

## Product Information

June 2005

# Ultramid<sup>®</sup> A3K (PA66)



### Product description

Easy flowing injection moulding grade for fast processing. Uses include highly stressed technical parts such as bearings and gear wheels. Also electrically insulating parts such as terminals and cable connectors.

### Physical form and storage

Ultramid is supplied dry and ready to use in moisture-proof packaging in the form of cylindrical or flat pellets. Its bulk density is about 0,7g/cm<sup>3</sup>. Standard packs are the special 25kg bag and the 1000kg bulk container (octagonal IBC= intermediate bulk container made from corrugated board with a liner bag). Subject to agreement other forms of packaging and shipment in tankers by road or rail are also possible. All containers are tightly sealed and should be opened only immediately prior to processing. To ensure that the perfectly dry material delivered cannot absorb moisture from the air the containers must be stored in dry rooms and always carefully sealed again after portions of material have been withdrawn. Ultramid can be kept indefinitely in the undamaged bags. Experience has shown that product supplied in IBCs can be stored for about 3 months without any adverse effects on processing properties due to moisture absorption. Containers stored in cold rooms should be allowed to equilibrate to normal temperature so that no condensation forms on the pellets.

### Product safety

Ultramid melts are thermally stable at the usual temperature for A, B and C up to 310°C and 350°C for T and do not give rise to hazards due to molecular degradation or the evolution of gases and vapors. Like all thermoplastic polymers Ultramid decomposes on exposure to excessive thermal load, e.g. when it is overheated or as a result of cleaning by burning off. In such cases gaseous decomposition products are formed. Decomposition accelerates above 310°C (T >350°C) approximately, the initial products formed being mainly carbon monoxide and ammonia, and caprolactam too in the case of Ultramid B. At temperatures above about 350°C (T >400°C) small quantities of pungent smelling vapors of aldehydes, amines and other nitrogenous decomposition products are also formed.

Further safety information see safety data sheet of the individual product.

### Note

The information submitted in this publication is based on our current knowledge and experience. In view of the many factors that may affect processing and application, these data do not relieve processors of the responsibility of carrying out their own tests and experiments; neither do they imply any legally binding assurance of certain properties or of suitability for a specific purpose. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed. In order to check the availability of products please contact us or our sales agency.

Typical values at 23°C <sup>1)</sup>	Test method	Unit	Condition	Values
<b>Properties</b>				
Abbreviated term	ISO 1043	-	-	PA66
Density	ISO 1183	g/cm <sup>3</sup>	-	1.13
Viscosity number (solution 0.005 g/ml sulfuric acid)	ISO 307	ml/g	-	150
Colour: natural (n), coloured (c), black (bk)	-	-	-	c
Water absorption, equilibrium in water at 23°C	ISO 62	%	-	8.00 - 9.00
Moisture absorption, equilibrium 23°C/50% r.h.	ISO 62	%	-	2.50 - 3.10
<b>Processing</b>				
Melting temperature, DSC	ISO 3146	°C	-	260
Melt volume rate MVR 275/5	ISO 1133	cm <sup>3</sup> /10 min	-	115
Melt temperature, injection moulding/extrusion	-	°C	-	280 - 300
Mould temperature, injection moulding	-	°C	-	40 - 80
Moulding shrinkage, constrained <sup>6)</sup>	-	%	-	0.85
<b>Flammability</b>				
UL94 rating at 1.6 mm thickness	UL 94	class	-	V-2
Automotive materials (thickness d ≥ 1mm)	FMVSS 302	-	-	+
<b>Mechanical properties</b>				
Tensile modulus	ISO 527-2	MPa	dry/cond.	3000/1100
Yield stress (v = 50 mm/min), Stress at break (v = 5 mm/min)*	ISO 527-2	MPa	dry/cond.	85/50
Yield strain (v = 50 mm/min)	ISO 527-2	%	dry/cond.	5.0/20.0
Nominal strain at break, Strain at break*	ISO 527-2	%	dry/cond.	30.0/>50.0
Tensile creep modulus, 1000 h, strain ≤ 0.5%, +23°C	ISO 899-1	MPa	cond.	700
Flexural modulus	ISO 178	MPa	dry/cond.	2900/
Flexural strength	ISO 178	MPa	dry/cond.	
Charpy unnotched impact strength <sup>3)</sup> +23°C	ISO 179/1eU	kJ/m <sup>2</sup>	dry/cond.	N/N
Charpy unnotched impact strength -30°C	ISO 179/1eU	kJ/m <sup>2</sup>	dry	N
Charpy notched impact strength <sup>3)</sup> +23°C	ISO 179/1eA	kJ/m <sup>2</sup>	dry/cond.	5.5/20.0
Charpy notched impact strength -30°C	ISO 179/1eA	kJ/m <sup>2</sup>	dry	4.0
Izod notched impact strength 1A <sup>3)</sup> +23°C	ISO 180/1A	kJ/m <sup>2</sup>	dry/cond.	5.5/N
Izod notched impact strength 1A -30°C	ISO 180/1A	kJ/m <sup>2</sup>	dry	6.0
Ball indentation hardness H 358/30, H 961/30*	ISO 2039-1	MPa	dry/cond.	160/100
<b>Thermal properties</b>				
Deflection temperature 1.8 MPa (HDT A)	ISO 75-2	°C	-	75
Deflection temperature 0.45 MPa (HDT B)	ISO 75-2	°C	-	220
Max. service temperature (short cycle operation) <sup>2)</sup>	-	°C	-	>200
Temperature index at 50% loss of tensile strength after 20000 h / 5000 h	IEC 216-1	°C	-	101 / 118
Thermal coefficient of linear expansion, longitudinal / transverse (23-80)°C	DIN 53752	10 <sup>-4</sup> /K	-	0.7 - 1 /
Thermal conductivity	DIN 52 612	W(m · K)	-	0.33
Specific heat capacity	-	J(kg · K)	-	1700.00
<b>Electrical properties</b>				
Dielectric constant at 1 MHz	IEC 60250	-	dry/cond.	3.2/5.0
Dissipation factor at 1 MHz	IEC 60250	10 <sup>-4</sup>	dry/cond.	250/2000
Volume resistivity	IEC 60093	Ω · m	dry/cond.	10 <sup>13</sup> /10 <sup>10</sup>
Surface resistivity	IEC 60093	Ω	dry/cond.	10 <sup>13</sup> /10 <sup>10</sup>
CTI, solution A	IEC 60112	-	cond.	600

Footnotes:

1) for uncoloured product, unless defined otherwise in the product name

2) Empirical values determined on articles repeatedly subjected to the temperature concerned for several hours at a time over a period of several years.

The proviso is that the articles were properly designed and processed according to our recommendations.

3) N = no break.

6) Test box with central gating, dimensions of base (107-47-1,5) mm,

processing conditions: T<sub>M PA6</sub> = 260 °C, T<sub>M PA66</sub> = 290 °C, mould surface temp. MST = 60 °C for unreinforced, MST = 80 °C for reinforced.