



**Plastic
Technologie
Service
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New material developments



A22/A23 for adhesion to standard PA

The previous very extensive TPE family with PA adhesion (A3.1 - A3.8) had moderate sealing properties and required some compromises in processing, as the products usually needed to be pre-dried.

The PTS-A22 family however has largely similar properties to the standard grades, including the processing behavior, flexibility and sealing properties.

As sealing properties and bond to PA becomes more and more important we developed the A23 and HH/A23 family. These families show outstanding sealing properties in combination with bond to PA.

This product family can currently be supplied with hardness values between Shore A 40 and 85.

Translucent grades are available

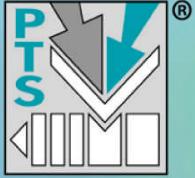


PTS-THERMOFLEX-B

PTS-THERMOFLEX-B: new TPS basic grades with improved price/performance ratio

PTS has developed a complete range of unfilled and filled PTS-THERMOFLEX-B grades suitable for consumer products and automotive applications.

This product family can currently be supplied with hardness values between Shore D 30 and 55.

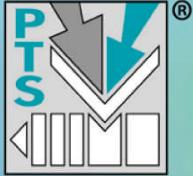


PTS-UNIFLEX oilresistant

PTS-UNIFLEX 65.1*: new oilresistant TPE with good sealing properties (crosslinkable)

This new development with a hardness of 65 Shore A shows outstanding oilresistance.

In combination with crosslinking a dramatic increase of compression set can be achieved.



PTS-UNIFLEX oilresistant

			UNI65.1*	UNI-65.1 crosslinked
Hardness	Shore A		66	66
Density	g /cm³	DIN 5379	1,15	1,15
Tensile Strength (md/pmd)	MPa	ISO 527-1/-2	8,0/9,3	10/11
Mould Shrinkage (Plate 60x60x2) md	%	PTS	1,9	
Mould Shrinkage (Plate 60x60x2) pmd	%	PTS	0,2	
Modulus 10% (md/pmd)	MPa	ISO 527-1/-2	0,9/0,8	
Modulus 50% (md/pmd)	MPa	ISO 527-1/-2	2,6/2,1	
Modulus 100% (md/pmd)	MPa	ISO 527-1/-2	3,6/2,9	
Modulus 300% (md/pmd)	MPa	ISO 527-1/-2	5,6/5,1	
Elongation at Break	%	ISO R527	590/640	280/340
Compression set 70h /23°C	%	ISO 815	50	27
Compression set 24h/70°C	%	ISO 815	82	57
Compression set 24h/100°C	%	ISO 815	95	63



DESMOFLEX[®]

DESMOFLEX[®] : TPU blend

Light-resistant, scratch-resistant and also suitable for
automotive surfaces





Scratch improved TPE with bond to PP

In the past, scratch improved types were only available out of our A1 family. These Types bond to PC/ABS, ABS, POM or PA.

Our latest development PTS-THERMOFLEX-A7000/82*9000 presents a scratch improved TPE with bond to PP.



ABS blend with adhesion to standard TPE

ABS blend with adhesion to standard TPE





ABS blend with adhesion to standard TPE

Properties			value	
			>CBLE-F5.0	>CBLE-F5.0
MECHANISCH				
Shrinkage (60x60x2) MD	%	ISO 294	0,9	0,3
Shrinkage (60x60x2) TD	%	ISO 294	1,0	0,7
Izod- +23°C	KJ/m ²	ISO 181	8	8
Charpy + 23°C	KJ/m ²	ISO 180	74	35
Tensile strength (50mm/min.)	MPa	ISO R527	27	75
Tensile modulus (1mm/min.)	MPa	ISO R527	1300	5800
Elongation at break	%	ISO R527	50	2,7
MFR (260°C/5kg)	g/10mi	ISO 1133	90	39
Flexural modulus +23°C	MPa	ISO R178	1000	5600



DURAMID® and PTS-CREAMID®-S





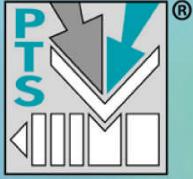
DURAMID® und PTS-CREAMID®-S

>CREAMID®-S

Semi-aromatic, highly filled polyamide grades

Key properties:

- **attractive surface finish**
- **flowability**
- **low warpage**
- **UV stable and deep black supplied as standard**
- **stiffness in the conditioned state**
- **ultraflowability**



DURAMID® und PTS-CREAMID®-S

>DURAMID®-S

Semi-aromatic, modified, highly filled special polyamides

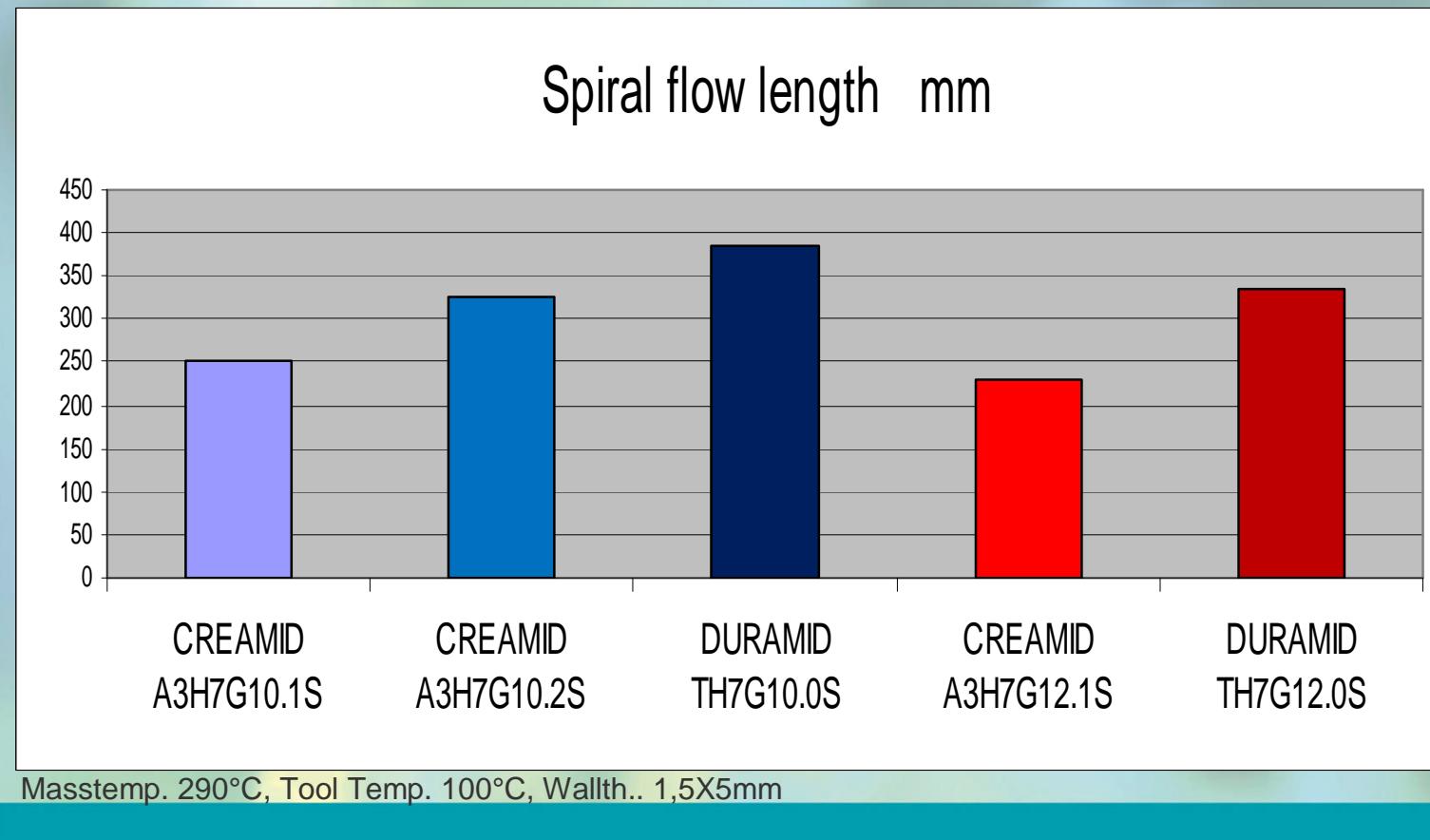
Key properties:

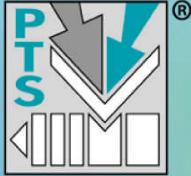
- attractive surface finish
- **ultraflowability**
- **extremely low warpage and high notched impact strength**
- UV stable and deep black supplied as standard
- stiffness in the conditioned state
- **high strength transverse to the fiber direction**



