



We create chemistry

Ultramid® B3PG6 BK23238

Inovadora PA6 com excepcional estabilidade térmica para os novos desafios do setor automotivo

Painel FEIPUR | Compostos Termoplásticos

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Setembro/2021

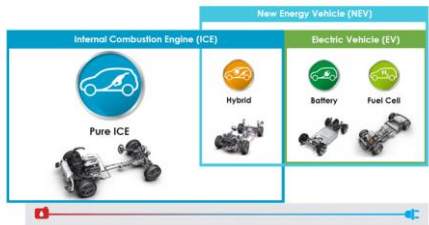


Powertrain | Tendências & Abordagens Estratégicas

Foco : redução das emissões, principalmente CO2



- **Lightweighting**
 - Redução do peso, por exemplo através de substituição a metais, é elemento-chave nos projetos atuais
- **ICE Powertrain Efficiency**
 - Turbocharging e o downsizing dos motores afetarão grande parte dos veículos produzidos nas Américas até 2025.
 - Injeção Direta (DI) representa evolução do controle de combustível.
- **Eletrificação**
 - Arquitetura do sistema : HEV, PHEV, BEV, FCEV

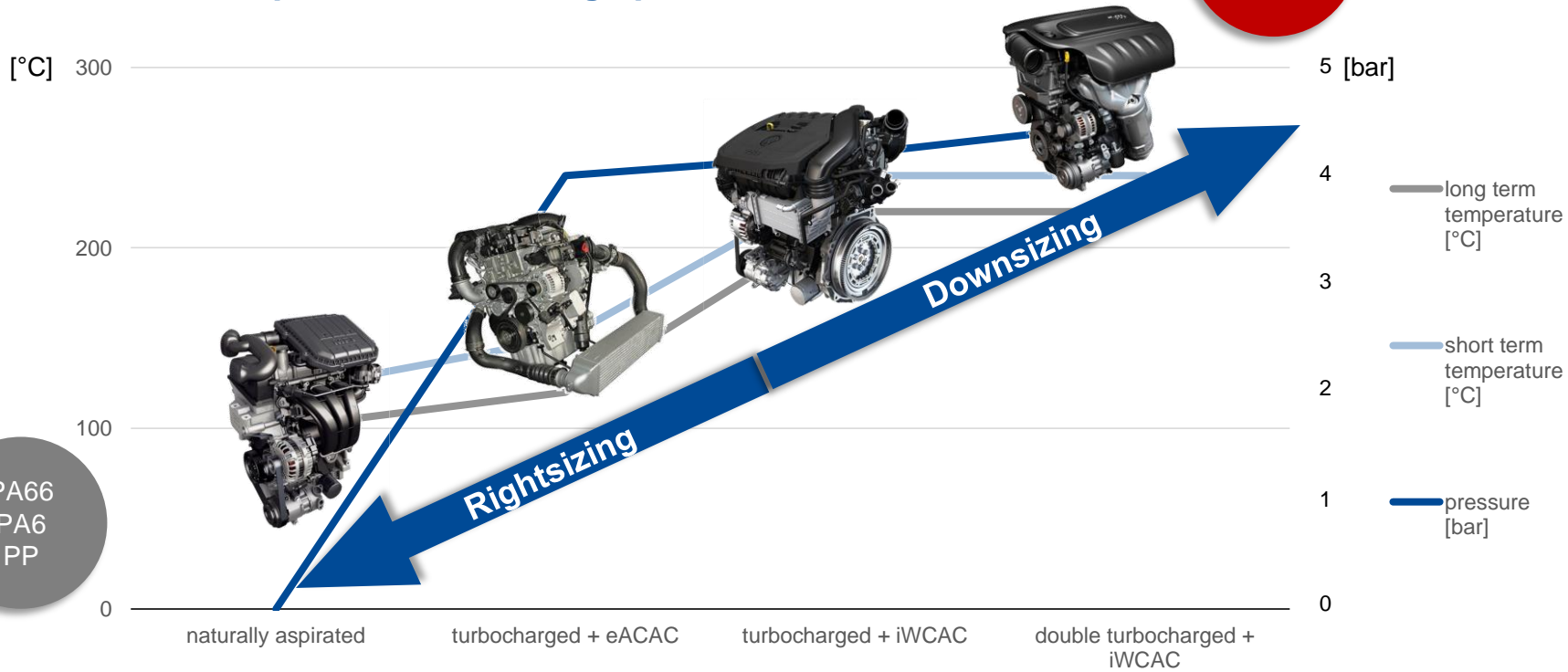


Impacto no Gerenciamento Térmico e Propriedades dos Materiais

Tendência: Downsizing & Rightsizing

Impacto: variação nos requisitos

Schematic temperature and charge pressure



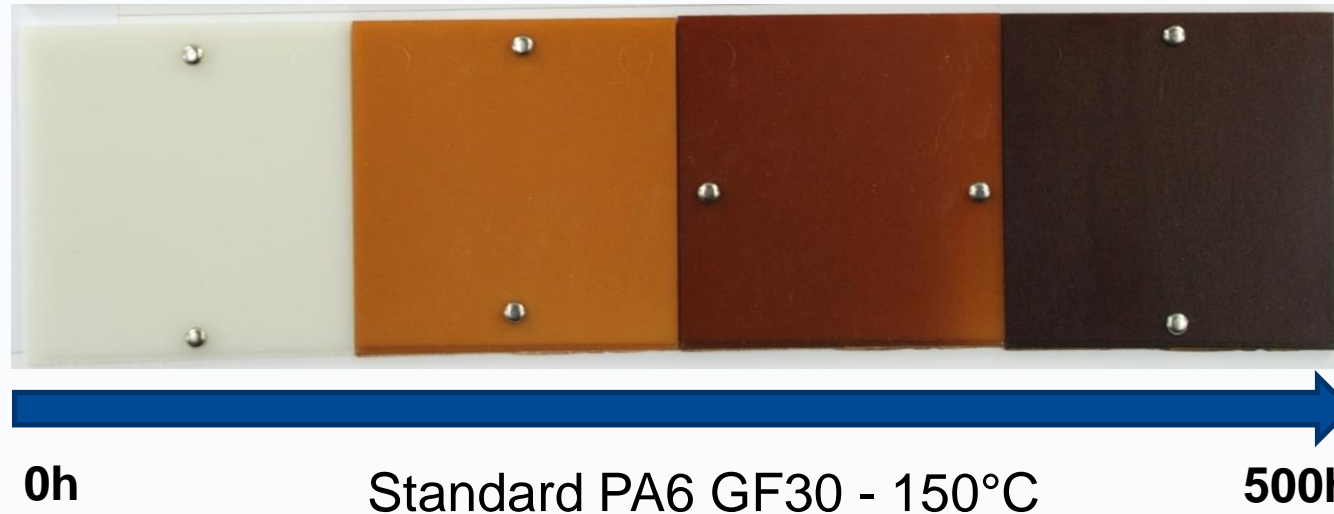
