ARCHIMEDES

PLASTICS

OUR PLASTICS PROCESSING CENTRE

We process and cut plastics in our production centre located in the city of Dąbrowa Górnicza.

The Plastics Processing Centre (PPC) is a part of the **Archimedes company,** which designs and implements industrial solutions. The main office is located in Toruń

We always select the most suitable technology, and we only produce our plastic precision parts using materials from renowned suppliers.

OUR OFFER INCLUDES:

- **processing and cutting** plastics according to drawing
- **producing precision parts** made of high-quality **certified materials** such as polyamide, polyethylene, or POM (acetal)
- **intermediate products,** including plastic sheets, bars, pipes, profiles, as well as finished products, manufactured according to d**rawings and specifications**
- **selling** plastics in **standard units** or **cut to size**
- processing **precision parts** with the use of **our own**, or a **Customer's materials**
- manufacturing **single** and **serialized** parts
- **delivering express solutions** and **immediate availability,** guaranteed through our cooperation with trusted partners

OUR MACHINERY AND WORKSHOP

- **two Kimla CNC** gate industrial plotters with three axes and 1700 x 3100 x 300 [mm] and 2100 x 3100 x 300 [mm] working surfaces respectively. These have 9 kW HSD spindles and an automated tool exchange feature
- **two CNC milling machines** with 450 x 380 x 400 [mm] and 900 x 500 450 [mm] working surfaces
- **a manual milling machine** with a 1000 x 250 x 450 [mm] working surface
- **a spindle moulder** with an adjustable spindle angle
- **two manual lathes** with working surfaces Ø350 x 1500 [mm] (throughlet Ø89), and Ø250 x 1400 [mm] (throughlet Ø57)
- **three CNC lathes** with working surfaces Ø300 x 500 [mm] (throughlet Ø65), Ø300 x 1500 [mm] (throughlet Ø105), and Ø150 x 100 [mm] (throughlet Ø30)
- **a sliding table saw** – for cutting sheets and bars of a diameter up to 120 mm
- **a circular saw** – for cutting Ø250 mm or larger bars

Our workshop is run by a **highly-qualified** and **experienced** staff

TECHNICAL SUPPORT AND ADVICE

Technical support and advice – the specialised knowledge and experience of Archimedes PPC team guarantee:

- technical support in selecting an **appropriate material** and filing **technical documentation** for plastic precision parts provided by our long experience
- help in modernising your machines – we can **duplicate existing part**
- an execution based on materials that are characterized by a **quality higher** than that of the original parts – machines and devices can then operate quieter, faster, and more efficiently
- **specialized software** for drawings and technical documentation with the use of 2D and 3D imaging in the most popular CAD formats – this allows us to tailor the process to a Customer's needs and expectations

Certified materials of the highest quality

WAREHOUSE

Archimedes' warehouse offers 50 tons of plastics available from stock. We focus on storig the following materials:

- **Pe300, Pe500, Pe1000, Pe1000R, Pe500R (standard and AST)** -sheets and bars in black/natural/ green/blue
- **Pa6/Pa6g (standard and MO)** - sheets and bars in black/natural
- **POM-C** - sheets and bars in black/natural
- **PTFE** - sheets and bars in natural
- clear **PC** sheets
- **PET** - sheets in natural
- **POM ELS** - sheets in black
- **PE1000 LUBX CV** - sheets in blue

All these come in their respective standard sizes, as per manufacturers' norms:

- 1 mm to 100 mm **sheets** sized 610x3000, 1000x2000 or 1220x3000
- 5 mm to 200 mm **bars**

We can also deliver other, non-standard dimensions (lead time: 1-2 weeks).

