SIL 30

SIL 30 is a soft, biocompatible, and tear-resistant silicone urethane elastomer that is ideal for skin-contact applications.

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Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	1 MPa	145 psi
Elongation at Break		350%	350%
Stress at 50% Elongation		0.4 MPa	60 psi
Stress at 100% Elongation		0.7 MPa	100 psi
Stress at 200% Elongation		1.5 MPa	220 psi
Ultimate Tensile Strength		3.5 MPa	500 psi

Other Mechanical Properties	Test Standard	Metric	US
Tear Strength	ASTM D624 Die C (die cut)	10 kN/m	57 lbf/in
Compression Set	ASTM D395-B 23 °C, 72 h	10%	10%
Bayshore Rebound Resilience	ASTM D2632	20%	20%

Thermal Properties	Test Standard	Metric	US
T_g (DMA, tan(d))	ASTM D4065	10 °C	50 °F

Dielectric/Electric Properties	Test Standard	
Dielectric Constant	ASTM D150	7.6
Dissipation Factor		0.15

General Properties	Test Standard	
Shore A Hardness	ASTM D2240	35 (Instant), 31 (5 sec)
Bulk Density	ASTM D792	1.07 g/mL

Parts were processed using an M series printer and a Smart Part Washer with VF 1 as the solvent. The washed test articles were baked following the standard baking schedule for SIL 30.

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Liquid Properties	
Liquid Density (Part A)	1.10 g/mL
Liquid Density (Part B)	1.00 g/mL
Liquid Density (Part A+B)	1.05 g/mL
Part A:B Volume Ratio (Mass Ratio)	1.00 (1.10)
25 °C Viscosity (Part A)	97000 cP
25 °C Viscosity (Part B)	320 cP
25 °C Viscosity (Part A+B)	2100 cP

Disclaimer

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.

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SIL 30

Extended TDS

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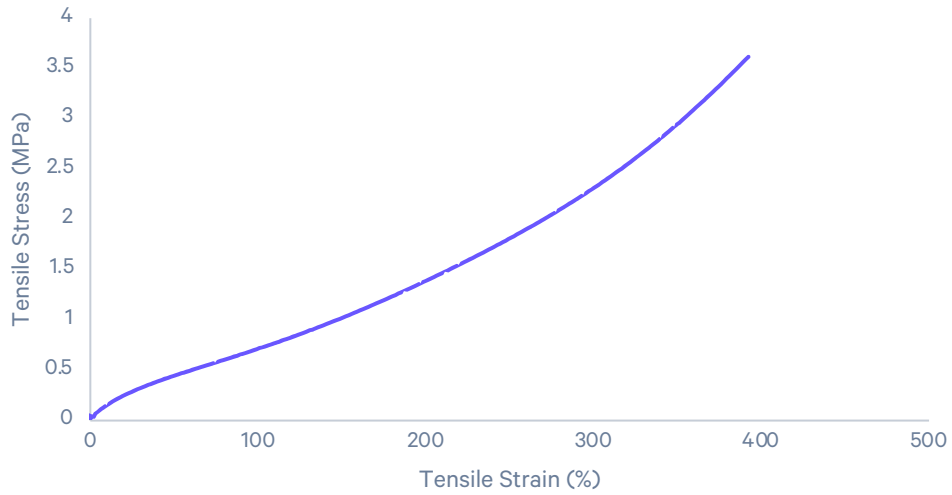
SIL 30 Mechanical Properties

