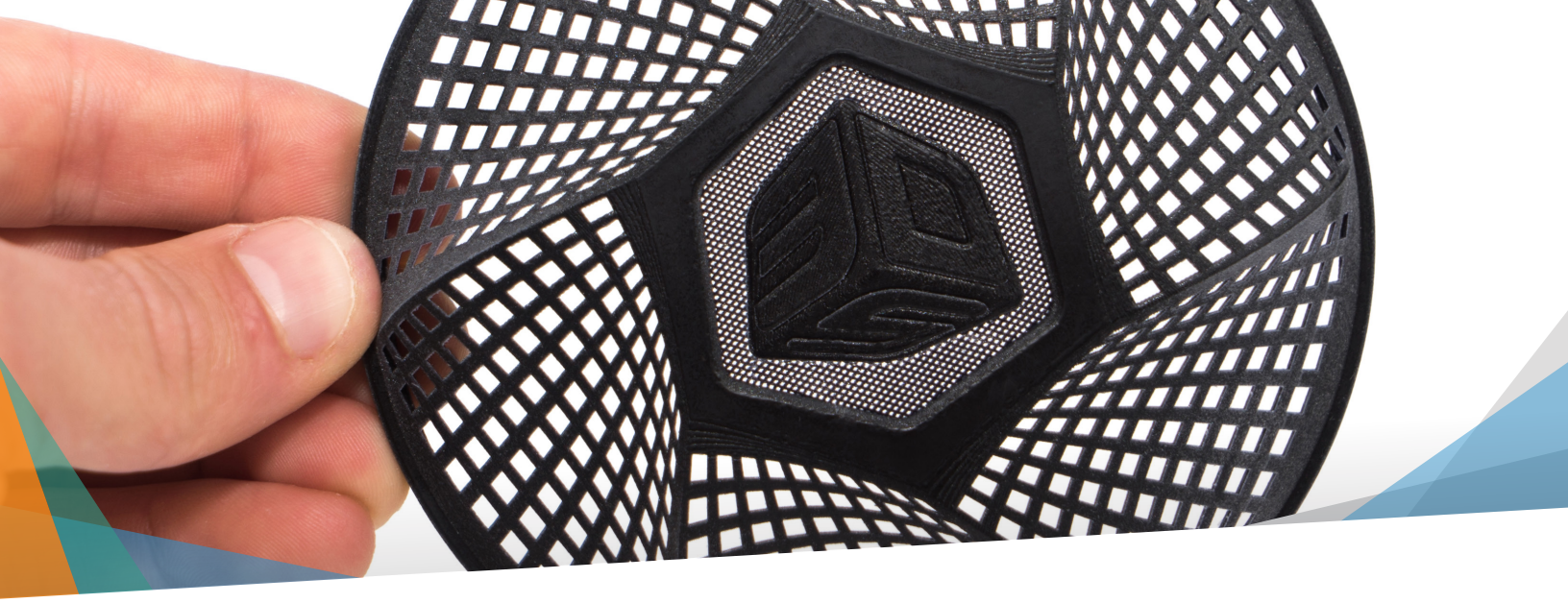


VisiJet® M2R-BK

Production Rigid

ProJet MJP 2500

Rigid general-purpose plastic with opaque black finish delivering a balance of strength and elongation with a moderate to high HDT

Similar to VisiJet M2R-TN (tan), VisiJet M2R-BK 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 suitable for general prototyping and some end-use parts.

APPLICATIONS

- Opaque functional prototypes and some end-use parts
- Rapid prototyping of plastic injection molded thermoplastic parts
- Able to be drilled, tapped and machined
- Panels, covers, housings, handles and static parts
- Functional printed assemblies and injection molded screw bosses

BENEFITS

- High- fidelity fine features, sharp edges and high accuracy
- Exceptional smooth and consistent surface finish
- No surface cure inhibition of paints or silicones; no sanding required
- Excellent for painting or 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

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

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.

