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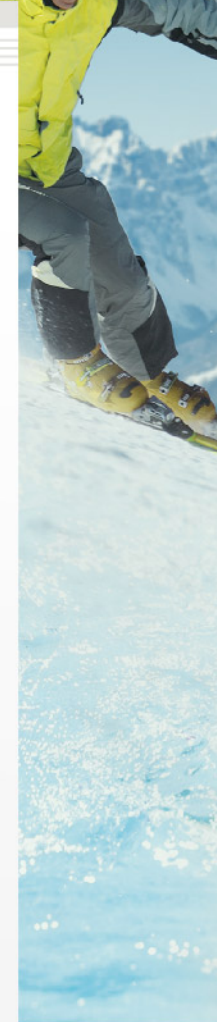
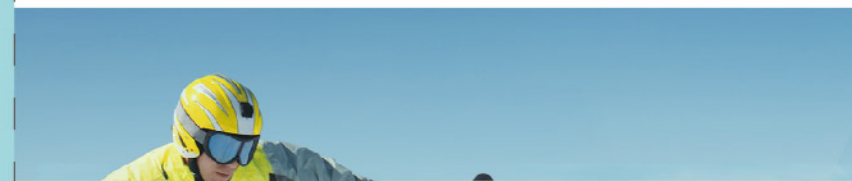
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ISOTHANE®

TPU RESINS

THERMOPLASTIC POLYURETHANE

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Beyond quality, Leading need

Best quality, high technology, and excellent services are always located in our entrepreneurship. From this concept, we established our quality policy as understanding customer requirements to provide the best products, enhance process controls to assure product quality, and improve quality management by applying the PDCA methodology. The whole concept is not only to make sure that we can base on our R&D technology and excellent production procedure to meet customer's needs, but also build up mutual benefit for both customers and us.

With the spirit of continued innovation and improvement, along with a diverse range of operations, the company continues to expand its product lines, and currently has four main product lines, including adhesives, plastic products, dry film photoresists and specialty chemicals. GRECO prides itself as a pioneer in green technology, and will continue to promote green products with improvements in environmental friendliness and safety.



ISOTHANE®

TPU RESINS

Innovative high performance, High value-added environmental friendly materials.

ISOTHANE® is the brand name for thermoplastic polyurethane (TPU) registered by GRECO.

TPU is a high environmental friendly material. It bridges the material gap between soft rubbers and rigid plastics. The advantages of TPU are excellent wear and abrasion, good chemical resistance to oils, greases and solvents and weather stability.

ISOTHANE® has extensive product portfolio, including aromatic or aliphatic, soft without plasticizer or glass fiber-reinforced, flame retardant or high transparency to bring innovative solutions into different industry sectors.

ISOTHANE® is well suited for wide variety of fabrication technology such as injection molding, extrusion, blow making, calendering and other coating applications.

GRECO adopts advanced computerized automatic processed with twin-screw coagulating extruders to produce high performance plastic materials. Appearance and storage quality are preserved through precision testing instruments and automated packaging equipment.

TPU SYSTEM

AROMATIC

Ether, Ester,
Polycaprolactone-Based TPU

Wide application

ALIPHATIC

Ether, Ester,
Polycaprolactone-Based TPU

Non-yellowing

| Ether | Excellent hydrolytic stability, bio-compatibility, resistance to micro-organism, excellent low temperature flexibility and good toughness.

| Ester | Excellent mechanical property, good chemical resistance, low cost and high toughness.

| Polycaprolactone-Based TPU | Polycaprolactone: High elasticity, hydrolysis resistance, oil resistance and low compression set.



INNOVATION, TEAMWORK, SUSTAINABILITY

ISOTHANE® TPU resins are certified by many well-known brand traders and have a wide range of product properties to meet the needs of customers.

ISOTHANE® TPU resins Series

- General Injection and Extrusion Grades
- Short Cycle Time Injection Grades
- High Transpancy Grades
- High Moisture Vapor Trasmission Grades
- Anti-static Grades
- Flame Retardant Grades
- Engineering Grades
- Bio-based Grades
- Biocompatible Grades
- TPU/PP/NYLON + Glass Fiber / Long Glass Fiber
- Low Compression Set Grades
- Calendering Grades
- Aliphatic Grades

