TECHNYL®

Consumer and Industrial Goods

TECHNYL® polyamide range

Rhodia

Polyamide

Contents

Rhodia Po

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Polyamide is one of the most valuable engineering plastics, particularly for applications requiring high mechanical properties, along with chemical and temperature resistance, plus an excellent finish. Polyamide is often the perfect answer for designers seeking weight savings, function integration and design freedom.

Rhodia Polyamide is focused on providing polyamide 6.6 and 6 based compounds to its customers in every market and on every continent. Rhodia's employee's talents, along with its technological and scientific expertise have allowed it to attain its strong position in polyamide through a robust program of new technology introduction and new process development.

Global Customer Support

Rhodia Polyamide offers global coverage for its customers for product development, supply and complete commercial services through direct sales with a dedicated key account manager structure as well as a representation in more than 60 countries, supported by an operational E-business channel (SSOL) and a strong commercial distribution network.

To provide its customers with the quality and product consistency they require, all Rhodia's Engineering Plastics' sites are accredited to the ISO/TS 16949 technical standard.

Rhodia's Engineering Plastics activity continually extends its market reach through an aggressive program of global investments. With its seven engineering plastics state-of-the art production facilities along with ten R&D and technical centres, Rhodia Polyamide covers all major areas for polyamide consumption, with the capability to develop products and technologies locally.

- WORLDWIDE HEADQUARTERS
- REGIONAL HEADQUARTERS
- APPLICATION & TECHNOLOGY DEVELOPMENT CENTERS
- MANUFACTURING PLANTS
- R&D CENTERS

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Customer-driven & Focused on Innovation

Rhodia offers the industry's largest polyamide brand, TECHNYL®, serving markets as varied as Automotive, Electric & Electronics, and Consumer and Industrial Goods. The company continuously strives for innovative solutions developed in close partnership with its customers, from design through production.

The company's innovative approach comes from the understanding of its customers' evolving needs, focusing on functionalities such as weight and size reduction, function integration, safety and comfort, as opposed to focusing on a single product or application.

As far as polymers and grades are concerned, new polyamide materials are regularly developed, resulting in the continuous expansion of the TECHNYL® family through breakthroughs as TECHNYL STAR™, TECHNYL® FORCE, TECHNYL® SI, TECHNYL® XT, TECHNYL® ALLOY and TECHNYL® XCELL. These materials are reaching into an ever wider range of new applications.

Most applications are developed in close collaboration with designers, mould producers and processors. Our technical support teams participate in part design and tool development, contributing with their plastics expertise and their in-depth application knowledge.

Rhodia's Engineering Plastics also drive innovation in other technologies, including the acoustic performance of materials, as well as advanced processing techniques, such as gas or water-assisted injection technology, or Mucell® technology. This enables higher levels of performances and productivity.

Sustainable Development

Last but not least, Rhodia's Engineering Plastics are committed to their role in the value chain of recycling in order to limit the use of natural resources in partnership with their customers. For example, the company offers a range of polymers based on recycled production waste.
Rhodia sustainable development policy is global and is being implemented through clear commitments and action plans. It encompasses three interlinked, equally important spheres: the Health/Safety/Environment sphere; the People sphere, which covers social, societal and ethical issues, and the Economic sphere, where the key objectives are innovation, partnerships, best practices and value creation.

Industrial Goods

Rhodia Polyamide is creating the solutions of tomorrow

Industrial goods manufacturers rely heavily on polyamide compounds due to their good mechanical properties, resistance to temperature and to chemicals, excellent ageing behaviour and easy, economic processing.

Rhodia's Engineering Plastics activity offers innovative products and services for numerous segments in the industrial market, including:

- **Extrusion and Blow-moulding**
- **Fastening devices**
- **Machine components**

From high viscosity to glass fibre reinforced grades, Rhodia's Engineering Plastics expertise provides customers with the best products and technical support for any existing or future application.

Rhodia's Engineering Plastics' product range:

TECHNYL® A	**Polyamide 6.6**
TECHNYL® B	**Copolyamide 6.6/6**
TECHNYL® C	**Polyamide 6**
TECHNYL STAR™	**High Flow Polyamide**
TECHNYL® XT	**High Viscosity Polyamide 6**

Extrusion and Bl

TECHNYL® high viscosity grades are perfectly adapted to the demanding requirements of the extrusion processes.

