Ensinger

AR

Stock Shapes from Engineering Plastics

Interactive Elements

This brochure contains content that is displayed using AR (Augmented Reality) and QR codes. In this guide we explain how to use the different functions.

If you have a printed version of our brochure, take your smartphone or tablet, open the camera and hold it over the QR code. The camera will scan the code and take you to more information on our website. In the digital version of our brochure, simply click on the QR code to go to the linked page.

This icon indicates the availability of a video. Click on the QR code to open the video on your device.

This icon indicates the availability of an augmented reality (AR) application. Use the adjacent QR code to experience the application in your environment!

Content

About Ensinger

Ensinger Group stands for modern, innovative high-performance plastics. As a family-owned company with around 2.700 employees at 34 locations worldwide, we have been working on the continuous further development and improvement of our products and services in the field of high-performance plastics since 1966. These consistent efforts, new applications and strategic internationalization have secured us a place in the front rank of the plastics industry.

Business Segments

The spectrum of thermoplastic polymers processed, ranges from engineering plastics, to the class of particularly temperature-resistant high-performance plastics. The products are used in a wide range of industrial sectors, including mechanical engineering, the automotive and aerospace industries, medical technology, the food industry, and electrical and semiconductor technology.

Stock Shapes

Stock shapes made of engineering plastics are the starting point for numerous new applications. Polymer materials are an important driver of technological progress. Plastics have a wide range of advantages and in many cases replace metals or ceramics. Even more: they are often the only alternative in the realization of extraordinary technical applications and thus real pacemakers for innovations. In the meantime, engineering and high-performance plastics are used in all major industrial sectors. Ensinger offers extruded, cast and pressed rods, plates and tubes in a wide range of dimensions and colours. The common thermoplastics and their most important modifications are always available from our European warehouse in Nufringen. In addition, we manufacture stock shapes specifically to customer requirements. Tight tolerances are guaranteed for individual cutting and blanking. Manufacturers of finished parts who only require small quantities of stock shapes for a small series or the production of a prototype, benefit from our conversion service just as much as bulk buyers. We realize diverse precision solutions by planing, grinding and form planing.

Materials for Every Purpose

In our portfolio you will find standard, engineering and high-temperature plastics with suitable property profiles for a wide range of applications:

Standard Plastics

This category includes polyolefins such as PMP, PP and PE. These materials offer the right property profile for many standard requirements in the temperature range up to 100 °C.

Engineering Plastics

Engineering plastics can be used permanently at temperatures up to 100 °C or 150 °C. The polyamides (PA), polyacetals (POM) and polyesters (PET, PC) belonging to this product group are also known as engineering thermoplastics. The materials have good mechanical properties and high resistance to chemicals and wear. Through material combinations and modifications, the product characteristics can be optimized over a broad range for different applications. Engineering plastics thus cover a spectrum of properties.

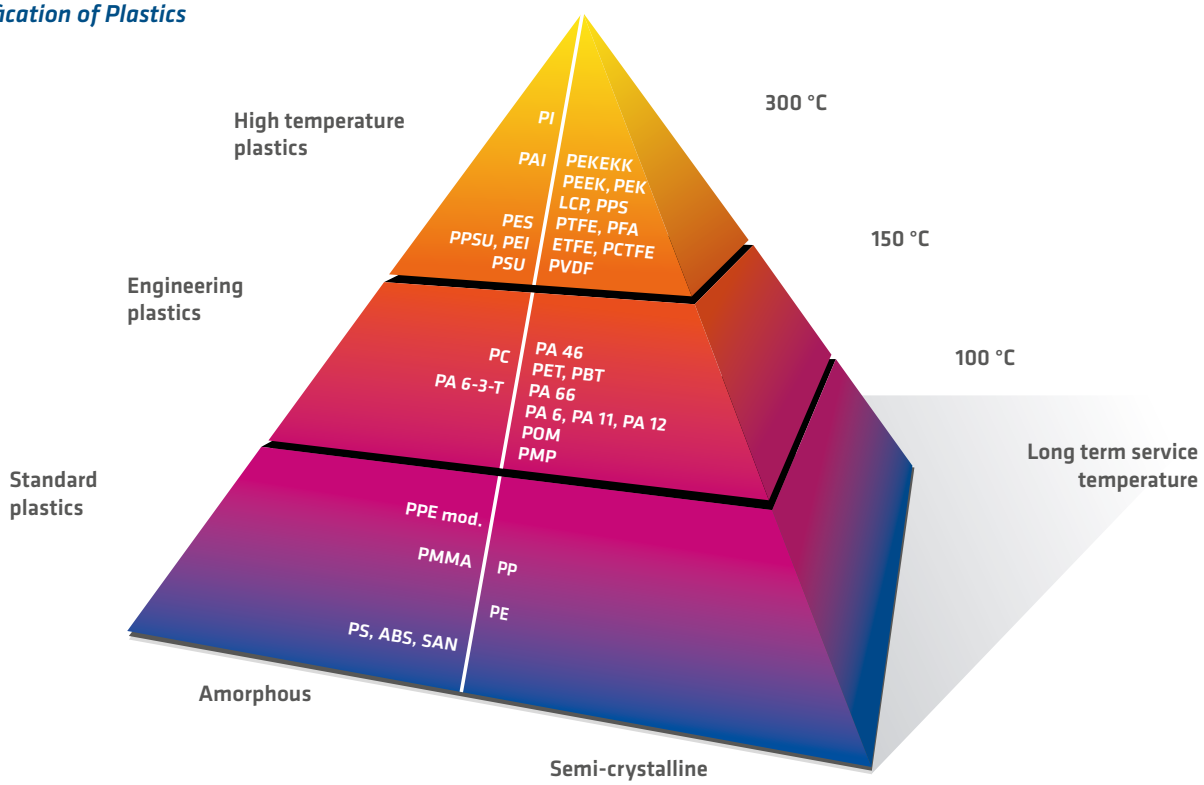
As the class designation already indicates, engineering plastics, which can be machined without difficulty, are frequently used to construct technical parts for applications in the automotive, mechanical engineering, apparatus engineering, electronics and electrical engineering sectors, as well as in the food, transport or household appliance sectors.

High-Performance Plastics

The success of high-performance plastics is based on a combination of material advantages that are also effective at elevated temperatures: These include, above all, the good mechanical properties, which are complemented by high to very high chemical resistance. The continuous service temperatures of materials such as PEEK, PPS and PSU range from 160 °C to 260 °C – with polyimides even significantly higher. Radiation resistance, excellent fire behavior (self-extinguishing) and good electrical properties at low density are further important advantages. With special additives, heat resistance and stiffness can be further increased, tribology improved or electrical conductivity adjusted.

High-performance plastics are used wherever conventional plastics exceed their technical properties or where the aim is to substitute metals in order to reduce weight.

Classification of Plastics



Services

Material Selection

Only the right material gives your construction the necessary functionality, safety and durability. First and foremost, the application conditions determine the selection of the material. In addition to the intended use, however, all further detailed requirements are also included in the considerations when searching for a suitable plastic.

Technical Consulting

Our material experts can provide users with a qualified material recommendation by comparing the available information with technical data and industry-specific empirical values. In the component design phase, the suitability of a plastic can be checked at an early stage with the aid of calculation tools. However, the material selection must always be confirmed by practical tests. In precise coordination with your requirements, our experienced and competent materials specialists will find the plastic material and production technology suitable for your application.

If you have any questions about material selection or machining recommendations, our technical service team at our headquarters in Nufringen will be happy to help. You can reach the application technology consultants by phone at +49 7032 819 101 or by e-mail at:
shapes@ensingerplastics.com

Contact us now!

Criteria for Optimum Material Selection

Conversion Service

Ensinger is your competent partner with a high-performance facility for the production-ready preparation of our stock shapes. According to your requirements, we can offer you a range of finishing processes in our cutting service:

→ Sawing of plates as well as rods and tubes
→ Grinding of bars
→ Thickness machining
→ Shape milling
→ Combined operation

For the use of the conversion service, online calculation options are available for your respective application. Thereby you benefit from different calculation programs, which allow you to quickly calculate cut-to-size and cut-offs. You can also find out at any time which dimensions or quantities are most profitable for you or whether the material you need is available in stock in the appropriate dimension.

Your custom-made parts will be shipped within a few hours upon request.

More information

Quality and Expertise

Delivery Reliability

Efficient warehouse management enables our subsidiaries and trading partners to make deliveries of very large quantities and special deliveries in the shortest possible time or even in cycles. The extension building at our headquarters in Nufringen brings our stock shape production and logistics closer together. The modern high-bay warehouse has more than 2,500 storage spaces and the fully automatic conveyor system enables racks to be loaded with containers up to 3m long and 2.5t in weight. The storage and availability of the required materials in the appropriate dimensions can be checked online by registered customers around the clock. This allows you to plan for the short and long term.

Quality

For a company that operates successfully worldwide, highest quality standards apply. We invest continuously in research and development in order to be able to meet future requirements with new materials and process technologies. Strict CAQ guidelines safeguard the individual process steps from raw material receipt to the end product. Ensinger is certified in accordance with DIN EN ISO 9001 and DIN EN ISO 13485.

Product Compliance Management

National and international legal requirements create the framework for the physiological safety and environmental compatibility of materials. Through our Product Compliance Management, we ensure compliance with these rules and regulations for our materials and production – among other things, through regular material testing. In close cooperation with our raw material suppliers, we provide all the information you need for the approval of your end products.

Know-How in Theory and Practice

As the demands of industry continue to grow, the variety and complexity of materials also increases. Ensinger takes this progress into account by constantly developing its portfolio of stock shapes. Many products can only be used optimally if they are processed with expertise. Therefore, we provide comprehensive information in our brochures as well as data and product handling sheets. We also offer our customers plastics training courses with a strong practical focus. The seminars are led by our application technology consultants.

Always Up-To-Date

The various material groups are described on the following pages on the basis of typical properties, recognisable features, structure, etc. You will also find characteristic application examples for the corresponding material. In the material selector you will find an overview of all our stock shapes, which you can filter according to various product specifications and compare products with each other. You can also download the latest data sheets and product handling information from the various product pages.

