

# Ultramid® (PA)

Product Range  
(Europe)



Ultramid® in the web: [www.ultramid.de](http://www.ultramid.de)

 **BASF**  
We create chemistry

## Ultramid® (PA)

BASF's Ultramid® grades are molding compounds on the basis of PA6, PA66 and various co-polyamides such as PA66/6. The range also includes PA610 and partially aromatic polyamides such as PA6T/6. The molding compounds are available unreinforced, reinforced with glass fibers or minerals and also reinforced with long-glass fibers for special applications. Ultramid® is noted for its high mechanical strength, stiffness and thermal stability. In addition, Ultramid® offers good toughness at low temperatures, favorable sliding friction behavior and can be processed without any problems. Owing to its excellent properties, this material has become indispensable in almost all sectors of engineering for a wide range of different components and machine elements, as a high-grade electrical insulation material and for many special applications.

# Ultramid® (PA)

<b>ULTRAMID® INJECTION-MOLDING GRADES WITHOUT FLAME RETARDANTS</b>	04
Unreinforced Ultramid® A grades	04
Reinforced Ultramid® A grades	06
Unreinforced Ultramid® B grades	12
Reinforced Ultramid® B grades	14
Reinforced Ultramid® D Aqua® grades	20
Unreinforced Ultramid® S Balance grades	20
Reinforced Ultramid® S Balance grades	20
Unreinforced Ultramid® T grades	22
Reinforced Ultramid® T grades	22
<b>ULTRAMID® INJECTION-MOLDING GRADES WITH FLAME RETARDANTS</b>	24
Unreinforced grades	24
Reinforced grades	26
<b>NOMENCLATURE</b>	32

# Ultramid® injection-molding grades without flame retardants

## Unreinforced Ultramid® A grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5 %, +23 °C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50 % loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1 MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

<sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.

<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.

<sup>3)</sup> NB = not broken

<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5) mm,

processing conditions: T<sub>M,PA6</sub> = 260 °C, T<sub>M,PA66</sub> = 290 °C,

T<sub>w</sub> = 60 °C for unreinforced and T<sub>w</sub> = 80 °C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290 °C, T<sub>w,UL,D</sub> = 80 °C

<sup>5)</sup> + = passed

A3K	A3W	A3Z	A4H
PA66	PA66	PA66-I	PA66
1.13	1.13	1.06	1.13
150	150		190
8-9	8-9	6.7-7.7	8-9
2.5-3.1	2.5-3.1	2-2.6	2.5-3.1
260	260	260	260
120	100	10	40
280-300	280-300	280-300	290-300
60-80	40-80	40-80	40-80
0.85	0.85	0.85	0.90
V-2, A3K R01	V-2	HB	V-2
+	+	+	+
3,100/1,100	3,000/1,100	1,900/850	3,100/1,200
85/50	85/50	48/40	85/50
5/20	4.4/20	5/18	4.2/20
700	700	450	700
2,900/-	2,900/-		3,000/-
N/N	N/N	N/N	N/N
5/20	5.5/20	N/N	5.7/25
4	5	31	5
5.5/N	5.5/N	90/N	5.5/N
6	6	29	7
75	75	60	75
220	220	125	220
200	>200		>200
101/118	121/147	-/*	118/138
0.7-1/-	0.7-1/-	0.7-1/-	0.7-1/-
0.33	0.33	0.33	0.33
1,700	1,700	1,700	1,700
3.2/5	3.2/5	3.1/3.6	3.2/5
250/2,000	250/2,000	160/700	250/2,000
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>9</sup>	4 · 10 <sup>12</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>9</sup>	10 <sup>12</sup>	10 <sup>10</sup>
600	500	600	600
FC, UN	UN	UN	UN
BK00464	BK00464	BK30464	BK00464

Easy flowing injection-molding 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, as FC grade suitable for food contact.

Free-flowing, heat aging resistant and rapidly processable grade for technical parts subject to high stress such as bearings and bearing cages, gearwheels and spool bodies.

Impact-modified and stabilized injection-molding grade for components and housings with good low temperature impact resistance.

Highly heat aging resistant, medium-viscosity injection-molding grade for highly stressed parts such as bearing cages, gearwheels, spool bodies and chain drive tensioners.

# Ultramid® injection-molding grades without flame retardants

## Reinforced Ultramid® A grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r.h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5%, +23°C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30°C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30°C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50% loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80)°C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

<sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.

<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.

<sup>3)</sup> NB = not broken

<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5)mm,

processing conditions: T<sub>M,PA6</sub> = 260°C, T<sub>M,PA66</sub> = 290°C,

T<sub>w</sub> = 60°C for unreinforced and T<sub>w</sub> = 80°C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290°C, T<sub>w,UL,D</sub> = 80°C

<sup>5)</sup> + = passed

A3WG3	A3EG5	A3WG5	A3HG5	A3EG6	A3WG6
PA66 - GF15	PA66 - GF25	PA66 - GF25	PA66 - GF25	PA66 - GF30	PA66 - GF30
1.23	1.32	1.32	1.32	1.36	1.36
145	145	145	145	145	145
6.7 - 7.3	5.7 - 6.3	5.7 - 6.3	5.7 - 6.3	5.2 - 5.8	5.2 - 5.8
1.9 - 2.5	1.7 - 2.1	1.7 - 2.1	1.7 - 2.1	1.5 - 1.9	1.5 - 1.9
260	260	260	260	260	260
60	50	50	50	40	40
280 - 300	280 - 300	280 - 300	280 - 300	280 - 300	280 - 300
80 - 90	80 - 90	80 - 90	80 - 90	80 - 90	80 - 90
0.75	0.55	0.55	0.55	0.55	0.55
HB	HB	HB	HB	HB	HB
+	+	+	+	+	+
6,000/4,500	8,600/6,500	8,600/6,500	8,600/6,500	10,000/7,200	10,000/7,200
130*/85*	175*/120*	180*/120*	170*/120*	190*/130*	190*/130*
3*/10*	3*/6*	3*/6*	3*/6*	3*/5*	3*/5*
2,600	4,300	4,400	4,300	5,300	5,300
5,500/4,000	7,600/6,000	7,600/6,000	7,600/6,000	8,600/6,500	8,600/6,500
200/125	260/200	260/200	260/200	280/210	280/210
45/70	65/90	65/90	65/90	85/100	85/100
43	55	55	55	70	70
8/11	12/18	12/18	12/18	13/22	13/22
7	9	9	9	10	10
5.5/6.5	9.5/15	9.5/15	9.5/15	11.5/15.5	11.5/15.5
240	245	245	245	250	250
250	250	250	250	250	250
240	240	240	240	240	240
145/175	135/165	145/175	140/170	135/165	145/175
0.3 - 0.35/0.7 - 0.8	0.25 - 0.35/0.6 - 0.7	0.25 - 0.35/0.6 - 0.7	0.25 - 0.35/0.6 - 0.7	0.2 - 0.3/0.6 - 0.7	0.2 - 0.3/0.6 - 0.7
0.33	0.34	0.34	0.34	0.35	0.35
1,800	1,600	1,600	1,600	1,500	1,500
3.5/5.5	3.5/5.5	3.5/5.5	3.5/5.5	3.5/5.6	3.5/5.6
140/3,000	140/1,600	140/3,000	140/1,600	140/1,600	140/3,000
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>
450	550	450	550	550	450
	UN	UN	UN	FC, UN	UN
		BK00564	BK00564		BK00564
Glass-fiber reinforced and heat aging resistant injection-molding grade for machine elements and housings of medium stiffness. For electric insulating parts, preference should be given to the grades A3EG3 and A3HG3.	Glass-fiber reinforced injection-molding grade for machine elements and housings of high stiffness and dimensional stability such as spool bodies and bearing cages as well as for electric insulating parts.	Glass-fiber reinforced injection-molding grade for machine elements and housings of high stiffness and dimensional stability such as spool bodies and bearing cages. For electric insulating parts, preference should be given to grades A3EG5 and A3HG5.	Glass-fiber reinforced injection-molding grade for machine elements and housings of high stiffness and dimensional stability such as spool bodies and bearing cages as well as for electric insulating parts.	Glass-fiber reinforced injection-molding grade for machine elements and housings of high stiffness and dimensional stability such as lamp socket housings, fans, insulating profiles for aluminum windows as well as for electric insulating parts, as FC grade suitable for food contact.	Glass-fiber reinforced and heat aging resistant injection-molding grade for machine elements and housings of high stiffness and dimensional stability such as lamp socket housings, fans and insulating profiles for aluminum windows. For electric insulating parts, preference should be given to grade A3EG6.

# Ultramid® injection-molding grades without flame retardants

## Reinforced Ultramid® A grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5 %, +23 °C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50 % loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1 MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

<sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.

<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.

