Solutions for Cooling and Heating Systems

Rhodia

Engineering Plastics

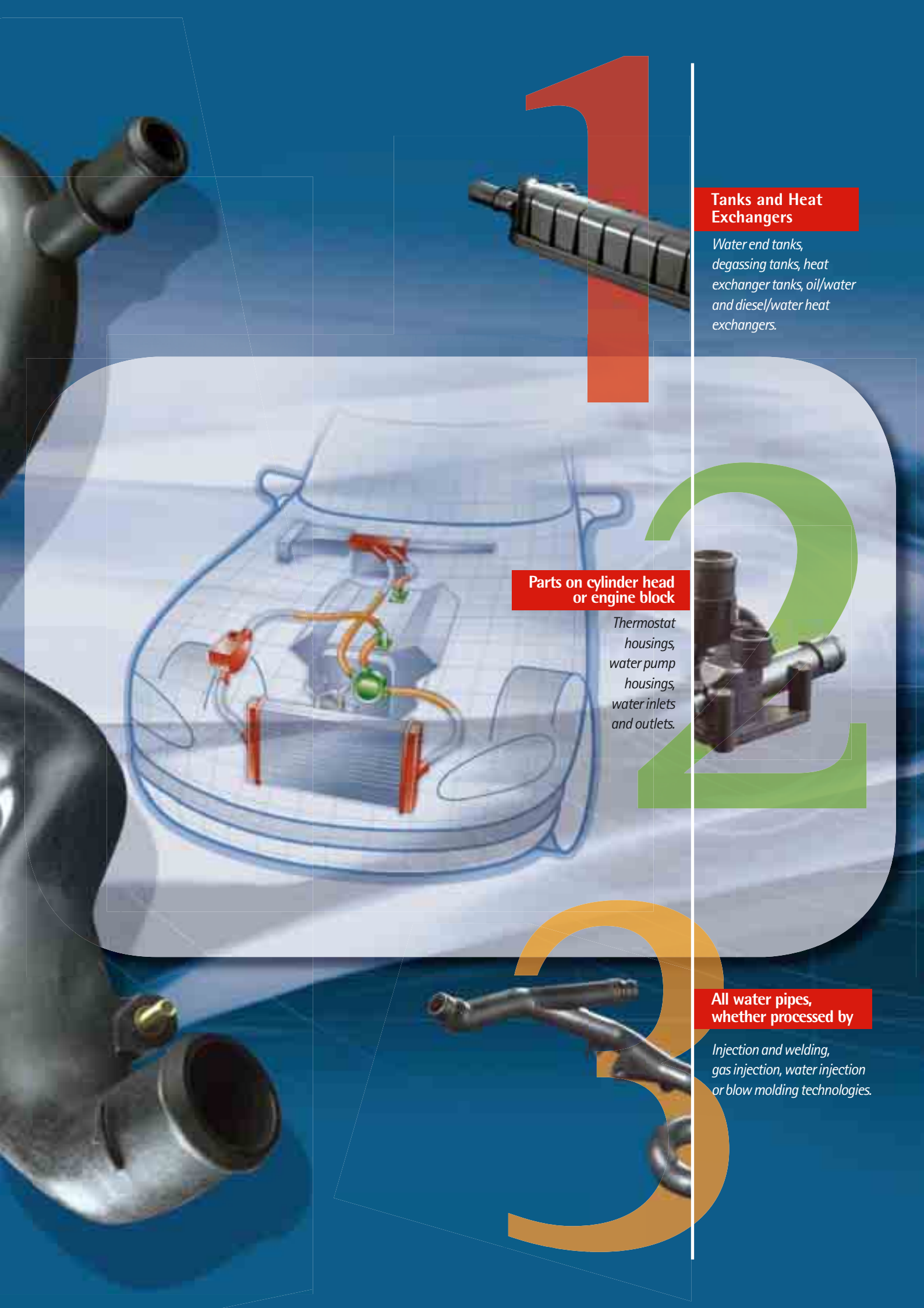
A complete range of solutions for Cooling and Heating systems to meet all specifications

As a global partner to the automotive industry, Rhodia Engineering Plastics works on materials, processes and applications simultaneously, to offer its customers a complete range of polyamide solutions.
Polyamide materials contribute both to optimizing manufacturing costs and to reducing vehicle weight. In addition, their processing flexibility enables very complex design and multi-functional integration.

Cooling and Heating systems are a major factor in engine lifetime, especially with the new generation of powerful motorization, which significantly increases engine heat. Engine cooling parts are subject to considerable strain on a constant basis, due to a highly aggressive glycol environment and frequent variations in temperature and pressure.