Our Portfolio

TECASINT

PI material is a non-melting high temperature polymer. PI polymers are characterised by an unusually complex property profile with many outstanding individual properties and are at the top of the materials pyramid. They are always used when conventional thermoplastics, ceramics or metals fail.

This is because excellent temperature resistance, high mechanical strength and dimensional stability remain high even in continuous use and under mechanical stress.

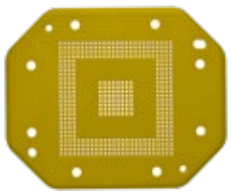
Further information on the material

Ensinger offers a number of different products based on PI. The QR code takes you to the material selector, material page and to the contact form.

PI

Application example

Test socket
TECASINT 4011 natural
High dimensional stability and temperature resistance.
Good chemical resistance.



***TECASINT** (PI)*

Long-term service temperature

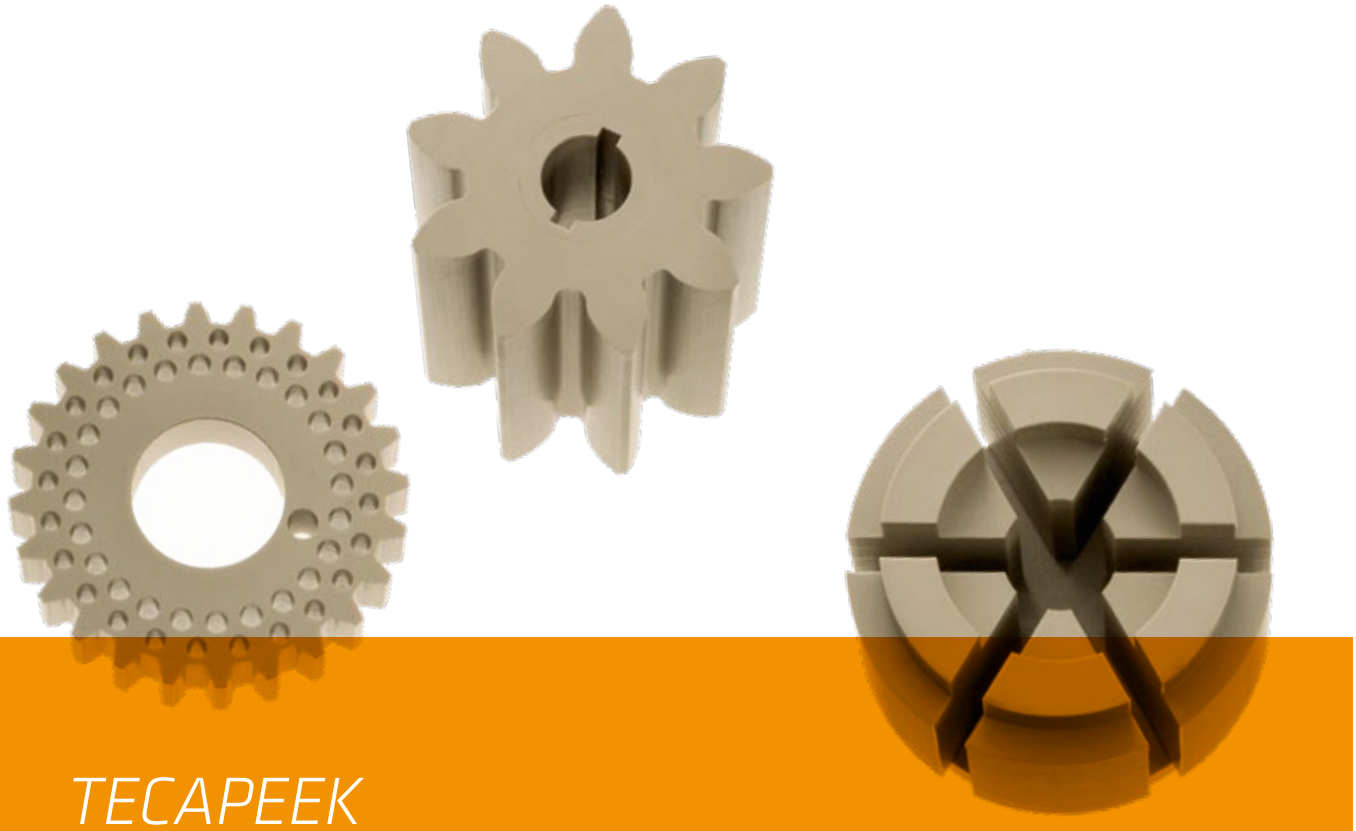
Glass transition temperature

Modulus of elasticity

Tensile strength

Modifications
- Fibre-reinforced
- Modified sliding properties
- Electrically conductive

Stock shapes
- 6 – 100 mm
- 5 – 100 mm



TECAPEEK

The material PEEK is a unique, versatile, semi-crystalline engineering thermoplastic with excellent chemical resistance. Due to its high heat distortion and temperature resistance, PEEK components can be used at temperatures up to 250 - 260 °C.

The melting point of the high temperature plastic is approx. 341 °C. PEEK materials are often used in environments with hot water or steam and are still able to maintain their physical properties such as flexural strength and tensile strength at a high level.

Further information on the material

Ensinger offers a number of different products based on PEEK. The QR code takes you to the material selector, material page, to the contact form and to the AR application.

PEEK

***TECAPEEK** (PEEK)*

Long-term service temperature

Glass transition temperature

Modulus of elasticity

Tensile strength

Modifications

- Fibre-reinforced
- Modified sliding properties
- Electrically conductive
- Detectable
- Medical technology
- Food technology

Stock shapes

- 4 – 210 mm
- 5 – 150 mm
- 16 – 360 mm

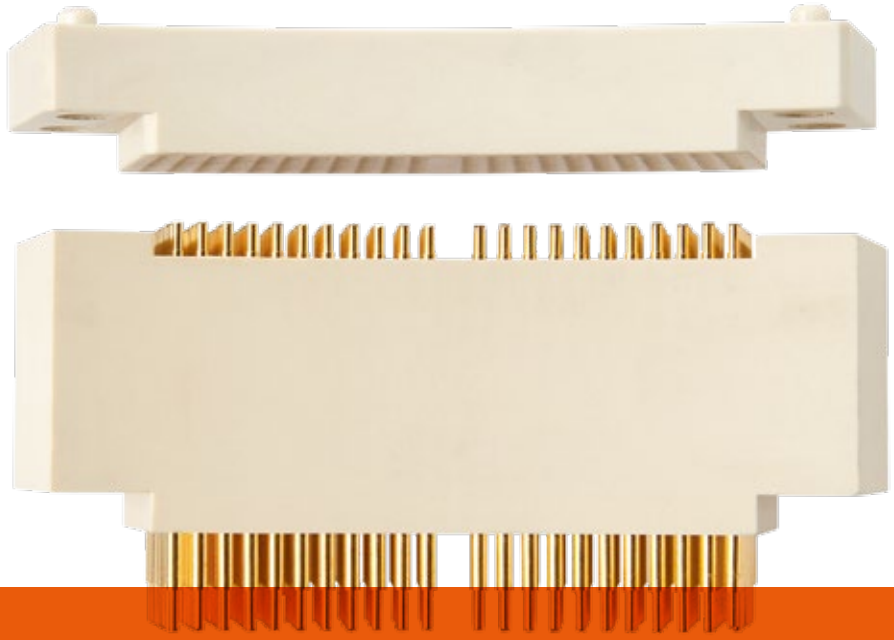
Application example

Gear rack
TECAPEEK PVX black
Good tribological properties. Good dimensional stability. High strength and rigidity.

AR

Fork for cardan joint
TECAPEEK natural and TECAPEEK PVX black
Very good radiation resistance. Good sliding and rubbing properties. Good dimensional stability.

AR



TECATRON

PPS material is a semi crystalline, thermoplastic high temperature polymer and chemically known as polyphenylene sulphide. Due to its structure, PPS plastic is chemical and corrosion resistant and has very good mechanical strength.

Its chemical resistance and tensile strength are maintained even at temperatures above 200 °C. In addition, the properties of PPS are characterised by low water absorption, resistance to hot water and steam, and good dimensional stability.

Further information on the material

Ensinger offers a number of different products based on PPS. The QR code takes you to the material selector, material page, to the contact form and to the AR application.

PPS

Application example

Snap contact
TECATRON GF40 black
Very good rigidity and strength even at high temperatures.
High dimensional stability.
Good chemical resistance.

AR

***TECATRON** (PPS)*

Long-term service temperature

Glass transition temperature

Modulus of elasticity

Tensile strength

Modifications
- Fibre-reinforced
- Modified sliding properties

Stock shapes
- 10 – 50 mm
- 6 – 30 mm

TECASON
TECAPEI

Polyarylsulfones (PSU, PPSU) are a family of thermoplastic, amorphous and polar polymers. TECASON P or TECASON S exhibit high strength and stability even at high temperatures.

Polyetherimide (PEI), an amorphous thermoplastic from the polyimide group, is very similar to polysulfones and is frequently used in electrical engineering.

Further information on the material

Ensinger offers a number of different products based on PSU, PPSU & PEI. The QR code takes you to the material selector, material page and to the contact form.

PSU, PPSU & PEI

Application example

Control plate for dialysis unit
TECAPEI natural
Good resistance to sterilisation.
Burr-free surface.
High transparency.

TECASON S *(PSU)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Stock shapes
- 8 – 150 mm
- 10 – 80 mm

TECASON P *(PPSU)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Detectable
- Medical technology

Stock shapes
- 8 – 150 mm
- 10 – 80 mm

TECAPEI *(PEI)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Fibre-reinforced
- Medical technology

Stock shapes
- 8 – 150 mm
- 10 – 80 mm

TECAFLON

PTFE material (with the chemical name polytetrafluoroethylene, commonly referred to as Teflon® plastic) is a semi-crystalline fluoropolymer with many unique properties. This fluoropolymer offers exceptionally high thermal stability, chemical resistance, and corrosion resistance.