<sup>3)</sup> NB = not broken

<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5) mm,

processing conditions: T<sub>M,PA6</sub> = 260 °C, T<sub>M,PA66</sub> = 290 °C,

T<sub>w</sub> = 60 °C for unreinforced and T<sub>w</sub> = 80 °C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290 °C, T<sub>w,UL,D</sub> = 80 °C

<sup>5)</sup> + = passed



A3HG6 HR	A3EG7	A3HG7	A3WG7	A3WG7 HRX	A3WG8
PA66 -GF30	PA66 -GF35	PA66 -GF35	PA66 -GF35	PA66 -GF35	PA66 -GF40
1.37	1.41	1.41	1.41	1.42	1.46
145	145	145	145	155	140
5.2-5.8	4.7-5.3	4.7-5.3	4.7-5.3	5.0-5.7	4.4-5.0
1.5-1.9	1.4-1.8	1.4-1.8	1.4-1.8	1.4-1.8	1.3-1.7
260	260	260	260	260	260
25	35	40	35	10	20
280-300	280-300	280-300	280-300	280-310	280-300
80-90	80-90	80-90	80-90	80-90	80-90
0.55	0.5	0.5	0.5	0.5	0.4
	HB	HB	HB		
	+	+	+		
10,000/6,800	11,500/8,500	11,200/8,500	11,500/8,500	11,000/7,300	13,000/8,500
190*/120*	210*/150*	200*/150*	210*/150*	205/130	220/145
3.2*/5.4*	3*/5*	3*/5*	3*/5*	3.4/5.7	3/5
5,300	6,650	6,600	6,600	-/4,100	-/4,900
8,700/5,800	10,000/8,000	10,000/8,500	10,000/8,000	10,500/7,000	12,000/8,400
275/200	300/240	300/240	300/240	310/200	330/230
80/90	95/105	95/100	95/105	100/105	100/110
65	75	75	75	85/95	85/95
11/16	14/22	13/22	14/22	12/17	13/17
9	12	12	12	9.5/10	10/11
13/20	14/18	14/18	14/18	15/-*	14/-*
9					
250	250	250	250	250	250
250	250	250	250	260	260
240	240	240	240	240	240
	135/165	140/170	145/175		
0.2-0.3/0.6-0.7	0.15-0.2/0.6-0.7	0.15-0.2/0.6-0.7	0.15-0.2/0.6-0.7	0.2-0.25/0.77-1.23	0.19-0.23/0.74-1.21
0.34	0.35	0.35	0.35	0.37	0.41
1,500	1,500	1,500	1,500	1,200	1,200
3.5/5.6	3.5/5.7	3.5/5.7	3.5/5.7	3.9/4.7	4.0/4.7
/3,000	200/1,500	200/1,500	200/3,000	180/910	170/830
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	2·10 <sup>14</sup> /2·10 <sup>10</sup>	3·10 <sup>14</sup> /5·10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	6·10 <sup>12</sup>	2·10 <sup>13</sup>
450	550	550	450	350	425
	FC, UN	UN	UN		
BK23591		BK00564	BK20560	BK23591	BK20560
Glass-fiber reinforced injection-molding grade with enhanced hydrolysis resistance, e. g., for applications in vehicle cooling systems.	Glass-fiber reinforced injection-molding grade for machine elements and housings of high stiffness and dimensional stability such as lamp socket housings, heat pump housings, instantaneous water heaters as well as for electric insulating parts, as FC grade suitable for food contact.	Glass-fiber reinforced and heat aging resistant injection-molding grade, e. g. for parts and components with high stiffness and dimensional stability as well as electrically insulating parts.	Glass-fiber reinforced and heat aging resistant injection-molding grade for technical articles such as gearwheels, solenoid valve housings, cable contacts and components for automotive gear shifting systems.	Glass-fiber reinforced injection-molding grade with enhanced resistance to hydrolysis and heat ageing, e. g. for applications in the automotive cooling circuit.	Glass-fiber reinforced and heat-aging resistant injection-molding grade for industrial items such as gear wheels, solenoid valve housings, cable attachments, automotive fuel distributors and components for automotive gearshift.

# Ultramid® injection-molding grades without flame retardants

## Reinforced Ultramid® A grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5 %, +23 °C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50 % loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1 MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

- <sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.  
<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.  
<sup>3)</sup> NB = not broken  
<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5) mm, processing conditions: T<sub>M,PA6</sub> = 260 °C, T<sub>M,PA66</sub> = 290 °C, T<sub>w</sub> = 60 °C for unreinforced and T<sub>w</sub> = 80 °C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290 °C, T<sub>w,UL,D</sub> = 80 °C  
<sup>5)</sup> + = passed

A3EG10	A3WG10	A3WGM53	A3ZG6
PA66 - GF50	PA66 - GF50	PA66 - GF25 M15	PA66 - I GF30
1.56	1.56	1.48	1.33
130	130	136	160
3.7-4.3	3.7-4.3	4.8-5.4	4.7-5.3
1-1.4	1-1.4	1.2-1.6	1.3-1.7
260	260	260	260
20	20	30	15
290-310	290-310	280-300	280-300
80-90	80-90	80-90	80-90
0.45	0.45	0.6	0.55
HB	HB		HB
+	+		+
16,800/12,500	16,800/12,500	12,100/6,100	8,500/6,000
240*/180*	240*/180*	160*/80*	140*/100*
2.5*/3.5*	2.5*/3.5*	2.3*/6*	3.5*/6*
7,800	7,800		3,000
15,000/13,500	15,000/13,500	10,100/5,500	7,300/4,900
360/300	360/300	225/125	210/150
95/100	95/100	55/62	90/95
90	90	50	85
18/25	18/25	8/16	19/26
13	13	6.7	10
13/14.5	13/14.5	9.5/16	17/20
		7.5	15
250	250	225	240
250	250	250	250
240	240	240	220
135/165	145/175	145/175	—/*
0.05-0.2/0.5-0.6	0.05-0.2/0.5-0.6	0.1-0.2/0.5-0.8	0.25-0.35/0.6-0.7
0.37	0.37	0.35	0.35
1,300	1,300	1,500	1,700
3.8/6.6	3.8/6.6	4/	3.5/5.5
150/1,700	150/3,000	200/	140/1,600
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>
550	450	375	550
UN	UN		
	BK00564	BK20560	BK20591
Glass-fiber reinforced injection-molding grade for technical articles of very high stiffness as well as for electric insulating parts.	Glass-fiber reinforced injection-molding grade with high heat aging resistance for technical articles of very high stiffness.	Combined glass-fiber and mineral-fiber reinforced injection-molding grade for the manufacture of parts having high stiffness and good dimensional stability as well as surface quality, for example, cylinder head covers for vehicles.	Impact-modified, glass-fiber reinforced injection-molding grade.

# Ultramid® injection-molding grades without flame retardants

Unreinforced Ultramid® B grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5 %, +23 °C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50 % loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

**Footnotes**

- <sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.
- <sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.
- <sup>3)</sup> NB = not broken
- <sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5)mm, processing conditions: T<sub>M,PA6</sub> = 260 °C, T<sub>M,PA66</sub> = 290 °C, T<sub>w</sub> = 60 °C for unreinforced and T<sub>w</sub> = 80 °C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290 °C, T<sub>w,UL,D</sub> = 80 °C
- <sup>5)</sup> + = passed

B3K	B3S	B3L
PA6	PA6	PA6-I
1.13	1.13	1.1
150	145	
9 - 10	9 - 10	8.5 - 9.5
2.6-3.4	2.6-3.4	2.1-2.9
220	220	220
160	160	110
250-270	250-270	250-270
40-80	60-80	40-80
0.65	0.55	0.65
HB	V-2, B3S R03	HB
+	+	+
3,000/1,000	3,400/1,200	2,800/900
85/40	90/45	70/35
4.5/20	4/20	3.5/18
700	1,100	550
2,800/-	3,000/-	2,300/-
N/N	250/N	N/N
100	200	N
5.5/60	4/50	10/N
4	3	6
5.5/N	5/N	15/N
5	5	5.5
65	65	55
180	180	150
180	180	>160
100/112	87/97	
0.7-1/-	0.7-1/-	0.7-1/-
0.33	0.33	0.32
1,700	1,700	1,500
3.5/7	3.3/7	3.5/6.4
230/3,000	300/3,000	240/2,400
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>
600	600	600
UN	UN	UN
BK00464	BK00464	BK00464

Easy flowing and stabilized injection-molding grade used for technical parts with wall thicknesses >2mm, e.g. machinery components, fans and power tool housings.

Easy flowing, finely crystalline injection-molding grade for very fast processing. Uses include thin-walled technical parts (e.g. housings, fittings, grips, small parts and fixing clamps).