CERTIFICATIONS

ISO 9001, ISO14001, OHSAS18001



TLSP, certified by TUV



TUV Rheinland
Certified QA Labs



Adidas FACT certifications
of tier 2 supplier



RoHS
COMPLIANT

NOMENCLATURE FOR ISOTHANE®

Nomenclature for ISOTHANE®

Forms	Grades	Hardness	Codes
Aromatic TPU	10 Polyadipate Ester Type	45 50 55 60 65 70 75 80 85 90 95 98	C Calendering
	11 High Transparency Type		E/EJ/J/EL Extrusion
	16 Moisture Vapor Transmission Type		K High Transparency
	20 Polycaprolactone Ester Type		L / N Hot Melt Adhesive
	30 Polyether Type		M Compression Set
	50 Biomedical Ether Type		S Anti-static
	8 Engineering Plastics		U UV Stablized
	88 Adhesives		FR Halogen Free Flame Retardant
Aliphatic TPU	71 Polyadipate Ester Type	98	RS Short Cycle Times
	72 Polycaprolactone Ester Type		GF Glass Fiber Reinforced
	73 Polyether Type		LGF Long Glass Fiber Reinforced
	77 Polycarbonate Type		LCF Long Carbon Fiber Reinforced

APPLICATIONS



Injection			Extrusion		T-DIE
Sports plates (football, golf, baseball)	Boots and bellows	Interior automotive components	Air powered tools	Power and energy	Industrial adhesive films
Inline skates	Automotive parts	Overmolded wire & cable components	Robotics	Telecommunications	Washable apparel
Ski boots	Consumer goods	Hand-held/Power tools	Dental equipment	Geophysical	adhesive films
Top-pieces	Lawn and garden equipment	Sporting goods	Automated equipment	Automotive	Conveyor belting
Inserts	Recreational	Athletic footwear	Pneumatic hoists	Industrial	Weather resistant wear layers
Casual shoes	sporting goods	Medical devices	Garden hoses	Retractable cable	Heat resistance barrier films
Unit soles	Industrial goods	Hand-held electrical	Packaging equipment	Video-audio	Wound care dressings
Safety shoes		Electronic devices	Transportation of chemical liquids, abrasive substances, and food & beverages	Medical	Apparel elastic
Hiking boots		Industrial components			Thermoforming films and sheets
Fashion shoes					Inflatables such as sporting equipment, life vests, rafts and mattresses.
Sports					Conveyor belts
Inserts					Bladders for footballs, basketballs
Automotive exterior painted trim					Oil booms
Automotive interior goods					Rafts and lifejackets
Mass transit and industrial transportation					Textile applications
Agricultural goods					Appliqués
Recreational sporting goods					Waterproof breathable
Consumer goods					Foul weather gear
Lawn & garden applications					Tents
Irrigation components					Protection garments
Arm rests					Athletic apparel
Wheels/ rollers / belts					
Seals & gaskets					
Living hinges					
Catheters					
Feeding Tubes					
Stents					
Leads and Headers					
Balloons					

Blow Film	Calender	Solution	Flame Retardant	Engineering Grade	Long Glass Fiber
Outerwear sportswear	Coated fabrics for weather-proof apparel and drapes	Medical components and devices	Power/energy cable (building/construction)	Diesel Fuel / Water IV System Connectors	Machinery Parts
footwear, gloves	Liners for fuel and water containment	Medical balloons	Automotive cable (harnesses)	Toothbrushes	Medical Equipment
Medical, surgical apparel	FDA Industrial conveyer belting	Direct coating (knife spread, spray, dot)	Industrial cable (mass transit, train/boat/airplane, subway/airport/public buildings)	Oil and Gas Well Sucker	Sports Equipment
Wound dressing	Protective wear layers	Transfer coating		Rod Guides	Automotive Part
Waterproof bedding	Barriers for medical mattresses	Coagulation		Gasoline Pump	
Military apparel	Bladders for sporting goods	Mould dripping		Break-away Sleeve	
Tents	Coated labels for apparel	Waterproof fabrics		Ultrasound Paddle	
Building and construction	Conveyor belts	Shoe lacquers		Handle	
protective products	Coated fabrics	Inks		Nuts and Bolts	
	Belting	Magnetic tape binders		Abdominal Retractor	
	Life rafts/jackets	Primer coating (adhesion) on textiles		Wheelchair	
	Cured in place pipe (CIPP)	Synthetic leather		Brake Release Handle	
		Upholstery		Scaffolding Fitting	
		Handbags			
		Luggage			
		Sportswear (cycling shorts, gel seats)			
		Artificial chamois products			
		Racket grips			

ISOTHANE®

1000 / 1100 Series

Polyester-Based Grade



- Characteristics** ISOTHANE® 1000 series resins are polyester based thermoplastic polyurethane. They exhibit excellent transparency, mechanical properties, abrasive resistance, and solvent resistance. ISOTHANE® 1000 series can be processed by extrusion and injection molding.
- Applications** Shoes Applications, Sporting Equipments, and Mechanical Items.