PLASTICS

Polyethylene (PE)

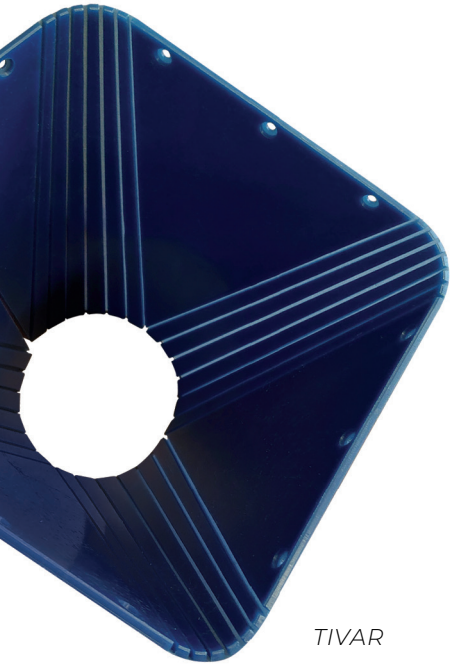
Polyethylene (PE), also called polythene, is a polymer that is produced by polymerization of ethylene. Just like PP, PE is a polyolefin – a mass-produced polymer that is the most popular type of plastic in terms of manufacturing quantities.

PE

The **general properties** of polyethylene include the following:

- low density
- great machinability – extrusion, pressing, moulding
- very good chemical resistance
- anti-adhesive properties
- very high thermal expansion factor
- low thermal stability
- partially crystal structure
- low durability and hardness
- good ductility
- isolating properties
- ease of cutting
- low absorption of water and moisture

	MAIN PROPERTIES	APPLICATION
Pe1000 generally known as PE-UHMW (ultra high molecular weight)	ultra high molecular weight, which makes Pe1000 very resistant to attrition and wear	the production of sliding components (guides, slides, turntables, etc.) and more
Pe1000R a budget version of Pe1000	this version is cheaper and does not last as long as the original material	the production of sliding components (guides, slides, turntables, etc.) and more
Pe1000 AST a plastic with antistatic additives (usually carbon)	special additives make the material antistatic	higher operating speeds and specific requirements defined by a Customer (surface resistance)
Pe1000 TECH polyethylene with the addition of molybdenum disulfide	lowered friction resistance and longer lifespan of precision parts thanks to self-lubrication	demanding applications
Pe1000 Ceram P polyethylene with the addition of micro glass beads	higher wear resistance. The addition of glass beads makes it possible for the material to operate at higher speeds and with greater loads	sliding elements in conveyors (e.g. in curved conveyors); the production of bottle transport profiles
Pe1000 SuperPlus partially cross-linked polyethylene	higher attrition resistance	the production of sliding components (guides, slides, turntables, etc.) and more
Pe1000 OL polyethylene with the addition of oil, which makes it self-lubricating	lower friction factor, no need for extra lubrication	the production of sliding and power components in conveyors
PE1000 HPV polyethylene with a lubricant	highly reduced friction factor makes this material suitable for applications based on high speeds and heavy loads	this version is mostly used in conveyor belts that operate at high speeds and with heavy loads
Pe1000 LUBX CV polyethylene with a solid lubricant	this version maintains a low friction factor even after 24 hours of continuous work at high sliding speeds and with heavy loads	slides in conveyors operating with heavy loads, other sliding elements
Pe1000 MD polyethylene that can be picked up by metal detectors	blue color for contrast, recognised as a food contact material	food production
Pe500 PE-HMW (high molecular weight) polyethylene	low attrition resistance	this version can be used in less demanding applications, where friction is low or nonexistent – for example, in cutting boards, food production, fish processing, machine processing
Pe500R a budget version of PE500	...	...
Pe300 PE-HD (high density)	this version is mostly used in welded materials and in elements that do not have to bear heavy loads	material mainly for use on welded elements, elements with low loads



TIVAR

Tivar

Dedicated Tivar materials - These are based on UHMW PE with additives, which improve the materials' operating properties.

The lining materials that we offer are **characterized by:**

- **very low friction factor**
- **high wear resistance**
- **chemical resistance**
- **resistance to cracking at impac**t

These properties streamline the processes associated with transporting and storing bulk materials. The use of TIVAR guarantees **maintenance-free operation** even with the most demanding materials that generally tend to clump or stick together, freeze or separate.