Impact-modified, free-flowing and rapidly processable injection-molding grade for dry impact-resistant technical articles such as, for example, housings, fittings, small parts and wall plugs.

# Ultramid® injection-molding grades without flame retardants

## Reinforced Ultramid® B grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5%, +23°C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30°C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30°C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50% loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80)°C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

- <sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.  
<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.  
<sup>3)</sup> NB = not broken  
<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5)mm, processing conditions: T<sub>M,PA6</sub> = 260°C, T<sub>M,PA66</sub> = 290°C, T<sub>w</sub> = 60°C for unreinforced and T<sub>w</sub> = 80°C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290°C, T<sub>w,UL,D</sub> = 80°C  
<sup>5)</sup> + = passed

B3EG3	B35EG3	B3EG5	B3WG5	B3EG6	B3WG6
PA6-GF15	PA6-GF15	PA6-GF25	PA6-GF25	PA6-GF30	PA6-GF30
1.23	1.23	1.32	1.32	1.36	1.36
140	170	140	140	140	140
7.7-8.3	7.7-8.3	6.8-7.4	6.8-7.4	6.3-6.9	6.3-6.9
2.3-2.9	2.3-2.9	2.1-2.5	2.1-2.5	1.9-2.3	1.9-2.3
220	220	220	220	220	220
75	55	55	55	50	50
270-290	270-290	270-290	270-290	270-290	270-290
80-90	80-90	80-90	80-90	80-90	80-90
0.45	0.55	0.35	0.35	0.35	0.35
HB	HB	HB	HB	HB	HB
+	+	+	+	+	+
5,800/3,500	5,800/3,500	8,000/5,500	8,000/5,000	9,500/6,200	9,500/6,200
130*/70*	130*/70*	160*/105*	160*/105*	185*/115*	185*/115*
3.5*/15*	4*/18*	3.5*/8.5*	3.5*/8.5*	3.5*/8*	3.5*/8*
2,100	2,100	3,000	3,000		
5,200/2,500	5,200/2,500	7,400/4,200	7,400/4,200	8,600/5,000	8,600/5,000
180/100	180/100	220/150	220/150	270/180	270/180
50/105	60/105	80/105	80/105	95/110	95/110
45	55	75	70	80	80
8/20	9/25	12/25	12/25	15/30	15/30
7	8	10	10	11	11
6/-	6.5/16	12/17	12/17	15/20	15/20
190	190	210	200	210	210
215	215	220	220	220	220
200	200	200	200	200	200
135/165	135/165	135/165	145/175	135/165	145/175
0.3-0.35/0.7-0.8	0.3-0.35/0.7-0.8	0.2-0.25/0.6-0.7	0.2-0.25/0.6-0.7	0.2-0.25/0.6-0.7	0.2-0.25/0.6-0.7
0.34	0.34	0.35	0.35	0.36	0.36
1,600	1,600	1,500	1,500	1,500	1,500
3.8/7	3.8/7	3.8/7	3.8/7	3.8/6.8	3.8/6.8
250/2,400	250/2,400	250/2,400	250/2,400	230/2,200	230/2,200
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>
550	550	575	450	575	450
UN	UN	UN	UN	UN	UN
BK00564	BK00564		BK00564	BK00564	BK00564
Glass-fiber reinforced injection-molding grade with enhanced impact resistance, for example, for vehicle mirror housings as well as for the wheels of mountain bikes.	Glass-fiber reinforced injection-molding grade for GIT applications such as, for example, steering column switches, vehicle mirror housings and the wheels of mountain bikes.	Glass-fiber reinforced injection-molding grade for industrial articles and electrical insulating parts.	Glass-fiber reinforced and heat aging resistant injection-molding grade, for instance, for fan impellers.	Glass-fiber reinforced injection-molding grade for technical articles as well as for electric insulating parts.	Glass-fiber reinforced and heat aging resistant injection-molding grade, for example, for vehicle intake manifolds and pedals.

# Ultramid® injection-molding grades without flame retardants

## Reinforced Ultramid® B grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5%, +23°C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30°C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23°C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30°C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50% loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80)°C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

- <sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.  
<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.  
<sup>3)</sup> NB = not broken  
<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5)mm, processing conditions: T<sub>M,PA6</sub> = 260°C, T<sub>M,PA66</sub> = 290°C, T<sub>w</sub> = 60°C for unreinforced and T<sub>w</sub> = 80°C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290°C, T<sub>w,UL,D</sub> = 80°C  
<sup>5)</sup> + = passed



B3WG7	B3WG10	B3G8	B3ZG3	B3ZG6	B3ZG8
PA6-GF35	PA6-GF50	PA6-GF40	PA6-I GF15	PA6-I GF30	PA6-I GF40
1.41	1.55	1.43	1.22	1.33	1.40
140	135	140	160	160	160
5.9-6.5	4.5-5.1	5.4-6.0	7.2-7.8	5.9-6.5	4.7-5.3
1.8-2.2	1.3-1.7	1.6-2.0	2.1-2.7	1.8-2.2	1.4-1.8
220	220	220	220	220	220
45	25	55	35	25	9
270-290	280-300	270-290	270-290	270-290	270-290
80-90	80-90	80-90	80-90	80-90	80-90
0.35	0.3		0.5	0.5	0.35
HB	HB		HB	HB	HB
+	+	+	+	+	+
11,000/7,200	16,700/11,000	13,000/8,200	5,500/2,900	9,000/5,300	11,600/6,700
195*/130*	225*/150*	205*/135*	110*/60*	150*/100*	165*/115*
3.5*/7*	2.5*/4.5*	2.8*/4.6*	4*/18*	3.6*/10*	4.6*/9.5*
3,300	7,400			3,000	
10,000/6,300	14,500/10,000	10,500/7,400	4,500/2,500	7,400/4,700	9,500/6,100
280/200	345/220	290/205	150/80	220/130	250/155
100/110	90/100	90/105	75/110	95/110	110/130
90	88	85	55	90	105
18/33	19/27	14/22	16/30	20/35	24/40
13	14	11	7	15	15
19/27	20/24	16/12	15/29	20/32	22
		12	5	10	14
215	215	215	180	200	205
220	220	220	200	220	220
200	200	200	180	180	180
145/175	145/175				
0.15-0.2/0.6-0.7	0.1-0.15/0.5-0.6	0.1-0.15/0.55-0.7	0.3-0.35/0.7-0.8	0.2-0.25/0.6-0.7	0.1-0.2/0.5-0.6
0.36	0.38	0.36	0.34	0.35	0.36
1,400	1,300	1,400			
3.9/6.2	4.2/6.1	4/6	3.7/6.2	3.8/6.8	4/5.3
210/1,900	140/1,400	140/1,300	250/2,000	200/2,000	200/1,300
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	13 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>
450		550	550	550	550
				UN	
BK00564	BK00564	BK00564	BK30564	BK30564	BK20560
Glass-fiber reinforced and heat aging resistant injection-molding grade, e. g. for automotive manifolds and pedals.	Glass-fiber reinforced and heat aging resistant injection-molding grade for technical parts with very high stiffness.	Glass-fiber reinforced injection-molding grade for pedals or pedal modules.	Impact-modified and glass-fiber reinforced injection-molding grade, for instance, for automotive cable conduits.	Impact-modified and glass-fiber reinforced injection-molding grade for technical articles of very high stiffness and toughness, for instance, for vehicle airbag housings and suitcase shells.	Impact-modified and glass-fiber reinforced injection-molding grade for technical articles of very high stiffness and toughness, for instance, for vehicle airbag housings and suitcase shells.

