

# Polyethylene (HD-PE & UHMW-PE)

## Technical Datasheet



**Tough, Chemical Resistant, Engineering Plastics**

Service. Quality. Value.

### Typical Applications

#### High density PE – (HDPE)

For - transport containers, pump and valve parts, tank construction, components with medical applications, gaskets, slide profiles, components for the food industry.

#### Ultra-high-molecular-weight PE –(UHMW-PE)

For - pump & valve parts, gaskets, glide profiles, parts for the food industry.

### Product Description

High-quality general purpose engineering plastic materials; the chemical name is polyethylene. It's available in a range of grades and forms to suit many applications.

### Technical Description

Smiths' range of extruded polyethylene includes the following grade options –

| Grade   | Modification   | Purpose   |
|---|--|---|
| High density PE (HD-PE or 300 grade)                    | None. Colours, natural black. Some sizes available in red or yellow. | Component identification. Black will have better UV resistance. |
| Ultra-high-molecular-weight PE. (UHMW-PE or 1000 grade) | None. Colours natural black, green.                                  | Component identification. Black will have better UV resistance. |

### Machinability

The machining of polyethylene is uncomplicated provided the component tolerances allow for polyethylene's relatively high co-efficient of thermal expansion and tensile elongation values. Full machining instructions can be supplied on request.

### Chemical Resistance

HD-PE has extremely good resistance to aqueous solutions of acids, alkalis and salts. Also alcohol and many solvents. Slight swelling may be caused by permanent contact with grease, oil and wax, but generally not enough to limit the use of the material. Aromatics and halogenated hydrocarbons will cause a reduction in useful working life. The material has no resistance to strong oxidising agents such as nitric or chromic acids, and halogens. The UHMWPE grade has even better chemical resistance; strong oxidising agents only cause surface swelling.

### Physiological Safety

The FDA (US Food & Drug Administration) has approved the raw materials used for both the HD-PE and UHMWPE grades to allow their use in contact with food – check for any specific limitations required by the FDA.

### Product Attributes

Range of grades available.

Able to resist very high impact loads

Excellent chemical resistance

Natural product may be used in contact with foodstuffs (subject to appropriate limits)

HDPE may be hot air welded.

UHMWPE is resistant to extreme abrasion

Low density - compared with other engineering plastics

Minimal absorption of moisture

Diameter (HD-PE)

Product sourced from longstanding manufacturer with ISO accreditation

### Customer Benefits

Correct grade selection for each application is optimised

Very good all-round product for diverse engineering applications

Low cost assembly.

Long wear life.

Easy handling, low inertia, saving energy

Aids dimensional stability

Huge components are possible.

Consistent quality ensures uniform machining & performance

### Product Availability \*

Extruded round bar  
HD-PE

10mm to 700mm dia in black (to 500mm dia in natural) ≤ 2m lengths.

UHMW-PE

20mm to 200mm in natural, black and green. ≤ 2m lengths. From 30mm o/d x 15mm i/d to 200mm o/d x 120mm i/d in 2m lengths.

Hollow round bar in  
HD-PE (black colour)

Square & rectangular hollow tubes, angles, channels and welding rod. Also hinges and handles for tank fabrication. All in black colour.

\* Sizes not stocked are available on relatively short delivery time. 1, 2 or 3m lengths supplied or cut to customer requirements.

