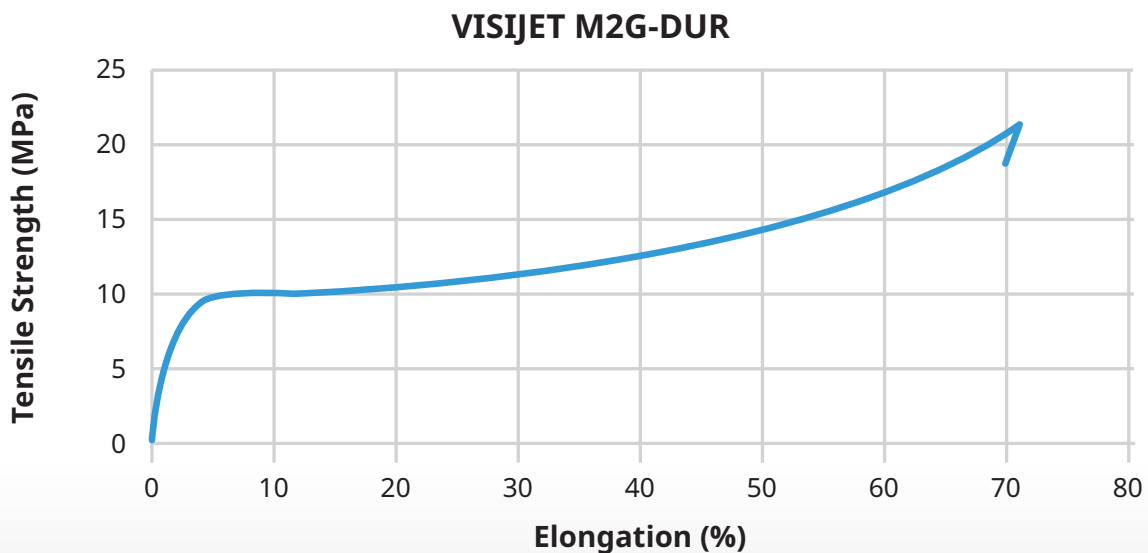
Parts do not need to be oriented to get the highest mechanical properties, further improving the degree of freedom for part orientation for mechanical properties.



SOLID MATERIAL								
METRIC	METHOD	METRIC						
MECHANICAL								
		XY	XZ	YX	YZ	Z45	ZX	ZY
Tensile Strength Ultimate	ASTM D638 Type IV	21 MPa	17 MPa	20 MPa	20 MPa	21 MPa	15 MPa	14 MPa
Tensile Strength at Yield	ASTM D638 Type IV	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tensile Modulus	ASTM D638 Type IV	400 MPa	290 MPa	300 MPa	380 MPa	450 MPa	500 MPa	480 MPa
Elongation at Break	ASTM D638 Type IV	71 %	68 %	72 %	72 %	72 %	61 %	57 %
Elongation at Yield	ASTM D638 Type IV	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flex Strength	ASTM D790	4 MPa	3 MPa	4 MPa	3 MPa	3 MPa	3 MPa	3 MPa
Flex Modulus	ASTM D790	240 MPa	140 MPa	160 MPa	90 MPa	70 MPa	80 MPa	90 MPa
Izod Notched Impact	ASTM D256	74 J/m	64 J/m	73 J/m	70 J/m	71 J/m	70 J/m	69 J/m
Shore Hardness	ASTM D2240	66 D	64 D	62 D	64 D	63 D	64 D	64 D

STRESS-STRAIN CURVE

The graph represents the stress-strain curve for Visijet M2G-DUR per ASTM D638 testing.