PVDF is an opaque, semi-crystalline, thermoplastic fluoropolymer. The PVDF plastic is characterised by excellent chemical resistance without sharing the disadvantages of other fluoroplastics, such as low mechanical values or processing difficulties.

Further information on the material

Ensinger offers a number of different products based on PTFE & PVDF. The QR code takes you to the material selector, material page and to the contact form.

PTFE & PVDF

Application example

Pillar
TECAFLON PTFE natural
Very good UV resistance.
Good electrical insulation.
High toughness.

***TECAFLON PTFE** (PTFE)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
Food technology
Stock shapes
4 – 300 mm
1 – 100 mm

***TECAFLON PVDF** (PVDF)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
Electrically conductiveFood technology
Stock shapes
4 – 300 mm
10 – 100 mm
40 – 90 mm

TECANAT

Polycarbonate is referred to by the abbreviation PC and is an amorphous thermoplastic that has high transparency due to its low crystallinity. This clear polycarbonate plastic offers good electrical insulation properties and excellent toughness. PC plastic can be used in a wide temperature range. At up to 120 °C, the plastic retains its rigidity and has very high impact strength even at low temperatures.

Further information on the material

Ensinger offers a number of different products based on PC.
The QR code takes you to the material selector, material page and to the contact form.

PC

Application example

Distributor block for analyser system
TECANAT natural
High purity.
Excellent toughness.
High dimensional accuracy.

***TECANAT** (PC)*

Long-term service temperature

Glass transition temperature

Modulus of elasticity

Tensile strength

Modifications
- Fibre-reinforced
- Food technology

Stock shapes
- 3 – 250 mm
- 10 – 100 mm

TECAPET
TECADUR

PET polymer is available as an amorphous or semi crystalline thermoplastic. The typical properties are hardness, rigidity and strength. PET plastic also offers excellent sliding behaviour and less sliding wear. Due to its good creep resistance as well as its low moisture absorption and excellent dimensional stability, PET plastic is ideal for use in complex parts with the highest demands on dimensional accuracy and surface quality.

PBT plastic is characterised by high strength, rigidity and dimensional stability when exposed to heat, as well as very high dimensional stability and a low tendency to creep.

Further information on the material

Ensinger offers a number of different products based on PET & PBT.
The QR code takes you to the material selector, material page and to the contact form.

PET & PBT

Application example

Piston
TECADUR PET white
High strength.
Good creep resistance.
High dimensional stability.

***TECAPET** (PET)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Fibre-reinforced
- Modified sliding properties
- Food technology

Stock shapes
- 10 – 200 mm
- 8 – 150 mm

***TECADUR PET** (PET)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Fibre-reinforced

Stock shapes
- 10 – 120 mm
- 8 – 150 mm

***TECADUR PBT** (PBT)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Fibre-reinforced

Stock shapes
- 10 – 120 mm
- 8 – 150 mm

TECAST
TECARIM

Semi-finished polyamide products with larger dimensions and a higher degree of crystallisation (mechanical strength) can be manufactured using the casting process. TECAST belongs to the family of moulded polyamides. TECARIM is Ensinger's trade name for the product group of tough, highly resilient polyamide 6 block copolymers, manufactured using the reactive casting process (Reaction Injection Moulding). Thanks to the production process, both polyamide materials are virtually stress-free.

Further information on the material

Ensinger offers a number of different products based on PA. The QR code takes you to the material selector, material page and to the contact form.

PA

Application example

Part of pulley
TECAST T natural
High toughness and strength.
Good damping properties.
High abrasion resistance.
High mechanical strength.

***TECARIM** (PA 6 C)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Stock shapes
- 30 – 180 mm
- 10 – 150 mm

***TECAST** (PA 6 C)*

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Modified sliding properties
- Food technology

Stock shapes
- 50 – 800 mm
- 8 – 130 mm
- 50 – 750 mm

TECAMID

PA material, Polyamide or commonly called nylon, is a semi crystalline thermoplastic with low density and high thermal stability. Nylon plastic is one of the most important construction plastics due to its excellent wear resistance, good coefficient of friction and very good temperature resistance and impact strength. The most commonly used nylon polymers are PA 6 and PA 66. The PA 6 plastic can be obtained either as extruded, injection moulded or cast nylon.

Further information on the material

Ensinger offers a number of different products based on PA.
The QR code takes you to the material selector, material page, the contact form and the AR application.

PA

Application example

Gear wheel
TECAMID 6 natural
Good strength and toughness.
Resistant to oils and greases.
Good dimensional stability.
High impact strength.

AR

TECAMID 6/66 (PA 6/66)

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Modifications
- Fibre-reinforced
- Modified sliding properties
- Detectable
- Food technology

Stock shapes
- 4 – 300 mm
- 1 – 100 mm
- 25 – 300 mm

TECAMID 12 (PA 12)

Long-term service temperature
Glass transition temperature
Modulus of elasticity
Tensile strength

Stock shapes
- 4 – 200 mm
- 5 – 50 mm

TECAFORM

POM material, also called acetal plastic, is a semi crystalline thermoplastic with high mechanical strength and rigidity. POM material has very good sliding properties, excellent wear resistance and low moisture absorption. The material's dimensional stability, particularly good fatigue strength and excellent machinability make plastic POM a very versatile engineering material, especially for complex components. The engineering plastic POM can be divided into acetal homopolymer (POM-H) – TECAFORM AD - and acetal copolymer (POM-C) – TECAFORM AH.

Further information on the material

Ensinger offers a number of different products based on POM.
The QR code takes you to the material selector, material page, the contact form and the AR application.

POM

TECAFORM AH *(POM-C)*

Long-term service temperature

Glass transition temperature

Modulus of elasticity

Tensile strength

Modifications
- Fibre-reinforced
- Modified sliding properties
- Electrically conductive
- Detectable
- Food technology

Stock shapes
- 3 – 300 mm
- 0,5 – 150 mm
- 20 – 435 mm

TECAFORM AD *(POM-H)*

Long-term service temperature

Glass transition temperature

Modulus of elasticity

Tensile strength

Modifications
- Modified sliding properties
- Food technology

Stock shapes
- 3 – 200 mm
- 5 – 100 mm
- 40 – 505 mm

Application example

Trolley
TECAFORM AH natural
Good dimensional stability.
Good sliding properties.
Resistant to oils and greases.

AR

TECAFINE TECANYL TECARAN

Polyolefins such as polyethylene (TECAFINE PE) and polypropylene (TECAFINE PP) are semi-crystalline thermoplastics from the group of standard plastics. In addition to their low density, they are characterised above all by good chemical resistance, low water absorption and good electrical insulating properties. Acrylonitrile-butadiene-styrene graft copolymer (TECARAN ABS) is an amorphous thermoplastic with high impact strength even at low temperatures and low moisture absorption. PPE (TECANYL) is primarily used for moulded parts that require high heat resistance, dimensional stability and dimensional accuracy.

Further information on the material

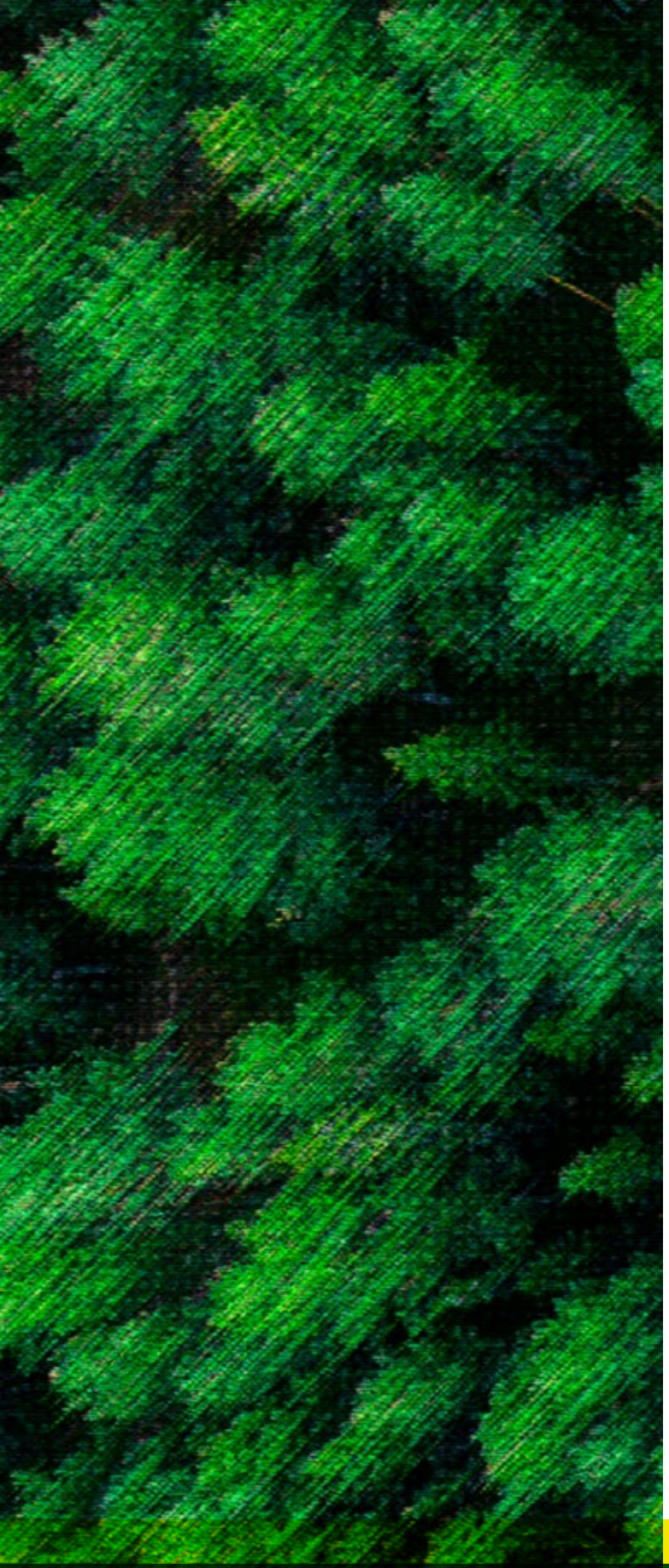
Ensinger offers a number of different products based on PE, PP, ABS & PPE. The QR code takes you to the material selector, material page and to the contact form

PE, PP, ABS & PPE

Application example

Grip for kitchen appliances
TECARAN black
Good strength and toughness.
High impact resistance.
Low weight.
Good adhesive properties.

