



General Engineering Plastic Stock Shapes

PROPERTIES	Test methods	Units	ERTALON 6 SA	ERTALON 66 SA	ERTALON 66 SA-C	ERTALON 4.6	ERTALON 66-GF30	NYLATRON GS
Colour	-	-	natural (white)/black	natural (cream)/black	natural (white)	reddish brown	black	grey-black
Density	ISO 1183-1	g/cm ³	1.14	1.14	1.14	1.18	1.29	1.15
Water absorption:								
- after 24/96 h immersion in water of 23°C (1)	ISO 62	mg	86/168	40/76	65/120	90/180	30/56	46/85
	ISO 62	%	1.28/2.50	0.60/1.13	0.97/1.79	1.30/2.60	0.39/0.74	0.68/1.25
- at saturation in air of 23°C / 50% RH	-	%	2.6	2.4	2.5	2.8	1.7	2.3
- at saturation in water of 23°C	-	%	9	8	8.5	9.5	5.5	7.8
Thermal Properties (2)								
Melting temperature (DSC, 10°C/min)	ISO 11357-1/-3	°C	220	260	240	290	260	260
Glass transition temperature (DSC, 20°C/min) - (3)	ISO 11357-1/-2	°C	-	-	-	-	-	-
Thermal conductivity at 23°C	-	W/(K.m)	0.28	0.28	0.28	0.30	0.30	0.29
Coefficient of linear thermal expansion:								
- average value between 23 and 60°C	-	m/(m.K)	90 x 10 ⁻⁶	80 x 10 ⁻⁶	85 x 10 ⁻⁶	80 x 10 ⁻⁶	50 x 10 ⁻⁶	80 x 10 ⁻⁶
- average value between 23 and 100°C	-	m/(m.K)	105 x 10 ⁻⁶	95 x 10 ⁻⁶	100 x 10 ⁻⁶	90 x 10 ⁻⁶	60 x 10 ⁻⁶	90 x 10 ⁻⁶
Temperature of deflection under load:								
- method A: 1.8 MPa	+ ISO 75-1/-2	°C	70	85	75	160	150	85
Max. allowable service temperature in air :								
- for short periods (4)	-	°C	160	180	170	200	200	180
- continuously : for 5,000 / 20,000 h (5)	-	°C	85/70	95/80	90/75	155/135	120/110	95/80
Min. service temperature (6)	-	°C	-40	-30	-30	-40	-20	-20
Flammability (7):								
- "Oxygen Index"	ISO 4589-1/-2	%	25	26	24	24	-	26
- according to UL 94 (3 / 6 mm thickness)	-	-	HB / HB	HB / V-2	HB / HB	HB / HB	HB / HB	HB / HB
Mechanical Properties at 23°C (8)								
Tension test (9):								
- tensile stress at yield / tensile stress at break (10)	+ ISO 527-1/-2	MPa	80 / -	90 / -	86 / -	105 / -	NA / 100	93 / -
	++ ISO 527-1/-2	MPa	45 / -	55 / -	50 / -	55 / -	NA / 75	55 / -
- tensile strength (10)	+ ISO 527-1/-2	MPa	80	93	86	105	100	95
- tensile strain at yield (10)	+ ISO 527-1/-2	%	4	5	5	18	NA	5
- tensile strain at break (10)	+ ISO 527-1/-2	%	> 50	50	> 50	25	5	20
	++ ISO 527-1/-2	%	> 100	> 100	> 100	> 100	12	> 50
- tensile modulus of elasticity (11)	+ ISO 527-1/-2	MPa	3300	3550	3350	3400	5900	3600
	++ ISO 527-1/-2	MPa	1425	1700	1475	1350	3200	1725
Compression test (12):								
- compressive stress at 1 / 2 / 5 % nominal strain (11)	+ ISO 604	MPa	24 / 46 / 80	25 / 49 / 92	24 / 47 / 88	23 / 45 / 94	28 / 55 / 90	25 / 49 / 92
Creep test in tension (9):								
- stress to produce 1% strain in 1000 h ($\sigma_{1/1000}$)	+ ISO 899-1	MPa	18	20	19	22	26	21
	++ ISO 899-1	MPa	7	8	7.5	7.5	18	9
Charpy impact strength - unnotched (13)	+ ISO 179-1/1eU	kJ/m ²	no break	no break	no break	no break	50	no break
Charpy impact strength - notched	+ ISO 179-1/1eA	kJ/m ²	5.5	4.5	5	8	6	4
Izod impact strength - notched	+ ISO 180/A	kJ/m ²	5.5	4.5	5	8	6	4
	++ ISO 180/A	kJ/m ²	15	11	13	25	11	9
Ball indentation hardness (14)	+ ISO 2039-1	N/mm ²	150	160	155	165	165	165
Rockwell hardness (14)	+ ISO 2039-2	-	M 85	M 88	M 87	M 92	M 76	M 88
Electrical Properties at 23 °C								
Electric strength (15)	+ IEC 60243-1	kV/mm	25	27	26	25	30	26
	++ IEC 60243-1	kV/mm	16	18	17	15	20	17
Volume resistivity	+ IEC 60093	Ohm.cm	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴
	++ IEC 60093	Ohm.cm	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²
Surface resistivity	+ IEC 60093	Ohm	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³
	++ IEC 60093	Ohm	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²
Relative permittivity ϵ_r : - at 100 Hz	+ IEC 60250	-	3.9	3.8	3.8	3.8	3.9	3.8
	++ IEC 60250	-	7.4	7.4	7.4	7.4	6.9	7.4
- at 1 MHz	+ IEC 60250	-	3.3	3.3	3.3	3.4	3.6	3.3
	++ IEC 60250	-	3.8	3.8	3.8	3.8	3.9	3.8
Dielectric dissipation factor tan δ : - at 100 Hz	+ IEC 60250	-	0.019	0.013	0.013	0.009	0.012	0.013
	++ IEC 60250	-	0.13	0.13	0.13	0.13	0.19	0.13
- at 1 MHz	+ IEC 60250	-	0.021	0.020	0.020	0.019	0.014	0.020
	++ IEC 60250	-	0.06	0.06	0.06	0.06	0.04	0.06
Comparative tracking index (CTI)	+ IEC 60112	-	600	600	600	400	475	600
	++ IEC 60112	-	600	600	600	400	475	600