PA66
PA6
PP



Resistência Térmica das Poliamidas

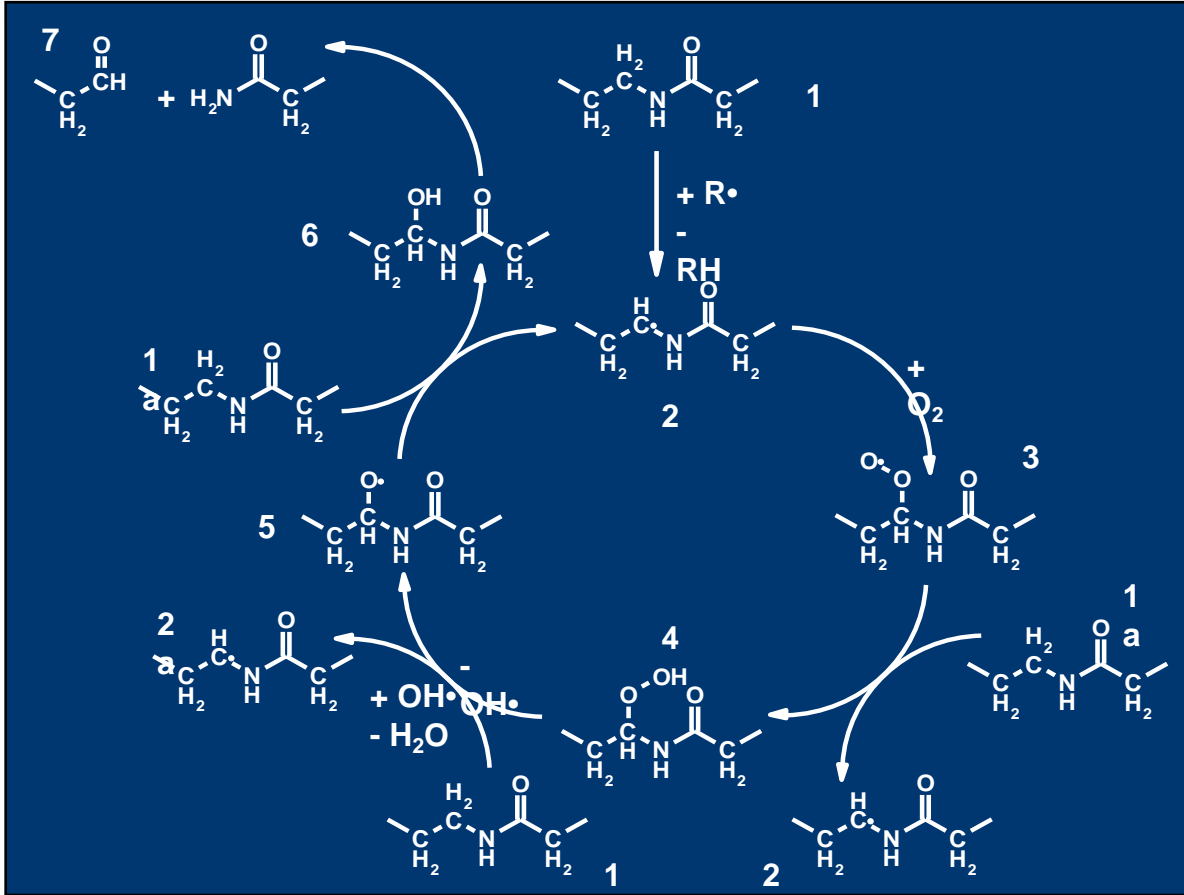
Efeitos da exposição contínua a temperaturas altas – PA6/GF30

Mudança na Cor, motivada pela exposição prolongada em temperaturas acima de 80°C



Resistência Térmica das Poliamidas

Mecanismos de estabilização térmica



Características:

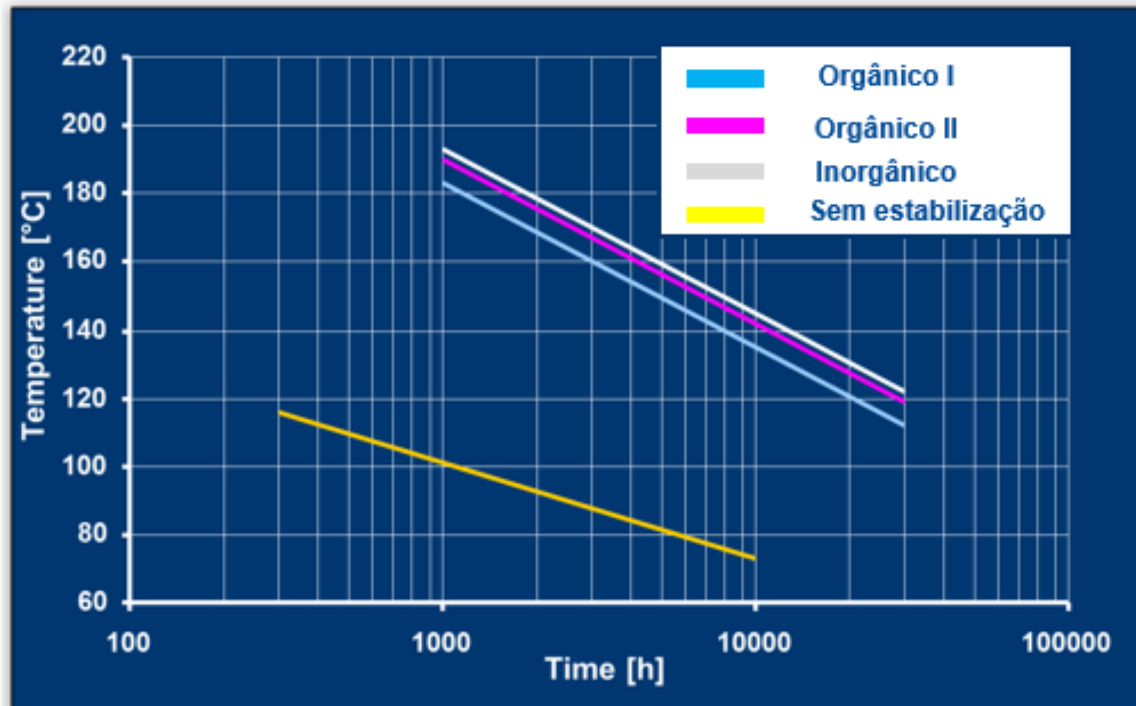
- Formação de radicais menos reativos
- Processo Cíclico : RedOX + Degeneração de Peróxidos
- Presença de Oxigênio é mandatória no processo

Estabilizantes Orgânicos
Estabilizantes Inorgânicos

Resistência Térmica das Poliamidas

Efeito da estabilização térmica – PA6/GF30

Gráfico Temperatura x Tempo - Redução em 50% da Resistência à Tração em PA6/GF30

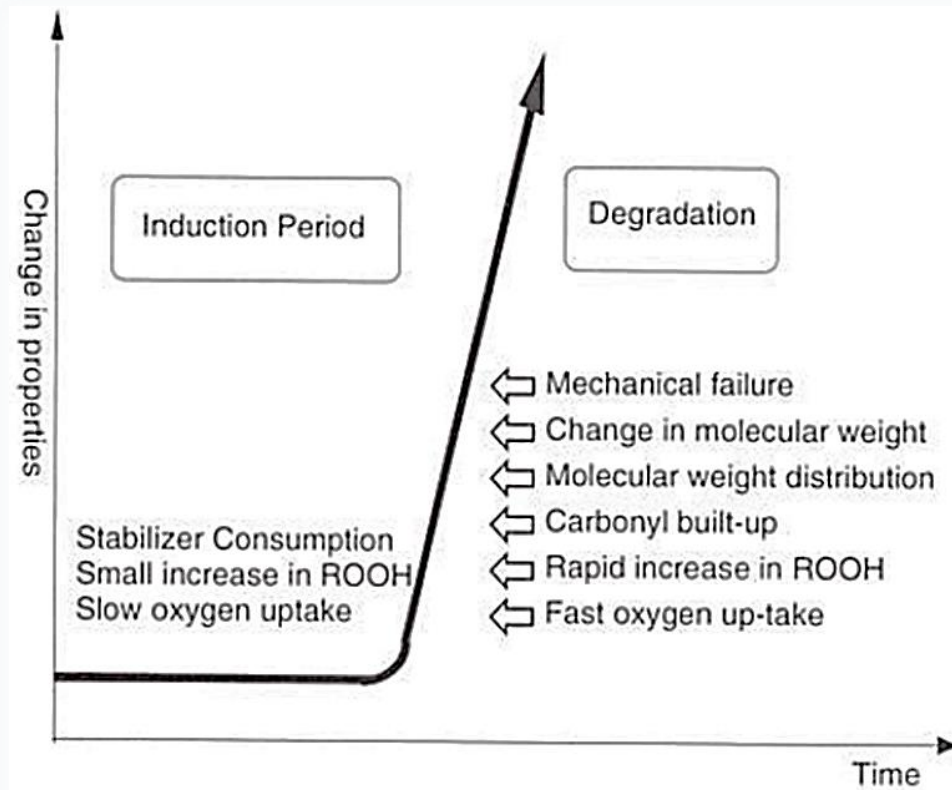


Recomendação geral : 500-3000h

- Orgânico I (E): 140 °C
- Orgânico II (H): 160 °C
- Inorgânico (W): 170 °C

Resistência Térmica das Poliamidas

Efeito da estabilização térmica – PA6/GF30



Estabilização Térmica controla a performance mecânica ao longo do período de uso contínuo