DURAMID® und PTS-CREAMID®-S

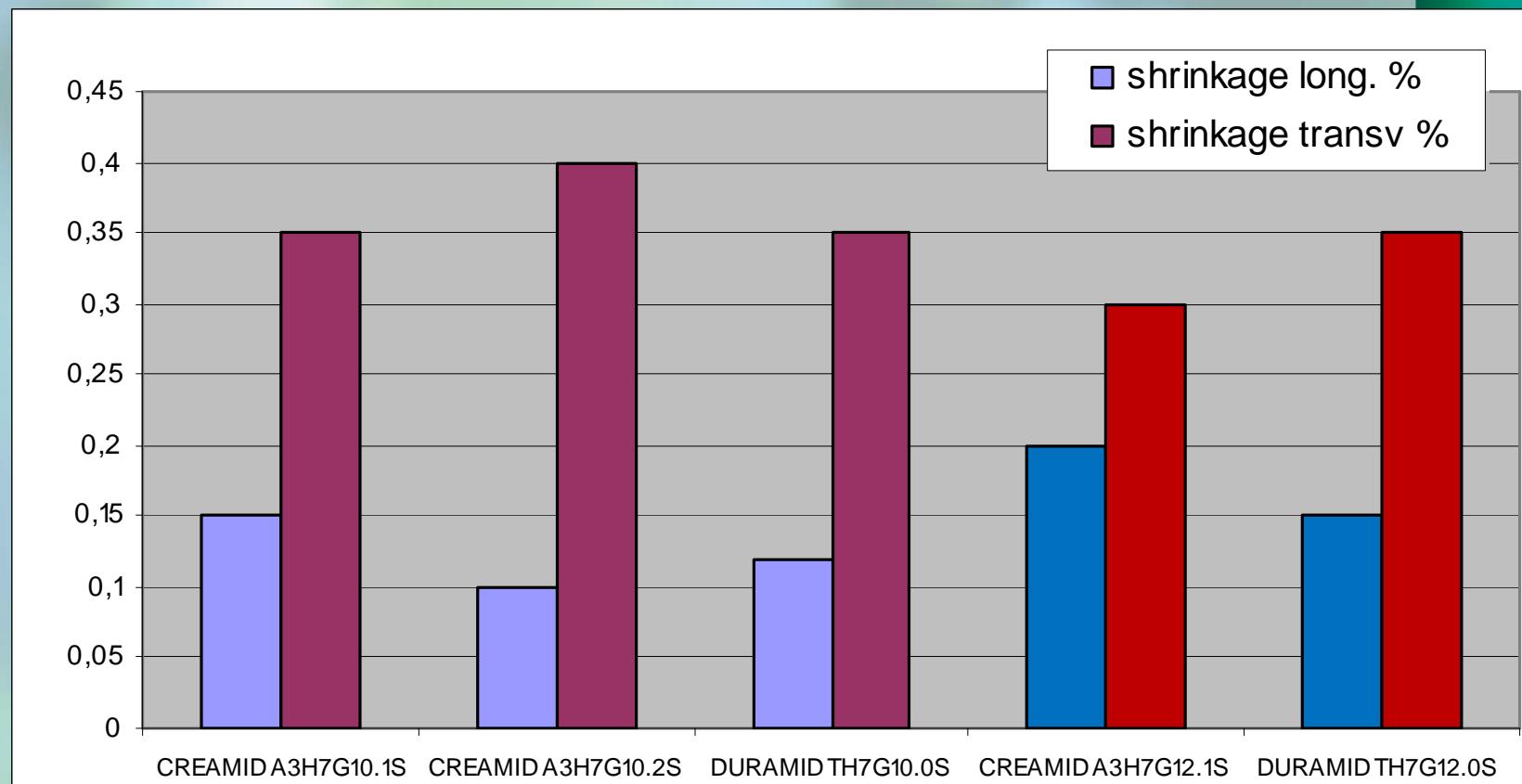
■ Ultraflowability:

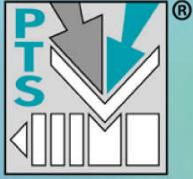




DURAMID® und PTS-CREAMID®-S

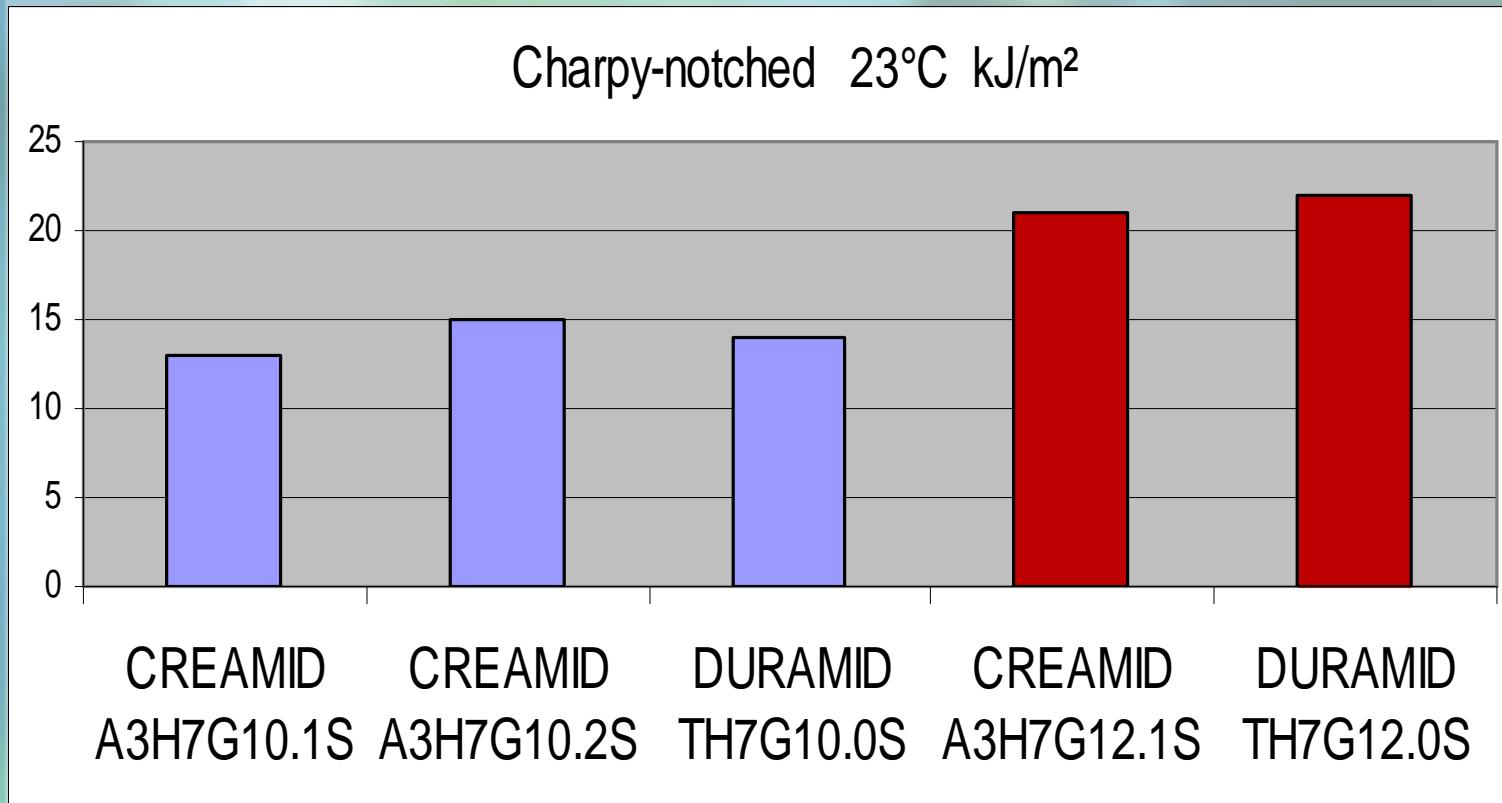
■(Extremely) low warpage:





DURAMID® und PTS-CREAMID®-S

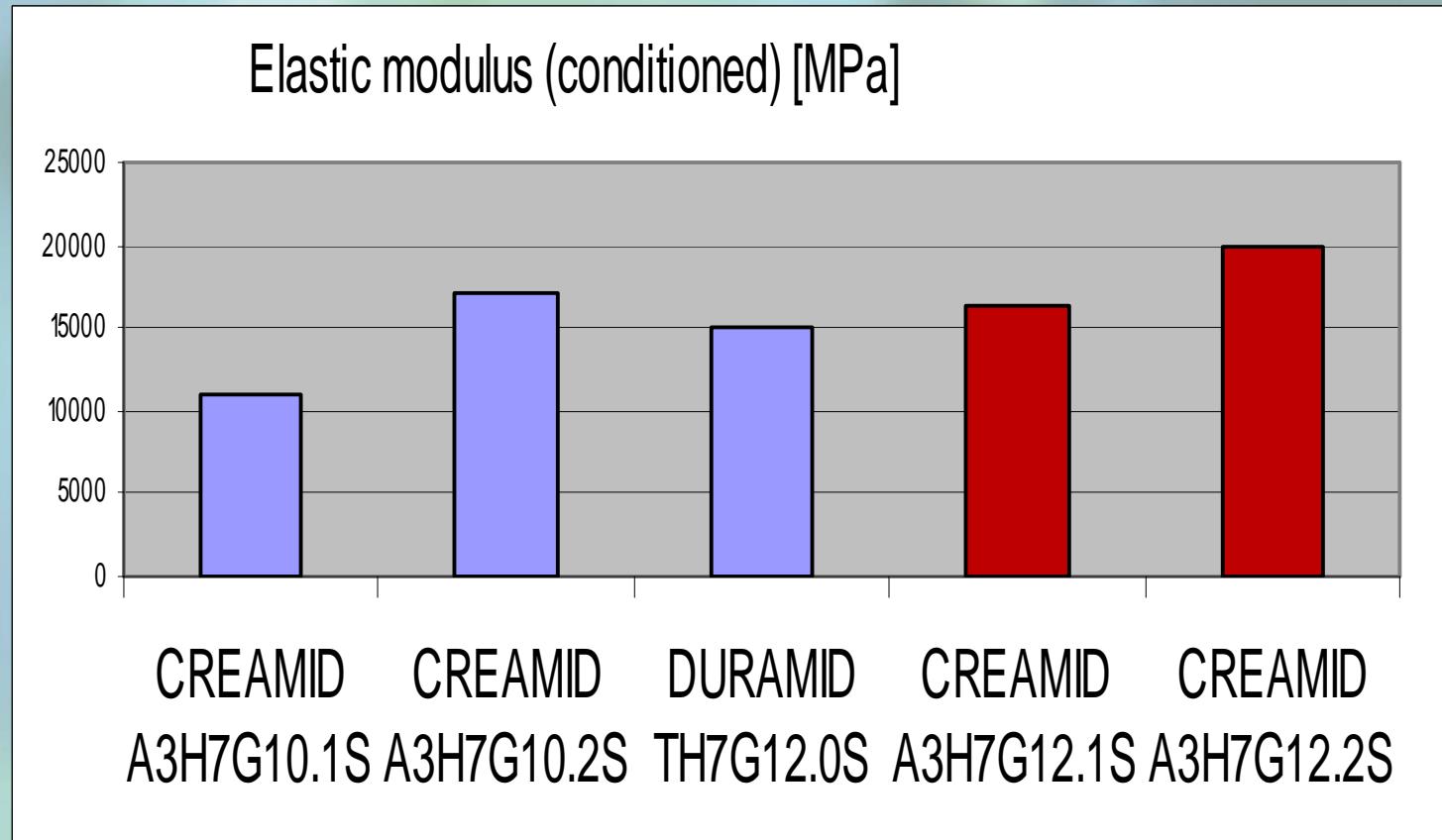
- **Extremely high notched impact strength:**





DURAMID® und PTS-CREAMID®-S

- **Stiffness in the conditioned state:**





PTS-CREALEN

High-impact PP compound



PTS-CREALEN

PTS-CREALEN: impact-modified PP compounds with high stiffness

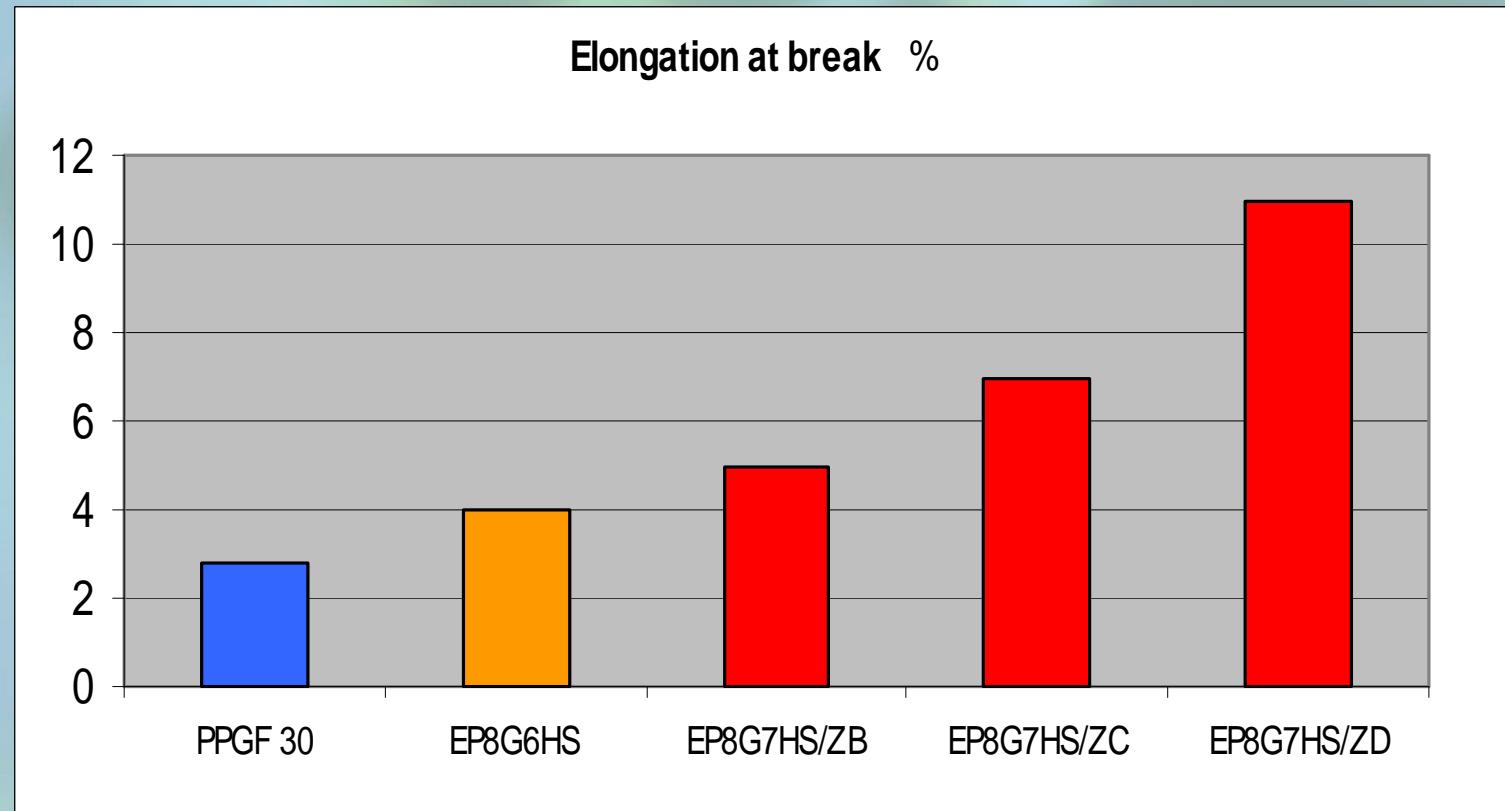
PTS has launched an extensive range of special impact-modified polypropylene materials with up to 40% reinforcement.

These materials occupy a niche between standard PP and long-glass-fiber PP.

The notched impact strength of the new products exceeds that of glass-fiber-reinforced polyamide in many cases.



PTS-CREALEN

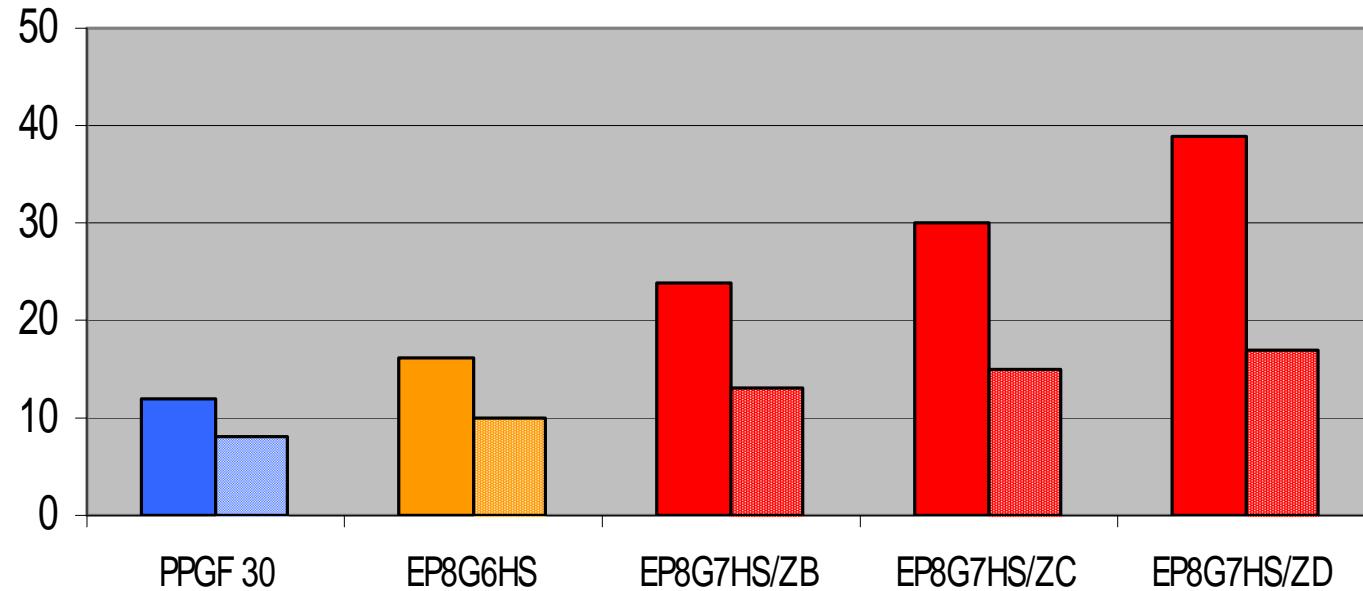




PTS-CREALEN

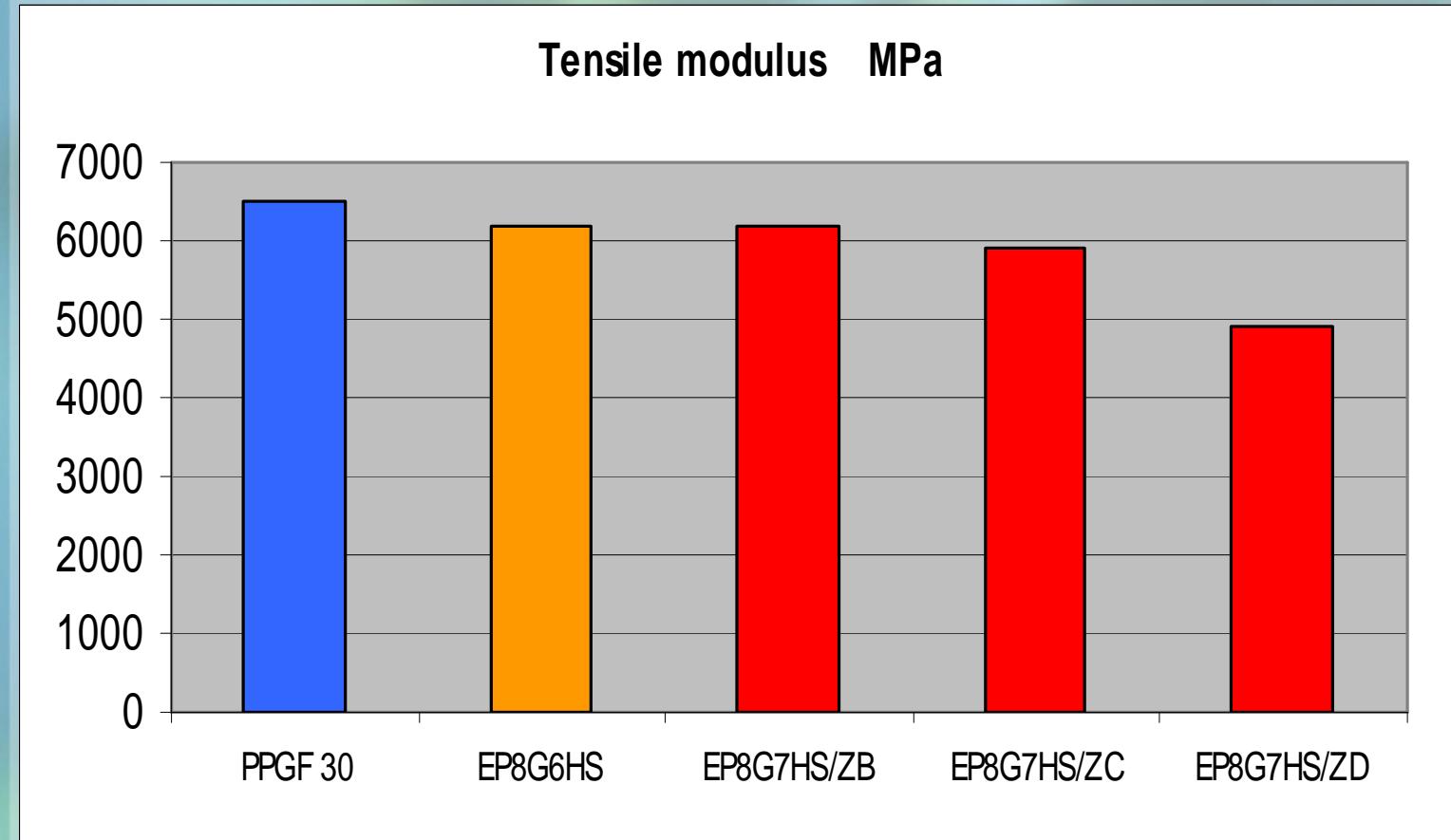
Charpy - notched kJ/m²

23° C / - 20° C



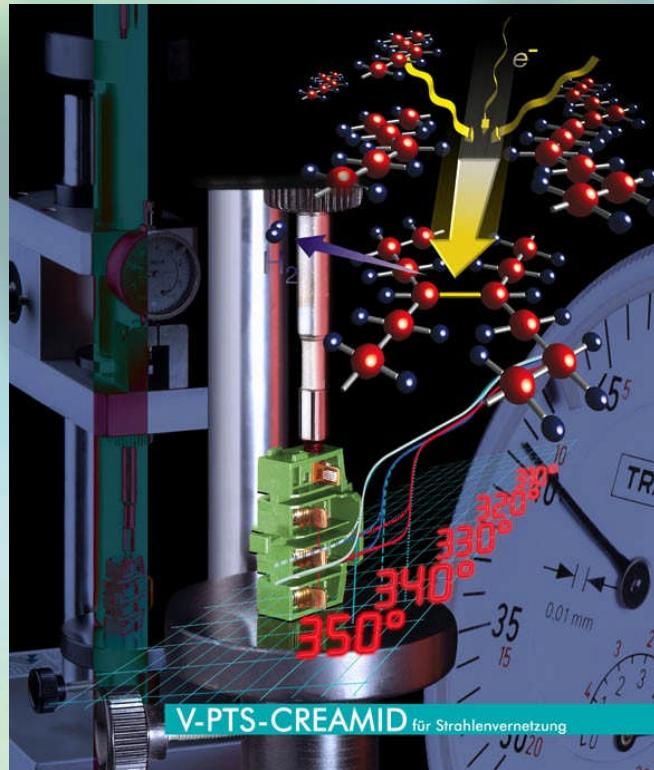


PTS-CREALEN





Crosslinking





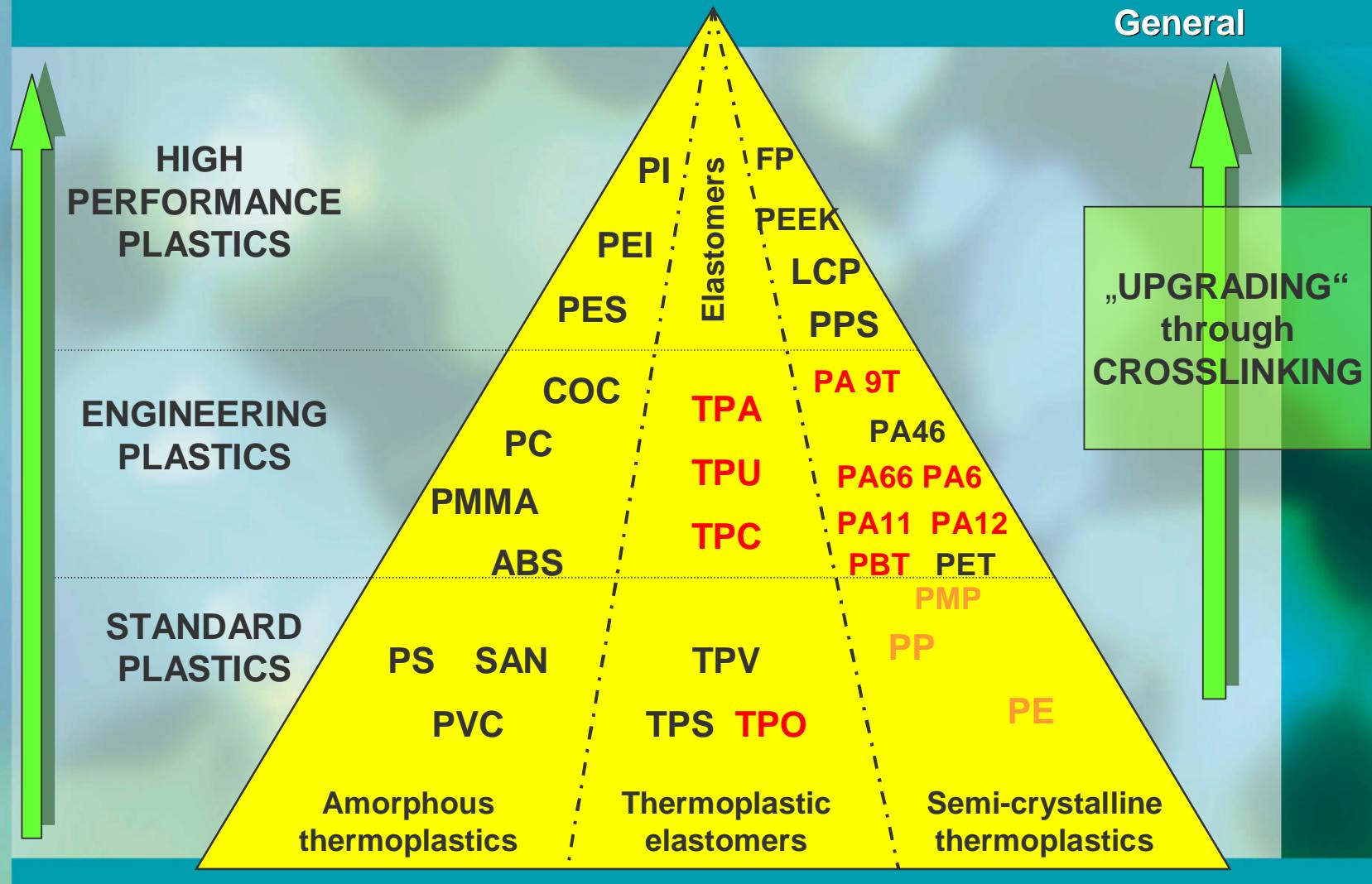
General

Glass-fiber-reinforced and mineral-filled, irradiation-crosslinkable polyamides, including grades flame-retardant-modified with red phosphorus, have been state-of-the-art for a long time.

However, the self-extinguishing versions of these materials have previously had the limitation of only being available in phosphorus red-brown or black.

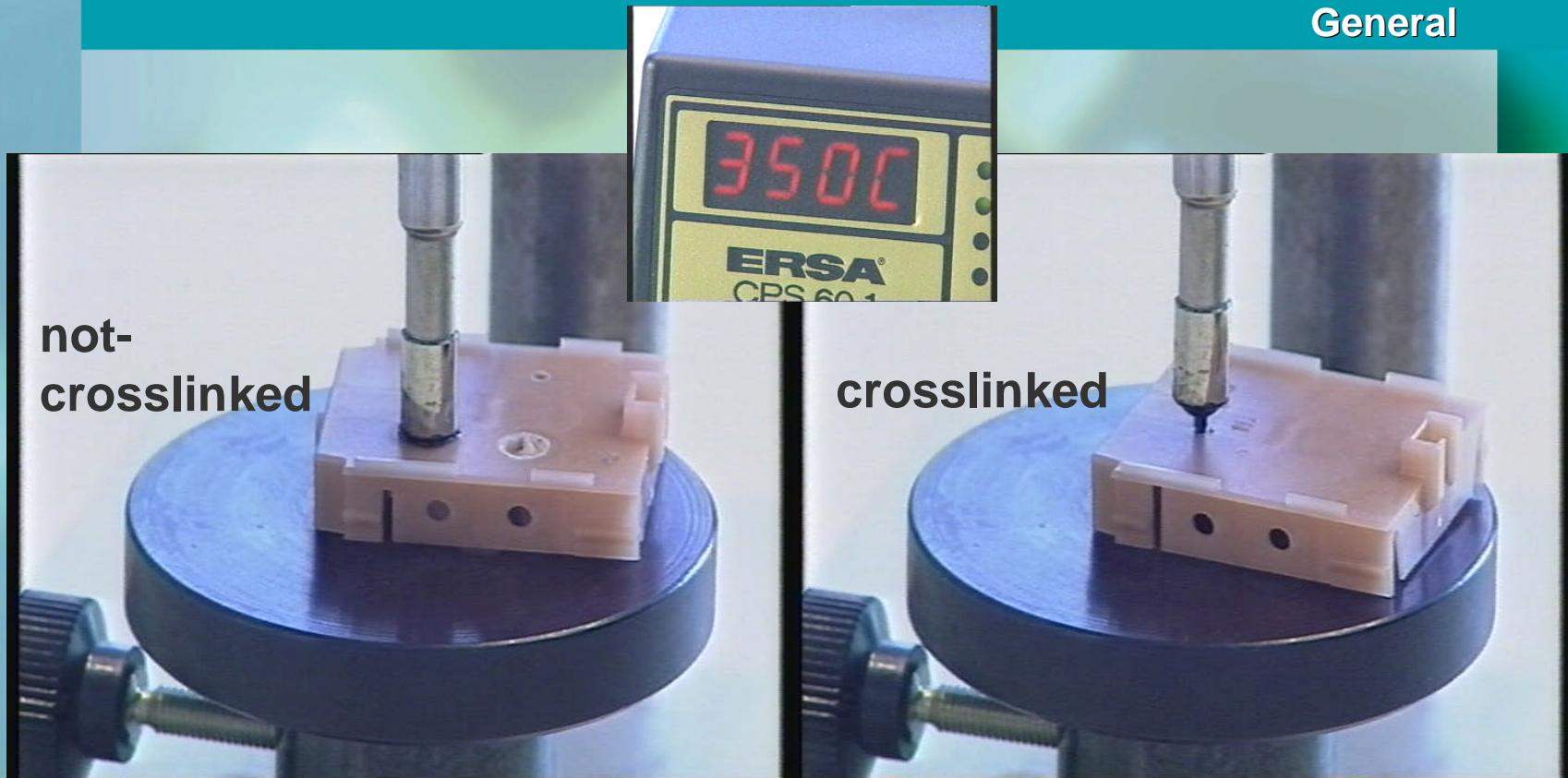
The following pyramid chart shows how irradiation-crosslinkable polymers, mainly polyamides, are upgraded to a higher performance level by irradiation.

The products of technical or commercial importance are coloured red or orange.





Testing the heat resistance of crosslinked components by the soldering iron test



Part: PA 6 GF30

Soldering iron tip: 1 mm d, Load: 1000 g, Temperature: 350°C

BGS

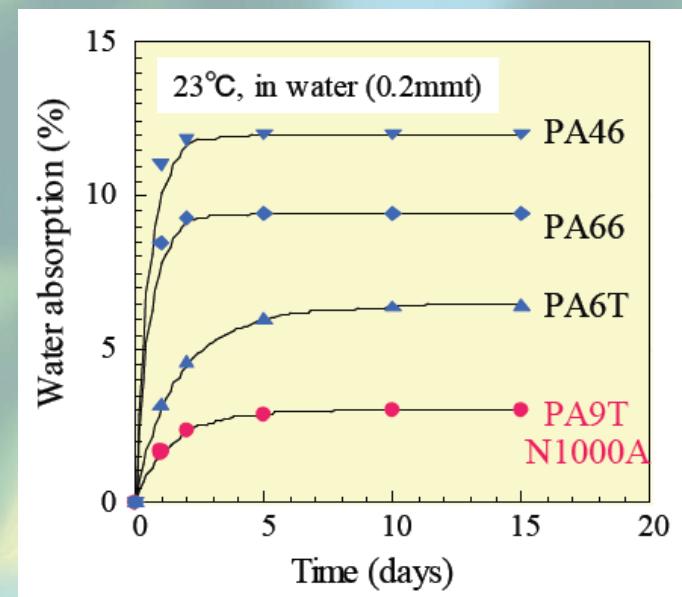


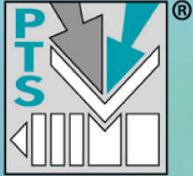
Polyamide 9T

Polyamide 9T is a semi-aromatic, high-temperature polyamide with a melting point of 304°C

Key properties:

- low water absorption → good chemical and moisture resistance
- high dimensional stability



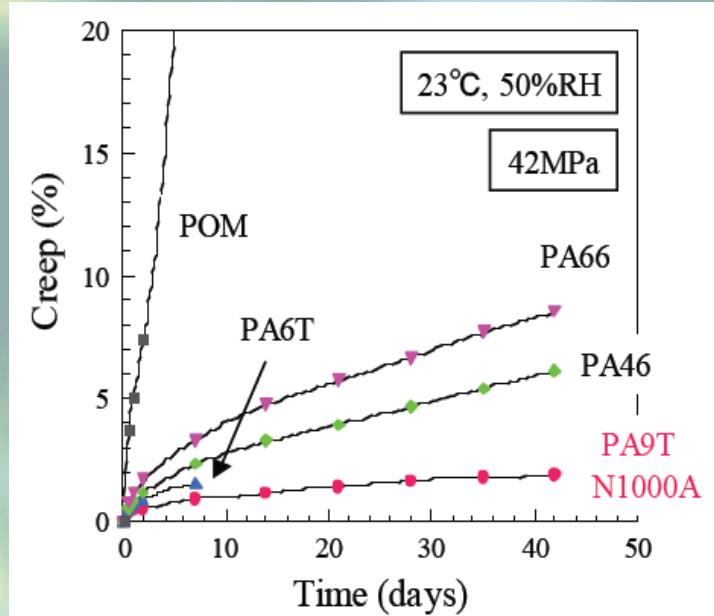
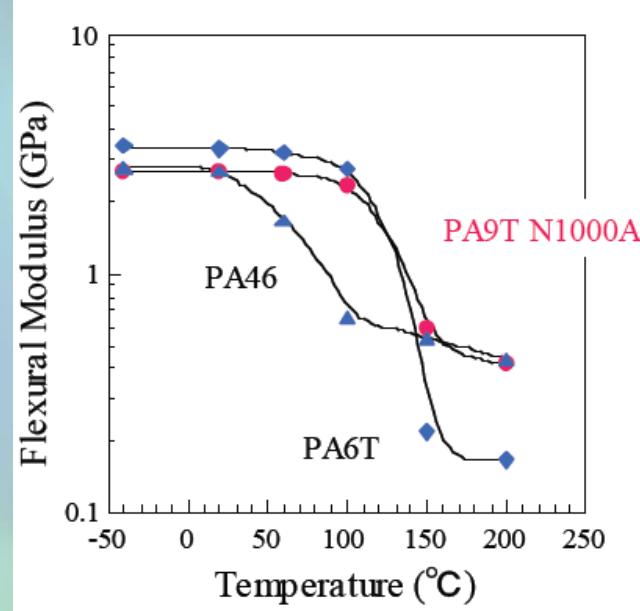


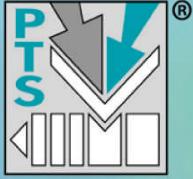
Polyamide 9T

Key properties:

high mechanical properties at elevated temperatures

- high stiffness, strength, low creep under load,
good flexural fatigue strength

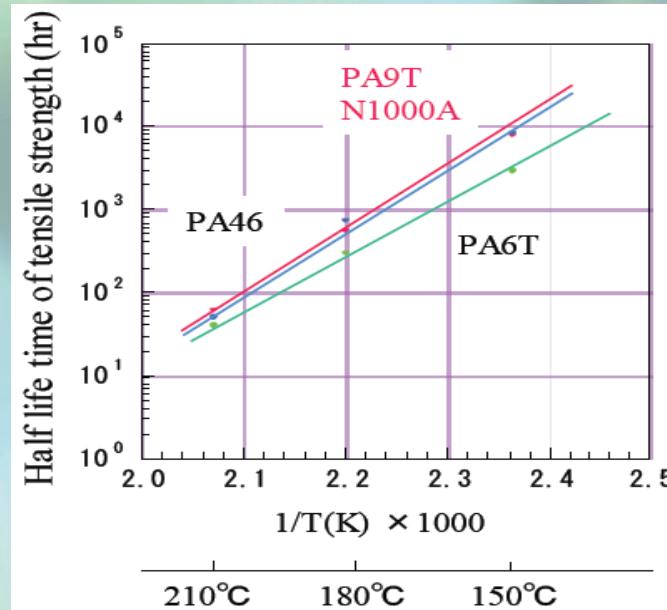




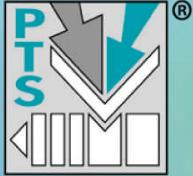
Polyamide 9T

Key properties:

- excellent heat ageing behaviour → longer service life



- wider processing window → easier to process
(20°C wider than for PA6T/6I)

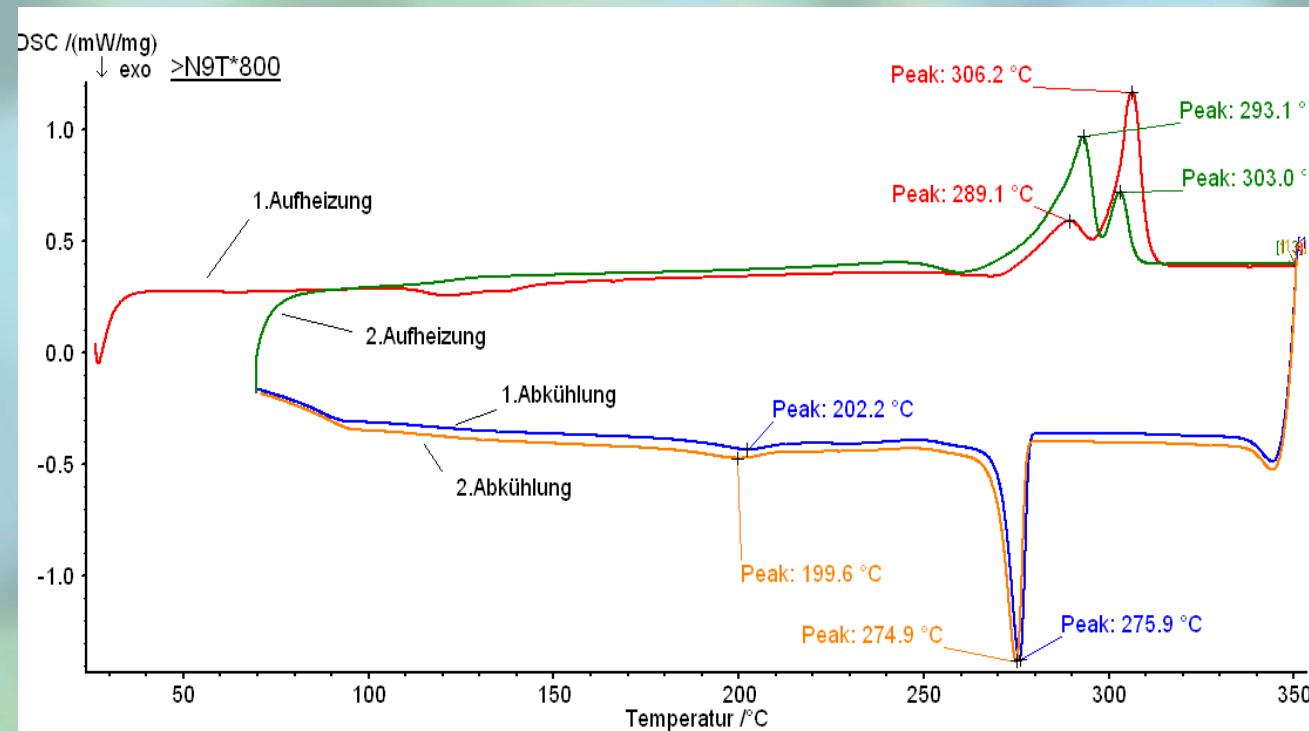


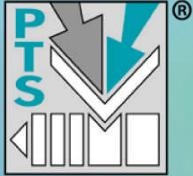
Polyamid 9T

Key properties:

Polyamide 9T is the first crosslinkable high-temperature material

➤ DSC PA9T not crosslinked



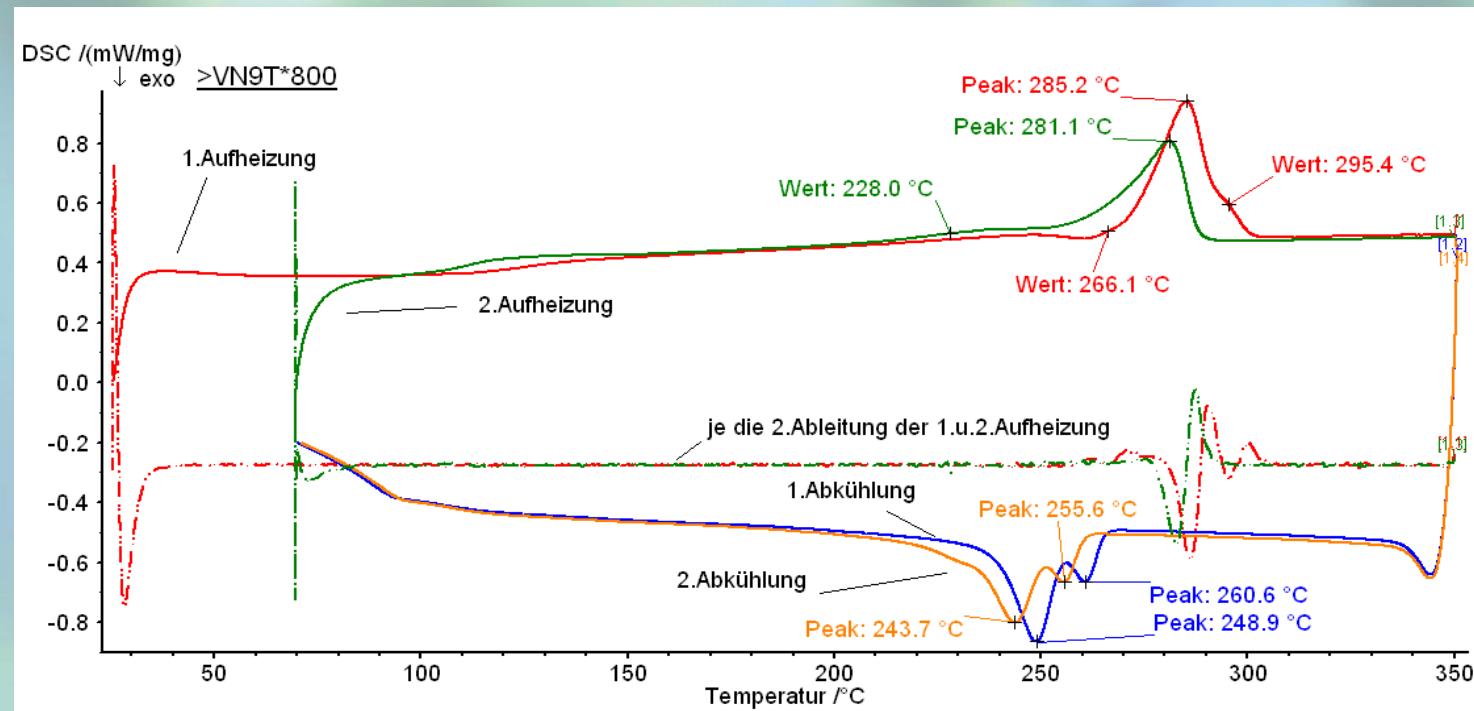


Polyamide 9T

Key properties:

Polyamide 9T is the first crosslinkable high-temperature material

➤ no more thermal melting

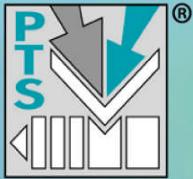




PA9T 25% GF, crosslinked PA9T 30% GF, not crosslinked

Polyamide 9T

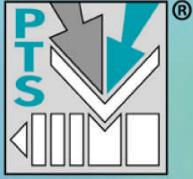
			PA9T GF 30	PA9T GF 25
				crosslinked
Density	g /cm ³	DIN 5379	1,37	1,34
Water Absorption (24 h)	%	ISO 62	0,2	0,2
Water Absorption (saturation)	%	ISO 62	1,6	1,6
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,4	0,4
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	1,4	1,4
Izod-Impact Strength notched + 23°C	KJ/m ²	ISO 180/1	8	6
Charpy-Impact Strength notched + 23°C	KJ/m ²	ISO 179-1/1eA	10	9
Charpy-Impact Strength +23°C	KJ/m ²	ISO 179-1/1eU	50	40
Tensile Strength (50mm/min.)	MPa	ISO R527	150	120
Tensile Modulus (1mm/min.)	MPa	ISO R527	9500	7800
Elongation at Break	%	ISO R527	2	2
Flexural Strength	MPa	ISO 178	210	180
Flexural Modulus	MPa	ISO 178	6700	6000
VICAT Softening Temperature 50°C/h 9,8N	°C	ISO 306	277	276
VICAT Softening Temperature 50°C/h 49N	°C	ISO 306	260	245
DTUL (1,81MPa)	°C	ISO 75-1/-2	259	265
UL 94	-	UL746C	HB	HB
Glass transition temperature	°C	DSC	125	125
Melting temperature	°C	DSC	304	No melting



PA9T 45% GF, crosslinked PA9T 50% GF, not crosslinked

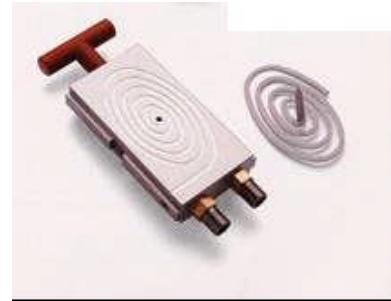
Polyamide 9T

			PA9T GF 50	PA9T GF 45
			vernetzt	
Density	g /cm³	DIN 5379	1,57	1,52
Water Absorption (24 h)	%	ISO 62	0,2	0,1
Water Absorption (saturation)	%	ISO 62	0,9	0,9
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,2	0,4
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	0,8	1,1
Izod-Impact Strength notched + 23°C	KJ/m²	ISO 180/1	15	11
Charpy-Impact Strength notched + 23°C	KJ/m²	ISO 179-1/1eA	14	11
Charpy-Impact Strength +23°C	KJ/m²	ISO 179-1/1eU	90	70
Tensile Strength (50mm/min.)	MPa	ISO R527	240	230
Tensile Modulus (1mm/min.)	MPa	ISO R527	17500	15000
Elongation at Break	%	ISO R527	2	2
Flexural Strength	MPa	ISO 178	330	300
Flexural Modulus	MPa	ISO 178	12500	11000
VICAT Softening Temperature 50°C/h 9,8N	°C	ISO 306	277	276
VICAT Softening Temperature 50°C/h 49N	°C	ISO 306	260	245
DTUL (1,81MPa)	°C	ISO 75-1/-2	260	260
UL 94	-	UL746C	HB	HB
Glass transition temperature	°C	DSC	125	125
Melting temperature	°C	DSC	304	No melting

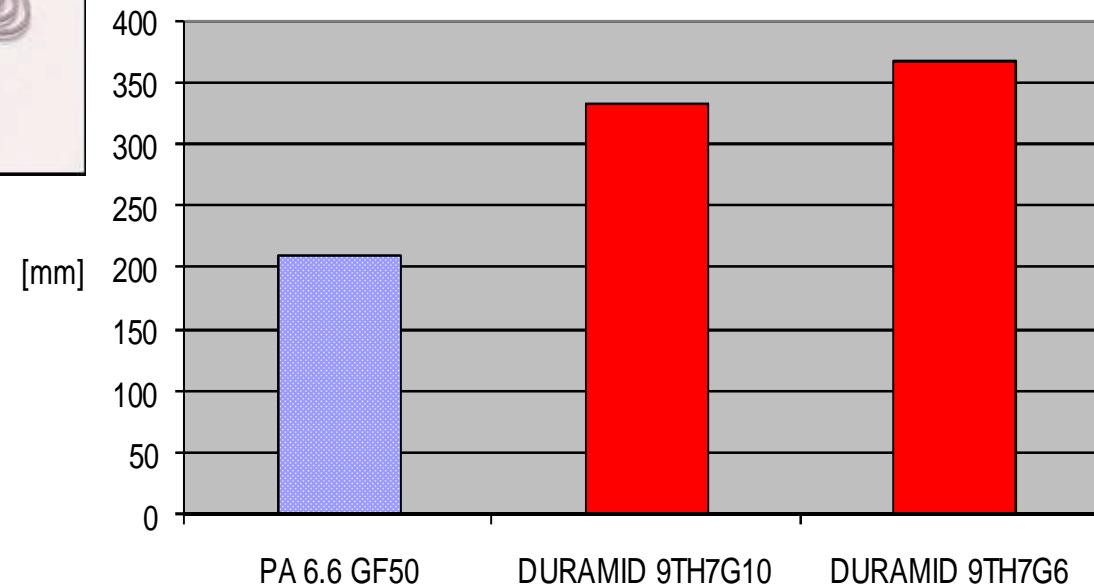


Polyamide 9T

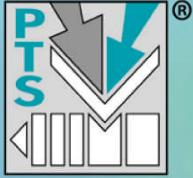
Flowability of polyamide 9T versus polyamide 66



Spiral flow length 5x1.5 mm spiral



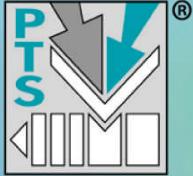
Proc. temp. 290°C, mould temp. 100°C, spiral 1,5X5mm



Polyamide 9T

Polyamide 9T grades supplied by PTS

- I. PA9T unreinforced + crosslinkable
- II. PA9T unreinforced, impact-modified (elongation at break 14%)
- III. PA9T 25% GF, crosslinkable (>VDMID-T9H2G5*)
- IV. PA9T 30% GF, non-crosslinkable (>DMID-T9H2G6*)
- V. PA9T 30% GF, crosslinkable
- VI. PA9T 35% GF, non-crosslinkable
- VII. PA9T 40% GF, non-crosslinkable
- VIII. PA9T 45% GF, crosslinkable (>VDMID-9TH2G9*)
- IX. PA9T 50% GF, non-crosslinkable (>DMID-9TH2G10*)



Halogen-free, glass-fiber-reinforced, semi-aromatic V0 polyamides

New semi-aromatic polyamides based on copolyamide 6/66 with a melting point of 243°C.

Key properties:

- low water absorption → high dimensional stability
- excellent flowability → thin-walled applications with excellent surface finish
- wide processing window → easy to process
- low shrinkage → less warpage
- UL94 V0 (up to 0.4 mm), all colours, Yellow Card in preparation
- 775°C GWIT, 960°C GWFI (0.8 mm)
- crosslinkable grades available



Halogen-free, glass-fiber-reinforced, semi-aromatic V0 polyamides

CREAMID-C3H2G5FRS versus CREAMID-C3H2G4FRSE PA 66/6+X GF 25 V0 versus ultraflow PA 66/6+X GF 20 V0

			>CMID-GF25	>CMID-GF20
Density	g /cm ³	DIN 5379	1,38	1,36
Water Absorption (24 h)	%	ISO 62	0,6	0,5
Water Absorption (saturation)	%	ISO 62	4,5	4,5
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,2	0,2
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	0,7	0,5
Izod-Impact Strength notched + 23°C	KJ/m ²	ISO 180/1	10	7
Charpy-Impact Strength notched + 23°C	KJ/m ²	ISO 179-1/1eA	10	7
Charpy-Impact Strength +23°C	KJ/m ²	ISO 179-1/1eU	70	55
Tensile Strength (50mm/min.)	MPa	ISO R527	145	125
Tensile Modulus (1mm/min.)	MPa	ISO R527	9100	8300
Elongation at Break	%	ISO R527	3	2
Flexural Strength	MPa	ISO 178	210	185
Flexural Modulus	MPa	ISO 178	7500	7300
GWFI / GWIT (0.8 mm)	°C	ISO 306	960 / 775	960 / 775
UL 94 (0.4/ 0.8/1.6/3.2 mm)	-	UL746C	V1/V0/V0/V0	V0/V0/V0/V0
DTUL (1,81MPa)	°C	ISO 75-1-3	205	205
Melting temperature	°C	DSC	243	243

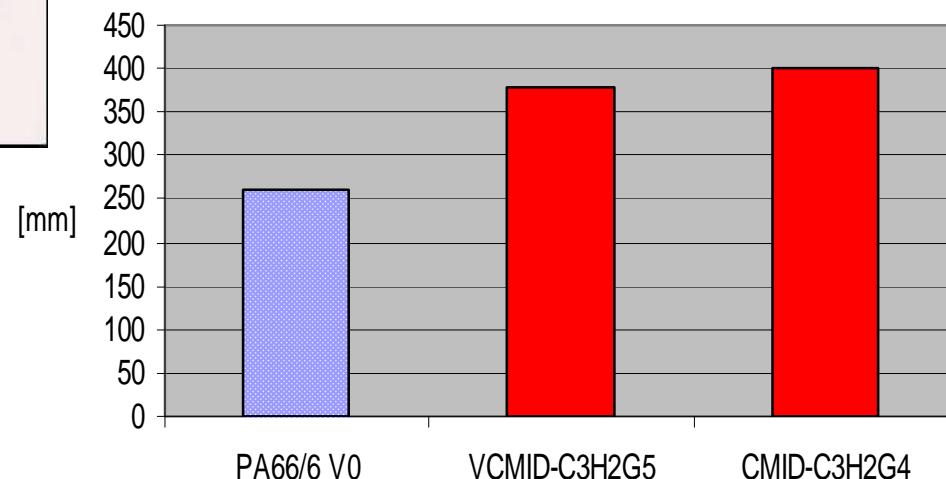


Halogen-free, glass-fiber-reinforced, semi-aromatic V0 polyamides

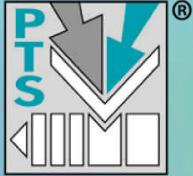
**PA66/6 V0 versus
VCREAMID-C3H2G5FRS, CREAMID-C3H2G4FRSE**



Spiral flow length 5x1.5 mm spiral



Proc. temp. 290°C, mould temp. 100°C, spiral 1,5X5mm



Polyamide for outdoor applications

New crosslinkable polyamide 12 GF 30, UV-stabilized
for outdoor connectors (>VCMID-12GF30H2ZB)

			V-CREAMID
Density	g /cm ³	DIN 5379	1,26
Water Absorption (24 h)	%	ISO 62	-
Water Absorption (saturation)	%	ISO 62	-
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,4
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	1,1
Izod-Impact Strength notched + 23°C	KJ/m ²	ISO 180/1	16
Charpy-Impact Strength notched + 23°C	KJ/m ²	ISO 179-1/1eA	17
Charpy-Impact Strength +23°C	KJ/m ²	ISO 179-1/1eU	65
Tensile Strength (50mm/min.)	MPa	ISO R527	115
Tensile Modulus (1mm/min.)	MPa	ISO R527	7000
Elongation at Break	%	ISO R527	4
Flexural Strength	MPa	ISO 178	140
Flexural Modulus	MPa	ISO 178	5600
UL 94 (0.8/1.6/3.2 mm)	-	UL746C	HB



PA12 50% Glasballs

Grilamid LKN-5H (EMS) vs >CREAMID-12-N800/16*9000 (PTS)
Kond. Werte

Polyamid 12

			EMS	PTS
Density	g /cm ³	DIN 5379	1,44	1,46
Water Absorption (24 h)	%	ISO 62	0,4	0,1
Water Absorption (saturation)	%	ISO 62	0,8	0,5
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,8	1,1
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	0,9	1,1
Izod-Impact Strength notched + 23°C	KJ/m ²	ISO 180/1	-	5
Charpy-Impact Strength notched + 23°C	KJ/m ²	ISO 179-1/1eA	5	5
Charpy-Impact Strength +23°C	KJ/m ²	ISO 179-1/1eU	n. B.	n. B.
Tensile Strength (50mm/min.)	MPa	ISO R527	45	60
Tensile Modulus (1mm/min.)	MPa	ISO R527	2300	3100
Elongation at Break	%	ISO R527	25	20
Flexural Strength	MPa	ISO 178	-	65
Flexural Modulus	MPa	ISO 178	-	2200
VICAT Softening Temperature 50°C/h 9,8N	°C	ISO 306	-	172
VICAT Softening Temperature 50°C/h 49N	°C	ISO 306	-	164
DTUL (1,81MPa)	°C	ISO 75-1/-2	65	80
UL 94	-	UL746C	HB	HB
Melting temperature	°C	DSC	178	178



Polyamide blend for corrugated pipes

New crosslinkable, unreinforced, extremely high impact-modified PA12 blend for corrugated pipes

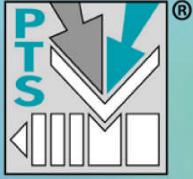
Key properties:

- excellent impact strength
- high abrasion resistance
- high resistance to flying electrical sparks
- high flexural fatigue strength
- no thermal melting



Polyamide blend for corrugated pipes

			>VN801/02
Density	g /cm³	DIN 5379	0,97
Water Absorption (24 h)	%	ISO 62	0,1
Water Absorption (saturation)	%	ISO 62	1,0
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,8
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	1,3
Izod-Impact Strength notched + 23°C	KJ/m²	ISO 180/1	50
Charpy-Impact Strength notched + 23°C	KJ/m²	ISO 179-1/1eA	85
Charpy-Impact Strength +23°C	KJ/m²	ISO 179-1/1eU	n.B
Tensile Strength (50mm/min.)	MPa	ISO R527	30
Tensile Modulus (1mm/min.) 23°C/-40°C	MPa	ISO R527	970
Elongation at Break 23°C/-40°C	%	ISO R527	65
Flexural Strength	MPa	ISO 178	26
Flexural Modulus	MPa	ISO 178	760
UL 94 (0.8/1.6/3.2 mm)	-	UL746C	HB



Electroplatable hard/soft combinations

Since 2004, the PTS Group has been working on the development of special semi-aromatic, electroplatable polyamides and adhesion-modified TPS or TPV grades, which can be processed into complex hard/soft components.

Thermoplastic elastomers such as these must be able to withstand electroplating baths without damage and form an adhesive bond with the pre-mould, so that no electroplating solution can penetrate.

For the soft component, adhesion-modified TPS or TPV grades are suitable. TPV has a particularly attractive matt finish after electroplating.



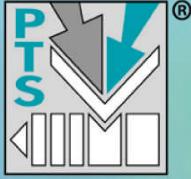
Electroplatable hard/soft combinations

New mineral-filled, semi-aromatic, modified polyamide for selective electroplating

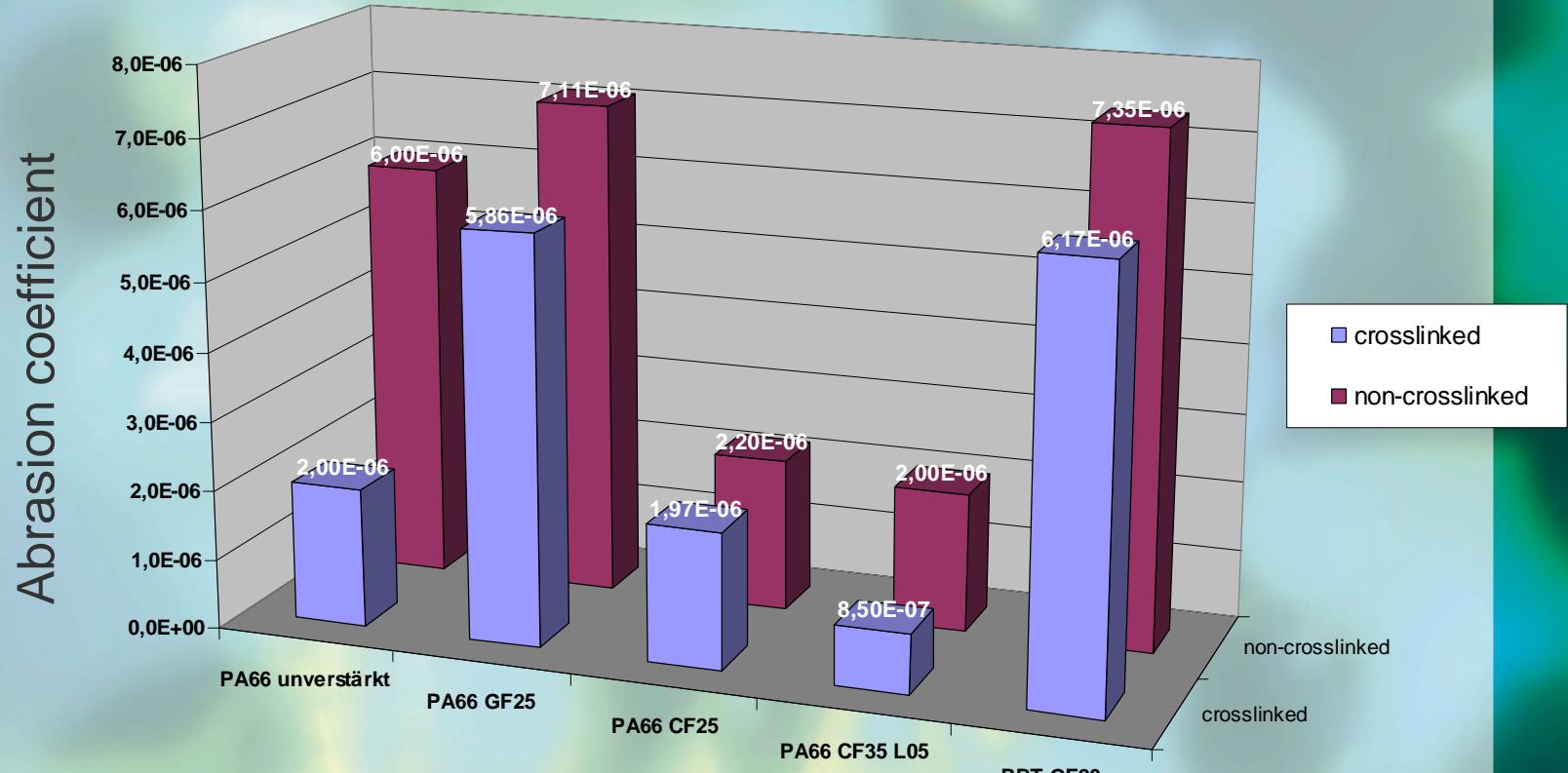
Key properties:

- excellent surface finish
- low warpage
- excellent coating adhesion
- selective electroplating of the hard component in hard/soft applications





V-PTS-CREAMID® for tribological applications





Other innovative materials

➤ PTS-CREALON

PC compound V0/transparent
and V0/10% GF

- PTS-CREABLEND-A
- PTS-CREABLEND-B
- PTS-CREABLEND-D
- PTS-CREABLEND-F

PC/ABS blends
PC/PBT blends
PA/ABS blends
PP/ABS blends

* V-PTS-CREAMID-A (PA66GF35) für Solarplugs (Hardcomponent)

* Thermoflex (TPS) , halogenfree, flame retardant (Softcomponent)

* PC/PBT-Blends reiinforced, PBT/ASA reinforced, PA/ASA reinforced



PC/PBT 20% Glasfibers

Pocan KU-7625 (Bayer) vs >CREABLEND-B50G4 (PTS)

PC/PBT

			BAYER	PTS
Density	g /cm ³	DIN 5379	1,40	1,34
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,45	0,4
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	0,5	0,5
Izod-Impact Strength notched + 23°C	KJ/m ²	ISO 180/1	-	22
Charpy-Impact Strength notched + 23°C	KJ/m ²	ISO 179-1/1eA	-	23
Charpy-Impact Strength +23°	KJ/m ²	ISO 179-1/1eU	35	65
Tensile Strength (50mm/min.)	MPa	ISO R527	75	105
Tensile Modulus (1mm/min.)	MPa	ISO R527	5100	6400
Elongation at Break	%	ISO R527	4,0	4,1
Flexural Strength	MPa	ISO 178	130	140



PBT/ASA 30% Glasfiber Ultradur S4090 G6 (BASF) vs >CREABLEND-C70/04 (PTS)

PBT/ASA

			BASF	PTS
Density	g /cm ³	DIN 5379	1,47	1,43
Mould Shrinkage (Platte 60x60x2) MD	%	ISO 294	0,3	0,4
Mould Shrinkage (Platte 60x60x2) TD	%	ISO 294	0,8	0,6
Izod-Impact Strength notched + 23°C	KJ/m ²	ISO 180/1	-	11
Charpy-Impact Strength notched + 23°C	KJ/m ²	ISO 179-1/1eA	9	11
Charpy-Impact Strength +23°	KJ/m ²	ISO 179-1/1eU	59	65
Tensile Strength (50mm/min.)	MPa	ISO R527	125	138
Tensile Modulus (1mm/min.)	MPa	ISO R527	9700	8200
Elongation at Break	%	ISO R527	2,2	2,7
Flexural Strength	MPa	ISO 178	-	200
Flexural Modulus	MPa	ISO 179	-	7400

With the proportion of PC/PBT we are able to adapt properties like HDT, Impact, density and chemical resistance to the requirements.



**Thank you very much
for your interest !**