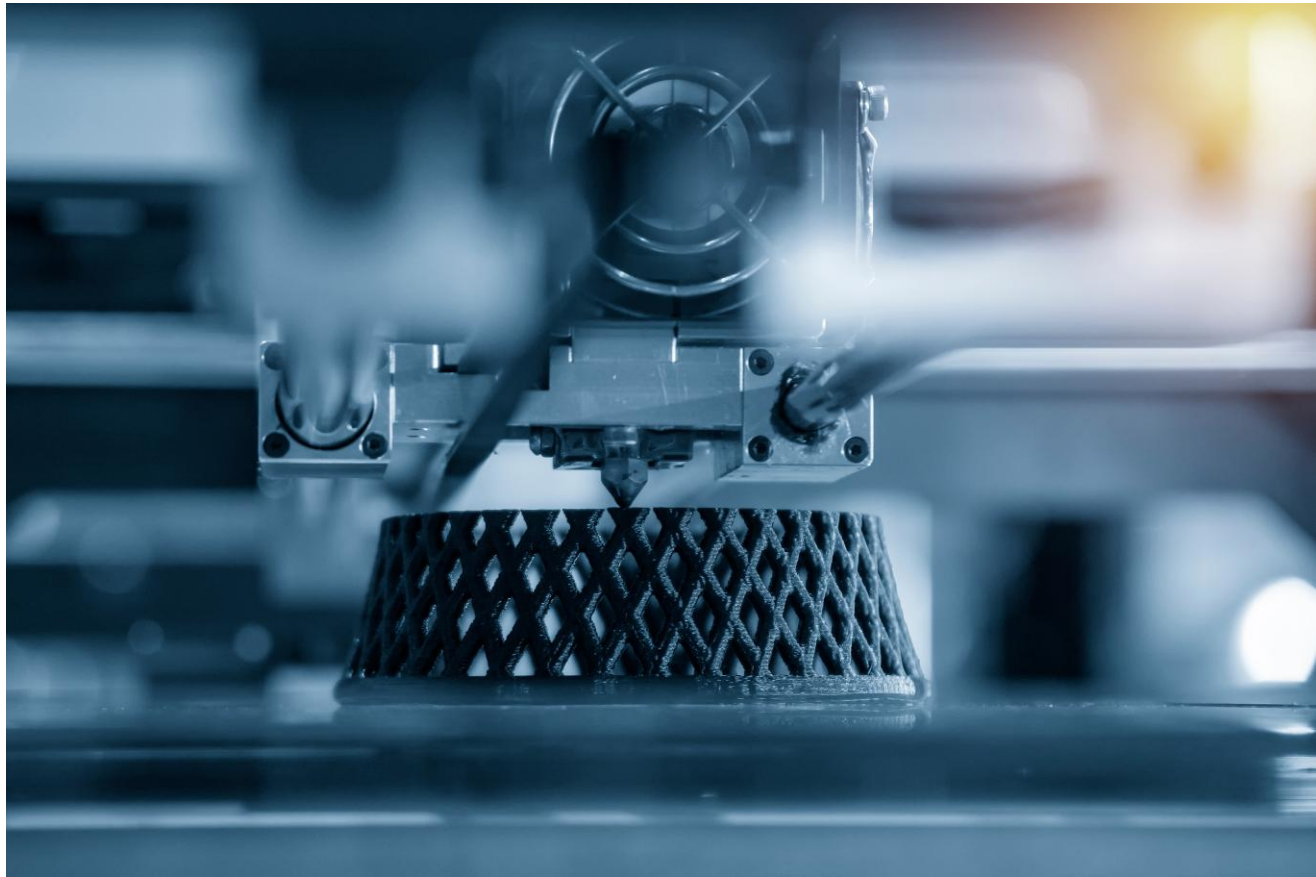
PLASTICS ENGINEERED BY GEHR®

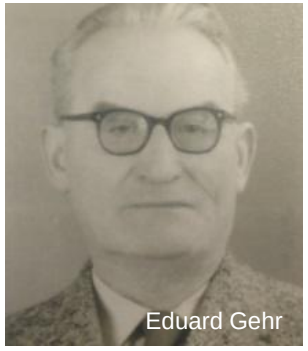
FIL-A-GEHR®

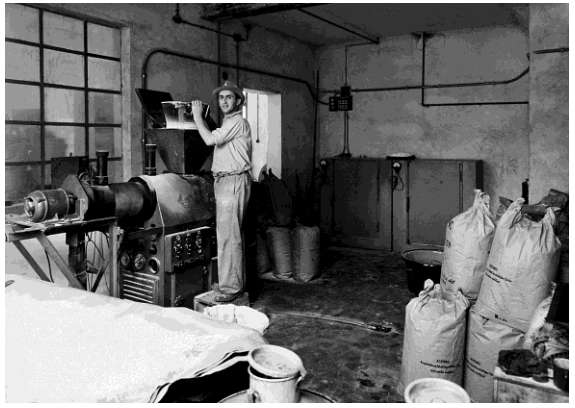
FOR ADDITIVE MANUFACTURING

CONTENT



FAMILY OWNED AND OPERATED COMPANY WITH TRADITION SINCE 1932

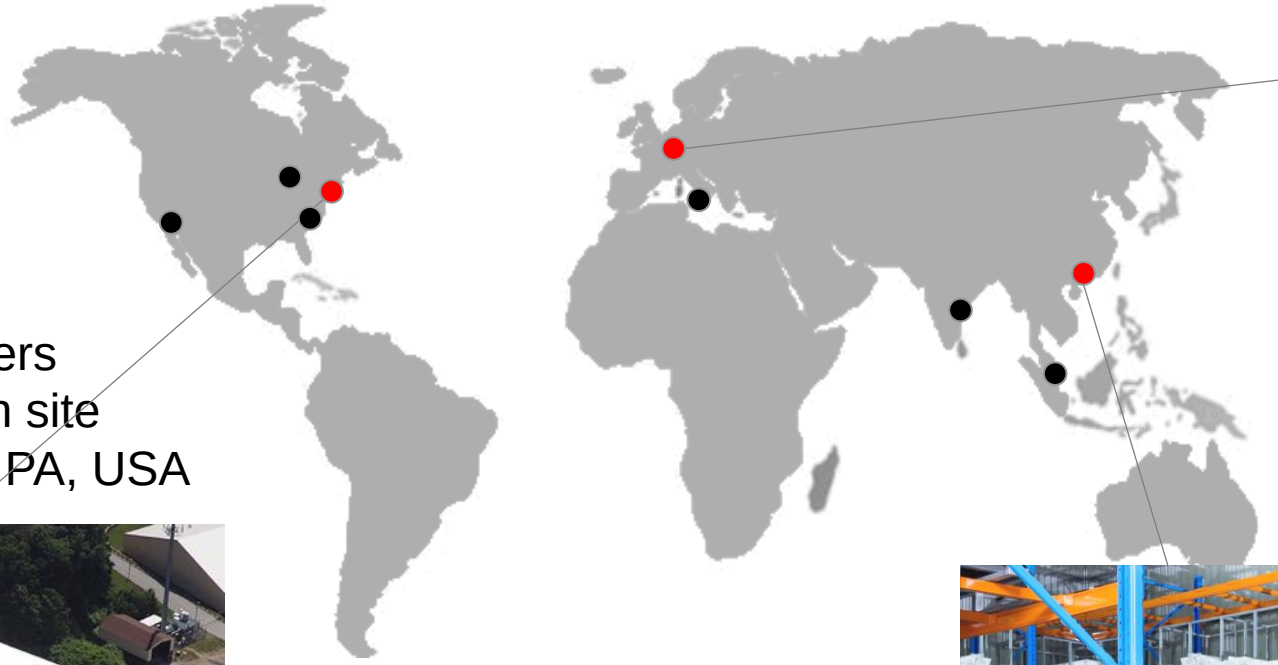

Eduard Gehr




Werner Gehr


Annette and Helmut Gehr

GEHR – AN INTERNATIONAL COMPANY



- World headquarters and production site **Mannheim**, Germany

- US headquarters and production site **Philadelphia**, PA, USA

- Asia headquarters and warehouse **Hong Kong**

QUALITY AND INNOVATION

TÜV SÜD ISO 14001

TÜV SÜD ISO 45001

TÜV SÜD ISO 9001

TÜV SÜD EN ISO 13485

TÜV SÜD ISO 50001

ISCC International Sustainability & Carbon Certification


FOCUS TOP ARBEITGEBER MITTELSTAND 2024
FOCUS-BUSINESS.DE IN KOOPERATION MIT FACTFIELD

URKUNDE

GEHR GMBH

wurde von FOCUS-Business in Kooperation mit dem Recherchepartner FactField als Top-Arbeitgeber Mittelstand identifiziert.

