

Plastic Solutions 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 30 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 every year and are constantly developing innovative new solutions for our customers.

We specialise in upgrading standards 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 as 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 extremely good mechanical properties. Our unique compounding technology enables us to produce polymer solutions with best-in-class reproducibility, enabling 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.



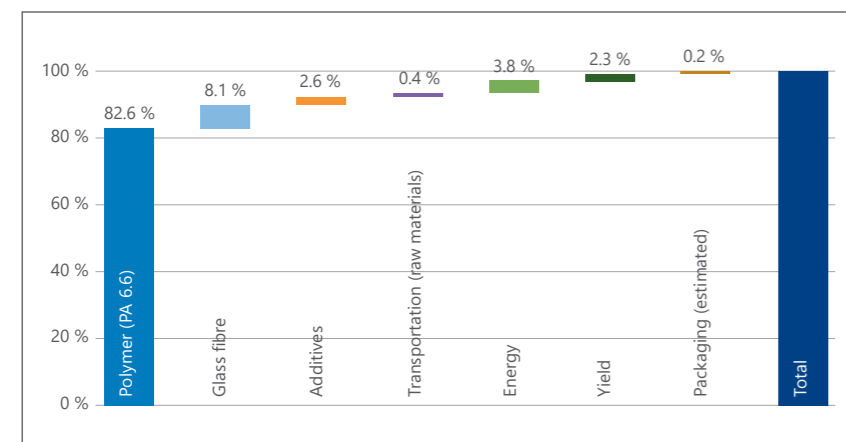
Sustainable in many ways

As a future-oriented company and member of a successful, globally active group of companies, led by K.D. Feddersen Holding GmbH underneath the 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) 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

Additional information <https://akro-plastic.com/sustainability/>

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 filler is key when looking for more sustainable solutions.

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.

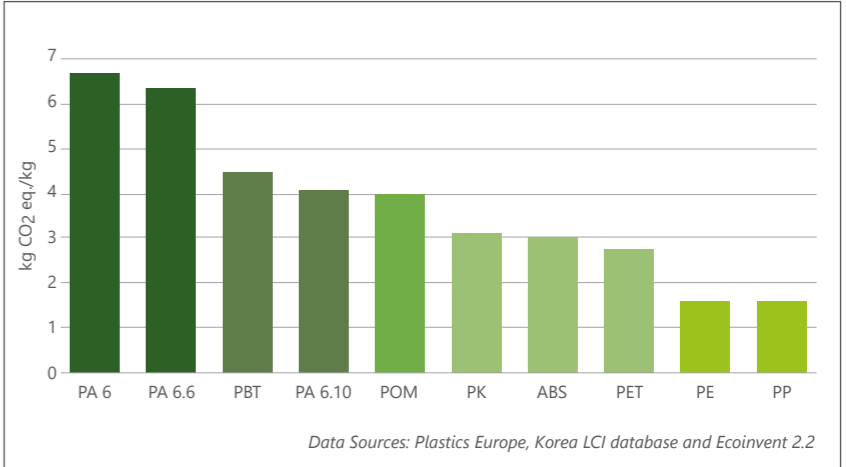




Sustainable products: biobased, recycling and more

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. 🌿

Use of polymers with lower carbon footprint



- Polymers based on sustainable feedstocks or biomass-balanced contents, e.g.**
- 🌿 **AKROMID® NEXT 5.6 3 GF 30 black (8466)**: biobased PA 5.6, HMD-free, high stiffness, biobased carbon content 39 %
 - 🌿 **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 GF 40 black (8480)**: biomass-balanced PP

