

# EPU 40

**EPU 40 is a high-performance polyurethane elastomer that is a good choice for applications where high elasticity and tear resistance are needed.**

<b>Tensile Properties</b> ASTM D412, Die C, 500 mm/min	<b>Metric</b>	<b>US</b>
Tensile Modulus	8 MPa	1200 psi
Elongation at Break	400%	400%
Stress at 50% Elongation	2 MPa	290 psi
Stress at 100% Elongation	3 MPa	440 psi
Stress at 200% Elongation	6 MPa	870 psi
Ultimate Tensile Strength	19 MPa	2700 psi

<b>Other Mechanical Properties</b>	<b>Metric</b>	<b>US</b>
Tear Strength, Die C (die cut), ASTM D624	25 kN/m	140 lbf/in
Compression Set, 23 °C, 72 h, ASTM D395-B	35% (20%*)	
Bayshore Rebound Resilience, ASTM D2632	17% (30%*)	

<b>Thermal Properties</b>	<b>Metric</b>	<b>US</b>
T <sub>g</sub> (DMA, tan(d)), ASTM D4065	10 °C	50 °F

<b>Dielectric/Electric Properties</b>		
Dielectric Constant, ASTM D150	4	
Dissipation Factor, ASTM D150	0.03	

<b>General Properties</b>		
Hardness, ASTM D2240	72 (Instant), 71 (5 sec), Shore A	
Bulk Density, ASTM D792	1.03 g/mL	
Relative Abrasion Volume Loss, ISO-4649 A	170 mm <sup>3</sup>	

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Parts were processed using an M series printer and a Smart Part Washer with DPM or VF 1 as the solvent.

\*Values obtained from materials printed using software versions prior to v1.33.

<b>Liquid Properties</b>	
Liquid Density (Part A)	0.99 g/mL
Liquid Density (Part B)	0.95 g/mL
Liquid Density (Part A+B)	0.99 g/mL
Part A:B Volume Ratio (Mass Ratio)	10.0 (10.4)
25 °C Viscosity (Part A)	5100 cP
25 °C Viscosity (Part B)	110 cP
25°C Viscosity (Part A+B)	3600 cP

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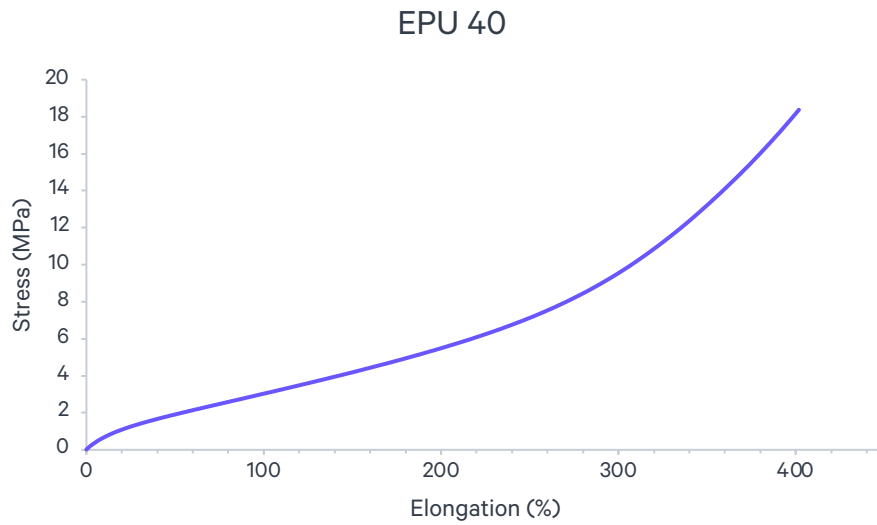
# EPU 40