***TECAFINE PE** (PE)*	***TECAFINE PP** (PP)*	***TECARAN ABS** (ABS)*	***TECANYL** (PPE)*
Long-term service temperature	*Long-term service temperature*	*Long-term service temperature*	*Long-term service temperature*
Glass transition temperature	*Glass transition temperature*	*Glass transition temperature*	*Glass transition temperature*
Modulus of elasticity	*Modulus of elasticity*	*Modulus of elasticity*	*Modulus of elasticity*
Tensile strength	*Tensile strength*	*Tensile strength*	*Tensile strength*
Modifications Modified sliding properties Electrically conductive Food technology	*Modifications* Flame retardant Electrically conductive Food technology	*Stock shapes* 10 – 200 mm 5 – 100 mm	*Modifications* Fibre-reinforced
Stock shapes 8 – 800 mm 1 – 150 mm	*Stock shapes* 8 – 800 mm 1 – 100 mm		*Stock shapes* 10 – 200 mm 5 – 60 mm



As we aim worldwide to reduce green house gas emissions, a sustainable use of plastic is essential. Many still end up in thermal treatment instead of being reused. Our sustainable solutions aim to prevent linear use of finite resources and reduce the reliance on fossil raw material.

Sustainable Solutions

TODAY FOR TOMORROW

Our Contribution – Our Responsibility

Ensinger is a modern family business. We stand for cutting-edge technology, sustainable business practices and are committed to meeting the social and ecological challenges of our time. Responsible behaviour towards our employees, customers, suppliers and partners in industry and society is important to us. This includes the economical use of resources as well as the development of applications that are produced sustainably and help to reduce the ecological footprint of our customers' products.

Environment

Careful use of the resources available to us and the avoidance of environmental pollution are among the Ensinger Group's most important strategic tasks.

Social

We also want to offer a working environment that goes beyond legal regulations and promotes employee motivation and potential.

Governance

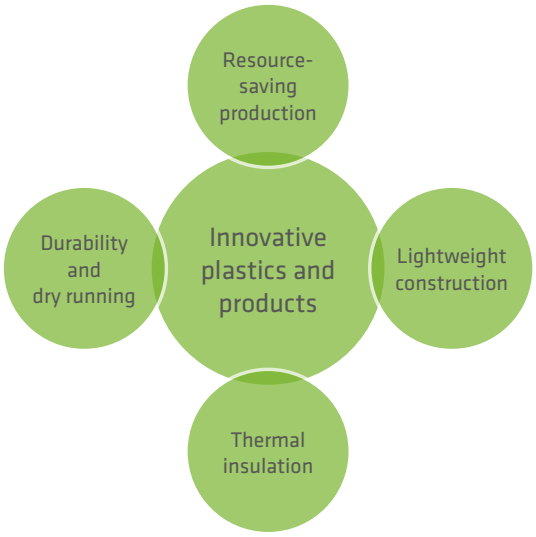
In this section, you will find explanations of important aspects of corporate governance that are orientated towards the principles of sustainability. Credible, responsible and lawful governance is based on our values and principles.

Products and Solutions

Embark on a journey of sustainability with Ensinger to pave the way to a greener future with our products and solutions.

Innovative Plastics and Products

More than almost any other class of materials, plastics are suitable for a sustainable economy if they are used specifically for long-lasting and sustainable applications. Their production requires fewer resources than metals or ceramics, and their special properties enable particularly durable, environmentally friendly and economical products with high benefits. Our products exemplify this. In particular, properties such as the resource-saving production of these materials, their low operating weight, excellent insulation properties, their suitability for recycling and resistance to aggressive media often make plastics the first choice when selecting a material.



Further information
More about sustainability at Ensinger

Products & Solutions

Be Part of the Journey to Sustainability

In the field of packaging, closed-loop systems have been on the rise for some time. Even in technical areas where thermoplastics are used, cycles are gradually being created. As a manufacturer of high-performance thermoplastics, Ensinger also wants to contribute to closing loops for engineering plastics and enabling products to be used for an extended period of time.

Prepare for Tomorrow

We focus on reducing our CO_2 footprint, aiming for net zero in Scope 1 - 3 according to GHG protocol. These actions include energy-saving measures and environmental efforts, which help to fulfill our responsibility to nature.

Reduce for Tomorrow

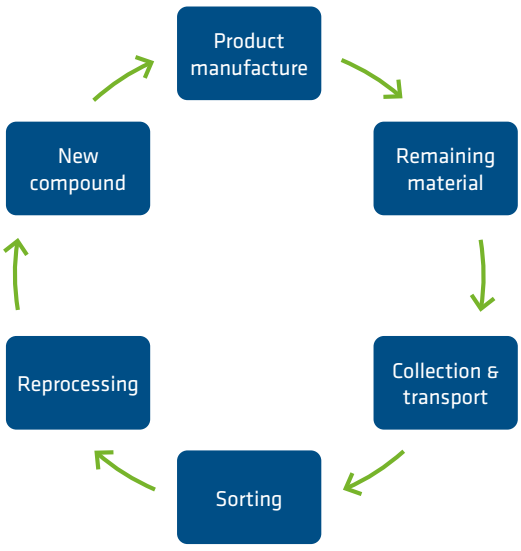
We support our customers in reducing their waste by offering cut parts in the exactly required size and they even have the option of ordering finished parts according to their drawings to further reduce local waste.

Reuse for Tomorrow

The sustainable use of plastics is essential. Ensinger offers products made from recycled plastic and products made from bio-based plastics with a reduced footprint.

Recycle for Tomorrow

Our focus is on closing the loop by implementing circular economy practices. We attach great importance to recycling residual materials and strive to make our products recyclable in order to enable a more sustainable product life cycle. By promoting the recycling of product left overs, we are actively working to minimise the environmental impact.



Further information

More on sustainable solutions made from thermoplastics

Reuse for Tomorrow

Reuse for Tomorrow – Choose Your Greener Journey

Our sustainable plastics are environmentally friendly and practical, with a reduced product footprint of up to 80 % compared to fossil-based variants. They also stand out thanks to their natural colour, which ensures easy sorting and return to the cycle. Unlike hard-to-recognise black plastics, our products offer a straightforward solution for a sustainable circular economy.

Our comprehensive approach accomplishes in two ways: We offer products made from bio-based plastics derived from biological waste like wood by-products or organic waste. In addition, we provide reprocessed plastic products sourced from production left overs, utilizing mechanical reprocessing methods.

Fossil products	Sustainable solutions	
	Bio-based products (EF)	Reprocessed products (RP)

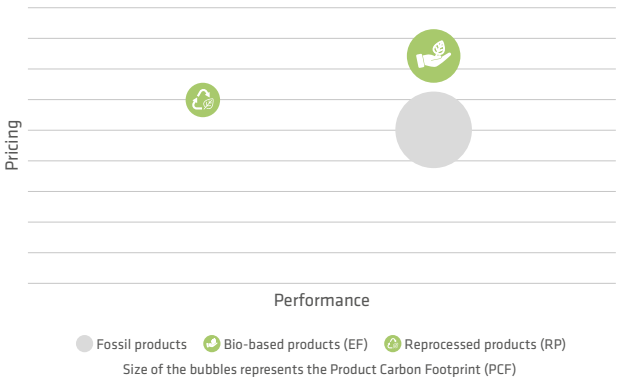
Reuse Biowaste with Mass Balanced Bioplastics

Discover our biopolymer EF products and exchange fossil resources by using products, crafted from bio-based raw materials. Biomass balanced indicates that a portion of the raw material is organic, sourced from the wood industry or organic waste. Consequently, our stock shapes biopolymers of the EF products boast a considerably reduced carbon footprint compared to their conventional counterparts.

Reuse Fossil Resources with Reprocessed Plastics

Discover our RP products and reprocess fossil resources, by giving them a second life. The reprocessed stock shapes are sourced from the production left overs from customers and Ensinger subsidiaries, which are returned to Ensinger and carefully refurbished.