Application:

These lining materials can be used in many industrial processes, e.g. in coal power plants, biomass power plants, mines and coal processing plants, as well as in factories that process other minerals, in brick, concrete and plaster production, as well as in ceramics and chemical processing, transportation, storage and more.

The **TIVAR Engineering** system can be applied in various sectors and stages of installations and logistics:

- silos
- chutes
- storage containers
- freight wagons
- vibrating conveyors
- storage tanks
- powder storage tanks
- feeder baskets
- tippers, and many more

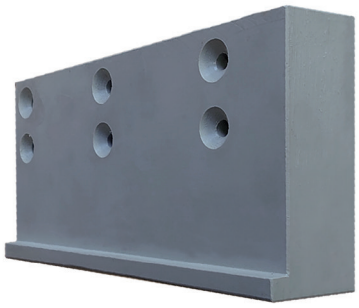
Examples of demanding bulk materials include:

- limestone
- synthetic plaster
- natural plaster
- sand
- clay
- peat
- torf
- lime
- marlstone
- iron
- ash
- coal
- grain

	MAIN PROPERTIES	APPLICATION
Tivar HOT	a special additive prevents the material from degrading – it can operate continuously at 100 °C or even up to 135 °C	sliding elements operating at higher temperatures (up to 135 OC), for example slides in blanching machines, slides in food or sweets production ovens, and chemical kilns
Tivar 88 and Tivar 88-2	low friction factor guarantees an uninterrupted flow of material; anti-adhesive properties	this type of material is mostly used whenever the flow of goods tends to be disrupted, e.g. in chutes, sliders and funnels where bulk goods often get stuck
Tivar DrySlide	an added lubricant guarantees higher attrition resistance. This material has a very low friction factor	package transportation sliders
Tivar BlueLine	an anti-adhesive material characterized by great sliding properties	just like Tivar 88 and 88-2, this version can be used in chutes and sliders. However, Tivar BlueLine is usually used with less abrasive materials
Tivar BurnGuard	great self-extinguishing properties	this is the only type that can be used in ATEX zones
Tivar QuickSilver	specialized material used in specific applications; very low friction factor	this version can be used in tippers, excavators, and other vehicles in which materials tend to stick to operating surfaces during excavation or transportation

Polypropylene (PP)

Polypropylene (PP) is made by catalytic polymerization of propylene. This polymer is a polyolefin characterized by well-balanced properties.



PP

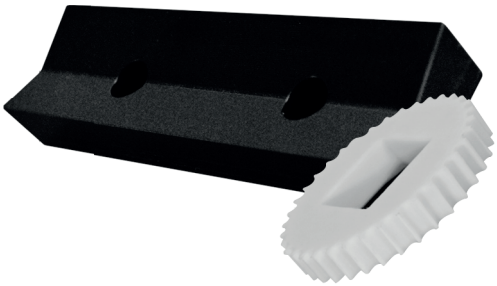
Its most important **features** include:

- density lower than 1
- high ductility
- very good chemical resistance
- good stiffness and durability
- hardness
- high thermal expansion factor
- not fit to be used in low temperatures – low resilience in cold environments
- physiologically neutral
- bad sliding properties, high friction wear

	MAIN PROPERTIES	APPLICATION
PP	scratch-proof material, a polyolefin characterized by high resilience	containers for storing chemicals, chemically resistant trays, filter components, food containers etc.

Polyamide (Pa)

Polyamide (Pa) Polyamides (Pa) can be divided into two types of materials used in the production of intermediate products. The first type is the moulded one (PA6G), and the second one is the extruded type (this group includes Pa6, Pa66, and Pa46). Each of these materials is characterized by a specific type of possible applications, which depend on the properties and modifications of a product.



Pa6g

Polyamide 6G (PA6G)
- this is the only polyamide that is produced by moulding. As a material used in machine construction, it has many typical properties.

