



DuraForm[®] ProX[®] HST Composite

Composite

A fiber-reinforced engineering plastic with excellent stiffness and high temperature resistance

Selective Laser Sintering

PRODUCTION-GRADE INDUSTRIAL COMPOSITE RESIN WITH SUPERIOR COMBINATION OF MATERIAL PERFORMANCE PROPERTIES FOR END-USE PLASTIC PARTS

DuraForm ProX HST Composite combines exceptional mechanical properties and long-term environmental stability to provide real capability for production applications.

Engineered for plastic parts requiring a high heat deflection temperature, rigid flexural modulus, and good notch impact strength, this production-grade plastic delivers capability similar to filled injection molded plastics.

This filled nylon 12 material combines long-term indoor and outdoor environmental stability with superior automotive fluid and chemical compatibility making it ideal for parts that require high performance properties in long lasting plastic parts.

The ability to print DuraForm ProX HST Composite parts at the recommended 75% fresh material ratio as well as a 50% fresh material ratio allows the user to leverage high performance quality versus standard build quality per the economics of the application.

Note: Not all products and materials are available in all countries — please consult your local sales representative for availability.

APPLICATIONS

- Stiff and complex ducts
- Heat shields, covers, and housings
- Electronic enclosures
- Air filter cases
- Plenums
- Automotive under hood components

BENEFITS

- Economical, complex end-use parts
- Functional prototyping
- Automotive engine compartment component testing

FEATURES

- High tensile modulus and heat deflection temperature
- UL 94 HB material
- Insulative electrical properties
- Meets ISO 10993-5
- Long-term UV and humidity stable for mechanical properties and color

MATERIAL PROPERTIES

The full suite of mechanical properties is given per ASTM and ISO standards where applicable. In addition, properties such as flammability, dielectric properties, and 24 hour water absorption are provided. This allows for better understanding of the material capability to aid in your design decisions for the material. All parts are conditioned per ASTM recommended standards for a minimum of 40 hours at 23 °C, 50% RH.

Solid material properties reported were printed along the XY-axis.

SOLID MATERIAL						
METRIC	ASTM METHOD	METRIC	ENGLISH	ISO METHOD	METRIC	ENGLISH
PHYSICAL				PHYSICAL		
Color		Lt. Gray				
Solid Density	ASTM D792	1.15 g/cm ³	0.042 lb/in ³	ISO 1183	1.15 g/cm ³	0.042 lb/in ³
24 Hour Water Absorption	ASTM D570	0.57%	0.57%	ISO 62	0.57%	0.57%
Blend Ratio - % Fresh		75%				
MECHANICAL				MECHANICAL		
Tensile Strength Ultimate	ASTM D638 Type I	41 MPa	6000 psi	ISO 527-1/2	50 MPa	7300 psi
Tensile Strength at Yield	ASTM D638 Type I	N/A	N/A	ISO 527-1/2	N/A	N/A
Tensile Modulus	ASTM D638 Type I	4800 MPa	770 ksi	ISO 527-1/2	4400 MPa	640 ksi
Elongation at Break	ASTM D638 Type I	5 %	5 %	ISO 527-1/2	4 %	4 %
Elongation at Yield	ASTM D638 Type I	N/A	N/A	ISO 527-1/2	N/A	N/A
Flex Strength	ASTM D790	73 MPa	10600 psi	ISO 178	80 MPa	11700 psi
Flex Modulus	ASTM D790	3500 MPa	510 ksi	ISO 178	3900 MPa	569 ksi
Izod Notched Impact	ASTM D256	47 J/m	0.9 ft-lb/in	ISO 180-A	5.4 kJ/m ²	2.6 ft-lb/in ²
Izod Unnotched Impact	ASTM D4812	290 J/m	5 ft-lb/in	ISO 180-U	21 kJ/m ²	10 ft-lb/in ²
Shore Hardness	ASTM D2240	77D	77D	ISO 7619	77D	77D
THERMAL				THERMAL		
Tg (DMA, E")	ASTM E1640 (E" Peak)	50 °C	114 °F	ISO 6721-1/11 (E" Peak)	50 °C	114 °F
HDT @ 0.455 MPa/66 PSI	ASTM D648	177 °C	350 °F	ISO 75- 1/2 B	178 °C	353 °F
HDT @ 1.82 MPa/264 PSI	ASTM D648	166 °C	331 °F	ISO 75-1/2 A	158 °C	317 °F
CTE below Tg	ASTM E831	111 ppm/°C	62 ppm/°F	ISO 11359-2	111 ppm/K	62 ppm/°F
CTE above Tg	ASTM E831	342 ppm/°C	190 ppm/°F	ISO 11359-2	342 ppm/K	190 ppm/°F
UL Flammability	UL94	HB	HB			
Thermal Conductivity	ASTM E1530	0.29 W/m·K	2.0 BTU·in/ hr·ft ² ·°F			
ELECTRICAL						
Dielectric Strength (kV/mm) @ 3.0 mm thickness	ASTM D149	17				
Dielectric Constant @ 1 MHz	ASTM D150	2.95				
Dissipation Factor @ 1 MHz	ASTM D150	0.049				
Volume Resistivity (ohm-cm)	ASTM D257	1.53x10 ¹⁵				
Surface Resistivity (ohm)	ASTM D257	1.53x10 ¹⁵				

