**Physical properties (indicative values *)**

**PROPERTIES**

- **Density**
  - ISO 1183-1  g/cm³  0.935
  - Average mass (average molecular weight) (1) 1.03 g/mol 5

- **Water absorption:**
  - after 24 h in water with 23 °C (2)  ISO 62  %  < 0.1
  - at saturation in water at 23 °C  %  < 0.1

**Thermal Properties (3)**

- Melting temperature (DSC, 10 °C/min) ISO 11357-1/-3 °C 135

- Thermal conductivity at 23 °C - W/(K.m) 0.40

- Coefficient of linear thermal expansion:
  - average value between 23 and 100 °C  m/(m.K) 200 x 10-6

- Temperature of deflection under load:
  - method A: 1.8 MPa ISO 75-1/-2 °C 42

- Max. allowable service temperature in air: continuously for min. 20,000 h (4) °C 80

- Min. service temperature (5) °C 150

- Flammability (6):
  - according to UL 94 (3 mm thickness) - HB

**Mechanical Properties at 23 °C (7)**

- Tensile test (9):
  - tensile strength 527.1/-2  MPa 20
  - tensile strain at yield(9) 527.1/-2  % 15
  - tensile strain at break (9) 527.1/-2  % > 50
  - tensile modulus of elasticity (10) 527.1/-2  MPa 790

- Compression test (11):
  - compressive stress at 1 / 2 / 5 % nominal strain (10) ISO 604 MPa 7 / 11 / 17.5

- Flexural test (12):
  - flexural strength ISO 178 MPa 18
  - flexural modulus of elasticity ISO 178 MPa 18

- Charpy impact strength - notched (13) ISO 179-1/-A  kJ/m² no break

- Charpy impact strength - notched (double 14°)- (14) ISO 1143-2/-2  kJ/m² 140

- Shore hardness D (15) ISO 868 - 61

- Relative volume loss during a wear test in "sand/water-slurry" : TIVAR®1000 - 0.1 %

- Charpy impact strength - notched (disk" ISO 15527 - 105

- Dynamic Coefficient of Friction (1)

- Wear rate ISO 7148-2 (16) 0.15-0.30

- Electric Properties at 23 °C

- Electrical strength (17) IEC 60243-1  kV/mm

- Volume resistivity

- Surface resistivity ANSI/ESD STM 11.11 Ohm.cm 10E8

- Relative permittivity ε

- Dielectric dissipation factor tan δ - 1 MHz IEC 60265 -

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**Note:** 1 g/cm³ = 1000 kg/m³; 1 MPa = 1 N/mm²; 1 kV/mm = 1 MV/m.

**TIVAR®** is a registered trademark of Mitsubishi Chemical Advanced Materials.

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By incorporating an effective carbon black grade, TIVAR® 1000 antistatic offers the electrostatic dissipative properties often required for PE-UHMW components operating at high speeds and conveying rates, maintaining the inherent key characteristics of PE-UHMW.

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**Legend:**

1. This is the average molar mass of the PE-UHMW resin (irrespective of any additives) used for the manufacture of this material. It is calculated by means of the Markörs-equation

2. According to method 1 of ISO 62 and done on discs Ø 50 mm x 3 mm.

3. The figures given for these properties are for the most part derived from raw material supplier data and other publications.

4. Temperature resistance over a period of min. 20,000 hours. After this period of time, there is a decrease in tensile strength – measured at 23 °C – of about 50 % as compared with the original value. The temperature value given here is thus based on the thermal-oxidative degradation which takes place and causes a reduction in properties. Note, however, that the maximum allowable service temperature depends in many cases essentially on the duration and the magnitude of the mechanical stresses to which the material is subjected.

5. Impact strength decreases with decreasing temperature, the minimum allowable service temperature is practically mainly determined by the extent to which the material is subjected to impact. The value given here is based on unfavourable impact conditions and may consequently not be considered as being the absolute practical limit.

6. These estimated ratings, derived from raw material supplier data and other publications, are not intended to reflect hazards presented by the material under actual fire conditions. There is no 'UL File Number' available for these stock shapes.

7. Most of the figures given for these mechanical properties of the materials are average values of tests run on dry test specimens machined either out of plate 15-20 mm thick or rod diameter 40-50mm, the test specimens were then taken from the stock shape with their length in a longitudinal direction (parallel to the extrusion direction).

8. Test specimens: Type 1 B

9. Test speed: either 5 or 50 mm/min (chosen acc. to ISO 10350-1 as a function of the ductile behaviour of the material (tough or brittle)

10. Test speed: 1 mm/min.

11. Test specimens: cylinder Ø x 8 mm x 16 mm

12. Test specimens: bars 4 mm (thickness) x 10 mm x 80 mm; test speed 2 mm/min ; span: 64 mm

13. Pendulum: used 4 J

14. Pendulum used 5J

15. Measured on 10 mm thick test specimens.

16. Test procedure similar to Test Method A: "Pin-on-disk" as described in ISO 7148-2. Load (MPa, sliding velocity 0.33 m/s, mating plate steel Ra= 0.7-0.9 µm, tested at 22 °C, 50%RH.

17. Electrode configuration: Ø 25 mm / Ø 75 mm coaxial cylinders; in transformer oil according to IEC 60296: 1 mm thick test specimens.

This table is a valuable help in the choice of a material. The data listed here fall within the normal range of product properties of dry material. However, they are not guaranteed and they should not be used to establish material specification limits nor used alone as the basis of design.

It has to be noted that reinforced and filled material shows an unfavourable impact conditions and may consequently not be considered as being the absolute practical limit.

*These properties are based on all the information obtained during the research. They may vary depending on the specific application and conditions.

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**Mitsubishi Chemical Advanced Materials**

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**PRODUCT DATA SHEET**

Ultra High Molecular Weight Polyethylene

**TIVAR® 1000 antistatic**

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