Productivity and performance

Thanks to an outstanding processing window, the new **TECHNYL® XT** product range is the right alternative to fit extrusion constraints and improve the process productivity.
TECHNYL® XT impact modified range designed for extrusion provides:

- High stability of process
- Constant wall thickness
- Lower extrusion temperature
- Good barrier properties
- FDA approved
- Excellent balance between stiffness and impact resistance
- Weight optimization
- Excellent surface aspect

TECHNYL® XT can be used for applications as varied as bag in can, tanks, corrugated pipes, ...

Performance and heat resistance

Profiles and bars can be used in a wide range of applications such as the low thermal transmission window and door systems where extruded profiles called "strips" are used.

TECHNYL® polyamide fully meets the thermal, mechanical and processing requirements for the production of thermal break strips for window and door systems:

- Easy and consistent processing
- Low thermal conductivity
- Excellent mechanical properties
- Compatible thermal expansion coefficient (similar to aluminum)

The superior heat resistance of TECHNYL® high viscosity grades enables the assembly of thermal break strips for window and door frames even before the high temperature coating or anodization processes, therefore reducing manufacturing cost.

KEY REQUIREMENTS

BAG IN CAN

FDA approved.
Puncture and tear resistance.
Good mechanical properties.
Easy processing.
Flexibility.

KEY REQUIREMENTS

WINDOW INSULATION

Easy processing.
Good mechanical performances.
Colourability.

PROPERTIES	STANDARDS
Water absorption (24 h at 23°C)	ISO 62
Density	ISO 1183-A
Moulding shrinkage parallel	RHODIA-EP
Moulding shrinkage normal or perpendicular	RHODIA-EP
Tensile modulus	ISO 527 type 1 A
Tensile strength at yield	ISO 527 type 1 A
Tensile strain at yield	ISO 527 type 1 A
Tensile strength at break	ISO 527 type 1 A
Tensile strain at break	ISO 527 type 1 A
Flexural modulus	ISO 178
Flexural maximum stress	ISO 178
Charpy notched impact strength	ISO 179/1eA
Charpy unnotched impact strength	ISO 179/1eU
Melting temperature	ISO 11357
Heat deflection temperature, 1,8 Mpa	ISO 75/Af
Coef. of linear thermal expension parallel (23°C to 85°C)	ISO 11359

*d.a.m = dry as moulded / cond. = conditioned according to ISO 1110

KEY REQUIREMENTS

FUEL TANKS

Permeation.
Impact.
Design freedom.
Excellent surface aspect.

o w - m o u l d i n g

KEY REQUIREMENTS

PIPES

Easy processing.
High mechanical properties.
Excellent wear properties.
Good resistance to fatigue.
Electrical insulation.
Colourability.

UNITS	CONDITIONS	HIGH VISCOSITY PA6.6			HIGH VISCOSITY PA6						
		TECHNYL® A 302	TECHNYL® A 402	TECHNYL® A 402 Nat. FA	TECHNYL® C 402	TECHNYL® C 402M	TECHNYL® C 442	TECHNYL® C 502 XT	TECHNYL® C 507 XT	TECHNYL® C 536 XT	TECHNYL® C 52 XT*
PHYSICAL											
%		1.3	1.5	1.5	1.3	1.9	1.15	1.37			
g/cm³		1.14	1.14	1.14	1.14	1.14	1.07	1.13	1.13		1.15
%		1.9	1.9	1.9							
%		1.9	1.9	1.9							
MECHANICAL											
MPa	d.a.m / cond.*	3100 / 1600	3100 / 1300	3100	2800 / 800	1200 / 550	900 / 400	2800/900	2780	2340	3200
MPa	d.a.m / cond.*	85 / 60	80 / 60	80	80 / 40	55 / 35	35 / 30	80 / 35	78	60	80
%	d.a.m / cond.*	7 / 25	8 / 30					4.1 / 25			4
MPa	d.a.m / cond.*	60 / 60	60 / -	60				49 / 55	50	49	52
%	d.a.m / cond.*	55 / 250	60 / 250	60	200 / 300	210 / 300	220 / 270	160 / 300	30	55	45
MPa	d.a.m / cond.*	3000 / 1400	2800 / 1300	2800	2700 / 750	1000 / 530	850 / 380				
MPa	d.a.m / cond.*	120 / 75	120 / 75	120	115 / 35	50 / 30	40 / 20				
kJ/m²	d.a.m / cond.*	6.5 / 25	7 / 30	7	6.5 / NB	18 / NB	NB / NB		5,8	73	5.6
kJ/m²	d.a.m / cond.*	NB / NB		NB	NB / NB	NB / NB	NB / NB	NB / NB	NB		NB
THERMAL											
°C		263	263	263	222	222	222	222	222	222	222
°C		75	75	75	75	65	50		55	56	
E-5 / °C		7	7	7	7	7	7			0	

