

#### Product Information

Standard injection molding grade for the production of various functional parts.

The products can also be offered as BMBcert™ and/or Ccycled™. Due to the Massbalance approach the product properties do not change

Abbreviated designation according to ISO 1043-1: PBT

#### Product safety

Ultradur® melts are stable at temperatures up to 280°C and do not give rise to hazards due to molecular degradation or the evolution of gases and vapors. Like all thermoplastic polymers, however, Ultradur decomposes on exposure to excessive thermal stresses, e.g. when it is overheated or as a result of cleaning by burning off. At temperatures of > 290 °C can be emitted: carbon monoxide, tetrahydrofuran.

Under special fire conditions traces of other toxic substances are possible. Formation of further decomposition and oxidation products depends upon the fire conditions.

When Ultradur® is properly processed and there is adequate suction at the die no risks to health are to be expected. Further safety information see safety data sheet of individual product.

Safety data sheet could be ask for at the Ultra-Infopoint under tel: 0621/60-78780.

#### Physical form and storage

Standard packaging includes the 25-kg-bag, the 1000 kg octabin (octagonal container) or the 1000 kg big bag. Other forms of packaging are possible subject to agreement. All containers are tightly sealed and should be opened only immediately prior to processing. Further precautions for preliminary treatment and drying are described in the processing section of the brochure. The bulk density is about 0,7 to 0,8g/cm<sup>3</sup>.

Ultradur® can be stored for a longer period of time in dry, well vented rooms without causing problems in processing.

Ultradur® should generally have a moisture content of less than 0,04% when being processed.

In order to ensure reliable production, therefore, pre-drying should generally be the rule and the machine should be loaded via a closed conveyor system. Appropriate equipment is commercially available. Pre-drying is also for the addition of batches, e.g. in the case of inhouse pigmentation.

In order to prevent the formation of condensed water, containers stored in unheated rooms must only be opened when they have attained the temperature prevailing in the processing area. This can possibly take a very long time.

Measurements have shown that the interior of a 25-kg bag originally at 5°C had reached the temperature of 20°C in the processing area only after 48 hours.

#### 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 their 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. In order to check the availability of products please contact us or our sales agency.

