TECHNYL®

Automotive market

TECHNYL® polyamide range

Rhodia

Polyamide

Contents

Rhodia Po

the worldwide
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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.

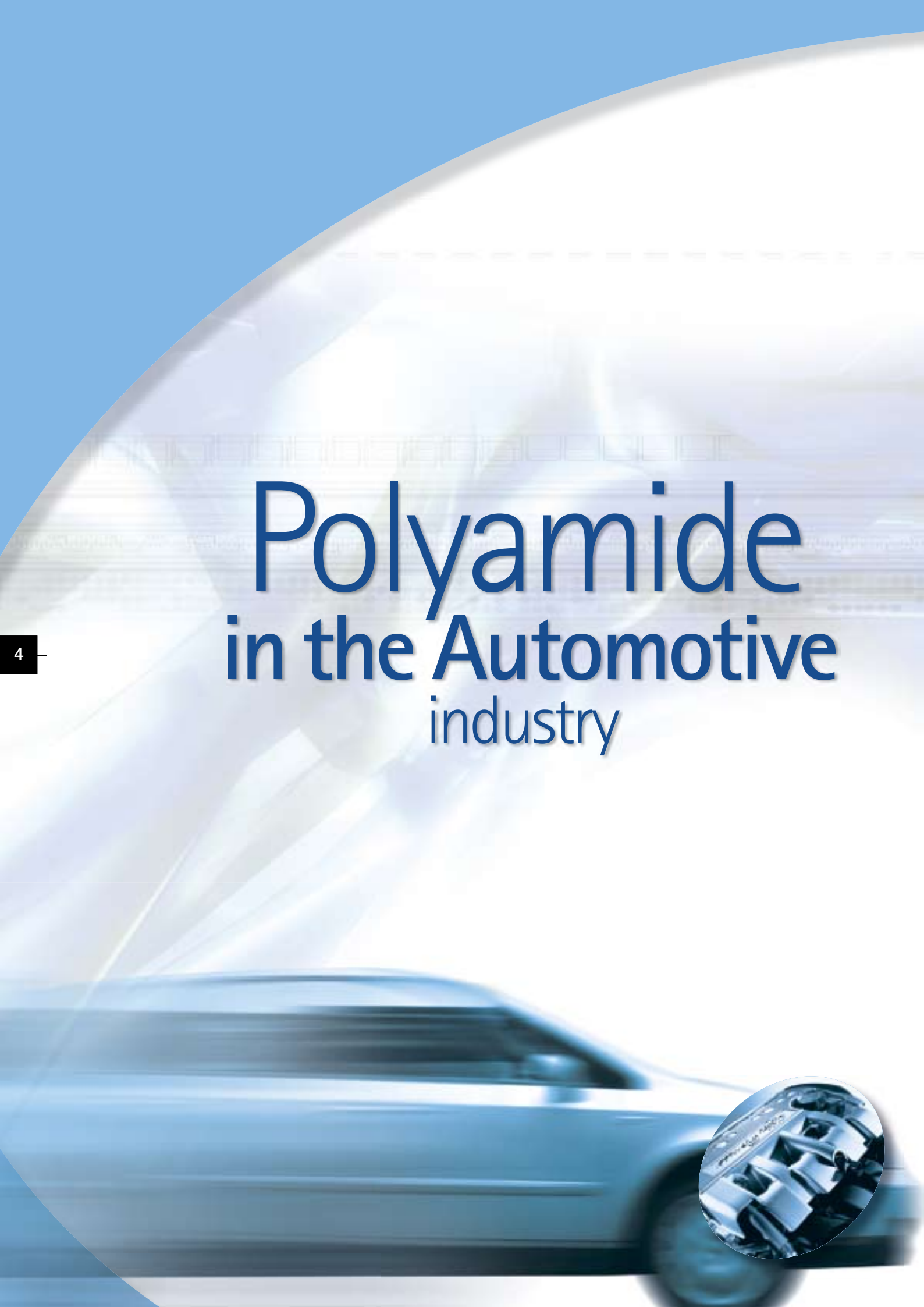
Most applications are developed in close collaboration with designers, mould producers and processors. Our technical support teams participate in part design and tool development, contributing with their plastics expertise and their in-depth application knowledge.