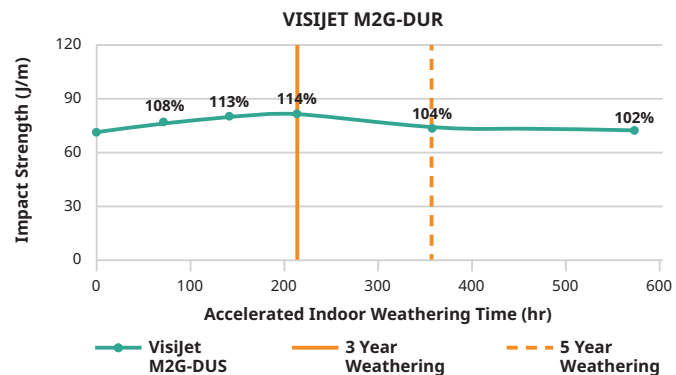
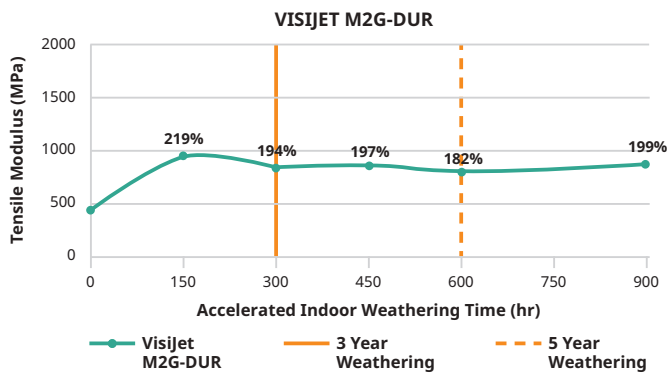
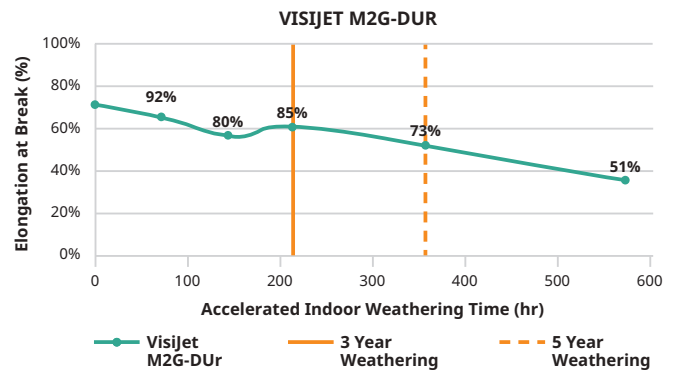
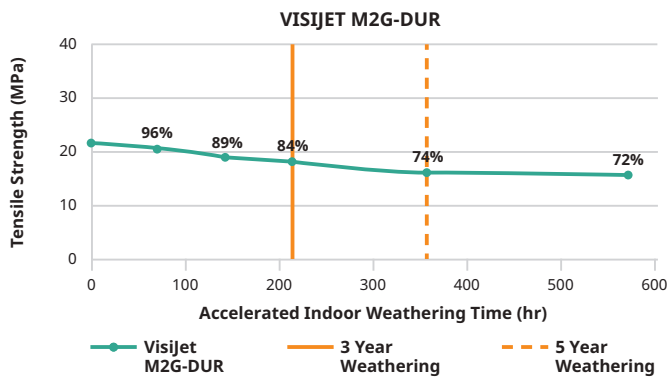


LONG TERM ENVIRONMENTAL STABILITY

Visijet M2G-DUR 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. This provides real design conditions to consider for the application or part. **Actual data value is on Y-axis, and data points are % of initial value.**

