Rigid Gray

Production Rigid

High-contrast gray material for durable, long-term parts with balanced thermal stability and mechanical strength.

Save on Tooling Costs and Time with Direct Production Plastic Parts

Figure 4® Rigid Gray is a production-grade resin that delivers an injection-mold-like surface finish and long-term environmental stability. Its high-contrast gray color improves the visibility of textures, engravings, and lettering, making it suitable for precision prototypes and small-batch production. The material supports painting, plating, and laser etching, offering strong post-processing flexibility. With thermoplastic-like behavior and controlled necking at break, it performs reliably in rigid snap-fit applications such as covers and enclosures. Delivering a 72°C heat deflection temperature and 30% elongation at break, the material provides a balanced combination of strength, flexibility, and print speed for efficient, high-throughput manufacturing.

HANDLING & POST-PROCESSING GUIDELINES

This material requires proper mixing, cleaning, drying, and curing to achieve consistent mechanical performance. Detailed post-processing instructions are provided at the end of this document.

Note: All reported properties are based on standardized post-processing procedures. Variations in method or parameters may affect final material performance.

APPLICATIONS

- Ideal for rigid production components such as housings and covers
- Suitable for small, detailed parts used in consumer and general-purpose applications
- Compatible with painting, plating, and laser-etching
- Designed for functional prototyping and low-volume production requiring high feature visibility

BENEFITS

- Reliable for long-term indoor and outdoor use
- High-contrast gray improves visibility of fine details, textures, and lettering
- Fast print-to-part throughput with no additional thermal curing required
- Provides a smooth surface finish with high accuracy and repeatability
- Compatible with post-finishing processes including painting, plating, and laser-etching

FEATURES

- Shows long-term environmental stability of mechanical properties and color (tested up to 8 years indoors and 1.5 years outdoors per ASTM standards)
- Exhibits thermoplastic-like behavior with controlled necking under tensile loading
- Delivers 72°C HDT (at 0.455 MPa) and 30% elongation at break
- Provides a flexural modulus of 2200 MPa for high stiffness and strength
- Biocompatibility-capable per ISO 10993-5
- UL94 HB flammability rating
- Print speeds up to 48 mm/hr at 50-micron layer thickness

MATERIAL PROPERTIES

All mechanical properties are evaluated according to ASTM and ISO standards, where applicable. Additional data, such as flammability, dielectric strength, and 24-hour water absorption, are provided to support informed design and material selection decisions.

All parts are conditioned for a minimum of 40 hours at 23°C and 50% RH, in line with ASTM recommendations, to ensure accurate performance representation.

The solid material properties listed are measured along the vertical (ZX) orientation. As outlined in the Isotropic Properties section, Figure 4 materials demonstrate consistent performance across print orientations, eliminating the need for specific part orientation to achieve optimal mechanical results.

LIQUID MATERIAL			
Property	**Test Method / Condition**	**Metric**	**Imperial**
Viscosity	Brookfield Viscometer @ 25 °C (77 °F)	300 cps	726 lb/ft·hr
Color		Gray	
Liquid Density	Kruss K11 Force Tensiometer @ 25 °C (77 °F)	1.07 g/cm^3	0.036 lb/in^3
Default Print Layer Thickness	Internal	50 µm	0.002 in
Speed - Standard Mode	Internal	mm/hr	48
Package Volume		1 kg bottle 2.5 kg cartridge 9 kg container	