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.

Polyamide
in the Automotive
industry



The automotive industry represents a vital driver for global economic growth, with about 60 million vehicles assembled yearly. The dynamics of the automotive market are characterised by the growing and demanding needs of consumers. This has led the industry to drive for continuous improvement. Globalisation and worldwide manufacturing have become the norm, with innovation and speed to market on new models being critical factors for success. To satisfy and follow market trends, car-makers and tier one manufacturers are strongly investing resources in key fields such as safety, comfort, environmental friendliness, consumption reduction, productivity and recycling.

Among the new technologies used widely by the automotive industry to meet the challenge of cost and performance, thermoplastic materials have long been held in high regard.

Thanks to its well-balanced performance profile, the use of polyamide in automotive has grown consistently over the past 20 years, with the introduction of advanced and effective solutions that have allowed the replacement of metals, thermoset or other materials.

Rhodia's product portfolio of TECHNYL® polyamides, formulated with proper reinforcements exhibits excellent mechanical properties, such as stiffness and toughness associated with heat distortion, temperature creep and fatigue resistance.
In addition TECHNYL®'s aging and the stress cracking resistance properties make components durable even when used in the most demanding environments.
Polyamide's ease of processing, especially evident in TECHNYL STAR™ grades, provides high productivity during injection moulding and high flexibility in design even in complicated and large components.
Polyamide leads then to the development of high value-added solutions for integrating functions in numerous applications. The end result is a strong contribution towards reducing vehicle weight, leading to improved fuel consumption and reductions in pollution.

Rhodia Engineering Plastics is deeply committed to support the automotive industry through:

- A broad line of TECHNYL® products, each with a balanced range of properties and outstanding technical performance, to drive new solutions for all of the different auto application segments.
- Complete "material/process" solutions approach enhanced by competencies and technologies from throughout the Rhodia Group.
- Technical expertise and value-added services to assist end-users through the process from concept through manufacturing.
- Specific partnerships and technologies (Mucell®...)

Cooling and Hea

The cooling and heating systems are major factors affecting the lifetime of an engine, especially with today's new generation of powerful engines, which operate at significantly higher temperatures.

Engine cooling parts are subject to considerable strain due to the highly aggressive glycol environment, along with frequent variations in temperature and pressure.

Main applications involving polyamide are:

- Water end tanks
- Water inlets and outlets pipes
- Cooling module
- Expansion tank
- Heat exchanger tank
- Water tubing

High performance grades

TECHNYL® A 218G1 V30 or V25 black 34N and TECHNYL® A 218G2 V30 or V25 black 34N, a new generation of glass fibre reinforced PA 6.6 has been specifically designed for cooling and heating circuit applications, and provide an attractive value solution to customers:

- Long life OAT glycol coolant resistance
- High temperature resistance
- Outstanding retention of properties in cooling liquids

Solutions for new processing technologies

Rhodia proposes a full range of TECHNYL® grades for producing water tubing applications through blow moulding, WIT and GIT processes, competing with rubber and metal solutions. Rhodia brings also expertise and know-how on those technologies.

