

Engineering Plastic Stock Shapes for Machined Parts

Formulation	Color	ZL Product	Stocked?	Sheet	Rod	Tube
Acetal Copolymer	Natural	ZL® 900 C	YES			
Acetal Copolymer	Black	ZL® 900 C BLK	YES			
Acetal Copolymer	Blue	ZL® 900 C Blue	YES			
Acetal Homopolymer (Delrin®150)	Natural	ZL® 900 H	YES			
Acetal Homopolymer (Delrin® 150)	Black	ZL® 900 H BLK	YES			
Acetal Copolymer Static Dissipative	Ivory	ZL® 900 AS	YES			
PET	Natural	ZL® 1400	YES			
PET	Black	ZL® 1400 BLK	YES			
PET w/ Solid Lubricant	Grey	ZL® 1400 T	YES			
Nylon 6/6	Natural	ZL® 250	YES			
Nylon 6/6	Black	ZL® 250 BLK	YES			
Nylon 6/6 w/ MoS ₂	Black	ZL® 250 MO	YES			
Nylon 6/6 w/ 30% Glass	Black	ZL® 250 GF 30	YES			
Cast Nylon 6	Natural	ZL® 1100	YES			
Cast Nylon 6 w/ MoS ₂	Black	ZL® 1100 MO	YES			
PEEK (450G)	Brown	ZL® 1500	YES			

*Special order

MISSION

Our experienced team is committed to supplying quality engineering plastics to mutually grow business with our distribution partners.

- Same day shipping
- Over 100 years of combined industry sales experience
- ISO 9001:2018 certified
- Materials meet or exceed ASTM, Mil-Spec and Federal standards
- All extruded materials *double annealed* as a standard
- All extruded materials ultrasound tested as a standard
- Production, stocking and sales in Lenexa, KS
- Backed with over 70 years of stock shape manufacturing experience by prominent European manufacture Zell-Metall GmbH



Material Descriptions

Acetal Copolymer (POM-C) offers much less centerline porosity compared to that of acetal homopolymer. As compared to acetal homopolymer, acetal copolymer offers superior hot water resistance; more resistance to strong alkalis and thermal-oxidative degradation; improved impact resistance and much lower outgassing.

Acetal Homopolymer (POM-H) is most commonly known by the E.I. DuPont trade name Delrin®. It offers higher crystallinity than copolymer acetal. Homopolymer acetal is harder, stronger, improved mechanical strength, stiffness, creep resistance and also has a lower thermal expansion rate than copolymer acetal.

Fast fact: Acetal provides excellent dimensional stability and is ideal for wear applications in wet environments.

Typical industries served: Conveying equipment, automotive, aerospace, food processing, medical & pharmaceutical equipment, forestry & pulp/paper processing

Typical applications: Bearings, bushings, solenoid blocks, hinge pins, wear pads, scraper blades, dispensing heads, cams, pistons, handles, pump parts, washers, sprockets & gears

PET also known as thermoplastic polyester, offers excellent wear and abrasion resistance in wet or dry environments. PET displays good hardness, stiffness and strength along with superb sliding properties. Good creep resistance, combined with low moisture absorption, it makes an excellent material choice for complex parts requiring excellent dimensional stability and surface quality. It also exhibits excellent resistance to acids and stain resistance.

Fast fact: PET combines the wear resistance of nylon with the dimensional stability of acetal, plus wears well in both wet and dry environments.

Typical industries served: Conveying equipment, automotive, aerospace, food processing, medical & pharmaceutical equipment, forestry & pulp/paper processing

Typical applications: Bearings, bushings, solenoid blocks, hinge pins, wear pads, scraper blades, dispensing heads, cams, pistons, handles, pump parts, washers, sprockets & gears

Nylon (PA 6.6 & PA 6) robust mechanical properties and wide range of size availabilities have enabled nylon to achieve wide use as a replacement for more traditional materials in many diverse applications.

Fast fact: Nylon will outwear acetal by a factor of 3:1 in dry applications. However, in very wet applications, the opposite is true.

Typical industries served: Conveying equipment, automotive, aerospace, food processing, medical & pharmaceutical equipment, forestry & pulp/paper processing

Typical applications: Bearings, bushings, solenoid blocks, hinge pins, wear pads, scraper blades, dispensing heads, cams, pistons, handles, pump parts, washers, sprockets & gears

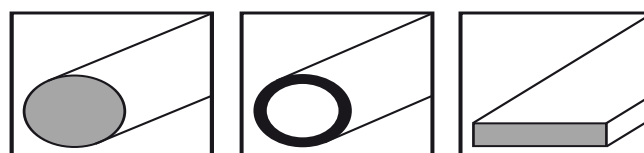
PEEK is a high temperature resistant material which exhibits a unique combination of: Good bearing and wear resistance, continuous use temperature up to 480°F, heat deflection temperature up to 320°F, retains good mechanical properties at temperature, excellent chemical resistance., (including steam), excellent stability (H₂O absorption and CLTE), excellent resistance to high energy radiation and FDA compliant.

Fast fact: PEEK has replaced higher cost imidized materials in applications such as down-hole electrical connectors due to its excellent chemical and steam resistance.

