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What is PE-HD EN

PE-HD / PE 300

PE-HD / PE 300 (high-density polyethylene) – semi-crystalline standard thermoplastic, chemically resistant, tough and light

PE-HD (high-density polyethylene, also called PE 300 or HDPE) is a semi-crystalline thermoplastic from the family of polyolefins. It combines a very broad chemical resistance with high toughness – even at low temperatures – low weight, very low moisture absorption and good sliding properties. PE-HD is also physiologically inert, suitable for food contact and one of the most economical engineering plastics.

Classification and basic character

PE-HD belongs to the polyolefins – thermoplastics with a pure hydrocarbon chain. The high density (around 0.95 g/cm³, yet lighter than water) gives a denser molecular packing than the softer PE-LD and therefore more strength, stiffness and hardness. PE-HD is tough, impact-resistant and slides well, yet is comparatively soft (Shore D 62) and yielding. It absorbs virtually no moisture and is chemically resistant across a very wide range.

Chemical resistance and toughness

The outstanding feature of PE-HD is its exceptionally broad chemical resistance: it withstands acids, alkalis, salt solutions and many solvents at room temperature and is virtually insoluble in water. Added to this is a high toughness and impact strength that is retained even at low temperatures down to about -50 °C. This makes PE-HD a preferred material for tanks, linings and components in contact with aggressive media as well as for impact-resistant low-temperature applications.

How PE-HD is made and processed

PE-HD is produced by low-pressure polymerisation of ethylene. For engineering parts it is extruded or press-sintered into semi-finished stock such as plates, round bars and pipes. From these we machine components – turning, milling, drilling and sawing are easy and clean. PE-HD can also be welded very well (hot-plate, hot-gas and extrusion welding), which favours tank and apparatus construction. Because of the high thermal expansion and softness, however, tight tolerances are only achievable to a limited extent.

Mechanical, thermal and electrical properties

PE-HD reaches a yield stress of about 25 MPa with a tensile modulus around 1,000 MPa and a density of about 0.95 g/cm³ – it is softer and more yielding than PET, POM or PA, but very tough (notched impact strength around 20 kJ/m²). The service temperature ranges from about -50 °C up to a continuous +80 °C, short-term to around 100 °C. Electrically, PE-HD is an excellent insulator with very high resistivity. The high coefficient of linear thermal expansion (150–230 · 10^{-6}/K) and the tendency to creep must be considered in the design.

When PE-HD is the right choice

PE-HD is worthwhile whenever chemical resistance, toughness and low weight are required at low cost – for example:

- Tanks, linings and components in contact with aggressive media
- Sliding and wear parts such as guides, wear strips and chain guides
- Components for food processing (FDA-compliant, cutting boards)
- Impact-resistant applications down to about -50 °C
- Light, corrosion-free components in water and apparatus construction

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When PE-HD is NOT the right choice

Equally important are the limits of the material:

- Precision parts with tight tolerances – high thermal expansion, creep tendency and softness; use PET or POM instead
- High mechanical load or stiffness requirements – low modulus and low strength
- Continuous service above about 80 °C – then PA, PVDF or PEEK
- Components with fire-safety requirements – PE-HD only reaches UL 94 HB
- Bonding – PE-HD is difficult to glue without elaborate pretreatment (welding preferred)

What does PE-HD cost?

PE-HD is one of the most economical engineering plastics and is priced considerably below POM, PET, PA and high-performance plastics. As a rough guide, semi-finished stock prices are in the range of about 3–8 €/kg. The component price is determined mainly by the semi-finished shape and dimension, material utilisation (offcut), machining effort and lot size. We are happy to quote binding prices on request based on your drawing.

Machining at Liedtke

PE-HD machines easily and cleanly – turning, milling, drilling and sawing are effortless. Because of its softness and high thermal expansion, we use sharp tools and adapted cutting parameters, ensure good cooling and account for spring-back and dimensional changes at tighter tolerances. This is how we reliably produce tank, sliding and wear parts – from single pieces to series production; welded assemblies on request.

Advantages and disadvantages at a glance

An honest assessment – and how the disadvantages can be mitigated in practice:

Advantages

- Very broad chemical resistance
- High toughness and impact strength, even in the cold (down to -50 °C)
- Very low moisture absorption, good sliding properties
- Suitable for food contact, physiologically inert
- Light, easily weldable and very economical

Disadvantages

- Soft and yielding – low strength and stiffness
- High thermal expansion and creep tendency – limited dimensional stability
- Continuous service limited to about 80 °C
- Only UL 94 HB, hard to glue without pretreatment, natural grade not UV-resistant

Practical tip: PE-HD plays to its strengths wherever chemical resistance, toughness and low cost matter – for example in tanks, linings and sliding parts. Where high stiffness and dimensional stability are required, we recommend PET or POM; for higher temperatures PA, PVDF or PEEK. For permanent outdoor use, a black, UV-stabilised grade is preferable.

Typical Properties

- Very broad chemical resistance
- High toughness and impact strength (down to -50 °C)
- Very low moisture absorption
- Good sliding and wear properties
- Suitable for food contact
- Easily weldable
- Light (density 0.95 g/cm³)
- Electrically insulating

Product Examples

- Tanks, containers and linings
- Guides, wear strips and chain guides
- Cutting boards and food processing components
- Pipes, fittings and apparatus components
- Impact-resistant functional parts
- Light, corrosion-free structural parts

Typical Industries

- Mechanical and plant engineering
- Chemical plant engineering
- Food industry
- Water and environmental technology
- Conveyor technology & automation
- Tank and apparatus construction

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	Test Method	Unit	Value
General Properties			
Density	DIN EN ISO 1183-1	g / cm³	0.95
Moisture absorption	DIN EN ISO 62	%	<0.01
Flammability (thickness 3 mm / 6 mm)	UL 94		HB
Mechanical Properties			
Yield stress	DIN EN ISO 527	MPa	25
Elongation at break	DIN EN ISO 527	%	>50
Tensile modulus	DIN EN ISO 527	MPa	1000
Notched impact strength	DIN EN ISO 179	kJ / m²	20
Shore hardness	DIN EN ISO 868	scale D	62
Thermal Properties			
Melting temperature	ISO 11357-3	°C	131
Coefficient of linear thermal expansion	DIN 53752	10^{-6} / K	150 ... 230
Service temperature, long-term	Average	°C	-50 ... 80
Service temperature, short-term (max.)	Average	°C	100
Vicat softening temperature	DIN EN ISO 306, Vicat B	°C	67
Electrical Properties			
Volume resistivity	DIN EN 62631-3-1	Ω * cm	$>10^{14}$
Surface resistivity	DIN EN 62631-3-2	Ω	$>10^{14}$
Dielectric strength	IEC 60243	kV / mm	>40

The values stated are typical average values for PE-HD natural; they serve as an aid to material selection and are not a legally binding warranty of specific properties. PE-HD is resistant to a very wide range of chemicals; media resistance must be verified case by case at elevated temperatures and with oxidising media. Natural-coloured PE-HD has only limited UV resistance without stabilisation – a black grade is preferable for permanent outdoor use. Price information is a rough, non-binding guide and may vary depending on market situation, grade, dimension and quantity.

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