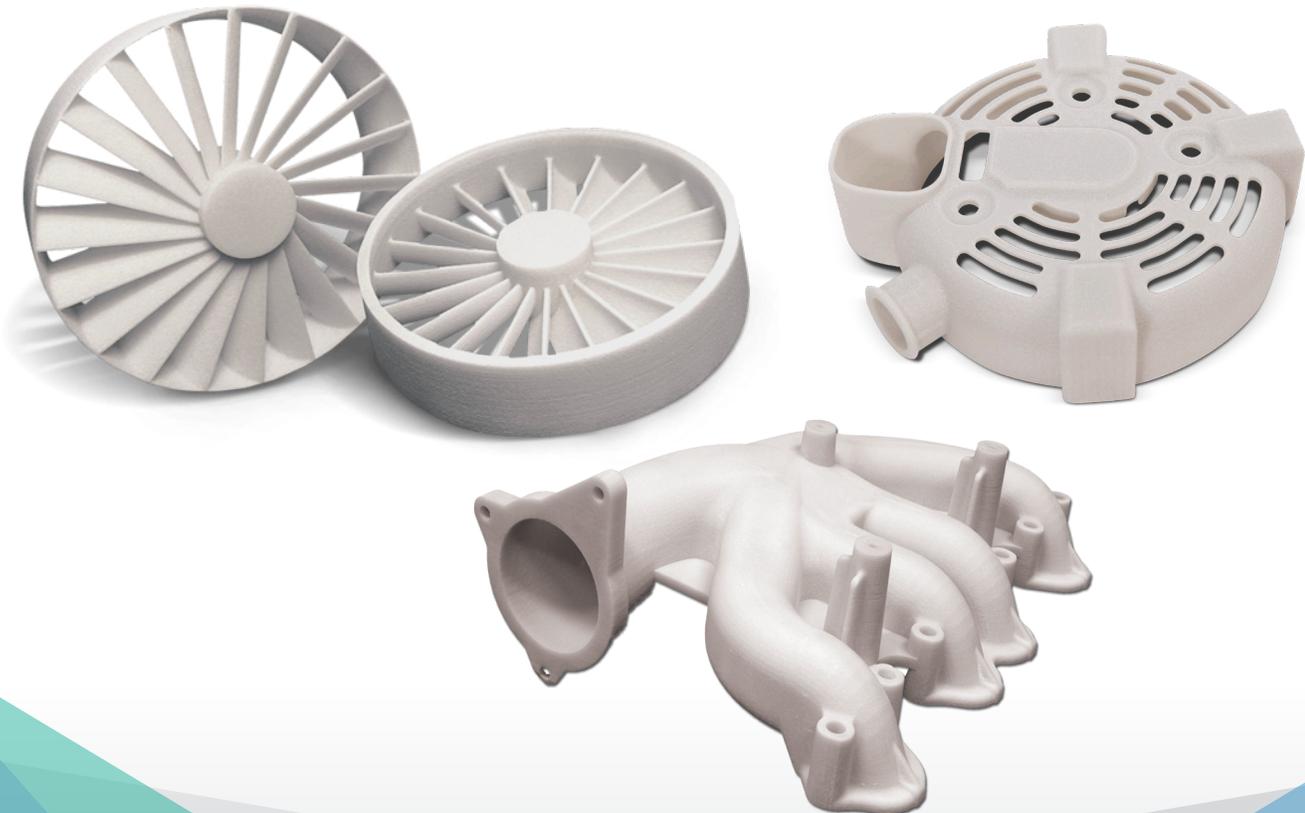
MATERIAL PROPERTIES

The mechanical properties below provide a comparison between a blend ratio of 50% compared to the recommended blend ratio of 75%, allowing the user to match the desired ratio and results with the intended user application. Note: The surface finish and some feature details of a part printed with a 50% blend ratio of fresh material may not meet those achieved at the recommended 75% blend ratio of fresh material.

