

Highlights by AKRO-PLASTIC GmbH



AKRO
COMPOUNDS



AKRO-PLASTIC GmbH

AKRO-PLASTIC GmbH is your specialist for innovative and application-oriented plastic compounds. With more than 35 years of experience, our comprehensive knowledge of plastic compounding means we have the right solutions for your every compounding need. We produce over 165,000 metric tons of plastic compounds worldwide every year and are constantly developing innovative new solutions for our customers.

We specialise in upgrading standard materials as well as engineering plastics, designed for specific industries and applications. We serve customers around the world. With production sites in Germany, Brazil and as the joint venture Highsun AKRO Engineering Materials (Changzhou) Co., Ltd. in China as well, we provide an international network covering the globe. We can offer services ranging from development right through to delivery.

AKRO-PLASTIC GmbH is focused on developing plastic compounds with outstanding good mechanical properties. Our unique compounding technology enables us to produce polymer solutions with best-in-class reproducibility, allowing you to create systems with extra tight tolerances. As an engineering plastics manufacturer, we offer flexible and individual services that are always up to date. Individuality is one of our greatest strengths. We offer a broad range of both standardised and specialised compounds as well as comprehensive knowledge about application-oriented polymer solutions.

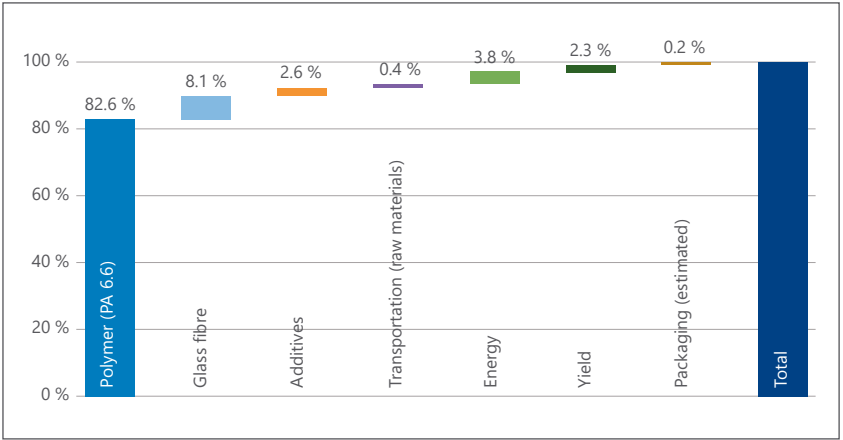


Sustainable in many ways

As a future-oriented company and member of a successful, globally active group of companies, led by K.D. Feddersen Holding GmbH. Their sole shareholder is the charitable K.D. Feddersen Foundation. We see it as our task to contribute to the fulfilment of the UN Sustainable Development Goals (SDGs). The Feddersen Group's climate target includes e.g.

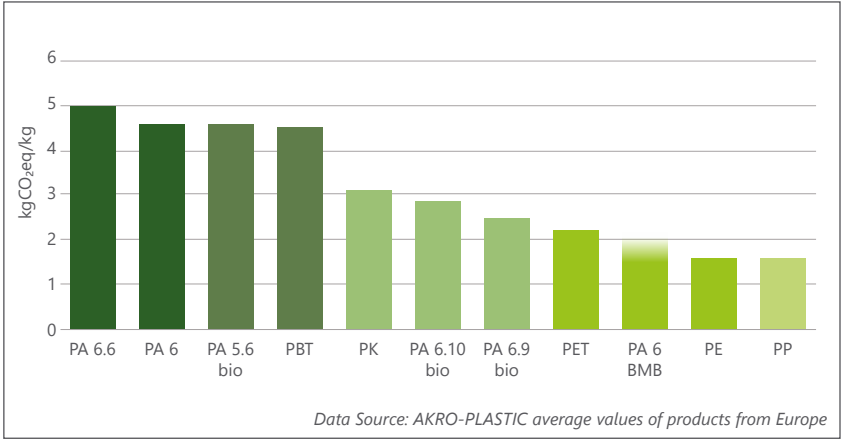
- To become climate neutral (Scope 1 & 2) in the group's German companies by end of 2025
- To reduce the Product Carbon Footprint (PCF) of all AKRO-PLASTIC products by around 35 % until 2027
- Focus on the sustainability of our products when developing projects and materials
- Support our customers by providing qualified advice on the selection of sustainable products