Items	Units	ASTM	1065A	1070A	1075A	1080A	1085A	1090A
Specific Gravity		D-792	1.18	1.18	1.18	1.18	1.18	1.21
Hardness	Shore A	D-2240	65A	70A	75A	80A	85A	90A
Tensile Strength	MPa psi	D-412	21 3,500	21 3,500	31 4,500	34 5,000	36 5,300	55 8,000
@ 50% Elongation	MPa psi	D-412	2 300	3 350	4 600	4 600	5 700	10 1,500
@ 100% Elongation	MPa psi		3 500	7 950	5 700	6 900	7 1,000	11 1,600
@ 300% Elongation	MPa psi		5 800	7 950	9 1,300	11 1,600	14 2,000	21 3,000
Elongation @ Break	%	D-412	850	850	800	600	600	560
Tear Strength	N/mm lb/in	D-624 DIE C	80 460	90 530	100 570	90 520	140 800	170 1,000

Items	Units	ASTM	B1095A	B1098A	1055D	1065D	1160D	1170D
Specific Gravity		D-792	1.22	1.22	1.21	1.21	1.21	1.23
Hardness	Shore A D	D-2240	95A	98A	55D	65D	60D	70D
Tensile Strength	MPa psi	D-412	60 8,700	54 7,800	43 6,300	41 6,000	40 5,800	40 5,800
@ 50% Elongation	MPa psi	D-412	13 1,900	17 2,400	15 2,200	19 2,700	15 2,200	13 1,900
@ 100% Elongation	MPa psi		15 2,200	18 2,600	19 2,700	21 3,000	19 2,700	17 2,500
@ 300% Elongation	MPa psi		25 3,600	32 4,700	33 4,800	33 4,800	33 4,800	25 3,700
Elongation @ Break	%	D-412	600	550	450	440	480	310
Tear Strength	N/mm lb/in	D-624 DIE C	180 1,100	220 1,300	120 680	240 1,400	200 1,200	220 1,200

The above values are shown as typical values and should not be used as specifications.

ISOTHANE®

1600 Series

Moisture Vapor Transmission



- Characteristics** ISOTHANE® 1600 series products are polyether based thermoplastic polyurethane with good balanced qualities. They exhibit excellent high moisture vapor transmission. ISOTHANE® 1600 series can be processed by blown film extrusion.
- Applications** Apparel Applications

Items	Units	ASTM	1680A-E2	1680A-E3	1685A-E	1685A-E2
Specific Gravity		D-792	1.2	1.2	1.2	1.2
Hardness	Shore A	D-2240	78A	78A	85A	83A
Tensile Strength	MPa psi	D-412	26 3,800	27 3,900	25 3,600	23 3,300
@ 300% Elongation	MPa psi		9 1,300	8 1,200	10 1,450	10 1,450
Elongation @ Break	%		780	950	750	850
Tear Strength	N/mm lb/in	D-624 DIE C	110 630	110 630	150 850	110 650
Ross Flexing Test	-6 °C 150000 times	D-1052	No Break	No Break	No Break	No Break
MVT Properties	g/m ² day	ASTM E96 BW	12,000	10,000	9,000	11,000
MVT Properties	g/m ² day	JIS L1099 B-1	100,000	140,000	15,000	70,000

Items	Units	ASTM	1690A-E5	1690A-E6	G1685A-E2	G1685A-E3
Specific Gravity		D-792	1.2	1.2	1.2	1.2
Hardness	Shore A	D-2240	90A	89A	83A	83A
Tensile Strength	MPa psi	D-412	38 5,500	26 3,800	20 2,900	24 3,500
@ 300% Elongation	MPa psi		15 2,200	10 1,500	12 1,750	7 1,000
Elongation @ Break	%		600	700	680	900
Tear Strength	N/mm lb/in	D-624 DIE C	245 1,400	110 630	130 750	80 460
Ross Flexing Test	-6 °C 150000 times	D-1052	No Break	No Break	No Break	No Break
MVT Properties	g/m ² day	ASTM E96 BW	8,000	10,000	10,000	11,400
MVT Properties	g/m ² day	JIS L1099 B-1	15,000	25,000	24,000	79,000

The above values are shown as typical values and should not be used as specifications.

- Characteristics

ISOTHANE® 2000 series products are poly(caprolactone) ester based thermoplastic polyurethane. They exhibit excellent mechanical properties, hydrolysis resistance, oil resistance and outstanding low compression set. ISOTHANE® 2000 series can be injection molded and extruded.
- Applications

Seals, Gaskets and Mechanical Items.