Note: 1 g/cm³ = 1,000 kg/m³; 1 MPa = 1 N/mm²; 1 kV/mm = 1 MV/m.

NA : Not applicable (there is no yield point)

Legend:

+ : values referring to dry material

++ : values referring to material in equilibrium with the standard atmosphere 23°C/50% RH (mostly derived from literature)

(1) According to method 1 of ISO 62 and done on discs Ø 50 x 3 mm.

(2) The figures given for these properties are for the most part derived from raw material supplier data and other publications.

(3) Values for this property are only given here for amorphous materials and not for semi-crystalline ones.

(4) Only for short time exposure (a few hours) in applications where no or only a very low load is applied to the material.

(5) Temperature resistance over a period of 5,000/20,000 hours. After these periods of time, there is a decrease in tensile strength of about 50% as compared with the original value. The temperature values given here are thus based on the thermal-oxidative degradation which takes place and causes a reduction in properties. Note, however, that, as for all thermoplastics, the maximum allowable service temperature depends in many cases essentially on the duration and the magnitude of the mechanical stresses to which the material is subjected.

(6) Impact strength decreasing with decreasing temperature, the minimum allowable service temperature is practically mainly determined by the extent to which the material is subjected to impact. The values given here are based on unfavourable impact conditions and may consequently not be considered as being the absolute practical limits.

(7) These estimated ratings, based on raw material supplier data and other publications, are not intended to reflect hazards presented by the materials under actual fire conditions. There are no UL-yellow cards available for these stock shapes.