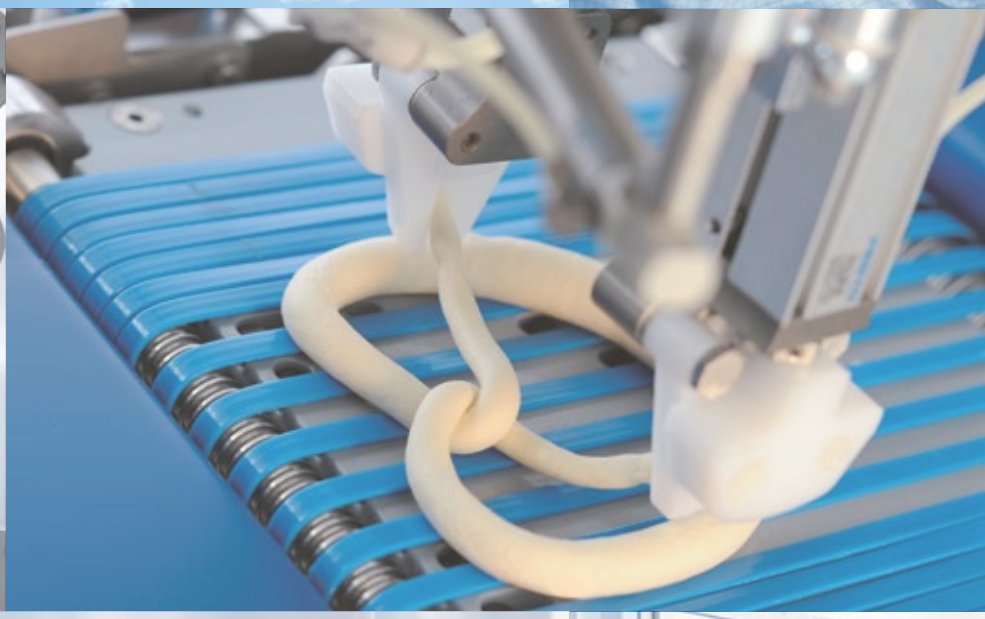
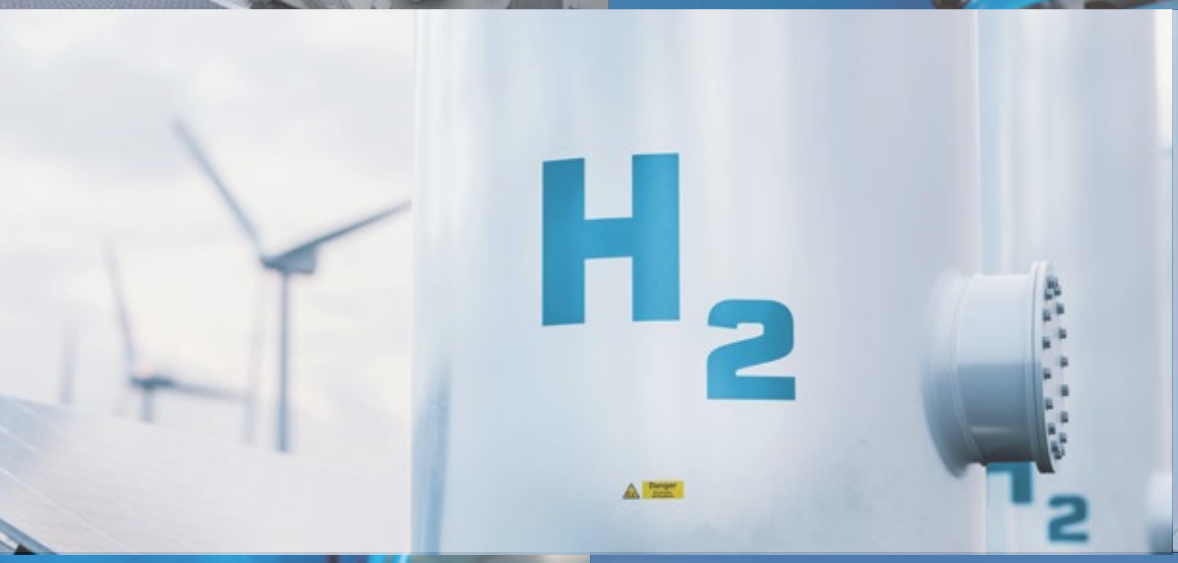
Relative Comparison: Fossil Products versus Sustainable Solutions

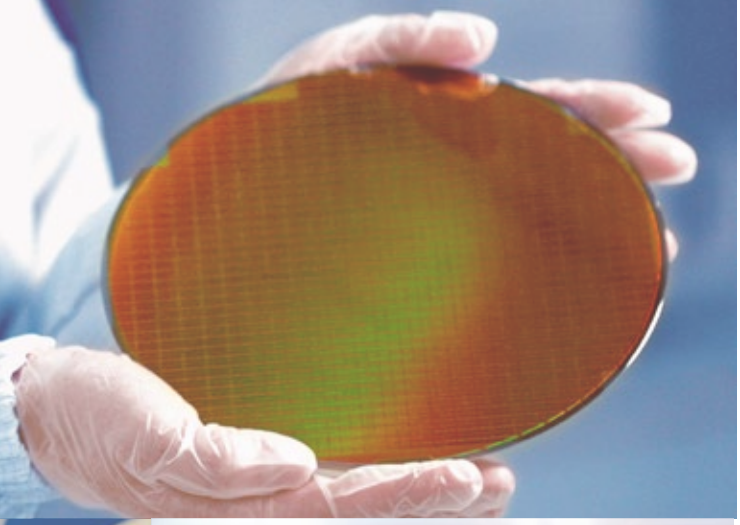


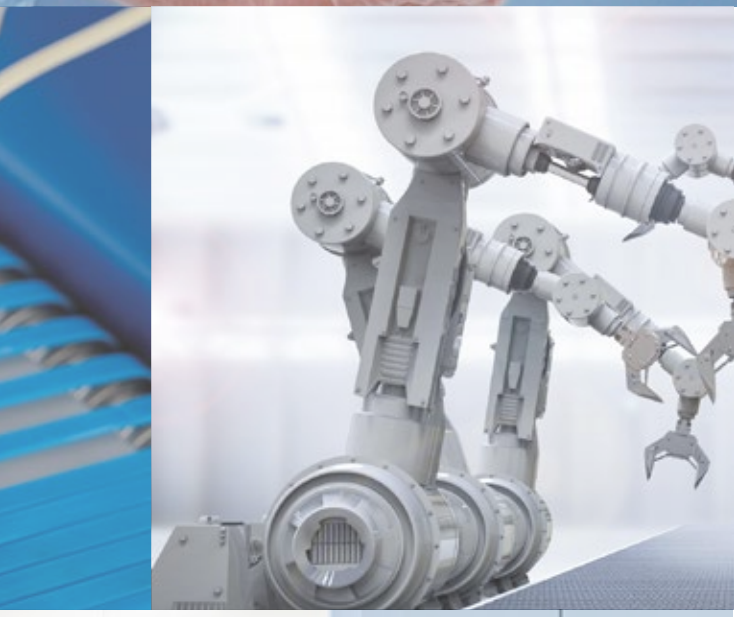
Further information

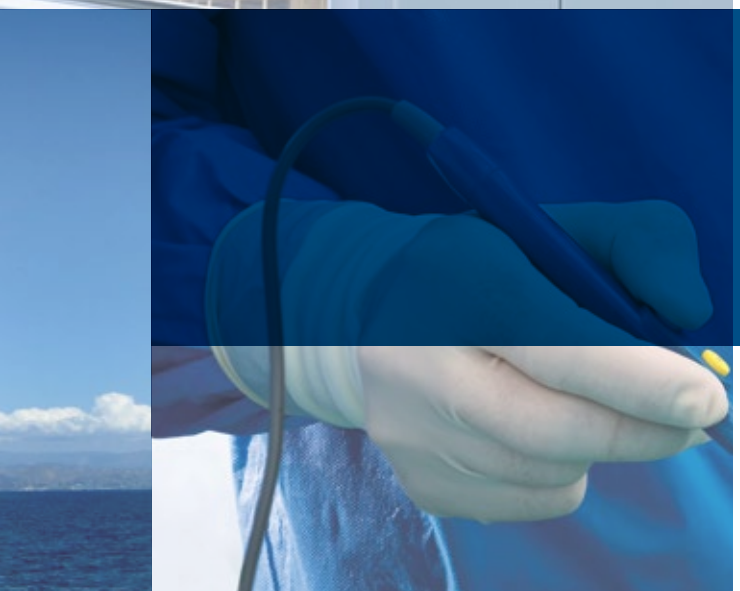
More about our mass-balanced bioplastics and recycled plastics






H2
H2





Semi-finished and finished parts made from thermoplastics are used in all industries. Technical applications can be found not only in the automotive and mechanical engineering industries, but also in the food and pharmaceutical industries, in construction and transport, in medical and electrical engineering and in aerospace, among others.

Our Industries

Medical

Plastic Solutions for Medical Technology

As a full-service provider for solutions in medical technology, Ensinger supports manufacturers of medical products with alternative but proven materials and process technologies. We cover the entire value chain in-house, offering our customers the highest level of quality, safety and flexibility.

Benefits for the Medical Technology Industry

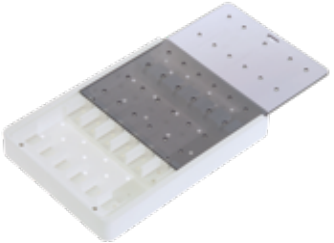
- → ***Quality management***
  The development, production and of materials, products and finished parts made from thermoplastics is carried out in accordance with DIN EN ISO 13485:2016.
- → ***Traceability***
  For consistent traceability of the customer order with regard to the products and the raw materials used, an order-related declaration of biocompatibility is issued for the MT portfolio.
- → ***Compliance – change notification***
  The aim is to keep the materials and the manufacturing process as unchanged as possible. In case of changes, the customers are informed of relevant changes as early as possible with a change notification. The aim is to always provide equivalent products.

Application examplee

Target arm
TECATEC PEEK MT CW50 black
Very high rigidity and strength.
For biocompatibility, see declaration of conformity.
Resistant to hot steam sterilisation.

Knee trial implants
TECASON P MT
Very good toughness.
For biocompatibility see declaration of conformity.
Good impact resistance.
resistant to hydrolysis and resistant to hot steam.

Caddies for surgical instruments
TECAPRO MT white
Heat stabilised.
Low moisture absorption.
Good sliding and rubbing properties.
For biocompatibility see declaration of conformity.



Further information

More about medical, contact and AR application

Biopharma

Plastics Solutions for the Pharmaceutical and Biopharmaceutical Industry

In the biopharmaceutical and pharmaceutical sectors, the highest demands are placed on materials and manufacturing processes. Ensinger can draw on many years of experience in these areas. Using proven materials and process technologies, we work with our customers to find tailor-made solutions and continuously develop our product range to create alternatives made from high-performance plastics.