Items	Units	ASTM	2090A-M	2095A-M1	2090A-MH	2095A-MH	2050D-MH
Specific Gravity		D-792	1.20	1.20	1.20	1.20	1.20
Hardness	Shore A D	D-2240	91A	94A	90A	95A	51D
Tensile Strength	MPa psi	D-412	56 8,180	56 8,060	30 4,400	33 4,780	34 4,980
@ 50% Elongation	MPa psi	D-412	9 1,310	12 1,690	6 910	14 2,020	18 2,630
@ 100% Elongation	MPa psi		11 1,620	15 2,100	8 1,200	16 2,320	20 2,900
@ 300% Elongation	MPa psi		26 3,700	35 5,130	14 2,050	24 3,510	26 3,770
Elongation @ Break	%	D-412	450	390	580	460	440
Compression Set 22 hrs @ 23°C 22 hrs @ 70°C 22 hrs @ 100°C 70 hrs @ 100°C	%	D-395 (B)	20 28 - -	20 29 - -	- - 33 45	- - 30 38	- - 30 38
Tear Strength	N/mm lb/in	D-624 DIE C	120 680	164 900	130 760	180 1,050	180 1,040

The above values are shown as typical values and should not be used as specifications.

- Characteristics

ISOTHANE® 3000 series resins are polyether based thermoplastic polyurethane. They exhibit excellent mechanical properties, hydrolytic resistance, fungus resistance, and low temperature performance properties. ISOTHANE® 3000 series can be processed by extrusion and injection molding.
- Applications

Apparel Applications And Outdoor Applications.

Items	Units	ASTM	3065A	3075A	3080AU	3085AU	3090AU
Specific Gravity		D-792	1.08	1.11	1.13	1.13	1.15
Hardness	Shore A	D-2240	65A	73A	80A	85A	90A
Tensile Strength	MPa psi	D-412	30 4,400	21 3,000	30 4,400	37 5,400	54 7,800
@ 50% Elongation	MPa psi	D-412	2 280	3 440	5 725	4.5 650	8 1,200
@ 100% Elongation	MPa psi		3 370	4 560	7 1,020	5.9 850	10 1,450
@ 300% Elongation	MPa psi		5 740	6 850	10 1,450	12 1,700	15 2,200
Elongation @ Break	%	D-412	730	930	750	600	550
Tear Strength	N/mm lb/in	D-624 DIE C	69 390	86 490	110 630	110 600	120 680

Items	Units	ASTM	3095AU	3055D	3060D	3065D	3070DU-W
Specific Gravity		D-792	1.15	1.16	1.17	1.17	1.20
Hardness	Shore A D	D-2240	93A	55D	60D	65D	70D
Tensile Strength	MPa psi	D-412	52 7,500	47 6,800	45 6,500	52 7,500	70 10,000
@ 50% Elongation	MPa psi	D-412	12 1,800	13 1,900	13 1,900	24 2,400	60 8,800
@ 100% Elongation	MPa psi		15 2,100	17 2,450	19 2,800	28 4,100	62 9,000
@ 300% Elongation	MPa psi		23 3,400	31 4,500	32 4,700	41 6,000	- -
Elongation @ Break	%	D-412	570	430	400	400	260
Tear Strength	N/mm lb/in	D-624 DIE C	136 780	150 850	150 850	240 1,400	500 2,900

The above values are shown as typical values and should not be used as specifications.



- **Characteristics** ISOTHANE® 5000 series products are polyether based thermoplastic polyurethanes. They exhibit excellent bio-compatibility according to USP class VI hydrolytic resistance, fungus resistance, and low temperature performance properties. ISOTHANE® 5000 series can be injection molded, blow molded, and extruded.
- **Applications** Medical Tubing and Medical Disposable Applications

Items	Units	ASTM	5075A	5080A	5085A	5090A	5095A
Specific Gravity		D-792	1.10	1.12	1.13	1.13	1.15
Hardness	Shore A	D-2240	75A	82A	85A	90A	95A
Tensile Strength	MPa psi	D-412	31 4,500	37 5,300	39 5,600	41 6,000	51 7,300
@ 50% Elongation	MPa psi	D-412	2.3 340	3.6 520	3.9 560	6.2 900	15 2,180
@ 100% Elongation	MPa psi		3.2 460	5.4 780	5.9 850	8.3 1,200	19 2,820
@ 300% Elongation	MPa psi		5.9 850	10 1,500	12 1,800	17 2,400	36 5,240
Elongation @ Break	%	D-412	650	620	540	550	438
Tear Strength	N/mm lb/in	D-624 DIE C	70 400	80 450	90 500	120 700	190 1,060
Flexural Modulus	MPa psi	D-792	29 4,140	35 5,050	43 6,200	72 10,400	96 14,000

Items	Units	ASTM	5055D	5065D	5075D	8101-B	8102-B
Specific Gravity		D-792	1.17	1.17	1.18	1.20	1.18
Hardness	Shore D	D-2240	57D	65D	74D	80D	76D
Tensile Strength	MPa psi	D-412	51 7,340	53 7,670	54 7,760	75 11,000	60 8,700
@ 50% Elongation	MPa psi	D-412	25 3,610	35 5,030	46 6,640	1,480 214,000	1,080 156,000
@ 100% Elongation	MPa psi		31 4,490	40 5,790	46 6,740		
@ 300% Elongation	MPa psi		48 6,980	49 7,110	52 7,540		
Elongation @ Break	%	D-412	400	340	322	125	150
Tear Strength	N/mm lb/in	D-624 DIE C	225 1,280	270 1,540	370 2,100	-	-
Flexural Modulus	MPa psi	D-792	134 19,500	420 60,800	1360 197,000	1,730 250,000	1,370 198,000

The above values are shown as typical values and should not be used as specifications.