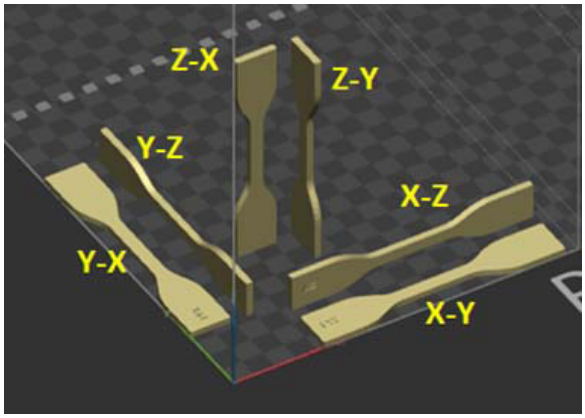
Solid material properties reported were printed along the vertical axis (ZX-orientation). As detailed in the Isotropic Properties section, material properties are relatively uniform across print orientations. Parts do not need to be oriented in a particular direction to exhibit these properties.

LIQUID MATERIAL						
Color			Black			
SOLID MATERIAL						
METRIC	**ASTM METHOD**	**METRIC**	**ENGLISH**	**ISO METHOD**	**METRIC**	**ENGLISH**
	PHYSICAL				**PHYSICAL**	
Solid Density	ASTM D792	1.16 g/cm³	0.042 lb/in³	ISO 1183	1.16 g/cm³	0.042 lb/in³
24 Hour Water Absorption	ASTM D570	.13 %	.13 %	ISO 62	.13 %	.13 %
	MECHANICAL				**MECHANICAL**	
Tensile Strength Ultimate	ASTM D638	52 MPa	7500 psi	ISO 527 -1/2	52 MPa	7500 psi
Tensile Strength at Yield	ASTM D638	52 MPa	7600	ISO 527 -1/2	N/A	N/A
Tensile Modulus	ASTM D638	2400 MPa	350 ksi	ISO 527 -1/2	2300 MPa	332 ksi
Elongation at Break	ASTM D638	6.0 %	6.0 %	ISO 527 -1/2	3.9 %	3.9 %
Elongation at Yield	ASTM D638	3.9 %	3.9 %	ISO 527 -1/2	N/A	N/A
Flex Strength	ASTM D790	87 MPa	12600 psi	ISO 178	80 MPa	11000 psi
Flex Modulus	ASTM D790	2500 MPa	360 ksi	ISO 178	2200 MPa	325 ksi
Izod Notched Impact	ASTM D256	13 J/m	0.2 ft-lb/in	ISO 180-A	1.9 kJ/m²	0.9 ft-lb/in²
Izod Unnotched Impact	ASTM D4812	100 J/m	49 ft-lb/in	ISO 180-U		
Shore Hardness	ASTM D2240	82 D	82 D	ISO 7619	82 D	82 D
	THERMAL				**THERMAL**	
Tg (DMA, E")	ASTM E1640 (E"at 1C/min)	50 °C	126 °F	ISO 6721-1/11 (E"at 1C/min)	50 °C	126 °F
HDT @ 0.455 MPa/66 PSI	ASTM D648	59 °C	138 °F	ISO 75- 1/2 B	55 °C	131 °F
HDT @ 1.82 MPa/264 PSI	ASTM D648	51 °C	123 °F	ISO 75-1/2 A	47 °C	117 °F
CTE below Tg	ASTM E831	88 ppm/°C	49ppm/°F	ISO 11359-2	88 ppm/K	49 ppm/F
CTE above Tg	ASTM E831	182 ppm/°C	101 ppm/°F	ISO 11359-2	182 ppm/K	101 ppm/F
UL Flammability	UL94	HB	HB			
	ELECTRICAL				**ELECTRICAL**	
Dielectric Strength (kV/mm) @ 3.0 mm thickness	ASTM D149	15				
Dielectric Constant @ 1 MHz	ASTM D150	3.2				
Dissipation Factor @ 1 MHz	ASTM D150	0.019				
Volume Resistivity (ohm-cm)	ASTM D257	7.16E+15				

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.

