Mayku Multiplier Materials TDS

MAYKU MULTIPLIER SHEET MATERIALS:

CIRCULAR: 428MM X 428MM

Mayku ABS Sheets

ABS (Acrylonitrile Butadiene Styrene) is a thermoplastic polymer that is commonly used in the manufacturing industry. It is a strong, durable, and lightweight material that is resistant to impact, heat, and chemicals. ABS is a popular material for producing consumer products such as toys, automotive parts, electronic housings, and kitchen appliances.

ABS sheet inserted into the Mayku Multiplier.

Automotive protoype part made on the Mayku Multiplier.

TECHNICAL

Property	Method	Unit	Values
Density[1]	ISO 1183	cm^3/10 min	1,06
Charpy Notched Impact Strength, 23° C	ISO 179/1eA	kJ/m^2	18
Tensile strength at break, 23 °C	ISO 527/50mm/min	MPa	45
Tensile Modulus of elasticity	ISO 527/1mm/min	MPa	2100
Elongation at break (MD)	ISO 527/50mm/min	%	2,7

THERMAL

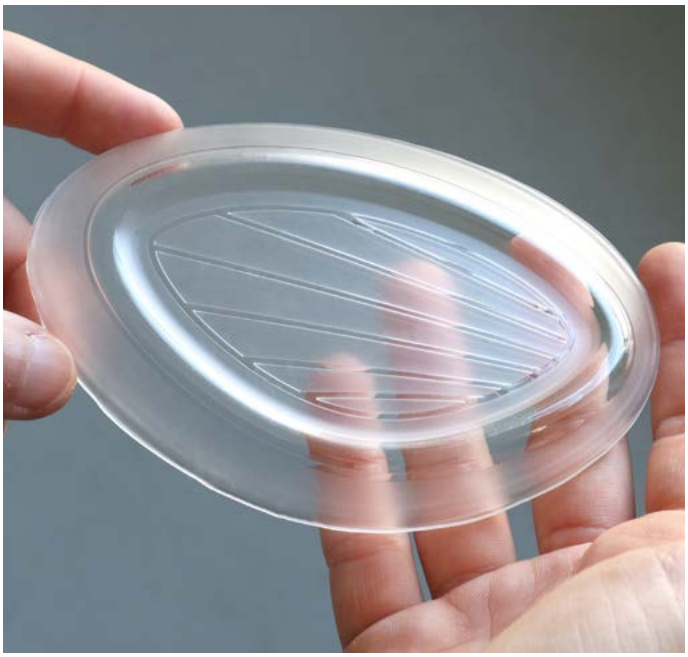
Property	Method	Unit	Values
Vicat Softening Temperature VST/B/50 (50N, 50°C/h)	ISO 306	°C	102
Temperature of deflection under load (1,8 MPa)	ISO 75-1,-2	°C	101
Flammability Rating	UL 94	> 1,5 mm	HB

[1] The density is only a guide and depends on pigments and additives used

Mayku PMMA Sheets

PMMA, also known as Polymethyl methacrylate and often referred to as acrylic, is a transparent thermoplastic that is widely used as a lightweight and shatter-resistant alternative to glass. It is a versatile material that has a variety of applications due to its transparency, durability, and weather resistance.

PMMA sheets are optically clear.



Car light lens made on the Mayku Multiplier.

GENERAL

Property	Method	Unit	CRYLUX®
Density	ISO 1183-1	g/cm³	1.19
Water absorption 24h/23 °C	ISO 62 Method 1	%	0.2
Rockwell Hardness	ISO 2039-2	M-Scale	105

MECHANICAL

Property	Method	Unit	CRYLUX®
Tensile strength	ISO 527-2	MPa	75
Elongation at break	ISO 527-2	%	6
Tensile modulus	ISO 527-2	MPa	3300
Flexural strength	ISO 178	MPa	125
Flexural modulus	ISO 178	MPa	3000
Impact strength Charpy unnotched	ISO 179-1	kJ/m²	18
Impact strength Charpy notched	ISO 179-1	kJ/m²	2

OPTICAL

Property	Method	Unit	CRYLUX®
Light transmission	ISO 13468-1	%	93
Refractive index	ISO 489	n^{D}_{20}	1.492