Typical characteristics of polyamide:

- 1,15 g/cm3 density
- great thermal stability
- great durability and toughness
- it absorbs water and moisture, which might change its mechanical and electric properties, and impact its wear resistance
- very good ductility, depending on moisture content
- very good chemical resistance, in particular to alkalis, solvents and fuels
- sensitivity to stress breaks only in dry environments (dry operating conditions)
- anti-adhesive properties
- inflammable
- good machinability

Polyamide 6 (Pa6) and **polyamide 66 (Pa66)**
- these are both extruded materials, characterized by similar chemical and mechanical properties. This makes them similar in general.

Pa6 and **Pa66 properties:**

- great dimensional stability (PA66 has a higher melting threshold than PA6)
- very good ductility, depending on moisture content
- very good chemical resistance
- PA66 is characterized by a better mechanical resistance
- PA6 is characterized by a higher resilience

Pa46 properties:

- very good thermal stability
- very good thermal dimensional stability
- good creep coefficient

	MAIN PROPERTIES	APPLICATION
Pa6g	this moulded material is one of the hardest thermoplastics	popular construction material that can be used to produce sprockets, sleeves and rollers, as well as cams, scrapers, lead screws, and more
Pa6	this extruded material has slightly worse mechanical and thermal properties than Pa6G, but is is characterized by greater resilience	popular construction material that can be used to produce sprockets, sleeves and rollers, as well as cams, scrapers, lead screws and more
Pa6g MD	a plastic that can be picked up by metal detectors	used in applications that require metal
Pa6G/Pa6 MO a modified polyamide with molybdenum disulfide	improved sliding properties and wear resistance	more demanding applications: sprockets, bearings, pulleys
Pa6G OL	added oil provides lower friction factor and prolonged lifespan	more demanding sliding applications that require self-lubrication
Pa6G NSM	the presence of solid lubricant in the material makes it possible to increase wear resistance and decrease the friction factor	conveyors and sliding elements, mostly those that operate at high speeds
Pa6 703 XL	the presence of internal lubricant completely eliminates the “stick slip” effect	this material can be used whenever it is important to maintain precision of the sliding movement – especially when the movement is small
Pa6 XAU+	this is a thermally stabilized polyamide, which allows it to operate constantly in temperatures that are higher than its base temperature	mainly bearings and other components that experience friction at temperatures higher than 60 °C
Pa66	in comparison to Pa6, this version is stiffer and more resistant in terms of mechanics, chemicals and temperatures. Additionally, it is more resistant to creeping. On the other hand, it does not damp vibrations as effectively	major construction elements
Pa66 FR	corresponds to the EN 45545-2 norm	fire protection in rail vehicles (railroad industry)
Pa66 MO	the addition of molybdenum disulfide increases the stiffness, hardness, and dimensional stability of the material in comparison to Pa66	this version is used whenever mechanical and friction resistance is required, e.g., in sliding elements of machines that bear heavy loads
Pa66 GF30	30% glass fiber content increases the stiffness, as well as mechanical and thermal properties. The wear resistance of this version is also better	mechanically resistant connectors, plugs, and major mechanical elements in machine construction
Pa46	resistance to high temperatures makes it more suitable for operating in hot environments than other polyamides – Pa46 maintains its full properties	It can be used for constant operation in places where the temperature reaches 130 °C

Polyacetal (POM)

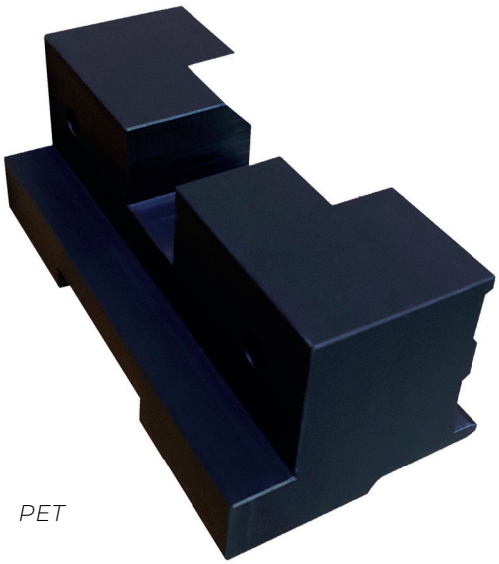
Polyoxymethylene (POM) also known as polyacetal and polyformaldehyde is a construction material produced in the process of formaldehyde polymerization. Polyformaldehyde can be divided into two types: copolymer and homopolymer (a type with repeated units).