High Density PE    Ultra-high molecular weight PE

| Mechanical Properties  |                    |                    |                                   |  |
|--|--------------------|--------------------|-----------------------------------|--|
| Density at 20°C  | 0.95               | 0.93               | g/cm <sup>3</sup>                 |  |
| Tensile strength @ yield   | 27                 | 17                 | MPa                               |  |
| @ break  | 35                 | 40                 | MPa                               |  |
| Elongation @ yield   | 9                  | ≥ 20               | %                                 |  |
| @ break  | ≥ 700              | ≥ 50               | %                                 |  |
| Tensile modulus of elasticity  | 1150               | 600                | MPa                               |  |
| Flexural strength  | 22                 | 27                 | MPa                               |  |
| Impact strength  | No break           | No break           | kJ/m <sup>2</sup>                 |  |
| Notched impact strength  | 29                 | No break           | kJ/m <sup>2</sup>                 |  |
| Ball indentation hardness / Rockwell Hardness (Shore D)                    | -                  | 35                 | N/mm <sup>2</sup>                 |  |
|  | 64                 | 51                 | -                                 |  |
| Electrical Properties  |                    |                    |                                   |  |
| Volume resistivity   | ≥ 10 <sup>15</sup> | ≤ 10 <sup>14</sup> | Ohm cm                            |  |
| Surface resistivity  | ≥ 10 <sup>16</sup> | ≤ 10 <sup>12</sup> | Ohm                               |  |
| Dielectric constant @ 1 MHz  | 2.35               | 3.0                | -                                 |  |
| Dielectric loss factor @ 1 MHz   | 0.0003             | 0.0001             | -                                 |  |
| Dielectric strength  | 17                 | 45                 | Kv/mm                             |  |
| Tracking resistance - IEC 60112  | -                  | KB ≥ 600           | V                                 |  |
| Thermal Properties   |                    |                    |                                   |  |
| Vicat softening point -VST/B/50  | 80                 | 80                 | °C                                |  |
| -VST/A/50  | 129                | -                  | °C                                |  |
| Heat deflection temperature -HDT/B   | 69                 | 65                 | °C                                |  |
| -HDT/A   | -                  | 42                 | °C                                |  |
| Coefficient thermal expansion  | 1.50               | 2.0                | 10 <sup>-4</sup> .K <sup>-1</sup> |  |
| Thermal conductivity at 20°C   | 0.42               | 0.42               | W/(m - K)                         |  |
| Service temperatures - upper limit   | 90                 | 90                 | °C                                |  |
| without high mech. load - lower limit                                      | -50                | -150               | °C                                |  |
| Other Physical Properties  |                    |                    |                                   |  |
| Moisture absorption - ISO 62   | 0.01               | 0.001              | %                                 |  |
| Suitability for bonding  | +                  | -                  | -                                 |  |
| Physiological indifference according to FDA or EEC 90/128 - natural colour | +                  | -                  | -                                 |  |
| Friction coefficient   | 0.30               | 0.25               | DIN 53375                         |  |
| Flammability according to UL94   | HB                 | HB                 | UL94                              |  |
| UV stability without additives   | 0                  | -                  | -                                 |  |

### Technical Assistance

Our knowledgeable staff backed up by our resident team of qualified metallurgists and engineers, will be pleased to assist further on any technical topic.

| UK Service Centres: |               | Quality & Testing:   |  |
|---------------------|---------------|--|--|
| Smiths Belfast      | 02895 908 897 | Smiths Leeds   | 0113 307 5167  |
| Smiths Biggleswade  | 01767 604 704 | Smiths Manchester  | 0161 794 8650  |
| Smiths Birmingham   | 0121 728 4940 | Smiths Norwich   | 01603 789 878  |
| Smiths Bristol      | 0117 971 2800 | Smiths Nottingham  | 0115 925 4801  |
| Smiths Chelmsford   | 01245 466 664 | Smiths Redruth   | 01209 315 512  |
| Smiths Gateshead    | 0191 469 5428 | Smiths Verwood   | 01202 824 347  |
| Smiths Horsham      | 01403 261 981 | Main Office  | 0845 527 3331  |
|                     |               |  |  |
|                     |               | <a href="http://www.smithmetal.com">www.smithmetal.com</a> | <a href="mailto:info@smithmetal.com">info@smithmetal.com</a> |

All information in our data sheet is based on approximate testing and is stated to the best of our knowledge and belief. It is presented apart from contractual obligations and does not constitute any guarantee of properties or of processing or application possibilities in individual cases. Our warranties and liabilities are stated exclusively in our terms of trading.