THERMAL

Property	Method	Unit	CRYLUX®
Vicat temperature (B 50)*	ISO 306	˚C	110
Heat deflection temperature (A)	ISO 75-2	˚C	105
Specific heat capacity	ISO 3146-C-60˚C	J/gK	2.16
Linear thermal expansion a	ISO 11359-2	mm/m˚C	0.07
Thermal conductivity	DIN 52612	W/mK	0.19
Service temperature continuous use		˚C	80
Max. temperature short term use		˚C	90
Degradation temperature		˚C	>280
Sheet forming temperature range		˚C	140-190

ELECTRICAL

Property	Method	Unit	CRYLUX®
Surface resistivity	IEC 60093	Ω	$>10^{14}$
Volume resistivity	IEC 60093	Ω × m	$>10^{15}$
Electrical strength	IEC 60243-1	kV/mm	10
Dielectrical strength	IEC 60243-1	kV/mm	30
Dielectrical dissipation factor 50 Hz	DIN 53483-2		0.06
Dielectrical dissipation factor 1 KHz	DIN 53483-2		0.04
Dielectrical dissipation factor 1 MHz	DIN 53483-2		0.02
Relative permittivity 50 Hz	DIN 53483-2		2.7
Relative permittivity 1 KHz	DIN 53483-2		3.1
Relative permittivity 1 MHz	DIN 53483-2		2.7

* = Pre-treatment: 16 h at 80 °C
Note: These technical data of our products are typical ones; the actually measured values are subject to production variations.

Mayku UHMW Sheets

UHMW (also known as UHMW-PE) stands for Ultra High Molecular Weight Polyethylene, which is a type of thermoplastic material characterized by its high strength-to-weight ratio, excellent abrasion resistance, low friction coefficient, and impact resistance. Its strength and ability to resist wear and tear can, in some cases, outperform traditional steel components.

GENERAL

Property	Method	Unit	Test specimen	GHR 8110	GUR 4113
Density	ISO1183 method A	g/cm³	Sheet	0.95	0.94
Viscosity number (VN)	ISO 1628 part 3	ml/g	Powder	600	2000
Intrinsic viscosity [n][1]		ml/g		510	1785
Average molecular weight [2]		g/mol		$6.1 \cdot 10^5$	$3.9 \cdot 10^6$
Melt Index MFR 190/21.6[3]	ISO 1133	g/10 min	Powder	1.4 ±0.3	-
Elongational stress F (150/10)	ISO 11542-2	MPa	Dumbbell specimen	-	0.13 ±0.02
Bulk density	DIN 53 466	g/cm³	Powder	≥0.4	≥0.4

GENERAL (Continued from table above)

	Basic grades					GUR® special formulations	
Property	**GUR 2122**	**GUR 4120**	**GUR 4130**	**GUR 4150**	**GUR 4170**	**ALGRA [4]**	**AST [5]**
Density	0.93	0.93	0.93	0.93	0.93	1.25	0.96
Viscosity number (VN)	2200	2400	3050	3850	4300	-	-
Intrinsic viscosity [n][1]	1945	2100	2585	3150	3450	-	-
Average molecular weight [2]	$4.5 \cdot 10^6$	$5.0 \cdot 10^6$	$6.8 \cdot 10^6$	$9.2 \cdot 10^6$	$10.5 \cdot 10^6$	-	-
Melt Index MFR 190/21.6[3]	-	-	-	-	-	-	-
Elongational stress F (150/10)	0.22 ± 0.05	0.22 ± 0.05	0.34 ± 0.07	0.51 ± 0.09	0.7 ± 0.09	-	-
Bulk density	≤ 0.25	≥0.4	≥0.4	≥0.4	≥0.4	-	-

[1] Calculated using Martin's equation:
$\log n = \log [n] + K \cdot [n] \cdot c$
where viscosity number
[n] intrinsic viscosity in dl/g
K = 0.139 g constant
c = 0.02 g/dl for GUR grades
c = 0.1 g/dl for GHR 8110

[2] Calculated molecular weight using Margolies' equation:
$M = 5.37 \cdot 104\ [n]^{1.49}$
where n is in dl/g

[3] Only for GHR 8110; not measurable with grades of GUR because of their extremely high melt viscosity

[4] Graphite-aluminium-filled (thermally conductive material)

