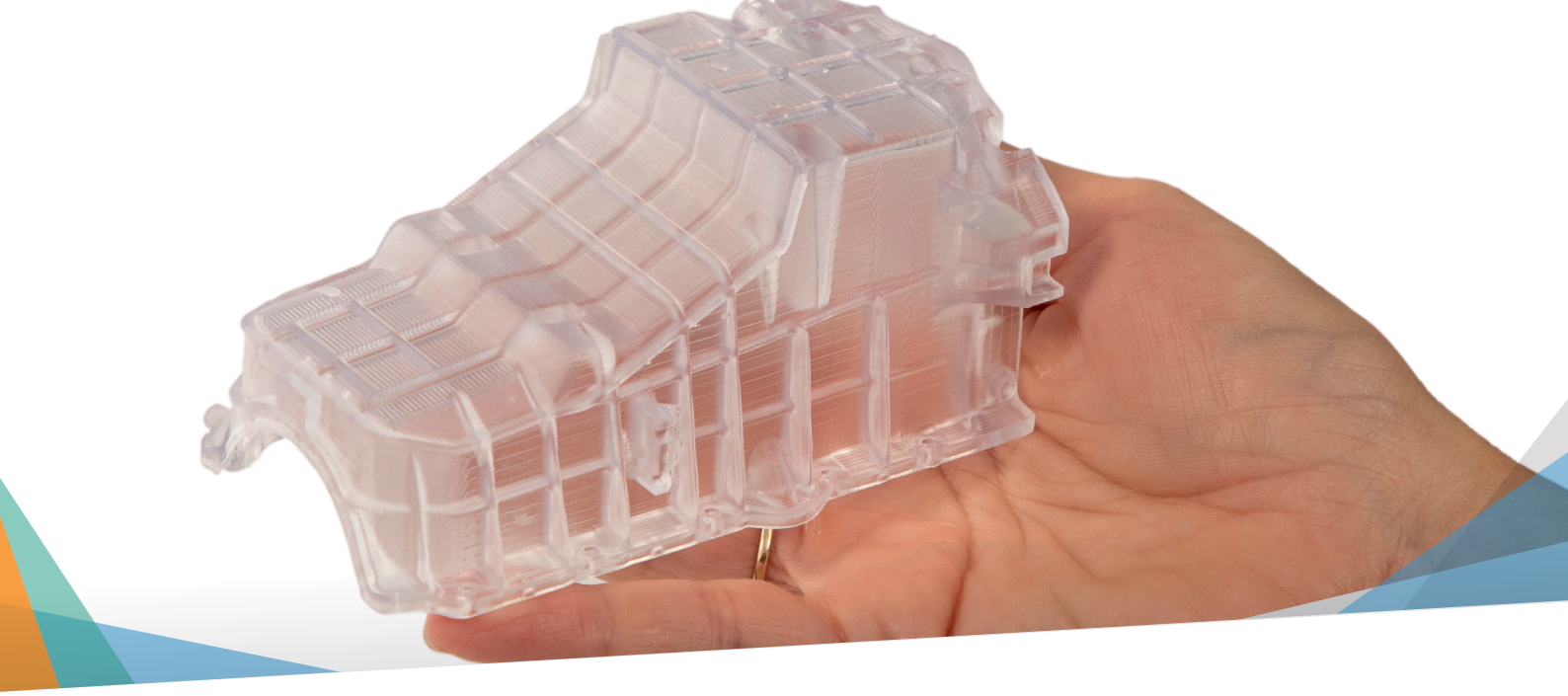

Figure 4 Tough Clear

Production Tough

FIGURE 4

A clear, production-grade material engineered to offer long-term, environmental UV, humidity stability, chemical compatibile, and has thermoplastic-like mechanical properties.

PRODUCTION-GRADE MATERIAL THAT IS DURABLE AND AVOIDS FADING OR DISCOLORATION UP TO 8 YEARS INDOORS

Figure 4 Tough Clear delivers long-term stability and a versatile combination of mechanical properties for functional prototyping or end-use parts. It offers high light transmission that can be made fully transparent with post-processing.

3D printing clear components is a cost-effective manufacturing process for product development. Get visibility into the workings of complex assemblies, observe gas or fluid flows and reduce product design cycles. Figure 4 Tough Clear introduces long-term stability which minimizes reprints due to resistance to discoloration or yellowing up to 8 years indoors.