Typical industries served: Conveying equipment, automotive, aerospace, food processing, medical & pharmaceutical equipment, forestry & pulp/paper processing

Typical applications: Bearings, bushings, solenoid blocks, hinge pins, wear pads, scraper blades, dispensing heads, cams, pistons, handles, pump parts, washers, sprockets & gears

Product Capability



ZL Product	Formulation	Color	Rod Diameters	Standard Length	Plate Thickness	Format
ZL® 900	Acetal Copolymer	Natural Black Blue	1/4"-12" 14"-20"	10 ft 3 ft and 4 ft	1/4"-6"	24"x48" - 48"x120"
ZL® 900 H	Acetal Homopolymer (Delrin® 150)	Natural Black	1/2"-6"	4 ft and 10 ft	1/2"-2 3/4" + thickness MTO	24"x48" - 48"x120"
ZL® 1400	PET	Natural Black	1/4"-8"	4 ft and 10 ft	1/4"-4"	24"x48"- 48"x120"
ZL® 1400 T	Internally Lubricated Bearing Grade PET	Light Grey	6mm - 160mm	3,000mm (10ft)	8mm - 100mm	24"x48" - 48"x120"
ZL® 250	Nylon 6/6	Natural	1/4"-6"	4 ft and 10 ft	1/4"-3"	24"x48"- 48" x 120"
ZL® 250 Black	Nylon 6/6	Black	1/4"-3"	4 ft and 10 ft	1/4"-1 1/2"	24" x 48" - 48" x 120"
ZL® 250 MO	Nylon 6/6 MoS2	Black	1/4"-2"	4 ft and 10 ft	3/8"-2"	24"x48"
ZL® 1100	Cast Nylon 6	Natural	2"-8" 8 1/4"-9"	4 ft	1/4" - 4"	24"x48" - 48"x120"
ZL® 1100 MO	Cast Nylon 6 MoS2	Black	2"-8" 8 1/4"-9"	4 ft	1/4"-6"	24"x48" - 48"x120"
ZL® 1500	PEEK (450G)	Brown	1/4"-6"	4 ft and 10 ft	1/4"-2 1/4"	24" x 48" - 39" x 78"

****Custom lengths available made-to-order****

Acetal Copolymer Tube Production Capabilities

OD mm	ID mm	OD mm	ID mm	OD mm	ID mm	OD mm	ID mm
25	10	55	25	70	50	90	30
25	12	55	30	70	55	90	40
25	15	55	35	70	60	90	50
25	20	55	45	75	25	90	60
30	15	55	50	75	35	90	70
30	20	60	20	75	40	90	75
35	15	60	25	75	45	90	80
35	20	60	30	75	50	100	35
35	25	60	35	75	60	100	40
35	30	60	40	75	65	100	50
40	15	60	45	80	30	100	60
40	20	60	50	80	35	100	70
40	25	60	55	80	40	100	80
40	30	65	30	80	45	100	85
40	35	65	35	80	50	100	90
45	20	65	40	80	60	110	40
45	25	65	45	80	65	110	45
45	30	65	50	80	70	110	50
45	35	65	55	85	30	110	60
50	20	70	25	85	40	110	70
50	25	70	30	85	60	110	80
50	30	70	35	85	65	110	90
50	35	70	40	85	70	120	50
50	40	70	45	85	75	120	60
120	70	150	100	190	140	260	170
120	80	150	110	190	150	260	190
120	90	150	120	200	70	265	90
120	100	160	50	200	90	265	210
125	80	160	60	200	100	270	90
125	90	160	80	200	130	280	100
125	100	160	90	200	140	280	140
130	50	160	100	200	150	280	210
130	60	160	120	200	160	280	240
130	80	160	130	210	150	300	90
130	90	160	140	210	160	300	100
130	100	170	60	220	70	310	130
130	110	170	80	220	75	350	200
140	60	170	100	220	160	400	200
140	70	170	120	220	190	400	300
140	80	170	130	230	120	450	200
140	90	170	140	230	160	450	300
140	100	180	70	230	170	500	200
140	110	180	100	230	190	500	300
140	120	180	110	250	70	500	375
150	50	180	120	250	150		
150	70	180	140	250	170		
150	80	180	150	260	130		
150	90	190	70	260	160		

Conversion:
25.4mm = 1.00"

Acetal Copolymer Tube Typical STOCKED Sizes

OD	ID	OD	ID
25 mm	15 mm	120 mm	60 mm
30 mm	15 mm	125 mm	80 mm
35 mm	15 mm	130 mm	60 mm
35 mm	25 mm	130 mm	90 mm
40 mm	20 mm	130 mm	110 mm
45 mm	25 mm	140 mm	80 mm
50 mm	20 mm	140 mm	100 mm
60 mm	30 mm	150 mm	70 mm
60 mm	40 mm	150 mm	80 mm
60 mm	50 mm	150 mm	120 mm
65 mm	30 mm	160 mm	100 mm
65 mm	55 mm	170 mm	100 mm
70 mm	30 mm	180 mm	70 mm
70 mm	50 mm	180 mm	120 mm
80 mm	40 mm	180 mm	140 mm
90 mm	40 mm	200 mm	130 mm
90 mm	70 mm	200 mm	150 mm
100 mm	40 mm	200 mm	190 mm
100 mm	60 mm	220 mm	70 mm
100 mm	70 mm	230 mm	170 mm
100 mm	80 mm		
110 mm	50 mm		
110 mm	80 mm		
120 mm	50 mm		

* Typical stocked sizes. Stocked items subject prior to sell.
* Additional sizes may be available as inventory changes. Please contact your ZL representative for current availability.

Please contact your ZL representative for size, configuration, and any minimum quantities for ZL Custom Products.