WATER END TANKS

Glycol resistance
Thermal resistance
Stiffness
Low creep

PROPERTIES		STANDARDS	UNIT	TECHNYL® A 218 V30 Black 34 NG
Density		ISO 1183-A	g/cm3	1.37
Water absorbtion (24h at 23°C)		ISO 62	%	0.8
Melting Temperature		ISO 11357	°C	263
Coefficient of linear thermal expansion parallel (23°C to 85C°)		ISO 11359	E-5/°C	2.5
Heat deflection temperature under load 1,8 MPa		ISO 75/Af	°C	250
Mould shrinkage	Direction //	RHODIA-EP	%	0.5
	Direction T	RHODIA-EP	%	0.8
TENSILE	Strength at break	ISO 527 type 1 A	MPa	190 / 135
	Strain at break	ISO 527 type 1 A	%	3 / 4
	Tensile Modulus	ISO 527 type 1 A	MPa	10000 / 7500
FLEXURAL	Strength at break	ISO 178	MPa	190 / 135
	Flexural Modulus	ISO 178	MPa	9000 / 6400
IMPACT	Izod notched	ISO 180/1A	kJ/m²	11 / 18
	Charpy notched	ISO 179/1eA	kJ/m²	11 / 15
	Charpy unnotched	ISO 179/1eU	kJ/m²	83 / 95

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

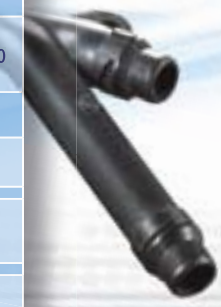
COOLING MODULE

Fatigue behaviour
Glycol resistance
Thermal resistance
Reduction in the number of materials used
Stiffness
Vibration behaviour

t i n g s y s t e m s

WATER PIPE ▶

Processable with gas-assisted injection moulding
Good internal surface
Reduced wall thickness
Reduced cycle time



GLASS REINFORCED AND GLYCOL-WATER RESISTANCE IMPROVED PA 6.6								
STANDARD INJECTION TECHNOLOGY				BLOW MOULDING TECHNOLOGY		GAS INJECTION TECHNOLOGY	WATER INJECTION TECHNOLOGY	
TECHNYL® A 218G1 V25 Black 34N	TECHNYL® A 218G1 V30 Black 34N	TECHNYL® A 218G2 V25 Black 34N	TECHNYL® A 218G2 V30 Black 34N	TECHNYL® A 548B V15 Black 23N	TECHNYL® A 548B V20 Black 23N	TECHNYL® A 218Z1 V30 Black 34N	TECHNYL® A 338Wit1 V30 Black 36N	TECHNYL® A 338Wit2 V30 Black 36N
1.32	1.37	1.32	1.37	1,19	1.23	1.37	1.37	1.37
0.9	0.8	0.9	0.8				0.8	0.8
263	263	263	263	242	261	263	263	263
2.7	2	2	2.7				2	2
245	250	245	250	215	228		225	230
0.6	0.5	0.6	0.5					
0.8	0.8	0.8	0.8					
170 / -	195 / 140	170 / -	195 / 140	100 / 60	120 / 80	110 / -	130 / -	140 / -
3 / 4	3 / 4	3 / 4	3 / 4	4 / 14	4 / 10	2.5 / -	4 / -	3 -
8400 / 6300	10000 / 7500	8400 / 6300	10000 / 7500	5200 / 2400	6500 / 3800	5800 / -	7400 / -	9000 / -
255 / 155	280 / 185	255 / 155	280 / 185	155 / 75	180 / 110		200 / -	210 / -
7900 / 5000	9200 / 6400	7900 / 5000	9200 / 6400	4000 / 2000	5100 / 3200	4900 / -	6300 / -	7900 / -
8 / 15	10 / 18	8 / 15	10 / 18	14 / -	16 / -		55 / -	
10 / 13	11 / 15	10 / 13	11 / 15	11 / 22	11 / 16	5 / -	12 / -	13 / -
68 / 87	85 / 100	72 / 90	87 / 105	68 / 95	74 / 83	35 / -	75 / -	80 / -

THERMOSTAT HOUSING ▶

Heat stabilisation
Resistance to glycol

Air Systems

Air intake manifolds manufactured in polyamide have represented a real breakthrough application in replacing metal alloys. The easier assembly, combined with function integration allows OEMs and tier one suppliers to achieve productivity and cost effectiveness, thanks to flexibility of design.

To ensure OEM specifications for applications such as Air Intake Manifolds and turbo-charger air ducts, TECHNYL® polyamide grades offer:

- Stiffness
- High continuous working temperature up to 130°C
- Retention of properties after thermal ageing
- Resistance to oil and grease
- Low noise emission

Productivity and design

New high Flow TECHNYL STAR™ grades S 218 V30 and V35 provide processing productivity and advanced flexibility in conception.