The suite of mechanical properties is given per ASTM standards below. All parts are conditioned per ASTM recommended standards for a minimum of 40 hrs at 23°C, 50% RH. Solid material properties reported were printed along the X-orientation.

SOLID MATERIAL			
METRIC	ASTM METHOD	75% FRESH	50% FRESH
PHYSICAL			
Solid Density	ASTM D792	1.15 g/cm ³	1.12 g/cm ³
MECHANICAL			
Tensile Strength Ultimate	ASTM D638 Type I	41 MPa	43 MPa
Tensile Modulus	ASTM D638 Type I	4800 MPa	3900 MPa
Elongation at Break	ASTM D638 Type I	5 %	4 %
Flex Strength	ASTM D790	73 MPa	71 MPa
Flex Modulus	ASTM D790	3500 MPa	3200 MPa
Izod Notched Impact	ASTM D256	47 J/m	49 J/m
Izod Unnotched Impact	ASTM D4812	290 J/m	270 J/m
Shore Hardness	ASTM D2240	77D	75D
THERMAL			
HDT @ 0.455 MPa/66 PSI	ASTM D648	177 °C	179 °F
HDT @ 1.82 MPa/264 PSI	ASTM D648	166 °C	164 °F

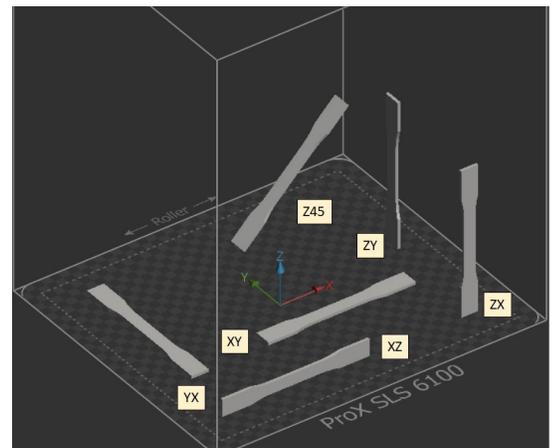
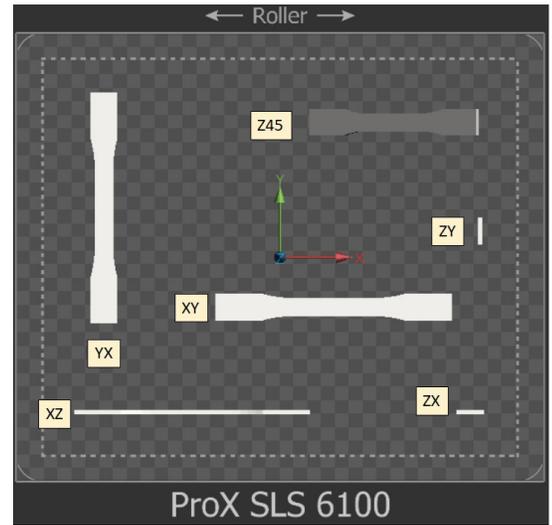
Note: User should consult CIB/instructions to run at 50% fresh.