[5] Antistatic-modified

MECHANICAL (Measured under standard conditions, ISO 291-23/50)

Property	Method	Unit	Test specimen	GHR 8110	GUR 4113
Yield stress	ISO 527 parts 1 & 2	MPa		≥21	≥17
Elongation at yield	testing rate	%		10	≤20
Nomical elongation at break	50 mm/min	%	Multipurpose	> 50	> 50
Tensile modulus	testing rate 1mm/min	MPa	specimen acc. to ISO 3167	1060	750
Tensile creep modulus	ISO 899 part 1, elongation <05%				
1 h value		MPa		680	450
1000 h value		MPa		340	250
Ball indentation hardness 30 s value, test load 358 N	ISO 2039 part 1	N/mm²	Sheet, 4mm	49	38
Shore hardness D, 15 s value	ISO 868	-	Sheet, 6mm	63	62
Charpy notched impact strength (with 14° V-notch on both sides)	ISO 11542 part 2	kJ/m²	120 × 15 × 10 mm	≥25	≥170
Wear by the sand slurry method based on GUR 4120 = 100)	internal test method		76.2 × 25.4 × 6.35 mm	250	110

	Basic grades					GUR® special formulations	

MECHANICAL (Continued from table above)

Property	GUR 2122	GUR 4120	GUR 4130	GUR 4150	GUR 4170	ALGRA [1]	AST [2]
Yield stress	≥ 17	≥ 17	≥ 17	≥ 17	≥ 17	≥ 17	≥ 17
Elongation at yield	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20
Nomical elongation at break	> 50	> 50	> 50	> 50	> 50	> 50	> 50
Tensile modulus	790	720	680	680	570	1350	840
Tensile creep modulus							
1 h value	550	460	430	430	370	1060	530
1000 h value	270	230	230	220	180	600	280
Ball indentation hardness 30 s value, test load 358 N	38	36	35	35	35	52	38
Shore hardness D, 15 s value	60	60	60	61	60	-	-
Charpy notched impact strength (with 14° V-notch on both sides)	≥ 120	≥ 210	≥ 180	≥ 130	≥ 90	≥ 50	≥ 130
Wear by the sand slurry method based on GUR 4120 = 100)	-	100	90	80	70	200	110

[1] Graphite-aluminium-filled (thermally conductive material)

[2] Antistatic-modified

THERMAL

Property	Method	Unit	Test specimen
Heat deflection temperature HDT/A (1.8 MPa)	ISO 75 parts 1 and 2	°C	80 x 10 x 4 mm
Vicat softening point VST/B/50	ISO 306	°C	10 x 10 x 4 mm
Melting point DSC, 10K/min	ISO 3146 method C	°C	Powder
Coefficient of linear thermal expansion between 23 and 80°C [1]	ISO 11359 part 1/2	$°C^{-1}$	30 x 10 x 4 mm
Thermal conductivity at 23°C	resistance wire method	W / m · K	Sheet, 10mm
Specific heat at 23°C	adiabatic calorimeter	kJ / kg · K	Powder

THERMAL (Continued from table above)

	GUR® special formulations			
Property	**GHR 8110**	**GUR basic grades [2]**	**ALGRA [3]**	**AST [4]**
Heat deflection temperature HDT/A (1.8 MPa)	44	42	46	42
Vicat softening point VST/B/50	80	80	101	88
Melting point DSC, 10K/min	130 – 135	130 – 135	130 – 135	130 – 135
Coefficient of linear thermal expansion between 23 and 80°C [1]	$\approx 2 \cdot 10^{-4}$	$\approx 2 \cdot 10^{-4}$	$\approx 1.5 \cdot 10^{-4}$	$\approx 2 \cdot 10^{-4}$
Thermal conductivity at 23°C	0.41	0.41	1.6	0.41
Specific heat at 23°C	1.84	1.84	1.56	-

[1] Measured on annealed specimens

[2] The thermal and electrical properties of all basic grades are the same

[3] Graphite-aluminium-filled (thermally conductive material)

[4] Antistatic-modified

Motorcyle vest prototype made from UHMW.

Template de-molded from a formed UHMW sheet.