Carbon footprint of PA 6.6 GF 30 black heat-stabilised



The carbon footprint calculation (cradle to gate) for a 30 % glass fibre reinforced PA 6.6 compound shows, that the polymer has by far the highest impact on the carbon footprint, followed by the filler content. A smart selection of polymers and fillers is key when looking for more sustainable solutions.

Use of polymers with lower carbon footprint



AKRO-PLASTIC GmbH offers ISCC PLUS and REDcert² certified products. For these, sustainably certified raw materials (biomass/recyclate) are used to replace an equivalent amount of fossil resources in the production process (mass balance approach). Through this, AKRO-PLASTIC GmbH contributes to the bioeconomy and circular economy.



Scan this QR code to get more information





Sustainable products: biobased, recyclable and more

There is no quality loss or physical difference compared to their fossil counterparts. There are multiple options to compose sustainable engineering compounds to reduce CO₂. At AKRO-PLASTIC GmbH you will find innovative alternatives for your sustainable applications! Our sustainable products are marked with a leaf. 🌿

Mass-balanced materials are technically identical sustainable substitutes for regular polymers like PA 6, PA 6.6, PP or other compound components like flame-retardants. Compounds using these drop-in materials can be offered with ISCC PLUS or REDcert² certification and come with the same compound name and formulation number, just marked with the suffix BMB (for biomass-balanced) or CMB (chemical recycling mass-balanced).

Polymers based on sustainable feedstocks or mass-balanced contents, e.g.

- 🌿 **AKROMID® NEXT B3 GF 30 1 black (2485BMB)**: biomass-balanced PA 6, exceptionally low carbon footprint
- 🌿 **AKROMID® NEXT 5.6 3 GF 30 FR black (8465)**: flame-retardant PA 5.6, free of halogens and red phosphorous, biobased carbon content 32 %
- 🌿 **AKROMID® NEXT G3 GF 30 1 black (8468)**: biobased PA 6.9, low moisture absorption, high chemical resistance, biobased carbon content 56 %
- 🌿 **AKROLEN® NEXT PP LGF 40 2 CI black (8560)**: biomass-balanced PP, exceptionally low carbon footprint

Recycled polymers from post-industrial feedstock

- 🌿 **AKROMID® B3 GF 35 ECO black (8472)**: PA 6 heat-stabilised, recycled content 30 %
- 🌿 **AKROMID® A3 GF 50 6 ECO black (8162)**: PA 6.6 heat-stabilised, recycled content 30 %

Post-industrial recycled carbon fibre compounds

- AKROMID®, AKROLOY®, PRECITE® ICF compounds
- Reduction in wall thickness due to higher stiffness
- Density advantage against glass fibre



AKROMID® NEXT 5.6 3 GF 30 FR black (8465)



Flame retardant

E-Mobility

The reduction of emissions created by humans is one of the biggest challenges in the modern world. With the e-mobility sector being a notable contributor to carbon dioxide emissions, it becomes imperative to revolutionise our approach to travel in the coming years. Recognising this need for change, AKRO-PLASTIC GmbH has developed a comprehensive FR portfolio tailored for the burgeoning e-mobility sector.

- **AKROTEK® PK-VM GF 30 FR orange (8537):** process improved polyketone with UL94 V0 @ 0.8 mm flammability, offers a wider processing window. Due to its good chemical resistance, good dimensional stability and high elongation at break, it is suitable for high voltage components.
- **AKROMID® B28 GF 35 9 FR black (8189):** with UL listed V-0 @ 1.6 mm, this easy flowing PA 6 with organic stabilisation is optimised for the use in e-mobility.
- **PRECITE® P3 GF 30 9 FR black (8424):** achieves UL94 V-0 @ 1.6 mm flammability, is free of halogens and red phosphorous. The product offers outstanding long-term heat-aging stability and is a good choice for e-mobility.
- **AKROLEN® PP-H GF 25 FR natural (8030):** this grade is also suitable for applications with good rigidity requirements in the automotive industry. It is UL94 V-0 @ 1.6 mm, free of halogens and red phosphorous and the flame-retardant system is characterised by low blooming in humid environments.