PHYSICAL PROPERTIES (INDICATIVE VALUES⁸⁾)

ERTALON 6 PLA	ERTALON 6 XAU+	ERTALON LFX	NYLATRON MC 901	NYLATRON GSM	NYLATRON NSM	NYLATRON LFG	NYLATRON 703 XL	ERTACETAL C	ERTACETAL H	ERTACETAL H-TF	ERTALYTE (16)	ERTALYTE TX	PC 1000
<i>natural (ivory)/black</i>	<i>black</i>	<i>green</i>	<i>blue</i>	<i>grey-black</i>	<i>grey</i>	<i>natural (ivory)/blue</i>	<i>purple</i>	<i>natural (white)/black</i>	<i>natural (white)/black</i>	<i>deep brown</i>	<i>natural (white)/black</i>	<i>pale grey</i>	<i>natural (clear, translucent)</i>
1.15	1.15	1.135	1.15	1.16	1.14	1.135	1.11	1.41	1.43	1.50	1.39	1.44	1.20
44/83	47/89	44/83	49/93	52/98	40/76	44/83	40/76	20/37	18/36	16/32	6/13	5/11	13/23
0.65/1.22	0.69/1.31	0.66/1.24	0.72/1.37	0.76/1.43	0.59/1.12	0.66/1.24	0.61/1.16	0.24/0.45	0.21/0.43	0.18/0.36	0.07/0.16	0.06/0.13	0.18/0.33
2.2	2.2	2	2.3	2.4	2	2	2	0.20	0.20	0.17	0.25	0.23	0.15
6.5	6.5	6.3	6.6	6.7	6.3	6.3	6.3	0.80	0.80	0.72	0.50	0.47	0.40
215	215	215	215	215	215	215	215	165	180	180	245	245	-
-	-	-	-	-	-	-	-	-	-	-	-	-	150
0.29	0.29	0.28	0.29	0.30	0.29	0.28	0.30	0.31	0.31	0.31	0.29	0.29	0.21
80 x 10 ⁻⁶	80 x 10 ⁻⁶	80 x 10 ⁻⁶	80 x 10 ⁻⁶	80 x 10 ⁻⁶	80 x 10 ⁻⁶	80 x 10 ⁻⁶	85 x 10 ⁻⁶	110 x 10 ⁻⁶	95 x 10 ⁻⁶	105 x 10 ⁻⁶	60 x 10 ⁻⁶	65 x 10 ⁻⁶	65 x 10 ⁻⁶
90 x 10 ⁻⁶	90 x 10 ⁻⁶	90 x 10 ⁻⁶	90 x 10 ⁻⁶	90 x 10 ⁻⁶	95 x 10 ⁻⁶	95 x 10 ⁻⁶	100 x 10 ⁻⁶	125 x 10 ⁻⁶	110 x 10 ⁻⁶	120 x 10 ⁻⁶	80 x 10 ⁻⁶	85 x 10 ⁻⁶	65 x 10 ⁻⁶
80	80	75	80	80	75	75	70	100	110	100	80	75	130
170	180	165	170	170	165	165	160	140	150	150	160	160	135
105/90	120/105	105/90	105/90	105/90	105/90	105/90	105/90	115/100	105/90	105/90	115/100	115/100	130/120
-30	-30	-20	-30	-30	-30	-20	-20	-50	-50	-20	-20	-20	-50
25	25	-	25	25	-	-	< 20	15	15	-	25	25	25
HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB	HB / HB
86 / -	84 / -	72 / -	82 / -	80 / -	78 / -	72 / -	60 / -	66 / -	78 / -	NA / 55	90 / -	76	74 / -
55 / -	55 / -	45 / -	50 / -	50 / -	50 / -	45 / -	40 / -	68 / -	78 / -	NA / 55	90 / -	76	74 / -
88	86	73	84	82	80	73	60	66	78	55	90	76	74
5	5	5	5	5	5	5	6	20	40	NA	4	4	6
25	25	25	35	25	25	25	15	50	50	10	15	5	> 50
> 50	> 50	> 50	> 50	> 50	> 50	> 50	> 25	35	35	10	15	7	> 50
3600	3500	3000	3300	3400	3150	3000	2750	2800	3300	3100	3500	3300	2400
1750	1700	1450	1600	1650	1525	1450	1350	2800	3300	3100	3500	3300	2400
26 / 51 / 92	26 / 51 / 92	22 / 43 / 79	24 / 47 / 86	25 / 49 / 88	23 / 44 / 81	22 / 43 / 79	20.5 / 40 / 67	19 / 35 / 67	22 / 40 / 75	20 / 37 / 69	26 / 51 / 103	24 / 47 / 95	18 / 35 / 72
22	22	18	21	21	18	18	16	13	15	13	26	23	17
10	10	8	9	9	8	8	7	13	15	13	26	23	17
no break	no break	50	no break	no break	100	50	25	150	200	30	50	30	no break
3.5	3.5	4	3.5	3.5	4	4	3	7	10	3	2	2.5	9
3.5	3.5	4	3.5	3.5	4	4	3	7	10	3	2	2.5	9
7	7	7	7	7	7	7	6	7	10	3	2	2.5	9
165	165	145	160	160	150	145	120	140	160	140	170	160	120
M 88	M 87	M 82	M 85	M 84	M 81	M 82	R 109 (M 59)	M 84	M 88	M 84	M 96	M 94	M 75
25	29	22	25	24	25	22	-	20	20	20	22	21	28
17	19	14	17	16	17	14	-	20	20	20	22	21	28
> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴
> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴
> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³
> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹²	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³	> 10 ¹³
3.6	3.6	3.5	3.6	3.6	3.6	3.5	-	3.8	3.8	3.6	3.4	3.4	3
6.6	6.6	6.5	6.6	6.6	6.6	6.5	-	3.8	3.8	3.6	3.4	3.4	3
3.2	3.2	3.1	3.2	3.2	3.2	3.1	-	3.8	3.8	3.6	3.2	3.2	3
3.7	3.7	3.6	3.7	3.7	3.7	3.6	-	3.8	3.8	3.6	3.2	3.2	3
0.012	0.015	0.015	0.012	0.012	0.012	0.015	-	0.003	0.003	0.003	0.001	0.001	0.001
0.14	0.15	0.15	0.14	0.14	0.14	0.15	-	0.003	0.003	0.003	0.001	0.001	0.001
0.016	0.017	0.016	0.016	0.016	0.016	0.016	-	0.008	0.008	0.008	0.014	0.014	0.008
0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	0.008	0.008	0.008	0.014	0.014	0.008
600	600	600	600	600	600	600	-	600	600	600	600	600	350 (225)
600	600	600	600	600	600	600	-	600	600	600	600	600	350 (225)