ELECTRICAL (Measured under standard conditions, ISO 291-23/50)

Property	Method	Unit	Test specimen
Volume resistivity	IEC 60093	Ω· m	
Surface resistivity		Ω	
Dielectric strength	IEC 60243 part 1	kV/mm	
Relative permittivity (e r)	IEC 60250		Sheet, 1mm
at 100 Hz		-	
at 1 MHz		-	
Dissipation factor	IEC 60250		Sheet, 1mm
tan DF		-	
at 100 Hz		-	
at 1 MHz		-	
Tracking	IEC 60250		15 x 15 x 4 mm
CTI[1]		-	
CTIM[2]		-	
Arc resistance	VDE 0303 part 5	rating	120 x 120 x 10 mm

ELECTRICAL (Continued from table above)

			GUR® special formulations	
Property	**GHR 8110**	**GUR basic grades [2]**	**ALGRA [3]**	**AST [4]**
Volume resistivity	> 10^{12}	> 10^{12}	> 10^{7}	> 10^{4}
Surface resistivity	> 10^{12}	> 10^{12}	> 10^{9}	> 10^{9}
Dielectric strength	40	45	-	-
Relative permittivity (e r)				
at 100 Hz	2.9	2.1	-	-
at 1 MHz	2.9	3.0	-	-
Dissipation factor				
tan DF				
at 100 Hz	2 · 10^{-4}	3.9 · 10^{-4}	-	-
at 1 MHz	4 · 10^{-4}	-	-	-
Tracking				
CTI[1]	600	600	-	-
CTIM[2]	600	600	-	-
Arc resistance	L4	L4	-	-

[1] Test solution A, [2] Test solution B

[2] The thermal and electrical properties of all basic grades are the same

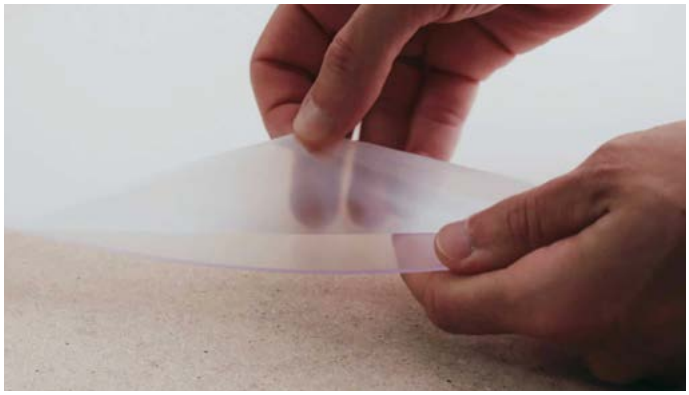
[3] Graphite-aluminium-filled (thermally conductive material)

[4] Antistatic-modified

Mayku PETG Sheets

PETG stands for Polyethylene Terephthalate Glycol, a thermoplastic polyester material that can cool efficiently without warping. PETG is transparent, strong, and semi-rigid, making it a popular substitute for polycarbonate and acrylic. It is highly durable, impact-resistant, and chemically resistant.

One of the major benefits of PETG is its environmental friendliness and ease of recycling. PETG is also FDA-approved for food contact, making it safe for use in food packaging and medical applications.



Protective film being removed from PETG sheet.

PETG Food container made with the Mayku Multiplier.

GENERAL

Property	Method	Unit	HIPEX® G
Density	DIN EN ISO 1183-1	g/cm^3	1.27
Rockwell hardness	EN ISO 2039-1 / ASTM D-785	R-Scale	105
Melting point		˚C	230-250
Glass transition temperature		˚C	80-85

MECHANICAL

Property	Method	Unit	HIPEX® G
Flexural modulus	DIN EN ISO 178	MPa	1900
Flexural strength	DIN EN ISO 178	MPa	70
Tensile modulus	DIN EN ISO 527-2	MPa	2000
Tensile strength	DIN EN ISO 527-2	MPa	50
Elongation	DIN EN ISO 527-2	%	60
Impact strength - Izod (notched)	DIN EN ISO 180/4A	kJ/m^2	11.5
Impact strength - Charpy (notched)	DIN EN ISO 179-1/1eA	kJ/m^2	7
Impact strength - Charpy (unnotched)	DIN EN ISO 179-1	kJ/m^2	NB (no break)