E&E

Electronic devices become smaller and more powerful, so the use of modern flame retardants in engineering thermoplastics is essential.

All flame-retardant grades are based on halogen- and red phosphorus-free solutions, leading to optimised electrical properties. By not using halogenated heat stabilisers or additives, the electrochemical corrosion is reduced to a minimum. The combination of these circumstances helps our customers to build miniaturised and long-lasting electrical devices. Coloration in special colors like RAL 2003 is possible, as well.

- **AKROMID® B3 GF 30 FR black (7459):** is listed by UL94 V-0 @ 0.4 mm, the flame retardant is free of halogens and red phosphorous.
- **AKROMID® C3 GF 25 1 FR black (7246):** UL94 V-0 @ 0.4 mm, RTI (elec. 150 °C), full UL Yellow Card, specially optimised for technical parts.
- **AKROLOY® PARA GF 35 FR black (7496):** this is the choice if no compromise in stiffness is possible. The aromatic character of the polymer leads to a reduced moisture uptake and therefore to almost no change of properties after conditioning.
- **AKROMID® T9 GF 15 FR LA black (8197):** if it comes to high temperature and media resistance, the PA 9T has a low moisture absorption, a very high stiffness and strength even at temperatures above 120 °C.

✓ For reduction of fossil based raw materials **AKROMID® NEXT 5.6 3 GF 30 FR black (8496)** is a good alternative to **PA 6.6 GF 30 FR**. Furthermore, there is also the possibility to use biomass-balanced flame retardants for all reinforced flame-retardant grades, which will in addition lead to a reduction of the materials' carbon footprint.



High performance

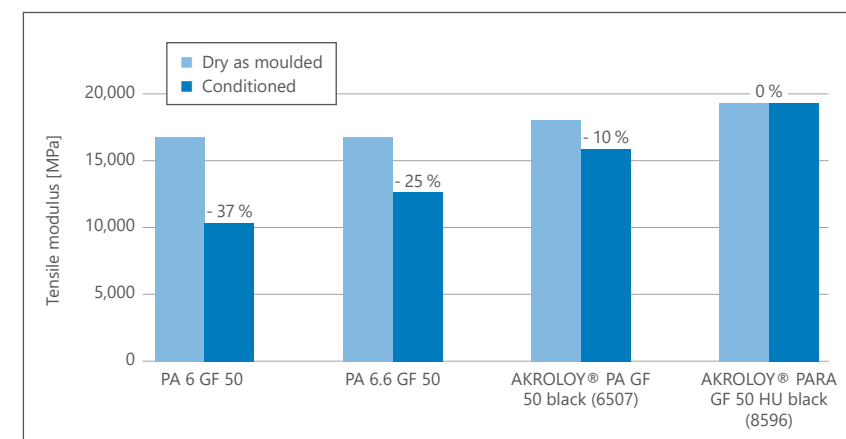
AKROLOY® PARA GF 50 HU black (8596) and **GF 60 HU black (8519)** are semi-aromatic compounds featuring

- High strength and stiffness
- Very low influence of moisture on mechanical performance

This leads to very constant properties over a larger range of moisture and temperature conditions. Engineers can design more efficiently with less safety margin in comparison to conventional PA 6 or 6.6 compounds. This makes AKROLOY® the first choice for high demanding applications as well as metal replacement.

AKROLOY® PARA GF 50 HU black (8596) reaches the best in class strength and stiffness. Highest flow and excellent surface give moulders design freedom and easy processing even for complex and thin-walled parts.

Stiffness in dry and humid environment



Moreover, AKRO's **long glass fibre (LGF)** reinforced compounds extend the performance of conventional products. Compared to short GF, LGF compounds show the same strength & creep at roughly 40 °C higher temperature environment, so parts can be kept at higher operating temperatures. The same effect appears after moisture uptake. **AKROMID® A28 LGF 50 9 black (7705)** has higher strength and stiffness after moisture absorption than a short GF material.