Answers to a wide range of processing technologies

Specific TECHNYL® grades C 548B, C 548B V15, A 548B V15 and A 548B V20 are available for producing turbo-charger air ducts via blow moulding, while grades such as TECHNYL® A 218 V30 and V35, C 218 V30 and V35 are available for fusible core and injection/welding technology.

PROPERTIES		STANDARDS	UNIT	GLASS FIBRE REINFORCED TECHNYL® A 218 V30 Black 21NS	GLASS FIBRE REINFORCED TECHNYL® A 218 V35 Black 21N
Density		ISO 1183-A	g/cm³	1.37	1.41
Water absorption (24h at 23°C)		ISO 62	%		0.75
Melting Temperature		ISO 11357	°C	263	263
Coefficient of linear thermal expansion parallel (23°C to 85°C)		ISO 11359	E-5/°C	2.5	2.2
Heat deflection temperature under load 1,8 MPa		ISO 75/Af	°C	250	255
Mould shrinkage	Direction //	RHODIA-EP	%	0,5	0.45
	Direction T	RHODIA-EP	%	0,8	0.75
TENSILE	Strength at break	ISO 527 type 1 A	MPa	190 / 135	210 / 150
	Strain at break	ISO 527 type 1 A	%	3 / 4	3 / 4
	Tensile Modulus	ISO 527 type 1 A	MPa	10000 / 7500	11400 / 8700
FLEXURAL	Strength at break	ISO 178	MPa	260 / 175	286 / 195
	Flexural Modulus	ISO 178	MPa	8400 / 5900	9500 / 6800
IMPACT	Izod notched	ISO 180 / 1A	kJ/m²	11 / 16	13 / 18
	Charpy notched	ISO 179 / 1eA	kJ/m²	12 / 16	13.5 / 18.5
	Charpy unnotched	ISO 179 / 1eU	kJ/m²	80/95	95 / 100

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

AIR INTAKE MANIFOLD

Stiffness
Thermal resistance
Weight saving
Good weldability
Vibration behaviour
Acoustic properties
Function integration
Design freedom
Weight saving

AIR DUCT

Blow-mouldability
Thermal resistance
Weldability
Strength
Acoustic properties

D PA 6.6	GLASS FIBRE REINFORCED PA 6		HIGH FLOW PA		HIGH FLOW HIGH STIFFNESS PA	BLOW MOULDING TECHNOLOGY			
TECHNYL® A 218 V50 Black 21N	TECHNYL® C 218 V30 Black 21N	TECHNYL® C 218 V35 Black	TECHNYL STAR™ S 218 V30 Black 31N	TECHNYL STAR™ S 218 V35 Black 31N	TECHNYL STAR™ SX 218 MZ40 V25 Black Z	TECHNYL® C 548B Black	TECHNYL® C 548B V15 Black	TECHNYL® A 548B V 15 Black 23N	TECHNYL® A 548B V20 Black 23N
1.57	1.35	1.38	1.34	1.41	1.8	1.05	1.18	1.19	1.23
0.6	0.95	0.9	0.95	0.9	0.46	1.2	1.42		
263	222	222	222	222	222	222	222	242	261
1.5	3.2	2.8	3.2			7	4		
255	205	210	205	210	200	55	185	215	228
0.3	0.35	0.3	0.35	0.3	0.3	1.2			
0.5	0.65	0.6	0.65	0.6	0.7	1.25			
240 / 175	190 / 110	195 / 115	180 / 110	195 / 115	180 / 110	55 / 45	85 / 70	100 / 60	120 / 80
2 / 2.5	4 / 5	3 / 4	3 / 5	3 / 4.5	2 / 2	150 / 220	3 / 5	4 / 14	4 / 10
16200 / 12500	9600 / 6200	10600 / 6900	10500 / 6200	11700 / 7400	20000 / 13000	1850 / 1000	5000 / 3800	5200 / 2400	6500 / 3800
345 / 250	240 / 145	310 / 190	260 / 170	295 / 195	250 / 160	70 / 45		155 / 75	180 / 110
13500 / 10000	8400 / 4900	10500 / 6800	9500 / 5200	10000 / 6200	15600 / 8800	1750 / 850		4000 / 2000	5100 / 3200
15 / 18	14 / 24	15 / 28	12 / 14	13 / 16	6 / 10	90 / NB	14 / 22	14 / -	16 / -
16 / 18	15 / 31.5	16.5 / 33	11 / 13	13 / 19		92 / NB	9 / -	11 / 22	11 / 16
95 / 100	100 / 108	102 / 110	65 / 75	72 / 80		NB / NB		68 / 95	74 / 83