Product Compliance

ZL Product	Formulation	Color	FDA Compliant	USDA Compliant	3A Dairy Compliant	NSF 51/61 Compliant
ZL® 250	Nylon 6/6	Natural	Yes	Yes	Yes	61-Yes
ZL® 250 BLK	Nylon 6/6	Black	Yes	Yes	No	No
ZL® 250 MO	Nylon 6/6 w/ MoS ₂	Black	No	No	No	No
ZL® 250 GF 30	Nylon 6/6 w/ 30% Glass	Black	No	No	No	No
ZL® 1100	Cast Nylon 6	Natural	Yes	Yes	Yes	No
ZL® 1100 MO	Cast Nylon 6 w/ MoS ₂	Black	No	No	No	No
ZL® 900 C	Acetal Copolymer	Natural	Yes	Yes	Yes	51 & 61-Yes
ZL® 900 C BLK	Acetal Copolymer	Black	Yes	Yes	No	51 & 61-Yes
ZL® 900 Blue	Acetal Copolymer	Blue	Yes	Yes	No	N/A
ZL® 900 H	Acetal Homopolymer	Natural	Yes	Yes	Yes	51 & 61-Yes
ZL® 900 H BLK	Acetal Homopolymer	Black	Yes	Yes	No	51 & 61 - Yes
ZL® 900 AS	Acetal Copolymer Static Dissipative	Ivory	Yes	Yes	No	No
ZL® 1400	PET	Natural	Yes	Yes	Yes	No
ZL® 1400 T	PET w/ Solid Lubricant	Grey	Yes	Yes	No	No
ZL® 1500	PEEK	Brown	Yes	Yes	Yes	51-Yes



Please note:

It is not part of our quality control to conduct tests to ensure the conformity. We depend on the statements of our raw material suppliers. It is the responsibility of the recipient of our products to ensure that any rights and existing laws and legislations are observed.

ASTM Standard Shape Guidelines

Material	ASTM	Diameter Size in	Diameter Tolerance in	Rod Camber in / ft	Thickness Size in	Thickness Tolerance in	Length Camber in / ft	Width Bow in / ft
ZL® 250 Extruded Nylon 6/6	ASTM D5989	1/4" - 7/8" 1" - 2" 2 1/8" - 2 3/4" 3" & over	+0.003 /-0 +0.005 /-0 +0.015 /-0 +0.250 /-0	2 1/2" / 8' 1 1/4" / 8' 1 1/4" / 8' 1/4" / 4'	1/4" - 7/8" 1" - 2" over 2"	+0.025 /-0 +0.025 /-0 +0.050 /-0	3/4" / 4' 1/4" / 4' 1/4" / 4"	3/16" / 2' 1/16" / 2' 1/16" / 2"
ZL® 1100 Cast Nylon 6	ASTM D5989	1" - 2 3/4" 3" & over	+0.015 /-0 +0.250 /-0	1/4" / 4' 1/4" / 4'	1/4" & over	+0.025 /-0	1/4" / 4'	1/16" / 2'
ZL® 900 Acetal Copolymer & Homopolymer	ASTM D6100	1/4" - 7/8" 1" - 2 3/8" 2 1/2" & over	+0.003 /-0 +0.005 /-0 +0.250 /-0	2 1/2" / 8' 1 1/4" / 8' 1" / 8'	1/4" - 1" 1 1/8" - 3" 3 1/8" & over	+0.025 /-0 +0.050 /-0 +0.125 /-0	3/4" / 4' 1/4" / 4' 1/4" / 4'	3/16" / 2' 1/16" / 2' 1/8" / 2'
ZL® 1400 PET	ASTM D6261	1/4" - 7/8" 1" - 1 7/8" 2" 2 1/8" - 2 1/2" 2 5/8" - 6"	+0.003 /-0.001 +0.005 /-0 +0.008 /-0 +0.030 /-0 +0.250 /-0	2 5/8" / 8' 1 3/8" / 8' 1 3/8" / 8' 1 1/8" / 8' 3/8" / 4'	1/4" - 2" 2 1/8" - 3" 3 1/8" & over	+0.025 /-0 +0.050 /-0 +0.350 /-0	3/4" / 4' 1/4" / 4' 1/4" / 4'	1/4" / 2' 1/8" / 2' 5/16" / 1'
ZL® 1500 PEEK	ASTM D6262	1/4" - 1" 1 1/8" - 2" 2 1/8" - 3" 3 1/4" & over	+0.003 /-0 +0.005 /-0 +0.030 /-0 +0.250 /-0	2 1/2" / 8' 1 1/4" / 8' 1 1/4" / 8' 1/4" / 4'	1/4" - 7/8" 1" & over	+0.025 /-0 +0.025 /-0	3/4" / 4' 1/4" / 4'	3/16" / 2' 1/16" / 2'

ZL's stock shape material tolerances meet or exceed ASTM standards.