POM **properties:**

- great mechanical resilience
- high stiffness
- low friction factor
- very good wear resistance
- low moisture absorption
- great chemical resistance, in particular to alkalis, solvents, and fuels
- good dimensional stability
- good thermal stability
- good ductility, even in cold environments
- high density
- good creeping resistance
- limited resistance to hot water and steam

POM-C

	MAIN PROPERTIES	APPLICATION
POM-C	a construction material characterized by very high dimensional stability and high resilience	small spur gears, bearings, and rollers operating at heavy loads, as well as latches, valve hubs, and precision parts used in construction
POM-H	a polyacetal hopolymer characterized by greater mechanical resistance than that of the POM-C version, stiffer, harder, more resistant to creeping	major construction elements where precision, accuracy, and dimensional stability are required
POM-C ELS	this version contains additives (usually electroconductive carbon black) which decrease its surface resistance	this material is perfectly suited to be used in ATEX zones, since it meets ATEX requirements
POM-H TF	the addition of PTFE makes this version softer, but it also lowers the friction factor while reducing the wear resistance and eliminating the “stick slip” effect	this version can be used wherever sliding occurs, and precision of movement and exactness of execution play a major role



PET

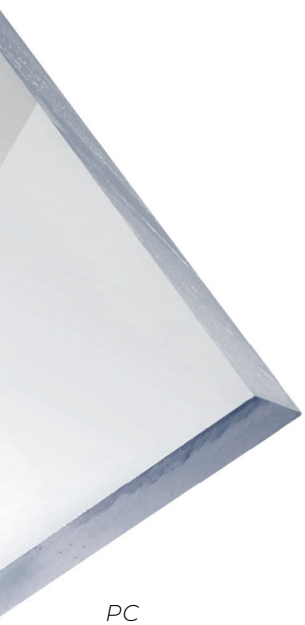
Polyethylene terephthalate (PET)

Polyethylene terephthalate (PET) is a construction material. It is produced through the polycondensation of ethylene glycol and dimethyl terephthalate.

Its main **properties** are:

- high mechanical resistance
- high stiffness and hardness
- high density
- low absorption of moisture
- high chemical resistance
- very good dimensional stability
- minimal thermal expansion
- good thermal stability
- very good sliding properties, attrition resistance

	MAIN PROPERTIES	APPLICATION
PET	a construction material characterized by very good sliding properties and low friction factor. It is stiff, very resistant to creeping, and it is more dimensionally stable than POM	construction and friction elements, slides
PET TX	the presence of a lubricant improves attrition resistance and lowers the friction factor	bearings and sliding elements



PC

Polycarbonate (PC)

Polycarbonate (PC) is an amorphous polymer. As a semi-transparent material, it is widely used in many applications.

Its main **properties** include:

- transparency – about 90% of light can pass through PC
- good mechanical properties
- very good resilience
- PC can operate in a wide range of temperatures: from -100 °C to +130 °C
- resistance to cracking

	MAIN PROPERTIES	APPLICATION
PC	great resilience, but low resistance to scratching	mainly machine covers, awnings, etc.

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Polymethyl methacrylate (PMMA, Plexiglas)

Polymethyl methacrylate (PMMA) is commonly known as acrylic glass of Plexiglas.

PMMA

Properties:

- low resilience
- resistant to scratching
- transparency – it allows about 92% of daylight to pass through
- micro cracks tend to appear during mechanical processing
- UV resistance
- very good mechanical properties
- very hard

	MAIN PROPERTIES	APPLICATION
PMMA	it is resistant to scratching, but it has a low resilience factor, as opposed to PC	mostly used in viewers, exhibition protection etc.

Polytetrafluoroethylene (PTFE)

Polytetrafluoroethylene (PTFE) commonly known as teflon, is a fluorothermoplastic produced by free-radical polymerization of tetrafluoroethylene.