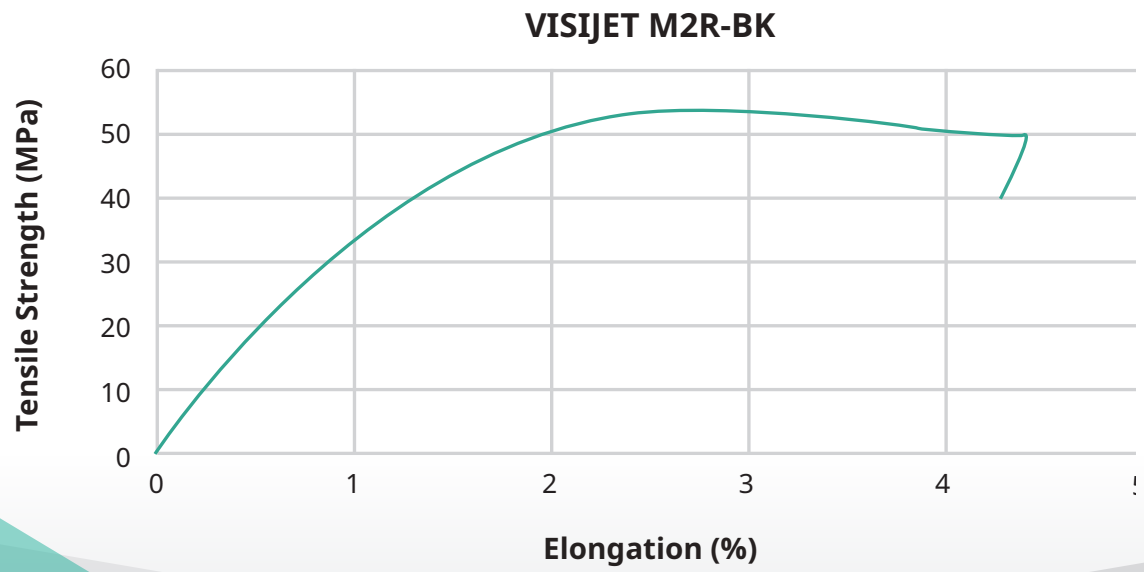
Parts do not need to be oriented to get the highest mechanical properties, further improving the degree of freedom for part orientation for mechanical properties.



SOLID MATERIAL								
METRIC	METHOD	METRIC						
MECHANICAL								
		XY	XZ	YX	YZ	Z45	ZX	ZY
Tensile Strength Ultimate	ASTM D638 Type IV	52 MPa	59 MPa	57 MPa	56 MPa	49 MPa	42 MPa	43 MPa
Tensile Strength at Yield	ASTM D638 Type IV	52 MPa	59 MPa	N/A	N/A	48 MPa	N/A	N/A
Tensile Modulus	ASTM D638 Type IV	2400 MPa	2600 MPa	2800 MPa	2400 MPa	1900 MPa	2100 MPa	2200 MPa
Elongation at Break	ASTM D638 Type IV	6 %	5.8 %	3.4 %	4 %	5.3 %	3 %	2.8 %
Elongation at Yield	ASTM D638 Type IV	3.9 %	4.3 %	N/A	N/A	4.5 %	N/A	N/A
Flex Strength	ASTM D790	87 MPa	78 MPa	92 MPa	82 MPa	72 MPa	49 MPa	55 MPa
Flex Modulus	ASTM D790	2500 MPa	2100 MPa	2400 MPa	2100 MPa	1900 MPa	1900 MPa	1800 MPa
Izod Notched Impact	ASTM D256	13 J/m	15 J/m	13 J/m	16 J/m	14 J/m	15 J/m	15 J/m
Shore Hardness	ASTM D2240	82 D	N/A	80 D	80 D	80 D	N/A	N/A

STRESS-STRAIN CURVE

The graph represents the stress-strain curve for VisiJet M2R-BK per ASTM D638 testing.

