VisiJet® M2R-GRY

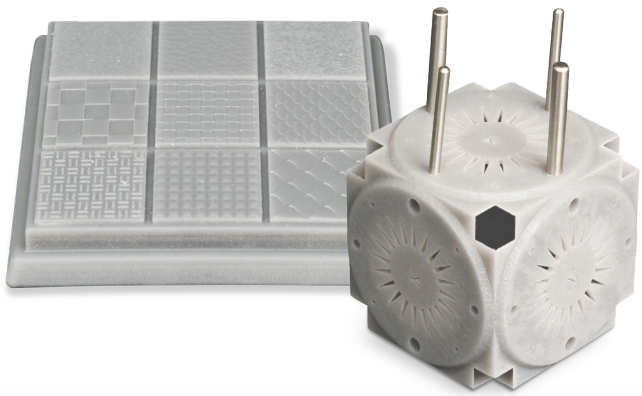
Production Rigid

ProJet MJP 2500

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

Similar to the VisiJet M2R-CL (clear) and VisiJet M2R-WT (white), Visijet M2R-GRY is a rigid material that is good for a broad range of concept models and functional prototypes.

It is opaque "primer gray" in color and 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 prototypes, printed assemblies, medical/dental/jewelry applications and some end-use parts.



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

APPLICATIONS

- High contrast primer gray color for easy visualization of surface detail
- Opaque functional prototypes and some end-use parts
- Rapid prototyping of plastic injection molded thermoplastic parts
- Able to be drilled, tapped, and machined and can create moderate functional snap fits
- Functional printed assemblies and injection molded screw bosses
- Functional printed screw-threads and thin walls
- Medical/dental applications
- Painted business/marketing collateral, prototypes and mockups

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
- Aesthetically pleasing, high detail visualization

FEATURES

- Moderate strength and stiffness, 20-30% 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.

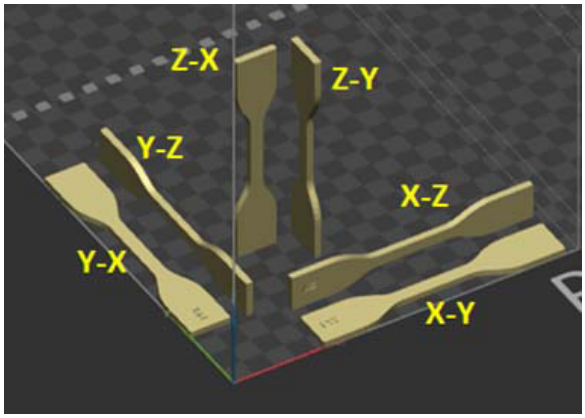
LIQUID MATERIAL			
MEASUREMENT	**CONDITION/METHOD**	**METRIC**	**ENGLISH**
Color		Gray	

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	0.5 %	0.5 %	ISO 62	0.5 %	0.5 %
	MECHANICAL				**MECHANICAL**	
Tensile Strength Ultimate	ASTM D638	49 MPa	7200 psi	ISO 527 -1/2	41 MPa	5900 psi
Tensile Strength at Yield	ASTM D638	49 MPa	7200 psi	ISO 527 -1/2	41 MPa	5900 psi
Tensile Modulus	ASTM D638	2200 MPa	320 ksi	ISO 527 -1/2	2000 MPa	290 ksi
Elongation at Break	ASTM D638	15 %	15 %	ISO 527 -1/2	18 %	18 %
Elongation at Yield	ASTM D638	4.1 %	4.1 %	ISO 527 -1/2	4.1 %	4.1 %
Flex Strength	ASTM D790	64 MPa	9200 psi	ISO 178	50 MPa	7700 psi
Flex Modulus	ASTM D790	1700 MPa	250 ksi	ISO 178	1600 MPa	231 ksi
Izod Notched Impact	ASTM D256	16 J/m	0.3 ft-lb/in	ISO 180-A	1.8 kJ/m²	0.9 ft-lb/in²
Izod Unnotched Impact	ASTM D4812	80 J/m	2 ft-lb/in	ISO 180-U		
Shore Hardness	ASTM D2240	79 D	79 D	ISO 7619	79 D	79 D
	THERMAL				**THERMAL**	
Tg (DMA, E")	ASTM E1640 (E"at 1C/min)	40 °C	105 °F	ISO 6721-1/11 (E"at 1C/min)	40 °C	105 °F
HDT @ 0.455 MPa/66 PSI	ASTM D648	47 °C	117 °F	ISO 75- 1/2 B	43 °C	109 °F
HDT @ 1.82 MPa/264 PSI	ASTM D648	42 °C	107 °F	ISO 75-1/2 A	38 °C	100 °F
CTE below Tg	ASTM E831	94 ppm/°C	52 ppm/°F	ISO 11359-2	94 ppm/K	52 ppm/°F
CTE above Tg	ASTM E831	179 ppm/°C	99 ppm/°F	ISO 11359-2	179 ppm/K	99 ppm/°F
UL Flammability	UL94	HB	HB			
	ELECTRICAL				**ELECTRICAL**	
Dielectric Strength (kV/mm) @ 3.0 mm thickness	ASTM D149	387				
Dielectric Constant @ 1 MHz	ASTM D150	3.17				
Dissipation Factor @ 1 MHz	ASTM D150	0.019				
Volume Resistivity (ohm-cm)	ASTM D257	6.56E+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.

