EPU Pro 50 & 90 Black

EPU Pro Black resins are single-part elastomers that offer tunable material stiffness and extended pot life. These resins are well suited for low-volume product development and high-volume production applications.

Table of Contents

EPU Pro 50 and 90 Black Overview

	EPU Pro 50 Black	EPU Pro 90 Black
Printers	M1, M2, M3, M3 Max, L1	
Post-processing options	• DPMA (dipropylene glycol methyl ether acetate) or PGDA (propylene glycol diacetate) wash followed by IPA wash • Centrifugal spinning	
Curing	Programmable oven schedule: • Ramp to 30 °C/50%RH over 10 MIN. • Ramp to 90 °C/80%RH over 30 MIN, hold for 4.5 HRS. • Ramp to 40 °C (humidity off) over 30 MIN.	
Baking	Inert bake Programmable oven schedule: • Hold at 30 °C for 30 MIN, ramp to 120 °C over 30 MIN. • Hold at 120 °C for 8 HRS.	
Alternate curing and baking	• Low-volume workflow is planned to be released at a later date.	

EPU Pro 50 and 90 Black

Tensile Properties	Test Standard	EPU Pro 50 Black		EPU Pro 90 Black	
		Metric	US	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min 0.8 mm thickness	3 MPa	400 psi	29 MPa	4200 psi
Elongation at Break		820%	820%	440%	440%
Stress at 50% Elongation		1 MPa	150 psi	5 MPa	700 psi
Ultimate Tensile Strength		14 MPa	2000 psi	22 MPa	3200 psi
Tensile Modulus	ASTM D412 Die C 500 mm/min 2 mm thickness	3 MPa	400 psi	26 MPa	3800 psi
Elongation at Break		810%	810%	350%	350%
Stress at 50% Elongation		1 MPa	150 psi	5 MPa	700 psi
Ultimate Tensile Strength		11 MPa	1600 psi	21 MPa	3000 psi

Other Mechanical Properties	Test Standard	EPU Pro 50 Black		EPU Pro 90 Black	
		Metric	US	Metric	US
Tear Strength, 0.8 mm thickness	ASTM D624 Die C (die cut)	20 kN/m	110 lbf/in	45 kN/m	260 lbf/in
Tear Strength, 2 mm thickness		21 kN/m	120 lbf/in	43 kN/m	250 lbf/in
Ross Flex, 23 °C	ASTM D1052, 2 mm thickness, 90° bending	> 100,000 cycles		> 100,000 cycles	
Ross Flex, -10 °C		> 100,000 cycles		> 100,000 cycles	
Compression Set	ASTM D395-B 23 °C, 72 h	29%		37%	

Thermal Properties	Test Standard	EPU Pro 50 Black		EPU Pro 90 Black	
		Metric	US	Metric	US
T_g (DMA, tan(d))	ASTM D4065, 2 °C/min, 1 Hz	-52 °C	-62 °F	-12 °C	10 °F

Dielectric/Electric Properties	Test Standard	EPU Pro 50 Black	EPU Pro 90 Black
Dielectric Constant	ASTM D150	10.5	10.9
Dissipation Factor		0.150	0.00124
Dielectric Strength	ASTM D149	316 V/mm	208 V/mil
Volume Resistivity	ASTM D257	1.25 x 10^{12} ohm-cm	9.90 x 10^{17} ohm-cm

General Properties	Test Standard	EPU Pro 50 Black	EPU Pro 90 Black
Shore A Hardness	ASTM D2240	53 (Instant), 54 (5 sec)	88 (Instant), 89 (5 sec)
Bayshore Resilience	ASTM D2632	44%	32%
Bulk Density	ASTM D792	1.06 g/cm^3	1.11 g/cm^3
Relative Abrasion Volume Loss	ISO-4649 A	98 mm^3	102 mm^3

Parts were processed using an L series printer and centrifugal spinner (EPU Pro 90) or PGDA wash followed by IPA wash (EPU Pro 50). The cleaned parts were cured and baked following the EPU Pro 50 and 90 Black standard workflow curing and baking schedule.

EPU Pro 50 and 90 Black

Liquid Properties	EPU Pro 50 Black	EPU Pro 90 Black
Liquid Density	1.02 g/mL	1.06 g/mL
25 °C Viscosity	6210 cP	9680 cP

Disclaimer

EPU Pro 50 and 90 Black - EAP is a Carbon Early Access Technology version of this Resin provided pursuant to Carbon's Early Access Program ("EAP"). Early Access Technologies are pre-commercial offerings not yet at production scale and may exhibit more variability in performance than generally-available resins. Customers should use them cautiously, fully aware of their limitations and potential impact on Printer use and printed part output. Support for these technologies may be limited through standard Carbon Support resources or provided on a case-by-case basis. Access may be restricted to a select group of users during this phase. Carbon may change, withdraw or opt to delay or not commercially release these technologies at any time and may introduce fees or additional terms with prior notice.