All technical datasheets are available at www.rhodia-ep.com.
* UL 94 V-2

KEY REQUIREMENTS

FILAMENTS

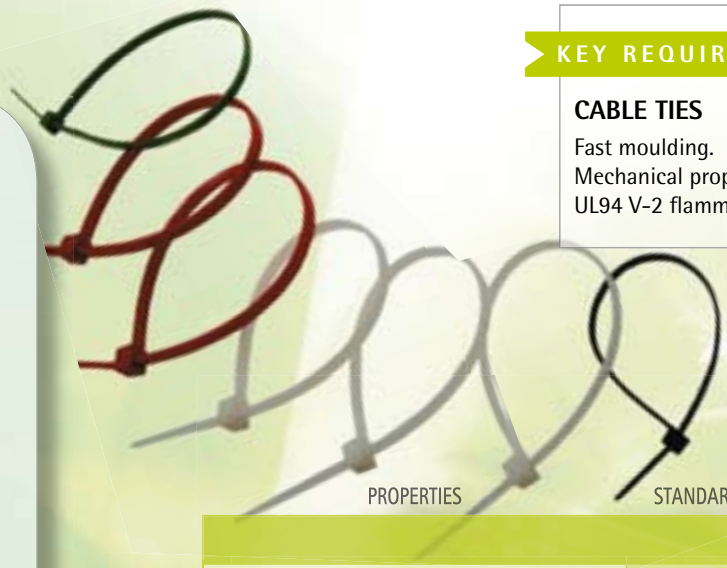
Easy processing.
Good mechanical performances.
Colourability.

KEY REQUIREMENTS

SAUSSAGE CASING

Good barrier to oxygen and aroma.
Easy cooking and heat resistance.
Touch.
Visual (Design and Printability).
Puncture resistance.
Food approved.

Fastening Device



KEY REQUIREMENTS

CABLE TIES

Fast moulding.
Mechanical properties.
UL94 V-2 flammability.

Everyday people experiment and benefit from the strength of TECHNYL® polyamide.

Strength and Durability

The excellent property combination of rigidity and impact resistance of TECHNYL® polyamide places it as a major material for the cable ties, fasteners and staples that play a critical role to fix, tie and bind parts together.

These fastening devices can be found in many automotive applications such as under-the-hood systems or wire, cable and hose binding. Many of the TECHNYL® polyamide grades used for these applications are designed to resist specific assembly processes, as well as at low service temperatures.

Fast cycling

High productivity is a key element for success in these performance-oriented applications and only materials allowing very short cycle times will be retained. TECHNYL® polyamide provides fast injection moulding cycles and allows fastening device manufacturers to minimize their production costs by increasing the process efficiency and reducing waste.