RESISTANCE TO CHEMICALS

		<u>Nylon 6/6</u> Cast Nylon 6 ZL® 250 series ZL® 1100 series	<u>Acetal copolymer</u> Acetal homopolymer ZL® 900C series ZL® 900H series	<u>PET</u> ZL® 1400 series	<u>PEEK</u> ZL® 1500 series
Chemical substance	%	Resistances capacity and material stability			
Acetone	TR	A	A	C	A
Acetylchloride	TR	D	D	---	---
Acetylene	TR	A	A	A	A
Alkylbenzoic	TR	A	A	---	---
Alu. salts of min.acids	20	B	B	A	A
Formic acid	10	B	D	A	B
Ammonia	TR	B	A	D	A
Benzene, Benzaldehyde	H	A	A	D	A
Chlorine moist	H	D	D	B	D
Boric acid	10	A / B	A	A	A
Bromwater	GL	D	D	---	A
Butadien	TR	A	A	A	---
n-Butyleneglycol	TR	A	A	A	A
Calcium chloride alcoholic	20	---	A	---	---
Chlorine, Chlorine moist	H	D	D	D	D
Chlorobenzene	TR	A	A	D	A
Chloroform	TR	B	C	D	A
Citric acid	10	A	A	A	A
aqueous	20	A	---	---	---
Cyclohexane/Cyclopentone	TR	A	A	A	A
Dichlortrethylene	TR	D	D	D	A
Dichlortetrafluorethan	TR	A	A	A	A
Dimethyleter	TR	---	---	A	A
Inert Gas	TR	A	A	A	A
Developing liquid	H	A	A	A	A
Mineral oil, Natural gas	H	A	A	A	A
Acetic acid aqueous	95	D	D	C	A
Ethanol	96	A	A	A	A
Essential oils	H	A	A	A	A
Alcoholic fat	H	A	A	A	---
Fatty acid	TR	A	A	A	A
Flurinated hydrocarbons	H	A	A	A	---
Flurinated hydroacid aq.	40	D	D	D	---
Fixer solution	H	A	A	A	---
Galvanic baths	H	D	D	---	---
Glycerine	TR	A	A	A	A
Glyceral	TR	A	A	A	A
Glyceral acid aqueous	30	---	---	---	---
Glysantin	H	A	A	D	---
Uric acid aqueous	10	A	A	A	A
Helium and rare gas	TR	A	A	A	A
Heptan Hexan	TR	A	A	A	A
Hydraulic oils	H	A	A	A	A
Impregnating oils	H	A	A	A	A
Isooctan	80	A	A	A	A
Isocyante	H	A	A	A	---
Cold machine oil	H	A	A	A	A
Potash lye	50	A	A	D	A
Potasiumchloride	10	A	A	A	A
Hydrofluoristic acid	30	---	---	D	---
Carbon dioxide	---	A	A	A	A
Super Otto-fuel	H	A	A	---	A
Diesel fuel	H	A	A	A	A
Turbine aircraft fuel	H	A	A	A	A
Kerosene	H	A	A	A	A

H: commercially **GL:** saturated aqueous solution [at 23 ° C] **TR:** technically pure **A:** resistant: only low weight and dimensional changes **B:** not resistant: significant weight, dimensions and property changes of the molding material **C:** inconstant: at long exposure **D:** unstable: within a short time strong attack

		<u>Nylon 6/6</u> <u>Cast Nylon 6</u>	<u>Acetal copolymer</u> <u>Acetal homopolymer</u>	<u>PET</u>	<u>PEEK</u>
		ZL® 250 series ZL® 1100 series	ZL® 900C series ZL® 900H series	ZL® 1400 series	ZL® 1500 series
Chemical substance	%	Resistances capacity and material stability			
Soldering solution	H	D	D	A	A
Magnesium salt aqueous	10	A	A	A	A
Seawater	---	A	A	A	A
Methan	TR	A	A	A	A
Methyl acetate	TR	A	B	B	A
Methylene Chloride	TR	B / C	D	D	A
Methylene Glycol	TR	A	---	---	A
Methylenglycolacetate	TR	A	---	---	---
Mixed acids	---	D	D	D	---
Engine oil	H	A	A	A	---
Naphtalene	H	A	A	A	A
Naphtalenesulfanacids	TR	D	D	D	C
Sodium salts aqueous	10	A	A	A	A
Sodium salts hypophosphit aqu	10	A	A	A	---
Sodium bisulfit aqueous	10	A	A	A	A
Caustic soda solution	10	A	D	D	---
Nitrobenzene	TR	B	A	A	A
Octane Octene	TR	A	A	A	A
Oleric acid	H	A	A	A	A
Ozon	TR	B / C	B / C	B / C	A / B
Petroleum	TR	A	A	A	A
Phenylethylalcohol	TR	A / B	---	---	---
Phosphoric acid	10	D	A	A	A
Phosphoric acid	85	---	---	---	---
Propane	TR	A	A	A	A
Mercury	TR	A	A	A	A
Mercury chlorid aqueous	GL	D	---	---	A
Nitric acid	>50	D	C	C	B
Hydrochloric aqueous	>20	D	B	B	A
Oxygen under pressure	TR	A	A	A	A
Sulphurdioxid dry	TR	A	---	---	A
Sulphurdioxid moist	TR	B	---	---	A
Sulphereous acid	GL	B	A	A	A
Sulphuric acid	>80	D	D	D	A
Sodium Carbonate	10	A	A	A	A
Nitrogen gas	TR	A	A	A	A
Styrol	TR	A	A	A	A
Turpentine oil	H	A	A	A	A
Tetrachloride-carbon	TR	A	A	A	---
Transformer oil	H	A	A	A	A
Trichlorethylene	TR	A / B	D	D	A
Uraniumfloride	TR	D	D	D	---
Urin	---	A	A	A	A
Vinylchloride	TR	A	A	A	A
Steam	>100	B / D	D	D	A
Hydrogen	TR	A	A	A	A
Hydreogensuperoxid	---	A	A	A	---
Acidity of Wine	10	A	---	---	A
Acidity of Wine	50	B	---	---	---
Xylol	TR	A	B	B	A
Xylol	TR/10	A	D	D	---
Zincchloride	10	B	---	A	A
Zincchloride	37,5	D	---	---	---
Zinc	---	A	A	A	A

