PROTIQ
A Phoenix Contact Company

MATERIAL DATASHEET
LASER SINTERING OF PLASTICS

3D PRINTING WITH HIGH-STRENGTH PLASTICS

Polyamide (PA) plastics are materials that feature long-term stability and resistance to stress. They are also highly resistant to many chemicals and are available in nearly all colours.
We can produce inpermeable objects on request. In addition to unfílled plastics, PROTIQ also uses filled, soft and hightemperature plastics.

MATERIAL				PA 12	PA 12 GF	Alumide	PrimePart ® PLUS PA 2221
							
	properties	test method	unit				
general properties	colour	–	–	white	beige/grayish	gray/silver	natural
	base material	–	–	PA 12	PA 12 + glass beads	PA 12 + Aluminium	PA 12
	density, laser-sintered	–	g/cm³	0,9-1,0	1,2-1,3	1,36–1,4	0,97
	surface roughness (Ra/Rz)	DIN EN ISO 4287	µm	8–11 / 50–70	6–7 / 40–50	5–7 / 25–40	–
mechanical properties	hardness (Shore A/D)	ISO 868	–	75±2 D	80 D	76 D	75 D
	flexural modulus	DIN EN ISO 178	MPa	1.500	2600 – 2.900*	3.600	1.340 – 1.390*
	flexural strength	DIN EN ISO 178	MPa	58	73 – 78,3	72	54 – 59*
	tensile modulus	DIN EN ISO 527	MPa	1.700 ± 150*	2800 – 3.200*	3.800	1.600 – 1.650*
	tensile strength	DIN EN ISO 527	MPa	45 – 50*	45 – 53*	48	40 – 47*
	ball indentation hardness	DIN EN ISO 2039	N/mm²	78	–	–	–
	elongation at break	DIN EN ISO 527	%	15 ± 10	5 – 9*	4	4 – 16*
	Izod impact strength	DIN EN ISO 180	kJ/m²	32,8 ± 3,4	15 – 21*	–	–
	Izod notched impact strength	DIN EN ISO 180	kJ/m²	4,4 ± 0,4	4 – 4,2*	–	–
	Charpy notched impact strength	DIN EN ISO 179/1eA	kJ/m²	4,8 ± 0,3	4,1 – 5,4*	4,6	3,2 – 3,9*
	Charpy impact strength	DIN EN ISO 179/1eU	kJ/m²	53 ± 3,8	21,8 – 35*	29	18,1 – 34,5*
thermal properties	melting point	EN ISO 11357-1	°C	176	176	176	187
	temperature of deflection (1,80 Mpa)	ISO 75-1/-2	°C	–	96 – 101	144	70
	temperature of deflection (0,45 Mpa)	ISO 75-1/-2	°C	–	157 – 163	175	157
	Vicat softening temperature B/50	DIN EN ISO 306	°C	163	163 – 166	169	–
	Vicat softening temperature A/50	DIN EN ISO 306	°C	–	175 – 179	–	–
electrical properties	volume resistivity	DIN 53482 ICE-Publ. 92	Ω*cm	10^{13} – 10^{15}	–	3E+12	–
	surface resistivity	DIN 53482 ICE-Publ. 92	Ω	10^{13}	–	5E+14	–
	dielectrical strength	DIN 53481	kV/mm	92	–	0,1	–

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MATERIAL DATASHEET
LASER SINTERING OF PLASTICS

MATERIAL				PA 11	PA 2241 FR	PP	PEEK HP3
							
	properties	test method	unit				
general properties	colour	–	–	white	white	white, translucent	–
	base material	–	–	PA 11	PA 12	Polypropylene	PAEK
	density, laser-sintered	–	g/cm³	1,02	1	0,89 – 0,93	1,31
	surface roughness (Ra/Rz)	–	–	6–10 / 35–45	–	–	–
mechanical properties	hardness (Shore A/D)	ISO 868	–	–	–	–	–
	flexural modulus	DIN EN ISO 178	MPa	1250 – 1300*	–	1250 – 1500*	–
	flexural strength	DIN EN ISO 178	MPa	–	–	–	–
	tensile modulus	DIN EN ISO 527	MPa	1.100 – 1.250*	1.600 – 1.900*	1400	4.250
	tensile strength	DIN EN ISO 527	MPa	45 – 46*	41 – 49*	28	90
	ball indentation hardness	DIN EN ISO 2039	N/mm²	–	–	–	–
	elongation at break	DIN EN ISO 527	%	31 – 45*	6 – 22*	10 – 30*	2,8
	Izod impact strength	DIN EN ISO 180	kJ/m²	No break – 86*	–	16 – 24*	–
	Izod notched impact strength	DIN EN ISO 180	kJ/m²	5,2 – 7,7*	–	3,0 – 3,5*	–
	Charpy notched impact strength	DIN EN ISO 179/1eA	kJ/m²	4,5 – 8,3*	–	3,2 – 3,3*	–
	Charpy impact strength	DIN EN ISO 179/1eU	kJ/m²	85 – 198*	–	20 – 29*	–
thermal properties	melting point	EN ISO 11357-1	°C	203	185	140	372
	temperature of deflection (1,80 Mpa)	ISO 75-1/-2	°C	76	84	62	165
	temperature of deflection (0,45 Mpa)	ISO 75-1/-2	°C	176	154	102	–
	Vicat softening temperature B/50	DIN EN ISO 306	°C	177	–	90	–
	Vicat softening temperature A/50	DIN EN ISO 306	°C	191	–	131	–