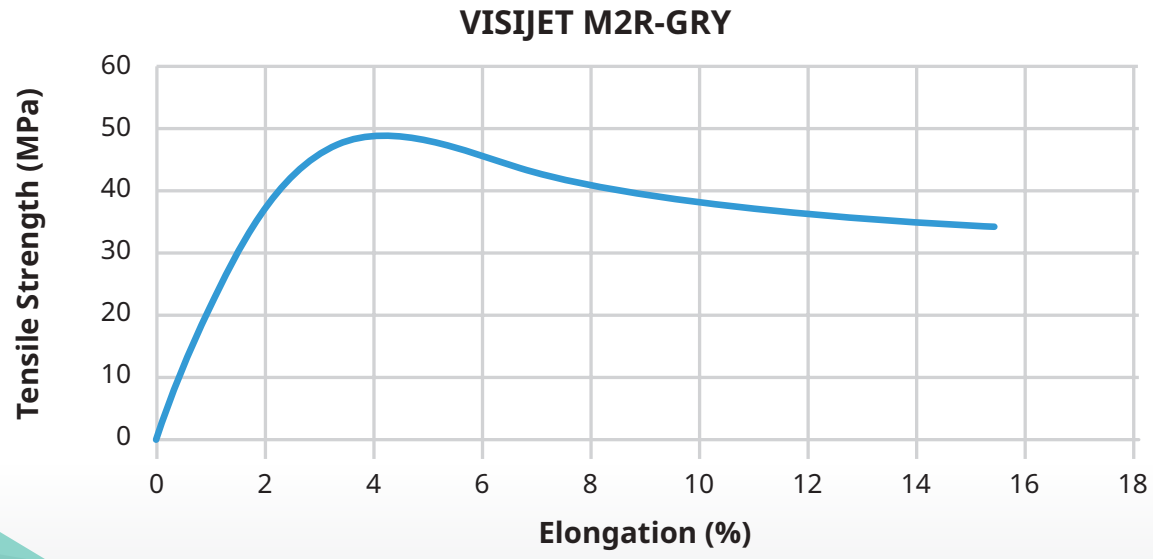
Parts do not need to be oriented to get the highest mechanical properties, further improving the degree of freedom for part orientation for mechanical properties.



SOLID MATERIAL								
METRIC	METHOD	METRIC						
MECHANICAL								
		XY	XZ	YX	YZ	Z45	ZX	ZY
Tensile Strength Ultimate	ASTM D638 Type IV	49 MPa	45 MPa	46 MPa	40 MPa	36 MPa	40 MPa	39 MPa
Tensile Strength at Yield	ASTM D638 Type IV	49 MPa	45 MPa	46 MPa	40 MPa	34 MPa	39 MPa	39 MPa
Tensile Modulus	ASTM D638 Type IV	2200 MPa	2100 MPa	2000 MPa	1900 MPa	1300 MPa	1900 MPa	1900 MPa
Elongation at Break	ASTM D638 Type IV	15 %	20 %	16 %	22 %	21 %	14 %	11 %
Elongation at Yield	ASTM D638 Type IV	4.1 %	4.3 %	4.3 %	4.2 %	4.7 %	4.3 %	4.2 %
Flex Strength	ASTM D790	64 MPa	50 MPa	57 MPa	47 MPa	53 MPa	42 MPa	40 MPa
Flex Modulus	ASTM D790	1700 MPa	1300 MPa	1500 MPa	1200 MPa	1400 MPa	1100 MPa	1000 MPa
Izod Notched Impact	ASTM D256	16 J/m	17 J/m	17 J/m	16 J/m	15 J/m	15 J/m	16 J/m
Shore Hardness	ASTM D2240	79 D	75 D	79 D	73 D	76 D	75 D	73 D