ISOTROPIC PROPERTIES

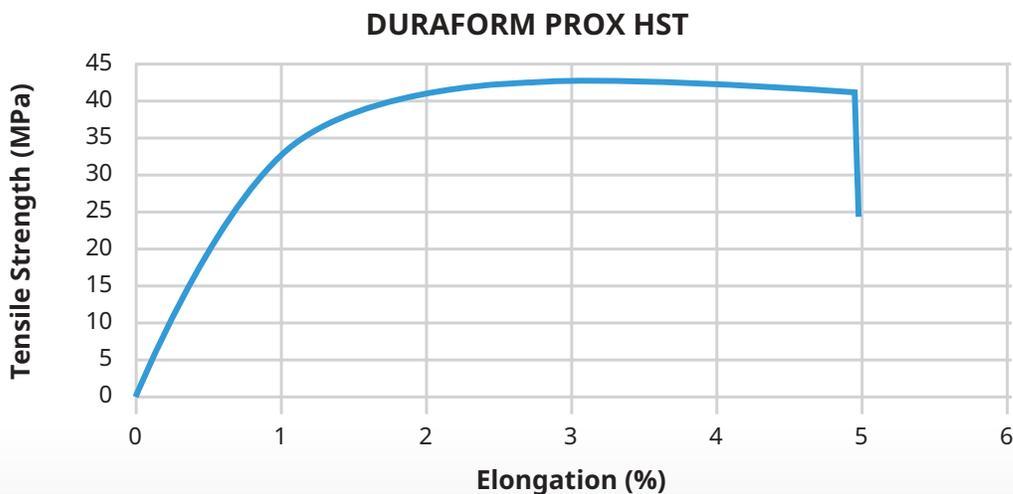
Parts are tested in the XYZ and angled orientations to determine the degree of isotropy within the mechanical properties.

SOLID MATERIAL					
METRIC	METHOD	METRIC			
MECHANICAL					
		XY	YX	ZY	Z45
Tensile Strength Ultimate	ASTM D638 Type I	41 MPa	38 MPa	30 MPa	34 MPa
Tensile Strength at Yield	ASTM D638 Type I	N/A	N/A	N/A	N/A
Tensile Modulus	ASTM D638 Type I	4800 MPa	5100 MPa	4700 MPa	3100 MPa
Elongation at Break	ASTM D638 Type I	5 %	5 %	3 %	4 %
Elongation at Yield	ASTM D638 Type I	N/A	N/A	N/A	N/A
Flex Strength	ASTM D790	73 MPa	63 MPa	50 MPa	57 MPa
Flex Modulus	ASTM D790	3500 MPa	2500 MPa	2100 MPa	2100 MPa
Izod Notched Impact	ASTM D256	47 J/m	43 J/m	32 J/m	39 J/m
Izod unnotched impact	ASTM D4812	290 J/m	241 J/m	168 J/m	218 J/m
Shore Hardness	ASTM D2240	77D	77D	77D	77D



STRESS-STRAIN CURVE

The graph represents the stress-strain curve for DuraForm ProX HST Composite per ASTM D638 testing.

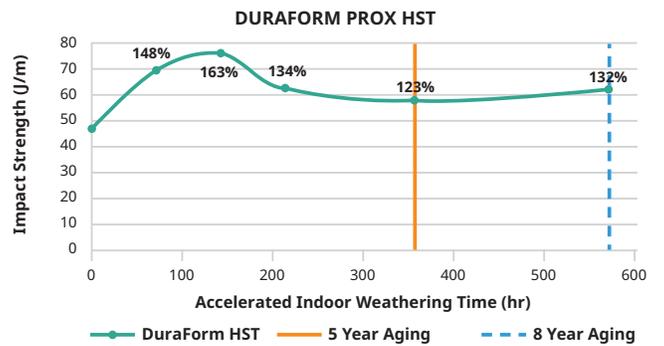
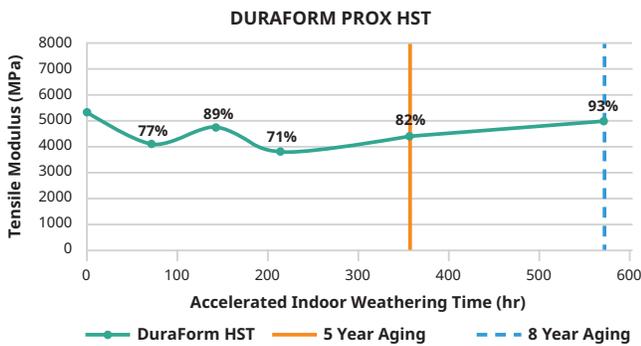
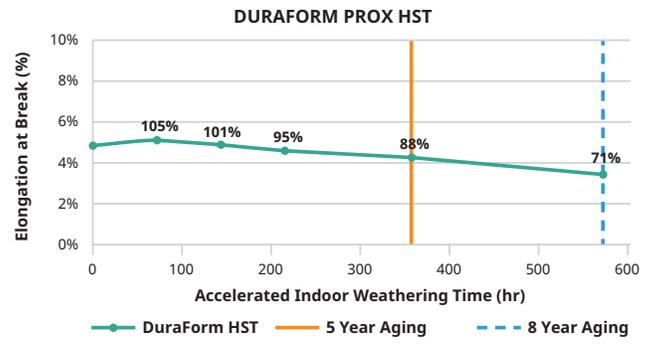
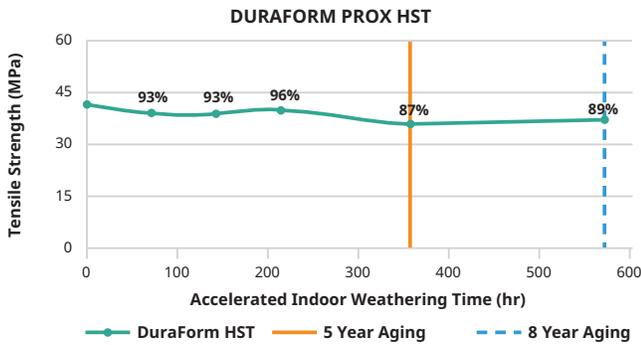