PTFE

Its main **characteristics** include:

- very low friction factor
- no “stick-slip” effect
- high density
- very high ductility
- low resistance
- softness
- low resistance to creeping
- very good chemical resistance
- good UV resistance
- self-extinguishing properties
- high thermal stability
- very low moisture absorption
- resistance to hydrolysis
- resistant to temperatures of over 250 °C
- low friction resistance
- high thermal expansion

	MAIN PROPERTIES	APPLICATION
PTFE	this material is characterized by the lowest frictional resistance, but it is also not resistant to wear. On the other hand, it can withstand high temperatures (over 250 °C)	sealing material than can be used in high temperatures, thermal insulators
PTFE BZ	the addition of bronze increases resistance to attrition and makes it a perfect sliding material. Since it contains bronze, this PTFE version is characterized by the best resistance to wear	sliding bearings, slides
PTFE GF30	glass fiber increases the mechanical strength and wear resistance	sliding elements of increased mechanical properties, able to withstand heavy loads
PTFE G	added graphite makes this type of PTFE more resistant to wear and gives it a higher friction factor than that of the original version	sliding and sealing elements in machine construction
PTFE C G	the addition of graphite carbon makes this version harder, but also more brittle. At the same time, it becomes more resistant to attrition	mechanical, sliding, and sealing components

PVDF

PVDF

Polyvinylidene fluoride (PVDF) is a fluorine polymer characterized by its crystal structure. It is an intermediate plastic resistant to temperatures both over 200 °C and up to 100 °C, so it perfectly fills in the gap between.

Its basic **properties** are:

- operating in ambient temperature of up to 150 °C
- very good chemical resistance and resistance to hydrolysis
- low flammability
- very good mechanical properties
- resistance to creeping

	MAIN PROPERTIES	APPLICATION
PVDF	this material can operate in high ambient temperatures – up to 150 °C – which makes it possible to use cheaper materials	mechanical components in chemical, metal-processing, paper-processing and food-processing industries, e.g., scrapers

PPS

Polyphenylene sulfide (PPS) is a partially crystal polymer, which fills the gap between POM, PA or PET, and high-performance polymers such as PI, PAI, PBI, or PEEK.

PPS

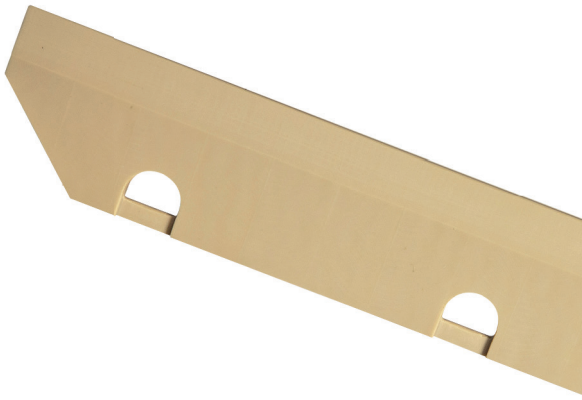
Its basic **properties** include:

- operating in high temperatures – up to 220 °C for continuous work
- very good chemical resistance and resistance to hydrolysis
- good UV resistance
- very good resistance to gamma ray and X-ray
- high resistance, stiffness and hardness – also in higher temperatures
- self-extinguishing

	MAIN PROPERTIES	APPLICATION
PPS	basic material with a higher friction factor	pumps, filters and valves components
PPS HPV	a material reinforced with a self-lubricating polymer, which ensures better sliding properties and resistance to wear	sleeves in conveyors that operate in chemically demanding environments, sliding elements in ovens

Polyether ether ketone (PEEK)

Polyether ether ketone (PEEK) is a semi-crystal and a highly efficient polyaryletherketone. PEEK is one of the best materials in terms of universally good properties and parameters, and it is also one of the most expensive ones. The cost is influenced by production processes.