Working in close cooperation with Car Manufacturers and Tier One suppliers, Rhodia's engineers have developed specific grades to meet the rigorous requirements of all cooling circuit applications. Their high resistance to heat and chemical attack, together with mechanical performance and good appearance, establish our Technyl® grades as the ideal choice for automotive Cooling and Heating systems.





1

Tanks and Heat Exchangers

Water end tanks, degassing tanks, heat exchanger tanks, oil/water and diesel/water heat exchangers.

2

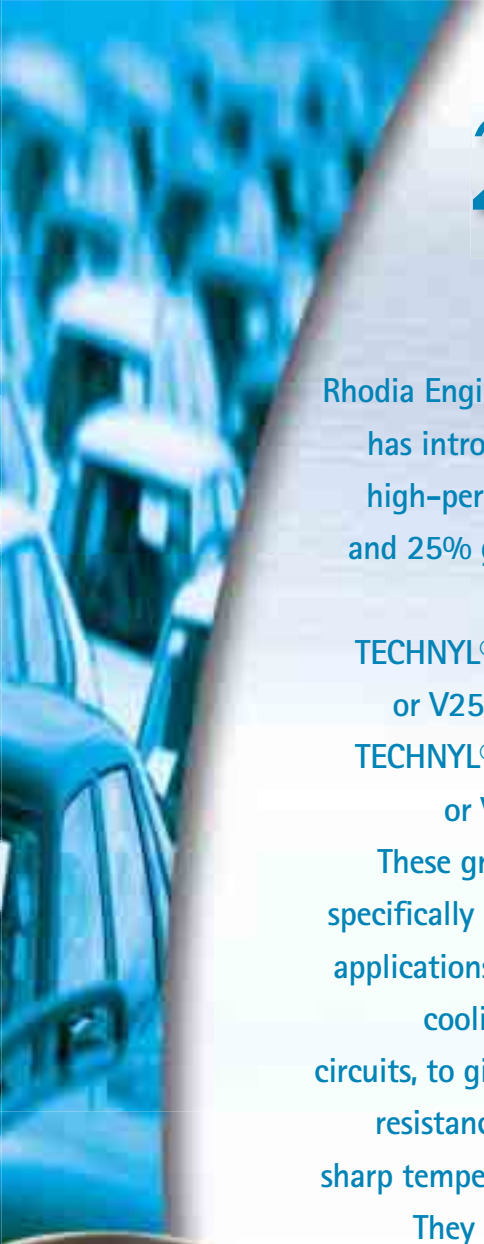
Parts on cylinder head or engine block

Thermostat housings, water pump housings, water inlets and outlets.

3

All water pipes, whether processed by

Injection and welding, gas injection, water injection or blow molding technologies.



2 TECHNYL® grades

Rhodia Engineering Plastics has introduced two new high-performance, 30% and 25% glass reinforced PA 6.6 grades: TECHNYL® A 218G1 V30 or V25 Black 34N and TECHNYL® A 218G2 V30 or V25 Black 34N. These grades have been specifically designed for all applications in automotive cooling and heating circuits, to give unparalleled resistance to glycol and sharp temperature increase. They were developed in anticipation of more stringent needs in the automotive market to fulfill new engine equipment requirements.

What follows focuses more on 25% glass fiber filled materials; 30% glass fiber filled products show the same behavior and similar impact properties after ageing. Furthermore, PA6.6 GF25 grades have lower density than PA6.6 GF30 grades and represent an attractive value offering to customers.

75% lifetime increase

In the process of developing new resins, Rhodia's research and development team found that most standard grades used in engine compartment applications show a decline in properties over time. For a typical nylon component, at a temperature of 130°C and pressure of 2 bars, the impact resistance after 1000 hours' ageing in a water-glycol environment was around 20MPa. Rhodia's new TECHNYL® A 218G2 V25 grade successfully increased that performance to 30MPa, while TECHNYL® A 218G1 V25 demonstrated a balance of mechanical and thermal properties sufficient for certain specifications. At equal stress, Rhodia's new automotive resins show increased lifetime (35% for TECHNYL® A 218G1 V25 grade and 75% for TECHNYL® A 218G2 V25).

60% mechanical strength increase

These new grades have been designed to absorb the high thermo-mechanical stresses, such as coolant pressure pulses, typical in most modern automotive cooling circuits. As a result, the mechanical strength of the new grades is reflected in their superior stress and elongation performance at break. TECHNYL® A 218G1 V25 Black 34N shows an increase of 30% in this critical performance criterion after a period of 1000 hours at 130°C in a 50/50 water-glycol environment, while TECHNYL® A 218G2 V25 Black 34N shows an increase of 60% under the same conditions.