The information provided herein is for informational purposes only based on present data available to Carbon. This information should not be used for testing, design specification or quality control purposes. Each Carbon customer using the resin is solely responsible for testing and evaluating the performance of any resin within the context of the customer's application or use of the resin. End-use material performance and test results may vary based on printing and/or post-processing procedures. Many variables can affect the properties of the resin and printed article, including but not limited to, design, processing, color treatment, operating and end-use conditions, test conditions, etc. In addition, product specifications are subject to change without notice. The information applies only to the Resin designated herein as sold by Carbon as used to make the test article and does not apply to use in any process, use, application, or in combination with any other material. Accordingly, Carbon makes no guarantee or representation and assumes no liability for customer's use of a resin in any process, use, application, or in combination with any other material. This information and Carbon's technical advice are given to you in good faith but without warranty. Carbon's sole warranty is that our products will meet our standard specifications in effect at the time of shipment and the exclusive remedy offered for breach of such warranty is limited to refund of purchase price or replacement of the product shown to be other than warranted.

TO THE FULLEST EXTENT PERMITTED BY LAW, CARBON MAKES NO REPRESENTATION, PROMISE, EXPRESS WARRANTY, IMPLIED WARRANTY OF MERCHANTABILITY, IMPLIED WARRANTY FOR A PARTICULAR PURPOSE, OR OTHER IMPLIED WARRANTY CONCERNING THE SUITABILITY OF ANY MATERIAL/RESIN FOR USE IN ANY SPECIFIC APPLICATION OR END USE OR THE SUITABILITY OF ANY PRINTED ARTICLE OR END-USE PRODUCT INCORPORATING A PRINTED ARTICLE MADE, WHOLLY OR IN PART, FROM ANY MATERIAL OR RESIN.

Carbon, Inc. | www.carbon3d.com
1089 Mills Way Redwood City, CA 94063
1 (650) 285-6307