OPTICAL

Property	Method	Unit	HIPEX® G
Light transmisson (3 mm clear transparent)	DIN EN ISO 13468-1	%	88
Refractive index	DIN EN ISO 489	n_D^{20}	1.57
Haze	ISO 14782 / ASTM D1003	%	<1
Solar energy transmittance g-valve	DIN EN 410	%	3 mm 83 / 10 mm 78

THERMAL

Property	Method	Unit	HIPEX® G
Forming Temperature		˚C	160
VICAT - Temperature (method B50)	DIN EN ISO 306	˚C	70
Heat Deflection Temp. (A/B)	DIN EN ISO 75-2	˚C	72/68
Specific Heat Capacity	DIN EN ISO 11357-4	J/gK	1.1
Coefficient of linear thermal expansion	DIN 53752 / ISO 11359-2	mm/m °C	0.068
Thermal conductiviy	DIN 52612 / DIN EN ISO 22007-1	W/mK	0.20
Degradation temperature		˚C	>280
Max. service temperature continuous use		˚C	60
Max. service temperature short term use		˚C	70
Forming temperature		˚C	120 - 160

ELECTRICAL

Property	Method	Unit	HIPEX® G
Dielectric constant (100 Hz)	IEC 250 / DIN 53483-2		2.6
Volume Resistivity	IEC 60093 / DIN EN 62631-1-3-1 ASTM D257	Ω.cm	$>10^{15}$
Surface Resistivity	IEC 60093 / DIN EN 62631-1-3-2 ASTM D257	Ω	$>10^{16}$
Dielectric strength	IEC 60243-1 / ASTM D149	kV/mm	16
Dissipation factor (50 Hz)	IEC 250 / DIN53483-2		0.01

OTHERS

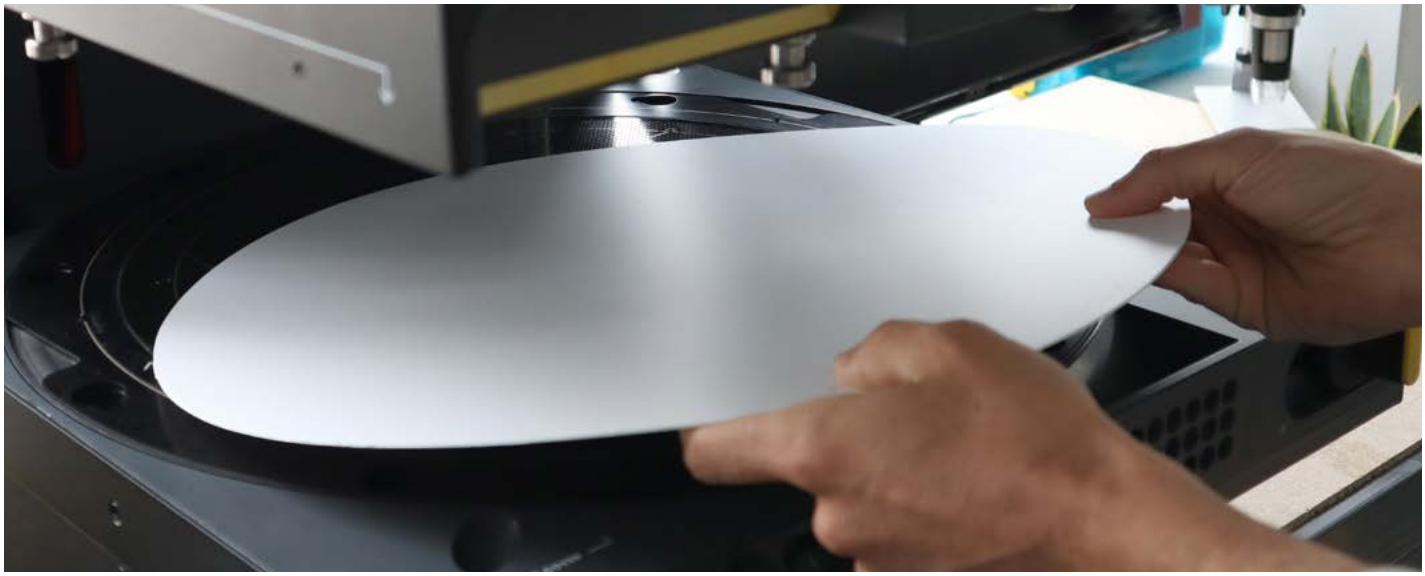
Property	Method	Unit	HIPEX® G
Fire performance (building product) up to 10 mm	DIN 4102-1	Technical Approval	B1
Fire performance up to 10 mm	DIN EN13501-1	Classification	B-s1, d0
Biocompatibility (skin contact)	DIN EN 10993-5	Classification	not cytotoxic

Note: These technical data of our products are typical ones; the actually measured values are subject to production variations.