160°C temperature resistance

The new "glycol grades" withstand a continuous temperature of 135°C, which represents an increase of 8°C compared with standard products. Furthermore, they respond to the most critical cases of vehicle function, where exceptional temperatures are reached over short periods, by handling peak temperatures of 160°C! In such cases, the new A 218G2 V30 grade successfully retains most of its impact resistance, while the impact properties of standard products decline by 50%.
Testing also showed that crazing and cracking due to chemical degradation is especially visible on standard products, while the surface of TECHNYL® A 218G2 V30 is not affected.

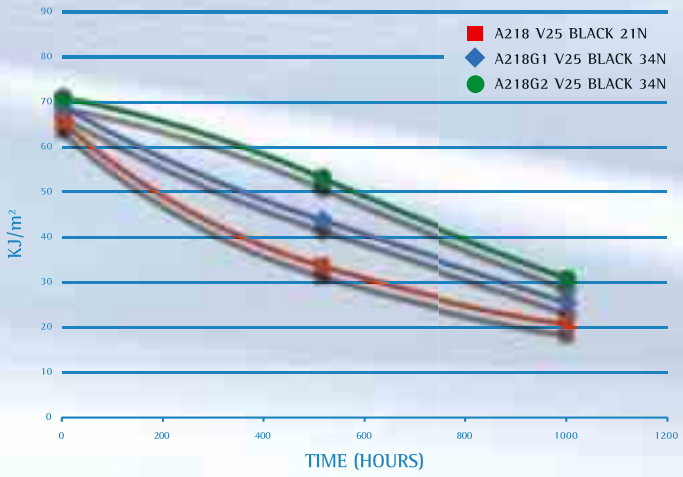
Years of dedicated research

These new engineering resins are the result of several years of dedicated polymer research carried out in Rhodia Engineering Plastics laboratories. The main focus of this material research was on specific polymers and additives, and the initial studies were conducted on test parts that were monitored for autoclave pressure and temperature throughout the ageing period. Further tests, such as "temperature-cycled pressure resistance," which were conducted in our customer application development centers,* confirmed the initial benefits.

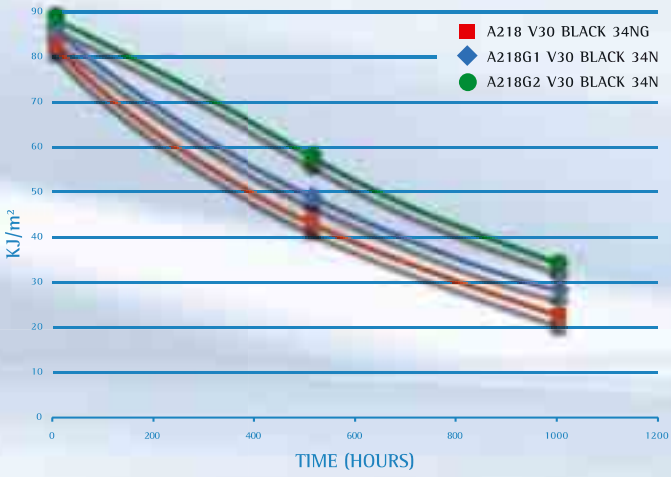
**Rhodia Engineering Plastics* Application & Technology Development Centers:
Lyon, France – Freiburg, Germany - Milano, Italy – Detroit, USA – Sao Paulo, Brazil - Seoul, Korea.

with unequalled resistance t

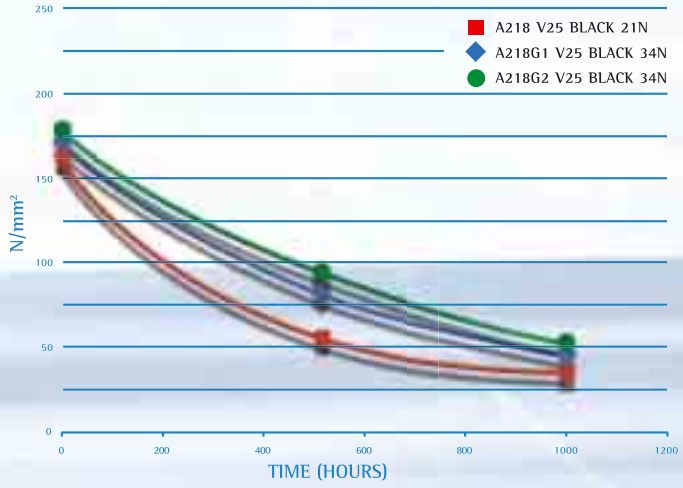
UN-NOTCHED CHARPY IMPACT
PA6.6 GF25 ageing at 130°C in glycol-water 50/50