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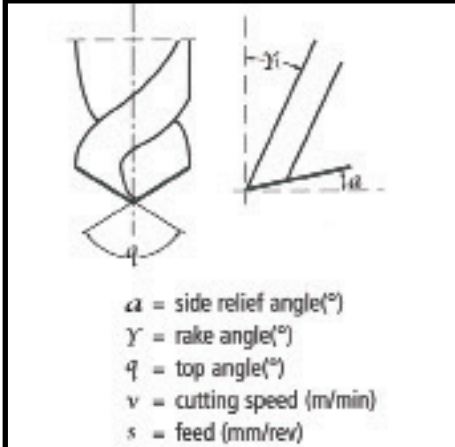
Machining Guidelines



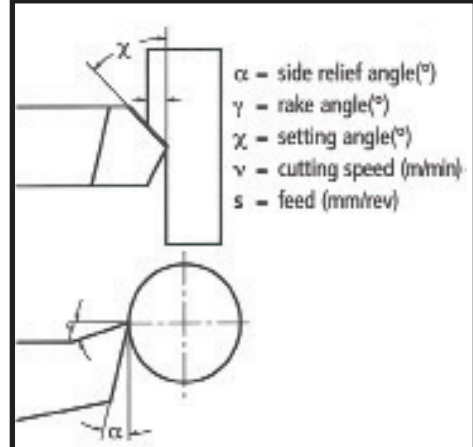
Machining ZL® materials is easy, but use only sharp tools with high cutting speeds and low feed. In order to obtain exact dimensions, machining should be done in several steps to allow the component to cool down properly. When drilling large diameters, start with a pilot hole of 10 - 12 mm. When machined, all corners should be rounded to avoid failure due to the notch effect.

Diamond coated tools and preheating of the stock shapes are recommended when machining glass-fiber filled engineering plastics.

Drilling



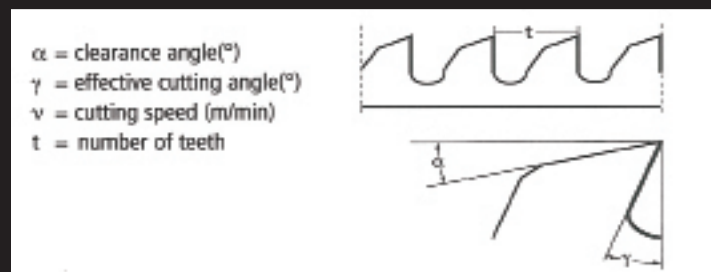
Turning on a Lathe



ZL Product	a	γ	q	v	s
ZL® 900 (Acetal)	5-10	3-5	60-90	50-100	0.1-0.3
ZL® 1400 (PET)	5-10	10-20	90	50-150	0.2-0.3
ZL® 250 (Nylon 6/6)	10-15	3-5	60-90	50-100	0.1-0.5
ZL® 1100 (Cast Nylon 6)	10-15	3-5	60-90	50-100	0.1-0.5
ZL® 1500 (PEEK)	5-10	10-30	90-120	70-200	0.1-0.3

a	γ	χ	v	s
5-10	0-5	0-45	200-500	0.05-0.5
5-10	0-5	0-45	200-500	0.05-0.5
5-15	0-10	0-45	200-500	0.1-0.5
5-15	0-10	0-45	200-500	0.1-0.5
6-8	0-5	45-60	250-500	0.1-0.4

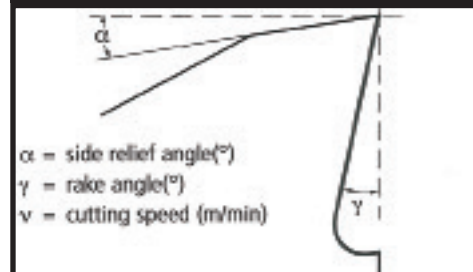
Sawing



Band Saw Circular Saw

ZL Product	a	γ	v	t	a	γ	v	t
ZL® 900 (Acetal)	30-40	0-8	200-1000	3-5/in	10-15	0-10	1000-3500	24-80
ZL® 1400 (PET)	15-30	5-8	300	2-8/in	10-15	0-10	1000-3500	24-80
ZL® 250 (Nylon 6/6)	30-40	0-8	200-1000	3-5/in	10-15	0-10	1000-3500	24-80
ZL® 1100 (Cast Nylon 6)	30-40	0-8	200-1000	2-8/in	10-15	0-10	1000-3500	24-80
ZL® 1500 (PEEK)	15-30	0-5	500-800	3-5/in	10-15	0-10	1000-3500	24-80

Milling



a	γ	v
5-15	5-15	250-500
5-15	5-15	250-400
10-20	5-15	250-500
10-20	5-15	250-500
5-15	6-10	180-450



PRE-HEATING

Glass-filled, carbon-filled, and PET products should be pre-heated before sawing or drilling to optimize ideal machinability. The temperature should be between 90°C and 120°C with a heating and cooling rate of approximately 10°C per hour. All other materials should be at room temperature before machining.