- (8) The figures given for the properties of dry material (+) are for the most part average values of tests run on test specimens machined out of rods Ø 40 - 60 mm. Considering the very low water absorption of ERTACETAL, ERTALYTE and PC 1000, the values for the mechanical and electrical properties of these materials can be considered as being practically the same for dry (+) and moisture conditioned (++) test specimens.
- (9) Test specimens: Type 1 B
- (10) Test speed: 5 or 50 mm/min (chosen acc. to ISO 10350-1 as a function of the ductile behaviour of the material ; only ERTALON 66-GF30, NYLATRON 703 XL, ERTACETAL H-TF and ERTALYTE TX had to be tested at 5 mm/min).
- (11) Test speed: 1 mm/min.
- (12) Test specimens: cylinders Ø 12 x 30 mm
- (13) Pendulum used: 15 J.
- (14) 10 mm thick test specimens
- (15) Electrode configuration: Ø 25 / Ø 75 mm coaxial cylinders ; in transformer oil according to IEC 60296 ; 1 mm thick natural coloured test specimens. Please note that the electric strength of black extruded material (ERTALON 6 SA, ERTALON 66 SA, ERTACETAL and ERTALYTE) can be considerably lower than that of natural material. Possible microporosity in the centre of polyacetal stock shapes also significantly reduces the electric strength.
- (16) The property-values given below do not apply to the 2 - 6 mm thick ERTALYTE sheets.
- This table is a valuable help in the choice of a material. The data listed here fall within the normal range of product properties. **However, they are not guaranteed and they should not be used to establish material specification limits nor used alone as the basis of design.** It has to be noted that ERTALON 66-GF30 is a fibre reinforced, and consequently an anisotropic material (properties differ when measured parallel and perpendicular to the extrusion direction).