Mayku HIPS Sheets

HIPS (High Impact Polystyrene) is a lightweight thermoplastic material which is a type of polystyrene that has been modified to improve its toughness and impact resistance.

HIPS is known for its high strength, rigidity, and dimensional stability. It has excellent electrical properties and is resistant to many chemicals. HIPS is also relatively inexpensive compared to other thermoplastics, which makes it a popular choice for a wide range of applications.



HIPS sheet being inserted into the Mayku Mutlipler.

HIPS prototype of food container next to 3D printed template used to create the form.

GENERAL

Property	Method	Unit	POLYCASA® HIPS Glossy/Matt	POLYCASA® HIPS Matt/Matt
Density	ISO 1183	g/cm^3	1.05	1.05
Burning resistance	UL standard 94		94 HB	94 HB
Melting point		°C	160-180	160-180
Glass transition temperature		°C	88-92	88-92
Forming temperature		°C	160	160

MECHANICAL

Property	Method	Unit	POLYCASA® HIPS Glossy/Matt	POLYCASA® HIPS Matt/Matt
Flexural modulus	ISO 178	MPa	1850	1800
Flexural strength	SO 78	MPa	34	32
Tensile modulus	ISO 527-2	MPa	1730	1670
Tensile strength	ISO 527-2	MPa	24	20
Elongation at break	ISO 527-2	%	2.9	42
Stress at break	ISO 527-2	MPa	18	16
Ball indentation hardness	ISO 2039-1	N/mm^2	80	80

THERMAL

Property	Method	Unit	POLYCASA® HIPS Glossy/Matt	POLYCASA® HIPS Matt/Matt
Vicat temperature (B 50)	ISO 306	°C	92	91
Heat defection temperature (A)	ISO 75-2	°C	82	84
Linear thermal expansion	DIN 53752	$K^{-1}x10^{-5}$	8	8
Service temperature continuous use	DIN 52612*	°C	70	70
Thermal conductivity	ISO 11501*	W/mK	0.16	0.16
Dimensional change on heating (4mm)	ISO 15015	%	5	5.5

ELECTRICAL (raw material specification)

Property	Method	Unit	POLYCASA® HIPS Glossy/Matt	POLYCASA® HIPS Matt/Matt
Volume resistivity	IEC 93	Ω.cm	$>10^{16}$	$>10^{16}$
Surface resistivity	IEC 93	Ω	$>10^{13}$	$>10^{13}$
Dielectrical strength	IEC 243-1	KV/mm	155	155
Dielectrical constant at 100Hz- 1 MHz	IEC 250		2.5	2.5
Dielectrical factor at 100Hz- 1 MHz	IEC 250		$>10^{-4}$	$>10^{-4}$