Benefits for Biopharma

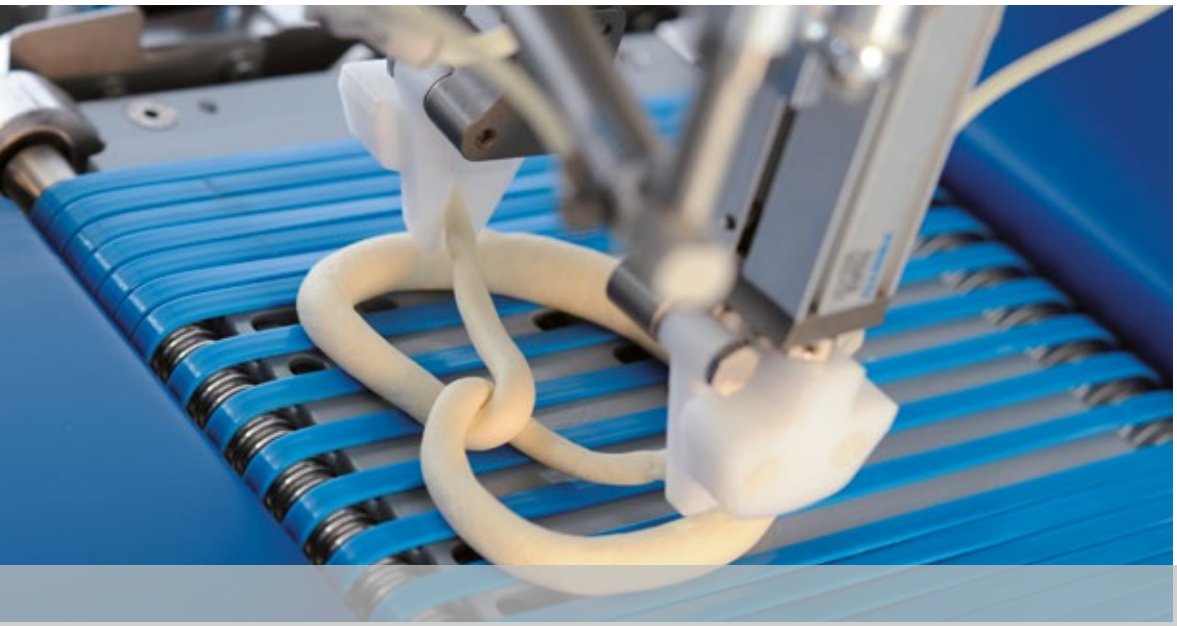
- ***Chemical resistant plastics***
  Due to their good chemical resistance, our plastics can come into contact with cleaning agents and other media without becoming brittle or yellowing.
- ***FDA compliant plastics***
  Plastics in the pharmaceutical industry often have to fulfil GMP requirements (Good Manufacturing Practice). The plastic must not have a negative impact on the quality of the pharmaceutical product.
- ***BSE-TSE free plastics***
  In the manufacture of our products, no animal substances are used based on the recipe.

Application example

Manifold block
TECADUR MT TR natural
Very good transparency.
Excellent impact strength.
Highly resistant to gamma radiation.

Further information

More about biopharma, contact and AR application



Food

Materials and Solutions for the Food Industry

The use of food-grade plastics that meet the most stringent specifications of the U.S. Food and Drug Administration (FDA) and European food contact regulations is an important requirement for food processing companies. For the Chinese market, Chinese food regulations must also be observed. As a processor of thermoplastics, Ensinger offers a wide range of solutions for corresponding applications. We offer many products from our standard portfolio of thermoplastics with the corresponding approvals for food contact. These products meet the special requirements of food technology in terms of safety and performance.

Benefits for the Food Industry

- → ***Weight reduction***
  Significant weight reduction compared to metals.
- → ***Resistance***
  When selecting the right plastics for regularly cleaned and sterilized food contact components, there is no need to provide additional protection against corrosion.
- → ***Detectability***
  Our portfolio of blue materials for food contact and metal- or X-ray-detectable plastics can improve safety in food production.

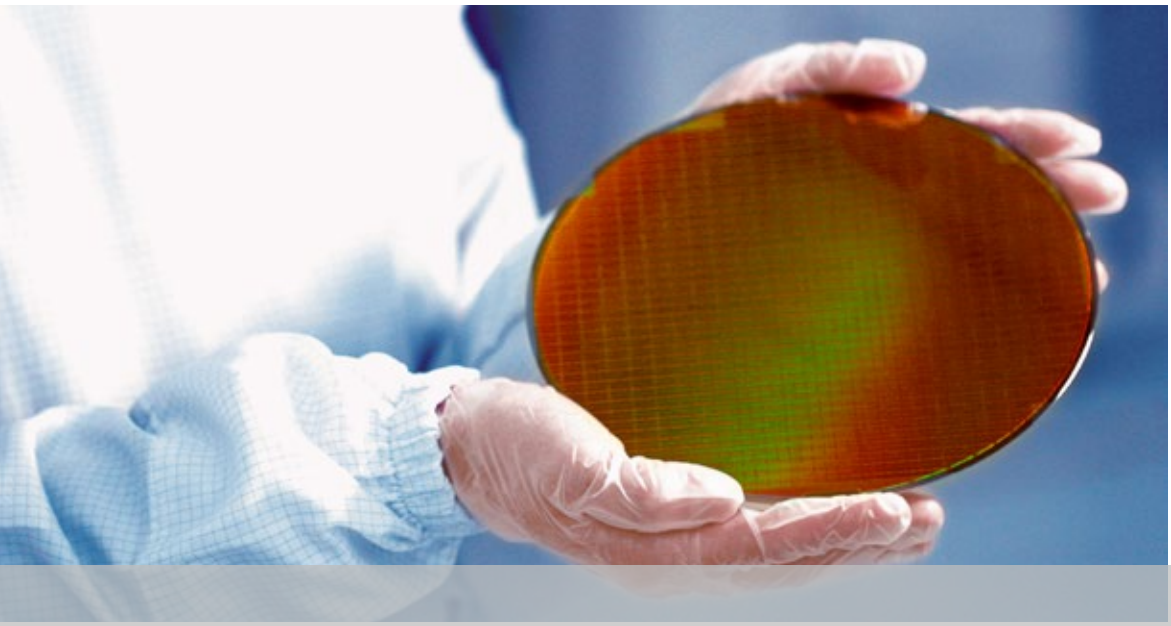
Application example

Food scraper
TECAFORM AH ID blue
Inductively detectable. Good sliding and friction properties. Low moisture absorption.

AR

Further information

More about food, contact and AR application



Semiconductor & Electronics Manufacturing

High-Performance Plastic Solutions for Semiconductor and Electronics Manufacturing

Ensinger is a global manufacturer of engineering and high-performance plastic solutions for semiconductor and electronics manufacturing equipment and components. Our compounds, machinable shapes, and finished components made of advanced thermoplastics, have a proven track record in almost all major semiconductor tools throughout the entire fabrication process, ranging from wet processes, chemical mechanical planarization, plasma etching, deposition, lithography, testing, assembly, and packaging.

Benefits of Semiconductor and Electronics Manufacturing

- → ***Copy exact conformity***
  The semiconductor material and parts are processed in compliance with copy exact requirements (also known as copy exactly). This ensures the highest level of consistent quality performance of materials and components.
- → ***Maximum purity and traceability***
  Consistent traceability and semiconductor-specific contamination and quality inspections possible at every process step.
- → ***Comprehensive portfolio***
  In addition to various dimensions, exclusive formulations are available with our own compounding process that prevent electrostatic discharges, improve dimensional accuracy and micromachinability and reduce defects in the CMP process.

Application examplee

PCB inspection fixture
TECATRON SX natural
High dimensional stability.
Tight tolerances possible.
High strength. Stiffness.

AR

Wafer holder
TECAPEEK SX natural
Low ionic impurities. Very good mechanical properties.
Excellent wear resistance.

AR

CMP retaining ring
TECAPEEK CMP natural
High strength. Toughness.
Good wear behaviour.

Further information

More about semiconductor, contact and AR applications

Aerospace

Plastic Solutions for the Highest Aerospace Requirements

At Ensinger, we can draw on many years of experience in both the technical and business sectors, which enables us to meet the especially high demands placed on plastics and solutions that are specific to the aerospace industry. The key properties of high-performance plastics include low weight, high strength and very good chemical resistance.

Benefits for the Aerospace Industry

→ ***One-stop shop solution provider***

As a full-service solution provider for plastics solutions in the aerospace industry, Ensinger relies on a fully integrated value chain. Ensinger operates four machining plants certified to AS/EN 9100: in France, the UK, China and the USA.

→ ***Expert partner for aerospace solutions***

Ensinger is a long-standing, recognised partner of renowned OEMs in the aerospace industry, such as Airbus, Boeing and Bombardier, as well as well-known Tier 1/2 suppliers to the aerospace industry.

Application example

Cushioning piston
TECAFORM AD natural
Dimensionally stable.
Resistant to grease.
Good sliding and friction properties.

AR

Further information

More about aerospace, contact and AR applications

Renewable Energy

Innovative Plastics Solutions for Renewable Energy Applications

Renewable energies are increasingly coming into focus when it comes to finding more climate-friendly and efficient solutions for energy production. Many global players, are therefore increasingly focused on green technologies. Ensinger has reliably accommodated the technological change in these industries as a long-standing partner of many OEMs. With our value chain from compound to finished component, we offer comprehensive complete plastic solutions for components in the automotive industry or storage technology, for example. Thanks to our high level of expertise in material development along with application and production technology, we can also advise our customers quickly and reliably.

Benefits for Renewable Energy

- → ***Traceability***
  Due to the consistent documentation during the individual process steps, continuous traceability all the way back to the raw material is standard at Ensinger. Ensinger also issues customer-specific conformities on request.
- → ***Complete project support***
  We accompany you through all phases of the product life cycle, from development and selection of the appropriate material for your prototypes, to large-scale production.

Application example

End plate
TECATRON GF 40 black
Very good strength. Stiffness.
High dimensional stability.
Excellent chemical resistance.

AR

Further information

More on renewable energies, contact and AR application

Oil & Gas

Plastic Material Solutions for the Oil and Gas Industry

The oil and gas industry demands high temperature, high pressure (HTHP), high mechanical strength and chemical resistance materials, suitable for the most extreme environments. Modern technical plastics have a major contribution to make towards improving existing solutions in the oil and gas industry due to state-of-the-art materials that offer a greater range of benefits. Current systems in place in the oil and gas sector largely use modern materials such as Polyimide, PTFE, PA 6 C, PPS, PAI and PEEK. In addition to this, Ensinger's PEEK products are tested in accordance with EN ISO 23936-1 and NORSOK M-710, which verifies the material's resistance to the severe conditions of the environment it will be exposed to.