APPLICATIONS

- End-use manufacturing of high volume, small plastic parts
- Load-bearing handles, cranks, knobs, and levers
- Structural brackets, snap-fits, and fasteners
- Lighting covers, cases, and reflectors
- Lenses and light guides
- Fast-moving consumer goods and consumer packaging

BENEFITS

- Excellent clarity that can be further improved with post-processing steps like clear coating
- Long-term environmental stability of mechanical properties and performance
- Ability to go from prototype to production parts using clear or transparent aesthetics
- Prototypes have longer lives and can be reused for longer periods of time
- Supports functional testing in outdoor settings
- Automotive fluid and chemical compatibility

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

Figure 4 Tough Clear

LIQUID MATERIAL						
METRIC	**METHOD**	**METRIC**	**US**			
Viscosity (@25C)	Brookfield viscometer	41 cps	97 lb/ft-hr			
Color		Clear				
Liquid Density (@25C)	Kruss K11 Force Tensiometer	1.21 g/cm³	0.044 lb/in³			
Default print layer thickness	Internal	30 µm	0.001 in			
Speed - Standard mode	Internal	17 mm/hr	0.67 in/hr			
Speed - Draft mode	Internal	22 mm/hr	0.87 in/hr			
SOLID MATERIAL						
METRIC	**ASTM METHOD**	**METRIC**	**US**	**ISO METHOD**	**METRIC**	**US**
	PHYSICAL				**PHYSICAL**	
Solid Density	ASTM D792	1.21 g/cm³	0.044 lb/in³	ISO 1183	1.21 g/cm³	0.044 lb/in³
24 Hour water absorption	ASTM D570	0.56%	0.56%	ISO 62	0.56%	0.56%
	MECHANICAL				**MECHANICAL**	
Tensile Strength Ultimate	ASTM D638 Type IV	50 MPa	7300 psi	ISO 527 -1/2	41 MPa	5900 psi
Tensile Strength at Yield	ASTM D638 Type IV	50 MPa	7200 psi	ISO 527 -1/2	41 MPa	5900 psi
Tensile Modulus	ASTM D638 Type IV	2200 MPa	320 ksi	ISO 527 -1/2	1800 MPa	260 ksi
Elongation at Break	ASTM D638 Type IV	13.1%	13.1%	ISO 527 -1/2	9.7%	9.7%
Elongation at Yield	ASTM D638 Type IV	4.1%	4.1%	ISO 527 -1/2	4.4%	4.4%
Flex Strength	ASTM D790	67 MPa	9700 psi	ISO 178	56 MPa	8100 psi
Flex Modulus	ASTM D790	2000 MPa	290 ksi	ISO 178	1700 MPa	249 ksi
Izod Notched Impact	ASTM D256	18 J/m	0.3 ft-lb/in	ISO 180-A	2 J/m²	0.001 ft-lb/in²
Izod Unnotched impact	ASTM D4812	400 J/m	7 ft-lb/in	ISO 180-U		
Shore Hardness	ASTM D2240			ISO 7619		
	THERMAL				**THERMAL**	
Tg (DMA E")	ASTM E1640 (E"Peak)	48 °C	119 °F	ISO 6721-1/11 (E" Peak)	48 °C	119 °F
HDT 0.455MPa/66PSI	ASTM D648	48 °C	119 °F	ISO 75- 1/2 B	47 °C	117 °F
HDT 1.82MPa/264 PSI	ASTM D648	42 °C	108 °F	ISO 75-1/2 A	42 °C	107 °F
CTE −40 to 15C	ASTM E831			ISO 11359-2		
CTE 55 to 125C	ASTM E831			ISO 11359-2		
UL Flammability	UL94	HB				
	ELECTRICAL				**ELECTRICAL**	
Dielectric Strength (kV/mm) @ 3mm thickness	ASTM D149					
Dielectric Constant @ MkHz	ASTM D150					
Dissipation Factor @ MkHz	ASTM D150					
Volume Resistivity (ohm-cm)	ASTM D257					

*Tensile testing done at 50mm/min after timeout at 5mm/min per ASTM D638 standards

Complete data set will be available in Q4 2022.