Efeitos da degradação podem ser retardados, mas não completamente eliminados

Source: M.N. Grigg, "Thermo-oxidative degeneration of polyamide 6, PhD-thesis, 2006, Queensland University of Technology

BASF Ultramid® portfolio for Air Induction

Case: Air Intake Manifold

Ultramid® Portfolio for Air Induction

Caso : Air Intake Manifold (Coletor de Admissão)

Atributo	Grade	Característica
Standard Grades	ULTRAMID® B3WG6 BGVW BK 564	• General purpose
	ULTRAMID® B3WG6 BK00564	• General purpose
Improved Burst Pressure	ULTRAMID® B3WG6 GPX BK23238 Improved burst pressure up to 170 °C	• Best in class, weld line strength, fatigue resistance
Superior Burst Pressure	ULTRAMID® B3PG6 BK23238 NEW Improved burst pressure over 180 °C	• Next gen powertrain, metal-free
High Temperature Resistance	ULTRAMID® A3W2G6 BK20560 Improved property retention to 190 °C	• Higher operating temperature range
	ULTRAMID® A3W3G7 BK20560 Harsh environment property retention to 210 °C	• Next step in high temp increase
	ULTRAMID® ENDURE D3G7 BK20560 Superior property retention to 220° C	• ENDURE technology to meet most challenging requirements



Ultramid® B3WG6 GPX

Superior performance em AIM

Item	Test method	Unit	Ultramid® B3WG6 BGWV	Ultramid® B3WG6 GPX	% Difference
Density	ISO 1183	g/cm ³	1.36	1.36	0.0
Tensile stress at break	ISO 527-2	MPa	176	195	+ 8.0 %
Tensile strain at break	ISO 527-2	%	3.1	3.3	+ 6.5 %
Tensile modulus	ISO 527-2	MPa	9490	9580	+ 0.9 %
Flexural strength	ISO 178	MPa	260	287	+ 10.4 %
Flexural modulus	ISO 178	MPa	8550	8510	- 0.5 %
Charpy impact with notch	ISO 179/1eA	kJ/m ²	11	16	+ 45.5 %
Charpy impact without notch	ISO 179/1eU	kJ/m ²	72	99	+ 37.5 %
HDT (Method A/1.8MPa)	ISO 75-2	Deg.C	209	207	+ 1.0 %

Versão GPX oferece :

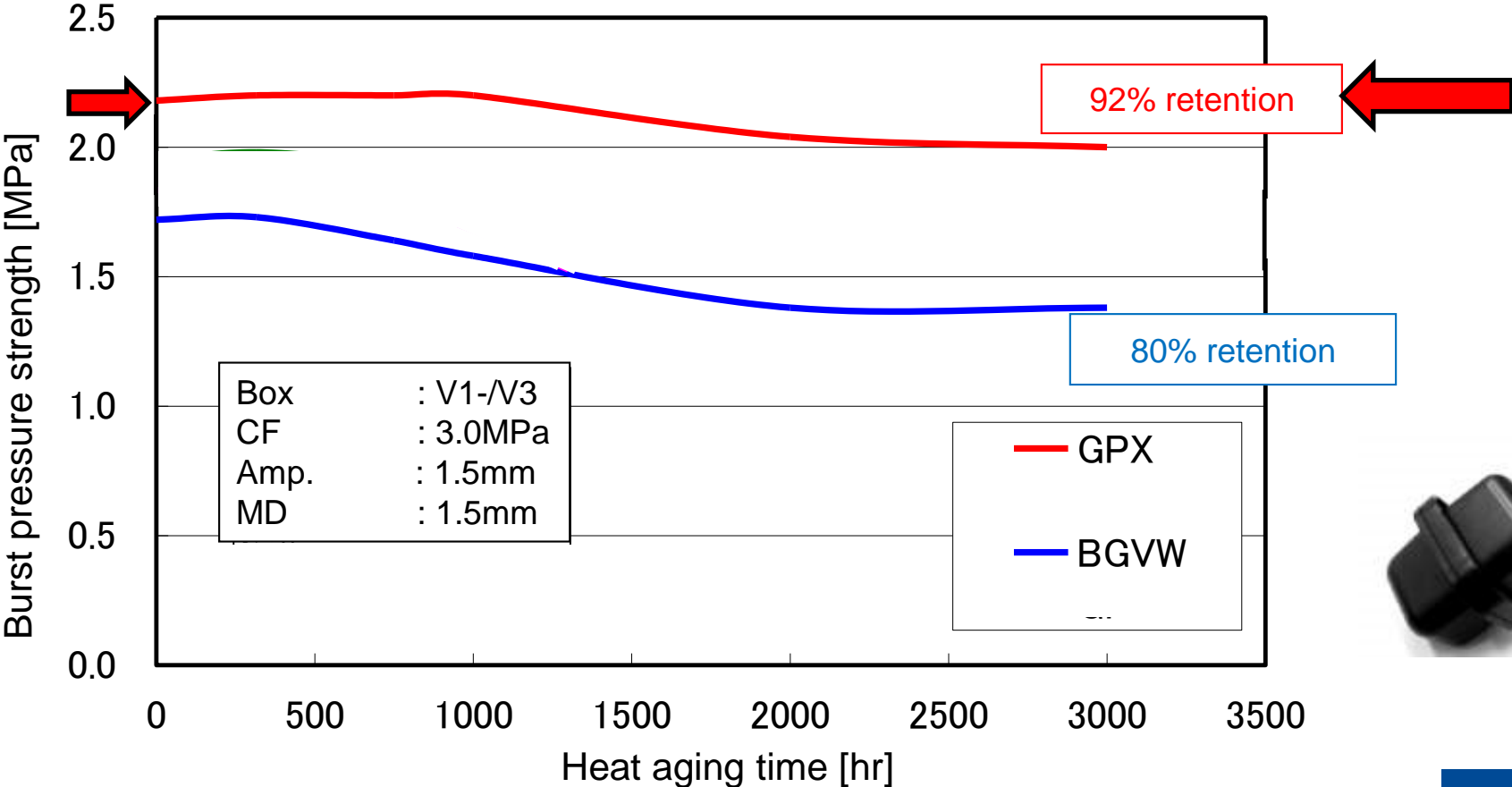
- . Superior Resistência Tração e Impacto vs PA6/GF30 standard
- . Maior Burst Pressure após Heat Aging @170 °C

Oportunidade para otimização de design e redução de espessura de parede, com potencial para redução de peso e custo.