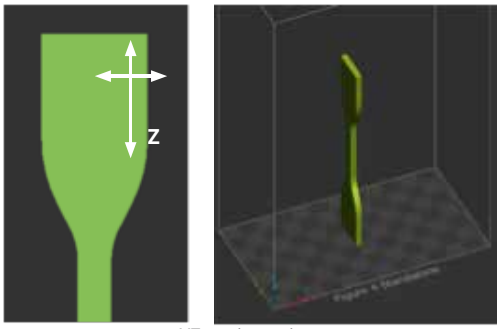
SOLID MATERIAL						
Property	**ASTM Method**	**Metric**	**Imperial**	**ISO Method**	**Metric**	**Imperial**
	PHYSICAL					
Solid Density 24 Hour	ASTM D792	1.15 g/cm^3	0.042 lb/in^3	ISO 1183	1.15 g/cm^3	0.042 lb/in^3
Water Absorption	ASTM D570	0.99%	0.99%	ISO 62	0.99%	0.99%
	MECHANICAL				**MECHANICAL**	
Tensile Strength Ultimate	ASTM D638	61 MPa	8800 psi	ISO 527 -1/2	58 MPa	8200 psi
Tensile Strength at Yield	ASTM D638	61 MPa	8800 psi	ISO 527 -1/2	58 MPa	8200 psi
Tensile Modulus	ASTM D638	2400 MPa	350 ksi	ISO 527 -1/2	2275 MPa	373 ksi
Elongation at Break	ASTM D638	4.6%	30%	ISO 527 -1/2	15%	20%
Elongation at Yield	ASTM D638	4.6%	4.6%	ISO 527 -1/2	4.3%	4.1%
Flex Strength	ASTM D790	87 MPa	12700 psi	ISO 178	89 MPa	12500 psi
Flex Modulus	ASTM D790	2200 MPa	320 ksi	ISO 178	2783MPa	346 ksi
Izod Notched Impact	ASTM D256	21 J/m	0.4 ft-lb/in	ISO 180-A	2.9 kJ/m^2	1.4 ft-lb/in^2
Izod Unnotched Impact	ASTM D4812	150 J/m	3 ft-lb/in	ISO 180-U	12.6 kJ/m^2	6 ft-lb/in^2
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)	60 °C	142 °F	ISO 6721-1/1 (E"at 1C/min)	60 °C	142 °F
HDT @ 0.455 MPa/66 PSI	ASTM D648	72°C	162 °F	ISO 75- 1/2 B	70 °C	157 °F
HDT @ 1.82 MPa/264 PSI	ASTM D648	59 °C	138 °F	ISO 75-1/2 A	56°C	133°F
CTE below Tg	ASTM E831	81 ppm/°C	45 ppm/°F	ISO 11359-2	81 ppm/°C	45 ppm/°F
CTE above Tg	ASTM E831	166 ppm/°C	92 ppm/°F	ISO 11359-2	166 ppm/°C	92 ppm/°F
UL Flammability	UL94	HB	HB			
	ELECTRICAL				**ELECTRICAL**	
Dielectric Strength (V/mil) @ 3.0 mm thickness	ASTM D149	15				
Dielectric Constant @ 1 MHz	ASTM D150	3.17				
Dissipation Factor @ 1 MHz	ASTM D150	0.02				
Volume Resistivity (ohm-cm)	ASTM D257	7.16x10^{15}				

ISOTROPIC PROPERTIES

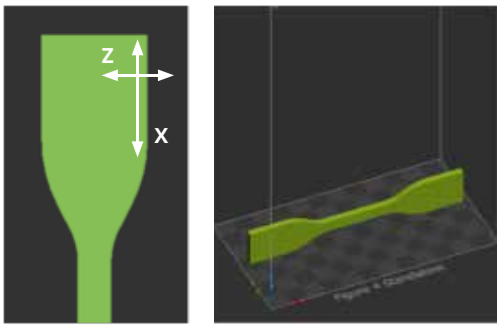
Figure 4 technology enables parts with consistent mechanical performance across all print orientations (XYZ axes).

This isotropic behavior means components deliver uniform strength and reliability, regardless of build direction, offering greater design flexibility and eliminating the need for orientation-specific optimization during printing.