## Extended TDS

# EPU 40 Mechanical Properties

## Representative Tensile Curve

ASTM D412, Die C, 500 mm/min



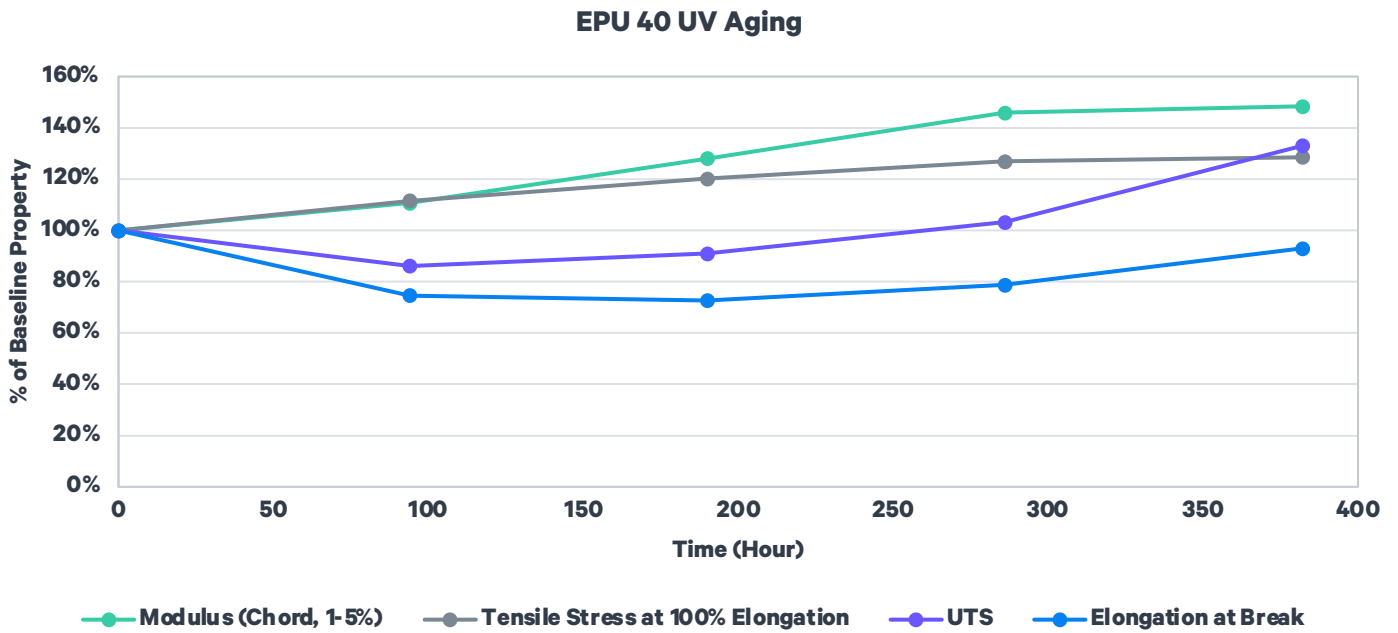
# EPU 40 Chemical Compatibility

	Mass Gain (%)
<b>Household Chemicals</b>	
Bleach (NaClO, 5%)	< 5%
Sanitizer (NH <sub>4</sub> Cl, 10%)	< 5%
Distilled Water	< 5%
Sunscreen (Banana Boat, SPF 50)	5 – 15%
Detergent (Tide, Original)	< 5%
Windex Powerized Formula	5 – 15%
Hydrogen Peroxide (30%)	15 – 30%
Ethanol (95%)	> 30%
<b>Industrial Fluids</b>	
Engine Oil (Havoline SAE 5W-30)	< 5%
Brake Fluid (Castrol DOT-4)	15 – 30%
Airplane Deicing Fluid (Type I Ethylene Glycol)	< 5%
Airplane Deicing Fluid (Type I Propylene Glycol)	< 5%
Airplane Deicing Fluid (Type IV Ethylene Glycol)	< 5%
Airplane Deicing Fluid (Type IV Propylene Glycol)	< 5%
Transmission Fluid (Havoline Synthetic ATF)	< 5%
Engine Coolant (Havoline XLC, 50%/50% premixed)	< 5%
Diesel (Chevron #2)	> 30%
Gasoline (Chevron #91)	> 30%
Skydrol 500B-4	> 30%
<b>Strong Acid/Base</b>	
Sulfuric Acid (30%)	> 30%
Sodium Hydroxide (10%)	< 5%

*\*Percent weight gained after one week submersion following ASTM D543. Values do not represent changes in dimension or mechanical properties.*

# EPU 40 UV Aging

Natural polymer aging can occur in the presence of light, sun, and heat. Carbon evaluated the UV aging performance of EPU 40 using ASTM D4459, which is intended to simulate indoor exposure of solar radiation through glass.



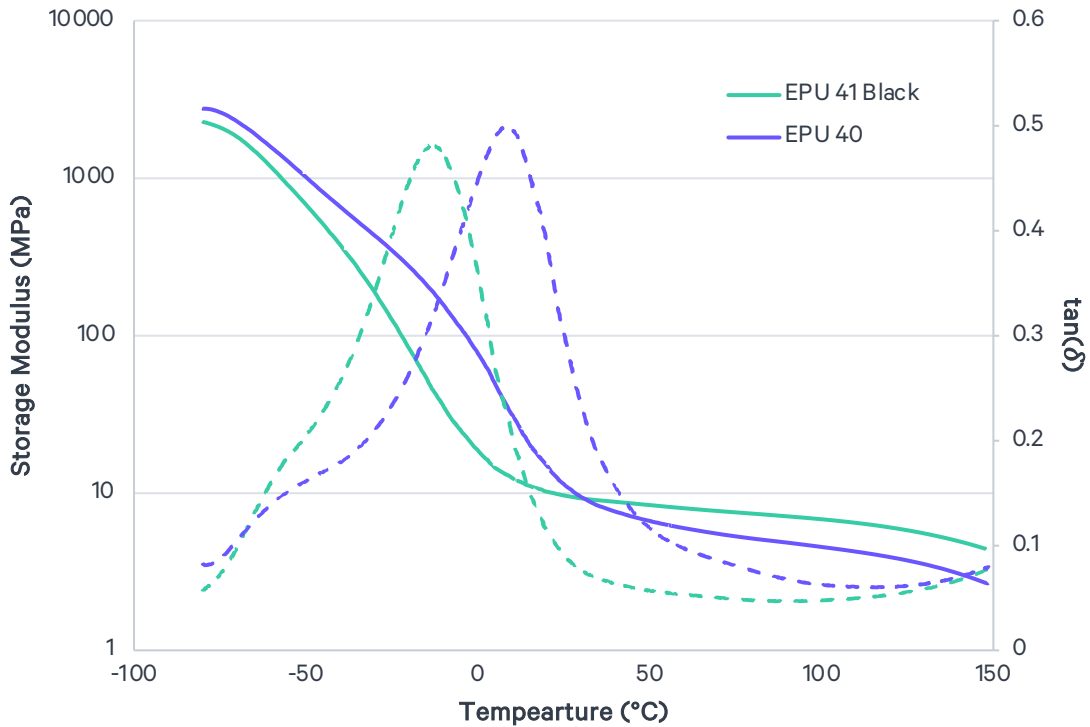
ASTM D4459: Q-Sun XE-1, 0.8 W/m<sup>2</sup>/nm at 420 nm, 55 °C  
ASTM D412: Die C, 500 mm/min, average values represented