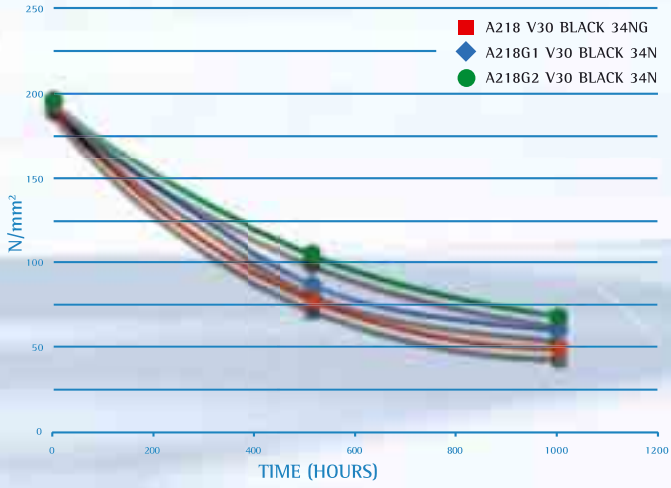
UN-NOTCHED CHARPY IMPACT
PA6.6 GF30 ageing at 130°C in glycol-water 50/50



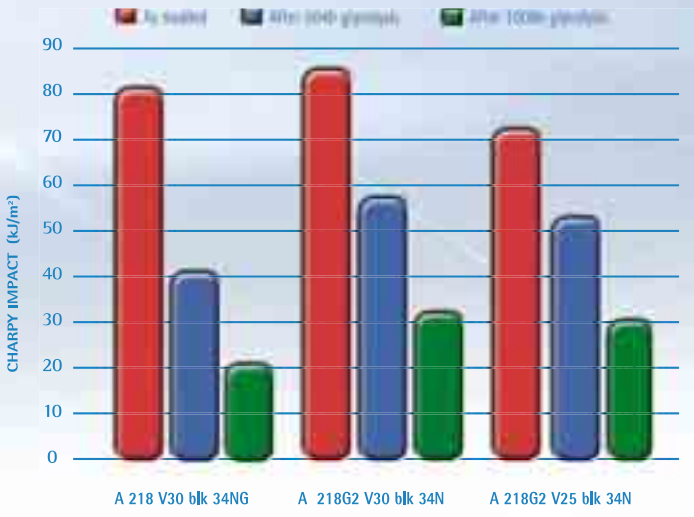
TENSILE STRENGTH AT BREAK
PA6.6 GF25 ageing at 130°C in glycol-water 50/50



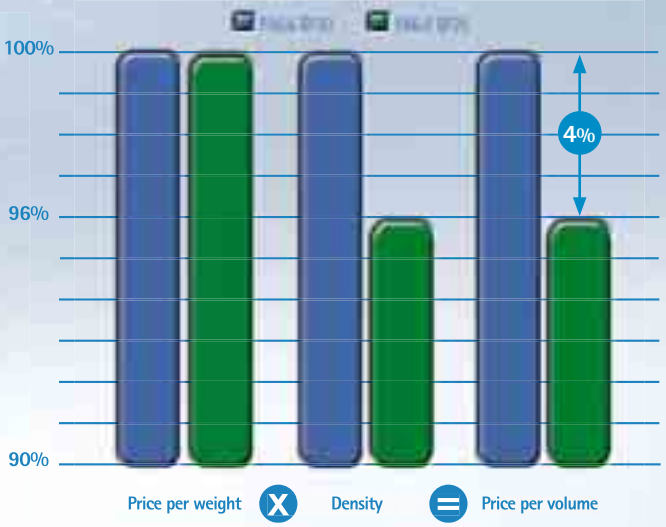
TENSILE STRENGTH AT BREAK
PA6.6 GF30 ageing at 130°C in glycol-water 50/50



RESISTANCE AFTER AGEING (130°C)