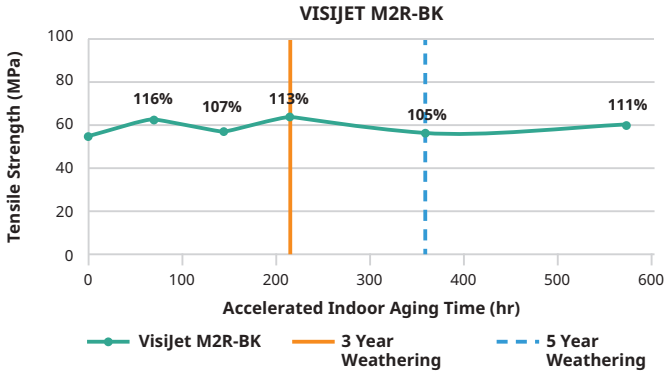


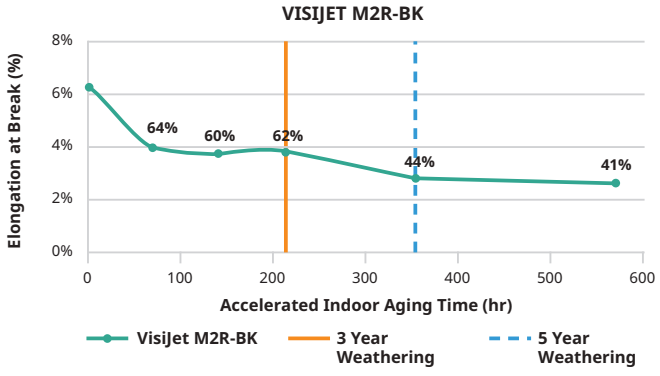
LONG TERM ENVIRONMENTAL STABILITY

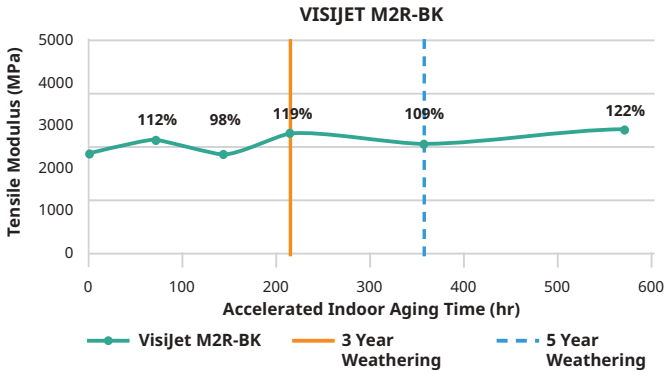
VisiJet M2R-BK is engineered to give long-term environmental UV and humidity stability. This means the material is tested for the ability to retain a high percent of the initial mechanical properties over a given period of time. This provides real design conditions to consider for the application or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

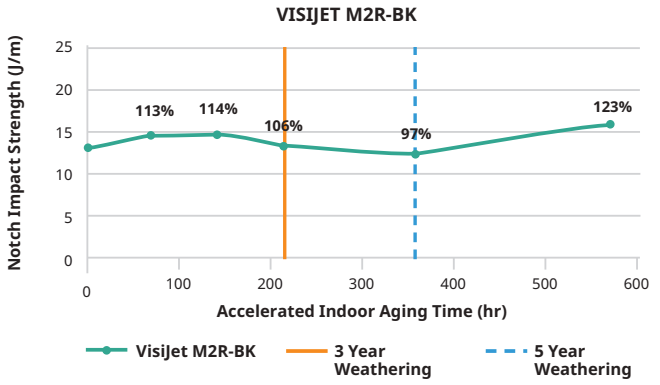
INDOOR STABILITY

INDOOR STABILITY: Tested per ASTM D4329 standard method.