High Perfomance Cables Ties

A fine-tuned high flexibility PA 6.6 range (TECHNYL® A 258 P2 & P1) developped for high cable ties requirements:

- Fast cycling
- High impact resistance at -20°C and at -30°C
- Excellent tensile elongation at break
- Weatherable

PROPERTIES	STANDARDS	UNITS	CONDITIONS	TECHNYL® A 205F
Water absorption (24 h at 23°C)	ISO 62	%		1.2
Density	ISO 1183-A	g/cm³		1.14
Moulding shrinkage parallel	RHODIA-EP	%		1.9
Moulding shrinkage normal or perpendicular	RHODIA-EP	%		1.9
Tensile modulus	ISO 527 type 1 A	MPa	d.a.m / cond.*	3200 / 1600
Tensile strength at yield	ISO 527 type 1 A	MPa	d.a.m / cond.*	85 / 50
Tensile strain at yield	ISO 527 type 1 A	%	d.a.m / cond.*	4 / 10
Tensile strength at break	ISO 527 type 1 A	MPa	d.a.m / cond.*	60 / 40
Tensile strain at break	ISO 527 type 1 A	%	d.a.m / cond.*	25 / 200
Flexural modulus	ISO 178	MPa	d.a.m / cond.*	2900 / 1300
Flexural maximum stress	ISO 178	MPa	d.a.m / cond.*	120 / 50
Charpy notched impact strength	ISO 179/1eA	kJ/m²	d.a.m / cond.*	4.5 / 8
Charpy unnotched impact strength	ISO 179/1eU	kJ/m²	d.a.m / cond.*	NB / NB
Melting temperature	ISO 11357	°C		263
Heat deflection temperature, 1,8 Mpa	ISO 75/Af	°C		75
Coef. of linear thermal expension parallel (23°C to 85°C)	ISO 11359	E-5 / °C		7
Flammability UL94 (thickness 0,4 mm)	ISO 1210 / UL94	-		V-2
Flammability UL94 (thickness 0,8 mm)	ISO 1210 / UL94	-		V-2
Flammability UL94 (thickness 1,6 mm)	ISO 1210 / UL94	-		V-2

*d.a.m = dry as moulded / cond. = conditioned according to ISO 1110 (1) Heat stabilised grade also available

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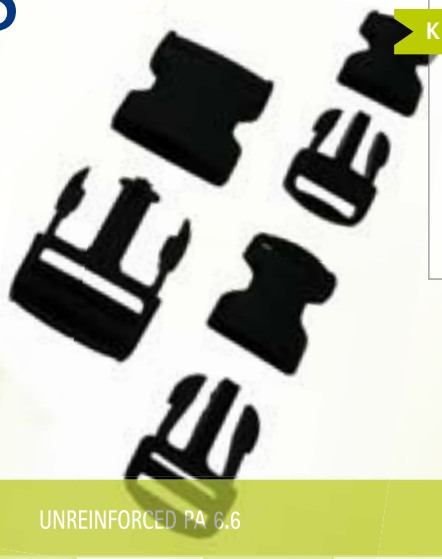

KEY REQUIREMENTS

CLIPS

Fast moulding.
Mechanical properties.
Suitable for low temperatures.
Thermal resistance.
Chemical resistance.

UNREINFORCED PA 6.6				IMPACT MODIFIED PA6.6				IMPACT MODIFIED GLASS FIBRE REINFORCED	IMPACT MODIFIED PA6.6/6	IMPACT MODIFIED PA6
TECHNYL® A 206K	TECHNYL® A 208F	TECHNYL® A 221	TECHNYL® A 225F	TECHNYL® A 258 P2	TECHNYL® A 258 P1	TECHNYL® A 238	TECHNYL® A 246M	TECHNYL® A 238 V13	TECHNYL® B 230	TECHNYL® C 230
PHYSICAL									(1)	
1.2	1.2	1.1	1.1			1.1	1.05		1.35	1.2
1.14	1.14	1.14	1.14	1.07	1.07	1.1	1.08		1.09	1.09
1.7	2	1.2	1.5			1.9	1.9	0.85	2.2	
1.7	2	1.2	1.8			1.9	1.9	1	2.05	
MECHANICAL PROPERTIES										
3200 / 1600	3200 / 1600	3700 / 1600	3700 / 1600	800 / 650	1175 / -	2550 / 1400	1900 / 600	5500 / 3650	2300 / 900	2600 / 1000
85 / 50	85 / 50	95 / 60	95 / 60			70 / 40	47 / 42	100 / 60	60 / 45	75 / 39
8 / 10	7 / 10	5 / 25	5 / -			5 / 15	20 / 210	4 / 8	5 / 12	
65 / 40	60 / 40	85 / 45	80 / 45		44 / -	50 / 40	44 / 35		50 / 40	
20 / 200	20 / 200	20 / 160	20 / 160	320 / 350	290 / -	30 / 200	65 / 210		50 / 250	80 / 300
2900 / 1300	2900 / 1300	3300 / 1600	3150 / 1400	900 / -		2250 / 1200	1800 / 700		2000 / 700	2500 / 800
120 / 50	120 / 60	137 / 60	137 / 60			95 / 47	70 / 27		80 / 27	100 / 35
5 / 10	4.5 / 10	2.5 / 5	3 / 7	90 / -	90.5 / -	8 / 20	55 / 100	6 / 8	8 / 30	11 / 90
NB / NB	NB / NB	NB / NB	NB / NB	NB / NB		NB / NB	NB / NB	65 / 60	NB / NB	NB / NB
THERMAL										
263	263	263	263	260	260	263	263	263	242	222
70	75	80	80			70	65	228	62	75
7	7	6.5	6.5			7	7	5	7	7
FLAMMABILITY										
	V-2		V-2							
V-2	V-2		V-2							
V-2	V-2		V-2	HB	HB	HB	HB	HB	HB	HB