ECONOMICAL INTEREST



o time and temperature in gl

Water inlets and outlets

Water end tanks

Cooling module

Degassing tank

Heat exchanger tank

	PROPERTIES		STANDARDS	UNITS	RH%	A 21 NATU
1.1	Specific gravity		ISO 1183	g/cm³		1.1
1.2	Moisture absorption	Cold water 24 h at 23°C	ISO 62	%		1.3
1.3	Melting point (DSC)		ISO 3146 - C	°C		263
1.4	Coefficient of linear expansion (23-80)° C		ASTM E 831	$10^{-5}K^{-1}$		7
1.5	Heat deflection temperature under load	1.80 MPa	ISO 75-2	°C		75
1.6	Mould shrinkage	Direction //	REP/ASTM D955	%		1.9
		Direction T		%		1.9
2.1	Tensile	Stress at break	ISO 527-2	Mpa	RH0/RH50	90 /
		Elongation at break	ISO 527-2	%	RH0/RH50	6 / 3
		Tensile Modulus	ISO 527-2	MPa	RH0/RH50	3000 /
2.2	Flexural	Stress at break	ISO 178	MPa	RH0/RH50	120 /
		Flexural Modulus	ISO 178	MPa	RH0/RH50	2900 /
2.3	Impact	Izod notched	ISO 180/1A (93)	kJ/m²	RH0/RH50	4 /
		Charpy un-notched	ISO 179/1eA	kJ/m²	RH0/RH50	4,5 /
		Charpy notched	ISO 179/1eU	kJ/m²	RH0/RH50	4.5 /
3.1	Glycol resistance Charpy un-notched (measurement at RH0 -23°C)	**120°C** after 200 h in water/glycol	ISO 179/1eA	kJ/m²		
		135°C after 200 h in water/glycol	ISO 179/1eA	kJ/m²		
		130°C after 500 h in water/glycol	ISO 179/1eA	kJ/m²		
		130°C after 1000 h in water/glycol	ISO 179/1eA	kJ/m²		

lycol coolant environment

	STANDARD PRODUCTS					NEW PRODUCTS			
7 RAL	A 218G V30 NATURAL	A 218 V25 BLACK 21 N	A 218 V30 BLACK 34 NG	A 218G V33 BLACK 34 N	A 218 V35 BLACK 34 NG	A 218G1 V25 BLACK 34 N	A 218G1 V30 BLACK 34 N	A 218G2 V25 BLACK 34 N	A 218G2 V30 BLACK 34 N
PHYSICAL									
4	1.37	1.32	1.37	1,39	1.41	1.32	1.37	1.32	1.37
3	0.8	0.9	0.8	0,77	0.75	0.9	0.8	0.9	0.8
3	263	263	263	2,63	263	263	263	263	263
	2.5	2.7	2.5	2,3	2.2	2.7	2.5	2.7	2.5
	250	245	250	253	255	245	250	245	250
)	0.5	0.6	0.5			0.6	0.5	0.6	0.5
)	0.8	0.85	0.8			0.8	0.8	0.8	0.8
MECHANICAL									
60	190 / 135	165	190 / 136	200 / 140	210 / 150	170	195 / 140	170	195 / 140
30	3 / 4	3 / 4	3 / 4	3/4	3 / 4	3 / 4	3 / 4	3 / 4	3 / 4
1500	10000 / 7500	8400 / 6300	10000 / 7500	10700 / 8000	11400 / 8700	8400 / 6300	10000 / 7500	8400 / 6300	10000 / 7500
50		255 / 155	280 / 185	290 / 198		255 / 155	280 / 185	255 / 155	280 / 185
1450	9200/6400	7900 / 5000	9200 / 6400	9500 / 6700		7900 / 5000	9200 / 6400	7900 / 5000	9200 / 6400
12	11 / 16	8 / 15	10 / 18	12 / 18	13 / 18	8 / 15	10 / 18	8 / 15	10 / 18
14	80 / 95	65 / 80	83 / 95	92 / 98	95 / 100	68 / 87	85 / 100	72 / 90	87 / 105
12	12 / 16	10 / 13	11 / 15	13 / 17	13.5 / 18,5	10 / 13	11 / 15	10 / 13	11 / 15
SPECIFIC									
	70		70						
			48			50	55	62	67
		34	42			43	48	52	57
		20	22			25	27	30	33

G1-G2 TECHNYL® GLYCOL GRADES A New Generation of Performance...

TECHNYL® A 218G1 V30 or V25 Black 34N
TECHNYL® A 218G2 V30 or V25 Black 34N

- ➔ Long life OAT glycol coolant resistant
- ➔ High breakthrough on temperature resistance
- ➔ Outstanding mechanical properties

...enhancing our current range:

- Unreinforced Polyamide 6.6 :

TECHNYL® A 217

- Glass fiber reinforced Polyamide 6.6 :

TECHNYL® A 218V30 or V25 or V35 Black 21N
TECHNYL® A 218V30 or V35 Black 34NG

Rhodia
Engineering Plastics
Avenue Ramboz - BP 64
F-69192 Saint-Fons Cedex
Tel +33 (0)4 72 89 27 00
Fax +33 (0)4 72 89 27 01
www.rhodia-ep.com

CHALLENGING BOUNDARIES