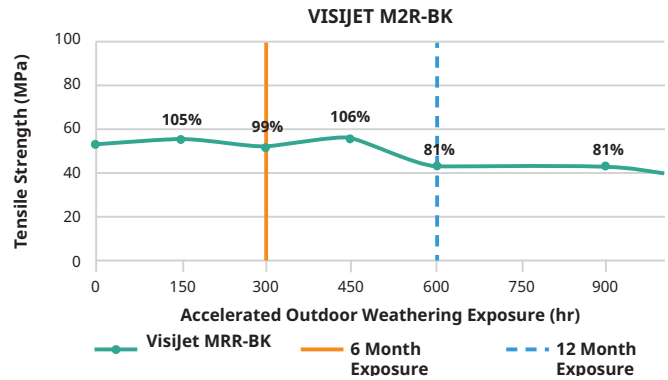


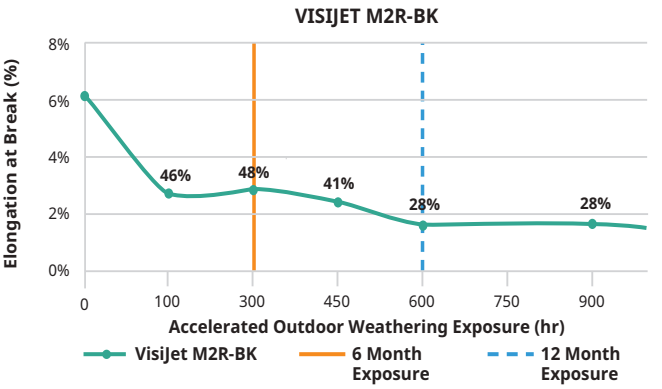


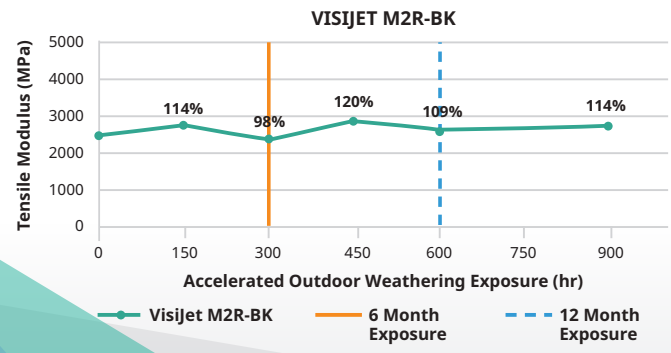


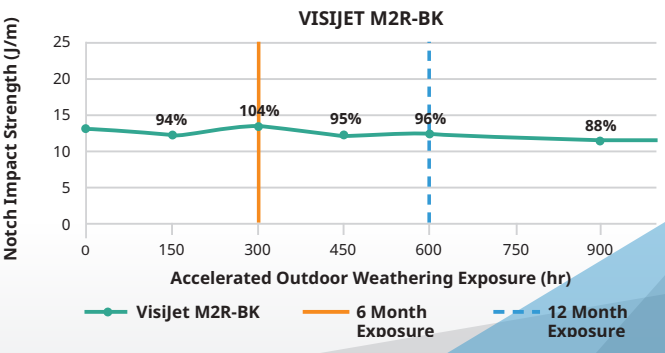
OUTDOOR STABILITY

OUTDOOR STABILITY: Tested per ASTM G154 standard method.









AUTOMOTIVE FLUID COMPATIBILITY

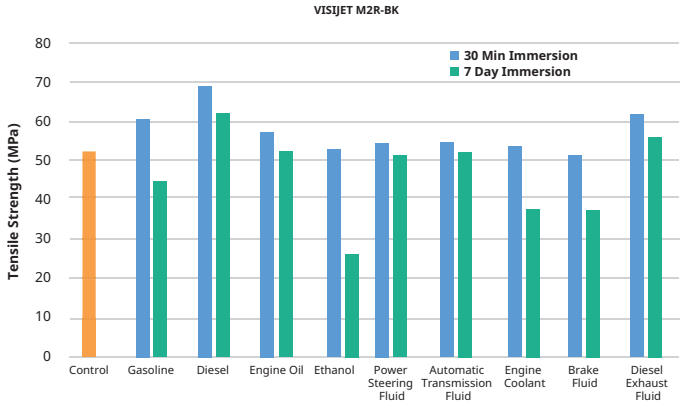
The compatibility of a material with hydrocarbons and cleaning chemicals is critical to part application. VisiJet M2R-BK parts were tested for sealed and surface contact compatibility per USCAR2 test conditions. The fluids below were tested in two different ways per the specs.