Trade Name Cross Reference

Product Description	ZL Engineering Plastics	Mitsubishi Chemical Advanced Materials	Ensinger	Röchling	Polymer Industries	Cast Nylons LTD	Nylatech	Gehr
Nylon 6/6 Extruded Natural	ZL® 250 Nat	Nylon 101® Nat	Tecamid® 66-Nat	Sustamid® 66-Nat	Mechetec® Nylon	-	-	GEHR® PA (nylon)
Nylon 6/6 Extruded Black	ZL® 250 Blk	Nylon 101® Blk	Tecamid® 66-Blk	Sustamid® 66-Blk	Mechetec® Nylon	-	-	-
Nylon 6/6 Extruded MoS2	ZL® 250 MO	Nylatron® GS	Tecamid® MDS	Sustamid® 66-MoS2	Mechetec® Nylon	-	-	-
Nylon 6 Cast Natural	ZL® 1100 Nat	MC®-907	Tecast® 6PA-Nat	Sustamid® 6G-Nat	-	Nycast® 6PA-Nat	Nylatech® Nat	-
Nylon 6 Cast MoS2	ZL® 1100 MoS2	Nylatron® GSM	Tecast® 6PAM	Sustamid® 6G-MoS2	-	Nycast® 6PA MoS2	Nylatech® MD	-
Copolymer Acetal-Natural	ZL® 900 C Nat	Acetron® GP Nat	Tecaform AH® Nat	Sustarin® C Nat	Mechetec® Acetal	Acetal/ POM C	-	GEHR® POM-C Nat
Copolymer Acetal-Black	ZL® 900 C Blk	Acetron® GP Blk	Tecaform AH® Blk	Sustarin® C Blk	Mechetec® Acetal	Acetal/ POM C	-	GEHR® POM-C Blk
Copolymer Acetal-Blue	ZL® 900C Blue	-	Tecaform AH® FG Blue	-	-	-	-	-
Homopolymer Acetal-Natural	ZL® 900 H Nat	Delrin® Nat	Delrin® 150 Nat	Sustarin® H Nat	Mechetec® Delrin®	-	-	-
Homopolymer Acetal-Black	ZL® 900 H Blk	Delrin® Blk	Delrin® 150 Blk	Sustarin® H Blk	Mechetec® Delrin®	-	-	-
PET-Natural	ZL® 1400	Ertalyte® PET P-Nat	Tecapet® PET-Nat	Sustadur® PET	Mechetec® PET	-	-	GEHR® PET
PET-Black	ZL® 1400 Blk	Ertalyte® PET P-Blk	Tecapet® PET-Blk	-	-	-	-	-
PET-Solid Lubricant	ZL® 1400 T	Ertalyte® TX	-	Sustadur® PET TF	-	-	-	-
PEEK	ZL® 1500	Ketron® PEEK	Tecapeek®	SustPEEK®	Mechetec® PEEK	-	-	GEHR® PEEK

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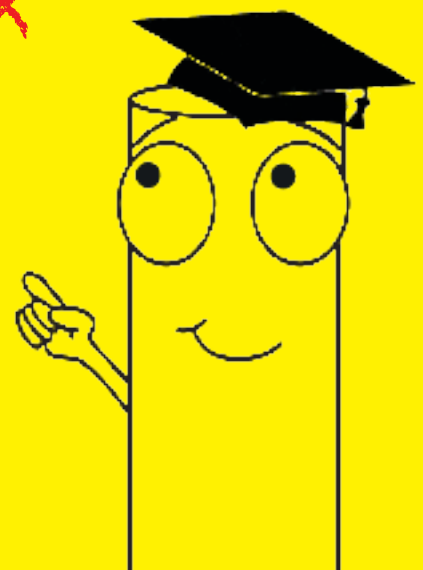
Product Property Terms Defined

Specific Gravity (SG) or Density ASTM D-792	Description	Why??
	Ratio of the weight of a material compared to the same volume of water	Determines the weight of a part. The higher the number, the heavier the material. Materials with a SG < 1.00 will float, as they are lighter than water
Tensile Strength ASTM D-638	Pulling force required to break a material (psi) at a given temperature (Tensile = "in tension" = pulling)	Determines how much load a given cross section of a given material can withstand in tension without breaking
Tensile Modulus ASTM D-638	A measure (psi) of how stiff a material is when in tension	Allows a calculation of how much a material will move (strain) under a given load (stress) when being pulled
Flammability UL 94	A measure of the way a material burns under very specific conditions	Very important safety consideration; ratings are listed by material thickness; generally are obtained by the resin supplier; actual UL testing generates a "Yellow Card" for that resin
Coefficient of Friction (COF)	Measures "slipperiness" of a material against another; with engineering plastics, usually against steel	Determines force required to start a material sliding (static COF) and to keep it moving (dynamic COF); important in designing slide bearings / wear pads; results are comparative only, not absolute values
Dielectric Constant ASTM D-150	Describes the ability of a material to store electrical energy (act as a capacitor)	Allows a designer to compare materials for their ability to store (inhibit) or "not store" (allow) electrical current to pass through it
Dissipation Factor ASTM D-150	Measures dielectric loss in an AC current	Dielectric loss is measured as heat, and since heat is normally NOT wanted, materials with low dissipation factors are preferred for electrical applications of all types.
Moisture (Water) Absorption ASTM D-570	The percentage increase in the weight of a material based on how much water it absorbs, usually measured by "24 hour" and "saturation"	This property addresses two areas: dimensional stability (the more water a material can absorb, the more it will grow); changes in properties – the more water a material absorbs, it generally becomes softer and less wear resistant
Elongation ASTM D-638	The percentage (%) increase in a material's length when it breaks	Used in failure prevention analysis (don't overstretch the material!) It is a measure of stiffness more than the actual strength of a material.
Flexural Strength ASTM D-790	A measure of how much bending force a material can take before breaking	Determines the max bending load a material in a given cross section can withstand, whether fixed at one end with a load at the other, or suspended at both ends with the load in the middle