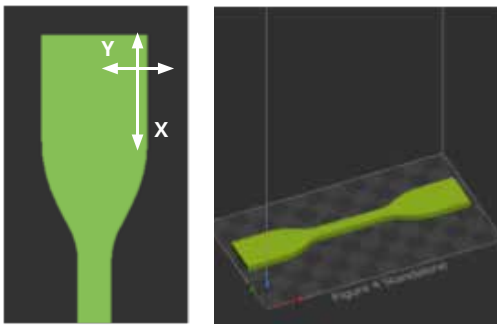
SOLID MATERIAL					
METRIC	METHOD	METRIC			
MECHANICAL					
METRIC	METHOD	ZY	XZ	XY	Z45
Tensile Strength Ultimate	ASTM D638	61 MPa	56 MPa	62 MPa	58 MPa
Tensile Strength at Yield	ASTM D639	61 MPa	56 MPa	62 MPa	58 MPa
Tensile Modulus	ASTM D640	2400 MPa	2300MPa	2200 MPa	2300 MPa
Elongation at Break	ASTM D641	30%	17%	20%	15%
Elongation at Yield	ASTM D642	4.6%	4.5%	4.8%	4.3%
Flex Strength	ASTM D790	87 MPa	88 MPa	78 MPa	71 MPa
Flex Modulus	ASTM D790	2200 MPa	2200 MPa	1800 MPa	1600 MPa
Izod Notched Impact	ASTM D256	21 J/m	24 J/m	23 J/m	24 J/m
Shore Hardness	ASTM D2240	82 D	N/A	N/A	N/A



YZ - orientation



XZ - orientation



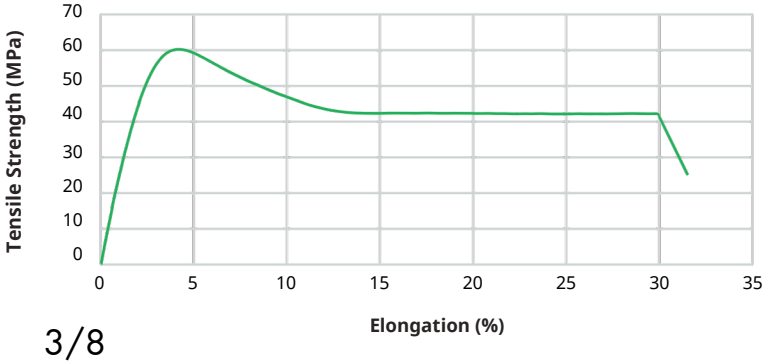
XY - orientation

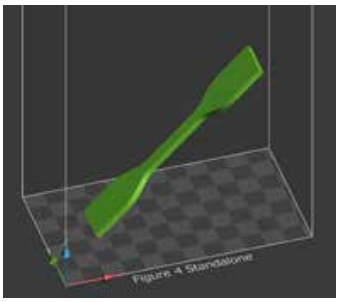
STRESS-STRAIN CURVE

Figure 4 Rigid Gray demonstrates thermoplastic-like behavior, showing a long plastic deformation phase with ductile necking before fracture.

This characteristic provides enhanced flexibility and reliable performance in applications requiring snap-fit or clip functionality.

