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Zell-Metall Engineering Plastics

09/2006

TECHNICAL PROPERTIES OF ZELLAMID®

Property		Unit	Test method	Condition of specimen	ZELLAMID® 202 (PA6)	ZELLAMID® 250 (PA6.6)	ZELLAMID® 250 GF 30 (PA6.6+30% Glassfibre)	ZELLAMID® 900 900SW (POM-C)
MECHANICAL PROPERTIES								
Tensile strength at break		MPa	ISO 527	dry	80	80	100	70
		MPa	ISO 527	moist	50	60	-	-
Elongation at break		%	ISO 527	dry	50- 100	50	8	40
		%	ISO 527	moist	200	150	-	-
Modulus of elasticity in tension		MPa	ISO 527	dry	3000	3200	4800	3000
		MPa	ISO 527	moist	1500	1600	-	-
Charpy Impact strength	+ 23°C	kJ/m²	ISO 179/1eU	dry	no break	no break	20	no break
	- 40°C	kJ/m²	ISO 179/1eU	dry	no break	no break	-	80
Charpy Impact strength (notched)		kJ/m²	ISO 179/1eA	dry	70	80	-	-
		kJ/m²		moist	-	-	-	-
Hardness Shore, scale D			ISO 868	dry	75	80	85	81
Time yield limit $\sigma_{1/1000}$	23°C/50% RH	MPa	ISO 899	moist	5.5	6.0	-	14
	100°C	MPa	ISO 899	dry	2.5	3.5	-	-
Apparent modulus $E_{C/1000\ 2G}$	23°C/50% RH	MPa	ISO 899	moist	230	400	-	-
THERMAL PROPERTIES								
Heat distortion temperature,	Method A	°C	ISO 75	dry	55 – 75	100	250	110
ISO 75	Method B	°C	ISO 75	dry	> 160	> 200	250	160
Melting point	Method A	°C	ISO 3146	-	220	255	255	164-168
Maximum service temperature for few hours operation		°C	- -	-	≤ 180	≤ 200	200	-
TEP 5 000 hours (50% of tensile strength) 4)		°C	IEC 216	-	90	95	-	-
TEP 20 000 hours (50% of tensile strength) 4)		°C	IEC 216	-	75	80	-	100
Thermal coefficient of linear expansion		$1/K.10^{-5}$	DIN 53452	dry	7– 10	7– 10	2 - 3	11
Thermal conductivity	Method A	W/(K.m)		dry	0.23	0.23	0.27	-
Specific heat		J/(g.K)	IEC 1006	dry	1.7	1.7	1.5	1.5
DIELECTRIC PROPERTIES								
Dielectric constant	1 MHz	-	IEC 250	dry	3.5	3.2	-	3.8
		-	IEC 250	moist	7.0	5.0	-	-
Dissipation factor tan δ	1 MHz	-	IEC 250	dry	0.023	0.026	-	0.024
		-	IEC 250	moist	0.3	0.2	-	-
Dielectric strength		KV/mm	IEC 243	dry	100	120	30	> 20
		KV/mm	IEC 243	moist	60	80	-	-
Volume resistivity		Ω.cm	IEC 93	dry	10^{15}	10^{15}	$> 10^{12}$	10^{15}
		Ω.cm	IEC 93	moist	10^{12}	10^{12}	-	-
Surface resistivity		Ω	IEC 93	dry	10^{13}	10^{13}	10^{11}	-
		Ω	IEC 93	moist	10^{10}	10^{10}	-	-
Resistance to tracking	KA/ KB method	-	IEC 112	dry/moist	KB > 600	KB >600	-	KB >600
	KC method	-	IEC 112	dry/moist	KC > 600	KC > 600	-	-
MISCELLANEOUS PROPERTIES								
Mass density	Method D, E	g/cm³	ISO 1183	dry	1.13– 1.15	1.13– 1.15	1.35	1.41-1.43
Moisture absorption at 23°C, 50% RH	Saturation	%	ISO 1110	-	3.0±0.4	2.8±0.3	1.5	0.20
Water absorption at 23 °C	Saturation	%	ISO 62	-	9.5±0.5	8.5±0.5	5.5	0.25
Fire performance	Flameability Acc. VDE		VDE 0304	dry	II b	II b	-	BH3-25mm/min
	Flameability of interior materials in passanger cars h>1mm	mm/min	FMVSS 302	moist	< 100	< 100	-	-
	Flameability according UL (thickness of specimen 1,6 mm)	-	UL 94	-	HB	HB	HB	HB
Resistance to wear 5)		µm/km	ISO 7148-2	dry	-	-	-	-

