## EPU 45 is an energy-damping elastomer that has exceptional damping performance and printability.

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Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	17 MPa	2400 psi
Elongation at Break		290%	290%
Stress at 50% Elongation		3 MPa	430 psi
Stress at 100% Elongation		4 MPa	580 psi
Stress at 200% Elongation		9 MPa	1300 psi
Ultimate Tensile Strength		24 MPa	3500 psi

Other Mechanical Properties	Test Standard	Metric	US
Tear Strength	ASTM D624 Die C (die cut)	28 kN/m	160 lbf/in
Compression Set	ASTM D395-B 23 °C, 72 h	31%	

Thermal Properties	Test Standard	Metric	US
T <sub>g</sub> (DMA, tan(d))	ASTM D4065, 2 °C/min, 1 Hz	30 °C	86 °F

Dielectric/Electric Properties	Test Standard	
Dielectric Constant	ASTM D150	5.51
Dissipation Factor	A31W 0100	0.0024
Dielectric Strength	ASTM D149	19 kV/mm
Volume Resistivity	ASTM D257	4.0 x 10 <sup>14</sup> ohm-cm

General Properties	Test Standard	
Shore A Hardness	ASTM D2240	77 (Instant), 62 (5 sec)
Bulk Density	ASTM D792	1.06 g/mL
Relative Abrasion Volume Loss	ISO-4649 A	457 mm <sup>3</sup>

Parts were processed using an L series printer and centrifugal spinner. The test articles were baked following the standard baking schedule for EPU 45.

Liquid Properties	
Liquid Density (Part A)	1.04 g/mL
Liquid Density (Part B)	0.97 g/mL
Liquid Density (Part A+B)	1.02 g/mL
Part A:B Volume Ratio (Mass Ratio)	2.665 (2.857)
25 °C Viscosity (Part A)	3800 cP
25 °C Viscosity (Part B)	150 cP
25 °C Viscosity (Part A+B)	1400 cP

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### **Extended TDS**

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## **EPU 45 with IPA Washing**

Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	18 MPa	2600 psi
Elongation at Break		240%	240%
Stress at 50% Elongation		3 MPa	430 psi
Stress at 100% Elongation		4 MPa	580 psi
Stress at 200% Elongation		9 MPa	1300 psi
Ultimate Tensile Strength		24 MPa	3500 psi

Other Mechanical Properties	Test Standard	Metric	US
Tear Strength	ASTM D624 Die C (die cut)	30 kN/m	171 lbf/in

Parts were processed using an L series printer and washed by isopropanol for 1 min. The cleaned test articles were baked following the standard baking schedule for EPU 45.

## **EPU 45 Mechanical Properties**

#### Representative Tensile Curve & Comparison with EPU 43

ASTM D412, Die C, 500 mm/min



#### EPU 45 Dynamic Mechanical Analysis (DMA) EPU 45 vs. EPU 43

The figure below shows the thermomechanical behavior of EPU 45 compared to EPU 43. EPU 45 has a T<sub>g</sub> at 30 °C and a room temperature storage modulus around 65 MPa.



#### **EPU 45 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, EPU 43, EPU 44 Gray, EPU 45, and SIL 30 were compressed to 25% of its original sample height and held at various temperatures (-20, 23, 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 D395-B

## **EPU 45 Chemical Compatibility**

	Mass Gain* (%)
Household Chemicals	
Bleach (NaClO, 5%)	< 5%
Sanitizer (NH4Cl, 10%)	5 - 15%
Distilled Water	< 5%
Sunscreen (Banana Boat, SPF 50)	5 - 15%
Detergent (Tide, Original)	5 - 15%
Windex Powerized Formula	5 - 15%
Hydrogen Peroxide (30%)	> 30%
Ethanol (95%)	> 30%
Industrial Fluids	
Diesel (Chevron #2)	< 5%
Strong Acid/Base	
Sulfuric Acid (30%)	> 30%
Sodium Hydroxide (10%)	< 5%
Sebum	5 - 15%

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

### **EPU 45 Biocompatibility**

#### **Biocompatibility Testing**

Test articles in the form of printed parts were provided to NAMSA for evaluation and met the requirements of the following test:

Biocompatibility Testing	Test Standard
Sensitization	ISO 10993-10: Biological evaluation of medical devices – Part 10: Tests for skin sensitization (Closed patch sensitization study in guinea pigs)

Test articles were processed using an L series printer and a centrifugal spinner. The cleaned test articles were baked following the standard baking schedule for EPU 45 (see below). Additional details about the test are available upon request.

Baking schedule: Ramp from room temperature to 120 °C over 75 minutes; Hold at 120 °C for 8 hours.

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