FIGURE 4 RIGID GRAY





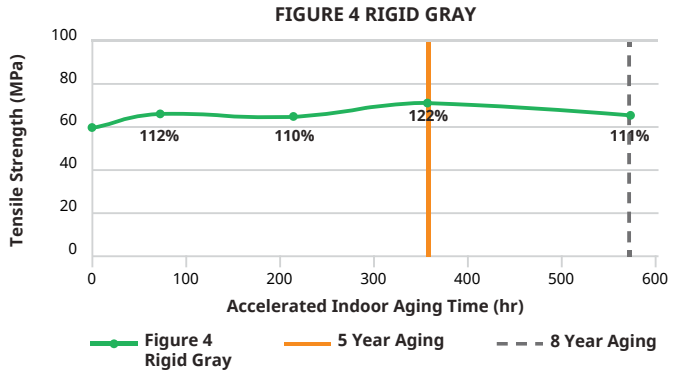
Z45-Degree - orientation

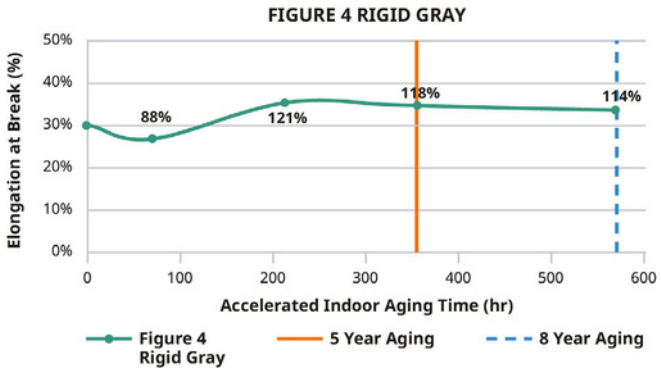
LONG TERM ENVIRONMENTAL STABILITY

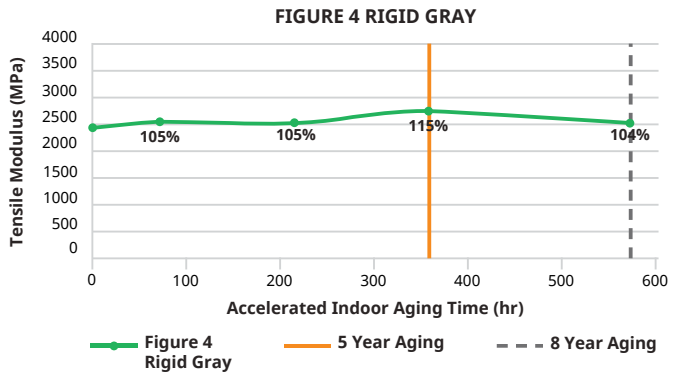
Figure 4 Rigid Gray is designed to deliver long-term resistance to UV exposure and humidity, ensuring consistent performance over time.
The material is tested for mechanical property retention, maintaining a high percentage of its initial strength and stability, providing engineers with reliable data for real-world design and application decisions.

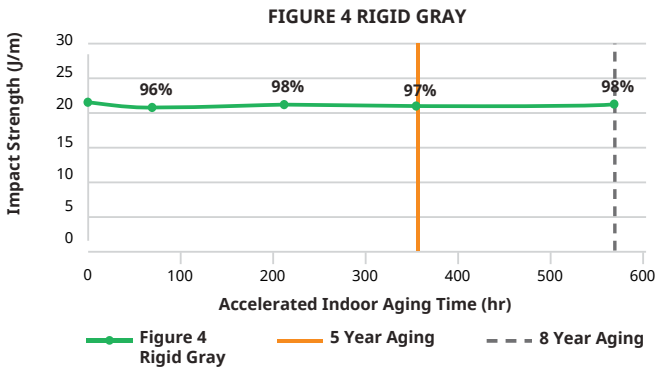
INDOOR STABILITY: Tested as per ASTM D4329 standard method to evaluate resistance to UV exposure and controlled humidity conditions.