# Ultramid® injection-molding grades without flame retardants

## Reinforced Ultramid® B grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5 %, +23 °C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50 % loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

### Footnotes

- <sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.  
<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.  
<sup>3)</sup> NB = not broken  
<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5)mm, processing conditions: T<sub>M,PA6</sub> = 260 °C, T<sub>M,PA66</sub> = 290 °C, T<sub>w</sub> = 60 °C for unreinforced and T<sub>w</sub> = 80 °C for reinforced grades, \*test box: T<sub>M,UL,D</sub> = 290 °C, T<sub>w,UL,D</sub> = 80 °C  
<sup>5)</sup> + = passed

B3M6	B3WGM24 HP	B3GM35	B3GK24
PA6-M30	PA6-(GF10+M20)	PA6-(GF15+M25)	PA6-(GF10+GB20)
1.36	1.37	1.48	1.34
145	123	135	140
5.9-6.5	6.9-7.5	6.3-6.9	6.3-6.9
2.2-2.6	2.1-2.5	1.8-2.2	1.9-2.3
220	220	220	220
60	85	40	70
270-290	250-290	270-290	270-290
80-90	70-90	80-90	80-90
0.75		0.4	0.5
HB		HB	HB
+			+
4,600/1,700	8,500/3,600	8,300/4,300	6,000/3,000
75*/45*	115*/50	125*/70*	110*/60*
12*/55*	2.7*/5	2.8*/7.5*	3.5*/15*
800		1,850	2,000
4,000/1,400			5,000/3,000
125/50		190/120	130/70
190/N	45/50	50/70	40/90
100	40	50	39
9/18	8/15	6/8	5/11
5	5.5	4	4.5
6.5/15	8/-	5.5/13	5/8.5
70	190	190	150
195	215	210	200
180	180	180	200
0.5-0.8/0.5-0.7	0.6-1.1/0.34-0.38	0.35-0.4/-	0.35-0.4/-
0.31		0.38	0.34
1,400	1,300	1,300	1,400
3.5/6.2	3.9/6.2	3.9/6.2	3.9/4.6
200/2,000	200/2,000	200/2,000	200/700
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>	10 <sup>10</sup>
450		400	425
			UN
BK30564+GRQ94 22319	BK23210	BK30564	BK00564
Mineral-fiber reinforced injection-molding grade for highly impact-resistant technical articles with very good dimensional stability such as, for instance, hubcaps.	Mineral-filled and glass-fiber reinforced injection-molding grade with outstanding flowability for technical parts with medium rigidity and high dimensional stability, e.g. for automotive engine covers, housings.	Mineral-filled and glass-fiber reinforced injection-molding grade for industrial articles having medium rigidity and high dimensional stability, used e.g. for covers and handles.	Combined glass-fiber and glass-bead reinforced injection-molding grade for technical articles of very good dimensional stability, for instance, vehicle ashtray housings and electronic housings.

# Ultramid® injection-molding grades without flame retardants

Ultramid® D Aqua®, Ultramid® S Balance

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r.h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5%, +23°C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50% loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1 MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

## Footnotes

<sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.

<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.

<sup>3)</sup> NB = not broken

<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5) mm,

processing conditions: T<sub>M PA6.10</sub> = 270 °C, T<sub>w</sub> = 60 °C for unreinforced and T<sub>w</sub> = 80 °C for reinforced grades,

\*test box: T<sub>M UR. D</sub> = 290 °C, T<sub>w UR. D</sub> = 80 °C

<sup>5)</sup> + = passed

D3EG10 FC Aqua® reinforced	S3K Balance unreinforced	S3WG6 Balance reinforced
PA GF50	PA610	PA610 GF30
1.58	1.08	1.31
120	150	150
3.5	3.6	2-2.6
1.3	1.4	0.8-1.2
250	220	220
	105	30
280-310	250-270	270-290
80-120	40-60	80-90
0.15	1.1-1.2	0.4
HB		
16,000/16,000	2,400/1,300	8,600/6,800
245*/210*	65/60	150/110
2.5*/2.5*	4.5/20	4/6
10,300		
15,700	2,100/1,200	7,700/6,300
350	80/45	225/180
95/85	N/N	85/85
90	330	80
12/11	4/7	13/13
12	3	8
225	55	200
	140	220
0.10-0.15/0.6-1.4	0.9-1.3/1-1.4	0.3/0.9-1.5
0.34	0.26	0.31
1,100	1,600	1,300
		3.8/4.3
		176/567
		7 <sup>10</sup> /8 <sup>9</sup>
	>10 <sup>15</sup>	2 <sup>14</sup>
	600	550
	UN	
BK23285		BK00564
Glass-fiber reinforced injection-molding grade, high surface quality and dimensional stability, low water absorption, as metal replacement for technical articles of very high stiffness, e. g. water meter housings. Material approvals for contact with water and food.	Long-chain polyamide for injection-molding, low water absorption, especially high hydrolysis, chemical and stress cracking resistance.	Glass-fiber reinforced injection-molding grade, low water absorption, especially high hydrolysis, chemical and stress cracking resistance, e. g. for quick connectors.

# Ultramid® injection-molding grades without flame retardants

Unreinforced Ultramid® T grades, reinforced Ultramid® T grades

Typical values at 23°C <sup>1)</sup>	Unit	Test specification	Condition
<b>Features</b>			
Symbol	–	ISO 1043	–
Density	g/cm <sup>3</sup>	ISO 1183	–
Viscosity number (solution 0.005 g sulfuric acid/ml)	ml/g	ISO 307	–
Water absorption, saturation in water at 23°C	%	ISO 62	–
Moist. absorption, saturation in standard cond. atmo. 23°C/50% r. h.	%	ISO 62	–
<b>Processing</b>			
Melting point, DSC	°C	DIN 53 765	–
Melt volume rate MVR 275/5	cm <sup>3</sup> /10min	ISO 1133	–
Melt temperature range, injection-molding/extrusion	°C	–	–
Mold temperature range, injection-molding	°C	–	–
Molding shrinkage, restricted <sup>4)</sup>	%	–	–
<b>Flammability</b>			
Test according to UL-Standard at d=1.6mm thickness	class	UL 94	–
Motor Vehicle Safety Standard Test: thickness ≥ 1 mm	–	FMVSS 302 <sup>5)</sup>	–
<b>Mechanical Properties</b>			
Tensile modulus of elasticity	MPa	ISO 527-1/-2	dry/cond.
Stress at yield (v=50 mm/min), at break (v=5 mm/min)*	MPa	ISO 527-1/-2	dry/cond.
Elongation at yield (v=50 mm/min), at break (v=5 mm/min)*	%	ISO 527-1/-2	dry/cond.
Tensile creep modulus, 1,000h, elongation ≤ 0.5 %, +23 °C	MPa	ISO 899-1	cond.
Flexural modulus	MPa	ISO 178	dry/cond.
Flexural stress at max. force	MPa	ISO 178	dry/cond.
Charpy impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry
Charpy notched impact strength <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 179/1eU	dry/cond.
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179/1eA	dry
Izod notched impact strength A <sup>3)</sup> +23 °C	kJ/m <sup>2</sup>	ISO 180/A	dry/cond.
Izod notched impact strength A -30 °C	kJ/m <sup>2</sup>	ISO 180/A	dry
<b>Thermal properties</b>			
Heat distortion temperature under 1.8 MPa load (HDT A)	°C	ISO 75-1/-2	–
Heat distortion temperature under 0.45 MPa load (HDT B)	°C	ISO 75-1/-2	–
Max. service temperature, up to a few hours <sup>2)</sup>	°C	–	–
Temp. index for 50 % loss of tensile strength after 20,000h/5,000h	°C	IEC 60216	–
Coefficient of linear expansion, longit./transv. (23-80) °C	10 <sup>-4</sup> /K	ISO 11359-1/-2	–
Thermal conductivity	W/(m·K)	DIN 52 612-1	–
Specific heat capacity	J/(kg·K)	–	–
<b>Electrical properties</b>			
Dielectric constant at 1 MHz	–	IEC 60250	dry/cond.
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250	dry/cond.
Volume resistivity	Ω·m	IEC 60093	dry/cond.
Surface resistivity	Ω	IEC 60093	cond.
Comparative tracking index CTI, test solution A	–	IEC 60112	–
<b>Core Products</b>			

## Footnotes

<sup>1)</sup> For undyed product, unless otherwise indicated in the product designation.

<sup>2)</sup> Empirical values for parts repeatedly exposed to this temperature for several hours at a time over a period of years, provided that shaping and processing were in accord with the material.

<sup>3)</sup> NB = not broken

<sup>4)</sup> Test box with central gating, base dimensions (107·47·1.5) mm, processing conditions: T<sub>M PA6T/6</sub> = 315 °C unreinforced and T<sub>M PA6T/6</sub> = 320 °C reinforced, T<sub>w</sub> = 90 °C unreinforced and T<sub>w</sub> = 100 °C reinforced