Ultramid® B3WG6 GPX

Superior performance em AIM – Heat Aging

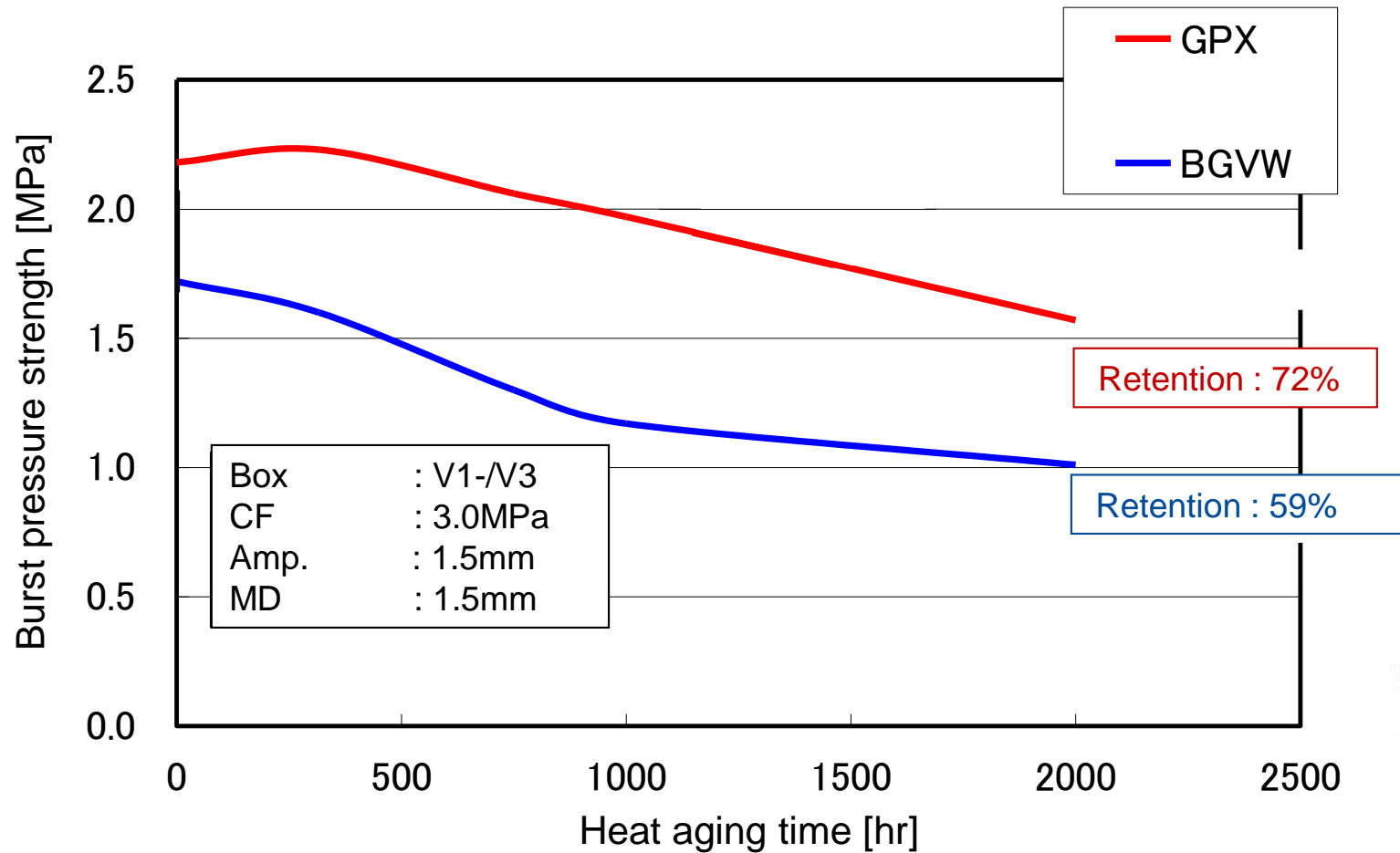
Burst Strength after Heat Aging @ 150°C



Ultramid® B3WG6 GPX

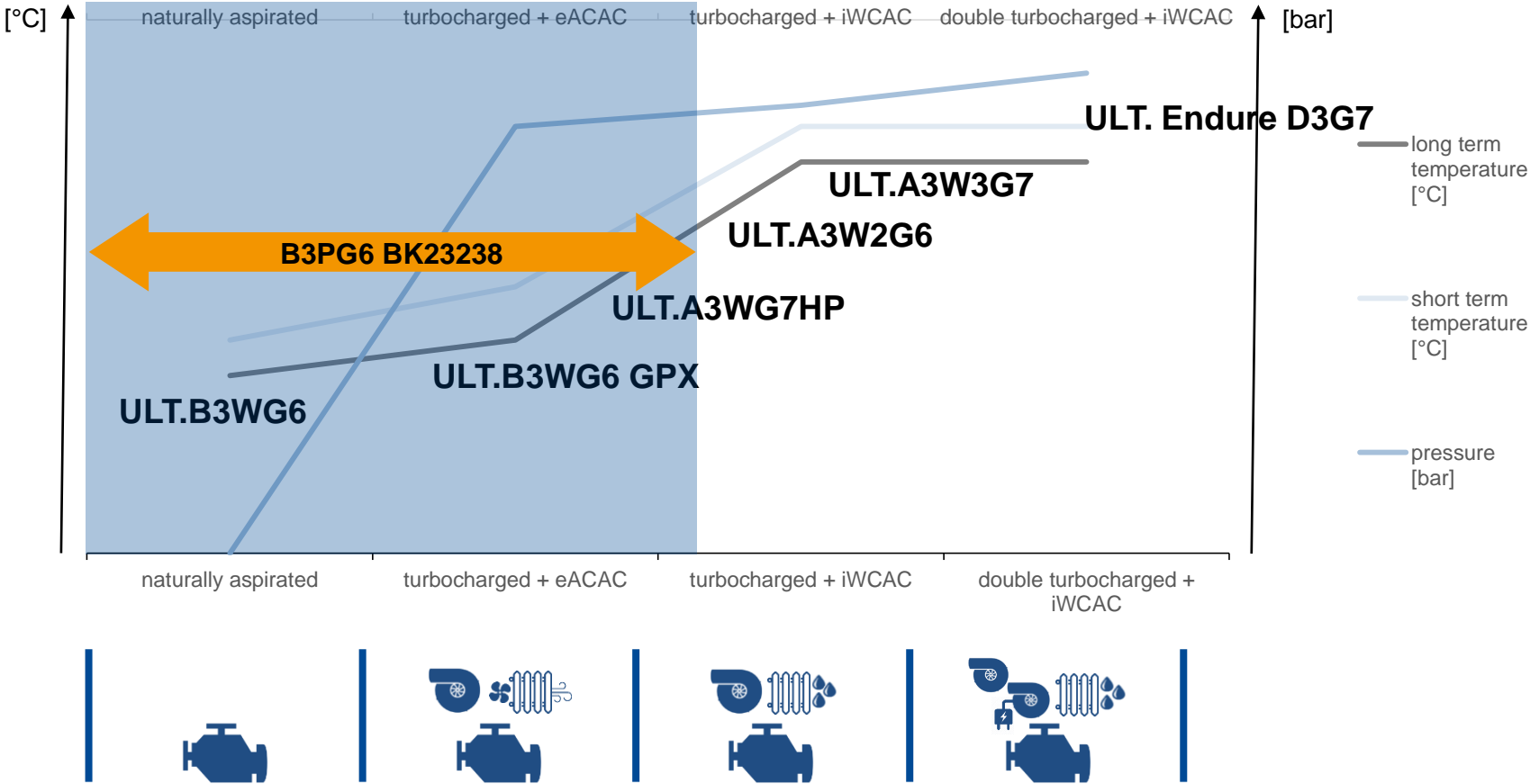
Superior performance em AIM – Heat Aging

Burst Strength after Heat Aging @ 180°C



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Inovadora PA6/GF30 para aplicações em gerenciamento térmico



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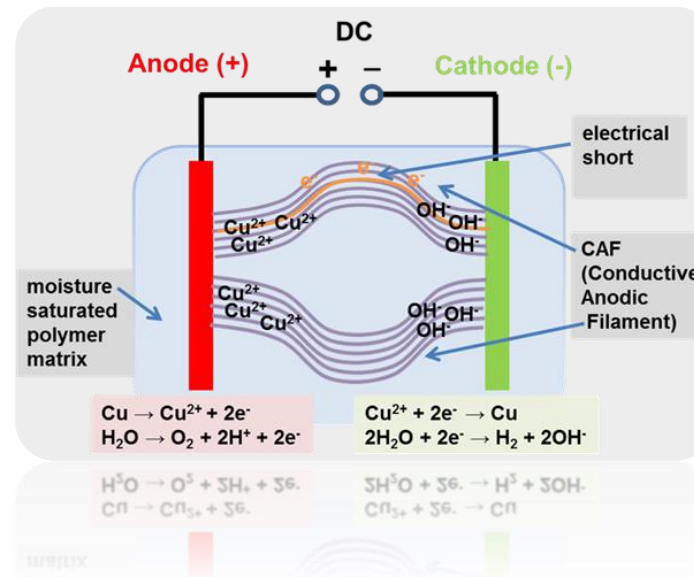
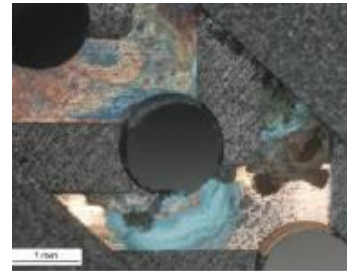
Eletricamente neutro

Standard PA heat stabilization

based on metal halides...