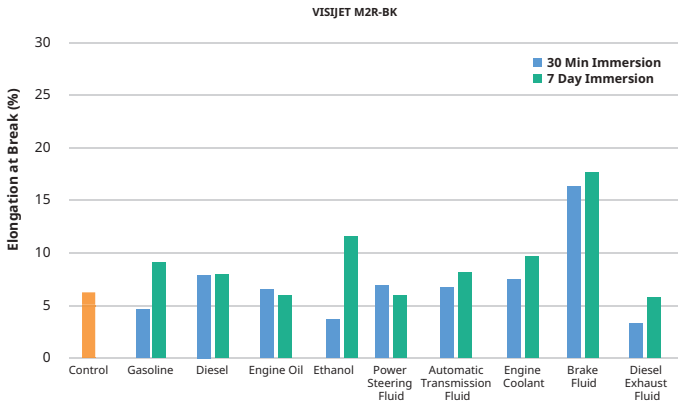
- Immerse for 7-days, then take mechanical property data for comparison.
- Immerse for 30-minutes, remove and take mechanical property data for comparison in 7-days.

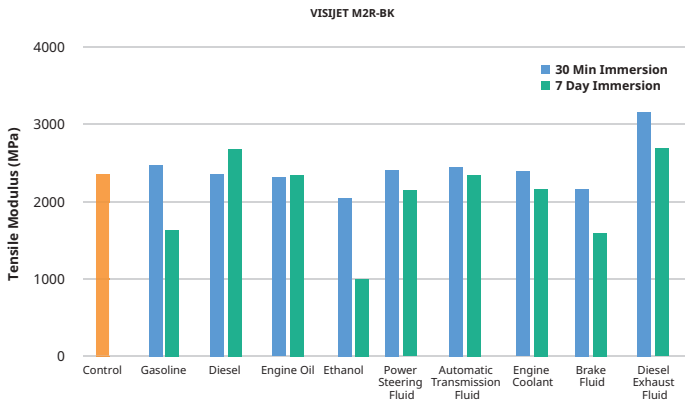
Data reflects the measured value of properties over that period of time.

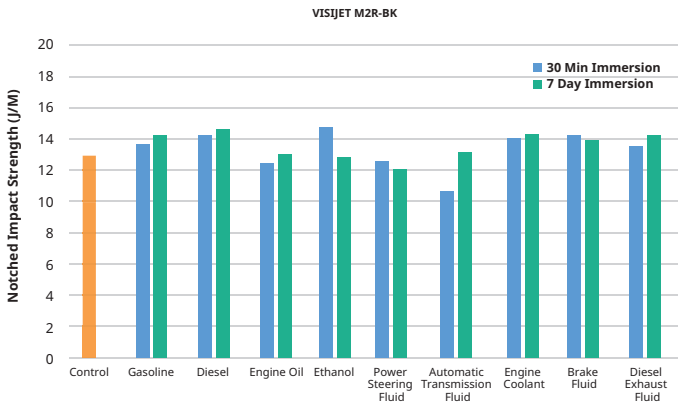
AUTOMOTIVE FLUIDS		
FLUID	**SPECIFICATION**	**TEST TEMP °C**
Gasoline	ISO 1817, liquid C	23 ± 5
Diesel Fuel	905 ISO 1817, Oil No. 3 + 10% p-xylene*	23 ± 5
Engine Oil	ISO 1817, Oil No. 2	50 ± 3
Ethanol	85% Ethanol + 15% ISO 1817 liquid C*	23 ± 5
Power Steering Fluid	ISO 1917, Oil No. 3	50 ± 3
Automative 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

