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What is Nylon

Nylon (PA 66)

Nylon – generic name for polyamide 66 (PA 66), semi-crystalline engineering thermoplastic

"Nylon" is the name introduced by DuPont in 1938 for the world's first fully synthetic polyamide fibre – chemically polyamide 66 (PA 66). Unlike other brand names, DuPont deliberately never trademarked "Nylon", using it from the outset as a generic category term. Today Nylon internationally refers mainly to PA 66, but is also colloquially used as an umbrella term for polyamides in general.

Classification and basic character

Nylon (PA 66) is a semi-crystalline engineering thermoplastic from the polyamide family, chemically closely related to PA 6 but built from two different monomers (hexamethylenediamine and adipic acid instead of caprolactam). This more symmetric chain structure gives PA 66 higher crystallinity than PA 6, a noticeably higher melting temperature, and greater stiffness and heat deflection temperature.

History: why "Nylon" was never a trademark

PA 66 was invented in 1935 by Wallace Carothers at DuPont and marketed from 1938 under the name "Nylon" – initially for toothbrushes, and from 1940 for the famous nylon stockings. DuPont deliberately chose not to trademark the name, in order to establish it as a universal generic term for the new fibre generation. This sets Nylon apart from other plastics brand names such as Ertalon® or Perlon®, which are registered trademarks for specific polyamide semi-finished products or fibres.

How Nylon (PA 66) is manufactured and processed

PA 66 is produced by polycondensation of hexamethylenediamine and adipic acid into long polyamide chains. Extruded semi-finished product (round rods, sheets, tubes) is machined into precision parts. Because of its higher melting temperature compared with PA 6, correspondingly higher process temperatures must be used for hot-gas welding and heat treatment. For dimensionally stable parts we account for moisture absorption and condition the semi-finished product if required.

Nylon (PA 66) versus PA 6 – the difference

PA 66 and PA 6 are similar in many properties but differ in important details: PA 66 melts at around 260 °C, significantly higher than PA 6's approximately 220 °C – a difference of around 40 °C, due to PA 66's more regular, more highly crystalline chain structure. This also gives PA 66 a higher heat deflection temperature (around 100 °C versus approx. 75 °C for PA 6) and somewhat higher stiffness and yield stress. PA 6, in turn, usually scores with somewhat higher impact strength and easier processing.

Mechanical and physical properties

PA 66 achieves (dry) a yield stress of around 85 MPa with a tensile modulus of around 3,400 MPa and a density of about 1.14 g/cm^3. The material is tough and impact-resistant, highly abrasion- and wear-resistant, and has good sliding properties with a low coefficient of friction. As with PA 6, toughness increases further in the conditioned (moist) state, while stiffness decreases.

Chemical and thermal resistance

PA 66 has good resistance to fuels, oils, greases, many solvents and alkalis. The material is not resistant to strong acids, strongly oxidising media, and – over extended periods – to hot water (hydrolysis). The service temperature ranges from about -40 °C to a continuous +100 °C, and up to around 170 °C short-term. PA 66 is a good electrical insulator but is not flame-retardant (UL 94 HB). Physiologically safe grades for food contact are available.

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When Nylon (PA 66) is the right choice

PA 66 is worthwhile when, compared with PA 6, additional stiffness, higher heat deflection temperature, or a higher service temperature are required – for example:

- Highly loaded gears, bushings and plain bearings requiring stiffness
- Components requiring a higher continuous service temperature than PA 6 allows
- Electrical and electronic components requiring heat deflection resistance
- Precision components in vehicle and mechanical engineering
- Components for food processing (food-grade types available)

When Nylon (PA 66) is NOT the right choice

Equally important are the limits of the material:

- Highest impact strength at low temperatures – PA 6 often has the advantage here
- Continuous contact with hot water/steam or strong acids (hydrolysis/attack)
- Flame-retardancy requirements (only UL 94 HB)
- Applications with very high chemical requirements – then PVDF, PPS or PEEK
- Precision parts that must remain permanently and absolutely dry/dimensionally stable

What does Nylon (PA 66) cost?

PA 66 is usually priced somewhat higher than PA 6, as the raw material and processing are slightly more involved. The component price is determined mainly by grade, shape and dimensions of the semi-finished product, material utilisation (offcuts), machining effort and batch size. We are happy to provide binding prices on request based on your drawing.

Machining at Liedtke

PA 66 machines well – turning, milling, drilling and sawing produce clean results with good surface finish. Because of moisture absorption and comparatively high thermal expansion, we account for swelling and shrinkage behaviour at tight tolerances and condition the semi-finished product if required. This allows us to reliably manufacture precision parts, from single items to series production.

Advantages and disadvantages at a glance

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

Advantages

- Higher stiffness and heat deflection temperature than PA 6
- Higher continuous service temperature (up to approx. 100 °C)
- High abrasion and wear resistance
- Good sliding and damping properties
- Machines and welds well

Disadvantages

- Absorbs moisture – dimensional and property changes
- Somewhat lower impact strength than PA 6
- Not resistant to strong acids and hot water (hydrolysis)
- Not flame-retardant (UL 94 HB)
- Somewhat higher price than PA 6

Practical tip: where maximum impact strength or the lowest price is required, we choose PA 6; where higher stiffness, heat deflection temperature or service temperature matter, PA 66 (Nylon) is the better choice.

Typical Properties

- Good toughness
- High mechanical strength and stiffness
- High abrasion resistance

Product Examples

- Gears, pinions and sprockets
- Plain bearings and bushings
- Electrical insulating components

Typical Industries

- Vehicle construction
- Mechanical and plant engineering
- Conveying technology & automation
- Electrical engineering and electronics

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- Good sliding properties
- Higher heat deflection temperature than PA 6
- Good machinability and weldability
- Good electrical insulating properties
- Food-grade types available
- Precision components in vehicle construction
- Guide and wear parts
- Components for food processing
- Aerospace
- Food industry
- Agriculture & commercial vehicles

	Test Method	Unit	Value
Mechanical			
Yield stress	DIN EN ISO 527	MPa	85
Elongation at break	DIN EN ISO 527	%	50
Tensile modulus	DIN EN ISO 527	MPa	3400
Shore hardness	DIN EN ISO 868	scale D	83
Thermal			
Melting temperature	ISO 11357-3	°C	260
Service temperature	Average	°C	-40 ... 100
Heat deflection temperature	DIN EN ISO 75	°C	100
General			
Density	DIN EN ISO 1183-1	g / cm³	1.14
Moisture absorption	DIN EN ISO 62	%	2.5
Flammability	UL 94		HB

Nylon is the term originally coined by DuPont that has since become the generic name for polyamide 66 (PA 66); the name was never trademarked. The values stated are typical averages, researched from common industry manufacturer data, and serve as an aid to material selection; they do not constitute a legally binding guarantee of specific properties. Moisture absorption changes the mechanical properties of polyamides; the values given apply to dry to conditioned material. Actual property values may vary somewhat depending on manufacturer and semi-finished product form.

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