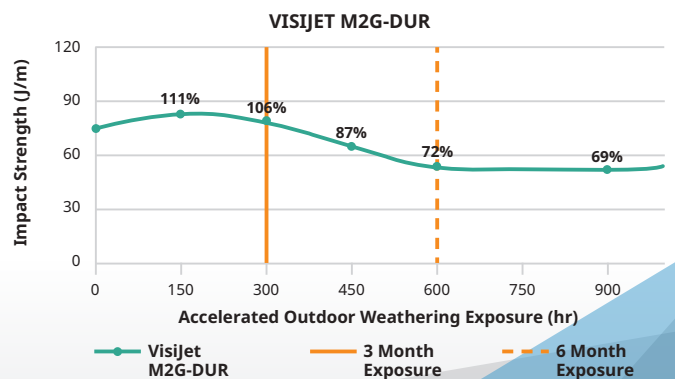
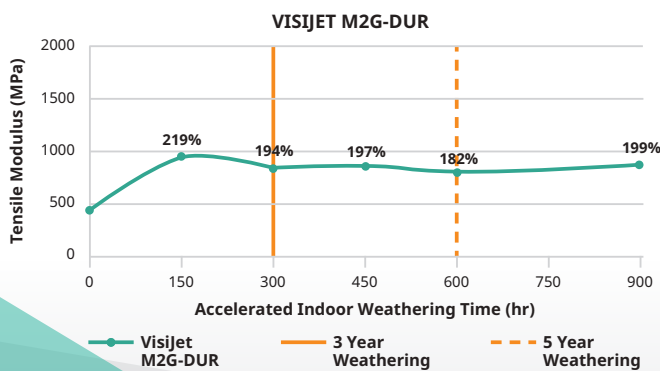
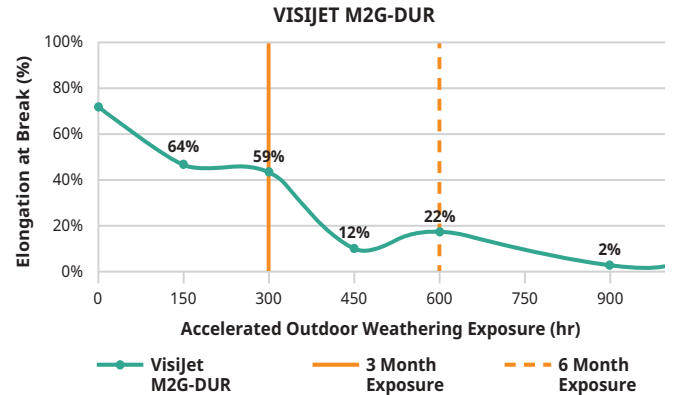
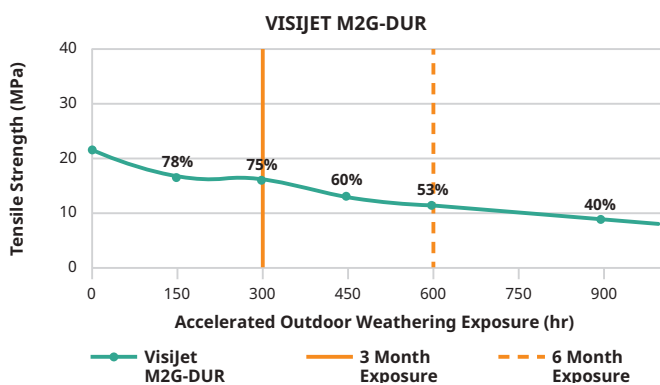
INDOOR STABILITY: Tested per ASTM D4329 standard method.

INDOOR STABILITY



OUTDOOR STABILITY: Tested per ASTM G154 standard method.

