



# NATIONWIDE PLASTICS, INC.

The Authority on Plastics Manufacturing and Distribution



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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)
<b>MECHANICAL PROPERTIES</b>							
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	ISO 179/1eU	dry	no break	no break	20	no break
	- 40°C	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 $\sigma_{112000}$	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 $E_{C1200,30}$	23°C/50% RH	MPa	ISO 899	moist	230	400	-
	-	-	-	-	-	-	-
<b>THERMAL PROPERTIES</b>							
Heat distortion temperature, Method A	°C	ISO 75	dry	55-75	100	250	110
	°C	ISO 75	dry	> 160	> 200	250	160
Melting point, Method A	°C	ISO 3146	-	220	255	255	164-168
	°C	-	-	≤ 180	≤ 200	200	-
Maximum service temperature for few hours operation	°C	-	-	90	95	-	-
	°C	IEC 216	-	75	80	-	100
TEP 5 000 hours (50% of tensile strength) 4)	°C	IEC 216	-	7-10	7-10	2-3	11
	°C	IEC 216	-	75	80	-	100
Thermal coefficient of linear expansion	1/K.10 <sup>-3</sup>	DIN 53452	dry	7-10	7-10	2-3	11
	W/(K.m)	-	dry	0.23	0.23	0.27	-
Thermal conductivity, Method A	W/(K.m)	-	dry	0.23	0.23	0.27	-
	W/(K.m)	-	moist	1.7	1.7	1.5	1.5
Specific heat	J/(g.K)	IEC 1006	dry	1.7	1.7	1.5	1.5
	-	-	-	-	-	-	-
<b>DIELECTRIC PROPERTIES</b>							
Dielectric constant	1 MHz	-	IEC 250	dry	3.5	3.2	3.8
	-	-	IEC 250	moist	7.0	5.0	-
Dissipation factor tan $\delta$	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	$\Omega$ .cm	IEC 93	dry	10 <sup>15</sup>	10 <sup>15</sup>	> 10 <sup>12</sup>	10 <sup>15</sup>
	$\Omega$ .cm	IEC 93	moist	10 <sup>12</sup>	10 <sup>12</sup>	-	-
Surface resistivity	$\Omega$	IEC 93	dry	10 <sup>13</sup>	10 <sup>13</sup>	10 <sup>11</sup>	-
	$\Omega$	IEC 93	moist	10 <sup>10</sup>	10 <sup>10</sup>	-	-
Resistance to tracking	KV/KB method	-	IEC 112	dry/moist	KB > 600	KB > 600	KB > 600
	KC method	-	IEC 112	dry/moist	KC > 600	KC > 600	-
<b>MISCELLANEOUS PROPERTIES</b>							
Mass density	Method D, E	g/cm³	ISO 1183	dry	1.13-1.15	1.13-1.15	1.35
	Saturation	%	ISO 1110	-	3.0±0.4	2.8±0.3	1.5
Moisture absorption at 23°C, 50% RH	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 passenger cars h>1mm	mm/min	FM/SS 302	moist	< 100	< 100	-
	Flameability according UL (thickness of specimen 1,6 mm)	-	UL 94	-	HB	HB	HB
Resistance to wear <sup>5)</sup>	-	$\mu$ m/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<sub>3</sub> = 0,35 – 0,45  $\mu$ m (steel disc), v = 0,3 m/s, p = 3 N/mm<sup>2</sup>, time T>16h

All information are without warranty and liability.

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Property	Unit	Test method	Condition of specimen	ZELLAMID® 1400 1400SW (PET)	ZELLAMID® 1400T (PET+solid lubricant)	ZELLAMID® 1500 (PEEK)	ZELLAMID® 1500T (PEEK mod.)
<b>MECHANICAL PROPERTIES</b>							
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	ISO 179/1eU	dry	82	23	no break	-
	- 40°C	ISO 179/1eU	dry	-	-	-	-
Charpy impact strength (notched)	kJ/m <sup>2</sup>	ISO 179/1eA	dry	14	10	-	-
	kJ/m <sup>2</sup>		moist	-	-	-	-
Hardness Shore, scale D		ISO 868	dry	81	81	88	-
Time yield limit $\sigma_{1/1000}$	23°C/50% RH	MPa	ISO 899	12	-	-	-
	100°C	MPa	ISO 899	-	-	-	-
Apparent modulus $E_{CI(200,20)}$	23°C/50% RH	MPa	ISO 899	-	-	-	-
<b>THERMAL PROPERTIES</b>							
Heat distortion temperature, ISO 75	Method A	°C	ISO 75	67	-	152	293
	Method B	°C	ISO 75	165	-	-	-
Melting point	Method A	°C	ISO 3146	255	-	340	340
		°C					
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 <sup>-2</sup>	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	-	-	-	-
<b>DIELECTRIC PROPERTIES</b>							
Dielectric constant	1 MHz	-	IEC 250	dry	3.3	-	-
		-	IEC 250	moist	-	-	-
Dissipation factor tan $\delta$	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	$\Omega$ .cm	IEC 93	dry	10 <sup>16</sup>	-	10 <sup>16</sup>	-
	$\Omega$ .cm	IEC 93	moist	-	-	-	-
Surface resistivity	$\Omega$	IEC 93	dry	-	-	-	-
	$\Omega$	IEC 93	moist	-	-	-	-
Resistance to tracking	KA/ KB method	-	IEC 112	dry/moist	KA >450	-	-
	KC method	-	IEC 112	dry/moist	KC > 600	-	-
<b>MISCELLANEOUS PROPERTIES</b>							
Mass density	Method D, E	g/cm <sup>3</sup>	ISO 1183	dry	1.36	1.38	1.32
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 passenger cars h>1mm	mm/min	FMVSS 302	moist	< 100	-	-
	Flameability according UL (thickness of specimen 1,6 mm)	-	UL 94	-	HB	HB	VO
Resistance to wear <sup>5)</sup>		$\mu$ m/km	ISO 7148-2	dry	22	1.1	-

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