...can cause
electrical failures
by galvanic corrosion & short circuits



P-Stabilization

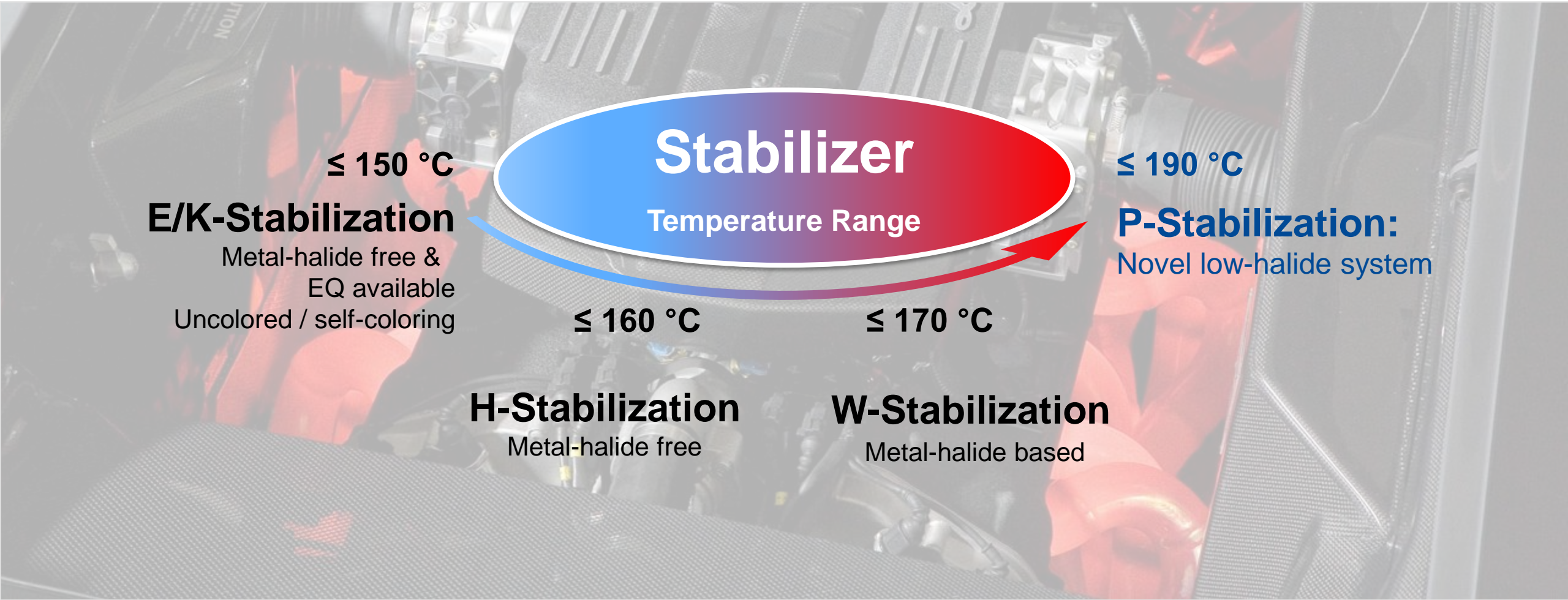
is metal-halide free



Minimized risk of electronic failure
by galvanic corrosion & short circuits

BASF PA6 Heat Stabilization

Background



Disclaimer: Temperature recommendations are based on 5,000h heat aging experiments and are indications. Specific products might differ

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Proposta de Valor

Cor Preta permitindo excelente acabamento superficial (Glossy)

Disponibilidade Global

Superior Performance Mecânica*

Maior Resistência Térmica (Heat Aging)*

Superior Burst Pressure após Heat Aging*

Excelente performance em soldagem : Vibration | Hot Gas

Sistema de estabilização eletricamente neutro

Drastic thin-walling = cost & weight out



Next Gen Powertrains

*versus standard PA6 GF30

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Quadro comparativo de propriedades

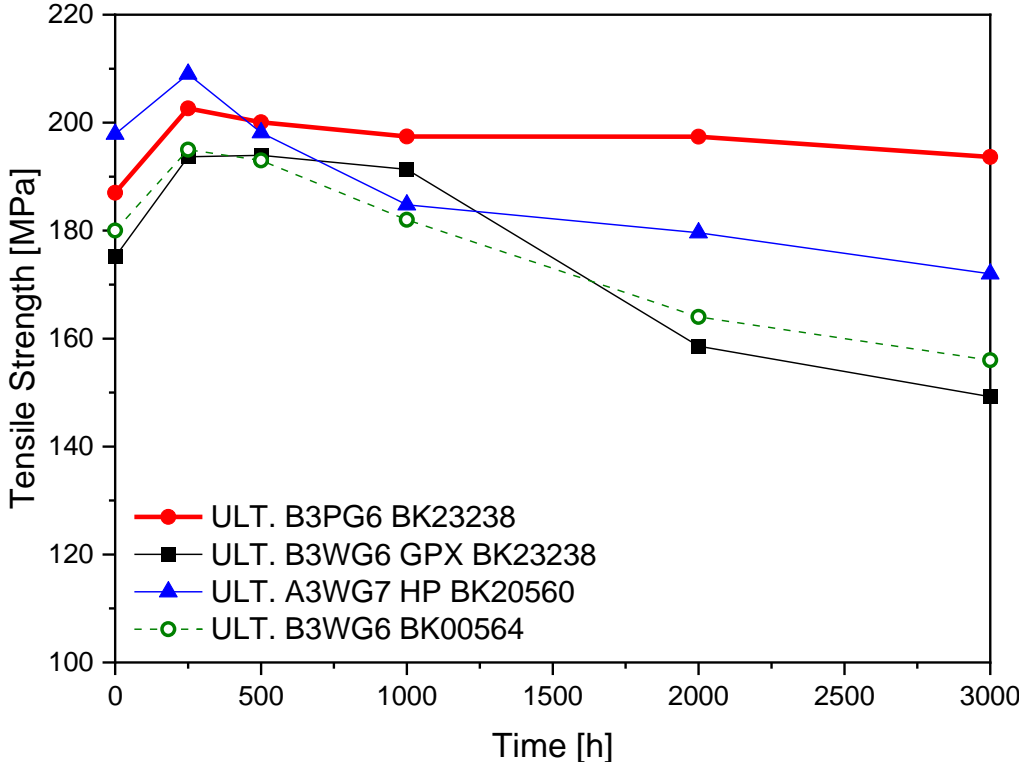
		ULT. B3WG6 GPX BK23238	ULT.B3WG6 BK00564	ULT.A3WG6 BK00564	A3WG7 HP BK20560	ULT. B3PG6 BK23238
MVR (275°C/5kg, 5min)	cm³/10'	20	40	25	55	18
DSC (T _c onset)	°C	181	194	238	228	185
DSC (T _c peak)	°C	167	186	230	217	167
E-Modulus	MPa	9 800	10 000	9800	11 200	10000
Tensile strength	MPa	185	180	185	200	187
Elongation at break	%	3.5	3.1	3.3	2.9	4.0
E-Modulus @ 120°C	MPa	3400	3300	4000	4600	3500
Tensile strength @ 120°C	MPa	80	76	90	95	80
Elongation at break @ 120°C	%	10.5	6.3	6.5	5.4	9.0
Charpy impact strength	kJ/m²	95	78	70	80	102
Charpy notched	kJ/m²	13	11	9	11	13
Halide content	ppm	>> 100	>> 100	>> 100	>> 100	< 50

Sistema de estabilização eletricamente neutro (baixa presença de haletos metálicos)