Representative Tensile Curve

ASTM D412, Die C, 500 mm/min



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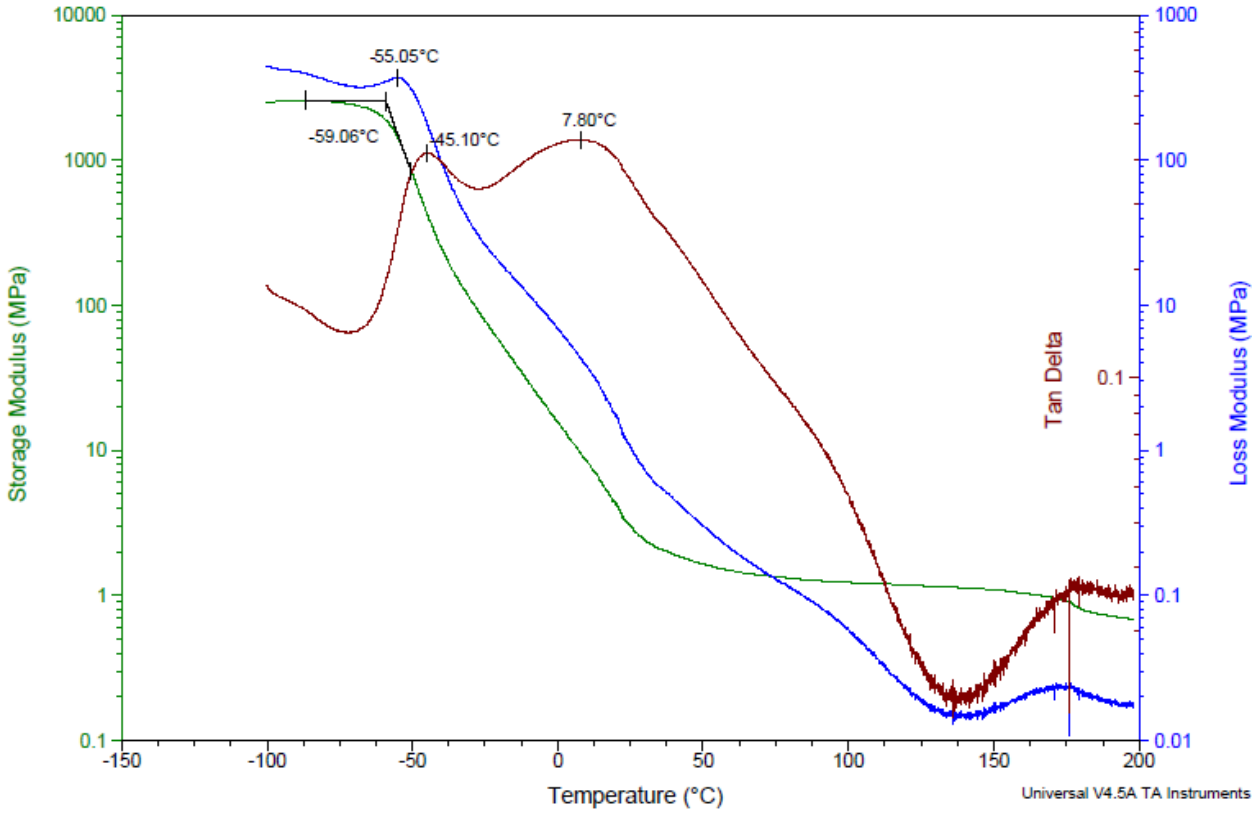
SIL 30 Dynamic Mechanical Analysis (DMA)

Dynamic mechanical analysis provides insight into a material's viscoelastic properties across a range of temperatures. The figure below shows a temperature ramp of SIL 30. The peak in the tan(d) curve indicates that the glass transition temperature for this material is approximately 10 °C. A rubbery plateau is observed in the storage modulus from 20 – 150 °C, reflecting the elastic nature of this material within this temperature window.



Standard: ASTM D4065
Instrument: TA DMA Q800
DMA Mode: Tension
Sample Dimensions: L=20 mm, W=10 mm, t=1 mm (rectangular block)
Strain Amplitude: 0.1% (linear regime of viscoelasticity)
Oscillation frequency: 1 Hz
Temperature Range: -100 °C to 200 °C
Ramp Rate: 1.5 °C/min
Print Conditions: All DMA samples were printed using software v1.9. Samples were hand-wiped and not washed with solvent. The thermal cure for all materials complies with the Carbon user manual.

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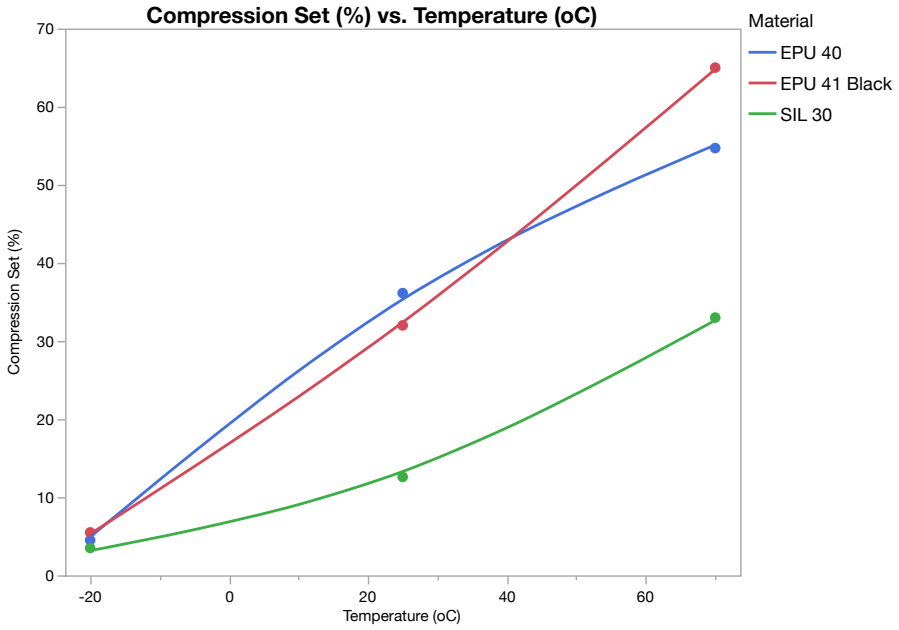
SIL 30 Compression Set

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, 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 D395-B

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SIL 30 Chemical Compatibility