| Typical values for uncoloured product at 23 °C <sup>1)</sup>         | Test method         | Unit                   | Values <sup>2)</sup> |
|----------------------------------------------------------------------|---------------------|------------------------|----------------------|
| <b>Properties</b>                                                    |                     |                        |                      |
| Polymer abbreviation                                                 | -                   | -                      | <b>PBT</b>           |
| Density                                                              | ISO 1183            | kg/m <sup>3</sup>      | <b>1300</b>          |
| Viscosity number (solution 0,005 g/ml Phenole/1,2 Dichlorbenzol 1:1) | ISO 307, 1157, 1628 | cm <sup>3</sup> /g     | <b>130</b>           |
| natural                                                              | -                   | -                      | <b>+</b>             |
| black                                                                | -                   | -                      | <b>+</b>             |
| Water absorption, equilibrium in water at 23°C                       | similar to ISO 62   | %                      | <b>0.5</b>           |
| Moisture absorption, equilibrium 23°C/50% r.h.                       | similar to ISO 62   | %                      | <b>0.25</b>          |
| <b>Processing</b>                                                    |                     |                        |                      |
| Melt volume-flow rate MVR at 250 °C and 2.16 kg                      | ISO 1133            | cm <sup>3</sup> /10min | <b>20</b>            |
| Melting temperature, DSC                                             | ISO 11357-1/-3      | °C                     | <b>223</b>           |
| Melt temperature, Injection moulding/Extrusion                       | -                   | °C                     | <b>250 - 275</b>     |
| Mould temperature, Injection moulding                                | -                   | °C                     | <b>40 - 70</b>       |
| Molding shrinkage (parallel)                                         | ISO 294-4           | %                      | <b>1.70</b>          |
| Molding shrinkage (normal)                                           | ISO 294-4           | %                      | <b>1.70</b>          |
| <b>Flammability</b>                                                  |                     |                        |                      |
| Burning Behav. at thickness d = 1.5 mm                               | IEC 60695-11-10     | class                  | <b>HB</b>            |
| Burning Behav. at thickness d = 0.75 mm                              | IEC 60695-11-10     | class                  | <b>HB</b>            |
| Automotive materials (thickness d ≥ 1mm) <sup>3)</sup>               | ISO 3795, FMVSS 302 | -                      | <b>+</b>             |
| Flammability by electrical sources of ignition, Method BH, d = 4 mm  | IEC 60707           | class                  | <b>HB</b>            |
| Yellow Card available                                                | UL-94, IEC 60695    | -                      | <b>yes</b>           |
| Yellow Card available                                                | UL-94, IEC 60695    | -                      | <b>yes</b>           |
| Oxygen index                                                         | ISO 4589-1/-2       | %                      | <b>20</b>            |
| Glow Wire Flammability Index, GWFI (Thickness)                       | IEC 60695-2-12      | °C (mm)                | <b>850 (≤ 1.5)</b>   |
| Glow Wire Ignition Temperature, GWIT (Thickness)                     | IEC 60695-2-13      | °C (mm)                | <b>775 (≤ 1.5)</b>   |
| <b>Mechanical properties</b>                                         |                     |                        |                      |
| Tensile modulus                                                      | ISO 527-1/-2        | MPa                    | <b>2400</b>          |
| Yield stress, 50 mm/min                                              | ISO 527-1/-2        | MPa                    | <b>55</b>            |
| Yield strain, 50 mm/min                                              | ISO 527-1/-2        | %                      | <b>3.7</b>           |
| Nominal strain at break, 50 mm/min                                   | ISO 527-1/-2        | %                      | <b>&gt;50</b>        |
| Tensile creep modulus, 1000 h, strain ≤ 0.5%, 23°C                   | ISO 899-1           | MPa                    | <b>1200</b>          |
| Charpy unnotched impact strength (23°C)                              | ISO 179/1eU         | kJ/m <sup>2</sup>      | <b>N</b>             |
| Charpy unnotched impact strength (-30°C)                             | ISO 179/1eU         | kJ/m <sup>2</sup>      | <b>180</b>           |
| Charpy notched impact strength (23°C)                                | ISO 179/1eA         | kJ/m <sup>2</sup>      | <b>5</b>             |
| Charpy notched impact strength (-30°C)                               | ISO 179/1eA         | kJ/m <sup>2</sup>      | <b>3</b>             |
| Flexural modulus                                                     | ISO 178             | MPa                    | <b>2400</b>          |
| Flexural strength                                                    | ISO 178             | MPa                    | <b>85</b>            |
| Ball indentation hardness at 358 N and 30 s                          | ISO 2039-1          | MPa                    | <b>130</b>           |
| Izod notched impact strength ASTM D 256 (23°C)                       | ASTM D 256          | J/m                    | <b>50</b>            |
| <b>Thermal properties</b>                                            |                     |                        |                      |
| HDT A (1.80 MPa)                                                     | ISO 75-1/-2         | °C                     | <b>55</b>            |
| HDT B (0.45 MPa)                                                     | ISO 75-1/-2         | °C                     | <b>165</b>           |
| Max. service temperature (short cycle operation)                     | -                   | °C                     | <b>200</b>           |
| Temperature index at 50% loss of tensile strength after 20000 h      | IEC 60216           | °C                     | <b>135</b>           |
| Temperature index at 50% loss of tensile strength after 5000 h       | IEC 60216           | °C                     | <b>145</b>           |
| Coefficient of linear thermal expansion, longitudinal (23-55)°C      | ISO 11359-1/-2      | E-6/K                  | <b>115</b>           |
| Coefficient of linear thermal expansion, transverse (23-55)°C        | ISO 11359-1/-2      | E-6/K                  | <b>115</b>           |
| Thermal conductivity                                                 | DIN 52612-1         | W/(m K)                | <b>0.27</b>          |
| Specific heat capacity                                               | -                   | J/(kg*K)               | <b>1250</b>          |

### Footnotes

1) If product name or properties don't state otherwise.

2) The asterisk symbol "\*" signifies inapplicable properties.

3) + = passed

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|--------------------------------------------------------------|---------------|-------|----------------------|
| <b>Electrical properties</b>                                 |               |       |                      |
| Relative permittivity (100 Hz)                               | IEC 62631-2-1 | -     | <b>3.4</b>           |
| Relative permittivity (1 MHz)                                | IEC 62631-2-1 | -     | <b>3.3</b>           |
| Dissipation factor (100 Hz)                                  | IEC 62631-2-1 | E-4   | <b>20</b>            |
| Dissipation factor (1 MHz)                                   | IEC 62631-2-1 | E-4   | <b>200</b>           |
| Volume resistivity                                           | IEC 62631-3-1 | Ohm*m | <b>1E14</b>          |
| Surface resistivity                                          | IEC 62631-3-2 | Ohm   | <b>1E13</b>          |
| Comparative tracking index, CTI, test liquid A               | IEC 60112     | -     | <b>550</b>           |
| Comparative tracking index, CTI M, test liquid B             | IEC 60112     | -     | <b>450</b>           |
| Electric strength K20/K20, (60*60*1 mm <sup>3</sup> )        | IEC 60243-1   | kV/mm | <b>36</b>            |

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