An additional benefit is the improved energy absorption. Therefore, LGF compounds are often used in crash relevant applications to achieve higher product safety.

ARKO also offers a PA 6/PP blend with long glass fibres. When conditioned, the mechanical performance of **AKROMID® B28 LGF 40 1 L black (6155)** is in line with a pure PA 6 LGF or with a PA 6 with 50 % standard GF. This saves density and finally weight of the part, especially interesting for moving parts.

The LGF portfolio is extended by semi-aromatic AKROLOY® and **AKROMID®T PPA** compounds, as well as biomass-balanced **AKROLEN® NEXT PP LGF 40 2 CI black (8560)** with a 70 % reduced CO₂ footprint.



Polyester compounds

Because of their lower carbon footprint, polyesters can be used as a sustainable alternative to polyamides. The PRECITE® portfolio focuses on reinforced PBT and PET with up to 50 % glass fibre or carbon fibre reinforcement.

Benefits of polyesters:

- High dimensional stability
- Outstanding heat aging performance
- Excellent sliding properties and wear resistance
- Post-consumer-recycled grades and biomass-balanced grades available
- unique stress/strain ratio

PRECITE® portfolio – PBT

- **PRECITE® P3 GF 30 black (6924):** general purpose - high stress / strain ratio
- ✓ **PRECITE® K GF 30 ECO black (8269):** is a 30 % glass fibre reinforced PBT/rPET blend with high strength. PET produced from post-consumer raw material contributes to the reduction of CO₂ emissions
- ✓ **PRECITE® K GF 30 4 ECO LA (8699):** PBT/rPET, hydrolysis resistant, GMA-free, lasermarkable
- **PRECITE® P3 GF 30 4 LA black (8286):** PBT hydrolysis-resistant and GMA-free
- **PRECITE® P3 GF 30 9 FR black (8424):** PBT flame retardant, free of halogens and red phosphorus, V-0 @ 1.6 mm, high strength and high elongation

PRECITE® portfolio – PET

Generally, PET (2.2 kgCO₂eq/kg) has a lower carbon footprint than PBT (4.2 kgCO₂eq/kg). The new PRECITE® ECO grades contain up to 30 % post-consumer PET. Its extraordinary mechanical performance makes these grades a valid, more sustainable solution against other engineering plastics.

- **PRECITE® E GF 50 black (7395):** PET has similar mechanics like PPA at higher temperatures for high-performance applications
- ✓ **PRECITE® E ICF 30 black (7429):** regenerated carbon fibre reinforcement, light weight, density 1.45 g/cm³, with very high tensile modulus
- ✓ **PRECITE® E GF 30 ECO black (8271):** is a 30 % glass fibre reinforced, medium viscosity PET with very high stiffness and toughness. This compound contains up to 25 % post-consumer raw material to reduce the carbon footprint.



Lightweight

Lightweight design is the most efficient way to reduce CO₂ emissions during lifetime in mobility applications.

There are multiple approaches for lightweight applications:

- Use of a polymer with lower density: **AKROMID® Lite**.
- Use of reinforcement with lower density: carbon fibres (CF, ICF compounds).
- Use of chemical foaming or MuCell® technology.
- Water-assisted injection moulding.

AKROMID® Lite:

- Approx. 8 % lower weight, good adhesion to TPE, ZnCl₂-resistant.
- Better dimensional stability due to less moisture absorption.
- Higher flow and easy processing.
- **AKROMID® B3 GF 30 1 L black (4365)**: with reduced density, outstanding chemical resistance and lower carbon emission

ICF reinforcement:

- **AKROMID® A3 ICF 20 black (5102)**: offers 10 % density reduction in comparison to a conventional PA 6.6 GF 30 at similar strength.
- **AKROLOY® PA ICF 40 black (5270)**: is combining lower density and low influence of moisture on mechanics. Applications in bicycle industry such as frame and pedal

Foaming for further reduction of density and part weight:

- By using a standard injection-moulding grade **AKROMID® B3 GF 30 6 (20009)** together with polyamide-based chemical foaming agent **AF-Complex® PA 990813 TM natural** significant weight reductions can be achieved, while maintaining a good surface quality.
- Foaming with core back or breathing mould process yields up to 40 % density reduction in a wide range of wall thicknesses from 2 mm up to 10 mm.