STRESS-STRAIN CURVE

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

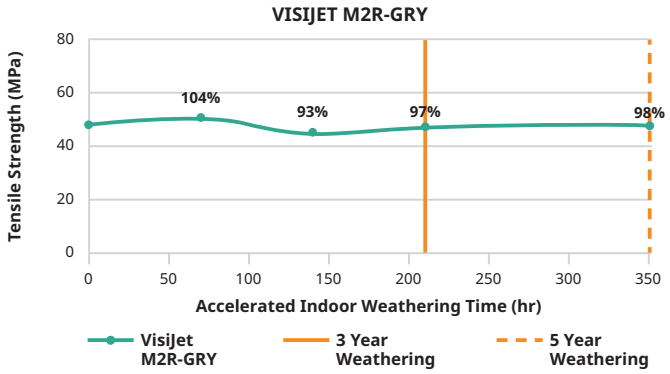


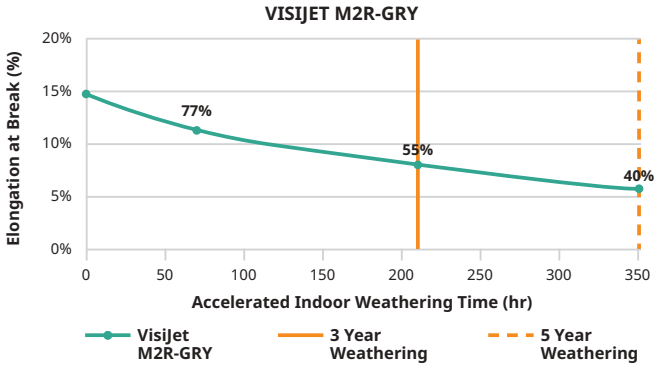
LONG TERM ENVIRONMENTAL STABILITY

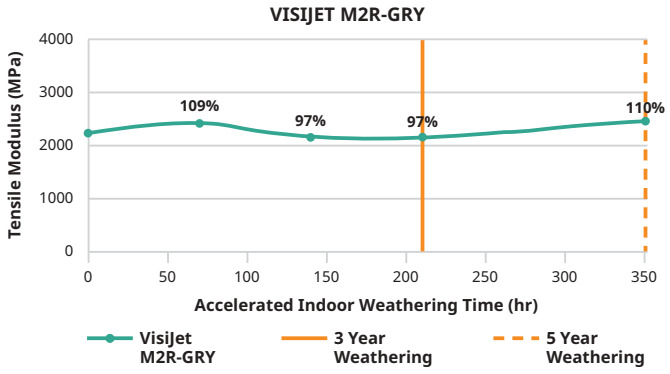
VisiJet M2R-GRY is engineered to give long-term environmental UV and humidity stability. This means the material is tested for the ability to retain a high percent of the initial mechanical properties over a given period of time. **Actual data value is on Y-axis, and data points are % of initial value.**

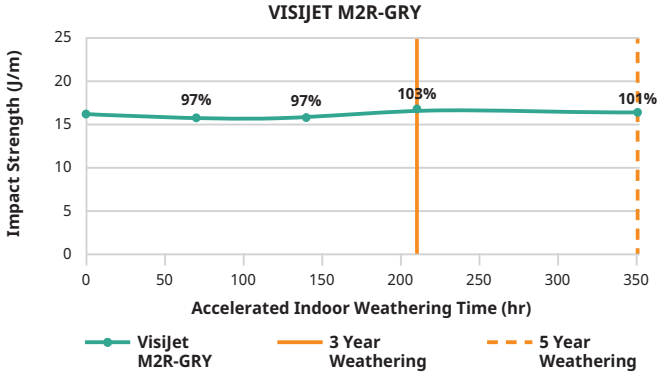
INDOOR STABILITY

INDOOR STABILITY: Tested per ASTM D4329 standard method.