Benefits for the Oil and Gas Industry

- ***Efficient plastics***
  Good resistance to common fluids, no corrosion, high thermal resistance, good wear resistance and low friction are properties our materials hold that contribute to reduced maintenance costs and increased equipment lifetime.
- ***Comprehensive portfolio***
  Ensinger also has extensive experience in the manufacture of PEEK tubes, offering a wide range of standard tube sizes and wall thicknesses.

Application example

Electrical connectors
TECAPEEK natural
Electrically insulating. Excellent chemical resistance. Very good mechanical properties.

Further information

More about oil & gas and contact

Mechanical

Engineering Mechanical Plastic Solutions

In the field of mechanical engineering, steel and metal alloys are traditionally used to achieve high mechanical strength and precision of components. However, metals are now often replaced by engineering plastics, as the latter offer a variety of advantages. It is often thought that high-performance plastics are too costly an alternative, but these particular materials can provide solutions where traditional materials fail - offering more scope for improvement and progress. Ensinger's goal is to use engineering plastics to achieve better and faster operation of equipment and lines through optimized material combinations. Plastics in mechanical engineering are often considered as a convenient solution for mechanical components such as gears, supports, sliding elements, spacers, and valve components.

Benefits for Mechanical Engineering

- → ***Corrosion resistance***
  Many environments, such as wet systems containing salt water, oxidizers and acids, or sterilization and cleaning processes are harmless to most plastics.
- → ***Lower weight, better performance***
  Their significantly lower weight brings great benefits to all moving parts.
- → ***Improved sliding properties***
  Many plastics can be used in completely dry conditions and simultaneously offer excellent wear resistance.

Application example

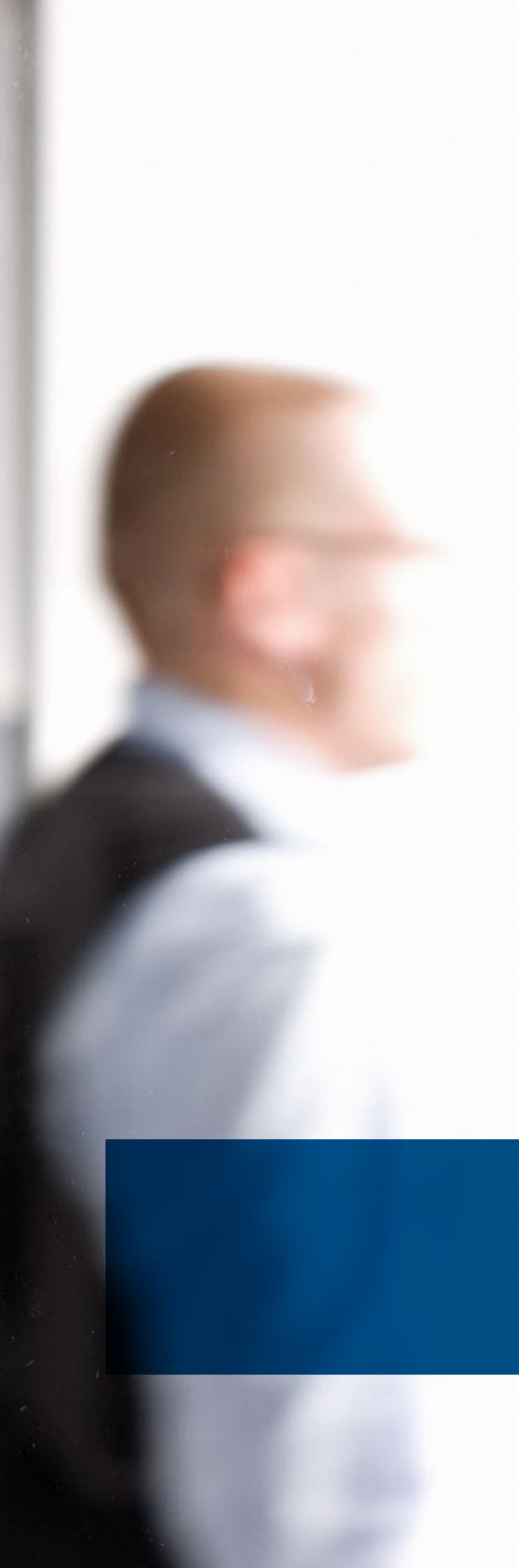
Sliding rail
TECAGLIDE green
Good sliding and rubbing properties. High toughness. Resistant to oils and greases. Good wear resistance.

AR

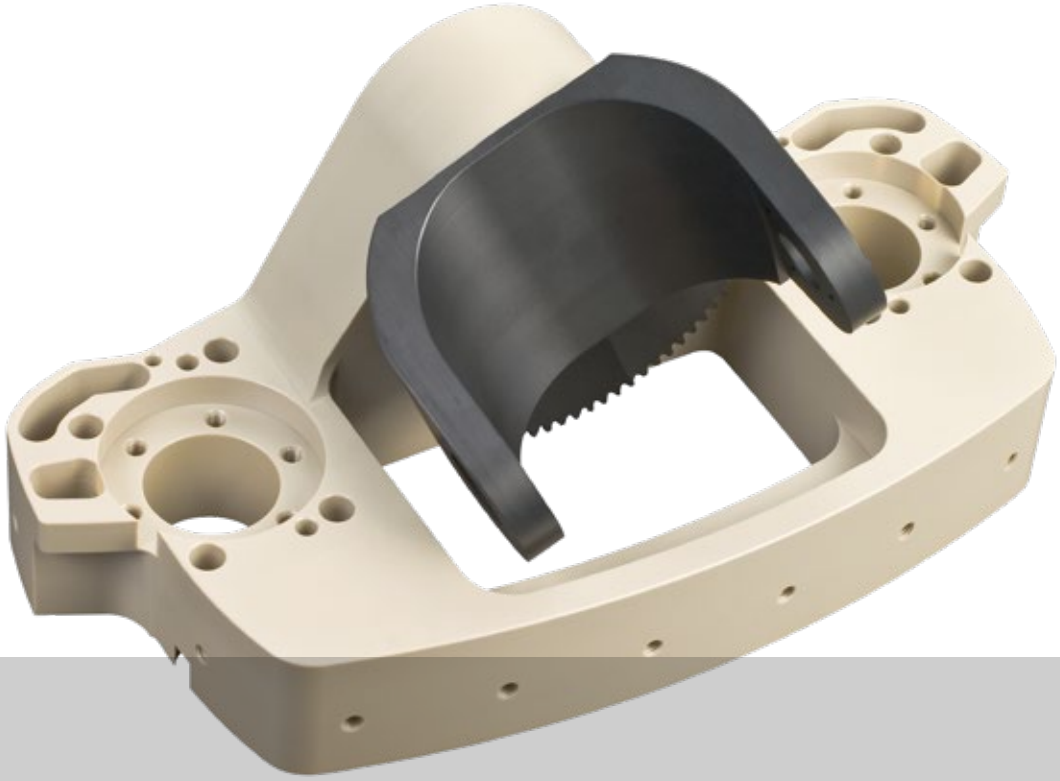
Composite robotic arm
TECAPEEK natural
High creep resistance. Good sliding and rubbing properties. Inherently flame retardant.

Further information

More about mechanical engineering, contact and AR application



Special Materials



Sliding Friction Applications

Sliding bearings, gears, guide elements and rollers frequently call for materials with good tribological characteristics.

Ensinger has extensive experience in the field of sliding applications, and offers a wide portfolio of tribological materials. A range of different additives to improve sliding properties can be used in order to ensure optimum compliance with requirements depending on the application. Together with the individual properties of plastics, these offer a range of possibilities for wide-ranging tribological applications.

However, selection of a suitable material depends not only on the thermal or mechanical requirements of the application. To allow suitable material recommendations to be made, a range of other system conditions such as pressure, relative sliding velocity, the structural design and the properties of the mating partner (surface roughness) are determining factors.

Application example

Trolley
TECAFORM AH natural
Good dimensional stability.
Good sliding properties.
Resistant to oil and greases.

AR

Track roller
TECAPET white
High stability.
High creep resistance.
Good mechanical properties.

Further information

More about sliding applications, contact and AR application

Compression Moulding Composite Materials

Compression moulding is a processing method for the manufacture of stock shapes or finished and semi-finished components.

The compression moulding process is primarily suited for finished parts in medium piece numbers, as the tooling costs are generally lower than other processes such as injection moulding. For stock shapes, this process allows larger dimensions to be achieved than is the case for extrusion, especially for large rings. The benefits of compression moulded components and stock shapes:

→ Semi-finished part geometries close to finished measurement
→ Extreme economy due to material savings
→ Low tendency to warp due to almost isotropic characteristics
→ Extremely low intrinsic stress levels
→ Consequently also easier to machine

Due to their outstanding properties, composites materials are already indispensable in numerous applications.

At Ensinger, you will find fibre-reinforced composites materials on a thermoplastic matrix as semi-preg, prepreg and organic sheets. Sheets are also available in thicknesses of up to 95 mm. The advantages of composite materials are:

→ High impact strength and elongation at break
→ Excellent mechanical properties
→ Good chemical properties & chemical resistance
→ Thermal resistance
→ High creep resistance and excellent fatigue behaviour

Application example

Back-up ring
TECAPEEK CM XP 96 natural
Very good chemical resistance. High creep resistance. Very good mechanical properties even at high temperatures.

Structural part for a light airplane
TECATEC PPS CW50 PL V01 black
Excellent mechanical properties. Very high chemical resistance.

Further information

More about compression moulding, tube selector and contact

More about composites materials and contact

Product Handling

Ensinger plastics are used as the raw material for a wide range of high-quality components and end products in fields such as the food industry and medical technology, as well as mechanical and automotive engineering, semi-conductor technology and in the aerospace industry. To ensure the high standard of quality and functionality in our materials for these applications, and also over extended storage periods, certain factors must be taken into consideration in the storage, treatment and handling of Ensinger stock shapes. By taking these precautions, it is possible to ensure that external influences are unable to significantly diminish the material properties. In the case of finished parts, the manufacturer or user is required to individually submit a statement of this, as conditions can differ considerably depending on the storage or utilization period.