LONG TERM ENVIRONMENTAL STABILITY

DuraForm ProX HST Composite is engineered to give long-term environmental UV and humidity stability. This means the material is tested for the ability to retain a high percent of the initial mechanical properties over a given period of time. This provides real design conditions to consider for the application or part. **Actual data value is on Y-axis, and data points are % of initial value.**

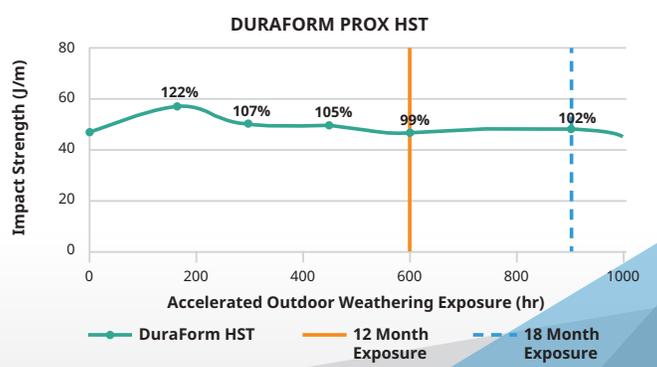
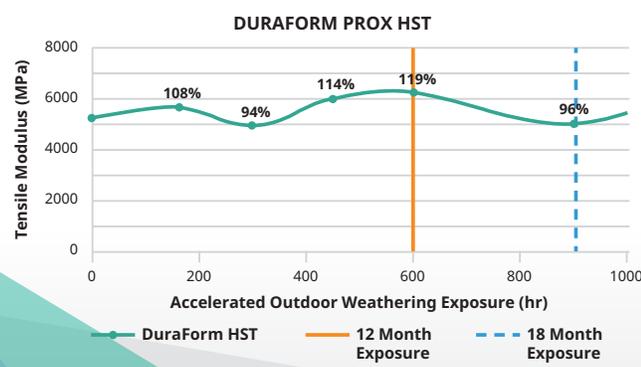
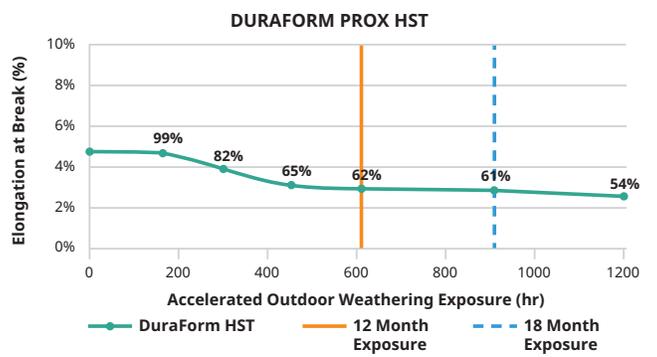
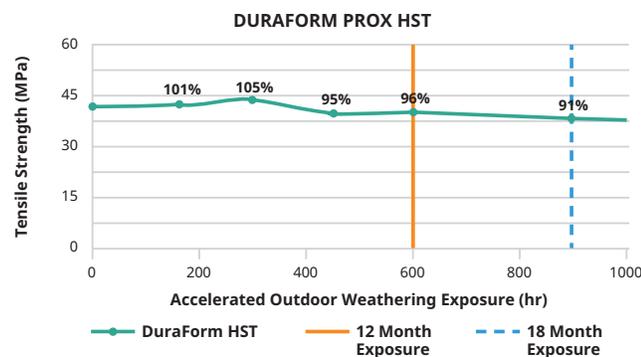
INDOOR STABILITY: Tested per ASTM D4329 standard method.