All technical datasheets are available at www.rhodia-ep.com.

KEY REQUIREMENTS

DOWELS

Fast moulding.
Mechanical properties.
Tear resistance.

Machine Compon

From the smallest workshop to the largest production unit, Rhodia Engineering Plastics serves a diverse industrial customer base through technological innovation, along with design and product diversity. Thanks to their excellent mix of properties, TECHNYL® and TECHNYL STAR™ polyamide resins have become the material of choice for many machine components.

Strength and Durability

Bearing cages, pumps, pneumatic connectors or cable chains benefit from the superior thermal and chemical properties offered by TECHNYL® and TECHNYL STAR™ polyamides even under the most critical operating conditions.

Some TECHNYL® and TECHNYL STAR™ polyamide grades have been specially developed to resist oils and greases and offer an ideal balance between flexibility and rigidity in order to facilitate assembly while maintaining properties. Even under severe service conditions, TECHNYL® and TECHNYL STAR™ polyamides provide:

- Good chemical resistance to oils and greases
- Good mechanical properties

Productivity

The ideal combination of high fluidity, chemical resistance and impact strength makes TECHNYL STAR™ S and TECHNYL STAR™ SX the materials of choice for complex structural parts production, which require:

- Easy processing
- Fast production cycles
- High stiffness
- Excellent surface aspect
- 50% to 60% glass fibre

PROPERTIES	STANDARDS	UNITS	CONDITIONS
Water absorption (24 h at 23°C)	ISO 62	%	
Density	ISO 1183-A	g/cm³	
Moulding shrinkage parallel	RHODIA-EP	%	
Moulding shrinkage normal or perpendicular	RHODIA-EP	%	
Tensile modulus	ISO 527 type 1 A	MPa	d.a.m / cond.*
Tensile strength at yield	ISO 527 type 1 A	MPa	d.a.m / cond.*
Tensile strain at yield	ISO 527 type 1 A	%	d.a.m / cond.*
Tensile strength at break	ISO 527 type 1 A	MPa	d.a.m / cond.*
Tensile strain at break	ISO 527 type 1 A	%	d.a.m / cond.*
Flexural modulus	ISO 178	MPa	d.a.m / cond.*
Flexural maximum stress	ISO 178	MPa	d.a.m / cond.*
Charpy notched impact strength	ISO 179/1eA	kJ/m²	d.a.m / cond.*
Charpy unnotched impact strength	ISO 179/1eU	kJ/m²	d.a.m / cond.*
Melting temperature	ISO 11357	°C	
Heat deflection temperature, 1,8 Mpa	ISO 75/Af	°C	
Coef. of linear thermal expension parallel (23°C to 85°C)	ISO 11359	E-5 / °C	
Injection pressure vs. Standard PA6		%	
Spiral length vs. Standard PA	RHODIA	%	

*d.a.m = dry as moulded / cond. = conditioned according to ISO 1110 (1) Heat stabilised grade also available