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PRIMEF

Compounds based on polyphenylene sulphide

The solution for
high temperature
applications.





Compounds based on polyphenylene sulphide

The PRIMEF compounds comprise a family of glass fibre reinforced thermoplastics with or without mineral fillers, based on polyphenylene sulphide PPS. They are used in the injection of high performance parts.






The PRIMEF range

The PRIMEF polyphenylene sulphide range is comprised of three main groups :

Grades	Characteristics
4000 Series PRIMEF 4002 PRIMEF 4010	Compounds reinforced with 40% glass fibres High fluidity Improved mechanical properties
7000 Series PRIMEF 7002 PRIMEF 7010	Compounds reinforced with glass fibres and mineral fillers High fluidity Improved mechanical properties
5000 Series PRIMEF 5084	Self-lubricating compounds Contains 30% Glass fibres and PTFE.

A combination of remarkable properties

Although properties vary between each grade, the most notable characteristics of parts produced in PPS PRIMEF are summarised as follows.

-  **Exceptional temperature resistance**
Continuous use temperature up to 220°C.
-  **Remarkable fire resistance**
All PRIMEF compounds are inherently VO.
-  **Excellent chemical resistance**
Excellent behaviour in contact with a wide range of organic and mineral based products, even at high temperatures.
-  **Dimensional stability**
PRIMEF parts have virtually no water absorption, excellent creep, and low thermal expansion.
-  **Ease of Processing**
High fluidity allows the production of complex, thin-walled parts.

Properties (Natural grades)	Standards	Units	PRIMEF 4002	PRIMEF 4010	PRIMEF 7002	PRIMEF 7010	PRIMEF 5084
GF: glass fibres MF: mineral filled			40 % GF High fluidity	40 % GF Improved mechanical properties	GF + MF High fluidity	GF + MF Improved mechanical properties	30 % GF Lubricated
Physical Properties							
Density	ISO 1183	g/cm ³	1,61	1,66	1,96	1,96	1,68
Filler Content	-	%	40	40	65	65	30
Mould shrinkage (flow direction)	(1)	%	0,1-0,3	0,1-0,3	0,1-0,2	0,1-0,2	0,1-0,2
Flow length (Spiral flow)	(2)	mm	250	190	150	90	-
Mechanical Properties (at 23 °C)							
Tensile							
ISO 527							
Strength at break		MPa	160	180	160	160	140
Modulus		GPa	13	14	20	21	12
Elongation at break		%	1,6	1,7	1,2	1,2	1,8
Flexural							
ISO 178							
Strength at break		MPa	225	250	240	240	190
Modulus		GPa	13	14	21	21	10,5
IZOD Impact strength							
ISO 180							
Notched		J/m	65	85	80	90	55
Unnotched		J/m	250	450	250	280	400
Thermal properties and flame resistance							
HDT/A	ISO 75	°C	> 260	> 260	> 260	> 260	> 260
Thermal conductivity	ISO 8302	W/m·K	0,5	0,3	0,6	0,6	-
Fire Classification	UL 94	(0,8 mm)	V-0	V-0	V-0	V-0	V-0
Limiting Oxygen Index (LOI)	ISO 4589	%	52	51	58	58	-
Electrical properties							
Dielectric strength	IEC 243	kV/mm	17	17	15	15	-
Volume resistivity	IEC 93/167	Ohm·cm	1·10 ¹⁶	1·10 ¹⁶	1·10 ¹⁵	1·10 ¹⁵	-
Dielectric Constant	IEC 250	at 1 kHz	4	4	5	5	-
		at 1MHz	3,9	3,9	4,9	4,9	-
Dielectric loss angle	IEC 250	at 1 kHz	0,002	0,002	0,03	0,03	-
		at 1MHz	0,002	0,002	0,009	0,009	-
Comparative tracking index (CTI)	IEC 112	V	150	150	200	200	-

(1) Solvay internal procedure (pressure = 750 bar; specimens 40x20xw mm; w between 2 and 4 mm)

(2) Solvay internal procedure (pressure = 1000 bar; thickness = 1mm; material temperature = 330 °C)

Non exhaustive list; other properties for special markets or applications are available on demand.