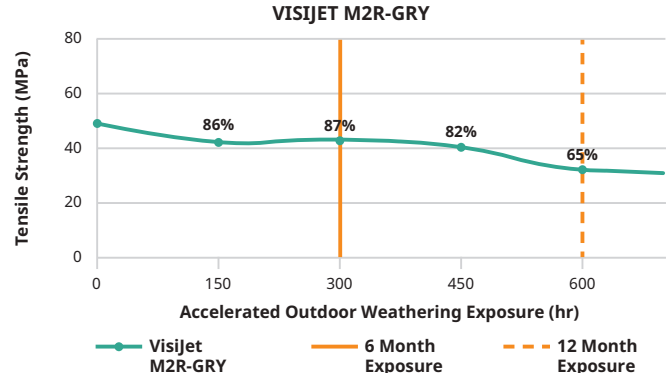


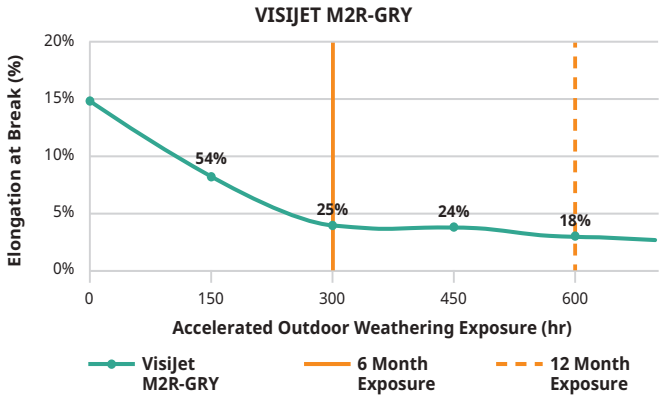


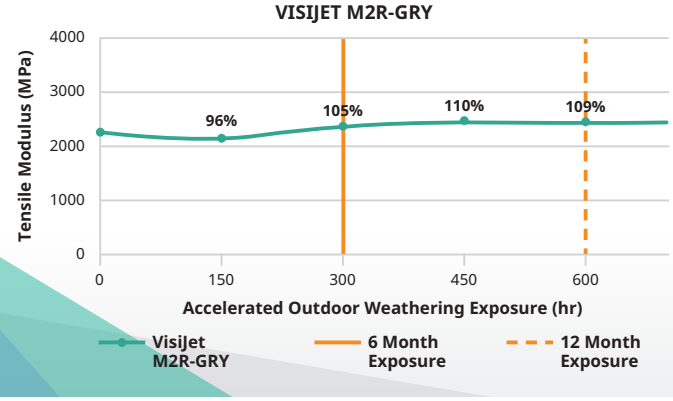


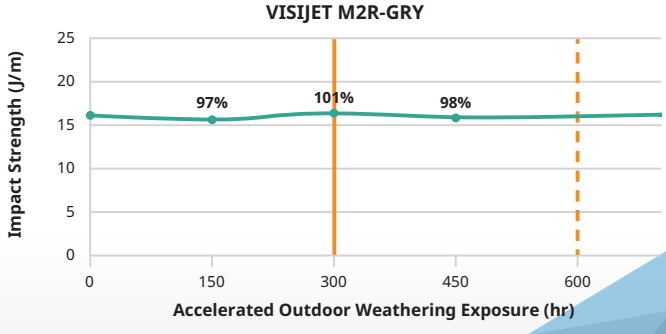
OUTDOOR STABILITY

OUTDOOR STABILITY: Tested per ASTM G154 standard method.