<sup>5)</sup> + = passed

TKR 4350 unreinforced	TKR 4355 G5 reinforced	TKR 4355 G7 reinforced	TKR 4355 G10 reinforced	TKR 4357 G6 reinforced
PA6T/6	PA6T/6 GF25	PA6T/6 GF35	PA6T/6 GF50	PA6T/6-I-GF30
1.16	1.35	1.43	1.62	1.37
130	130	130	135	130
6.5-7.5	5-6	4.3-5.3	3.5-4.5	4-5
1.6-2	1.1-1.5	0.8-1.2	0.4-0.8	0.6-1
295	295	295	285	295
310-330	310-330	310-330	310-330	310-330
70-100	80-120	80-120	80-120	80-120
0.60	0.4	0.35	0.3	0.35
HB	HB	HB	HB	HB
+		+		+
3,100/3,100	9,000/9,000	12,000/12,000	17,000/16,000	9,300/9,000
80/70	185/170	210/200	240/190	165/145
5/5	3/3	3/3	2.5/2.5	3.5/3.5
2,300	6,500	8,700	10,500	6,500
2,900	7,300	10,600	16,400	8,400
		290	390	240
140	80	100	90/80	95
130			85/75	
8	11	14.5	13	17
6				
8	8.5			23
95	245	245	245	240
250	270	270	260	270
110/130	135/160	135/160	145/170	130/160
0.6-0.8	0.25/0.5-0.6	0.15/0.5-0.6	0.18/0.5-0.6	0.25/0.5-0.6
0.23	0.25	0.28	0.32	0.25
1,500	1,400	1,300	1,000	1,400
4/4	4.3/4.5	4.2/4.4	4.7/4.8	4.3/4.5
300/400	300/400	200/300	200/300	300-400
10 <sup>13</sup> /10 <sup>12</sup>	10 <sup>13</sup> /10 <sup>12</sup>	10 <sup>13</sup> /10 <sup>12</sup>	>10 <sup>15</sup> / <sup>&gt;</sup> 10 <sup>14</sup>	10 <sup>13</sup> /10 <sup>12</sup>
10 <sup>13</sup>	10 <sup>13</sup>	10 <sup>13</sup>	>10 <sup>16</sup>	10 <sup>13</sup>
600	600	600	600	600
UN	UN	UN	UN	UN
BK00464	BK00564	BK00564	BK23215	BK00564
For injection-molding and extrusion, exhibiting high toughness, strength and stiffness, low water absorption, high melting point (295 °C [563 °F]). The mechanical properties remain constant after moisture absorption up to a temperature of 60 °C [140 °F].	Glass-fiber reinforced product for injection-molding; high toughness, strength and stiffness, low water absorption, high melting point (295 °C [563 °F]). The mechanical properties remain constant after moisture absorption up to a temperature of 60 °C [140 °F], for instance, for brush collars (electric motors).	Glass-fiber reinforced product for injection-molding; high toughness, strength and stiffness, low water absorption, high melting point (295 °C [563 °F]). The mechanical properties remain constant after moisture absorption up to a temperature of 60 °C [140 °F], for instance, for automotive valve housings.	Glass-fiber reinforced product for injection-molding; high toughness and rigidity; low water absorption, high melting point (285 °C); mechanical properties remain constant up to 60 °C after moisture absorption; suitable e.g. for valve housings.	Glass-fiber reinforced, impact-modified product for injection-molding; high toughness, strength and stiffness, low water absorption, high melting point (295 °C [563 °F]). The mechanical properties remain constant after moisture absorption up to a temperature of 60 °C [140 °F], for instance, for automotive plug-in connectors.

# Ultramid® injection-molding grades with flame retardants

## Unreinforced grades

Typical values at 23 °C for uncolored products	Unit	Test method
<b>Features</b>		
Symbol		
Density	g/cm <sup>3</sup>	ISO 1183
Water absorption, equilibrium in water at 23 °C	%	ISO 62
Moisture absorption, equilibrium in standard cond. atmo. 23 °C/50% r.h.	%	ISO 62
<b>Flammability</b>		
Flammability acc. to UL 94 (thickness)	class (mm)	UL 94
UL (f1) proven for outdoor use: color code, min. thickness	color, mm	UL 746 C
UL 746 C fire/ignition performance (UL 94 + HAI + HWI), min. thickness	mm	UL 746 C
GWFI (thickness)	°C (mm)	IEC 60695-2-12
GWIT (thickness)	°C (mm)	IEC 60695-2-13
Oxygen index	%	ISO 4589-1/-2
Railway: Spec. optical density of smoke DS max. (20 min.), 25 kW/m <sup>2</sup> , 2 mm	–	EN ISO 5659-2: 2007-04
Railway: Toxicity of smoke CIT NLP acc. to EN 45545-2: 2013-08	–	NF X70-100-1/-2
Testing of materials for automobile interior, burning rate ≤ 100 mm/min, d ≥ 1 mm		ISO 3795, FMVSS 302 <sup>1)</sup>
Railway: Hazard level acc. to requ. sets R22 and R22	class	EN 45545-2: 2013-08
<b>Electrical properties</b>		
Condition		
Dielectric constant at 1 MHz		IEC 60250
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250
Volume resistivity	Ω · m	IEC 60093
Surface resistivity	Ω	IEC 60093
CTI, test liquid A		IEC 60112
<b>Thermal properties</b>		
Heat distortion temperature HDT A (1.80 MPa)	°C	ISO 75-1/-2
Heat distortion temperature HDT B (0.45 MPa)	°C	ISO 75-1/-2
Temperature limit for application, max. time of use, known value for parts	°C	–
Temperature index for 50% loss of tensile strength after 20,000 h/5,000 h	°C	IEC 60216
RTI "dielectric strength" at 1.5 mm thickness	°C	UL 746 B
Thermal conductivity, 23 °C	W/(m · K)	DIN 52612-1
Specific heat capacity, 23 °C	J/(kg · K)	–
Coeff. of linear therm. expansion 23 °C - 55 °C (parallel/perpendicular)	10 <sup>-4</sup> /K	ISO 11359-1/-2
<b>Mechanical properties</b>		
Condition		
Tensile modulus of elasticity	MPa	ISO 527-1/-2
Yield stress*, Stress at break	MPa	ISO 527-1/-2
Yield strain	%	ISO 527-1/-2
Strain at break	%	ISO 527-1/-2
Tensile creep modulus, 1,000 h	MPa	ISO 899-1
Flexural modulus	MPa	ISO 178
Flexural stress at max. force	MPa	ISO 178
Charpy impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Izod notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 180-A
Izod notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 180-A
<b>Processing</b>		
Melting temperature, DSC (10 °C/min)	°C	ISO 11357-1/-3
Melt volume-flow rate MVR, test temperature/load	cm <sup>3</sup> /10 min., °C/kg	ISO 1133
Melt temperature range injection-molding	°C	
Mold temperature range injection-molding	°C	
Molding shrinkage, test box, d = 1.5 mm, T <sub>M</sub> , T <sub>W</sub>	%/°C/°C	–
Molding shrinkage parallel/perpendicular	%	ISO 294-4

Footnote  
<sup>1)</sup> passed: +



A3U30	C3U	C3U11
PA66 FR	PA66/6 FR	PA66/6 FR
1.18	1.16	1.33
7-8	8-9	-
2.2-2.8	2.6-3.2	-
V-0 (≥0.25)	V-0 (≥0.4)	V-2 (0.4)
0.75	0.4	-
960 (0.8)	960 (0.4)	960 (0.4)
775 (0.8)	775 (≤1.5)	800 (0.4)
-	34	-
-	60	-
-	0.41	-
+	+	-
-	R22: HL3/R23: HL3	-
dry/moist	dry/moist	dry/moist
3.5/-	3.6/6	3.6/4.2
200/-	200/3,000	250/850
10 <sup>14</sup> /10 <sup>11</sup>	10 <sup>13</sup> /10 <sup>9</sup>	10 <sup>14</sup> /10 <sup>10</sup>
-/10 <sup>15</sup>	-/10 <sup>10</sup>	-/10 <sup>13</sup>
600	600	400
80	70	-
215	210	-
200	200	200
-	107/123	-
130	120	120
0.33	0.33	-
1,500	1,700	-
0.6-0.8/0.6-0.9	0.6-1/0.6-1.2	-
dry/moist	dry/moist	dry/moist
3,700/1,800	3,500/1,500	3,900/1,300
75*/50*	75*/45*	75*/40*
3.5/15	4/20	3.6/16
-	-	-
-	-/890	-
3,600/1,800	3,000/-	3,700/-
120/55	-	120/-
55/120	80/N	50/N
45/-	-	45/-
3/4	6/35	3/5
-	4/-	-
-	4.5/11	3/5
-	3.5/-	-
260	243	240
200, 275/5	140, 275/5	160, 275/5
270-280	250-270	250-270
60-80	60-80	60-80
0.9/270/60	0.8/270/60	-
1.5/1.7	1.25/1.27	1.1/1.1
Halogen-free injection-molding grade with flame retardance, used for example for electrical insulating parts with very small wall thicknesses.	Halogen-free injection-molding grade with flame retardance, used for example for impact-resistant electrical insulating parts such as contact carriers and plug connector strips.	Flame-retardant injection-molding grade; light-colorable; outstanding mechanical and electrical properties; specially optimized for the glow-wire requirements of IEC 60335; for applications such as plugs, switches, housings etc. of household appliances.