Mechanical Parts

To answer the high performance demands of mechanical parts, TECHNYL® and TECHNYL STAR™ polyamide grades offer high strength and stiffness, in conjunction with outstanding deflection temperature. These materials allow metal replacement for several applications in the engine compartment, providing both weight savings and cost effectiveness.

Dedicated solutions

TECHNYL® polyamide grades ensure leakproof protection to engine cylinders thanks to superior ageing resistance, even after severe mechanical loading and temperature cycles.
TECHNYL® A 218 MZ15 V25 is in particular especially designed for cylinder head cover.

TECHNYL STAR™ polyamide range is a high fluidity polymer range providing an excellent surface appearance as well as other key benefits: cycle time and injection pressure reduction, lower clamping force and consequently the opportunity to downsize the machine.
The TECHNYL STAR™ range is perfectly suitable material for applications such as engine covers.

TECHNYL® XCell is a range of polyamide 6.6 and 6 grades specifically designed for Mucell® process.
This highly innovative range combined with this microcellular foaming technology provides weight reduction with an outstanding surface quality.
TECHNYL® XCell offers less warpage on moulded parts, significant retention of mechanical properties and improved productivity during manufacturing.

CYLINDER HEAD COVER

Thermal resistance
Stiffness
Creep behaviour
Chemical resistance (oil)
Surface finish
Weldability
Paintability
Acoustic properties
Function integration
Weight saving

PROPERTIES		STANDARDS	UNIT	GLASS FIBRE REINFORCED PA 6.6			
				TECHNYL® A 218 V25 Black 21N	TECHNYL® A 218 V30 Black 21NS	TECHNYL® A 218 V35 Black 21N	TECHNYL® A 218 V50 Black 21N
Density		ISO 1183-A	g/cm3	1.32	1.37	1.41	1.57
Water absorption (24h at 23°C)		ISO 62	%	0.9	0.8	0.75	0.6
Melting Temperature		ISO 11357	°C	263	263	263	263
Coefficient of linear thermal expansion parallel (23°C to 85°C)		ISO 11359	E-5/°C	2.7	2.5	2.2	1.5
Heat deflection temperature under load 1,8 MPa		ISO 75/Af	°C	255	255	255	255
Mould shrinkage	Direction //	RHODIA-EP	%	0.6	0.5	0.45	0.3
	Direction T	RHODIA-EP	%	0.85	0.8	0.75	0.5
TENSILE	Strength at break	ISO 527 type 1 A	MPa	165 / 120	190 / 135	210 / 150	240 / 175
	Elongation at break	ISO 527 type 1 A	%	3 / 4	3 / 4	3 / 4	2 / 2.5
	Tensile Modulus	ISO 527 type 1 A	MPa	8400 / 6300	10000 / 7500	11400 / 8700	16200 / 12500
FLEXURAL	Stress at break	ISO 178	MPa	235 / 156	260 / 175	286 / 195	345 / 250
	Flexural Modulus	ISO 178	MPa	7300 / 5000	8400 / 5900	9500 / 6800	13500 / 10000
IMPACT	Izod notched	ISO 180/1A	kJ/m²	8.5 / 15	11 / 16	13 / 18	15 / 18
	Charpy notched	ISO 179/1eA	kJ/m²	10 / 13	12 / 16	13.5 / 18.5	16 / 18
	Charpy unnotched	ISO 179/1eU	kJ/m²	57 / 87	80 / 95	95 / 100	95 / 100
SPECIFIC	Acoustic insulation	Rhodia - EP	dB				