OUTDOOR STABILITY



AUTOMOTIVE FLUID COMPATIBILITY

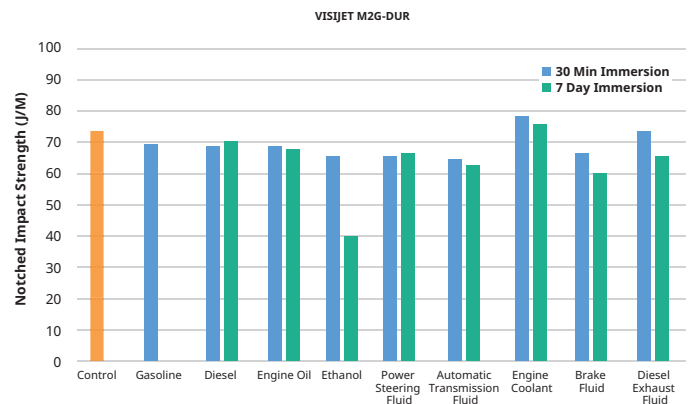
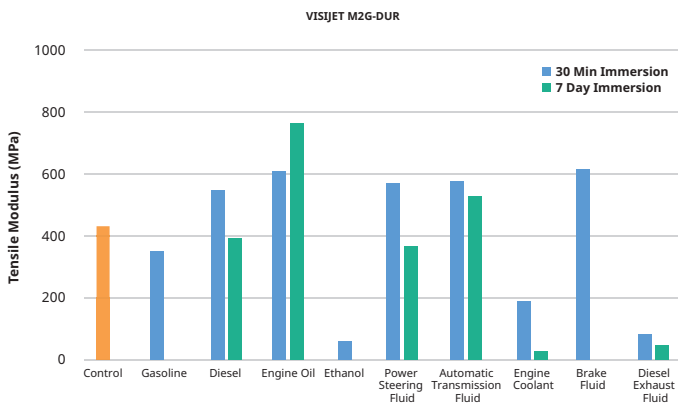
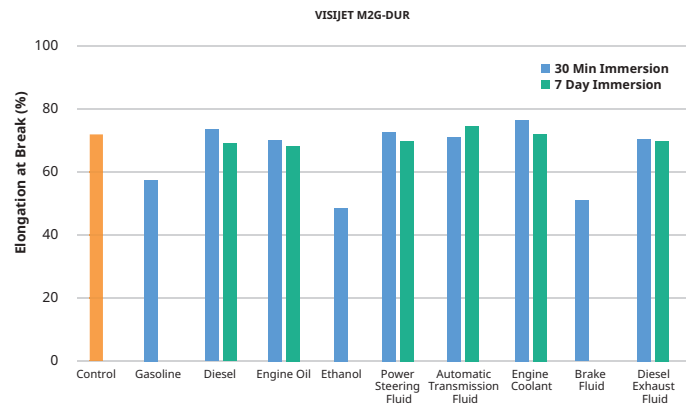
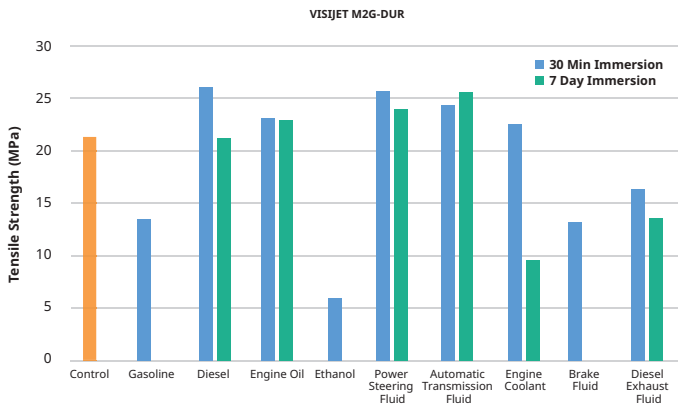
The compatibility of a material with hydrocarbons and cleaning chemicals is critical to part application. Visijet M2G-DUR parts were tested for sealed and surface contact compatibility per USCAR2 test conditions. The fluids below were tested in two different ways per the specs.

- Immerse for 7-days, then take mechanical property data for comparison.
- Immerse for 30-minutes, remove, and take mechanical property data for comparison in 7-days.