# Ultramid® injection-molding grades with flame retardants

## Reinforced grades

Typical values at 23 °C for uncolored products	Unit	Test method
<b>Features</b>		
Symbol		
Density	g/cm <sup>3</sup>	ISO 1183
Water absorption, equilibrium in water at 23 °C	%	ISO 62
Moisture absorption, equilibrium in standard cond. atmo. 23 °C/50% r.h.	%	ISO 62
<b>Flammability</b>		
Flammability acc. to UL 94 (thickness)	class (mm)	UL 94
UL (f1) proven for outdoor use: color code, min. thickness	color, mm	UL 746 C
UL 746 C fire/ignition performance (UL 94 + HAI + HWI), min. thickness	mm	UL 746 C
GWFI (thickness)	°C (mm)	IEC 60695-2-12
GWIT (thickness)	°C (mm)	IEC 60695-2-13
Oxygen index	%	ISO 4589-1/-2
Railway: Spec. optical density of smoke DS max. (20 min.), 25 kW/m <sup>2</sup> , 2 mm	–	EN ISO 5659-2: 2007-04
Railway: Toxicity of smoke CIT NLP acc. to EN 45545-2: 2013-08	–	NF X70-100-1/-2
Testing of materials for automobile interior, burning rate ≤ 100 mm/min, d ≥ 1 mm		ISO 3795, FMVSS 302 <sup>1)</sup>
Railway: Hazard level acc. to requ. sets R22 and R23	class	EN 45545-2: 2013-08
<b>Electrical properties</b>		
Condition		
Dielectric constant at 1 MHz		IEC 60250
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250
Volume resistivity	Ω · m	IEC 60093
Surface resistivity	Ω	IEC 60093
CTI, test liquid A		IEC 60112
<b>Thermal properties</b>		
Heat distortion temperature HDT A (1.80 MPa)	°C	ISO 75-1/-2
Heat distortion temperature HDT B (0.45 MPa)	°C	ISO 75-1/-2
Temperature limit for application, max. time of use, known value for parts	°C	–
Temperature index for 50% loss of tensile strength after 20,000 h/5,000 h	°C	IEC 60216
RTI "dielectric strength" at 1.5 mm thickness	°C	UL 746 B
Thermal conductivity, 23 °C	W/(m · K)	DIN 52612-1
Specific heat capacity, 23 °C	J/(kg · K)	–
Coeff. of linear therm. expansion 23 °C - 55 °C (parallel/perpendicular)	10 <sup>-4</sup> /K	ISO 11359-1/-2
<b>Mechanical properties</b>		
Condition		
Tensile modulus of elasticity	MPa	ISO 527-1/-2
Yield stress*, Stress at break	MPa	ISO 527-1/-2
Yield strain	%	ISO 527-1/-2
Strain at break	%	ISO 527-1/-2
Tensile creep modulus, 1,000 h	MPa	ISO 899-1
Flexural modulus	MPa	ISO 178
Flexural stress at max. force	MPa	ISO 178
Charpy impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Izod notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 180-A
Izod notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 180-A
<b>Processing</b>		
Melting temperature, DSC (10 °C/min)	°C	ISO 11357-1/-3
Melt volume-flow rate MVR, test temperature/load	cm <sup>3</sup> /10 min., °C/kg	ISO 1133
Melt temperature range injection-molding	°C	
Mold temperature range injection-molding	°C	
Molding shrinkage, test box, d = 1.5 mm, T <sub>M</sub> , T <sub>W</sub>	%/°C/°C	–
Molding shrinkage parallel/perpendicular	%	ISO 294-4

**Footnote**  
<sup>1)</sup> passed: +

A3UG5	A3U41G5 SI	A3U42G6	A3X2G5	A3XZG5
PA66 GF25 FR	(PA66+PA6) GF25 FR	(PA66+PA6) GF30 FR	PA66 GF25 FR	PA66-I GF25 FR
1.39	1.39	1.45	1.34	1.32
4-4.6	–	4.7-5.1	5.7-6.3	4.7-5.3
1.1-1.5	–	1.5-1.7	1.2-1.6	1-1.4
V-0 (0.75)	V-0 (0.75)	V-0 (0.4)	HB (0.4)	V-0 (1.5)
	5VA (1.6)	5VA (1.6)	V-0 (0.81)	
bk/gr, 0.75	–	–	5VA (3)	bk: 5VA (2.3)
0.75	–	–	bk, 1.6	bk23187, 0.75
960 (0.75)	960 (0.75)	960 (1)	0.6	1.5
775 (≥ 2)	–	–	960 (0.8)	–
32	–	–	–	–
250	–	112	27	28
0.38	–	0.37	217	–
–	–	–	0.42	–
R22:HL3/R23:HL3	–	R22:HL3/R23:HL3	+	+
			–	–
dry/moist	dry/moist	dry/moist	dry/moist	dry/moist
3.8/4.6	–	–	3.7/5	3.8/4
170/1,000	–	–	200/1,000	200/300
10 <sup>14</sup> /10 <sup>11</sup>	–	>10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>
–/10 <sup>15</sup>	–/–	–/10 <sup>10</sup>	–/10 <sup>10</sup>	–/10 <sup>10</sup>
600	400	550	550	575
245	220	230	250	240
260	–	250	250	250
–	–	–	220	180
130/155	–	–	139/157	–
120	150	150	120	120
0.34	–	–	0.33	0.33
1,300	–	–	1,500	–
–	–	0.22-0.24/0.7-1.1	0.25-0.35/0.6-0.8	0.2-0.3/0.6-0.7
dry/moist	dry/moist	dry/moist	dry/moist	dry/moist
9,500/6,100	10,000/6,000	11,000/7,500	8,000/6,000	6,500/4,500
145/90	145/90	145/95	140/100	105/70
–	–	–	–	–
3/5	3/5.5	3/5	3/4.5	6/11
–	–	–	–/3,500	–/2,000
9,500/6,100	–	11,000/7,500	7,100/–	5,500/–
230/160	–	230/160	–	115/100
65/65	60/60	70/75	65/70	90/100
63/–	–	55/60	60/65	85/80
7.5/9	7.5/9	8/11	13/17	25/30
–	–	7/7	–	–
10/14	–	10/12	12/17	24/–
–	–	–	–	10/10
260	260	260	260	260
25, 275/5	40, 275/5	20, 275/5	30, 275/5	–
280-300	280-300	280-300	280-300	280-300
80-90	60-100	80-90	60-90	80-90
0.4/290/80	–	0.4/290/80	0.5/290/80	0.55/290/80
0.40/1.20	0.35/0.90	0.35/0.80	0.48/1.23	–
Glass fiber-reinforced injection-molding grade that is flame-retardant without halogens; light colorable; outstanding mechanical and electrical properties.	Glass fiber-reinforced injection-molding grade that is flame-retardant without halogens; outstanding mechanical and electrical properties.	Glass fiber-reinforced injection-molding grade that is flame-retardant without halogens; light colorable; outstanding mechanical and electrical properties.	Glass fiber-reinforced injection-molding grade with improved flame-retardant properties for components with increased stiffness requirements; flame retardance based on red phosphorus; outstanding mechanical and electrical properties.	Impact-modified, glass fiber-reinforced injection-molding grade with improved flame-retardant properties; flame retardance based on red phosphorus; for components requiring high stiffness and enhanced toughness such as photovoltaic connectors and junction boxes.