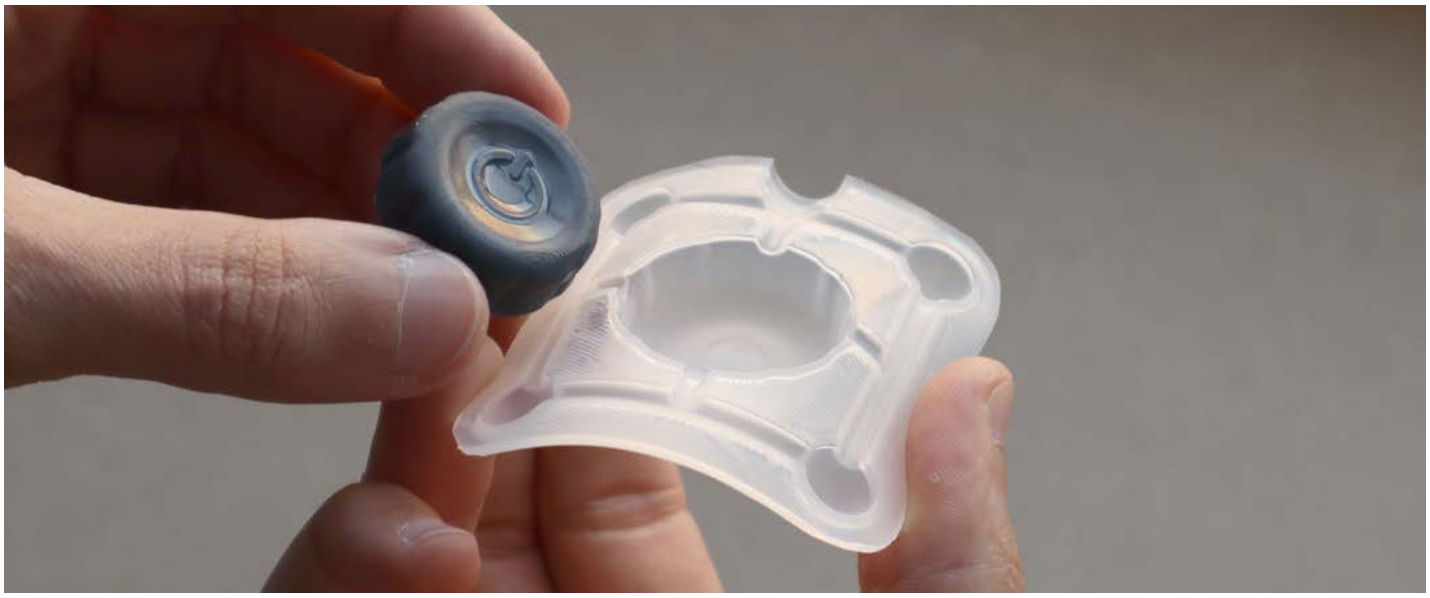
IMPACT STRENGTHS

Property	Method	Unit	POLYCASA® HIPS Glossy/Matt	POLYCASA® HIPS Matt/Matt
Charpy notched glossy side impacted	ISO 179-1/1fA	KJ/m^2	9	-
Charpy notched matt side impacted	ISO 179-1/1fA	KJ/m^2	6	10

Note: all mentioned data is based on extruded sheets in a thickness of 4mm.
These technical data of our products are typical ones, the actually measured values are subject to production variations.

Mayku EVA Sheets

EVA stands for Ethylene Vinyl Acetate, and is known for its flexibility, durability, and lightweight properties. EVA is a non-toxic material, making it safe for use in consumer products such as shoes, toys, and even food packaging. EVA is increasingly popular in many different industries because it is easy to process and recycle, making it more environmentally friendly than other plastics.



Button cast with epoxy in an EVA mold.

Both elements of a 2-part mold used to create a button.

PHYSICAL

Property	Nominal Value (English)	Nominal Value (SI)	Test Method
Density	0.938 g/cm^3	0.938g/cm^3	ASTM D1505
Melt Mass-Flow Rate (MFR) (190°C/2.16 kg)	2.5g/10 min	2.5g/10 min	ASTM D1238
Vinyl Acetate Content	18.0 wt%	18.0 wt%	

MECHANICAL

Property	Nominal Value (English)	Nominal Value (SI)	Test Method
Tensile Strength			ASTM D638
Yield	640 psi	4.41 MPa	
Break	2130 psi	14.7 MPa	
Tensile Elongation (Break)	800%	800%	ASTM D638
Flexural Modulus	2130 psi	14.7 MPa	ASTM D790

HARDNESS

Property	Nominal Value (English)	Nominal Value (SI)	Test Method
Durometer Hardness (Shore A)	• 88 • 38	• 88 • 38	ASTM D2240

THERMAL

Property	Nominal Value (English)	Nominal Value (SI)	Test Method
Brittleness Temperature	-94.0°F	-70.0°C	ASTM D746
Vicat Softening Temperature	140°F	60.0°C	ASTM D1525
Melting Temperature	183°F	84.0°C	

INJECTION

Property	Nominal Value (English)	Nominal Value (SI)
Processing (Melt) Temp	302 to 356°F	150 to 180°C

Note: Typical properties - these are not to be construed as specifications.

Visit materials.mayku.me to order sheets.