INDOOR STABILITY



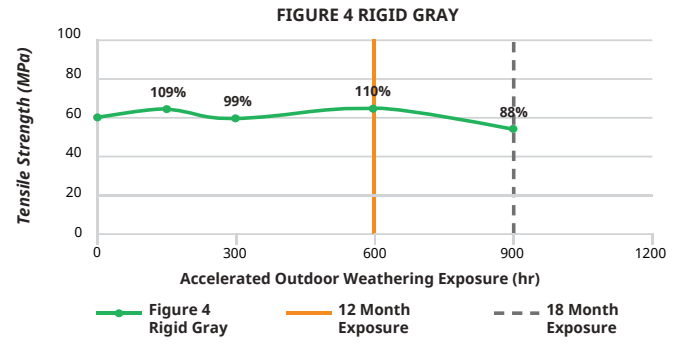


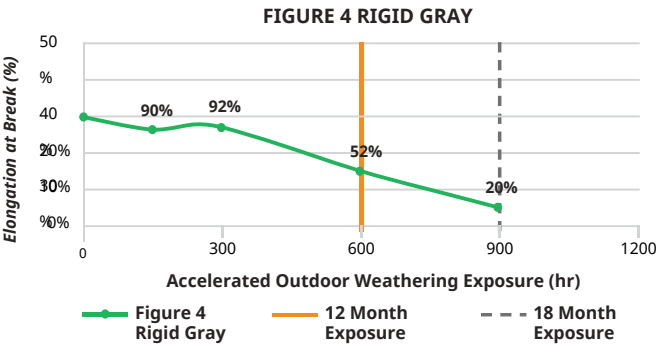


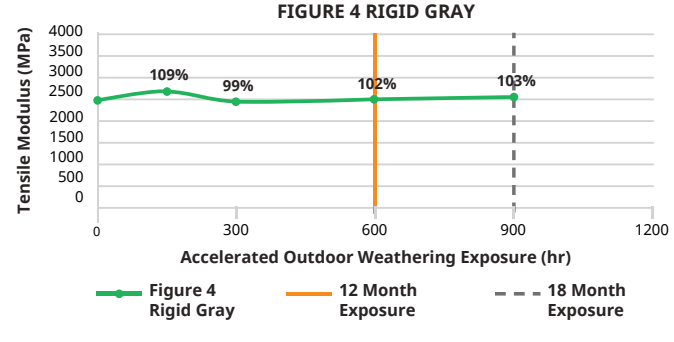


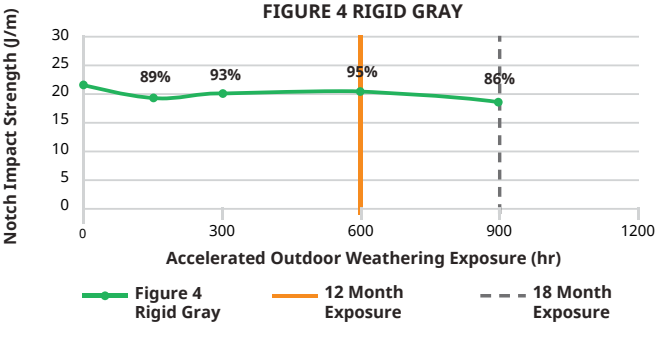
OUTDOOR STABILITY: Tested per ASTM G154 standard method.

OUTDOOR STABILITY









AUTOMOTIVE FLUID COMPATIBILITY

Material compatibility with hydrocarbons and cleaning agents is essential for ensuring long-term performance in automotive applications.
Figure 4: Rigid Gray parts were tested for sealed and surface contact resistance as per USCAR2 test conditions.

Testing was conducted in two stages:

- 7-day immersion, followed by mechanical property evaluation.
- 30-minute immersion, followed by testing again after 7 days for comparison.

The results reflect the measured mechanical stability and retention of properties over each testing period.

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 1817, 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 (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

FIGURE 4 RIGID GRAY

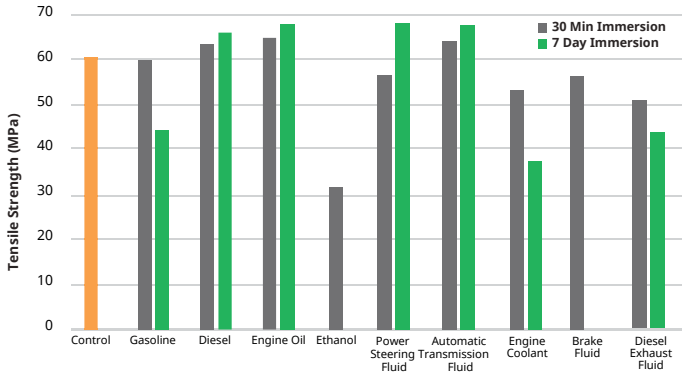
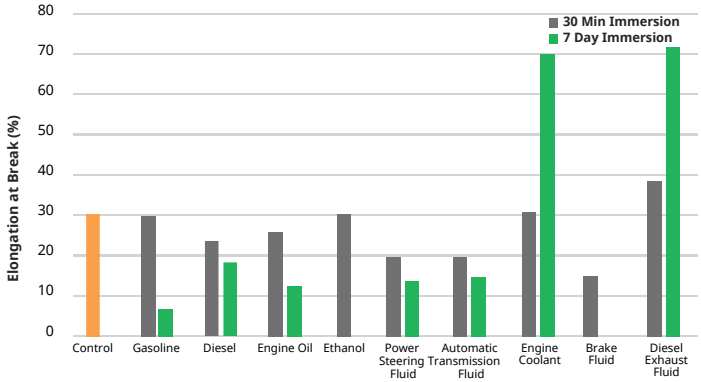