- 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 %

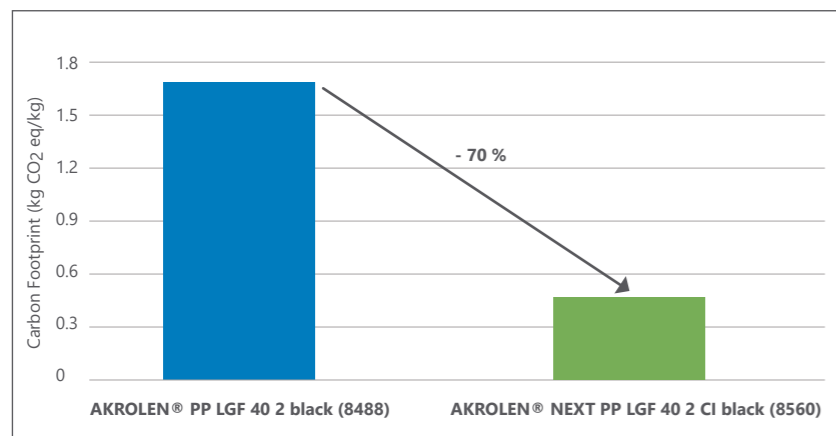
- Recycled reinforcements**
- AKROMID®, AKROLOY®, PRECITE® ICF compounds
 - Post-industrial recycled carbon fibres
 - Reduction in wall thickness due to higher stiffness
 - Density advantage against glass fibre

Long glass fibre reinforced compounds

New long glass fibre reinforced compounds based on biomass-balanced PP

AKROLEN® NEXT PP LGF 40 2 CI black (8560)

- Sustainable future generation compound with low carbon footprint (0.5 kg CO₂ eq/kg)
- Biomass-balanced and certified according to ISCC PLUS
- Biocircular feedstock: vegetable oil waste
- High crash energy absorption, good dimensional stability, low creep, high stiffness
- Stabilised against exposure to UV radiation
- Perfect fibre impregnation by producing with a FEDDEM FLF PT pultrusion line featuring ICX® Technology





Flame retardant

The reduction of emissions created by humans is one of the biggest challenges in the modern world. Since the mobility sector is an emitter of carbon dioxide, there must be a change of how we travel in the future. Besides e-mobility, using public transportation such as buses or rolling stocks provides an alternative to decrease emissions. To support this change, AKRO-PLASTIC GmbH developed a portfolio to match the strict requirements in terms of flame retardancy and surface quality.

- **AKROMID® B28 GF 15 natural (6940), B28 GF 25 natural (6430) and B28 GF 30 natural (6941)** are certified according to the bus standard ECE R118 Annex 6, 7 and 8.
- **AKROMID® B3 K1 FR natural (8045)** was developed for rolling stock applications which require highest quality in surface aspects. Certified according to EN 45545-2 R21/22/23/24.
- Bigger parts (i.e. seats) must meet stricter requirements. **AKROMID® C28 GF 25 FRT natural (7332)** is certified according to EN 45545-2 R1/R6/R7 featuring an excellent surface.

The portfolio of AKRO-PLASTIC GmbH for classic E&E and e-mobility covers different polymers, reinforcement levels and flame retardant systems which are tailored to the applications' requirements.

- **AKROMID® B3 1 FR black (6580) and AKROMID® C3 1 FR black (5266)** are unreinforced, UL-94 V-0 rated polyamides for thin parts with a good ratio of costs and flame retardancy.
- **AKROMID® C3 GF 25 1 FR black (7246) and AKROMID® B3 GF 30 FR black (7459)**, both UL94 V-0 listed from thickness 0.4 mm and thicker, are specially optimised for technical parts.
- For automotive applications AKRO-PLASTIC GmbH offers optimised grades which reach UL-94 V-0 at a thickness of 1.6 mm and above. As an example, **AKROMID® B28 GF 35 9 FR black (8189)** shows better flowability, higher mechanical properties and cost advantages when compared to traditional E&E grades.
- If no compromise in stiffness is possible, **AKROLOY® PARA GF 35 FR black (7496)** is the first choice. The aromatic character of the polymer leads to a reduced moisture uptake and therefore to almost no change of properties after conditioning.
- ✓ 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.

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.



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 9 L black (7227)** material with improved aesthetics and lower carbon emission for automotive interior.

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.
- ✓ **AKROMID® NEXT G3 ICF 15 7 L CI black (8379)** is combining low density polymer matrix with low density reinforcement. This PA 6.9/PP blend with 15 % recycled carbon fibre is also made from a biomass-balanced PP.