	Mass Gain* (%)
Household Chemicals	
Bleach (NaClO, 5%)	< 5%
Sanitizer (NH_4Cl, 10%)	5 – 15%
Distilled Water	5 – 15%
Sunscreen (Banana Boat, SPF 50)	5 – 15%
Detergent (Tide, Original)	5 – 15%
Windex Powerized Formula	5 – 15%
Hydrogen Peroxide (30%)	15 – 30%
Ethanol (95%)	> 30%
Industrial Fluids	
Engine Oil (Havoline SAE 5W-30)	< 5%
Brake Fluid (Castrol DOT-4)	> 30%
Airplane Deicing Fluid (Type I Ethylene Glycol)	< 5%
Airplane Deicing Fluid (Type I Propylene Glycol)	5 – 15%
Airplane Deicing Fluid (Type IV Ethylene Glycol)	< 5%
Airplane Deicing Fluid (Type IV Propylene Glycol)	5 – 15%
Transmission Fluid (Havoline Synthetic ATF)	< 5%
Engine Coolant (Havoline XLC, 50%/50% premixed)	< 5%
Diesel (Chevron #2)	15 – 30%
Gasoline (Chevron #91)	> 30%
Skydrol 500B-4	> 30%
Strong Acid/Base	
Sulfuric Acid (30%)	> 30%
Sodium Hydroxide (10%)	< 5%

*Percent weight gained after 1 week submersion following ASTM D543. Values do not represent changes in dimension or mechanical properties.

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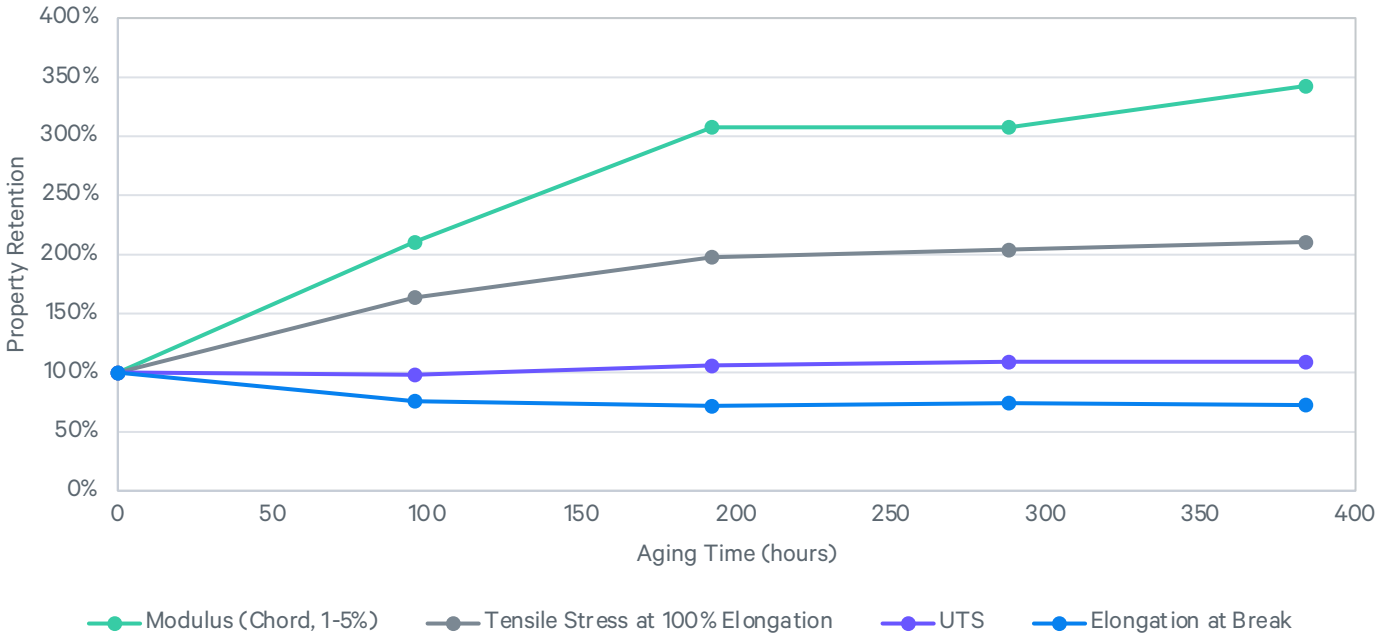
SIL 30 UV Aging

Natural polymer aging can occur in the presence of light, sun, and heat. Carbon evaluated the UV aging performance of SIL 30 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^2 at 420 nm, 55 °C
ASTM D412: Die C, 500 mm/min, average values represented

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SIL 30 Biocompatibility

Biocompatibility Testing

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

Biocompatibility Testing	Test Standard
Cytotoxicity	ISO 10993-5: Biological evaluation of medical devices – Part 5: Tests for *in vitro* cytotoxicity (MEM extract)
Sensitization	ISO 10993-10: Biological evaluation of medical devices – Part 10: Tests for skin sensitization (Closed patch sensitization study in guinea pigs)
Irritation	ISO 10993-23: Biological evaluation of medical devices – Part 23: Tests for irritation (Intracutaneous study in rabbits)

Test articles were processed using an M series printer and a Smart Part Washer with VF 1 as the solvent. The washed test articles were baked following the standard baking schedule for SIL 30: 120 °C for 8 hours. Additional details about the tests are available upon request.

Disclaimer

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