High temperature polyamide

AKROMID® T5 and **T9** are the high temperature polyamides in the AKRO portfolio. In opposite to classic PA 6 and PA 6.6, AKROMID® T compounds keep their high strength and modulus even at higher temperatures or in conditioned state.

AKROMID® T5 GF 50 6 black (8000) is based on PA 6T. It has a melting point of 325 °C and a Tg of 135 °C. It is an ideal engineering material for demanding applications requiring durability and strength even at elevated temperatures.

AKROMID® T9 GF 50 black (7601) is based on PA 9T homopolymer. The lower melting point of 300 °C and faster crystallisation widens the processing window and reduces thermal degradation. This helps the moulder to achieve good part results with less effort and cost for equipment and mould design. AKROMID® T9 absorbs significantly less moisture which leads to a higher consistency of the glass transition temperature, Tg, resulting in even mechanical performance in dry or conditioned state. With this narrow field of conditions over temperature and moisture, engineers can design the applications more precisely and reduce safety margins (as you can see in the graphic below).

The lower density of **AKROMID® T9** compounds offers an additional benefit for lighter parts and less material consumption and cost.

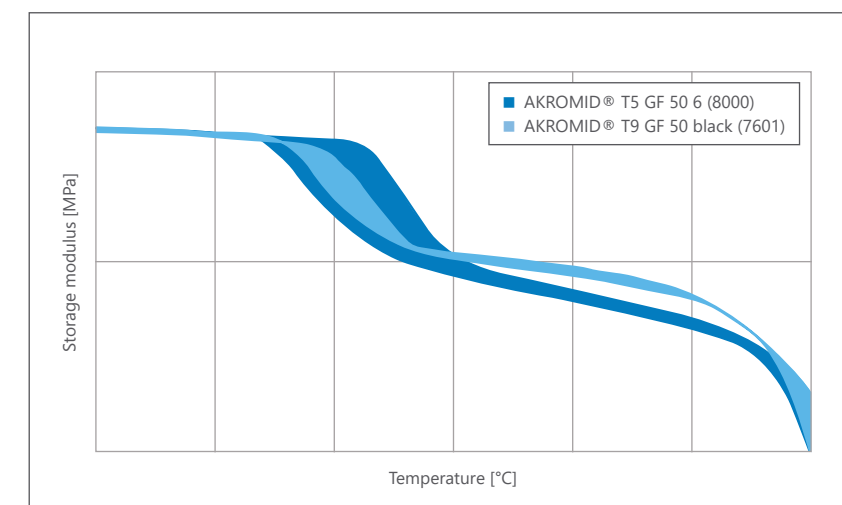
Features of AKROMID® T

- High strength even at high temperatures
- High melting point
- Low influence of moisture on mechanical properties
- Excellent creep properties

Additional features of T9

- Reduced moisture uptake
- Very constant mechanical properties
- Improved processing, high flow
- Lower density