Foaming for further reduction of density and part weight:

- **AKROMID® A28 GF 30 9 EN MCL black (5966)** is developed for the MuCell® process. MuCell® parts typically have a high bending strength and outstanding surface quality.
- Using a standard injection-moulding grade **AKROMID® B3 GF 30 6 (20009)** together with polyamide-based chemical foaming agent **AF-Complex® PA 990735 TM natural** significant weight reductions can be achieved while maintaining a good surface quality.
- Foaming with core back or breathing mould process yields to a density reduction up to 40 % in a wide range of part thickness from 2 mm up to 10 mm.





High temperature polyamide

AKROMID® T5 and **T9** are partially aromatic high temperature polyamides (PPA) in the AKRO-PLASTIC GmbH portfolio. As opposed to PA 6 or PA 6.6, **AKROMID® T** compounds keep their high strength and modulus even at higher temperatures or in conditioned state.

- **AKROMID® T5** 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® T5 GF 50 black (6247)**: high-performance grade with elevated strength
- **AKROMID® T5 GF 40 4 black (7585)**: grade with superior hydrolysis resistance

AKROMID® T9 is based on a PA 9T polymer. The lower melting point of 300 °C and quicker crystallisation widens the processing window and reduces thermal degradation versus other PPAs. **AKROMID® T9** absorbs significantly less moisture which leads to a higher consistency of the glass transition temperature resulting in equal mechanical performance in dry or conditioned state.

- **AKROMID® T9 GF 50 black (7693)**: high strength and good surface quality
- **AKROMID® T9 GF 35 4 black (7858)**: hydrolysis resistance
- **AKROMID® T9 GF 40 LT black (7827)**: laser-transparent
- **AKROMID® T9 GF 15 FR LA black (8197)**: flame-retardant, free of halogene and red phosphorus, laser-markable



Polyester compounds

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

Benefits of polyesters:

- Low moisture absorption
- High dimensional stability
- Outstanding heat aging performance
- Excellent sliding properties and wear resistance

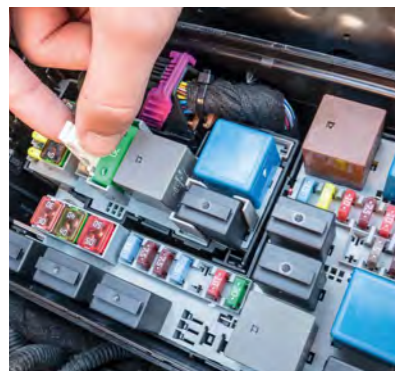
PRECITE® portfolio – PBT

- **PRECITE® P3 GF 30 4 LA black (8286)**: PBT hydrolysis-resistant and GMA free
- **PRECITE® P3 GF 50 black (6925)**: PBT superior combination of strength and elongation at break
- **PRECITE® NEXT P3 GF 30 CR black (8373)**: With biomass-balanced PBT
- **PRECITE® P3 GF 30 9 FR black (8424)**: PBT flame retardant, free of halogens and red phosphorus, V0 @ 1.6 mm, high strength and high elongation

PRECITE® portfolio – PET

Generally PET (2.2 kg CO₂ eq/kg) has a lower carbon footprint than PBT (4.5). The new PRECITE® ECO grades contain up to 30 % post-consumer PET. These new grades are even more sustainable than virgin PET. Combined with the higher mechanical performance compared to other engineering plastics, PET offers an excellent technical solution for demanding applications.

- **PRECITE® E GF 50 black (7395)**: PET has similar mechanics like PPA at higher temperatures, high-performance application
- **PRECITE® E ICF 30 black (7429)**: Regenerated carbon fibre reinforcement, light weight, density 1.45g/cm³, very high tensile modulus
- **PRECITE® K GF 30 ECO black (8269)** is a 30 % glass fibre reinforced PBT/PET blend with high strength. PET produced from post-consumer raw material contributes to the reduction of CO₂ emissions
- **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 30 % post-consumer raw material to reduce the carbon footprint.