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

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ENGINE AND FRONT COVERS

Good surface aspect
Low shrinkage
Design freedom
Paintability
Acoustic properties

	GLASS FIBRE REINFORCED AND IMPACT MODIFIED PA 6.6		MINERAL GLASS FILLED PA			HIGH FLOW PA				ACOUSTIC IMPROVED GRADES		LONG GLASS FIBRE PA
TECHNYL® AR 130/1 Black	TECHNYL® A 238 V13 Black 21N	TECHNYL® A 248 V33 Black 21N	TECHNYL® A 218 MZ15 V25 Black 31N	TECHNYL® C 218 MT25 V20 Black TP	TECHNYL® C 218 MZ20 V10 Black Z	TECHNYL STAR™ S 218 V30 Black 31 N	TECHNYL STAR™ S 218 V35 Black 31 N	TECHNYL STAR™ S 218 MT 40 Black 23 N	TECHNYL STAR™ S 218 MZ20 V10 Black 2N	TECHNYL STAR™ S 218 dB1 M50 Black 36N	TECHNYL STAR™ S 218 dB2 MV60 Black 36N	TECHNYL® FORCE SX 218 LGF50** Black 31N
PHYSICAL												
1.37	1.19	1.39	1.47	1.52	1.36	1.34	1.41	1.45	1.36	1.75	1.89	1.65
	0.75	1.25		0.9		0.95	0.9	0.72				
260	263	263	263	222	222	222	222	221	222	222	222	222
2.5	5	2.5		4		3.2						
255	225	248	232	210	205	205	210	90	186		190	215
0.5	0.85	0.5	0.4	0.3		0.35	0.3	1.0		1.0		0.29
0.8	1.0	0.7	0.7	0.5		0.65	0.6	1.1		1.0		0.35
MECHANICAL												
135 / 95	90 / 60	130 / 100	135 / -	130 / 75	100 / 60	180 / 110	195 / 115	86 / 50	110 / -	54 / -	84 / 50	250 / 170
2.5 / 3.5	4/8	4 / 8	2 / -	2.4 / 3	3.2 / 5.5	3 / 5	3 / 4.5	7 / 25	2.8 / -	1.8 / -	2 / 6	2
8400 / 6300	5500 / 3600	8500 / 6000	10000 / -	10200 / 7000	7400 / 4500	10500 / 6200	11700 / 7400	6000 / 2400	7800 / -	4600 / -	7800 / 4850	18000/12200
210 / 160	150 / 100	235 / 130	210 / -			260 / 170	295 / 195	150 / 65				
7200 / 5000	4200 / 2500	7800 / 5500	9000 / -			9500 / 5200	10000 / 6200	5500 / 1850				15500/10900
7 / -	8 / 10	15 / 18	4 / -	4.5 / 11	5.5 / -	12 / 14	13 / 16	5 / 7	4 / -			
6 / 8	6 / 8	14 / 22	5 / -	5.2 / 13	7 / 10	11 / 13	13 / 19	5 / 6	3 / -			38/38
30 / 35	60 / 55	80 / 90	45 / -	38 / 45	60 / 85	65 / 75	72 / 80	45 / 220	35 / -	30 / -	34 / -	
										31.4 / 33.8		

**exists also in 30, 40, 60 %, Long Glass Fibre reinforced

FAN AND SHROUD

Thermal resistance
Vibration damping
Fatigue resistance
Stiffness
Surface quality
Roundness
Isotropic shrinkage

Structural Parts

TECHNYL® FORCE and TECHNYL STAR™ materials allow pure plastics solutions with benefits on costing and weight saving compared to hybrid metal plastic concept.