Rigidity depending on temperature and moisture level





Additive manufacturing

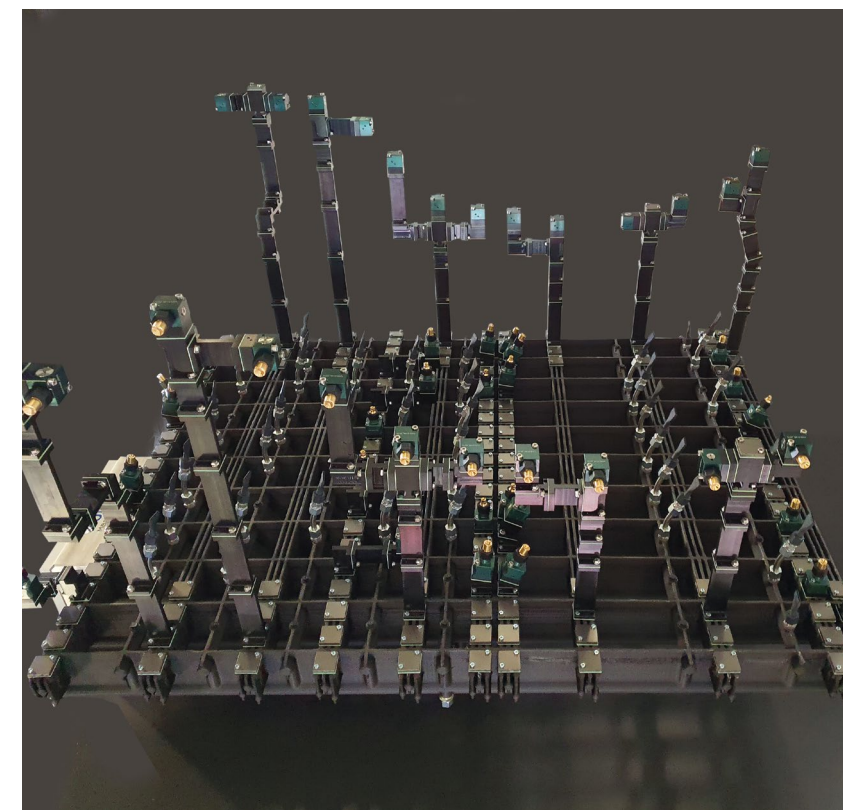
Additive manufacturing technology advances rapidly. 3D-printing becomes a well-established manufacturing process in a growing number of industries. Directly processing thermoplastic pellets using screw extrusion for a layer-by-layer deposition in additive manufacturing makes high production speeds and large parts possible. AKRO's ICF compounds combine high strength and low density with high production speeds for additive manufacturing.

✓ **AKROMID® B3 ICF 30 AM black (7451)** and **AKROMID® B3 ICF 40 AM black (8236)**: large production aids like jigs, fixtures or entire handling systems with weights easily exceeding 100 kg can be printed due to high dimensional stability and mechanical properties. Structural parts with high demand for stiffness and strength are feasible with these compounds.

✓ **AKROLEN® PP ICF 30 AM black (8344)**: combining easy processing with good mechanical properties and chemical resistance, the compound is used in additive manufacturing of individualised spray heads for die-casting machines with significant weight and size advantages over standard solutions as demonstrated by Maschinenbau Böhmer GmbH and Yizumi Germany GmbH. As shown by Fraunhofer IWU and MOSOLF Special Vehicles GmbH it can even replace metal parts and achieve significant weight savings (-26,5 kg) with tailored solutions for vehicle equipment.

✓ **AKROLEN® NEXT PP ICF 20 AM schwarz (8759)**: combining biomass-balanced polypropylene with recycled carbon fibre (PIR) carbon footprints as low as 0 kg kgCO₂eq/kg can be achieved. This opens up the prospect of carbon-neutral additive manufacturing of high-quality parts.

✓ **AKROMID® NEXT U28 ICF 40 1 black (8238)**: biobased PA 11 reinforced with 40 % recycled carbon fibre (PIR). This unique combination of biobased feedstocks and recycled reinforcing fibres is fit for large parts with the highest requirements in strength, stiffness and ductility at minimised density for lightweight designs and the use in automotive applications.



Competence Center

We can offer machines, equipment and experienced engineers to develop your business of tomorrow, so your production can focus on your business of today.