Additive manufacturing

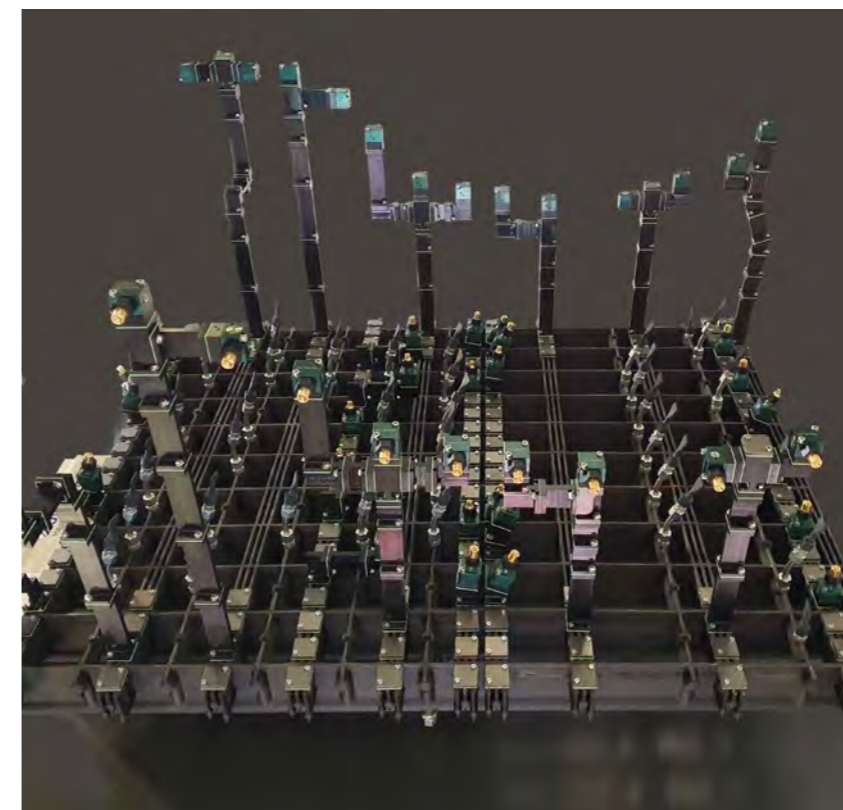
Additive manufacturing technology is advancing rapidly. 3D-printing is becoming a well-established manufacturing process in a growing number of industries. Directly processing thermoplastic pellets using screw extrusion for a layer-by-layer deposition in additive manufacturing makes high production speeds 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)**: Is used in series production of a 3D-printed carrier of a hygiene shield manufactured by Faurecia and Yizumi Germany for ride pooling company MOIA.

✓ **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.

✓ **AKROLEN® PP ICF 30 AM black (8344)**: Combining processing characteristics, mechanics 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.

✓ **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.



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.

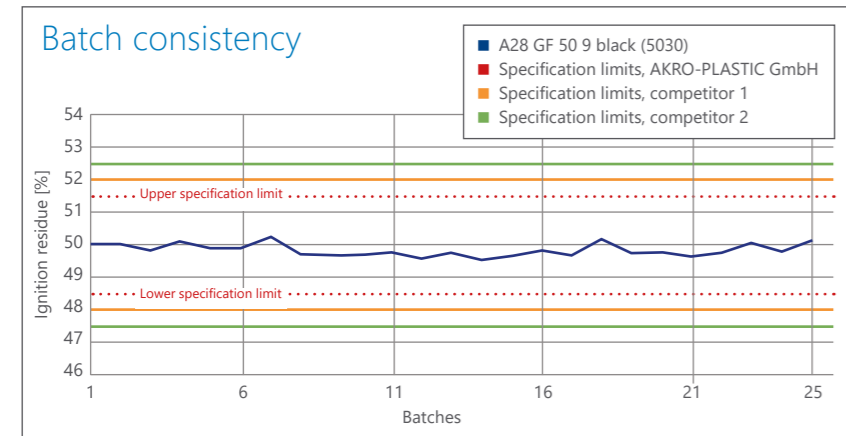
- **Twin shot:** Injection moulding machines with 80–300 tons clamping force and including a twin-shot machine
- **Foam injection moulding:** Injection moulding machine, singular with precision opening for the investigation of foam injection moulding processes using core pull back technology
- **Water-assisted 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(hr)LOG[®] are registered trademarks of AKRO-PLASTIC GmbH.

AKRO-PLASTIC GmbH

Member of the Feddersen Group

Industriegebiet Brohltal Ost
Im Stiefelfeld 1 · 56651 Niederzissen · Germany
Phone: +49(0)2636-9742-0
info@akro-plastic.com · akro-plastic.com