# Ultramid® injection-molding grades with flame retardants

## Reinforced grades

Typical values at 23 °C for uncolored products	Unit	Test method
<b>Features</b>		
Symbol		
Density	g/cm <sup>3</sup>	ISO 1183
Water absorption, equilibrium in water at 23 °C	%	ISO 62
Moisture absorption, equilibrium in standard cond. atmo. 23 °C/50% r.h.	%	ISO 62
<b>Flammability</b>		
Flammability acc. to UL 94 (thickness)	class (mm)	UL 94
UL (f1) proven for outdoor use: color code, min. thickness	color, mm	UL 746 C
UL 746 C fire/ignition performance (UL 94 + HAI + HWI), min. thickness	mm	UL 746 C
GWFI (thickness)	°C (mm)	IEC 60695-2-12
GWIT (thickness)	°C (mm)	IEC 60695-2-13
Oxygen index	%	ISO 4589-1/-2
Railway: Spec. optical density of smoke DS max. (20 min.), 25 kW/m <sup>2</sup> , 2 mm	–	EN ISO 5659-2: 2007-04
Railway: Toxicity of smoke CIT NLP acc. to EN 45545-2: 2013-08	–	NF X70-100-1/-2
Testing of materials for automobile interior, burning rate ≤ 100 mm/min, d ≥ 1 mm		ISO 3795, FMVSS 302 <sup>1)</sup>
Railway: Hazard level acc. to requ. sets R22 and R23	class	EN 45545-2: 2013-08
<b>Electrical properties</b>		
Condition		
Dielectric constant at 1 MHz		IEC 60250
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250
Volume resistivity	Ω · m	IEC 60093
Surface resistivity	Ω	IEC 60093
CTI, test liquid A		IEC 60112
<b>Thermal properties</b>		
Heat distortion temperature HDT A (1.80 MPa)	°C	ISO 75-1/-2
Heat distortion temperature HDT B (0.45 MPa)	°C	ISO 75-1/-2
Temperature limit for application, max. time of use, known value for parts	°C	–
Temperature index for 50% loss of tensile strength after 20,000 h/5,000 h	°C	IEC 60216
RTI "dielectric strength" at 1.5 mm thickness	°C	UL 746 B
Thermal conductivity, 23 °C	W/(m · K)	DIN 52612-1
Specific heat capacity, 23 °C	J/(kg · K)	–
Coeff. of linear therm. expansion 23 °C - 55 °C (parallel/perpendicular)	10 <sup>-4</sup> /K	ISO 11359-1/-2
<b>Mechanical properties</b>		
Condition		
Tensile modulus of elasticity	MPa	ISO 527-1/-2
Yield stress*, Stress at break	MPa	ISO 527-1/-2
Yield strain	%	ISO 527-1/-2
Strain at break	%	ISO 527-1/-2
Tensile creep modulus, 1,000 h	MPa	ISO 899-1
Flexural modulus	MPa	ISO 178
Flexural stress at max. force	MPa	ISO 178
Charpy impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Izod notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 180-A
Izod notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 180-A
<b>Processing</b>		
Melting temperature, DSC (10 °C/min)	°C	ISO 11357-1/-3
Melt volume-flow rate MVR, test temperature/load	cm <sup>3</sup> /10 min., °C/kg	ISO 1133
Melt temperature range injection-molding	°C	
Mold temperature range injection-molding	°C	
Molding shrinkage, test box, d = 1.5 mm, T <sub>M</sub> , T <sub>W</sub>	%/°C/°C	–
Molding shrinkage parallel/perpendicular	%	ISO 294-4

Footnote  
<sup>1)</sup> passed: +

A3X2G7	A3X2G10	B3UG4	B3U30G6	B3UGM210
PA66 GF35 FR	PA66 GF50 FR	PA6 GF20 FR	PA6 GF30 FR	PA6 (GF10+M50) FR
1.45	1.6	1.31	1.44	1.67
4.4-5	3.7-4.3	6.6-7.2	5.3-5.9	4.1-4.7
1-1.4	0.7-1.1	2-2.4	1.5-2	1-1.4
HB (0.4)	V-2 (0.4)	V-2 (0.71)	HB (0.4)	V-2 (0.75)
V-0 (0.75)	V-0 (1.5)		V-2 (0.75)	V-0 (1.5)
bk: 5VA (1.5)				
bk23187, 0.75	–	bk, 0.71	–	–
0.75	0.75	1.5	0.75	0.75
960 (1)	960 (1)	960 (1)	960 (1)	960 (1)
–	–	–	–	–
28	28	31	–	52
180	184	203	–	10
0.38	0.36	0.55	–	0.23
+	+	+	–	+
–	–	R22: HL2 / R23: HL2	–	R22: HL3 / R23: HL3
dry/moist	dry/moist	dry/moist	dry/moist	dry/moist
3.6/5	3.6/5	3.8/–	4/4.8	4.5/5
200/2,000	200/–	150/–	200/1,000	150/500
10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>10</sup>	10 <sup>13</sup> /10 <sup>11</sup>	10 <sup>13</sup> /10 <sup>9</sup>	10 <sup>13</sup> /10 <sup>10</sup>
–/10 <sup>10</sup>	–/10 <sup>10</sup>	–/10 <sup>10</sup>	–/10 <sup>14</sup>	–/10 <sup>13</sup>
600	600	550	525	600
250	250	170	180	195
250	250	210	210	215
220	220	200	–	200
140/157	125/145	160/185	–	149/167
115	115	140	140	130
0.34	0.35	0.4	0.28	1
1,400	1,300	1,300	1,200	1,400
0.15-0.2/0.6-0.7	0.15-0.2/0.4-0.5	0.5-0.55/0.5-0.6	0.3/0.67-0.9	0.4-0.6/0.4-0.5
dry/moist	dry/moist	dry/moist	dry/moist	dry/moist
11,000/8,500	16,000/12,000	6,000/3,000	8,000/4,300	11,000/6,500
160/120	180/130	95/50	95/50	110/80
–	–	–	–	–
3/4	2/3	3/6	3.2/10	1.8/2.5
–/4,250	–/5,400	–/1,500	–	–
9,200/–	13,000/–	5,700/2,800	7,800/4,500	10,000/–
–	–	150/70	160/90	165/115
70/70	55/55	40/110	35/65	30/30
65/–	50/–	35/–	25/25	30/–
14/18	13/16	3/9	3.7/6	2.5/4
10/–	11/–	3.4/–	–	2.7/–
13/20	14/20	5/10	3.7/6	2.5/4.5
–	–	4/–	–	–
260	260	220	220	220
25, 275/5	25, 275/5	80, 275/5	150, 275/5	30, 275/5
280-300	290-300	250-275	250-270	290-310
80-90	80-90	80-90	80-90	80-90
0.45/290/80	0.4/290/80	0.5/270/80	0.5/270/80	0.5/290/80
0.34/1.14	–	0.80/0.80	0.40/0.90	–
Glass fiber-reinforced injection-molding grade with improved flame-retardant properties; flame retardance based on red phosphorus; very high stiffness and strength; outstanding electrical properties.	Glass fiber-reinforced injection-molding grade with improved flame-retardant properties; flame retardance based on red phosphorus; very high stiffness and strength; outstanding electrical properties.	Injection-molding grade that is flame-retardant without halogens and has outstanding free-flow properties, good electrical properties and low smoke density. Passes glowwire test GWFI up to 960°C [1760°F].	Injection-molding grade that is flame-retardant without halogens and has outstanding free-flow properties and good electrical properties. Passes glow-wire test GWFI up to 960°C [1760°F].	Injection-molding grade that is flame-retardant without halogens and has very high stiffness, outstanding electrical properties and low smoke density.

# Ultramid® injection-molding grades with flame retardants

## Reinforced grades

Typical values at 23 °C for uncolored products	Unit	Test method
<b>Features</b>		
Symbol		
Density	g/cm <sup>3</sup>	ISO 1183
Water absorption, equilibrium in water at 23 °C	%	ISO 62
Moisture absorption, equilibrium in standard cond. atmo. 23 °C/50% r.h.	%	ISO 62
<b>Flammability</b>		
Flammability acc. to UL 94 (thickness)	class (mm)	UL 94
UL (f1) proven for outdoor use: color code, min. thickness	color, mm	UL 746 C
UL 746 C fire/ignition performance (UL 94 + HAI + HWI), min. thickness	mm	UL 746 C
GWFI (thickness)	°C (mm)	IEC 60695-2-12
GWIT (thickness)	°C (mm)	IEC 60695-2-13
Oxygen index	%	ISO 4589-1/-2
Railway: Spec. optical density of smoke DS max. (20 min.), 25 kW/m <sup>2</sup> , 2 mm	–	EN ISO 5659-2: 2007-04
Railway: Toxicity of smoke CIT NLP acc. to CEN/TS 45545-2	–	NF X70-100-1/-2
Testing of materials for automobile interior, burning rate ≤ 100 mm/min, d ≥ 1 mm		ISO 3795, FMVSS 302 <sup>1)</sup>
Railway: Hazard level acc. to requ. sets R23 and R24	class	EN 45545-2: 2013-08
<b>Electrical properties</b>		
Condition		
Dielectric constant at 1 MHz		IEC 60250
Dissipation factor at 1 MHz	10 <sup>-4</sup>	IEC 60250
Volume resistivity	Ω · m	IEC 60093
Surface resistivity	Ω	IEC 60093
CTI, test liquid A		IEC 60112
<b>Thermal properties</b>		
Heat distortion temperature HDT A (1.80 MPa)	°C	ISO 75-1/-2
Heat distortion temperature HDT B (0.45 MPa)	°C	ISO 75-1/-2
Temperature limit for application, max. time of use, known value for parts	°C	–
Temperature index for 50% loss of tensile strength after 20,000 h/5,000 h	°C	IEC 60216
RTI "dielectric strength" at 1.5 mm thickness	°C	UL 746 B
Thermal conductivity, 23 °C	W/(m · K)	DIN 52612-1
Specific heat capacity, 23 °C	J/(kg · K)	–
Coeff. of linear therm. expansion 23 °C - 55 °C (parallel/perpendicular)	10 <sup>-4</sup> /K	ISO 11359-1/-2
<b>Mechanical properties</b>		
Condition		
Tensile modulus of elasticity	MPa	ISO 527-1/-2
Yield stress*, Stress at break	MPa	ISO 527-1/-2
Yield strain	%	ISO 527-1/-2
Strain at break	%	ISO 527-1/-2
Tensile creep modulus, 1,000 h	MPa	ISO 899-1
Flexural modulus	MPa	ISO 178
Flexural stress at max. force	MPa	ISO 178
Charpy impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eU
Charpy notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Charpy notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 179-1eA
Izod notched impact strength +23 °C	kJ/m <sup>2</sup>	ISO 180-A
Izod notched impact strength -30 °C	kJ/m <sup>2</sup>	ISO 180-A
<b>Processing</b>		
Melting temperature, DSC (10 °C/min)	°C	ISO 11357-1/-3
Melt volume-flow rate MVR, test temperature/load	cm <sup>3</sup> /10 min., °C/kg	ISO 1133
Melt temperature range injection-molding	°C	
Mold temperature range injection-molding	°C	
Molding shrinkage, test box, d = 1.5 mm, T <sub>M</sub> , T <sub>W</sub>	%/°C/°C	–
Molding shrinkage parallel/perpendicular	%	ISO 294-4