AUTOMOTIVE FLUID COMPATIBILITY

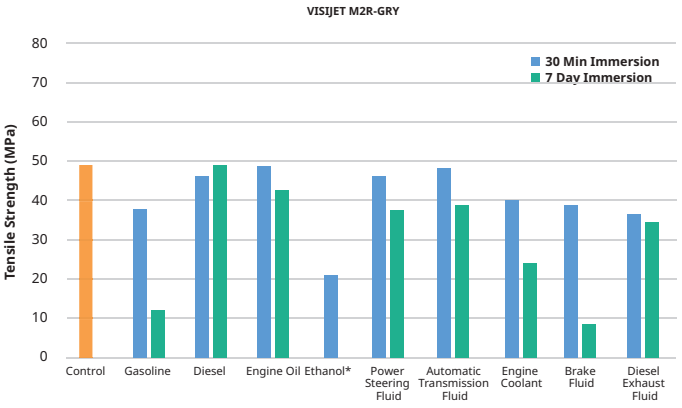
The compatibility of a material with hydrocarbons and cleaning chemicals is critical to part application. VisiJet M2R-GRY parts were tested for sealed and surface contact compatibility per USCAR2 test conditions. The fluids below were tested in two different ways per the specs:

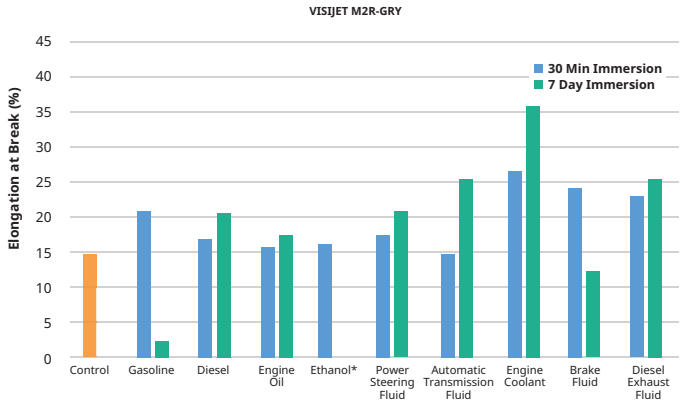
- Immersed for 7-days, followed by mechanical property comparison.
- Immersed for 30-minutes, followed by mechanical property comparison to 7-day data.

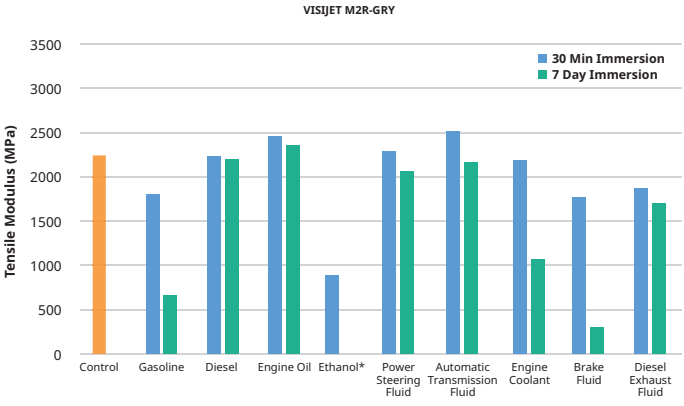
Data reflects the measured value of properties over that period of time.

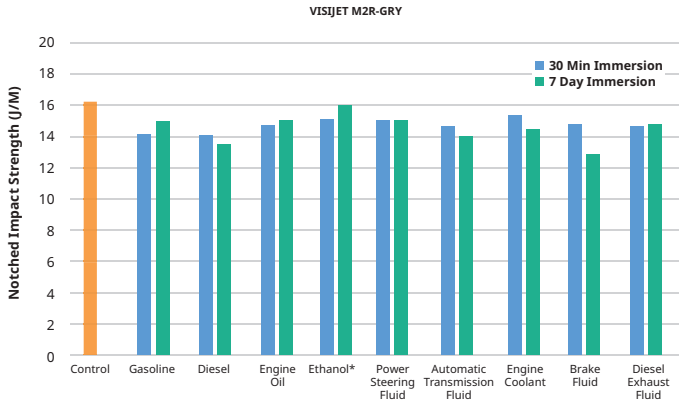
AUTOMOTIVE FLUIDS		
FLUID	**SPECIFICATION**	**TEST TEMP °C**
Gasoline	ISO 1817, liquid C	23 ± 5
Diesel Fuel	905 ISO 1817, Oil No. 3 + 10% p-xylene*	23 ± 5
Engine Oil	ISO 1817, Oil No. 2	50 ± 3
Ethanol	85% Ethanol + 15% ISO 1817 liquid C*	23 ± 5
Power Steering Fluid	ISO 1917, Oil No. 3	50 ± 3
Automative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