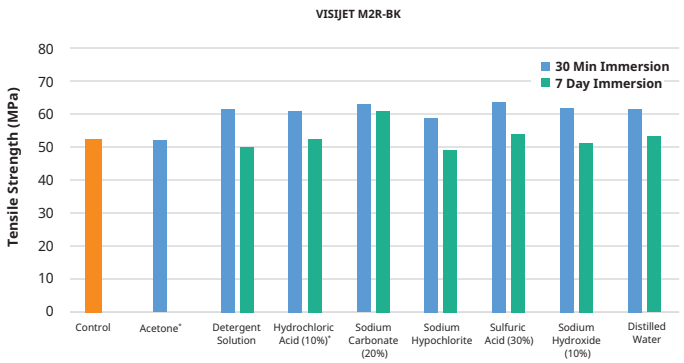
The compatibility of a material with cleaning chemicals is critical to part application. VisiJet M2R-BK parts were tested for sealed and surface contact compatibility per ASTM D543 test conditions. The fluids below were tested in two different ways per the specs.

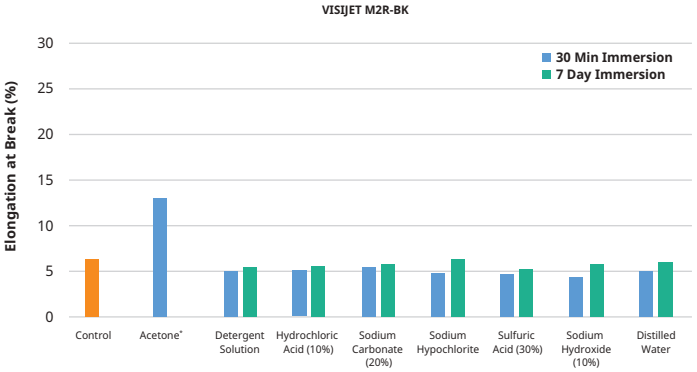
- Immerse for 7-days, then take mechanical property data for comparison.
- Immerse for 30-minutes, remove, and take mechanical property data for comparison in 7-days.

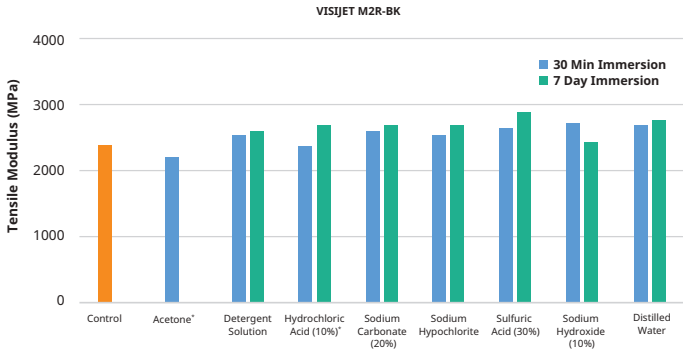
Data reflects the measured value of properties over that period of time.

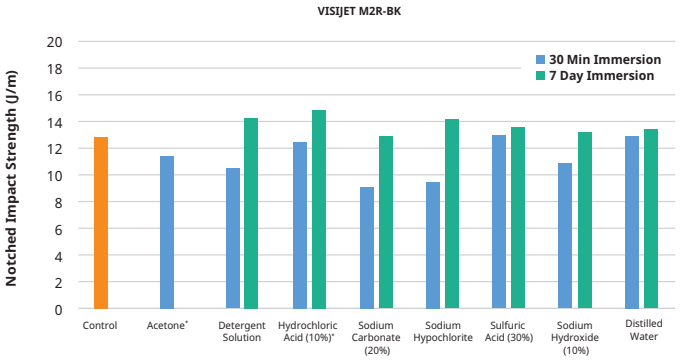
*Denotes materials did not go through 7-day soak conditioning.

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









USP CLASS VI CERTIFICATION

VisiJet M2R-BK material printed on a ProJet MJP 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-BK 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-BK material, please contact your local sales representative.