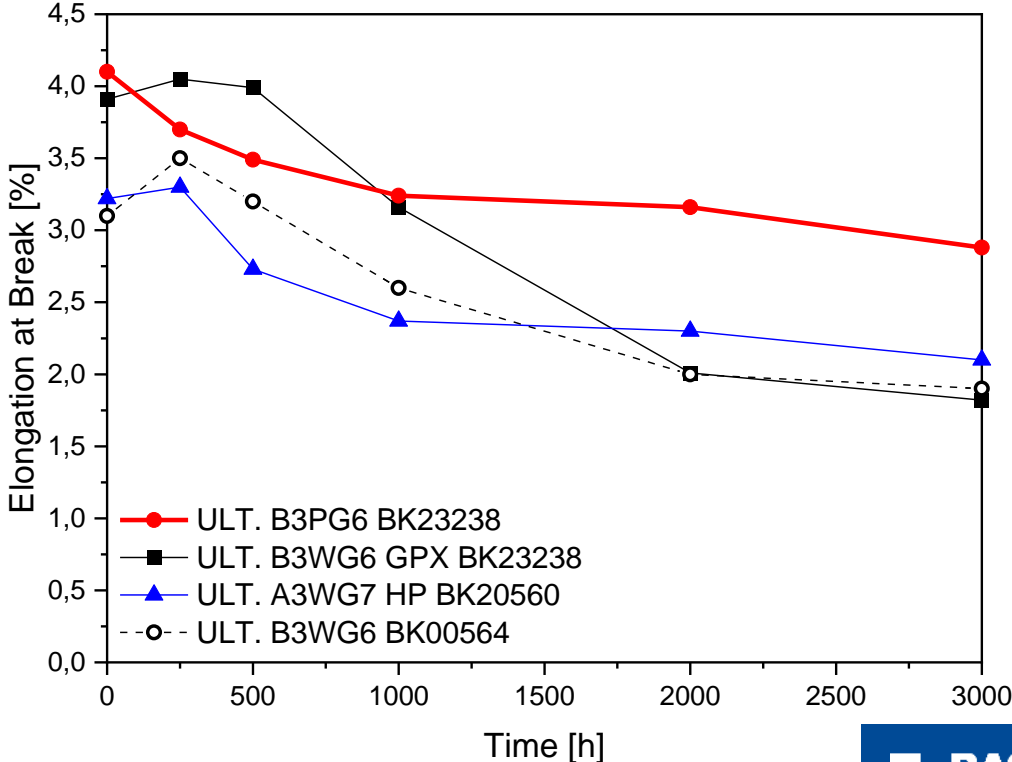
Ultramid® B3PG6 BK23238

Heat ageing | 150°C

Tensile Strength



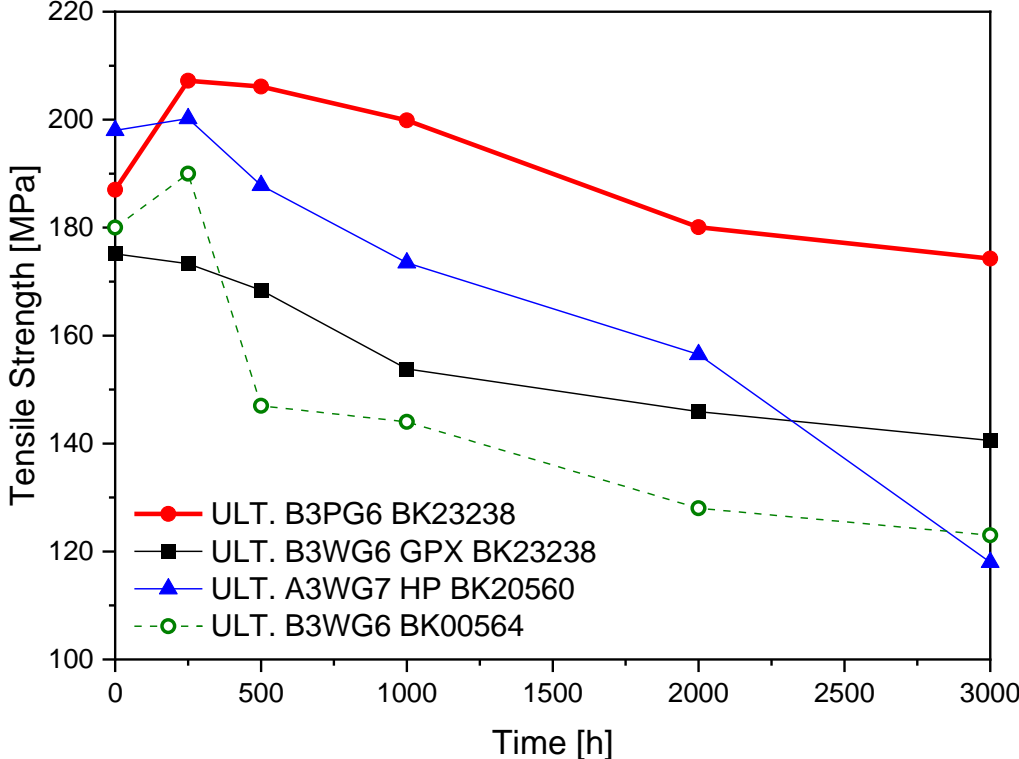
Elongation at Break



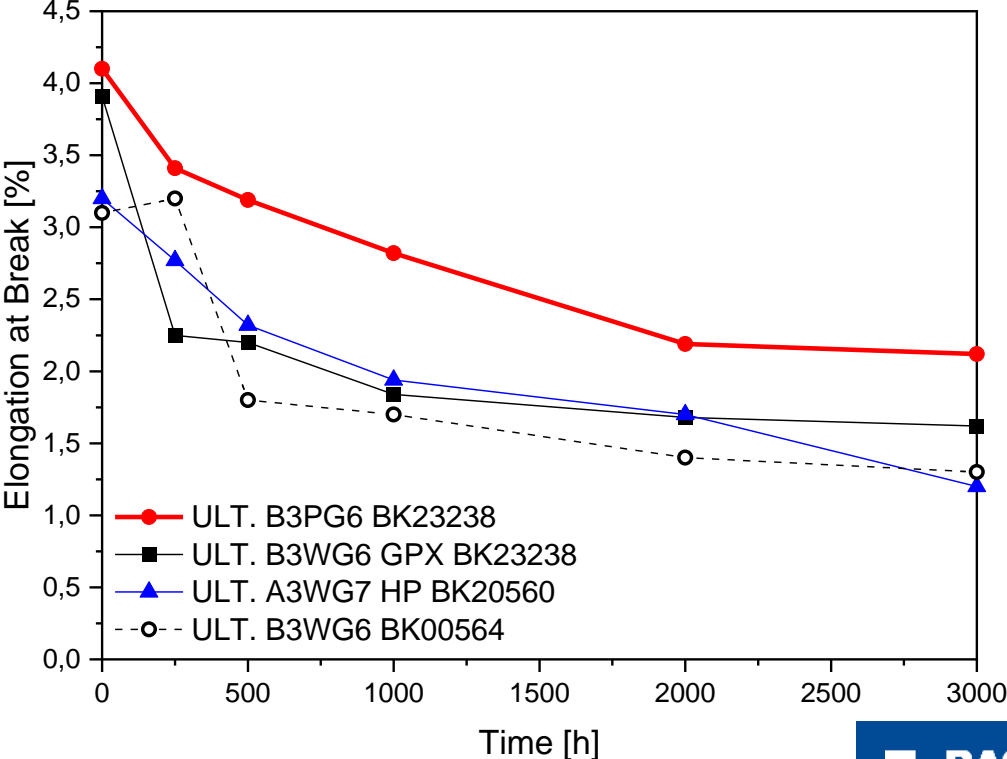
Ultramid® B3PG6 BK23238

Heat ageing | 180°C

Tensile Strength



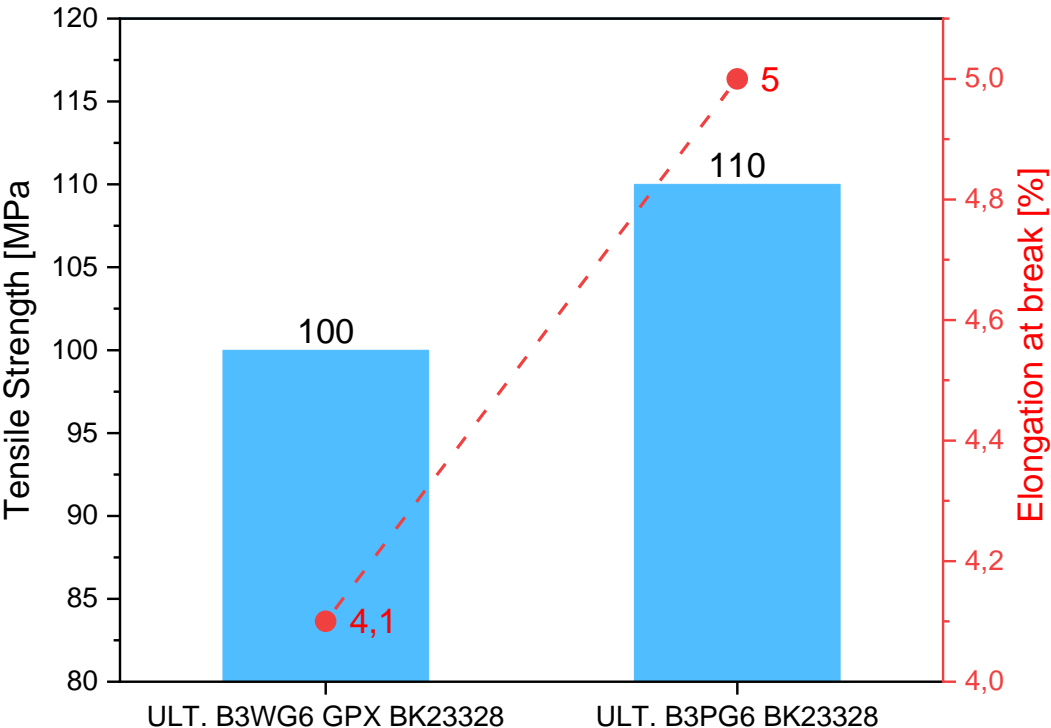