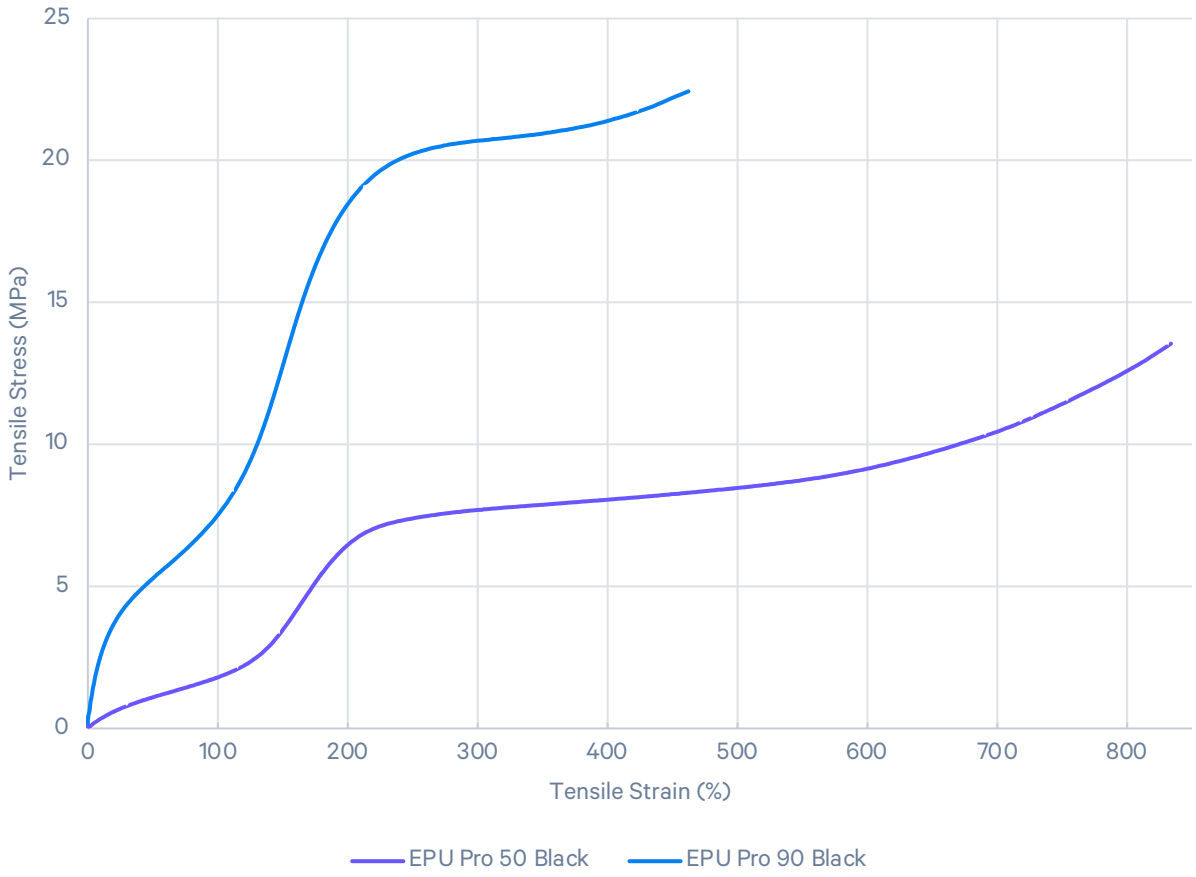
EPU Pro 50 & 90 Black

Extended TDS

EPU Pro 50 and 90 Black Mechanical Properties

Representative Tensile Curve & Comparison

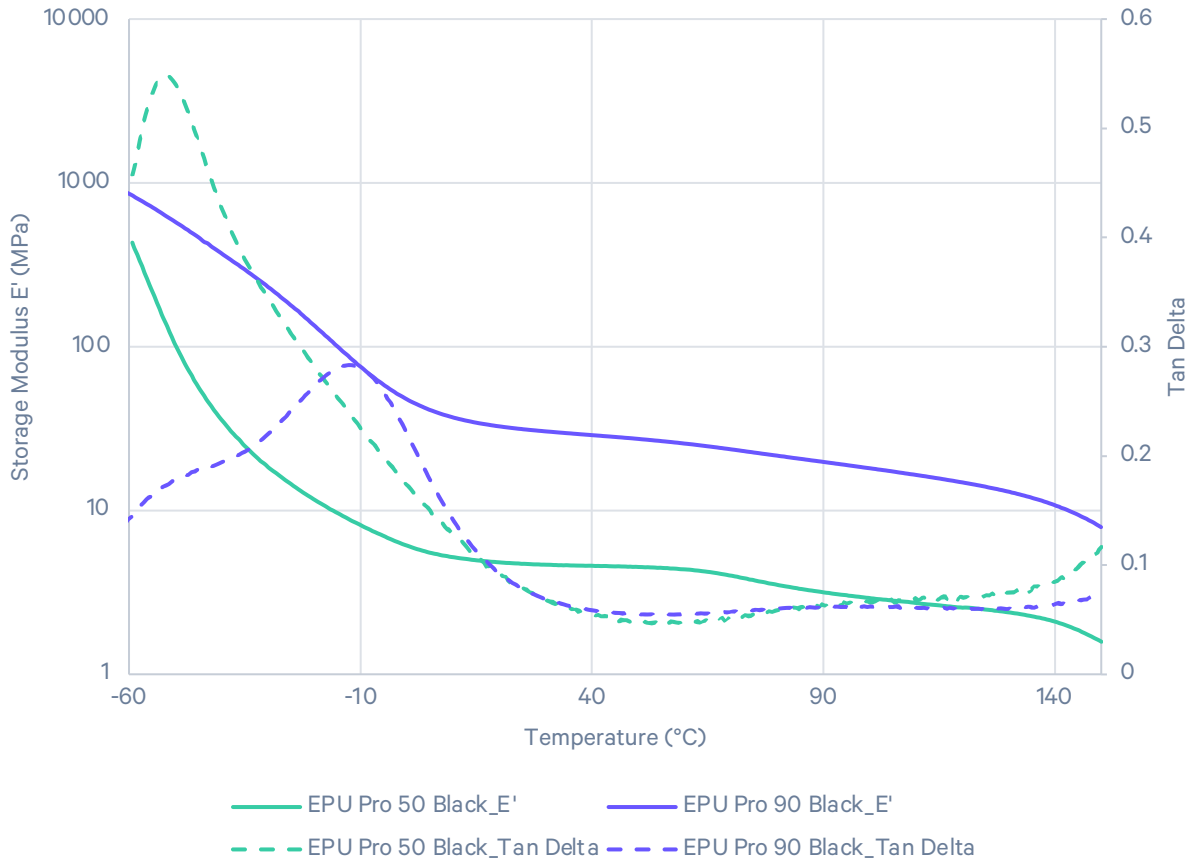
ASTM D412, Die C, 500 mm/min, 0.8 mm thickness



Parts were processed using an L series printer and centrifugal spinner (EPU Pro 90 Black) or PGDA wash followed by IPA wash (EPU Pro 50 Black). The cleaned parts were cured and baked following the EPU Pro 50 and 90 Black standard workflow curing and baking schedule.

EPU Pro 50 and 90 Black Dynamic Mechanical Analysis (DMA)

The figure below shows the thermomechanical behavior of EPU Pro 50 and 90 Black. Aside from the storage modulus difference between the two, the glass transition temperatures are also different, with EPU Pro 50 Black at -52 °C and EPU Pro 90 Black at -12 °C.