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
Automotive 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

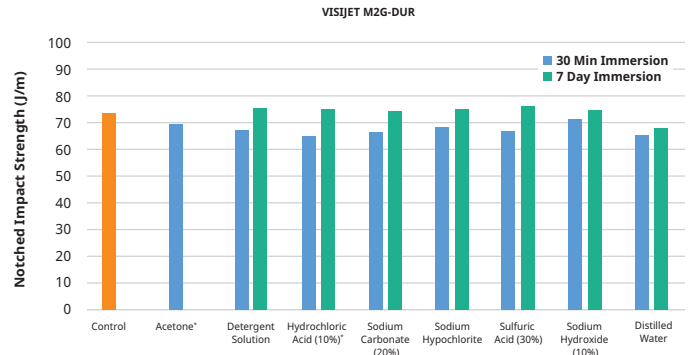
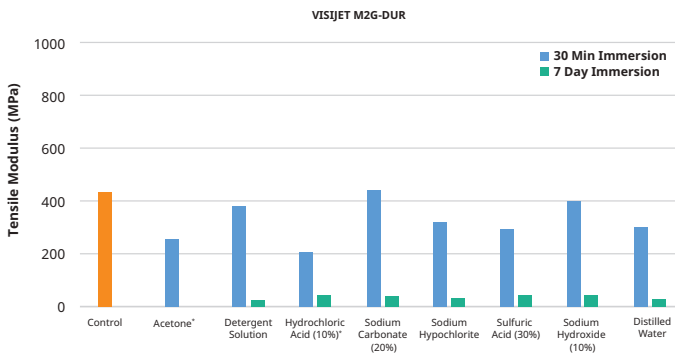
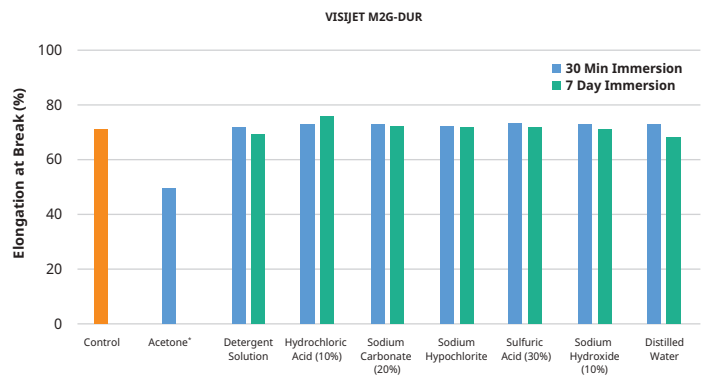
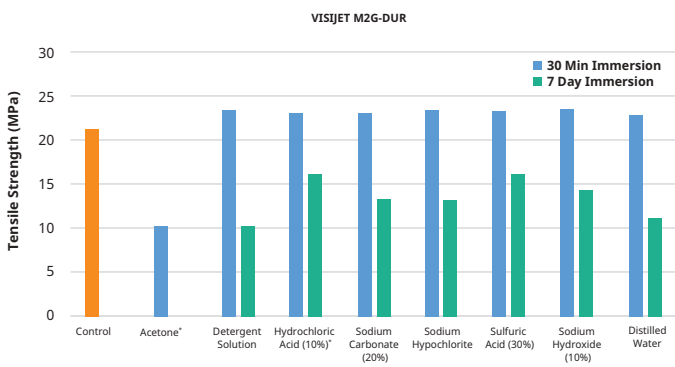
The compatibility of a material with cleaning chemicals is critical to part application. Visijet M2G-DUR parts were tested for sealed and surface contact compatibility per ASTM D543 test conditions. The fluids below were tested in two different ways per the specs.

- Immerse for 7-days, then take mechanical property data for comparison.
- Immerse for 30-minutes, remove, and take mechanical property data for comparison in 7-days.

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 Solution (10%)
6.3.15 Distilled Water



BIOCOMPATIBILITY POST-PROCESS

Outline of MJP biocompatible cleaning procedure. More detail is available in the Post-Processing section of the User Guide:

- Remove wax support in an oven
- Clean with EZ Rinse-C or mineral oil
- Ethyl alcohol (ethanol) rinse with sonication
- Second fresh high purity ethanol rinse with sonication
- Air dry