- **Characteristics** ISOTHANE® 7000 series products are aliphatic grade thermoplastic polyurethane having high elasticity and transparency. They exhibit excellent mechanical properties, abrasion resistance, hydrolysis resistance and no yellowing on exposure to UV light. ISOTHANE® 7000 series can be processed by extrusion and injection molding.
- **Applications** Automotive Protective Films and Smart Wearable Devices

Items	Units	ASTM	Polyester TPU			Polycaprolactone TPU	
			7185A	7190A	7195A	7285A	7290A-E
Specific Gravity		D-792	1.16	1.16	1.18	1.12	1.11
Hardness	Shore A	D-2240	85A	90A	95A	85A	90A
Tensile Strength	MPa psi	D-412	27 3,930	33 4,790	44 6,380	23 3,780	23 3,340
@ 50% Elongation	MPa psi	D-412	7 1,020	7 1,020	14 2,030	5 725	6 870
@ 100% Elongation	MPa psi		9 1,310	11 1,600	15 2,180	7 1,020	7 1,020
@ 300% Elongation	MPa psi		19 2,780	21 3,050	24 3,490	13 1,890	17 2,470
Elongation @ Break	%	D-412	600	550	500	650	450
Tear Strength	N/mm lb/in	D-624 DIE C	165 925	180 1,010	220 1,240	135 760	120 675

Items	Units	ASTM	Polyether TPU			
			7380A-E	7385A	7385A-E	7390A-E
Specific Gravity		D-792	1.08	1.04	1.08	1.08
Hardness	Shore A	D-2240	80A	85A	85A	90A
Tensile Strength	MPa psi	D-412	42 6,090	31 4,500	43 6,090	45 6,530
@ 50% Elongation	MPa psi	D-412	5 725	5 725	6 870	8 1,160
@ 100% Elongation	MPa psi		8 1,160	6 870	9 1,310	10 1,450
@ 300% Elongation	MPa psi		31 4,500	10 1,450	35 5,080	39 5,660
Elongation @ Break	%	D-412	400	700	400	400
Tear Strength	N/mm lb/in	D-624 DIE C	110 620	140 785	115 645	120 675

The above values are shown as typical values and should not be used as specifications.

8000 Series
High Performance Engineering Grade

- Characteristics

ISOTHANE® 8000 series products are polyether based engineering thermoplastic polyurethanes. They exhibit excellent tensile and flexural strength, toughness, abrasive resistance, good fatigue resistance, solvent resistance, and maintenance of good physical properties under UV exposure. ISOTHANE® 8000 series can be injection molded and extruded.
- Applications

Electronics, Automotive, Power Tools, Oil-Water Separator, Optics Products.

Items	Units	ASTM	8101	8201	8301	8306	8102	8303	8309
Specific Gravity		D-792	1.20	1.19	1.20	1.20	1.18	1.20	1.20
Hardness	Shore D	D-2240	80D	81D	85D	80D	76D	78D	83D
Tensile Strength	MPa psi	D-638	75 11,000	83 12,000	90 13,000	68 10,000	60 8,700	67 9,700	78 11,400
Tensile Modulus	MPa psi	D-638	1,480 214,000	1,570 228,000	1,880 258,000	1,280 186,000	1,080 156,000	1,350 196,000	1,700 242,000
Elongation @ Break	%	D-638	125	40	40	193	150	92	34
Flexural Strength	MPa psi	D-790	95 13,800	108 15,600	110 16,000	88 12,800	74 10,800	91 13,100	100 14,500
Flexural Modulus	MPa psi	D-790	1,730 250,000	1,850 268,000	2,000 290,000	1,630 236,000	1,370 198,000	1,580 229,000	1,730 250,000
Izod Impact Strength Notched, 1/4 in., 23°C	J/m ft-lb/in	D-256	117 2.2	108 2	113 2.1	108 2	1,060 20	646 12	356 6.6
Heat Deflection Temperature HDT/B (0.46 MPa)	°C °F	D-648	93 199	105 221	132 270	65 149	90 194	110 230	127 261
Vicat Softening Point	°C °F	D-1525	100 212	112 233	142 288	77 170	98 208	129 264	139 282
Appearance	-	-	Transparent	Transparent	Transparent	Transparent	Opaque	Opaque	Opaque

The above values are shown as typical values and should not be used as specifications.