INDOOR STABILITY



OUTDOOR STABILITY: Tested per ASTM G154 standard method.

OUTDOOR STABILITY



AUTOMOTIVE FLUID COMPATIBILITY

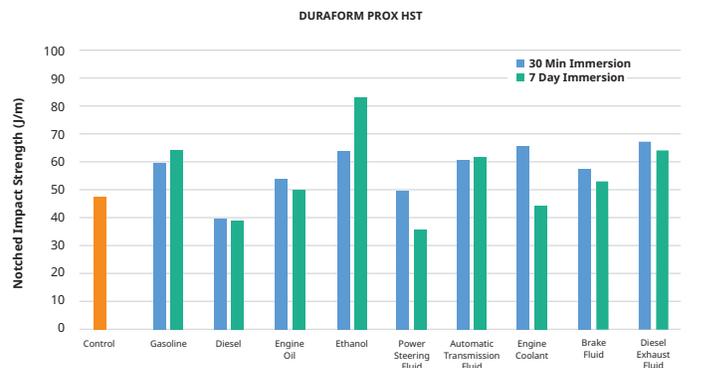
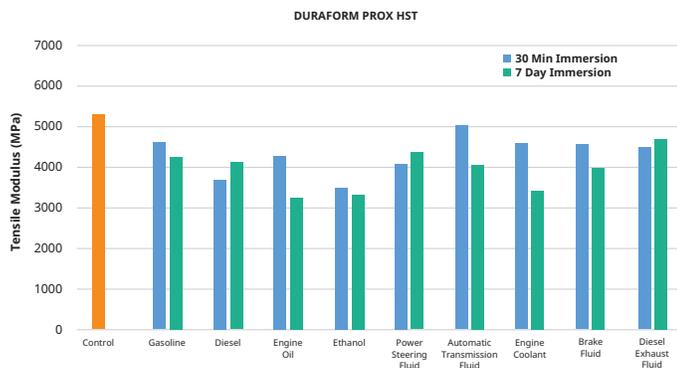
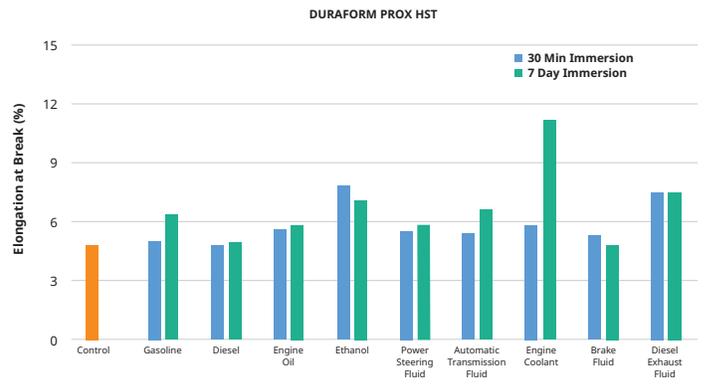
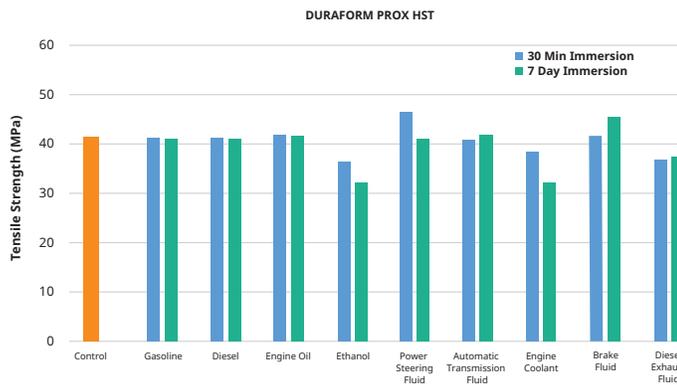
The compatibility of a material with hydrocarbons and cleaning chemicals is critical to part application. DuraForm ProX HST Composite parts were tested for sealed and surface contact compatibility per USCAR2 test conditions. The fluids below were tested using two different methods per the specs.

- Immerse for 7-days, then take mechanical property data for comparison
- Immerse for 30-minutes, remove, and take mechanical property data for comparison in 7-days

Data reflects the measured value of properties over that period of time.