Highly Technical Applications

Due to their intrinsic properties, the PRIMEF compounds are suitable for a wide range of highly technical applications in a variety of markets:

- Electronics and Electrical Industry: bobin supports, connectors, boxes, etc.
- Automotive Industry: pumps, turbo compressor parts, oil sumps, cases, etc.
- Chemical, Petrochemical Industry: pumps, fans, valves, fittings, etc.
- Mechanical and Calibration Industry: rotors, measurement apparatus, chassis, frames, etc.



PRIMEF

Recommendations for easy processing

The following table summarises the processing parameters recommended for IXEF compounds.

Temperatures	
Barrel Temperature (°C)	
• Feed Zone	290 - 300
• Compression Zone	310 - 320
• Mixing Zone	320 - 330
• Nozzle	320 - 350
Melt Temperature (measured on purged material) (°C)	320 - 330
Mould Temperature (°C)	150 -160
Plasticising	
• Peripheral screw speed (m/min)	3 - 10
• Hydraulic back pressure (bar)	0 - 10
Injection	
• Injection Speed	élevée
• Material injection pressure (bar)	500 - 1500
Holding and cooling	
• Material holding pressure (bar)	300 - 1500
• Holding time* (s)	3 e **
• Cooling time (includes holding pressure) (s)	2,5 e ² **

* indicative ** e = thickness (mm)



Readily available technical support

SOLVAY technical services are at your disposal to help you bring your projects to fruition:

- Help with the design of parts and tooling
- Stress and flow calculations
- Advice and optimisation of processing conditions



Specific properties

Physical properties

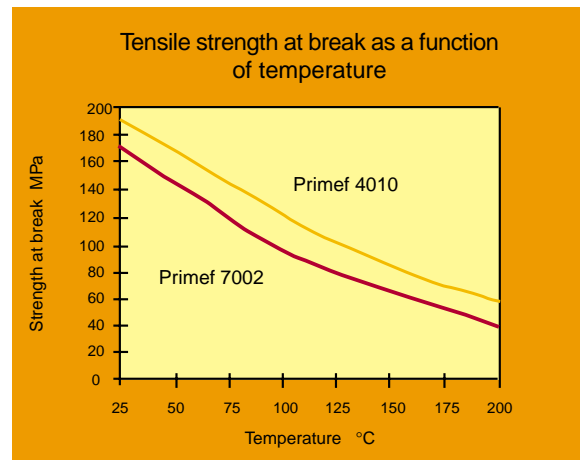
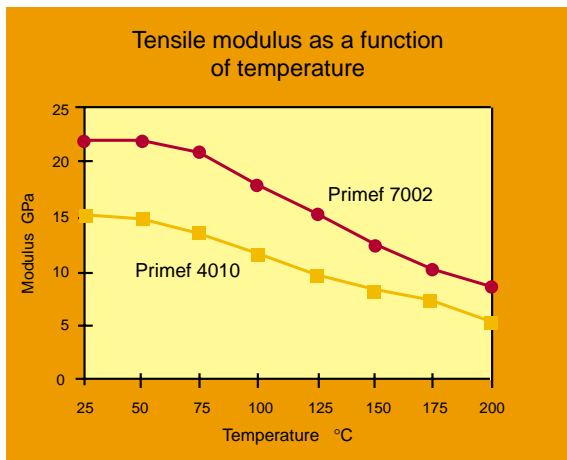
The Polyphenylene Sulphide, which is the base resin for PRIMEF compounds, is a semi-crystalline polymer, which has a glass transition temperature of around 90°C (passing from the vitreous to the rubbery state).

It has a melting temperature in the region of 280°C, but the start of crystallisation occurs during cooling, around 250 °C.

Mechanical properties

PRIMEF compounds maintain a significant proportion of their mechanical properties at high temperatures.

The graphs below illustrate this fact, with respect to the tensile modulus and tensile strength at break.



PRIMEF compounds also show a high resistance to creep, even at high temperature, as well as excellent fatigue properties.

Electrical properties

Final components moulded from PRIMEF are very good insulators, even at high temperatures: the volume resistivity and the dielectric strength remain high up to 200°C.

PRIMEF PPS grades characteristically have a low dielectric constant and a low loss factor throughout a wide temperature range.

Chemical properties

PRIMEF compounds resist an impressive range of chemical products: mineral acids and alkalis, common solvents, brake fluid, motor oils, fuels, etc.

For certain grades, we must take into account that the chemical environment could affect the mineral filler.

The resistance to water, including boiling water, is particularly good for PRIMEF compounds.

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Health and Safety Information

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