8800 Series | Adhesive Grade

- Characteristics

ISOTHANE® 8800 series products have good initial adhesive strength, fast crystallization, good solubility, good washing durability etc. Viscosity ranges from 150~2800cps (15% MEK Solution), and viscosity could be customized for different viscosity. They exhibit good adhesive with TPU, PVC, polyester fabric, leather and other materials.
- Applications

Footwear Adhesive, Textiles, and Furniture Applications.

Items	Units	ASTM	8888-03U	8888-F1	8888-F3	8895	8890
Specific Gravity		D-792	1.2	1.2	1.2	1.2	1.2
Hardness	Shore A	D-2240	93 A	93 A	93 A	93 A	93 A
Crystallization Rate	-	-	High	High	High	High	High
Melting Temperature	°C	DSC	45~60	45~60	45~60	45~60	40~60

The above values are shown as typical values and should not be used as specifications.

Calendering Series
Calendering Grade

- Characteristics

ISOTHANE® calendering series products are thermoplastic polyurethane for coating applicatons. They exhibit excellent mechanical properties, abrasive resistance, and easy process. ISOTHANE® calendering series can be processed by extrusion and calendering.
- Applications

Synthetic Leather, Furniture, Sports and Recreations.

Items	Units	ASTM	Polyester TPU			Polyether TPU		
			1045A-C	1065A-C	1085A-C	3065A-C	3085A-C	3090A-C
Specific Gravity		D-792	1.18	1.20	1.20	1.15	1.20	1.20
Hardness	Shore A	D-2240	45A	62 A	85 A	65A	85A	90A
Tensile Strength	MPa psi	D-412	10 1,500	18 2,600	33 4,800	15 2,800	20 2,900	23 3,300
@ 50% Elongation	MPa psi	D-412	1 120	1 145	6 870	1 145	4 580	7 1,020
@ 100% Elongation	MPa psi		1 185	2 260	7 1,020	2 290	5 725	8 1,160
@ 300% Elongation	MPa psi		2 330	3 400	16 2,300	3 435	8 1,160	14 2,030
Elongation @ Break	%	D-412	950	750	550	800	650	450
Tear Strength	N/mm lb/in	D-624 DIE C	28 160	49 280	88 500	42 240	74 420	96 540

The above values are shown as typical values and should not be used as specifications.

ISOTHANE®

Extrusion Series

Extrusion Grade

■ **Characteristics** ISOTHANE® extrusion series products exhibit excellent transparency, mechanical properties, abrasive resistance, and easily processing. ISOTHANE® extrusion series can be processed by extrusion and injection molding.

■ **Applications** Footwear, Films, Tubing, Sports Items and Conveyor Belts.

Items	Units	ASTM	1070AEU-J3	1080AEU-J	1080AU-K	1085A-E1	1085AEU-L2	1085AEU-J1
Specific Gravity		D-792	1.20	1.17	1.17	1.18	1.19	1.19
Hardness	Shore A	D-2240	70A	80A	79A	85A	85A	86A
Tensile Strength	MPa psi	D-412	23 335	36 5,250	40 5,800	35 5,080	23 3,340	46 6,680
@ 50% Elongation	MPa psi	D-412	2 310	3 435	4 600	6 870	6 870	6 875
@ 100% Elongation	MPa psi		3 440	4 600	5 725	7 1,020	7 1,020	8 1,180
@ 300% Elongation	MPa psi		4.5 655	7 1,050	10 1,450	11 1,600	10 1,450	12 1,750
Elongation @ Break	%	D-412	900	800	750	650	810	700
Tear Strength	N/mm lb/in	D-624 DIE C	65 355	100 560	115 650	125 700	110 620	130 730

Items	Units	ASTM	1085AEU-J2	1090A-E	1090A-E2	1095AEU-J	B1095AEU-S	3085AU-EJ
Specific Gravity		D-792	1.18	1.20	1.18	1.20	1.20	1.12
Hardness	Shore A	D-2240	85A	90A	90A	95A	95A	85A
Tensile Strength	MPa psi	D-412	30 4,350	48 5,500	61 8,900	50 5,500	45 6,530	30 5,500
@ 50% Elongation	MPa psi	D-412	6 875	12 1,750	10 1,450	16 2,330	14 2,030	5 725
@ 100% Elongation	MPa psi		8 1,180	14 2,050	11 1,600	20 2,900	15 2,180	7 1,020
@ 300% Elongation	MPa psi		10 1,450	20 2,900	17 2,500	30 4,350	24 3,500	12 1,760
Elongation @ Break	%	D-412	700	650	650	500	550	700
Tear Strength	N/mm lb/in	D-624 DIE C	120 675	190 1,080	170 975	220 1,240	190 1,080	120 675

The above values are shown as typical values and should not be used as specifications.