Elongation at Break



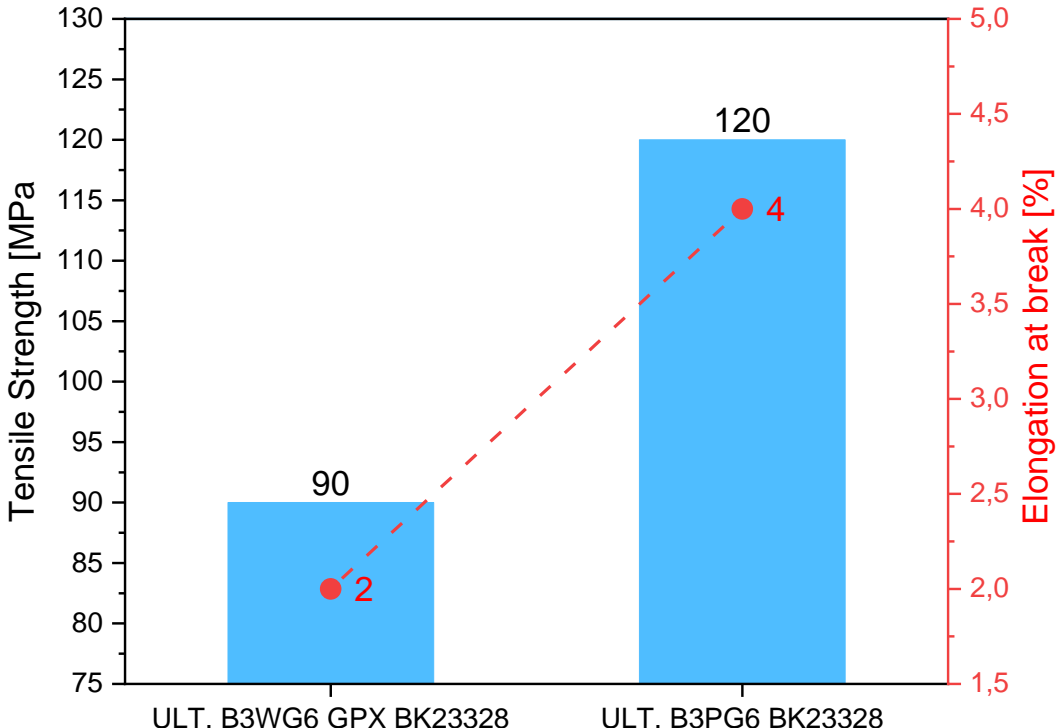
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Resistência Tração @ 120°C

After heat ageing 150°C / 3000h

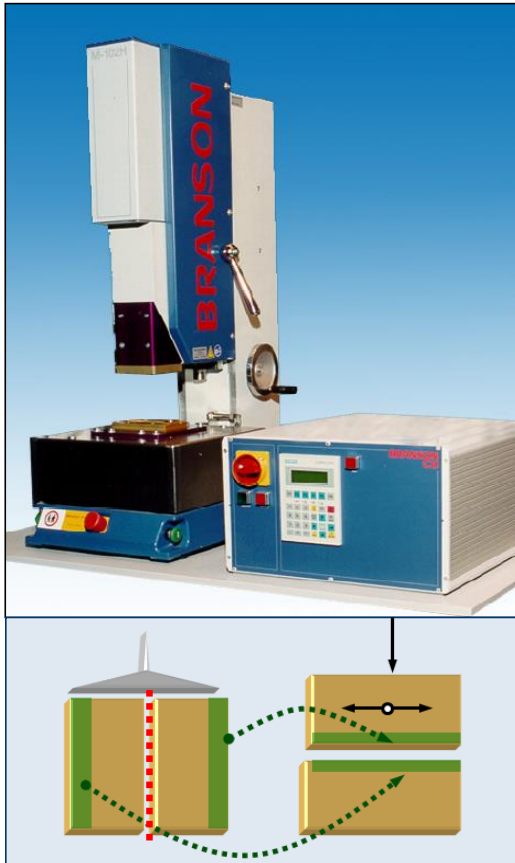


After heat ageing 180°C / 3000h

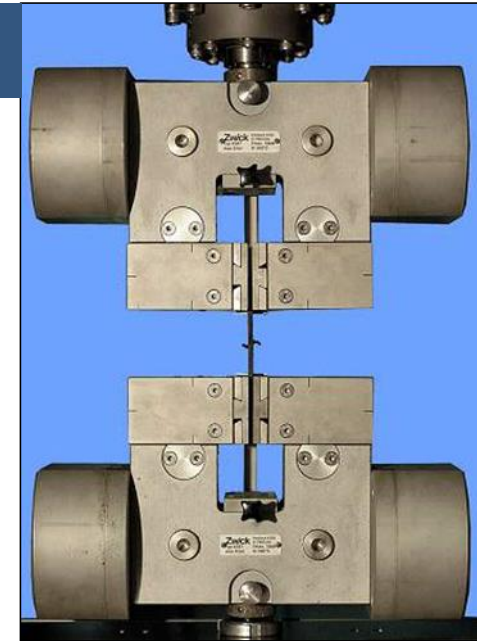
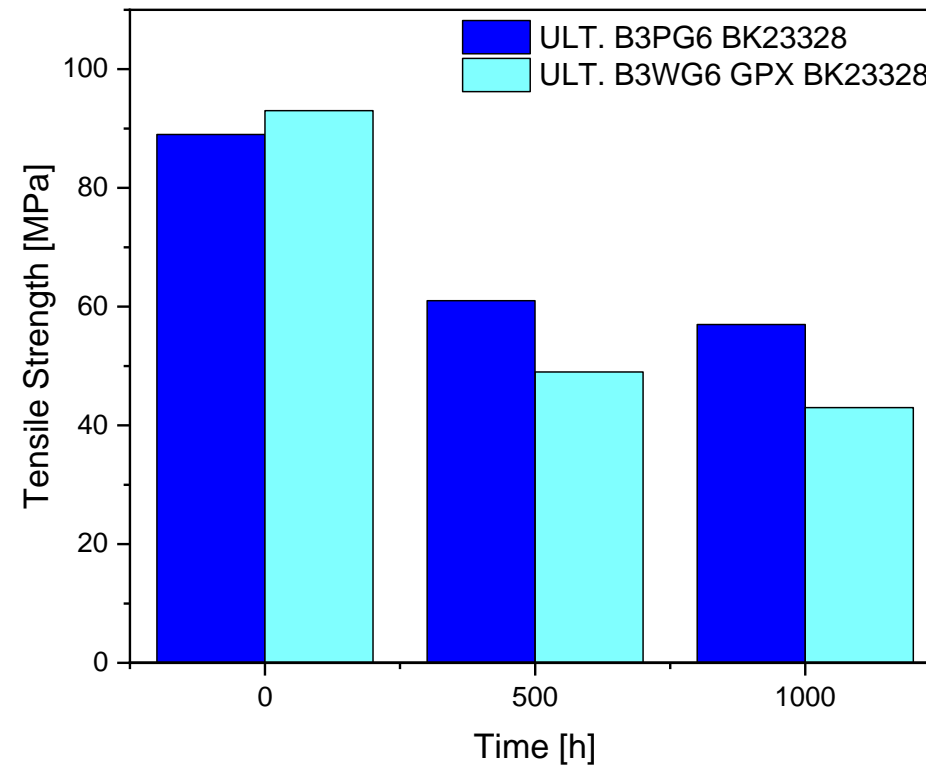


