DATA SHEET
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4MG.001
Aramid Fibre

Summary

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Overview

The word 'aramid' is a contraction of 'aromatic polyamide'. The chemical name is para phenylene terephthalamide or PPD-T. Created in the 1960's, aramid fibres consist of yellow filaments of about ten microns in diameter, assembled into threads. There are three main families of polyamides:

- **Para-aramids:** used in many fields with high-tech applications, they are mainly known under the brand name Kevlar®, from DuPont, and are used for their mechanical properties.

- **Para-aramid copolymers:** derived from para-aramids, these are also used for their excellent mechanical properties.

- **Meta-aramids:** these are mainly recognised for their thermal and chemical characteristics and are known under the brand name Nomex® from DuPont. They are mainly used in the fields of technical textiles and protective clothing.

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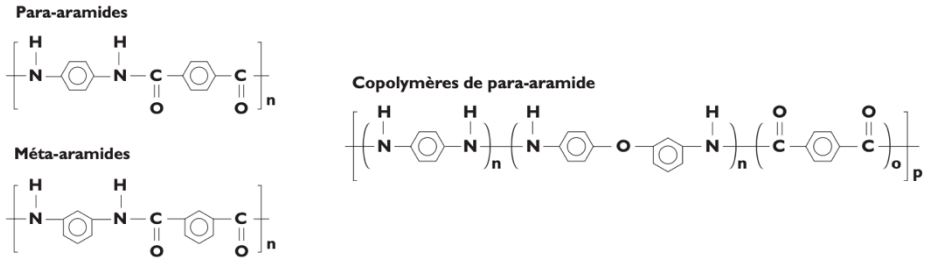
Manufacturing:

Paraphenylenediamine is reacted with terephthalyl chloride in an organic solvent to obtain PPD-T. The polymer obtained is dissolved in sulphuric acid. The polymer is then partially oriented into a liquid crystal form. This polymer is extruded in a die and spun. The filaments are cooled by an air jet. The washing, drying and spooling phases are then carried out. The difference between para-aramid and meta-aramid arises from the place the functional groups have on the aromatic rings.



Source : INRS, 2018

General Characteristics

Traction modulus and resistance:

The aramid fibres have a tensile strength equivalent to that of steel and a traction modulus that can be up to two times higher than that of glass. These properties make it a balanced material with excellent tensile strength.

Compressive strength:

Aramid fibres have poor compression characteristics, which is a probable consequence of their poor adhesion to resins.

Flexural strength:

The fibre is elastic under a low load and plastic under a heavy load, demonstrating a degree of similarity with metals.

Elongation at break:

Depending on the type of fibre, it is 1.9 % or 4 %, the intermediate between those of glass fibres and carbon.

Resistance to UV:

Aramid fibres are highly sensitive to UV rays (loss of characteristics and discolouration). It is advisable to store aramid fibre materials away from light.

Thermal characteristics:

Aramid fibres have good thermal resistance. The elastic modulus under tension keeps at 300 °C more than 80 % of its value at room temperature. Aramid fibres are used continuously at an average temperature of 200 °C. They have a coefficient of thermal conductivity of around 0.05 $W.m^{-1}.K^{-1}$.

Benefits

- High tensile resistance
- High elastic modulus
- Excellent vibration damping factor
- Low density
- Excellent thermal stability from –70 °C to 200 °C
- Does not sustain combustion, does not melt
- Carbonisation at 425 °C
- Good resistance to fatigue
- Excellent dielectric properties
- Good chemical resistance to fuel and seawater but not strong acids and bases

Comparative Table

	Unit	E-Glass	Steel	Aramid	HT Nylon
Tensile Resistance	**MPa**	3,400	2,600	2,400 to 3,300	990
Traction Modulus*	**GPa**	70	200	45 to 160	5.6
Elongation at Break	**%**	4.5	2	1.9 to 4.5	18
Density	**g/cm³**	2.6	7.8	1.44 to 1.47	1.14
Peak Temperature	**°C**	~ 700	~ 800	~ 300	~ 170

**Young's tensile modulus: the proportionality factor between pressure and deformation, characterising the elasticity of a given material.* //Source: INRS

Applications

- Reinforcement of rubber materials (pneumatic, transport belts, piping, transmission belts)
- Reinforcement of composite materials (sports, aeronautical, naval, protective shielding)
- Reinforcement of cables (rope, telecommunication cables, etc.)
- Protective fire and ballistic clothing
- Friction and sealing (brakes, clutches, seals)

Product range

Our aramid products are primarily made from continuous fibres to achieve the best possible mechanical properties. We offer different aramid textile formats to suit all requirements:

Threads

We offer two ranges of technical-use threads.