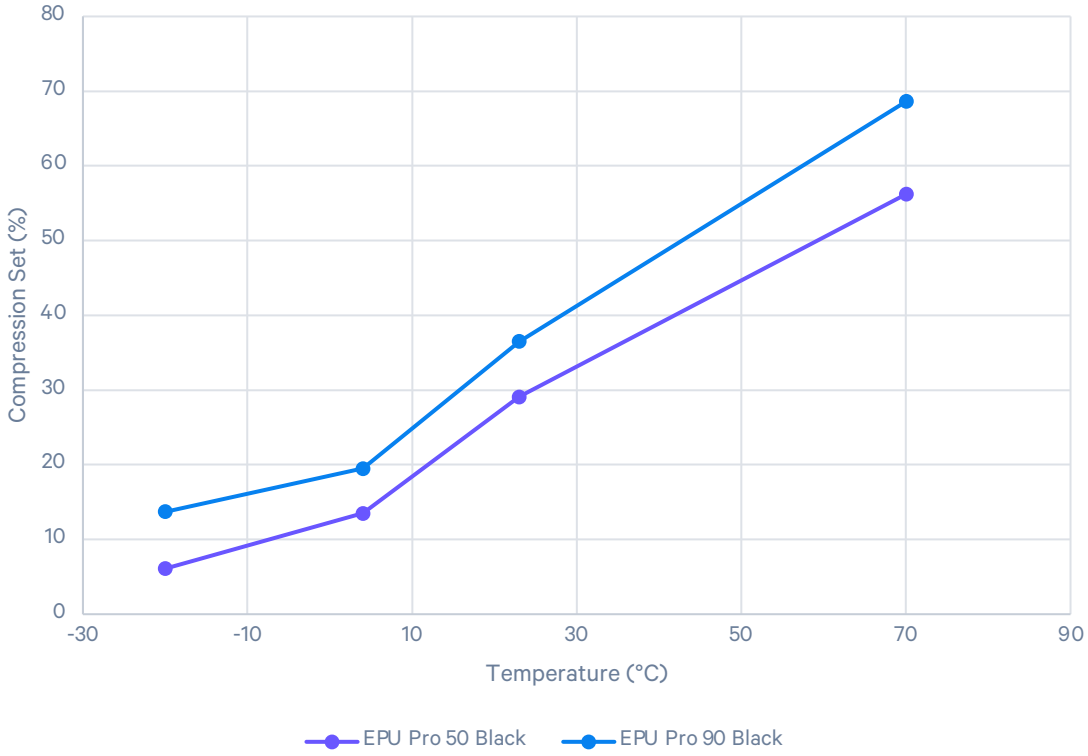


Parts were processed using an L series printer and centrifugal spinner (EPU Pro 90 Black) or PGDA wash followed by IPA wash (EPU Pro 50 Black). The cleaned parts were cured and baked following the EPU Pro 50 and 90 Black standard workflow curing and baking schedule.

Test method: ASTM D4065, 2 °C/min, 1 Hz

EPU Pro 50 and 90 Black 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 Pro 50 and 90 Black were compressed to 25% of its original sample height and held at various temperatures (-20, 4, 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.



Parts were processed using an L series printer and centrifugal spinner (EPU Pro 90 Black) or PGDA wash followed by IPA wash (EPU Pro 50 Black). The cleaned parts were cured and baked following the EPU Pro 50 and 90 Black standard workflow curing and baking schedule.

Test Method: ASTM D395-14 Method B

EPU Pro 50 and 90 Black Chemical Compatibility

	Mass Gain* (%)	
	EPU Pro 50 Black	EPU Pro 90 Black
Household Chemicals		
Bleach (NaClO, 5%)	< 5%	< 5%
Sanitizer (NH_4Cl, 10%)	< 5%	< 5%
Distilled Water	< 5%	< 5%
Sunscreen (Banana Boat, SPF 50)	< 5%	< 5%
Detergent (Tide, Original)	< 5%	< 5%
Windex Powerized Formula	5 – 15%	5 – 15%
Hydrogen Peroxide (30%)	15 – 30%	15 – 30%
Ethanol (95%)	> 30%	> 30%
Industrial Fluids		
Diesel (Chevron #2)	5 – 15%	< 5%
Strong Acid/Base		
Sulfuric Acid (30%)	5 – 15%	< 5%
Sodium Hydroxide (10%)	< 5%	< 5%

Parts were processed using an L series printer and centrifugal spinner (EPU Pro 90 Black) or PGDA wash followed by IPA wash (EPU Pro 50 Black). The cleaned parts were cured and baked following the EPU Pro 50 and 90 Black standard workflow curing and baking schedule.

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