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Performance em soldagem por vibração



Weld line performance after heat ageing @ 180°C



Meltdown set value: 1.5 mm

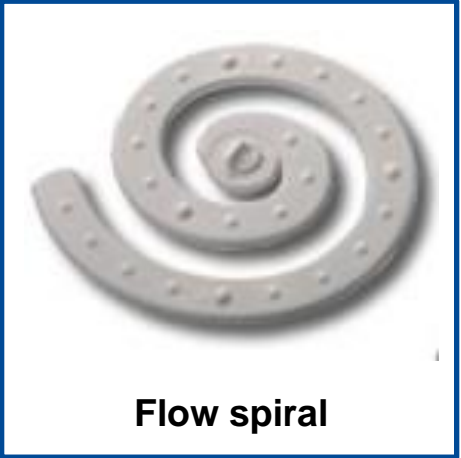
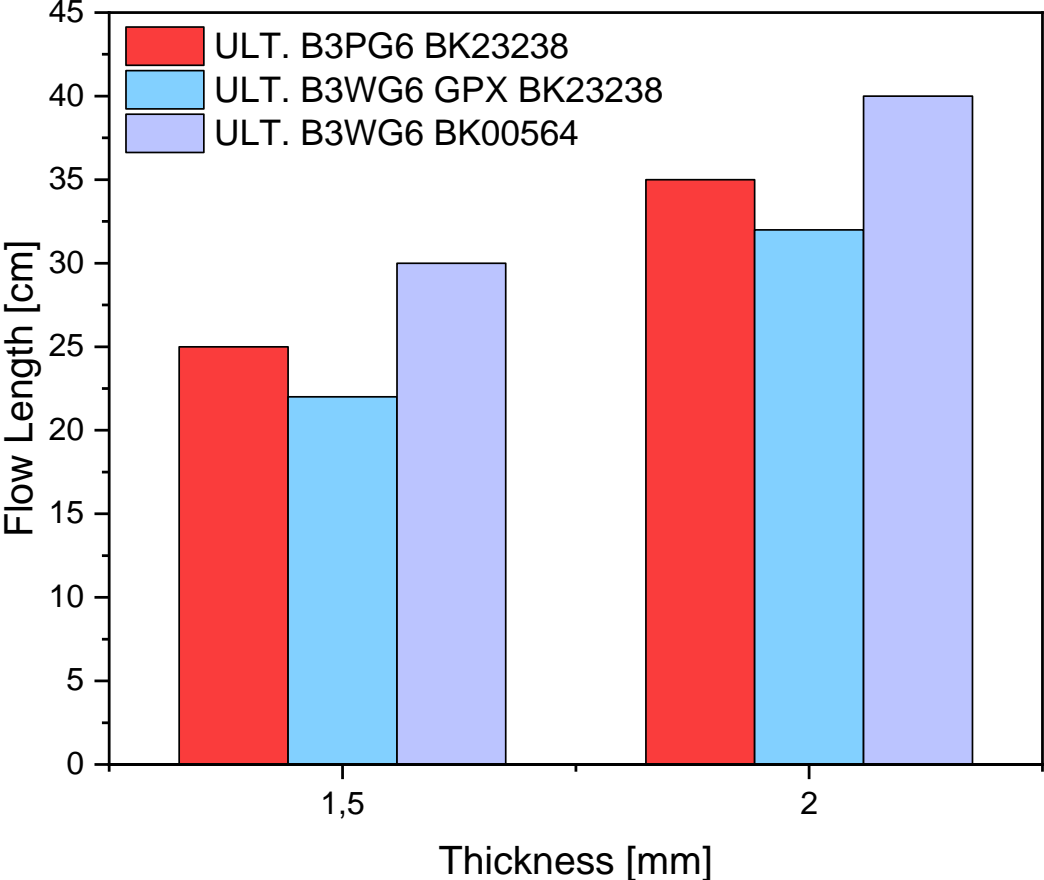
Clamp pressure: 1 Mpa

Amplitude: 0.9 mm

25 % increased weld line strength after ageing at 1000h / 180°C

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Processabilidade – fluxo espiral (cm)



Flow spiral

Melt temp. = 280°C
Mould temp. = 80°C

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Resumo Geral

Principais Características

- Excelente estabilidade Térmica : 1000-3000h | 180-190°C
- Eletricamente neutro → baixo conteúdo de haletos metálicos
- Excelente Performance em Soldagem
- Excelente Burst Pressure após Heat Aging

Principais Aplicações

- Powertrain

Ultramid® Polyamide Product Portfolio

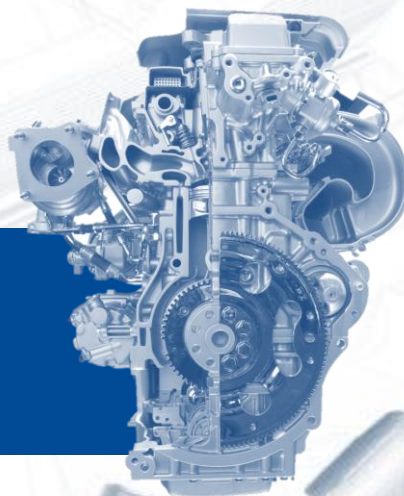
Injection grades

Standard Grades	Ultramid® B3WG6, G7, G8, G10 Continuous use temperature 130° - 170°C	PA6 grades GF30%, 35%, 40%, 50%
	Ultramid® A3WG7 Continuous use temperature 170°C	PA66 GF35%, 1 st level of heat stabilization
	Ultramid® A3WG10 Continuous use temperature 170°C	PA66 GF50%, 1 st level of heat stabilization
Improved Temperature Resistance	Ultramid® A3W2G6 (DPPD-free) Improved property retention to 190°C	PA66 GF30%, 2 nd level of heat stabilization
	Ultramid® A3W2G7 (exp. DPPD-free) Improved property retention to 190°C	PA66 GF35%, 2 nd level of heat stabilization
	Ultramid® A3W2G10 (DPPD-free) Improved property retention to 190°C	PA66 GF50%, 2 nd level of heat stabilization
Superior Temperature Resistance	Ultramid® A3W3G7 Superior property retention to 200-210°C	PA66 GF35%, 3 rd level of heat stabilization
	Ultramid® A3W3G10 Superior property retention to 200-210°C	PA66 GF50%, 3 rd level of heat stabilization
Extreme Temperature Resistance	Ultramid® Endure D3G7 Extreme property retention to 220°C	PA66 GF35%, highest level of heat stabilization
	Ultramid® Endure D3G10 Extreme property retention to 220°C	PA66 GF50%, highest level of heat stabilization





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**Buscando mais informações ou
suporte técnico ?**

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