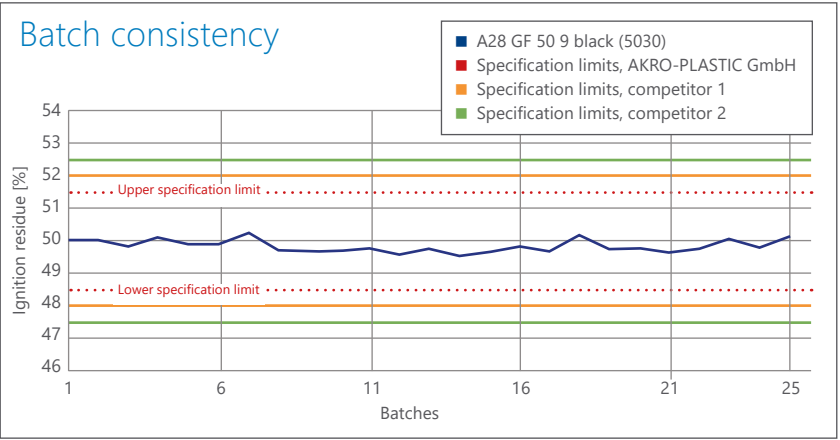
- **Twin shot:** injection moulding machines with 80–300 tons clamping force and including a twin-shot machine
- **Foam injection moulding:** injection moulding machine, singular with precision opening for the investigation of foam injection moulding processes using core pull back technology
- **Water-assisted injection technology:** PME WIT PowerModul
- **Plastic metal hybrids:** Plasma SealTight® PTU1212 stand-alone unit including a KUKA robot enhancing plastic and metal adhesion in over-moulded parts
- **Laser marking:** fibre laser-marking systems REA JET FL 20 for the development of laser-markable compounds
- **3D printing:** industrial 3D printing unit Yizumi Germany SpaceA-1100-500-S using screw extrusion with standard size pellets for a layer-by-layer deposition



ICX[®] Technology

Increasing pressure on order lead times, consistent product quality, growing product variety and global availability at competitive prices shape the business environment for compounds. The key to meeting these challenges is to ensure that the production is as flexible as possible. For this reason, we have developed the standardised machine concept **ICX[®] Technology** (Innovative Compounding and Extrusion Technology) in partnership with our sister company FEDDEM GmbH & Co. KG.

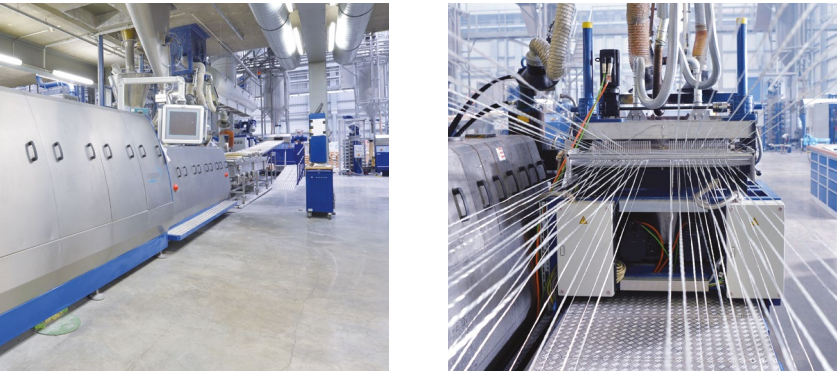
ICX[®] Technology is used at all our production sites worldwide and, using raw materials of the same quality along with our certified quality management and in-house test laboratory, ensures the unparalleled quality of our products. This concept leads to significant time and cost savings in material validation.



ICX[®] Technology

Innovative Compounding and Extrusion Technology

$$\text{Customer value (CV)} = \frac{\text{Quality (Q)} \cdot \text{Flexibility (F)}}{\text{Price (P)} \cdot \text{Time (T)}} \hat{=} \text{Investments}$$



Disclaimer: All specifications and information given in this brochure are based on our current knowledge, experience and internal laboratory testing. A legally binding promise of certain characteristics or suitability for a concrete individual case cannot be derived from this information. The information supplied here is not intended to release processors and users from the responsibility of carrying out their own tests and inspections in each concrete individual case. AKRO[®], AKROMID[®], AKROLEN[®], AKROLOY[®], AKROTEK[®], ICX[®], PRECITE[®] and DIA(hn)LOG[®] are registered trademarks of AKRO-PLASTIC GmbH.

AKRO-PLASTIC GmbH

Member of the Feddersen Group

Im Stiefelfeld 1 · 56651 Niederzissen · Germany

Phone: +49(0)2636-9742-0

info@akro-plastic.com · akro-plastic.com