1. Storage and handling should take place in such a way that the material designations and product numbers (batch number) are clearly recognizable on the semi-finished products and can be maintained. This allows clear identification and traceability of products in the event of a possible compliant, allowing the possible root cause of the problem to be determined.

2. Weathering effects can impact on the properties of plastics. As result of the impact of solar radiation (UV radiation), atmospheric oxygen and moisture (precipitation, humidity) can exert a lasting negative impact on material characteristics. These influences can result in colour changes, oxidation of surfaces, swelling, warping, brittleness or even a change in mechanical properties. For this reason, semi-finished products should not be exposed to direct sunlight or the effects of weather over protracted periods. Ideally, the semi-finished products should be stored in closed rooms under normal climatic conditions (23°C / 50% rH).

The following materials in particular should be protected against the influence of the weather:

→ TECAPEEK (PEEK)*
→ TECATRON (PPS)*
→ TECASON P (PPSU)*
→ TECASON S (PSU)*
→ TECASON E (PES)*
→ TECAFORM AH, AD (POM-C, POM-H)**
→ TECAPET (PET)**
→ TECAMID 6, 66, 11, 12, 46 (PA 6, 66, 11, 12, 46)**
→ TECAST (PA 6 C)**
→ TECAFINE (PE, PP)**
→ TECARAN ABS (ABS)*

* all variations should be protected generally
** not black coloured variants should be protected

3. Wherever possible, plastics should not be exposed to low temperatures over long periods. In particular, marked fluctuations in temperature should be avoided, as this can cause stock shapes to warp or become brittle. Hard knocks caused by throwing or dropping should be avoided, as otherwise cacks and fracture damage can occur. In addition, semi-finished products stored in cold conditions should be allowed sufficient time to acclimatize to room temperature before processing. This can help to prevent defects such as cavities occurring during processing. It will also help to compensate for shrinkage or also elongation after exposure to hot atmospheres caused by the high coefficient of linear thermal expansion of plastics.

4. Semi-finished products made of plastic should consequently always be stored flat or on a suitable support (in case of rods and tubs) and with the greatest possible surface contact in order to avoid deformation through their own intrinsic weight or heat.

5. When handling plastic semi-finished products, ensure that suitable warehousing equipment is used. Ensure that storage facilities, lifting gear, slings and other lifting equipment are stable and secure. Stock shapes must also be stored and stacked so as to eliminate any danger of tipping or falling. Bear in mind here that plastics often have a relatively low coefficient of friction and are consequently easily able to slip out of load suspension devices, with the possibility of serious injury to staff members.

6. Avoid the effects of high-energy radiation such as gamma or X-rays wherever possible due to possible microstructure damage through molecular breakdown.

7. Plastic stock shapes should be kept away from all kinds of chemicals and water in order to prevent possible chemical attack or the absorption of moisture. Contact with chemicals or water can result in swelling, chemical decomposition or stress cracking.

8. Plastics are organic substances and consequently combustible. The combustion or decomposition products may have a toxic or corrosive effect. If correctly stored, plastics themselves do not pose a fire risk. However, they should not be stored together with other combustible substances. On this subject, observe the product handling information sheets for the individual materials.

9. Under normal conditions, plastic semi-finished or finished products do not release any toxic constituents and permit risk-free surface contact. Tobacco products should not be allowed in the vicinity when handling and machining plastics, as particles of some plastics (in particular fluoropolymers) can release strong toxic gases in some cases during pyrolization of the smouldering tobacco. In respect of health protection, please also note the product handling information sheets for the individual materials.

10. If the above recommendations are adhered to, it may be assumed that no significant changes to typical properties will occur during the storage period. It is possible that minimal surface discolouration may occur due to environmental influences. However, this does not represent any significant deterioration of material properties, as the surface is generally only affected down to a few microns in depth.

11. Plastic waste and chips can be processed and recycled by professional recycling companies. However, it is also possible to send the waste for thermal processing to generate energy by a professional company in a combustion plant with a suitable emission control in place. This applies in particular to applications where the plastic waste produced is contaminated, e.g. in the case of machining swarf contaminated with oil.

In order to store finished and semi-finished products for high levels of manufacturing precision, we consequently recommend storage under constant conditions in a normal climate (23°C / 50% rH). This allows external influences to be minimized and dimensional stability to be maintained over long periods.

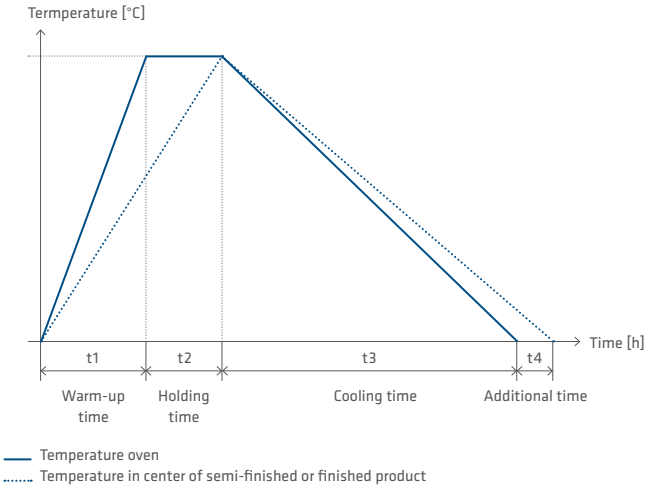
It is not possible to specify a maximum storage period, as this depends heavily on the materials, storage conditions and external influences.

These recommendations should always be adjusted in line with individual requirements and circumstances. They do not replace the fundamentally applicable statutory regulations, or exonerate customers using the products from their responsibility or individuals from their duty of care. These are merely intended as recommendations drawn up on the basis of current knowledge. They do not constitute any generally applicable assurance.

Annealing

Ensinger stock shapes are always subjected in principle to a special annealing process after production to reduce the internal tension created during manufacture. Annealing is carried out in a special recirculating air oven, but can also take place in an oven with circulating nitrogen or in an oil bath. Annealing results in increased crystallinity, as well as improved strength and chemical resistance. It also brings about a reduction of inner tension as described above and increases dimensional stability over a wide temperature range.

Typical annealing cycle



Processing of Plastics

General Information*

Non-reinforced thermoplastic polymers can be machined using carbide-tipped tools. In addition to PCD tools for longer tool life, these can also be used for reinforced materials. Due to the poor thermal conductivity of plastics, good heat dissipation must be ensured. The best form of cooling is heat dissipation via the chip.

Dimensional Stability

Plastics require higher production tolerances than metals. Furthermore, the very much higher thermal expansion needs to be taken into consideration. This applies in particular to the machining of products. Localised heat input can lead to temperature gradients in the component, which can inevitably lead to stresses and distortion. This is why "cold machining" is essential. In the case of high machining volumes, intermediate tempering can also be helpful to reduce stresses. Details on this can be found in our tempering recommendations. In principle, however, Ensinger semi-finished products are already tempered to reduce stress.

Machining Methods

1. Turning Guide values for tool geometry are given in the table. For surfaces with particularly high quality demands, the tool must be designed as a wide smoothing tool as shown in Figure 1. For parting off, the lathe tool should be ground as shown in Figure 2 to prevent the formation of burrs. For thin-walled and particularly flexible workpieces, on the other hand, it is better to work with tools that are ground to a knife-like cutting geometry (Figure 3).

2. Milling For planed surfaces, face milling is more economical than peripheral milling. For peripheral and profiling milling, the tools should not have more than two cutters so that vibrations caused by the number of cutters are kept low and the gaps between the chips are sufficiently large. Optimum cutting performances and surfaces finished are obtained with single-cutter tools.

3. Drilling Twist drills can generally be used. These should have a twist angle of 12° to 16° and very smooth spiral grooves for good chip removal. Larger diameters should be predrilled or should be produced using hexagonal milling cutter. Particular attention should be paid to properly sharpened drills when drilling into solid material. Reinforced plastics have a lower impact resistance and are therefore particularly susceptible to cracking. Where possible, they should be heated to around 120°C before drilling (heating time approx. 1 hour per 10mm cross-section). This method is also to be recommended for polyamide 66 and polyester.

4. Sawing Unnecessary heat generation caused by friction must be avoided. Well sharpened sawblades with large tooth offsets are therefore expedient.

5. Thread cutting Threads are best cut using thread chasers. Burr formation can be avoided by using twin-toothed chasers.

Figure 1
Wide smoothing tool

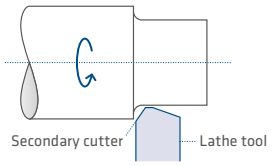


Figure 2
Grinding prevents burr formation

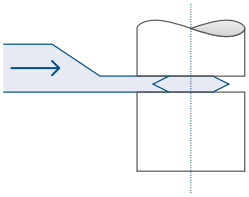
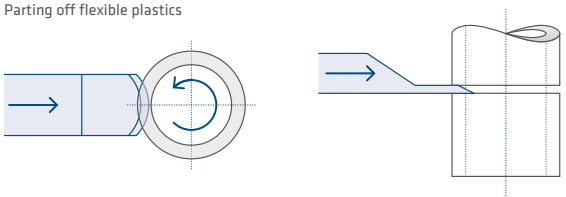


Figure 3
Parting off flexible plastics



* Our application advice, both written and oral, is intended to help you in your work. It must be regarded as a recommendation without obligation, also with respect to possible third-party property rights. We can assume no liability for any damage occurring during machining

Technical Appendix

Machining brochure

Further information on machining can be found in the machining brochure.

Chemical resistance

Chemical compatibility, chemical resistance and corrosion resistance are among the greatest advantages of plastics compared to metals. After selecting the right polymer family, users can establish resistance to even the most demanding environmental conditions without the need for additional protective measures such as surface treatment, painting or cathodic protection.

General Terms and Conditions

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