# EPU 40 Dynamic Mechanical Analysis (DMA)

In impact and shock performance, damping properties are important. EPU 40 has a higher  $T_g$  compared to EPU 41 ( $\tan(\delta)$  peak) and overall higher damping coefficient ( $\tan(\delta)$ ), indicating better damping performance at a broader temperature window.

EPU 41  $T_g(\tan(\delta)) = -10\text{ }^\circ\text{C}$

EPU 40  $T_g(\tan(\delta)) = 10\text{ }^\circ\text{C}$



ASTM D4065

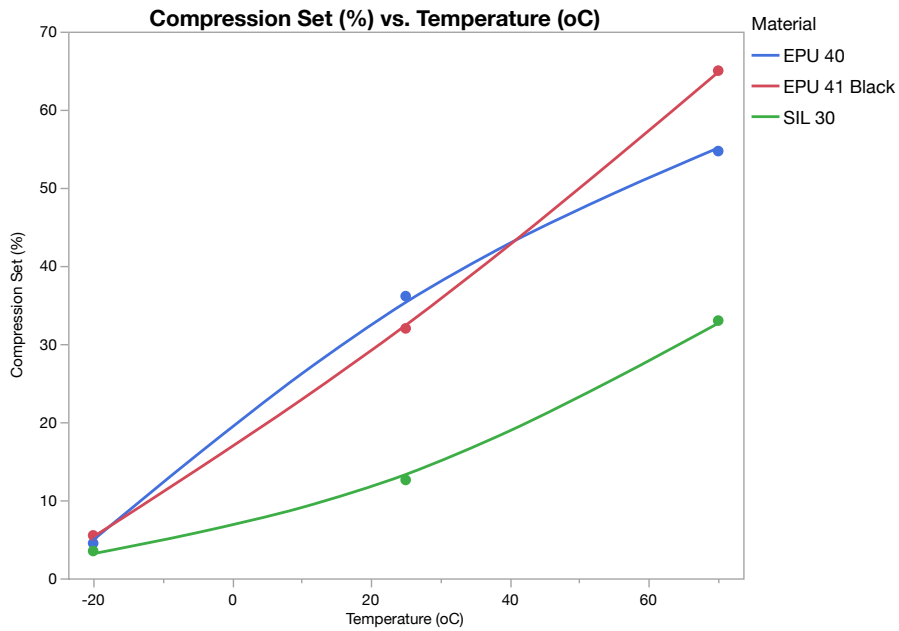
Q800 Tension Mode, Ramp Rate 2 °C/min, 1 Hz, 0.1% strain

Samples were post processed using DPM Smart Part Washer.



# EPU 40 Compression Set

In many elastomeric applications, compression set is an important property that reflects the amount of residual deformation after holding compression at a fixed time, temperature and displacement. EPU 40, EPU 41 Black, and SIL 30 were compressed to 25% of its original sample height and held at various temperatures (-20, 4, 25, and 70 °C) for 72 hours. The compression set measurement is the residual deformation of a test specimen where 0% represents full recovery of the original thickness and 100% indicates no recovery. The image below summarizes the compression set results for various Carbon elastomers.



ASTM D394-14 Method B

# EPU 40 Biocompatibility

## Biocompatibility Testing

Printed parts were provided to NAMSA for evaluation in accordance with ISO 10993-5, *Biological evaluation of medical devices - Part 5: Tests for in vitro cytotoxicity*, and ISO 10993-10, *Biological evaluation of medical devices - Part 10: Tests for irritation and skin sensitization* (specifically the Closed Patch Sensitization Study). Parts were processed using an M series printer and a Smart Part Washer with VF 1 as the solvent. The results for all tests indicated that EPU 40 passed the requirements for biocompatibility according to the above tests. **Carbon makes no representation and is not responsible for the results of any biocompatibility tests other than those specified above.**

## Disclaimer

Biocompatibility results may vary based on printing and/or post-processing procedures.

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