1. Dry= dried at 80°C and 1 mbar until weight is constant (moisture content less than 0.2%)
2. Moist=after storage in a standard atmosphere of 23° C and 50% relative humidity (DIN 50014) until saturation.
3. pecimen boxes, thickness t=1.5 mm
4. Data of the resin only
5. Made by a pin / rotating disc test according DIN-ISO 7148-2 under following conditions: R_z = 0,35 – 0,45 µm (steel disc), v = 0,3 m/s, p = 3 N/mm2, time T>16h

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TECHNICAL PROPERTIES OF ZELLAMID®

Property		Unit	Test method	Condition of specimen	ZELLAMID® 1400 1400SW (PET)	ZELLAMID® 1400T (PET+solid lubricant)	ZELLAMID® 1500 (PEEK)	ZELLAMID® 1500T (PEEK mod.)
MECHANICAL PROPERTIES								
Tensile strength at break		MPa	ISO 527	dry	80	75	97	141
		MPa	ISO 527	moist	-	-	-	-
Elongation at break		%	ISO 527	dry	20	5	25	2
		%	ISO 527	moist	-	-	-	-
Modulus of elasticity in tension		MPa	ISO 527	dry	3200	2230	3600	9000
		MPa	ISO 527	moist	-	-	-	-
Charpy Impact strength	+ 23°C	kJ/m²	ISO 179/1eU	dry	82	23	no break	-
	- 40°C	kJ/m²	ISO 179/1eU	dry	-	-	-	-
Charpy Impact strength (notched)		kJ/m²	ISO 179/1eA	dry	14	10	-	-
		kJ/m²		moist	-	-	-	-
Hardness Shore, scale D			ISO 868	dry	81	81	88	-
Time yield limit $\sigma_{1/1000}$	23°C/50% RH	MPa	ISO 899	moist	12	-	-	-
	100°C	MPa	ISO 899	dry	-	-	-	-
Apparent modulus $E_{C/1000\,2G}$	23°C/50% RH	MPa	ISO 899	moist	-	-	-	-
THERMAL PROPERTIES								
Heat distortion temperature,	Method A	°C	ISO 75	dry	67	-	152	293
ISO 75	Method B	°C	ISO 75	dry	165	-	-	-
Melting point	Method A	°C	ISO 3146	-	255	-	340	340
Maximum service temperature for few hours operation		°C	- -	-	160	160	300	300
TEP 5 000 hours (50% of tensile strength) 4)		°C	IEC 216	-	115	115	260	260
TEP 20 000 hours (50% of tensile strength) 4)		°C	IEC 216	-	100	100	-	-
Thermal coefficient of linear expansion		$1/K.10^{-5}$	DIN 53452	dry	6	6	4.7	2.2
Thermal conductivity	Method A	W/(K.m)		dry	-	-	0.25	0.24
Specific heat		J/(g.K)	IEC 1006	dry	-	-	-	-
DIELECTRIC PROPERTIES								
Dielectric constant	1 MHz	-	IEC 250	dry	3.3	-	-	-
		-	IEC 250	moist	-	-	-	-
Dissipation factor tan δ	1 MHz	-	IEC 250	dry	0.02	-	0.004	-
		-	IEC 250	moist	-	-	-	-
Dielectric strength		KV/mm	IEC 243	dry	50	-	20	-
		KV/mm	IEC 243	moist	-	-	-	-
Volume resistivity		Ω.cm	IEC 93	dry	10^{16}	-	10^{16}	-
		Ω.cm	IEC 93	moist	-	-	-	-
Surface resistivity		Ω	IEC 93	dry	-	-	-	-
		Ω	IEC 93	moist	-	-	-	-
Resistance to tracking	KA/ KB method	-	IEC 112	dry/moist	KA >450	-	-	-
	KC method	-	IEC 112	dry/moist	KC > 600	-	-	-
MISCELLANEOUS PROPERTIES								
Mass density	Method D, E	g/cm³	ISO 1183	dry	1.36	1.38	1.32	1.48
Moisture absorption at 23°C, 50% RH	Saturation	%	ISO 1110	-	~ 0.23	~ 0.23	0.1	-
Water absorption at 23 °C	Saturation	%	ISO 62	-	~ 0.5	~ 0.5	0.5	-
Fire performance	Flameability Acc. VDE		VDE 0304	dry	II b	-	-	-
	Flameability of interior materials in passanger cars h>1mm	mm/min	FMVSS 302	moist	< 100	-	-	-
	Flameability according UL (thickness of specimen 1,6 mm)	-	UL 94	-	HB	HB	VO	VO
Resistance to wear 5)		µm/km	ISO 7148-2	dry	22	1.1	-	-

1. Dry= dried at 80°C and 1 mbar until weight is constant (moisture content less than 0.2%)
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3. Specimen boxes, thickness t=1.5 mm
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