FIGURE 4 RIGID GRAY



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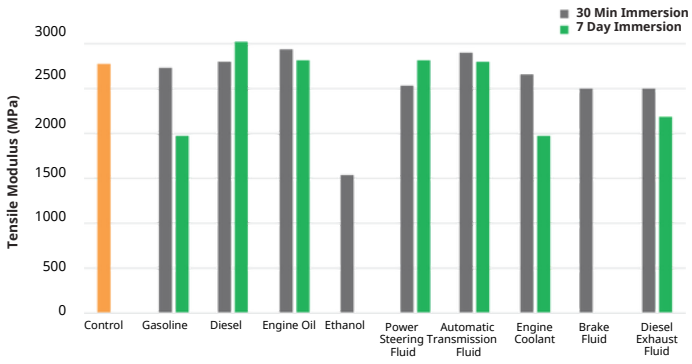

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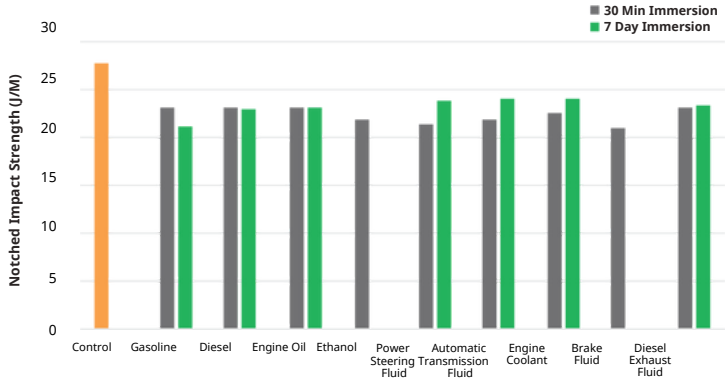


CHEMICAL COMPATIBILITY

Material compatibility with cleaning agents is a key factor in determining long-term performance and part reliability.
Figure 4: Rigid Gray samples were tested for sealed and surface contact resistance as per ASTM D543 test conditions.

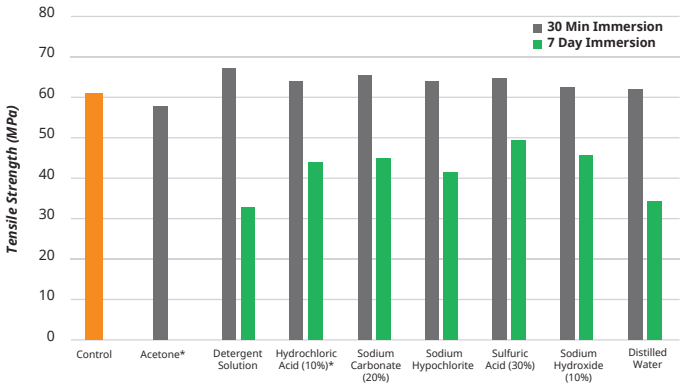
Testing was conducted under two evaluation cycles:

- 7-day immersion, followed by mechanical property comparison.
- 30-minute immersion, with data recorded again after 7 days.

The results indicate the retention of mechanical integrity and stability across both conditions.
*Materials marked with an asterisk were not subjected to 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%)
Distilled Water

FIGURE 4 RIGID GRAY



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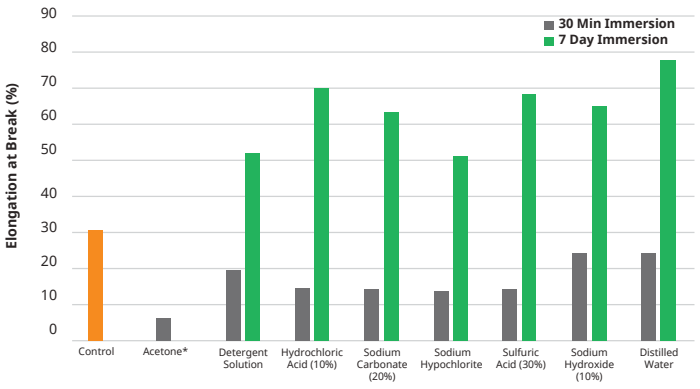