**Footnote**
<sup>1)</sup> passed: +

**T KR 4365 G5**
**T KR 4340 G6**

PA6T/6 GF25 FR	PA6T/6 GF30 FR
1.38	1.46
5-6	4.3-5.3
1.1-1.5	1.4-1.8
V-2 (0.37)	V-0 (0.4)
V-0 (0.75)	
5VA (1.5)	5VA (1)
–	–
0.75	0.4
960 (0.75)	960 (0.4)
775 (0.75)	775 (0.4)
26	50
–	–
–	–
+	+
–	–
dry/moist	dry/moist
4/–	3.9/4.1
200/–	150/270
10 <sup>13</sup> /10 <sup>12</sup>	10 <sup>15</sup> /10 <sup>14</sup>
–/10 <sup>13</sup>	–/10 <sup>14</sup>
600	600
220	220
–	–
270	270
125/150	–
140	160
0.31	0.37
1,400	1,200
0.25/0.5-0.6	0.2-0.25/0.65-0.75
dry/moist	dry/moist
8,300/8,000	11,000/11,000
150/140	150/130
–	–
3/–	2.5/2.5
–/6,400	–
–	11,000/11,000
–	240/210
75/–	65/50
–	65/–
13/–	8.5/8
–	8/–
13/–	–
–	–
295	290
–	45, 325/5
310-330	310-330
80-120	80-120
0.4/320/100	0.1/320/100
0.55/1.00	0.40/0.90

Glass fiber-reinforced partially aromatic polyamide for injection-molding; flame retardance based on red phosphorus; good mechanical properties, low water absorption, high melting point, high tracking resistance, resistant to soldering temperatures.

Glass fiber-reinforced partially aromatic polyamide, halogen-free flame retardance; light colorable, outstanding flame-retardant properties, high tracking resistance, resistant to soldering temperatures.

# Nomenclature

## Structure

The name of Ultramid® commercial products generally follows the scheme below:



## Subnames

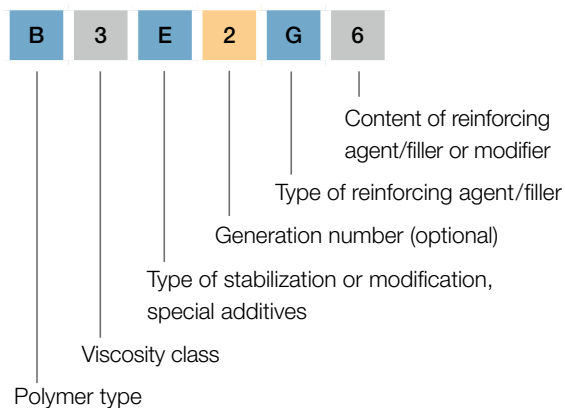
Subnames are optionally used in order to particularly emphasize a product feature that is characteristic of part of a range.

### Examples of subnames:

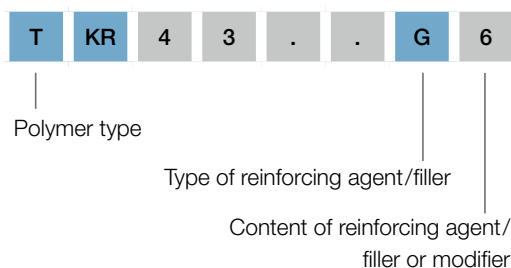
Endure	Particularly good long-term stabilization against hot air
Structure	Particularly good notched impact strength at low temperatures, and without any disadvantages for the stiffness and strength

## Technical ID

The technical ID is made up of a series of letters and numbers which give hints about the polymer type, the melt viscosity, the stabilization, modification or special additives and the content of reinforcing agents, fillers or modifiers. The following classification scheme is found with most products:



Ultramid® T generally has the following classification scheme:



### Letters for identifying polymer types

A	Polyamide 66
B	Polyamide 6
C	Copolyamide 66/6
D	Special polymer
S	Polyamide 610
T	Polyamide 6T/6

### Numbers for identifying viscosity classes

3	Free-flowing, low melt viscosity, mainly for injection-molding
35	Low to medium viscosity
4	Medium viscosity



**Letters for identifying stabilization**

- E, K Stabilized, light natural color, enhanced resistance to heat aging, weather and hot water, electrical properties remain unaffected
- H Stabilized, enhanced resistance to heat aging, hot water and weather, only for engineering parts, electrical properties remain unaffected, depending on the grade light-beige to brown natural color
- W Stabilized, high resistance to heat aging, can only be supplied uncolored and in black, less suitable if high demands are made on the electrical properties of the parts

**Letters for identifying special additives**

- F Functional additive
- L Impact-modified and stabilized, impact resistant when dry, easy flowing, for rapid processing
- S For rapid processing, very fine crystalline structure, for injection-molding
- U With flame-retardant finish without red phosphorus
- X With red phosphorus as the flame-retardant finish
- Z Impact-modified and stabilized with very high low-temperature impact strength (unreinforced grades) or enhanced impact strength (reinforced grades)

**Letters for identifying reinforcing agents/fillers**

- C Carbon fibers
- G Glass fibers
- K Glass beads
- M Minerals
- GM Glass fibers in combination with minerals
- GK Glass fibers in combination with glass beads

**Key numbers for describing the content of reinforcing agents/fillers or modifiers**

- 2 approx. 10% by mass
- 3 approx. 15% by mass
- 4 approx. 20% by mass
- 5 approx. 25% by mass
- 6 approx. 30% by mass
- 7 approx. 35% by mass
- 8 approx. 40% by mass
- 10 approx. 50% by mass

In the case of combinations of glass fibers with minerals or glass beads, the respective contents are indicated by two numbers, e. g.

GM53 approx. 25% by mass of glass fibers and approx. 15% by mass of minerals

GK24 approx. 10% by mass of glass fibers and approx. 20% by mass of glass beads

M602 represents approx. 30% by mass of a special silicate (increased stiffness).

## Suffixes

Suffixes are optionally used in order to indicate specific processing or application-related properties. They are frequently acronyms whose letters are derived from the English term.

### Examples of suffixes:

Aqua®	Meets specific regulatory requirements for drinking water applications
Balance	Based at least partly on renewable raw materials
CR	Crash Resistant
EQ	Electronic Quality
FC	Food Contact; meets specific regulatory requirements for applications in contact with food
GIT	Gas Injection Technology
GP	General Purpose
High Speed	High flowability of the melt
HP	High Productivity
HR	Hydrolysis Resistant, increased hydrolysis resistance
HRX	New generation of HR products
LDS	Laser Direct Structuring, for preparing the electroplating of electrical conductor tracks
LF	Long Fiber Reinforced
LS	Laser Sensitive, can be marked with Nd:YAG laser
LT	Laser Transparent, can be penetrated well with Nd:YAG lasers and lasers of a similar wavelength
SF	Structural Foaming
SI	Surface Improved, for parts with improved surface quality
ST	Super Tough
WIT	Water Injection Technology

## Color

The color is generally made up of a color name and a color number.

### Examples of color names:

Uncolored  
Black 00464  
Black 00564  
Black 20560

---

# For your notes

---

## Selected Product Literature for Ultramid®:

- Ultramid® – Product Brochure
- Ultramid® – Product Range
- Ultramid®, Ultradur® and Ultraform® – Resistance to Chemicals

### Note

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed. (May 2016)

### Please visit our websites:

[www.plasticsportal.com](http://www.plasticsportal.com) (World)

[www.plasticsportal.eu](http://www.plasticsportal.eu) (Europe)

### Additional information on specific products:

[www.plasticsportal.eu/name of product](http://www.plasticsportal.eu/name%20of%20product)

e.g. [www.plasticsportal.eu/ultramid](http://www.plasticsportal.eu/ultramid)

### Request of brochures:

PM/K, F204

Fax: +49 621 60-49497

If you have technical questions on the products,  
please contact the Ultra-Infopoint:

