LATI® HIGH PERFORMANCE THERMOPLASTICS

METAL REPLACEMENT

Structural compounds

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Materials and structures

The use of metals in the production of structural elements has always gone hand in hand with technological and industrial development. The mechanical strength, stiffness and hardness of these materials, and their alloys, make it possible to create products capable of withstanding heavy loads and stresses, as required, for example, in the load-bearing structures of buildings, vehicles and machinery.

Because of the increasingly extreme demands of today's designs, engineers are now also taking notice of new synthetic materials made from thermoplastic or thermosetting polymers.
Compounds and composites, boasting mechanical properties comparable to those of traditional materials, are currently being used successfully to replace or re-engineer metal parts.

Polymers offer further advantages: **reduced weight**, thanks to their **lower density**, **chemical resistance**, **easy processing** and waste management, and the possibility of producing complicated shapes without specific machining or expensive assembly processes.
From a **cost-containment** perspective, these advantages immediately translate into lower expenditure, increasingly faster time to market, and greater **respect for the environment** and for resources.

LATI, a leading name in technical compounds, provides engineers and designers with a wide and complete range of compounds for metal replacement: reinforced with glass and carbon fibres, and based on the most diverse thermoplastic matrices, these products range from PP to PEEK, and include versatile polyamides and high-performance matrices such as PPS and PPA.

As well as compounds, LATI also provides its customers with advanced support services: **technical assistance** with processing and design, **research and development, and customised formulation**.
All consolidated by the many decades of experience that only a leading industry player can offer.

How to choose?

Correctly choosing the compound most suited to the needs of the project is the foundation stone on which a winning approach to an idea is built.

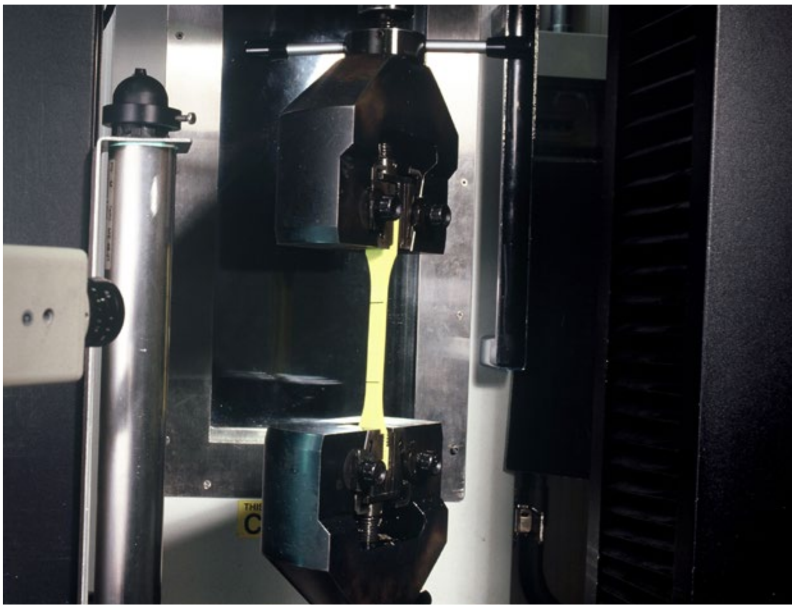
Careful design and cost evaluation are the other key elements in a development process based strictly on the choice of the most appropriate material.

So, what questions need to be asked when choosing the compound?

If you know that the costs of remedying a wrong choice can be really substantial, especially if you are forced to alter the mould, modify the production chain, or, worse, withdraw the finished products from the market, then polymers are the perfect solution. Finding a valid compromise between all the different needs may not be easy.

This guide aims to be a tool to help you answer to your questions.
The LATI structural compounds are here illustrated in detail, taking a look, albeit partial, at what is currently available.

1. What **mechanical properties** are needed? The presence of exclusively static loads requires different solutions compared with situations in which impulsive stresses, e.g., impacts and vibrations, are also envisaged.
2. What **environment** is the product to work in? Factors such as exposure to chemicals sunlight, bad weather or ambient humidity are key factors affecting the resistance of polymers.
3. What **temperatures** will be involved? Heat causes significant variations in the mechanical performance of polymers, making it essential to evaluate the maximum, minimum, peak and continuous temperatures the material will be subjected to during use.
4. What **life expectancy** is required? Compounds are subject to ageing, creep and relaxation, physical phenomena that drastically change the mechanical behaviour of the material over time. Not taking these aspects into account can prove to be a serious mistake.
5. What **safety factor** should be used? Metals and polymers have very different characteristics, and it is therefore necessary to approach the design phase with care and caution.
6. What **other properties** must our product have? A structural compound often also has to meet other requirements. For example, it may need to be self-extinguishing, suitable for contact with food, self-lubricating, or offer thermal or electrical conductivity.
7. **How much can we spend?** A winning idea stays a winning idea when it is marketed at a competitive price.



Support and service

Introducing structural engineering plastics into metal replacement projects requires caution and experience. Inadequate solutions can lead to undersized or oversized products and, in both cases, the risk of damage or wasted time and money.
However, hesitating before adopting plastic materials in your project, out of fear or a lack of the necessary knowledge, can generate equally substantial losses. LATI, being well aware of these difficulties, provides its customers with dedicated resources, to facilitate the tricky entry into the world of technical compounds.

The Co-design service:

offers design support in the form of feasibility checks supported by FEM structural and fluid dynamics analysis. Based on the outcome of the simulations, it is possible to predict and manage concrete problems relating to strength and life expectancy, or filling and deformation in the case of injection moulding processes.
It is important to note that LATI's co-design service also takes into **consideration certain aspects of polymers** that are often overlooked in the design phase by those without specific expertise:

- non-linear mechanical behaviour;
- the effects of temperature;
- the effects of environmental conditions;
- the effects of ageing, creep and fatigue;
- the presence of inserts and any post-processing required.

Overlooking even one of these aspects can lead to erroneous conclusions and, consequently, practical problems. The simulations are carried out by highly experienced LATI engineers working directly on the geometries provided by the customer and using specific mechanical and rheological data obtained under the appropriate conditions of use.

Moulding support service:

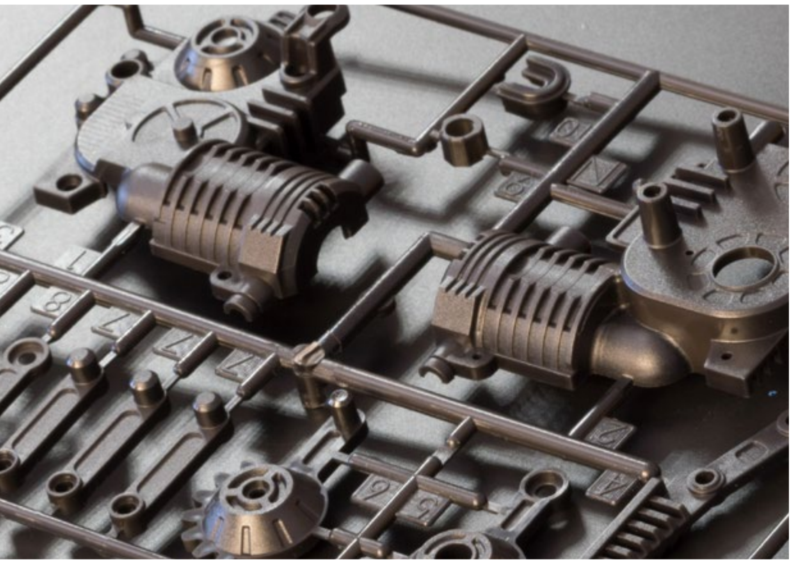
Correctly processing a highly-reinforced compound can be a complex undertaking, especially when you are striving to get the most from the chosen material.
To ensure the best results, LATI offers moulding departments the expertise of engineers specialised in injection moulding processes, machines and moulds.

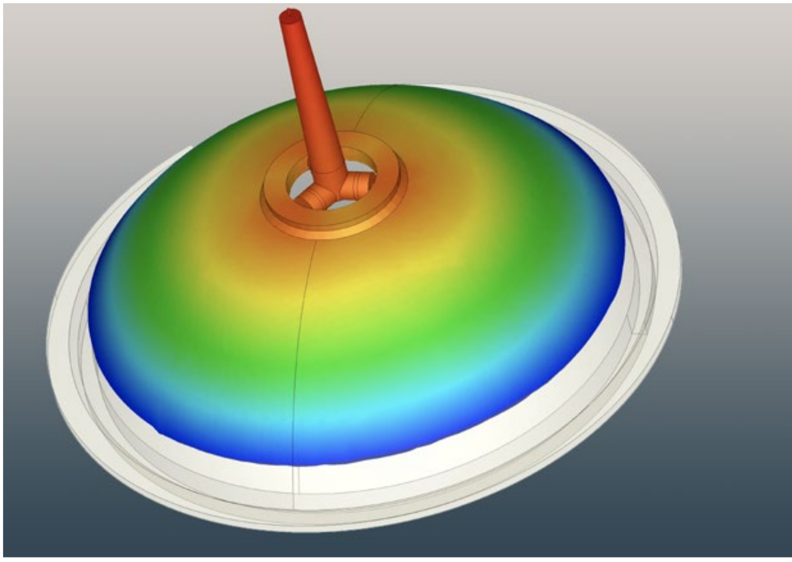
Research and development service:

Developing responses that are perfectly tailored to customers' needs is part of LATI's mission.

All special compounds can, in fact, be reformulated and optimised to provide the best results in relation to the needs of the project in question, even deviating significantly from the standard materials.

This is the aspect taken care of by the LATI R&D team, always attentive to market supply and demand: a team that has already produced a number of solutions that proved to be global ground breakers.





LATAMID: PA6 e PA66

Among the most widespread and versatile thermoplastic resins, polyamides 6 and 66 lend themselves to the creation of structural compounds with exceptional price/performance ratios.

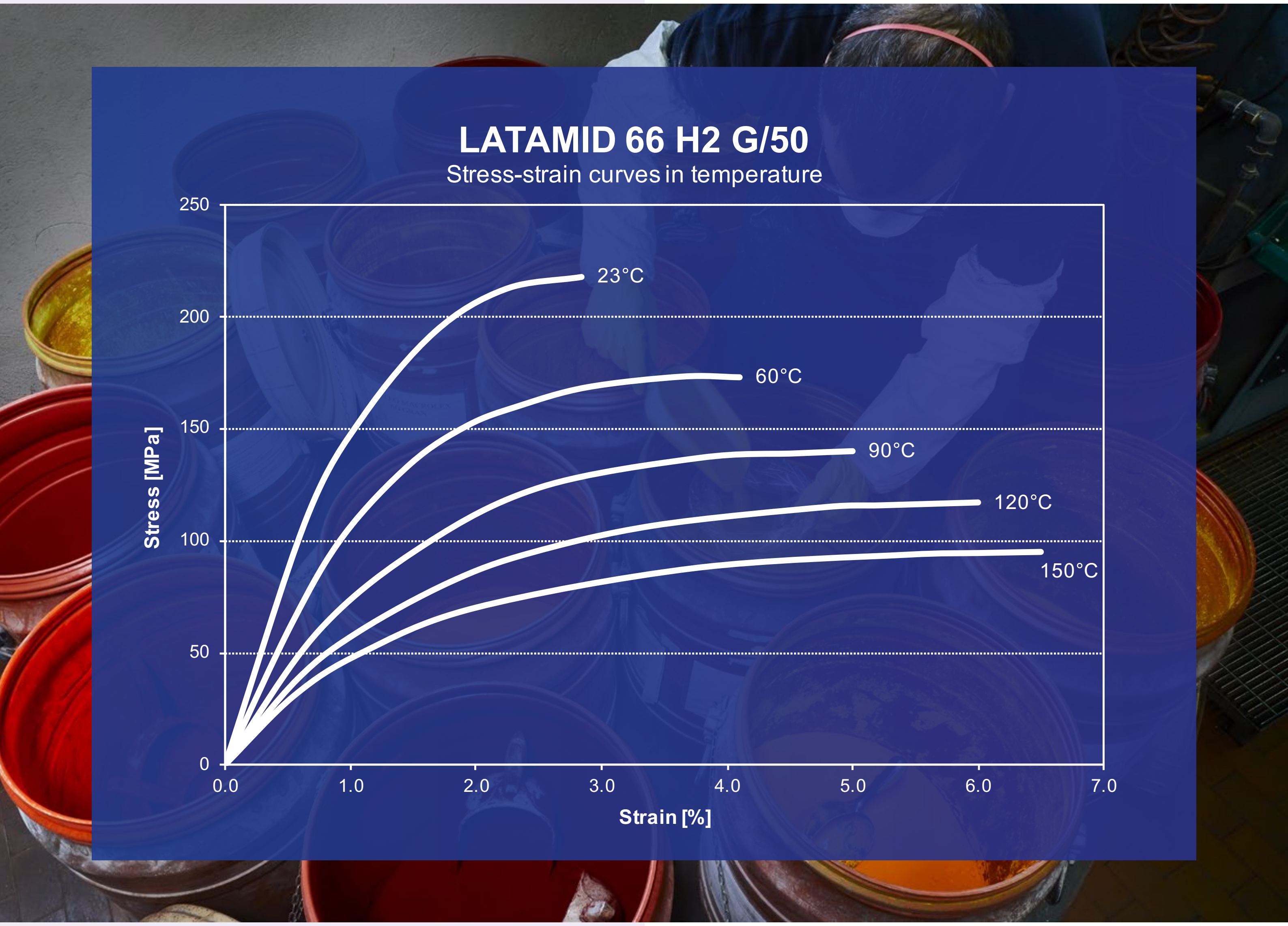
Traditional polyamides have numerous advantages. They are remarkably easy to process, for example, moreover without the need for particular equipment, high temperatures, special precautions, or specific experience.
They can also be used to create highly sophisticated formulations in order to simultaneously satisfy the most disparate project requirements: from self-lubrication to self-extinguishing or antistatic properties and good aesthetics.

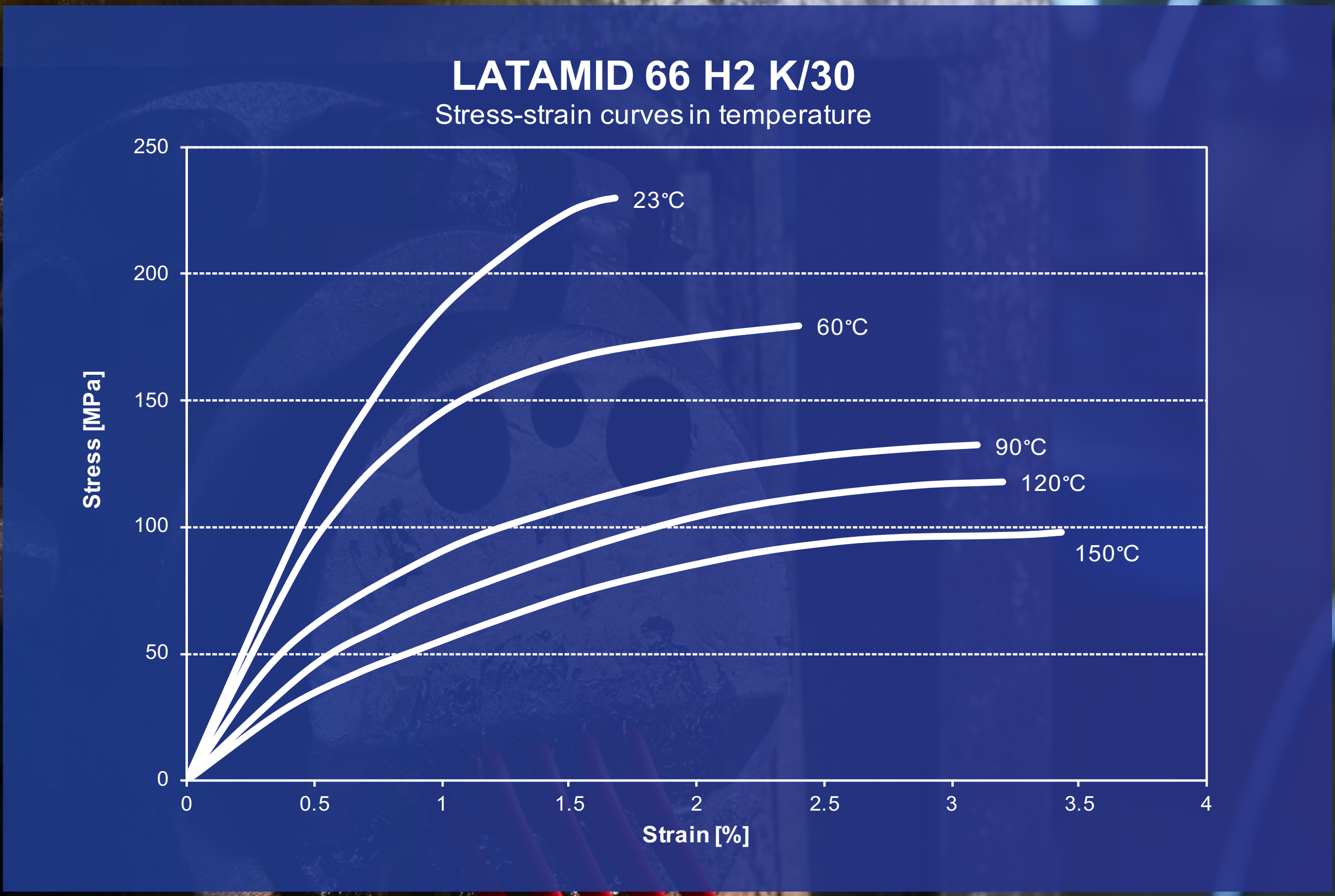
Thanks to their good chemical resistance polyamide-based compounds, especially to organic aggressors, can be used in applications in direct contact with most hydrocarbons, solvents and oils.
Bearing in mind their natural hygroscopicity, they can also be used in the presence of water or aqueous solutions, even at high temperatures, such as in heating/cooling circuits.
However, it is in the structural field that polyamides produce their most exciting results, with up to 65% glass fibre or 50% carbon fibre reinforced grades, for example.

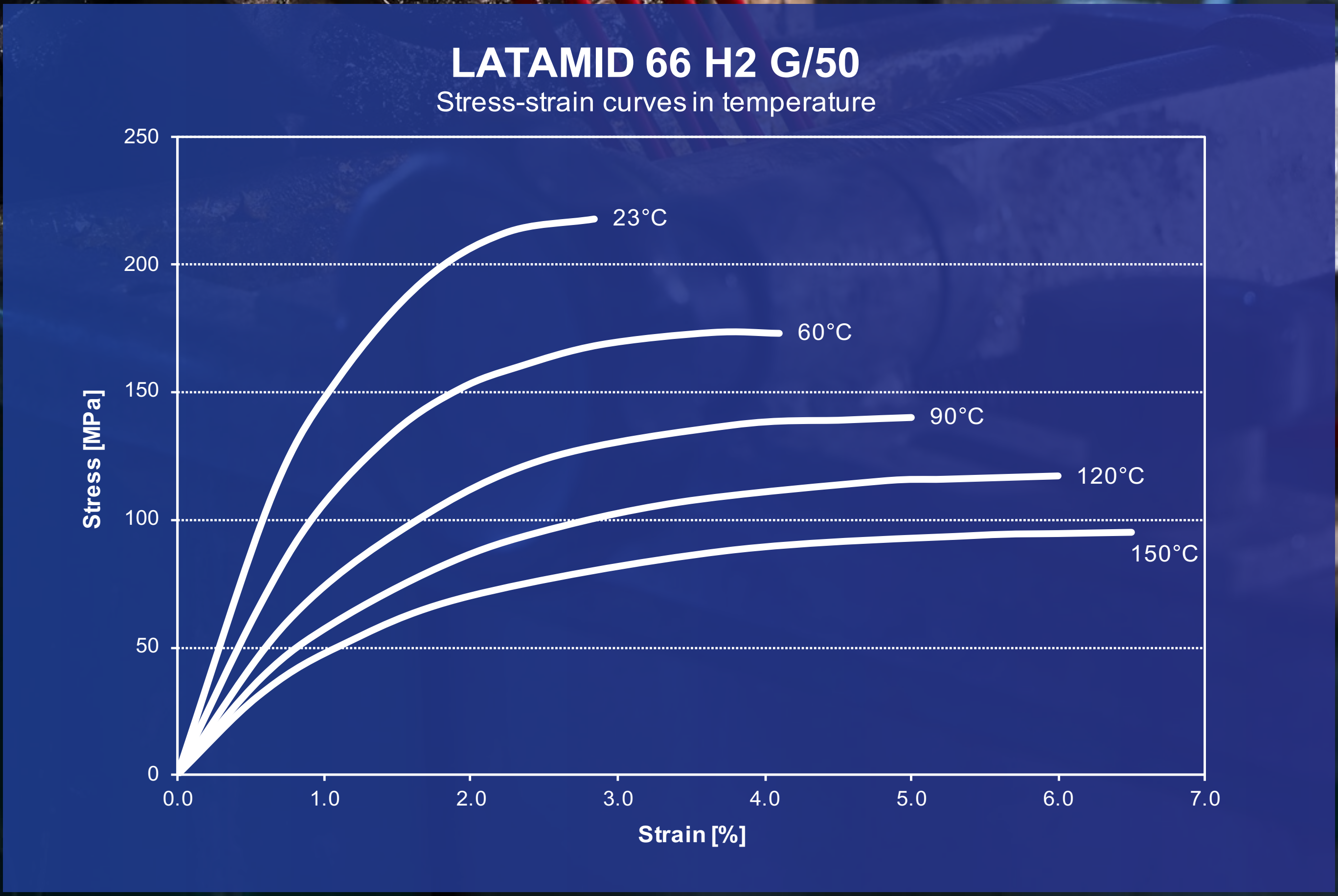
Mechanical data confirm that PA-based compounds can exceed 2,000 kg/cm^2 in tensile strength, with elastic moduli ranging between 15,000 and 28,000 MPa.
Their temperature resistance is also excellent, allowing continuous use even at temperatures of over 120°C.

Finally, their remarkable resistance to creep and to fatigue complete what amounts to a set of extremely interesting features for the designer.

Representing first step in metal replacement proper, PA66- and PA6-based compounds are an alternative to traditional metal materials, such as zamak or die-cast aluminium alloys, offering similar mechanical properties, but with densities much lower than 2 g/cm^3.




LATAMID 66 H2 K/30
Stress-strain curves in temperature
Stress [MPa]
Strain [%]
23°C
60°C
90°C
120°C
150°C
0
50
100
150
200
250
0
0.5
1
1.5
2
2.5
3
3.5
4


LATAMID 66 H2 G/50
Stress-strain curves in temperature
Stress [MPa]
Strain [%]
23°C
60°C
90°C
120°C
150°C
0
50
100
150
200
250
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0

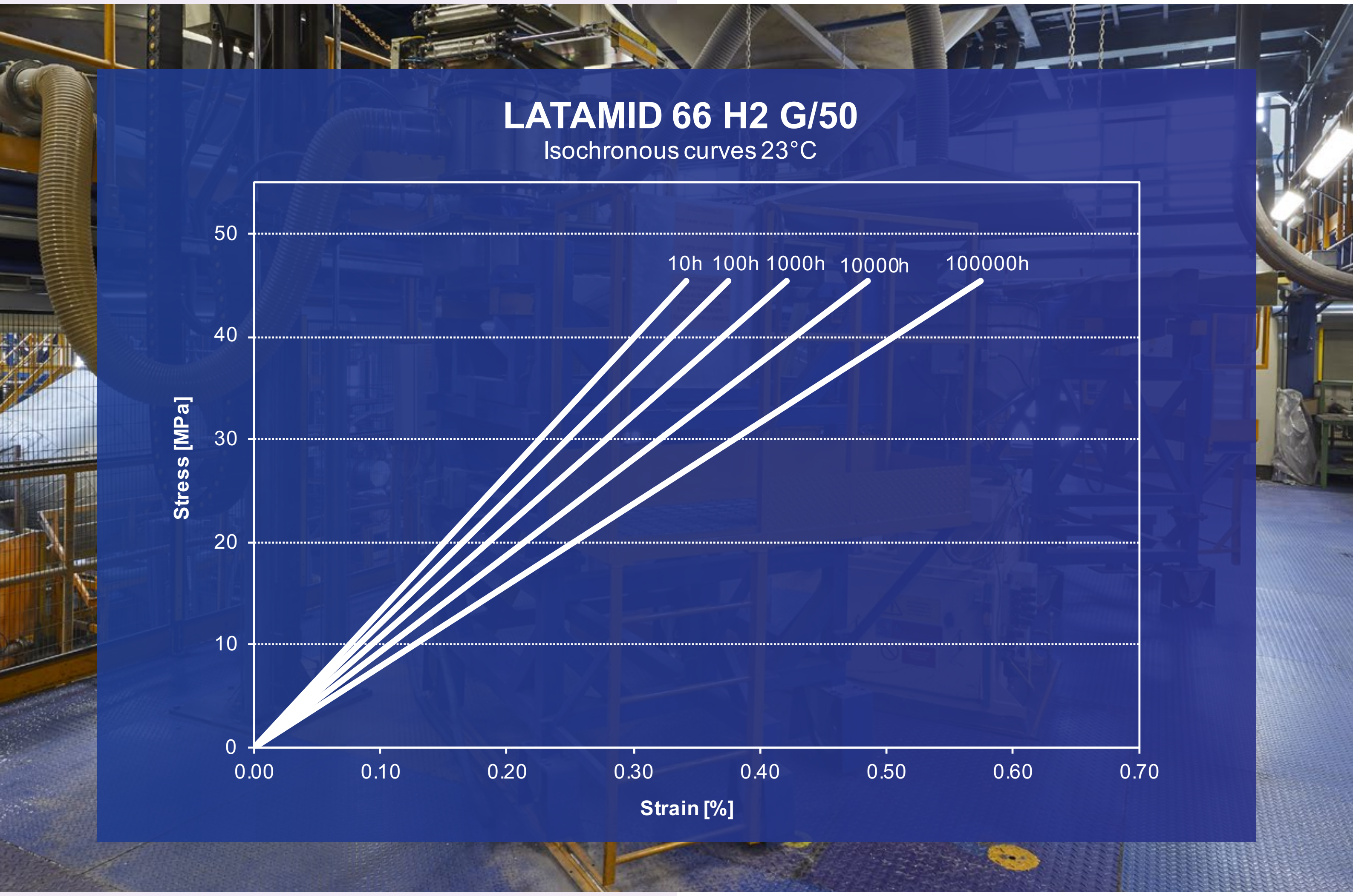
Furthermore, PA processing consumes less energy than metal machining and allows you to obtain a finished product without needing to perform further steps such as cleaning, removal of burrs and scraps, etc., thus saving you time, money and resources. The limitations of these compounds are linked almost exclusively to their performance at higher temperatures: at temperatures of over 130°C, it is necessary to switch them for better performing and more expensive polymers.

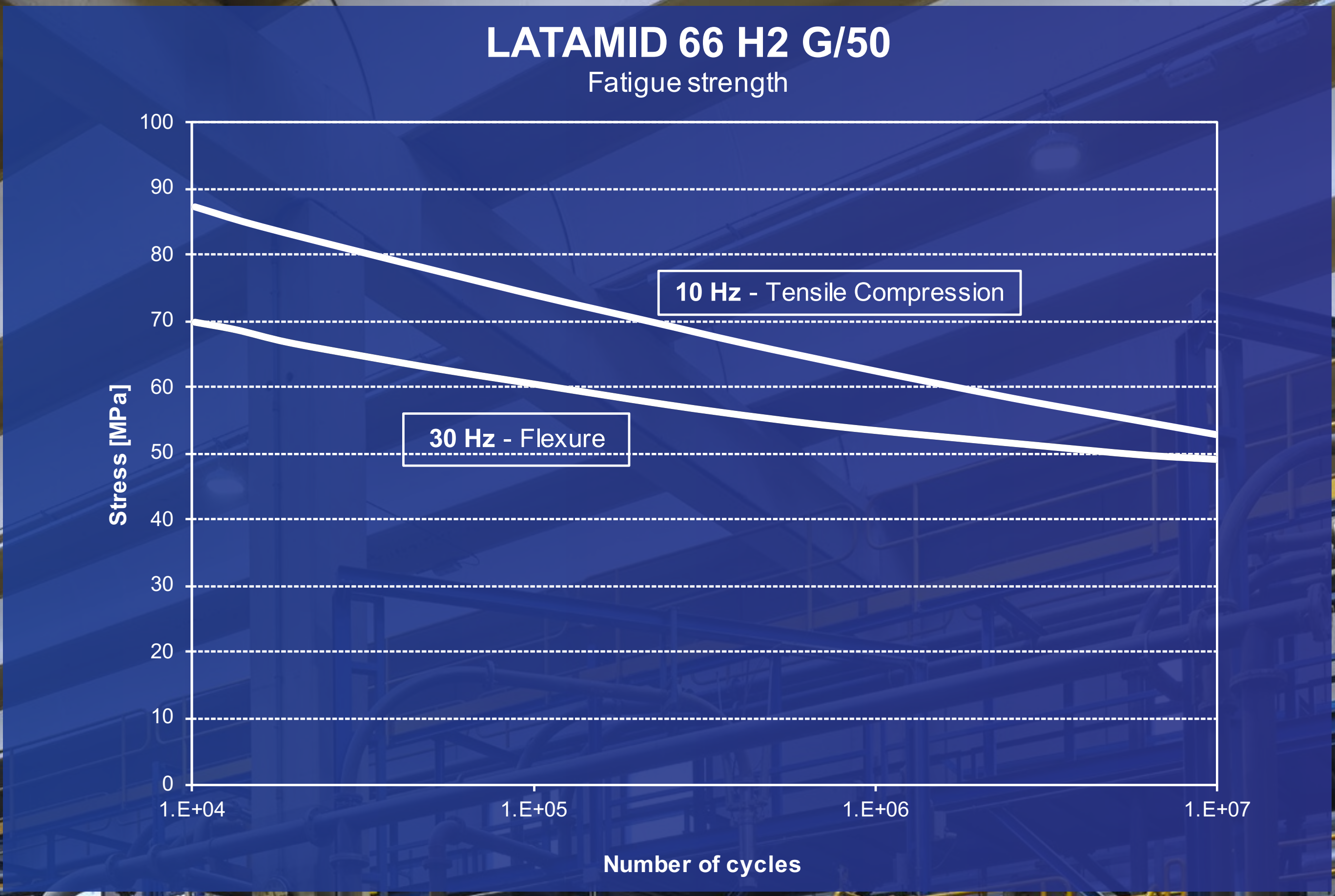
A further limitation, often, is the base resin's tendency to absorb ambient humidity. This is a specific characteristic that increases the toughness and resilience of compounds, but at the same time leads to dimensional variation and loss of elastic modulus.

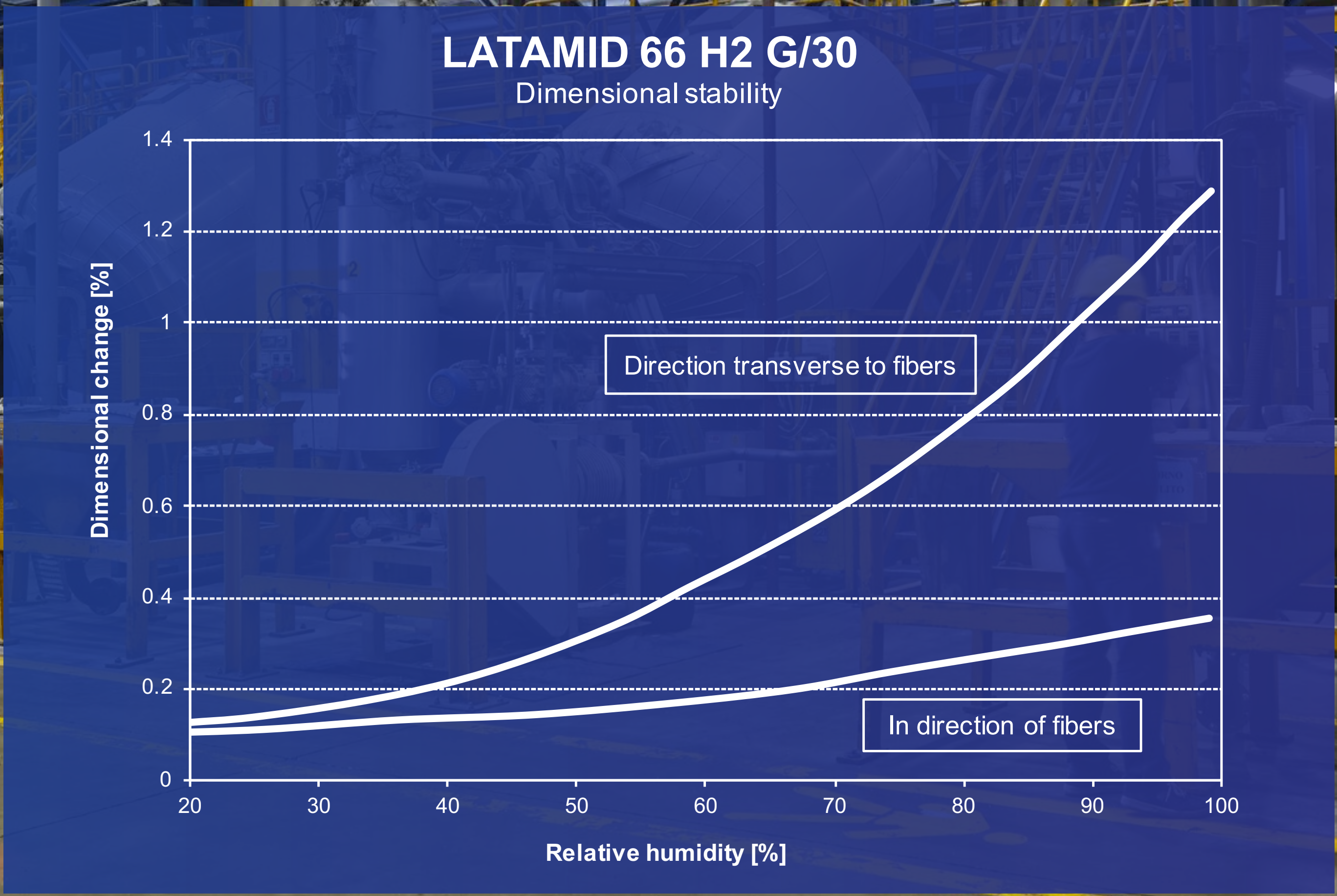
The number of application fields is enormous: PA6- and PA 66-based compounds have the same structural uses across practically all industries, except for those in which very high temperatures and prolonged exposure to hot water or strong acids/ alkalis are envisaged.

The most successful structural compounds include 30%, 50% and 65% glass fibre-reinforced PAs, and this is due not only to their particular properties, but also to their great flexibility of use and very attractive performance/price ratio.
For uncompromising applications that require high stiffness but also antistatic and self-lubricating properties, 30% or 40% carbon fibre grades are recommended instead.

All polyamides absorb moisture spontaneously until equilibrium with the surrounding environment is reached. The water molecules introduced into the polymer modify its mechanical response, reducing stiffness and stress at break, but making the material more plastic. Learn more about this phenomenon from the "Polyamides and moisture absorption" brochure.




LATAMID 66 H2 G/50
Fatigue strength
Stress [MPa]
100
90
80
70
60
50
40
30
20
10
0
10 Hz - Tensile Compression
30 Hz - Flexure
1.E+04
1.E+05
1.E+06
1.E+07
Number of cycles


LATAMID 66 H2 G/30
Dimensional stability
Dimensional change [%]
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Direction transverse to fibers
In direction of fibers
20
30
40
50
60
70
80
90
100
Relative humidity [%]

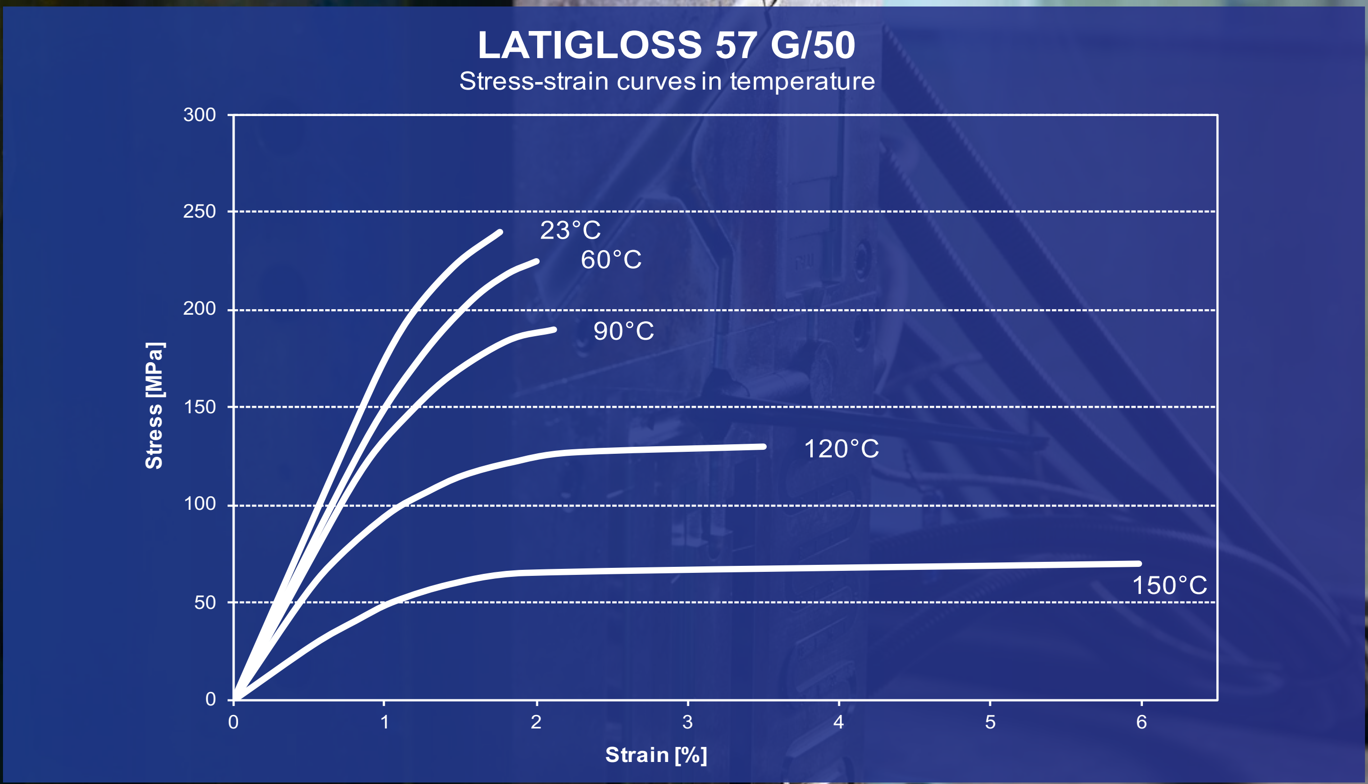
LATIGLOSS: Strength and aesthetics

In many cases, completely replacing metal also means having to reproduce its **appearance**: shiny, uniform and flawless.
It is difficult to obtain good results with traditional structural compounds as, especially with thicknesses greater than 4-5 mm, the reinforcing fibres tend to become visible, spoiling its appearance.
To address this problem and offer a group of structural compounds with high aesthetic performance, LATI created the materials making up the LATIGLOSS family.
Based on PA6, 66 or PPA, the LATIGLOSS products have a high content of selected glass or carbon fibres, dispersed in a matrix made up of specially selected resins.
The result is a structural compound that can give you **smooth, homogeneous and aesthetically flawless surfaces**, even in the case of bright or particularly critical colours, like black.
The appearance of the product is immediately convincing, without the need for additional painting or special mould finishing (embossing, EDM processes, etc.).

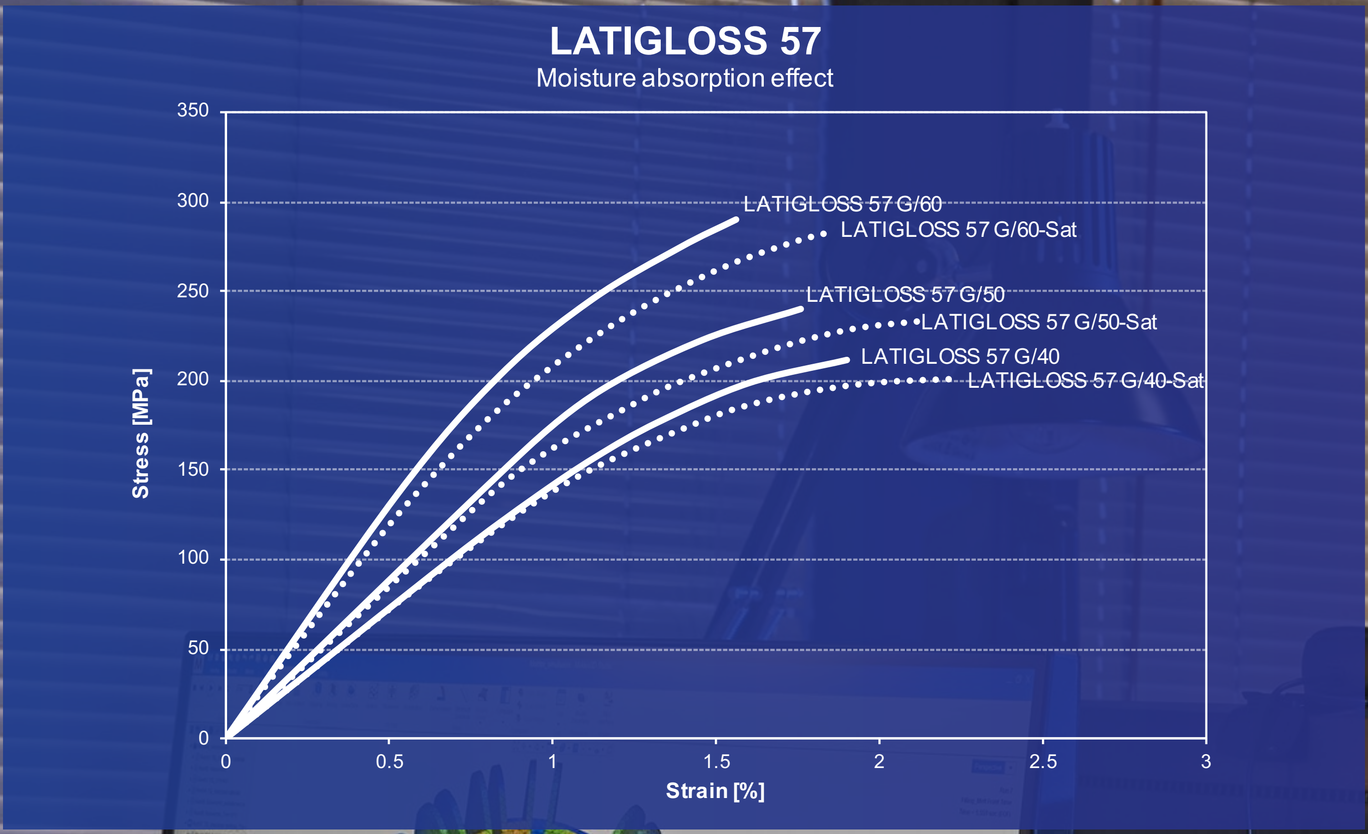
Furthermore, LATIGLOSS products can undergo **metallisation treatments**, which give excellent valid surfaces whose brightness is not compromised by any defects in the substrate.
Despite being reinforced polyamides, LATIGLOSS products also deliver a series of further advantages linked precisely to the formulation and the quality of the surface:

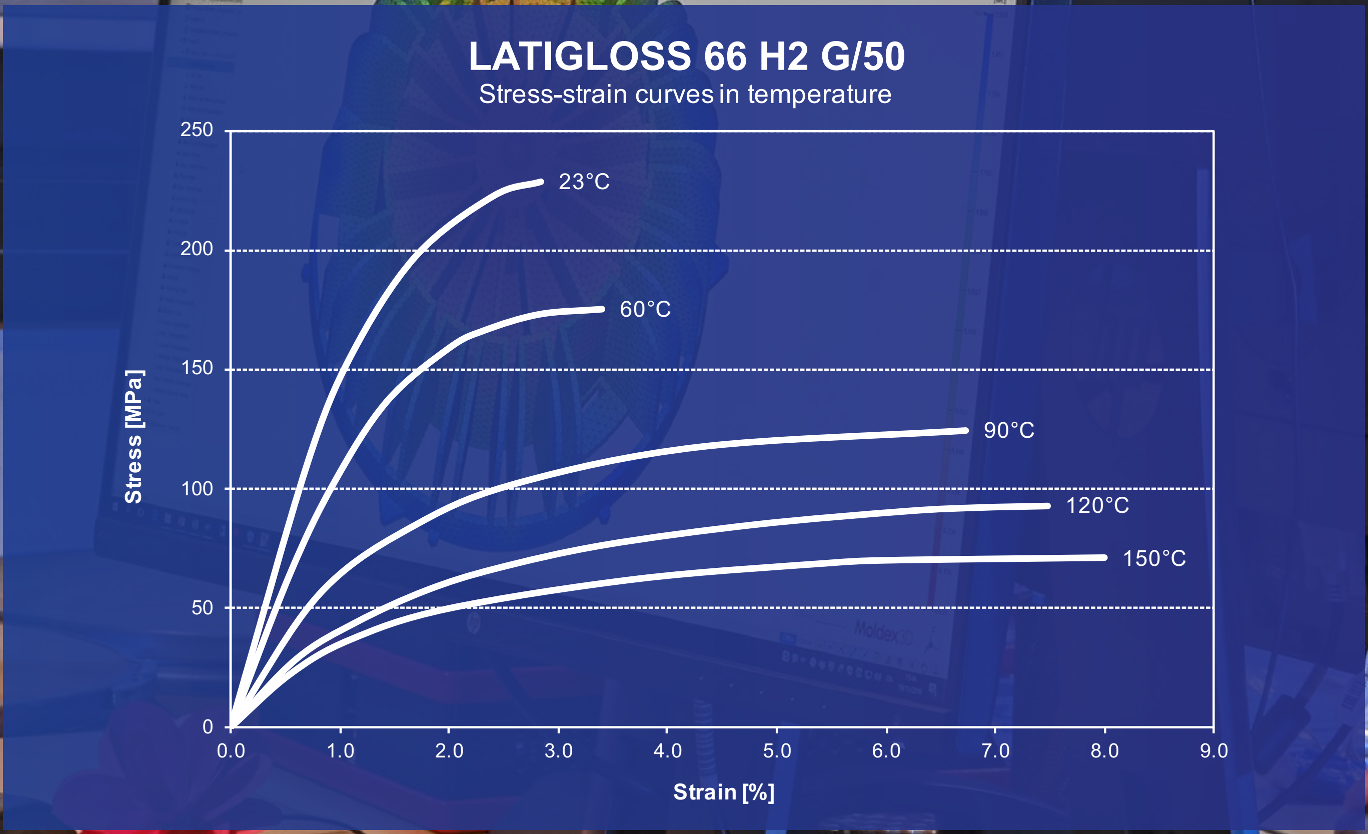
- self-lubrication;
- better fatigue resistance;
- higher dimensional stability than the standard formulation grade.

Comparison between standard compounds and LATIGLOSS compounds



The LATIGLOSS range is completed with glass fibre-reinforced grades suitable for contact with drinking water and foodstuffs, and designed for structural applications, e.g., in healthcare and food processing.
More information can be found in the brochure "LATI compounds for contact with water and foodstuffs".





LARPEEK 10 (PEEK resin)
Splashshield

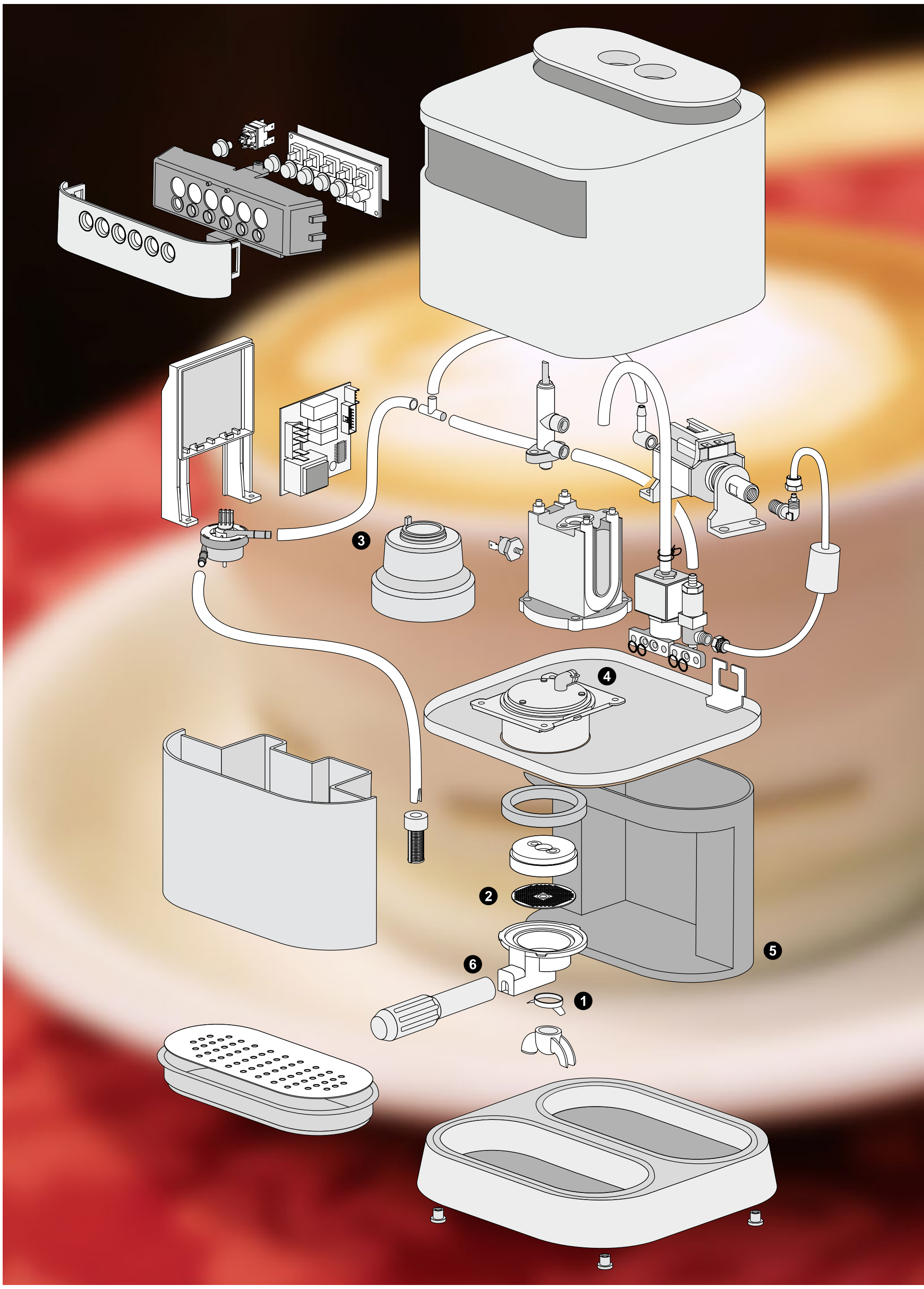
Main features
High temperature,
dimensional stability,
no-compromise chemical resistance.

LAPEX R (PPSU resin)
Perforator

Main features
Though, temperature and steam
resistant, dimensional stability.

LARTON G/40
(PPS, 40% glass fiber)
Pod holder

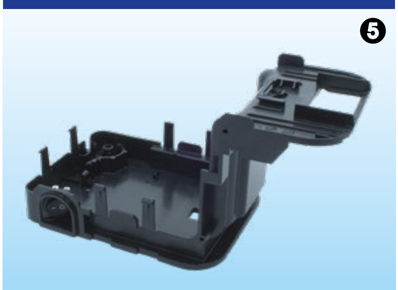
Main features
Stiff and resistant to
high temperatures and hot water.



LATIGLOSS 66 H2 G/50
(PA66 50% glass fibre)
Infusion chamber

Main features
Good mechanical and thermal
properties, though,
hot water resistant.

LATAMID 66 H2 G/50
(PA66, 50% glass fibre)
Coffee machine chassis



Main features
Dimensional stability,
easy moulding,
good mechanical properties.

LATIGLOSS 57 G/50
(PPA, 50% glass fibre)
Holding arm for coffee pods

Main features
Excellent surface finish and
mechanical properties at 100°C,
resistant to hot water.

LARTON: PPS

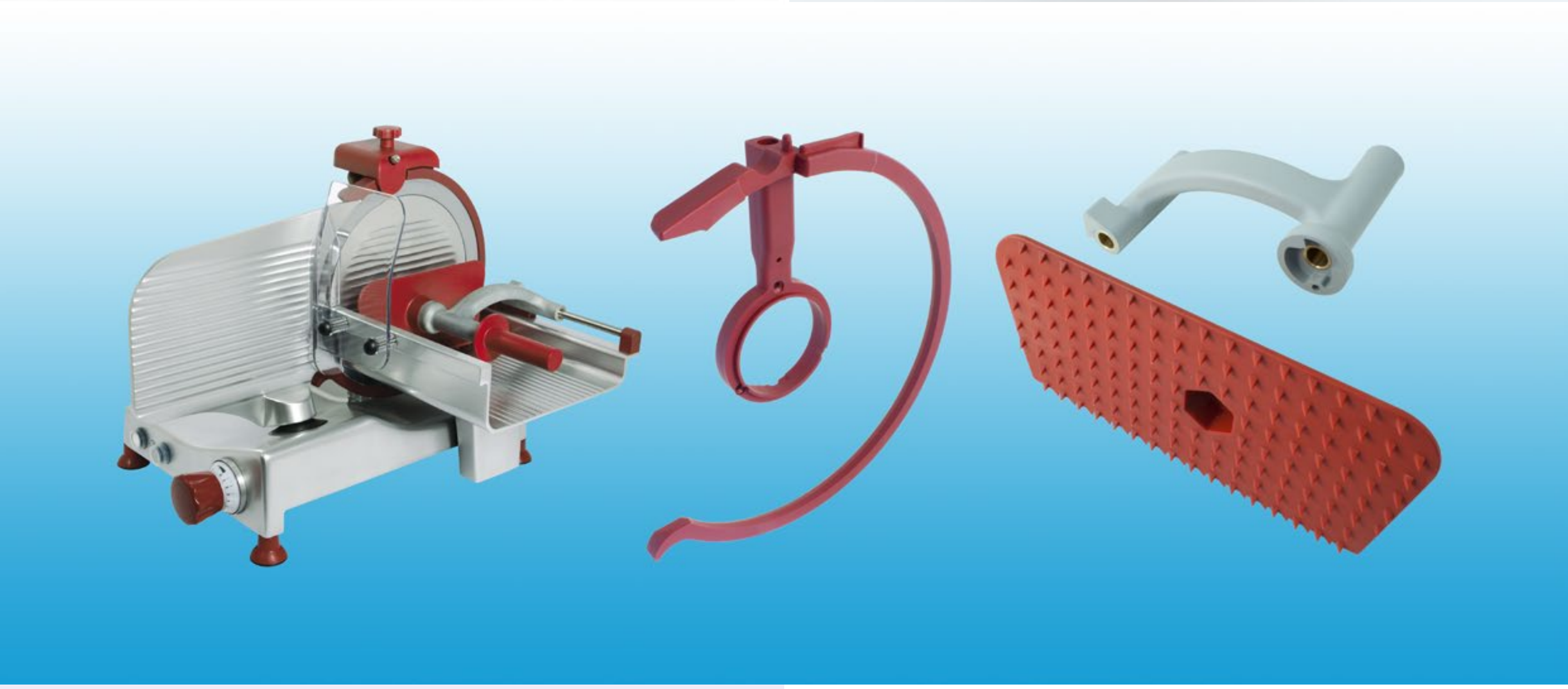
Polyphenylene sulphide is a resin suitable for producing structural compounds that not only provide excellent mechanical performance, but also allow products made from PPS to be used at temperatures of around **200°C**.
In fact, the chemical nature and molecular structure of PPS make the material **particularly resistant** to the action of **temperature** and to the effects of constant mechanical stresses over time, i.e., **creep and relaxation**.
PPS has **extraordinary chemical resistance**, which makes it suitable for use in aggressive environments characterised by continuous exposure to oils, organic solvents, hydrocarbons and many inorganic acids and alkalis.
Being **totally non-hygroscopic**, PPS does not absorb ambient humidity and therefore, unlike polyamides for example, is not subject to dimensional or performance variations according to climatic conditions.
Products made from PPS show **excellent tolerance and dimensional stability.** They can be made using relatively simple injection moulding processes, taking care to ensure the correct temperatures, especially of the mould.
From a mechanical point of view, PPS is offered with high percentages of glass and carbon fibre reinforcement. The compounds formulated in this way all offer **high stiffness**, good tensile and flexural breaking loads, and above all great reliability over time, even in the case of alternating stresses and therefore **fatigue**.
The excellent creep resistance shown by PPS makes this polymer one of the best candidates for producing items that need to maintain their geometry and strength over time, even many years, without having to worry about any gradual loss of functionality.
Even though the glass fibre-reinforced grades already offer extremely high dimensional stability, it is now possible to find compounds containing a mix of mineral fillers that can reduce moulding deformations to a minimum, ensuring compliance with even centesimal tolerances.
Finally, we should not forget that PPS-based compounds are **intrinsically self-extinguishing**. Thanks to this property, many formulations are naturally self-extinguishing with a flammability rating of V0 according to the UL94 standard, even when used in thin-wall applications.

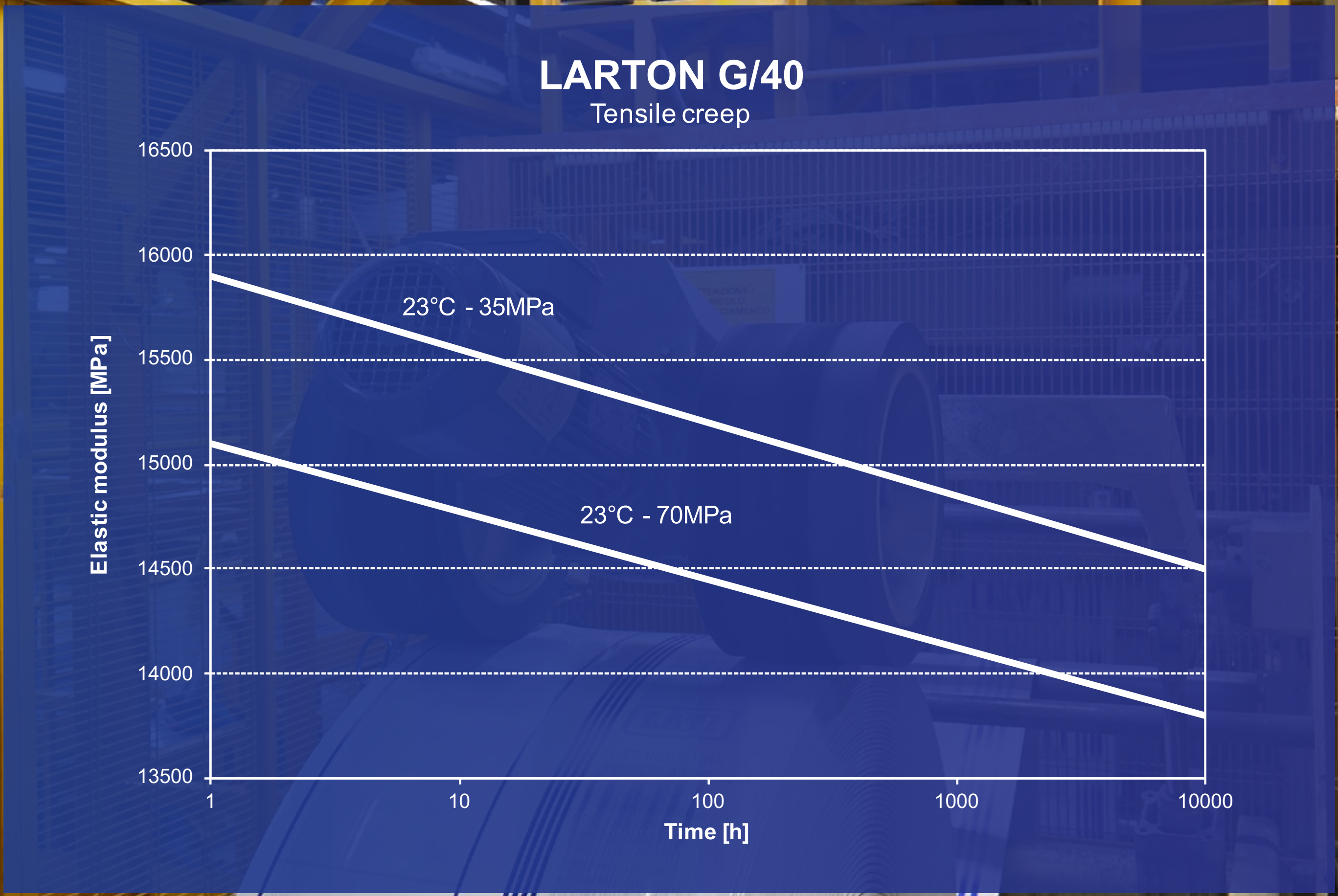
Nevertheless, PPS does have certain limitations that need to be guarded against, especially in the design phase.
It is in fact relatively fragile; its **low elongation at break, just over 1%**, makes it unable to withstand even apparently limited imposed deformations – as in the case of clips, force fit, shrink fit, and so on. For the same reason, particular care is needed if self-tapping screws are used or post-processing is carried out.
Furthermore, the electrical performance of the material is poor, as it has a **creeping current resistance** of just 125V.
Finally, it is crucial to point out that reinforced PPS does not lend itself to the **moulding of high thicknesses** due to its tendency to form internal cracks during cooling.

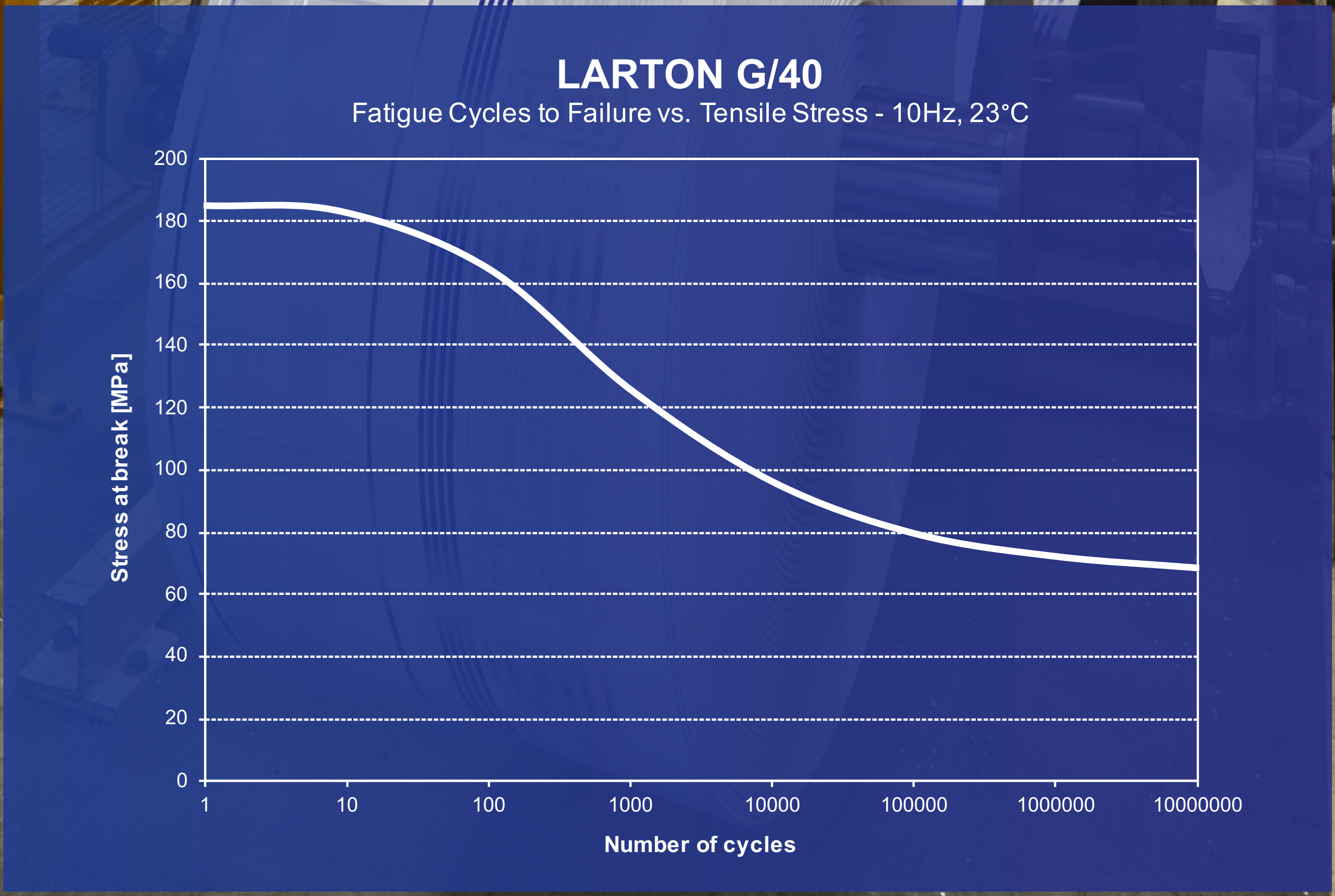
As a replacement for metal, PPS, e.g., in its versions reinforced with 40% glass fibre or 30% carbon fibre, is therefore recommended for making parts that:

- are very rigid, dimensionally stable and compliant with the tolerances of the design;
- are destined to be used in a hostile chemical environment;
- will have to withstand high temperatures, of up to 200°C;
- need to be reliable over time, and therefore resistant to creep, relaxation and fatigue.

Typical application fields: automotive, chemical industry, precision mechanics, hydraulics, alternative energy.



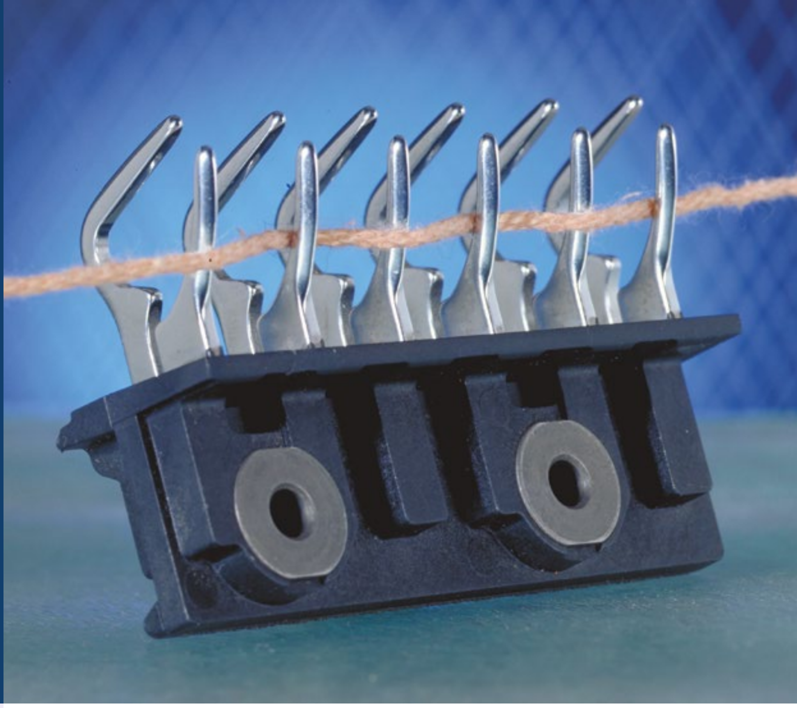

LARTON G/40
Tensile creep
Elastic modulus [MPa]
16500
16000
15500
15000
14500
14000
13500
23°C - 35MPa
23°C - 70MPa
1
10
100
1000
10000
Time [h]


LARTON G/40
Fatigue Cycles to Failure vs. Tensile Stress - 10Hz, 23°C
Stress at break [MPa]
200
180
160
140
120
100
80
60
40
20
0
1
10
100
1000
10000
100000
1000000
10000000
Number of cycles

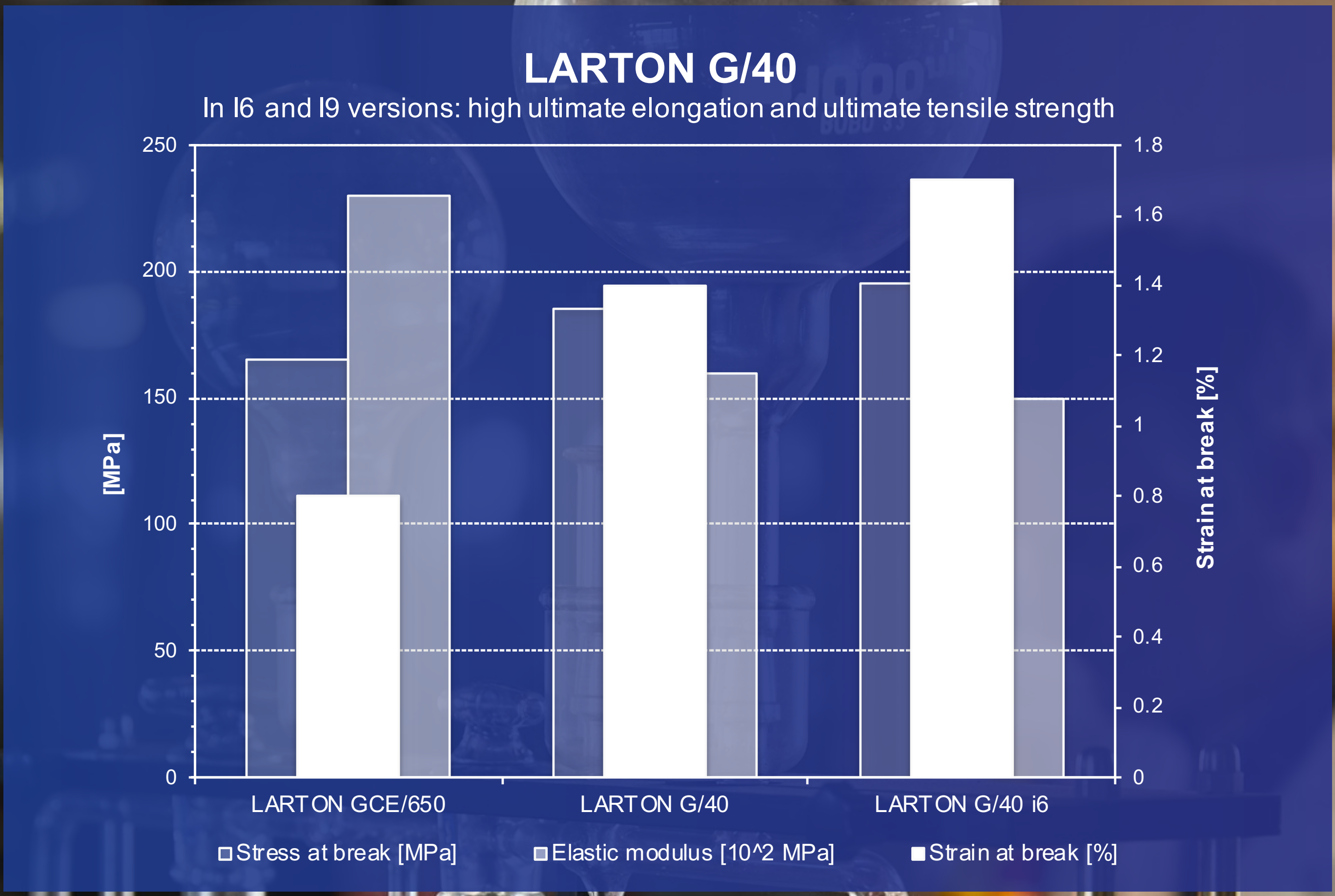
LATI's experience in PPS compounding is reflected into a wide range of compounds for structural applications.

In particular, LATI has reduced the effects of the intrinsic brittleness of PPS by developing special versions of this polymer that deliver greater resilience and up to 50-60% greater elongation at break compared with traditional products.

These formulations, named **I6** and **I9**, can be used to produce structural elements in PPS that withstand relatively high deformation.



Special knife in LARTON G/40 BLACK:3355 for a textile machine.



LARAMID: PPA

The inclusion of aromatic groups in the molecular structure of polyamide makes it possible to significantly increase the already excellent properties of this family of compounds.
The main features of PPAs that can be **improved** significantly are the **thermal and chemical properties**, heat resistance is generally over 40-50°C higher compared to PA6, allowing for example the use even in high temperature environments such as the engine compartment of cars or the interior of boilers, compressors and electrical devices.
PPAs prove **highly resistant** to aggressive organic chemicals, can withstand acids and inorganic alkalis fairly well and are significantly less hygroscopic than PA66.
In addition, PPAs can incorporate high quantities of reinforcement fibres to produce compounds with extraordinarily high mechanical properties, especially in terms of breaking load, impact resistance and modulus of elasticity.

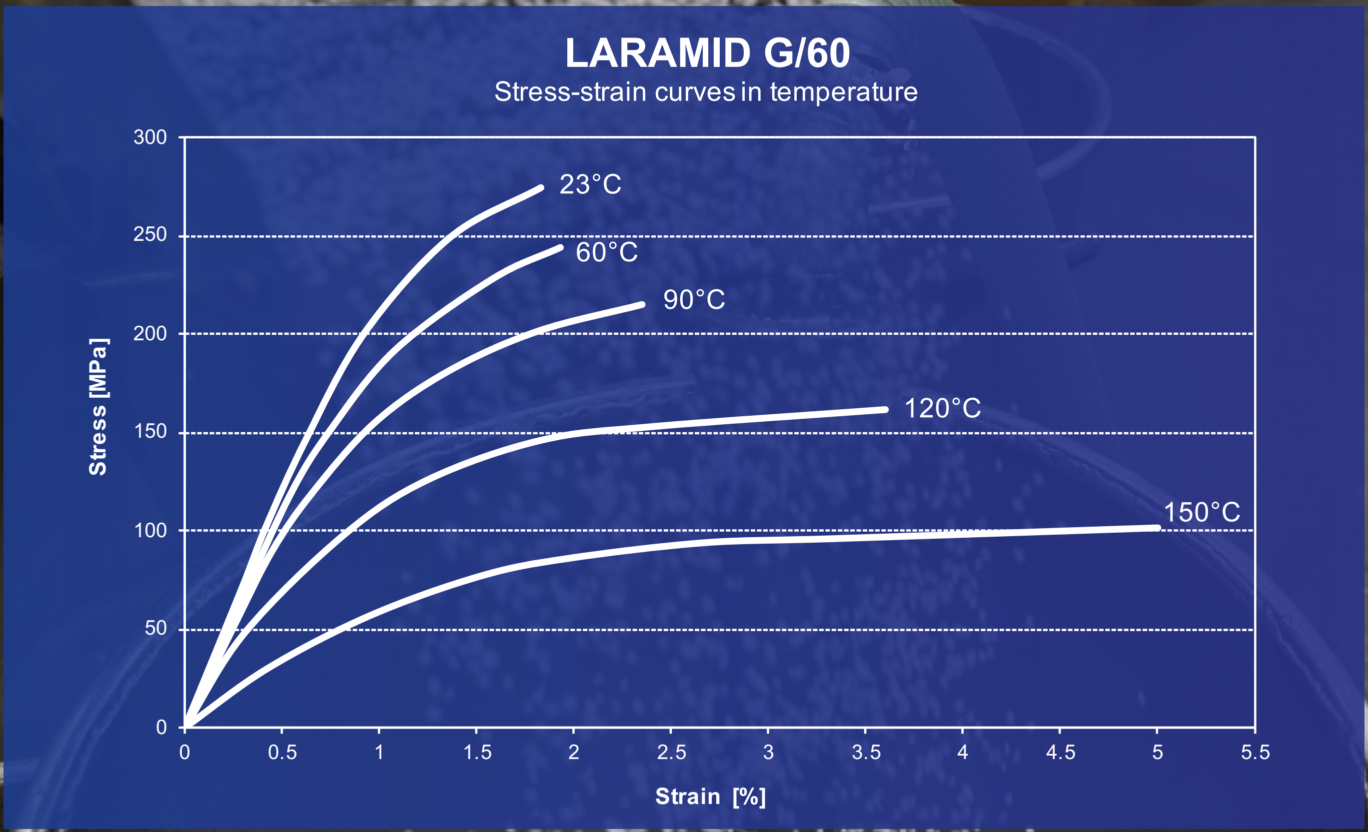
Compared to PPS, a resin with which PPAs share some application sectors, PPAs entail greater adaptability to applications involving local deformation, post-processing, tight assemblies but also overmoulded metal inserts, high thicknesses (poorly tolerated by PPS), impacts and impulsive stress loads.

With a view to metal replacement, PPA-based compounds are able to meet the highest requirements, with breaking loads close to 3.000 kg/cm² (300 MPa) and modulus of elasticity higher than 25.000 MPa for versions reinforced with 60% glass fibre.
The limits of PPAs are mainly related to processing: a certain experience is required to obtain dimensionally stable products with enhanced appearance that fully exploit the extraordinary mechanical properties of these compounds.

PPA-based materials are suitable for structures requiring:

- breaking load and elongation at break directly comparable with certain aluminium alloys or with zamak;
- excellent resistance to high temperatures;
- toughness and resilience;
- easy post-processing.

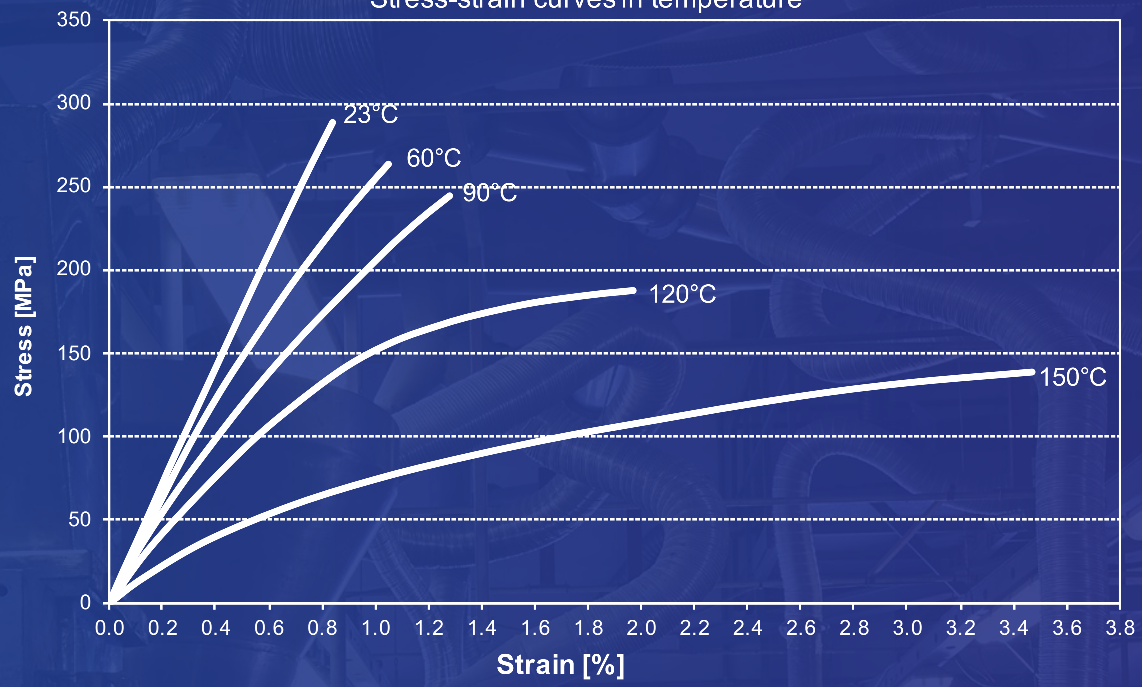
PPAs are widely used thanks to the fact that they can be considered a high-performance **version of polyamide resins and a direct alternative to PPS**. They are therefore adopted in automotive and interior design applications, in the construction of pressure vessel parts, actuators, pump and motor components, etc.
The most interesting products in the LATI range include structural compounds with a high content of **glass fibre ranging from 30% to 60%**.
In metal replacement applications that need particularly high performance levels, a **carbon fibre reinforced grade** is also available offering a modulus of elasticity well above 30 GPa.



LATI's PPA family has been enlarged with the addition of the PA9T polymer.
The new **LARAMID T** structural compounds stand out for their toughness and very low moisture absorbency.
Find out more about this range on the dedicated brochure!

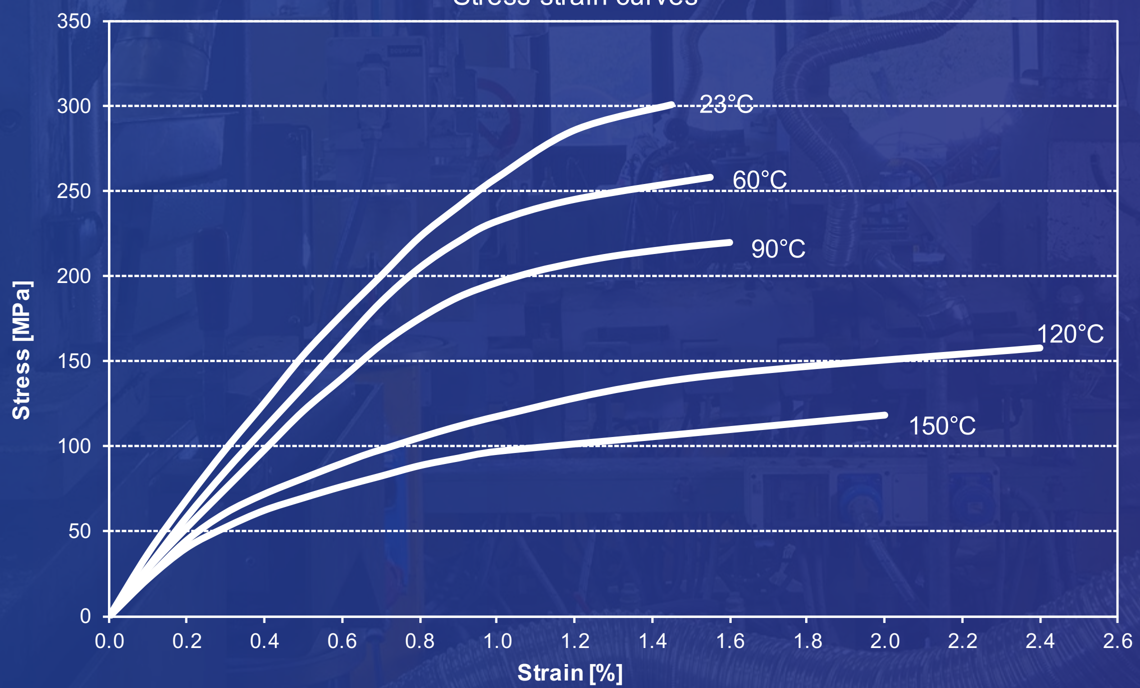
LARAMID K/40 HM

Stress-strain curves in temperature



LARAMID T K/40

Stress-strain curves



LARPEEK: PEEK

Sitting on the top of the pyramid of engineering thermoplastics, PEEK is a material with extraordinary properties developed for **continuous use at temperatures close to 260°C.** The performance levels reached by this polymer can be described simply by indicating it as one of the best materials from every point of view (chemical, tribological, thermal, toxicological etc.). However, it is necessary to keep into account that its price, rather high, makes its use only viable in specific situations where there is no other alternative or it is necessary to avoid any risk.

The structural compounds based on PEEK do not differ from those obtained from other resins, e.g. PPS: they are available in reinforced grades with up to 50% glass fibre and up to 45% carbon fibre.
With the same reinforcement content, the extraordinary properties of the matrix polymer do not make PEEK compounds mechanically stronger than other less expensive materials.
For this reason the adoption of LARPEEK is only recommended in applications involving very high **temperatures or in case of particularly severe exposure to chemicals.**

MATERIAL	Moisture absorp. (24h RH50%)	Moisture absorp. (eq. RH50%)	Moisture absorp. (24h immersed)	Moisture absorp. (eq. immersed)
LATAMID 66 H2 G/30	0.27	1.7	0.65	5.2
LATAMID 66 H2 K/30	0.27	1.75	0.67	5.5
LATAMID 66 H2 G/50	0.25	1.3	0.5	4.5
LATAMID 66 H2 G/60	0.24	1.2	0.45	4.3
LATIGLOSS 66 H2 G/50	0.3	1.35	0.55	4.5
LATIGLOSS 66 H2 G/60	0.29	1.25	0.5	4.4
LARAMID G/60	0.17	0.6	0.3	2.9
LATIGLOSS 57 G/40	0.2	1	0.33	3.3
LATIGLOSS 57 G/50	0.18	0.9	0.31	3.1
LATIGLOSS 57 G/60	0.17	0.65	0.3	3

MAXIMUM STIFFNESS: HM MATERIALS

Metals are adopted in certain applications owing to their resistance to the deformation caused by loads in working conditions.
In this case, even the strongest structural compound may guarantee a good resistance to stress but not the necessary stiffness, as a result leading to unacceptable deformation levels.
To meet these needs, LATI has created a family of compounds featuring a particularly high modulus of elasticity – more than double compared to conventional structural materials.

LATI's **HM (High Modulus)** resins are obtained from high performance matrices (e.g. PPA) reinforced with 40-45% high modulus carbon fibres that are longer than the traditional chopped strand.
The resulting materials offer performance levels that are almost identical to traditional grades but with a **much higher modulus of elasticity** and, consequently, they prove less deformable under the same loads.

The tests have also shown a general **improvement in fatigue behaviour** compared to, for example, a traditional material reinforced with 30% carbon fibre.

The unique formulation of HM compounds by LATI does not need special precautions to be taken in their handling or processing, on both presses and moulds.

For this reason, these grades can be injection moulded the same way as any other reinforced engineering polymer.
With regard to moulds, it is sufficient to adopt the type of steel and surface hardening treatment that are normally used for compounds reinforced with high percentages of glass or carbon fibre.

With the HM compounds, the challenge of metal replacement reaches its highest level, offering opportunities in application fields hitherto beyond the reach of polymer-based materials while still maintaining interesting aspects in terms of final cost of the product.
Designed to provide a very specific answer to a purely mechanical requisite, HM compounds can replace metal in a number of sectors where operating precision is mandatory during use:

- robotics and automation,
- textile industry,
- precision mechanics,
- defence and aerospace industries.

PROPERTIES (typical values)	TESTING CONDITIONS	STANDARDS	UNITS (SI)	LATILON 28D G/30	LAPEX A G/30	LATENE AG7H G/30	LATENE AG7H2 G/50	LATIBLEND 6252 H2 G/30	LATER 4 G/30	LATER 4 G/50	LATER 4 K/30
				PC	PES	PPH		PA6/PP	PBT	PBT	PBT
PHYSICAL											
Density	23°C	ISO 1183	g/cm³	1.44	1.60	1.12	1.32	1.24	1.52	1.74	1.40
Linear shrinkage at moulding* (60x60x2mm)-packing pressure: 60MPa	along flow	ISO 294-4	%	0.15 ÷ 0.35	0.30 ÷ 0.45	0.30 ÷ 0.70	0.25 ÷ 0.50	0.35 ÷ 0.50	0.30 ÷ 0.55	0.25 ÷ 0.40	0.10 ÷ 0.25
	across flow			0.35 ÷ 0.55	0.60 ÷ 0.75	0.40 ÷ 0.80	0.75 ÷ 1.05	0.80 ÷ 1.10	1.00 ÷ 1.30	0.70 ÷ 0.90	0.80 ÷ 1.20
MECHANICAL											
Charpy - Impact strength notched (specimen 80x10x4 mm)	23°C	ISO 179-1eA	kJ/m²	7.5	6	10	5	10	8	9	6
Charpy - Impact strength unnotched (specimen 80x10x4 mm)	23°C	ISO 179-1eU	kJ/m²	20	25	65	20	55	55	45	40
Tensile modulus	23°C	ISO 527-1	MPa	8000	9600	6300	10000	9400	9500	15500	21500
	60°C			7500	9400	4500	8200	6400	6900	10000	15500
	90°C			7000	9200	3300	5300	4700	5100	7700	9300
	120°C			6200	9000			3100	4100	5500	6200
	150°C				8600			2100	3200	4500	4700
Tensile strength	23°C	ISO 527-1	MPa	90	130	80	105	125	125	135	150
	60°C			80	125	55	65	78	85	90	110
	90°C			70	115	40	40	53	70	70	80
	120°C			50	100			40	50	55	60
	150°C				90			27	45	45	45
Elongation at break	23°C	ISO 527-1	%	1.7	2	3	2.5	2.7	2.5	1.8	1
	60°C			1.4	2.1	3.5	3.4	4.6	3.2	2.5	1.3
	90°C			1.5	2.3	6	5.8	6	5	2.5	1.5
	120°C			1.5	2.4			6.7	5.5	3	1.7
	150°C				2.5			7.5	5.5	3	2
THERMAL											
Vicat - Softening point (heating rate 50°C/h)	49 N - 50°C/h	ISO 306	°C	145	220	135	140	170	215	215	225
HDT – Heat Distortion Temperature	0.45 MPa	ISO 75	°C	140	220	155	160	195	220	225	215
	1.82 MPa			135	215	135	140	160	210	215	215
Coefficient of linear thermal expansion				10	4	20	8	8	15	10	3
SELF-EXTINGUISHING											
				UL		UL		UL	UL		

FEATURES

UL — UL approved grade

Intrinsically self-extinguishing base resin

LATI — Flame retardant material-LATI tested

LATAMID 12 G/50	KELON B H CET/30	LATAMID 6 H2 G/35	LATAMID 6 S/30	LATAMID 6 H2 G/50	LATAMID 6 H2 G/65	LATIGLOSS 62 H2 G/50	LATAMID 66 H2 G/30	LATAMID 66 H2 G/50	LATAMID 66 H2 G/50-V0KB1	LATAMID 66 H2 G/50-V0HF1	LATAMID 66 H2 G/50-GWHF1	LATAMID 66 H2 G/60	LATAMID 66 H2 K/30	LATAMID 66 H2 K/40
PA12	**PA6**	**PA6**	**PA6**	**PA6**	**PA6**	**PA6**	**PA66**	**PA66**	**PA66**	**PA66**	**PA66**	**PA66**	**PA66**	**PA66**
1.45	1.38	1.41	1.34	1.56	1.74	1.55	1.36	1.56	1.56	1.68	1.58	1.69	1.28	1.30
0.35 ÷ 0.55	0.35 ÷ 0.60	0.30 ÷ 0.50	0.90 ÷ 1.20	0.25 ÷ 0.45	0.10 ÷ 0.25	0.20 ÷ 0.45	0.35 ÷ 0.65	0.30 ÷ 0.60	0.25 ÷ 0.55	0.25 ÷ 0.60	0.30 ÷ 0.60	0.25 ÷ 0.55	0.15 ÷ 0.35	0.15 ÷ 0.35
0.75 ÷ 1.00	0.40 ÷ 0.65	0.60 ÷ 0.80	1.00 ÷ 1.25	0.50 ÷ 0.70	0.30 ÷ 0.45	0.50 ÷ 0.70	0.75 ÷ 1.05	0.65 ÷ 0.95	0.65 ÷ 0.95	0.75 ÷ 1.10	0.80 ÷ 1.20	0.60 ÷ 0.90	0.55 ÷ 0.85	0.45 ÷ 0.70
18	3	10	3	15	12	10	10	15	10	8	12	10	5	8
100	35	75	25	85	60	80	85	60	65	45	65	70	50	50
10500	6500	10500	4200	15500	20000	14500	9400	17000	13500	16000	16500	21000	22500	25500
6300	4200	8500	2000	12500	15500	10500	8500	10000	8500	11500	11000	16000	21500	23000
5100	2200	5800	1100	8500	9500	6000	7400	8000	7200	7100	6500	10500	15000	16000
4300	1700	4600	700	6900	7800	4500	5500	7100	6000	6000	6000	8200	10500	11000
3300	1500	3700	580	6000	6500	3800	4400	6000	4500	5300	5000	6300	7700	8200
150	70	175	70	215	200	200	175	215	180	175	205	215	220	220
110	55	130	45	160	145	140	135	170	125	125	150	170	160	170
90	30	100	35	130	115	85	110	140	100	95	110	130	135	145
80	25	90	25	115	105	65	100	120	80	90	90	110	120	125
55	20	80	20	100	95	55	85	100	65	80	80	95	100	105
4.5	2.5	3	4	2.5	2.2	2.8	3.2	3	2.2	2	2.2	2	1.7	1.2
6.2	3.8	3.8	10	3	2.7	4	4	4.2	3.2	2.8	3	3	2.3	1.8
6.7	8.5	5	15	3.8	3.5	6.3	5.5	5	3.5	3.6	3.8	3.5	3	2.7
7.7	18	5.5	20	4.2	3.8	7.6	6	6	3.7	4	4.1	4.5	3.2	3
8.6	30	6	35	4.5	4	9	6.5	6.5	3.8	4.2	4.4	5	3.4	3.2
180	200	215	205	220	215	210	255	255	255	255	255	245	255	255
190	210	220	195	225	215	210	260	260	265	260	260	255	260	260
185	155	205	85	215	205	185	240	255	245	250	250	235	250	255
8	30	12	35	10	6	10	8	7	4	4	4	6	2	2
	UL	UL		UL			UL	UL	UL	UL	LATI	UL		

** Values obtained according to ISO norm at the specified pressure. Actual shrinkage values may differ because of the design*

PROPERTIES (typical values)	TESTING CONDITIONS	STANDARDS	UNITS (SI)	LATAMID 66 H2 K/50	LATAMID 66 E21 K/30	LATIGLOSS 66 H2 G/50 F2	LATIGLOSS 66 H2 G/50-V0	LATIGLOSS 66 H2 G/60	LATIGLOSS 66 H2 K/30	LARAMID G/35	LARAMID G/50
				PA66	PA66	PA66	PA66	PA66	PA66	PPA	PBT
PHYSICAL											
Density	23°C	ISO 1183	g/cm³	1.37	1.20	1.57	1.83	1.68	1.27	1.46	1.64
Linear shrinkage at moulding* (60x60x2mm)-packing pressure: 60MPa	along flow	ISO 294-4	%	0.10 ÷ 0.30	0.25 ÷ 0.45	0.30 ÷ 0.60	0.25 ÷ 0.45	0.30 ÷ 0.50	0.15 ÷ 0.35	0.30 ÷ 0.55	0.20 ÷ 0.40
	across flow			0.35 ÷ 0.55	0.65 ÷ 0.95	0.65 ÷ 0.90	0.55 ÷ 0.80	0.60 ÷ 0.85	0.55 ÷ 0.85	0.75 ÷ 1.05	0.45 ÷ 0.70
MECHANICAL											
Charpy - Impact strength notched (specimen 80x10x4 mm)	23°C	ISO 179-1eA	kJ/m²	7	15	15	8.5	10	5	8	12
Charpy - Impact strength unnotched (specimen 80x10x4 mm)	23°C	ISO 179-1eU	kJ/m²	35	50	85	55	55	35	55	75
Tensile modulus	23°C	ISO 527-1	MPa	29000	20000	16000	22000	22500	21000	13500	17500
	60°C			27000	19500	12000	15500	18000	16000	12000	14500
	90°C			17500	11700	7000	10000	11000	10000	10000	12500
	120°C			12000	8200	5000	7800	6600	6100	8500	11000
	150°C			9500	6000	4000	6000	5800	4900	4500	6000
Tensile strength	23°C	ISO 527-1	MPa	210	180	230	210	235	230	225	260
	60°C			170	140	175	170	180	155	180	205
	90°C			140	110	125	135	130	110	155	185
	120°C			125	95	95	115	100	80	130	155
	150°C			100	75	70	100	75	65	85	95
Elongation at break	23°C	ISO 527-1	%	1	1.8	2.8	1.8	2.2	1.7	2.5	2.1
	60°C			1.5	3.2	3.2	3	2.6	2.6	2.8	2.3
	90°C			2.4	3.2	6.7	3.5	5.7	4.2	3	2.4
	120°C			2.8	4.2	7.5	3.8	7	4.6	4.4	3.8
	150°C			2.9	4.3	8	4	7.5	5	8.6	6.5
THERMAL											
Vicat - Softening point (heating rate 50°C/h)	49 N - 50°C/h	ISO 306	°C	255	245	250	250	240	245	270	275
HDT – Heat Distortion Temperature	0.45 MPa	ISO 75	°C	260	260	255	255	255	255	285	290
	1.82 MPa			255	250	235	235	235	240	280	280
Coefficient of linear thermal expansion				2	5	7	4	6	2	8	4
SELF-EXTINGUISHING											

FEATURES

UL approved grade

Intrinsically self-extinguishing base resin

Flame retardant material-LATI tested

LARAMID G/60	LARAMID K/40 HM	LATIGLOSS 57 G/40 F2	LATIGLOSS 57 G/50 F2	LATIGLOSS 57 G/60 F2	LARTON G/40	LARTON L G/40	LARTON G/40 I6	LARTON GK/400	LARTON GCE/650	LARTONK/30	LARPEEK 10 G/40	LATAMID 66 H2 G/60	LARPEEK 50 K/30	LARPEEK 10 K/40 HM
PPA	PPA	PPA	PPA	PPA	PPS	PPS	PPS	PPS	PPS	PPS	PPS	PEEK	PEEK	PEEK
1.78	1.37	1.53	1.63	1.77	1.67	1.65	1.65	1.59	1.97	1.44	1.5	1.62	1.4	1.47
0.15 ÷ 0.35	0.05 ÷ 0.20	0.25 ÷ 0.45	0.15 ÷ 0.30	0.15 ÷ 0.25	0.20 ÷ 0.35	0.25 ÷ 0.40	0.15 ÷ 0.45	0.10 ÷ 0.20	0.10 ÷ 0.20	0.10 ÷ 0.20	0.10 ÷ 0.20	0.20 ÷ 0.45	0.05 ÷ 0.25	0.05 ÷ 0.20
0.40 ÷ 0.65	0.30 ÷ 0.55	0.45 ÷ 0.70	0.30 ÷ 0.50	0.25 ÷ 0.45	0.45 ÷ 0.65	0.50 ÷ 0.70	0.70 ÷ 1.10	0.20 ÷ 0.40	0.15 ÷ 0.30	0.15 ÷ 0.25	0.15 ÷ 0.25	0.50 ÷ 0.75	0.30 ÷ 0.50	0.25 ÷ 0.45
15	8	8.5	9	10	9	8	10	5.5	5.5	4.5	3.5	10	6.5	5
90	60	60	70	75	30	30	40	30	15	25	10	70	45	25
24000	36000	14500	18000	25000	16000	17000	15000	22000	23000	25000	45000	14200	21600	39700
22000	32000	13000	15500	23500	15500	14800	14500	19300	22000	23500	42000	13900	20600	37000
20000	27000	11500	14000	21500	15000	12200	14000	17700	20800	21000	39000	13700	20500	35000
15000	20000	9000	11000	15500	9800	8400	9200	11400	14200	15000	22000	13000	19000	31000
6500	12000	4000	5500	6000	6800	7200	6000	9000	9400	11000	15000	12800	15400	22000
280	290	210	240	290	185	160	195	190	165	185	175	205	225	210
240	265	195	225	250	170	140	180	170	145	165	160	190	200	185
215	245	175	190	210	140	120	150	155	125	130	145	175	180	170
165	190	125	130	130	100	90	110	105	105	85	120	150	155	155
100	140	65	70	70	75	70	85	85	90	70	100	130	100	110
1.8	0.8	1.9	1.8	1.6	1.4	1.2	1.7	1.1	0.8	0.8	0.4	1.9	1.5	0.7
1.9	1	2.1	2	1.7	1.7	1.3	1.7	1.1	0.9	0.9	0.5	1.9	1.7	0.7
2.2	1.3	2.3	2.1	1.9	2	1.8	2.6	1.3	1	1.3	0.8	2	1.7	0.8
3.3	2	4	3.5	3	3	2.2	3	1.7	1.6	1.6	1	2	2	1
5	3.5	8	6	4.5	3.4	2.5	3.3	1.8	2.3	1.8	1.2	2	2.5	1.4
280	275	260	260	260	255	255	260	260	260	255	255	>300	>300	>300
290	290	290	285	285	280	280	280	280	285	280	280	>300	>300	>300
280	280	265	260	260	270	270	260	265	275	270	270	295	>300	>300
3	2	4	3	3	6	6	6	4	4	2	1	12	2	2
					UL	UL	UL		UL					

** Values obtained according to ISO norm at the specified pressure. Actual shrinkage values may differ because of the design*

HIGH PERFORMANCE THERMOPLASTICS

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