ISOTHANE®

FR Series

Halogen-Free / Flame Retardant Grade

■ **Characteristics** ISOTHANE® FR series products are thermoplastic polyurethane containing halogen-free fire retardant. They not only offer excellent flame retardancy, but also possess good mechanical properties, hydrolytic stability, low temperature flexibility and abrasion resistance. ISOTHANE® FR series can be processed by extrusion and injection molding.

■ **Applications** Building/Construction, Mining, Wire and Cables

Items	Units	ASTM	Polyester FR-TPU		
			1085A-FR	1085A-FRT	1090A-FR
Specific Gravity		D-792	1.18	1.20	1.20
Hardness	Shore A	D-2240	84A	85A	90A
Tensile Strength	MPa psi	D-412	32 4,620	36 5,260	35 5,120
@ 50% Elongation	MPa psi	D-412	4 570	4 570	8 1,140
@ 100% Elongation	MPa psi		5 780	5 710	9 1,280
@ 300% Elongation	MPa psi		11 1,560	10 1,420	14 2,000
Elongation @ Break	%	D-412	610	600	600
Tear Strength	N/mm lb/in	D-624 DIE C	110 620	110 620	150 840
Flammability (2mm)	-	UL-94	V-0	V-0	V-0
Appearance	-	-	White	Transparent	White

Items	Units	ASTM	Polyether FR-TPU					
			3080A-FR	3085A-FR	3085A-FRT	3085A-FRC	3090A-FR	3095A-FR
Specific Gravity		D-792	1.15	1.15	1.18	1.20	1.15	1.18
Hardness	Shore A	D-2240	80A	85A	84A	85A	91A	94A
Tensile Strength	MPa psi	D-412	20 2,920	29 4,270	33 4,840	15 2,130	30 4,400	25 3,560
@ 50% Elongation	MPa psi	D-412	4 640	6 850	4 640	6 920	10 1,420	10 1,500
@ 100% Elongation	MPa psi		6 850	8 1,140	6 850	7 1,070	12 1,710	12 1,710
@ 300% Elongation	MPa psi		10 1,420	13 1,850	11 1,560	9 1,280	19 2,770	19 2,700
Elongation @ Break	%	D-412	610	570	700	710	480	400
Tear Strength	N/mm lb/in	D-624 DIE C	93 530	130 730	120 670	110 620	133 750	130 730
Flammability (2mm)	-	UL-94	V-0	V-0	V-0	V-0	V-0	V-0
Appearance	-	-	White	White	Transparent	White	White	White

The above values are shown as typical values and should not be used as specifications.

■ Characteristics ISOTHANE® HMA series products are the polyester based hot melt adhesive grade thermoplastic polyurethane having high elasticity and recovery. They exhibit excellent transparency, toughness, and balanced mechanical properties. ISOTHANE® HMA series can be processed by extrusion.

■ Applications Heat Transfer Lamination, Hot-Melt Adhesive Film, Textile Lamination, and Fabric Coatings

Items	Units	ASTM	1070AU-N	1080AU-L	1080AU-L2	1085AU-N	1090AU-L
Specific Gravity		D-792	1.2	1.22	1.22	1.22	1.22
Hardness	Shore A	D-2240	70A	77A	78A	79A	84A
Tensile Strength	MPa psi	D-412	12 1,750	8 1,200	20 2,950	23 3,350	24 3,500
@ 50% Elongation	MPa psi	D-412	1.5 230	4 580	4 580	4 580	5 730
@100% Elongation	MPa psi		2 300	5 730	5 730	5 730	7 1,000
@300% Elongation	MPa psi		3.5 500	6 880	8 1,150	8 1,150	10 1,450
Elongation @ Break	%	D-412	900	660	700	700	700
Tear Strength	N/mm lb/in	D-624 DIE C	50 290	60 350	100 570	100 570	110 630
Loading of T _{fb} Test	KG		30				
Type of die	mm		D=1 mm, L=1 mm				
Flow Beginning Temperature (Tfb)	°C		108	88	112	118	138

The above values are shown as typical values and should not be used as specifications.

■ Characteristics ISOTHANE® G Series products are high performance environment-friendly TPU based on renewable materials with various bio-based content. They exhibit excellent transparency, mechanical properties, abrasive resistance and solvent resistance. ISOTHANE® G series can be processed by extrusion and/or injection molding.

■ Applications Packing Materials and Molded parts for various market segments, such as footwear, industrial, consumer goods, and Automotive.