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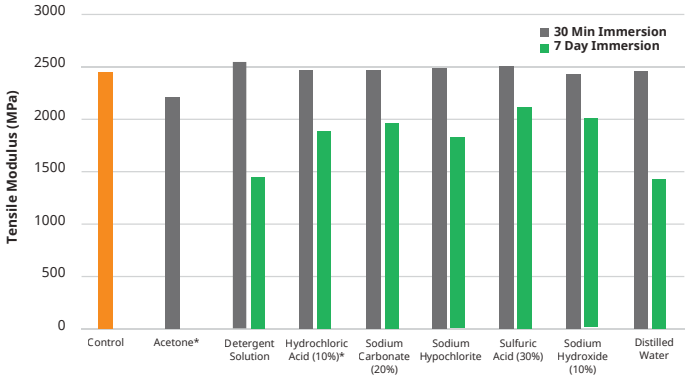

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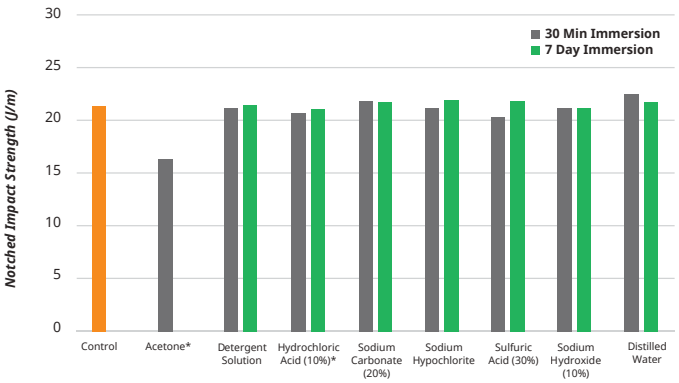

BIOCOMPATIBILITY

Samples of Figure 4® Rigid Gray, printed and processed as per the standard post-processing guidelines, were evaluated by an external biological testing laboratory in accordance with ISO 10993-5 — Biological Evaluation of Medical Devices: Tests for In Vitro Cytotoxicity.
The results confirm that Figure 4® Rigid Gray meets the biocompatibility requirements under the specified test conditions.
It remains the user's responsibility to ensure that the material's use is appropriate, compliant, and technically suitable for their specific application.
As regulatory standards and material compositions evolve, Mech Power recommends that users periodically validate the material's biocompatibility status to ensure continued adherence to relevant requirements.

POST-PROCESSING INSTRUCTIONS (REQUIRED FOR ISO 10993-5 COMPLIANCE)

MIXING INSTRUCTIONS

To ensure consistent print quality, thoroughly mix the resin before printing, as pigment may settle over time.

For 1 kg Bottle

- Roll the bottle for 1 hour before first use using a resin mixer.
- Roll for 10 minutes before subsequent uses.

For 2.5 kg Cartridge

- Shake vigorously for 2 minutes before installation.
- For modular systems, roll the cartridge for 20 minutes at the start of each day.

For 9 kg Container

- Shake vigorously for 2 minutes before installation.

Tip: Use the resin mixer to stir material in the tray for 30 seconds between print jobs.

MANUAL CLEANING INSTRUCTIONS

- Clean manually using two IPA containers (wash and rinse).
- Wash parts in IPA for 2.5 minutes with agitation.
- Rinse in clean IPA for another 2.5 minutes with agitation.
- Do not exceed 10 minutes total IPA exposure to maintain mechanical properties.
- Gentle brushing or manual agitation can improve cleaning efficiency.
- Replace IPA when cleaning effectiveness decreases.

DRYING INSTRUCTIONS

- Oven dry at 35 °C for 25 minutes.

UV CURE TIME

- UV cure the parts for 90 minutes using a suitable UV post-curing unit.