PEEK

Properties:

- operating in high temperatures – up to 250 0C for continuous work
- good sliding and friction properties
- high resistance to wear
- ductility
- very low moisture absorption
- minimal thermal expansion
- very good dimensional stability
- non-inflammable, self-extinguishing
- low friction factor
- great chemical resistance
- low creeping factor

	MAIN PROPERTIES	APPLICATION
PEEK	operating in high temperatures, the highest resilience of all types of PEEK	mechanical elements operating in higher temperatures, sliding elements in ovens, main bodies in satellites (aerospace engineering applications)
PEEK HPV	the addition of PTFE, graphite and carbon fibre link the properties of all these elements with the base material, creating a polymer characterized by low friction coefficient, better attrition and wear resistance, and good mechanical properties	major, more demanding slides and bearings
PEEK GF30	30% content of fibre glass increases stiffness and resistance to creeping. This makes it possible to use this version as an element that bears long lasting static loads	a construction element in machines, sliding element, main bodies, casings
PEEK CA30	30% carbon fibre content makes this version better than the GF30 one. Additionally, carbon fibre increases its conductive properties	sliding bearing, machine components

Poliimid (PI)

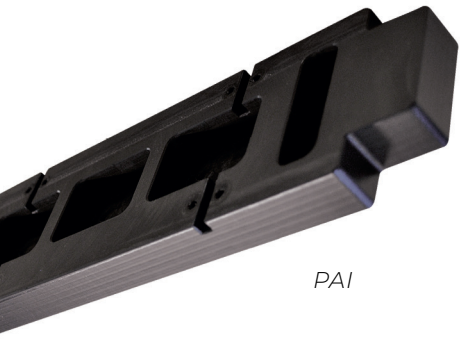
Poliimid (PI) belong to high-efficiency materials too, and are produced by polymerisation performed in stages, that is by polycondensation of imides. The manufacturing process of intermediate materials or elements formed directly can only be achieved by sintering.

PI

Properties:

- it does not melt
- resistance to temperatures of about 300 °C in continuous work
- high resistance to pressing and creeping
- high density
- good chemical resistance
- high durability and stiffness
- fire resistance
- good electric and thermal insulation
- great hardness
- resistance to intense radiation

	MAIN PROPERTIES	APPLICATION
PI	this material can only be manufactured by sintering. It is perfectly suited for applications based on higher temperatures	guiding rollers and chains in industrial ovens, glass production



PAI

PAI

Polyamide-imides (PAI) are amorphous, high-efficiency polymers, known for their great thermal properties. PAI is a thermoplastic poly-imide. These materials are typically characterized by improved parameters which make them great in terms of thermal, chemical and resistance properties. This in turn causes them to be much more expensive than other materials.

Properties:

- amorphous material
- low flammability
- high moisture absorption
- good sliding and friction properties
- high resistance to wear
- very good hardness and resistance
- great chemical resistance
- high thermal stability
- resistance to high temperatures – it can work for a long time in temperatures up to 250 °C
- low friction coefficient
- resistant to creeping
- sensitive to hydrolysis, overheated steam, and alkalis
- great UV resistance

	MAIN PROPERTIES	APPLICATION
PAI	a highly efficient material than can be used in higher temperatures, but it is not resistant to steam	rotational compressor plates, hubs, chip control frames

PBI

PBI

Polybenzimidazole (PBI) offers a high-quality blend of the best properties of polyamides. It can be used whenever other materials do not guarantee a good-enough performance.

Properties:

- it can operate in about 310 °C (short-term work is also possible in up to 500 °C)
- resistance and stiffness maintained across a wide spectrum of temperatures
- low friction coefficient
- very good resistance to wear
- low linear expansion coefficient
- low friction coefficient
- very good resistance to gamma ray and X-ray

	MAIN PROPERTIES	APPLICATION
PBI	in terms of ion residue, this is a very clean material. It is not resistant to steam	light bulb components, electrotechnical connectors, aviation, space engineering

PLEASE NOTE

This description should be used for informational purposes. A proper selection of material should take place after a consultation with an experienced professional. We offer more than these materials – **please inquire** for other types of plastics.

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