Compressive Strength ASTM D-695	Description	Why??
	A measure of how much weight a material can withstand in compression (being "squeezed")	Determines how much load a given cross section of a given material can withstand in compression before deforming 10% of original cross section
Flexural Modulus ASTM D-790	A measure (psi) of how stiff a material is when being flexed.	Allows a calculation of how much a material will move (strain) under a given flexural load (stress). It represents a combination of the tensile strain (one side is stretching) PLUS the compressive strain (the other side is compressed)
Compressive Modulus ASTM D-695	A measure (psi) of how stiff a material is when being compressed	Allows a calculation of how much a material will move (strain) under a given load (stress) when being compressed
Shear Strength ASTM D-695	A measure of how much shearing force a material can take before breaking	Determines how much load a given cross section of a given material can withstand in shear without breaking. (when a paper is cut with scissors, the paper fails in "shear".)
Hardness ASTM D-785	Durometer Rockwell scale Determines resistance to indentation a given material can withstand	There are various test methods and scales, and except for materials reported in the same scale, there is no direct correlation between any two of them! Within a scale, higher number = harder; most engineering plastics are reported in Rockwell scales
IZOD Impact Resistance ASTM D-256	Method "A" (ft.lbs/in) A measure of the impact resistance, or "toughness", of a material	Allows comparison of materials using a specific impact criteria, it actually measures notch sensitivity; this is usually used in conjunction with other properties to determine best candidate materials in an impact environment
Coefficient of Linear Thermal Expansion ASTM D-831	(CLTE) Measures how much a material shrinks or grows with changes in temperature	Determines the allowance that must be designed to allow for material movement over a given temperature range (the larger the range, the more important this is); values reported are the "line" (average) in the graph from 30°F through 300°F

Melt Point ASTM D-348 (F)	Description	Why??
	Gives the temperature at which a crystalline / semi-crystalline material melts (becomes fluid)	Most important for processing (extrusion) of polymeric materials.
Glass Transition Temperature ASTM D-348 (F)	The "softening" temperature for amorphous materials	Important to companies doing thermoforming, this is the minimum temperature needed to be able to thermoform PC, PMMA, PET-G, etc
Continuous Use Temperature (CUT) UL 746 or resin data	The maximum temperature at which a material can withstand, in air, for 100,000 hours (11 years) with no load and still retain at least 50% of its physical properties	This is important for very lightly loaded parts that must withstand long term elevated temperatures; the material oxidizes over time and can become brittle. Few plastic parts see this type of service
Heat Deflection Temperature ASTM D-648 (F)	The temperature where a 1/2" thick test bar deflects .010"	This is the "working stress" number, a fair indicator of the maximum operating temperature of a material under load, very important design consideration; usually reported with a load of 264 psi
Thermal Conductivity ASTM D-5930	Gives the rate at which heat is conducted through a material	Determines the ability of a material to act as a thermal insulator (the lower the value, the better the thermal insulation)
Dielectric Strength ASTM D-149	The voltage where a 1mm sample fails as an electrical insulator	Basically, a comparative test only between materials, NOT a design criteria by itself
Volume Resistivity ASTM D-257	Another measure of electrical insulation properties	Provides a means to estimate how many amps go through a material with a given application of volts; important when considering static dissipative material performance

Simplified



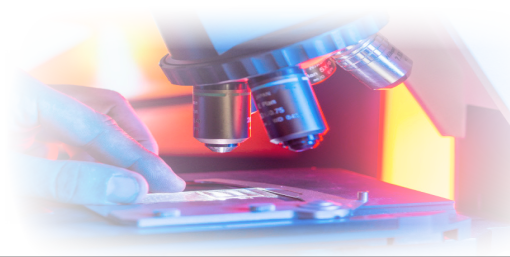
Product Properties



	Test Method ASTM	Units	ZL® 250 Extruded Nylon 6/6	ZL® 250 MO Extruded Nylon 6/6 MoS2
Mechanical Properties				
Specific Gravity	D-792	gm/cm ³	1.14	1.16
Tensile Strength, 73° F	D-638	psi	12,000	10,000-14,000
Tensile Modulus, 73° F	D-638	psi	420,000	480,000
Elongation, Break, 73° F	D-638	%	60	120
Flexural Strength, 73° F	D-790	psi	15,000	17,000
Flexural Modulus, 73° F	D-790	psi	410,000	460,000
Compressive Strength, 73° F	D-695	psi	12,500	16,000
Compressive Modulus	D-695	psi	420,000	420,000
Impact Strength, Notched, 73° F	D-256	ft-lbs/in	0.6-0.9	0.5
Hardness, Rockwell	D-785	R	R121	R125
Hardness, Durometer, Shore D	2240	D	D80	D85
Shear Strength	D-732	psi	10,000	10,500
Coefficient of Friction against steel	-	-	0.25	0.20
Thermal Properties				
Deflection Temperature - 66 psi	D-648	°F	455	-
Deflection Temperature - 264 psi	D-648	°F	194	200
Maximum Temperature - Long Term	-	°F	220	220
Maximum Temperature - Short Term	-	°F	-	-
Melting Point		°F	500	500
Coefficient of Linear Thermal Expansion	D-696	in/in/ °F	4x10 ⁻⁵	4x10 ⁻⁵
Thermal Conductivity	C-177	Btu-in/hr-ft ² -°F	1.7	1.7
Electric Properties				
Dielectric Strength	D-149	V/mil	600	350
Dielectric Constant, 1kHz	D-150	-	3.9	3.7
Dissipation Factor, 1 kHz	D-150		0.02	0.02
Flammability	UL 94		V-2	V-2
Volume Resistivity, 73° F	D-257	ohm-cm	10 ¹⁵	-
Water Absorption Rates				
Water Absorption, 24 hrs. 73° F	D-570	%	1.2	1.0
Water Absorption, Saturation, 73° F	D-570	%	7.0	7.0