Kevlar® threads can continuously withstand 170 °C. Easier to handle than fibreglass threads, they are used in many technical fields:

- Ballistics (bullet-proof vests)
- Safety shoes
- Protective clothing:
  - heat resistant
  - flame resistant
  - cut resistant (gloves, loggers' trousers)
- Composite materials
- Airbags
- Air dust extraction filters (hot gas filtration)
- Tyres (reinforcement)

Property	Unit	Para-aramid Kevlar® Thread			
Item N°		060-0010	060-0020	060-0030	060-0040
Construction		Continuous filaments	Discontinuous filaments		
Titel	tex	135	80	60	40
Rupture Force ISO 2062	N	239.6	102.5	76.7	48.0
Elongation at Break ISO 2062	%	3	4	4	3
Diameter	mm	0.51	0.40	0.30	0.23
Linear Density	m/kg	6,570	11,680	16,130	23,450
Packaging	coil	500 g 3,000 m	250 g 3,000 m	200 g 3,000 m	125 g 3,000 m

Nomex® threads are particularly suitable due to their thermal protection, thanks to their self-extinguishing properties and a continuous application temperature of 220 °C. A highly technical thread, they are used for particularly targeted purposes:

- Heat and flame resistant clothing, textiles and stitching
- Safety shoes
- Protective gloves
- Aircraft seats
- Airbags

Aramid Fibre

Property	Unit	Meta-aramid Nomex® Thread					
Item N°		060-0110	060-0120	060-0130	060-0140	060-0170	060-0180
Construction		Continuous filaments				Discontinuous filaments	
Titel	tex	140	95	70	45	40	25
Rupture Force (ISO 2062)	N	63.3	41.7	31.7	20.7	13.4	7.47
Elongation at Break (ISO 2062)	%	36	36	37	34	27	23
Packaging		Kingspool 147 g 1,000 m	Kingspool 146 g 1,500 m	Kingspool 144 g 2,000 m	Kingspool 148 g 3,000 m	Box 10 cops 462 g 1,000 m	Cone 126 g 5,000 m

A version with mixed filament is available on request.

Tapes

Our tapes are composed of continuous para-aramid fibres, which gives them excellent mechanical and thermal properties. They are mainly used in the glass industry, valued for their homogeneity and the regularity of their weaving, in the manufacture of fire resistant materials and as conveyor belts.

Property	Unit	Aramid Tape					
Item N°		207-1201					
Thickness	mm	2	2	2	3	3	3
Width	mm	25	50	75	25	50	75
Length	m	50	50	50	50	50	50
Operating Temperature	°C	300	300	300	300	300	300
Peak Temperature	°C	400	400	400	400	400	400

Other dimensions are available on request.

Braided Ropes

Their properties are similar to tapes. They are mainly used as seals. In order to offer diversified technical solutions, we have a range of ropes available in round or square sections.

Property	Unit	Aramid Braided Ropes					
Item N°		207-1304					
Section		square					
Diameter	mm	5,5	6	8	9,5	10	15
Length	m	250	150	100	100	100	50
Operating Temperature	°C	350	350	350	350	350	350
Peak Temperature	°C	400	400	400	400	400	400

Aramid Fibre

Property	Unit	Aramid Braided Ropes					
Item N°		207-1303					
Section		round					
Diameter	mm	5	6	8	10	12	15
Length	m	250	250	100	50	50	50
Opearting Temperature	°C	350	350	350	350	350	350
Peak Temperature	°C	400	400	400	400	400	400

Other dimensions are available on request.

Sleeves

Recognised for their resistance to abrasion and their mechanical and thermal characteristics, our sleeves are made with various diameters to suit your requirements. As with our ropes, they are mainly used for thermal sealing, but also in the glass industry and to insulate cables.

Property	Unit	Aramid Sleeves			
Item N°		207-1502			
Diameter	mm	10	20	25	30
Length	m	50	50	50	50
Operating Temperature	°C	350	350	350	350
Peak Temperature	°C	400	400	400	400

Other dimensions are available on request.

Fabrics

Woven in plain weave, 100 % para-aramid fabrics have excellent thermal characteristics. In addition to their good insulating properties, they can reach a peak temperature of 500 °C and a continuous temperature of 350 °C. In addition to this, they have excellent resistance to cuts, abrasion, tearing and acids, as well as excellent mechanical properties. Available in different versions (aluminised, fleece, etc.), they are particularly suitable for the manufacture of protective clothing and thermal insulation.

100% para-aramid (Kevlar®) fabrics always include a cross-twill woven version (two single twills in different directions). Particularly resistant to high temperatures up to 450 °C and cuts, it is mainly used to reinforce protective clothing. Coated versions (silicone, aluminium, flame retardant, etc.) are available.

Property	Unit	Aramid Fibre Fabrics			
Item N°		207-1101	207-1102	122-0030	122-0040
Weave		twill	plain	cross twill	twill
Area Density	g/m²	490	600	300	265
Width	mm	1,000	1,000	1,600	1,600
Thickness	mm	1.75	1.9	0.6	0.5
Length	m	50	50	50	50
Operating Temp.	°C	350	350	350	400
Peak Temp.	°C	425	425	425	600

Packings

Packings are made of a glass-fibre core and of a para-aramid fibre sleeve. The glass-fibre core of the packing improves its thermal and mechanical properties Primarily used as insulation products, they are ideal for industrial furnaces.

Property	Unit	Aramid/Glass Packing
Item N°		207-1401
Diameter	**mm**	30
Length	**m**	50
Operating Temperature (Aramid)	**°C**	350
Peak Temperature (Aramid)	**°C**	400

Autres dimensions disponibles sur demande.

Physical variables included in this documentation are provided by way of indication only and do not, under any circumstances, constitute a contractual undertaking. Please contact our technical service if you require any additional information.