AUTOMOTIVE FLUIDS		
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 1917, 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 (Use 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



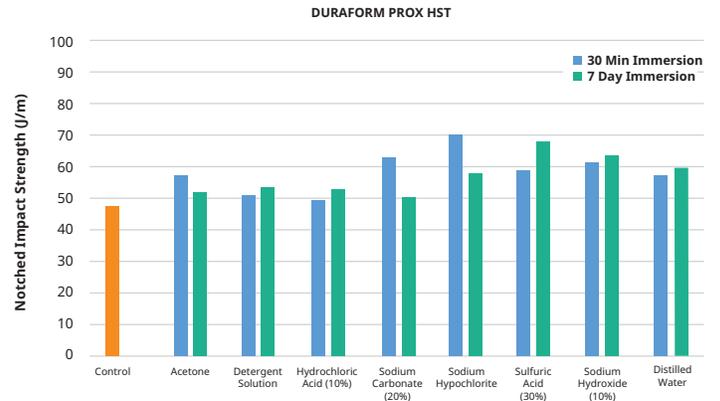
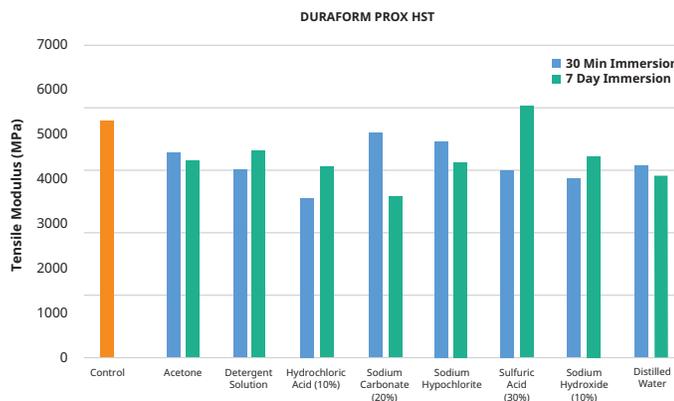
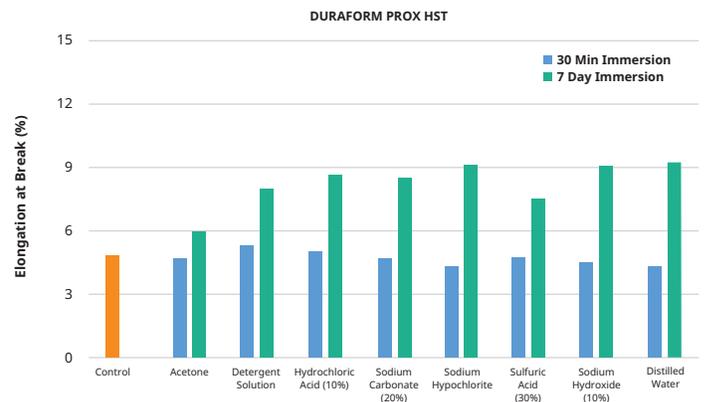
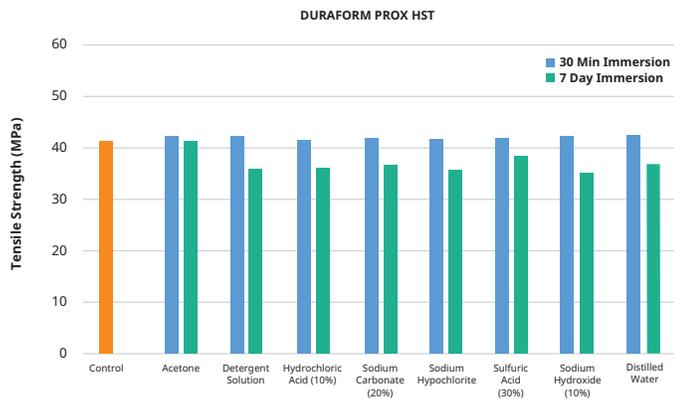
CHEMICAL COMPATIBILITY

The compatibility of a material with cleaning chemicals is critical to part application. DuraForm ProX HST Composite parts were tested for sealed and surface contact compatibility per ASTM D543 test conditions. The fluids below were tested using two different methods per the specs.

- Immerse for 7-days, then take mechanical property data for comparison
- Immerse for 30-minutes, remove, and take mechanical property data

Data reflects the measured value of properties over that period of time.

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%)
6.3.15 Distilled Water



Learn more at <https://www.3dsystems.com/materials/duraform-hst-composite>