ZL® 250 GF30 30% Glass filled Extruded Nylon 6/6	ZL® 1100 Cast Nylon 6	ZL® 1100 MO Cast Nylon 6 MoS2	ZL® 900 C Acetal Copolymer	ZL® 900 H Acetal Homopolymer	ZL® 900 AS Antistatic Acetal Copolymer
* Alternative test method if notated					* Alternative test method if notated
1.35	1.15-1.16	1.15-1.17	1.41	1.42	1.35
*15,900 (ISO 527)	11,000-14,000	11,000-14,000	8,800	10,000	*6,000 (ISO 527)
*790,000 (ISO 527)	350,000-450,000	350,000-450,000	400,000	450,000	*230,000 (ISO 527)
*8 (ISO 527)	20-40	20-40	55	40	*15 (ISO 527)
*24,500 (ISO 527)	12,500-14,500	12,500-14,500	13,000	14,100	*8,700 (ISO 178)
	350,000-450,000	350,000-450,000	400,000	450,000	
	15,000	14,000	15,000	16,000	
*507,000 (ISO 604)	400,000	400,000	400,000	450,000	*275,000 (ISO 604)
*2.75 (ISO 179/1eU)	0.6-0.9	0.6-0.9	1.3	1.5	1.8
	R115-R120	R115-R120	R120(M80)	R122 (M94)	
D85	D78-D83	D85	D80-D82	D84	D74
	10,000-11,000	10,000-11,000	8,000	9,000	
	0.22	0.22	0.15	0.15	
	370	370	316	346	
	200	200	205	277	
266	200	200	180	180	194
392	300	300	-	-	266
500	420	420	335	347	329
	5.0×10^{-5}	5.0×10^{-5}	5.4×10^{-5}	4.7×10^{-5}	
	1.7	1.7	1.6	2.5	
*760 (IEC 60243)	500-600	400	2,100	3,000	1,400
	3.7	3.7	3.7	3.7	
	-	-	0.005	0.005	
HB	HB	HB	HB	HB	
* $< 10^{12}$ (IEC 60093)	10^{14}	10^{15}	10^{15}	10^{15}	10^{10}
*1.5 (ISO 62)	0.6-1.2	0.6-1.2	0.22	0.25	
*5.5 (ISO 62)	5.0-6.0	5.0-6.0	0.9	0.9	0.8

Product Properties



	Test Method ASTM	Units	ZL® 1400 PET	ZL® 1400 T Bearing Grade PET	ZL® 1500 PEEK (Victrex® 450G)
Mechanical Properties			* Alternative test method if notated		
Specific Gravity	D-792	gm/cm ³	1.38	1.44	1.30
Tensile Strength, 73° F	D-638	psi	11,500	10,900	*15,225 (ISO 527)
Tensile Modulus, 73° F	D-638	psi	400,000	360,000	*609,000 (ISO 527)
Elongation, Break, 73° F	D-638	%	70	5	*20 (ISO 527)
Flexural Strength, 73° F	D-790	psi	15,000	14,000	*23,200 (ISO 178)
Flexural Modulus, 73° F	D-790	psi	400,000	360,000	*565,000 (ISO 178)
Compressive Strength, 73° F	D-695	psi	15,000	15,000	17,100
Compressive Modulus	D-695	psi	420,000	400,000	*507,500 (ISO 604)
Impact Strength, Notched, 73° F	D-256	ft-lbs/in	0.7	0.8	*1.66 (ISO 179/1EA)
Hardness, Rockwell	D-785	R	R117(M94)	R117(M94)	R126(M99)
Hardness, Durometer, Shore D	2240	D	D83-D84	D83	*D86 (ISO 868)
Shear Strength	D-732	psi	8,000	8,500	7,600
Coefficient of Friction against steel	-	-	0.15	0.19	0.40
Thermal Properties					
Deflection Temperature - 66 psi	D-648	°F	-	-	-
Deflection Temperature - 264 psi	D-648	°F	175	180	320
Maximum Temperature - Long Term	-	°F	230	210	500
Maximum Temperature - Short Term	-	°F	-	-	572
Melting Point		°F	490	491	*644 (ISO 3146)
Coefficient of Lineral Thermal Expansion	D-696	in/in/ °F	3.9x10 ⁻⁵	4.5x10 ⁻⁵	2.6x10 ⁻⁵
Thermal Conductivity	C-177	Btu-in/hr-ft ² -°F	2.0	1.9	1.75
Electric Properties					
Dielectric Strength	D-149	V/mil	400	-	*380 (IEC 60243)
Dielectric Constant, 1kHz	D-150		3.4	-	3.05
Dissipation Factor, 1 kHz	D-150		0.002	-	0.003
Flammability	UL 94		HB	HB	V-0
Volume Resistivity, 73° F	D-257	ohm-cm	-	-	*10 ¹⁵ (IEC 60093)
Water Absorption Rates					
Water Absorption, 24 hrs. 73° F	D-570	%	0.10	0.06	0.5
Water Absorption, Saturation, 73° F	D-570	%	0.9	0.47	0.5

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Notes:

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Research for the Trade Name Cross Reference page was based upon information available on above mentioned manufacture websites.

klepsch group- the plastic power network



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