Items	Units	ASTM	G1075AU	G1085AEU-J2	G1085AU-L	G1095AU
Specific Gravity		D-792	1.21	1.21	1.2	1.22
Hardness	Shore A	D-2240	75A	83A	75A	95A
Tensile Strength	MPa psi	D-412	15 2,200	23 3,300	19 2,800	44 6,400
@ 50% Elongation	MPa psi	D-412	3 470	7 1,000	4 580	14 2,000
@ 100% Eongation	MPa psi		4 600	8 1,200	5 730	16 2,200
@ 300% Elongation	MPa psi		7 1,000	11 1,600	8 1,150	20 2,900
Elongation @ Break	%	D-412	1,100	750	900	700
Tear Strength	N/mm lb/in	D-624 DIE C	100 570	115 650	110 630	195 1,100
Bio content	wt %	D6866-08	46	28	28	32

Items	Units	ASTM	G1685A-E2	G1685A-E3	G3095AU
Specific Gravity		D-792	1.2	1.21	1.18
Hardness	Shore A	D-2240	83A	83A	95A
Tensile Strength	MPa psi	D-412	20 2,900	24 3,500	51 7,250
@ 50% Elongation	MPa psi	D-412	6 870	3 450	13 1,900
@ 100% Elongation	MPa psi		7 1,100	4 580	15 2,200
@ 300% Elongation	MPa psi		12 1,750	7 1,000	23 3,350
Elongation @ Break	%	D-412	680	900	570
Tear Strength	N/mm lb/in	D-624 DIE C	120 680	80 460	195 1,100
Bio content	wt %	D6866-08	33	16	25

The above values are shown as typical values and should not be used as specifications.

Characteristics ISOOTHANE® Long glass fiber series. They exhibits excellent tensile and flexural strength, toughness, abrasive resistance, high rigidity, and maintenance of good physical properties under UV exposure. ISOOTHANE® Long glass fiber series can be injection molded and extruded.

Applications Automotive and Hand Tools.

GRADE	Tensile Strength Kg/cm ² (MPa)	Elongation @Break (%)	Flexural Strength kg/cm ² (MPa)	Flexural Modulus Kg/cm ² (MPa)	Notched Izod Impact 23°C Kg-cm/cm ² (J/m)	Specific Gravity	Mold Shrinkage (%)	Application
1.TPU (Thermoplastic Polyurethane)								High Rigidity Heat Resistance Dimensional Stability
8102LGF40	1,930 (190)	2	2,440 (240)	102,000 (10000)	29 (290)	1.5	0.1~0.2	Mechanical Parts Medical Equipment Sports Equipment
8102LGF50	2,040 (200)	2	2,750 (270)	150,900 (14800)	30 (300)	1.6	0.1~0.2	
8102LGF60	2,140 (210)	2	2,950 (290)	158,000 (15500)	31 (310)	1.7	0.05~0.2	
8101LGF60	2,140 (210)	2	3,260 (320)	183,000 (18000)	25 (250)	1.7	0.05~0.2	
2.PA (Polyamide, Nylon)								Excellent Strength Heat Resistance Dimensional Stability
NL6130	1,800 (176)	2	2,900 (284)	110,000 (10791)	25 (245)	1.35	0.1~0.2	Mechanical Parts Sports Equipment
NL6140	2,000 (196)	2	3,000 (294)	120,000 (11772)	30 (294)	1.45	0.1~0.2	
NL6150	2,200 (216)	2	3,500 (344)	140,000 (13739)	40 (400)	1.57	0.05~0.2	
NL6240	2,200 (216)	2	3,100 (304)	120,000 (11776)	20 (200)	1.45	0.05~0.2	
NL6250	2,400 (236)	2	3,600 (353)	150,000 (14720)	32 (320)	1.58	0.05~0.2	
NL6340	2,000 (196)	2	3,200 (314)	165,000 (16192)	30 (300)	1.5	0.05~0.2	
NL6350	2,500 (245)	2	3,750 (363)	195,000 (18646)	35 (350)	1.59	0.05~0.2	
NL6360	2,600 (255)	1.8	4,000 (393)	200,000 (19627)	37 (370)	1.7	0.05~0.2	
3.PP (Polypropylene)								Excellent Stiffness Heat Resistance Dimensional Stability
PL6230	1,000 (98)	2	1,600 (156)	60,000 (5886)	16 (156)	1.12	0.1~0.3	Mechanical Parts Automotive Part
PL6240	1,100 (107)	2	1,700 (166)	85,000 (8338)	25 (245)	1.2	0.1~0.3	
PL6250	1,250 (122)	2	2,000 (196)	110,000 (10791)	30 (294)	1.33	0.1~0.3	

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Great Eastern Resins Industrial CO., LTD.



Great Eastern Resins R&D Center



Kaohsiung Plant Office