TECHNYL® FORCE is a high flow polyamide long glass fibre reinforced from 30 to 60%.
Compared to TECHNYL® short glass fibre, TECHNYL® FORCE offers breakthrough in crash management in terms of impact behaviour and energy absorption. Other benefits provided by TECHNYL® FORCE are creep and fatigue resistance, and stiffness in temperature.
TECHNYL® FORCE is easy to process thanks to its high fluidity based polymer.

TECHNYL STAR™ SX is a high flow polyamide with extreme stiffness thanks to high reinforcement until 60% glass fibre. It allows very good surface aspect finish combined with excellent processability while bringing shorter cycle time, less energy cost and lower clamping force.

A complete **TECHNYL® 6.6** glass fibres reinforced range is also available for developing structural parts applications.

Rhodia technical support and simulation capabilities along with expertise in moulding technologies, are key elements to offer perfectly suited technical answers to customers.

Density		ISO 1183-A
Water absorption (24h at 23°C)		ISO 62
Melting Temperature		ISO 11357
Coefficient of linear thermal expansion parallel (23°C to 85°C)		ISO 11359
Heat deflection temperature under load 1,8 MPa		ISO 75/Af
Mould shrinkage	Direction //	RHODIA-EP
	Direction T	RHODIA-EP
TENSILE	Strength at break	ISO 527 type 1 A
	Strain at break	ISO 527 type 1 A
	Tensile Modulus	ISO 527 type 1 A
FLEXURAL	Strength at break	ISO 178
	Flexural Modulus	ISO 178
IMPACT	Izod notched	ISO 180 / 1A
	Charpy notched	ISO 179 / 1eA
	Charpy unnotched	ISO 179 / 1eU

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

SEAT STRUCTURE

Stiffness
Toughness
Fatigue resistance
Function integration
Weight saving

FRONT END

Stiffness
Thermal and impact resistance
Dimensional stability
Vibration damping
Function integration
Design freedom
Weight saving

	LONG GLASS FIBRE PA				HIGH FLOW PA		GLASS FIBRE REINFORCED PA 6.6	
	TECHNYL® FORCE S 218 LGF 30 Black 31N	TECHNYL® FORCE S 218 LGF 40 Black 31N	TECHNYL® FORCE SX 218 LGF 50 Black 31N	TECHNYL® FORCE SX 218 LGF 60 Black 31N	TECHNYL STAR™ SX 218 V50 Black Z	TECHNYL STAR™ SX 218 MZ40 V25 Black	TECHNYL® A 218 V30 Black 21NS	TECHNYL® A 218 V50 Black 21N
g/cm³	1.34	1.45	1.65	1.65	1.55	1.80	1.37	1.57
%					0.72	0.46		0.6
°C	222	222	222	222	222	222	263	263
E-5/°C							2.5	1.5
°C	215	215	215	215	210	200	250	255
%	0.35	0.32	0.29	0.30			0,5	0.3
%	0.47	0.40	0.35	0.32			0,8	0.5
MPa	170 / 125	210 / 146	250 / 170	265 / 170	230 / 162	180 / 112	190 / 135	240 / 175
%	2 / 2.5	2 / 2.2	2	1.5 / 1.80	2.6 / 4	2 / 2	3 / 4	2 / 2.5
MPa	10500 / 7300	14000 / 9300	18000 / 12200	22000 / 15000	17000 / 11600	20000 / 13000	10000 / 7500	16200 / 12500
MPa							260 / 175	345 / 250
MPa	9500 / 6600	12700 / 8400	15500 / 10900	19000 / 13000	15500 / 10000	15600 / 8800	8400 / 5900	13500 / 10000
kJ/m²						6 / 10	11 / 16	15 / 18
kJ/m²	26 / 26	30 / 30	38 / 38	40 / 40	15 / 20		12 / 16	16 / 18
kJ/m²	-						80/95	95 / 100

**exists also in 30, 40, 60 %, Long Glass Fibre reinforced

STRUCTURAL DOOR MODULE

Rigidity
Dimensional stability
Function integration
Weight saving