* The mechanical properties may vary, depending on x-, y- and z-position of the test object and illumination parameters.

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MATERIAL DATASHEET
LASER SINTERING OF PLASTICS

MATERIAL				PA 6X	PA 2210 FR	TPU-90	PrimePart® ST PEBA 2301
							
	properties	test method	unit				
general properties	colour	–	–	white	white	natural	white
	base material	–	–	PA 6X	PA 12	TPU	TPA
	density, laser-sintered	EOS-method	g/cm³	1,00 – 1,04	1,06	1,1–1,2	0,95
	roughness (Ra/Rz)	–	–	5–10 / 30–50	6–10 / 30–55	13–17 / 72–84	–
mechanical properties	hardness (Shore A/D)	ISO 868 / *ISO 7619-1	–	78 D	79 D	88 – 92A	35 D
	flexural modulus	DIN EN ISO 178	MPa	–	2300	45 – 58*	–
	flexural strength	DIN EN ISO 178	MPa	–	65	–	–
	tensile modulus	DIN EN ISO 527	MPa	2200 – 2500*	2.200 – 2.500*	58 – 69*	75-80*
	tensile strength	DIN EN ISO 527	MPa	54 – 60*	38 – 46*	6 – 13*	7-8*
	ball indentation strength	DIN EN ISO 2039	N/mm²	–	–	–	–
	elongation at break	DIN EN ISO 527	%	15–25*	3–7*	50 – 350*	70-200*
	Izod impact strength	DIN EN ISO 180	kJ/m²	–	–	–	–
	Izod notched impact strength	DIN EN ISO 180	kJ/m²	–	–	–	–
	Charpy notched impact strength	DIN EN ISO 179/1eA	kJ/m²	–	–	–	–
	Charpy impact strength	DIN EN ISO 179/1eU	kJ/m²	–	–	–	–
thermal properties	melting point	EN ISO 11357-1	°C	215	185	160	150
	temperature of deflection (1,80 Mpa)	ISO 75-1/-2	°C	–	–	–	–
	temperature of deflection (0,45 Mpa)	ISO 75-1/-2	°C	–	–	–	–
	Vicat softening temperature B/50	DIN EN ISO 306	°C	–	–	–	–
	Vicat softening temperature A/50	DIN EN ISO 306	°C	–	–	96 – 100 (A/10)	–

* The mechanical properties may vary, depending on x-, y- and z-position of the test object and illumination parameters.

flammability PA 2241 FR					
	result	testing standard	method	ignition time	
flammability	passed	CS 25/JAR25/ FAR 25 § 25-853	–	12s	1,0 mm
	passed		–		1,5 mm
	passed		–		2,0 mm
	passed		–	60s	1,0 mm
	passed		–		1,5 mm
	passed		–		2,0 mm
flue gas density	passed	ABD 0031 (Issue:F)	AITM 2.0007	–	1,0 mm
	passed			–	1,5 mm
	passed			–	2,0 mm
toxicity	passed	ABD 0031 (Issue:F)	AITM 3.0005	–	1,0 mm
	passed			–	1,5 mm
	passed			–	2,0 mm
flammability PA 2210 FR					
	result	testing standard	method	ignition time	
flammability	passed	CS 25/JAR25/ FAR 25 § 25-853	–	12s	1,7 mm
	passed		–		2,0 mm
flammability	passed	UL 94	HB		1,1
	passed	UL 94	V-0		2,0
flue gas density	passed	ABD 0031 (Issue:F)	AITM 2.0007	–	1,7 mm
	passed			–	2,0 mm
toxicity	passed	ABD 0031 (Issue:F)	AITM 3.0005	–	1,7 mm
	passed			–	2,0 mm
approval specifications: JAR 25, UL 94					