Folgende Kriterien* lagen der Empfehlung u. a. zugrunde:

- Mindestens 10 Bewertungen von Arbeitnehmern über alle Datenquellen hinweg
- Bewertungsdurchschnitt von mindestens 3,5 von 5 möglichen Punkten
- Mitarbeiteranzahl zwischen 11 und 500
- Unternehmensstandort in Deutschland

Andrea Key
Geschäftsführung

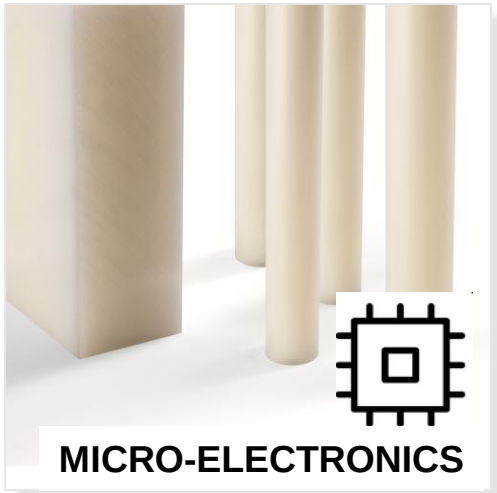
FOCUS BUSINESS

*FOCUS-Business vergibt ein Siegel an Unternehmen der größten Empfehlungsgruppe für Top-Arbeitgeber Mittelstand. Die Auswahl erfolgt anhand von Recherchen durch den Recherchepartner FactField GmbH. Die Empfehlungsliste erhebt keinen Anspruch auf Vollständigkeit. Die Ergebnisse sind nicht repräsentativ. Der kaufliche Erwerb eines Listenplatzes ist ausgeschlossen. Eine werbliche Nutzung der FOCUS-Business-Urkunde ist nicht gestattet.

OUR COMPETENCES

STOCK SHAPES


INDUSTRIAL


MICRO-ELECTRONICS

MEDICAL

ADDITIVE MANUFACTURING

CUSTOMER SOLUTIONS

CONSUMER GOODS

SUSTAINABLE MATERIALS

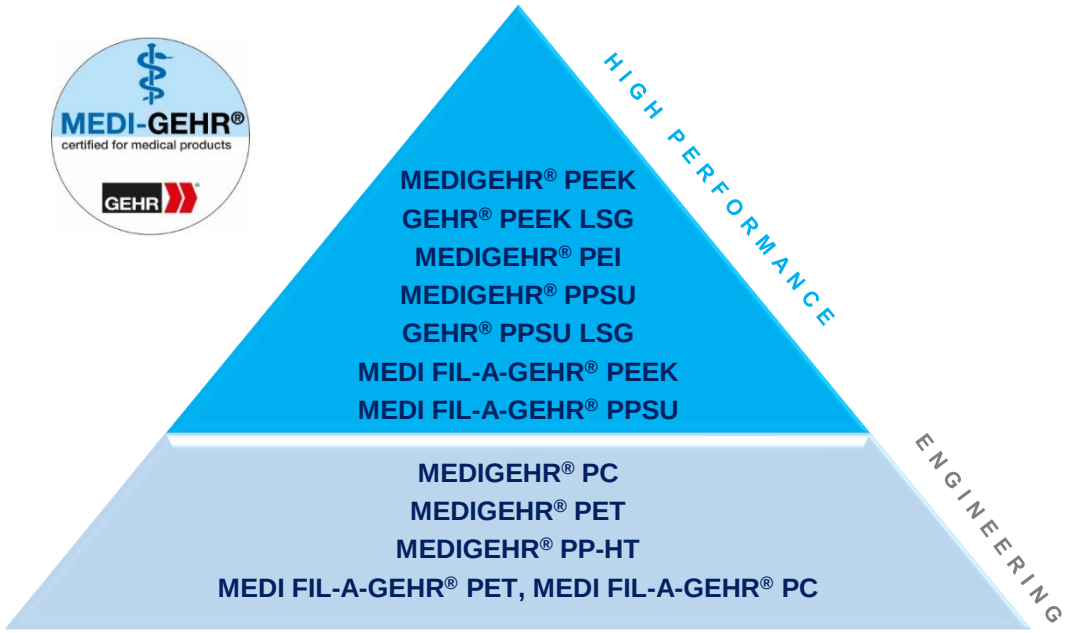

MULTI-LAYER TUBES

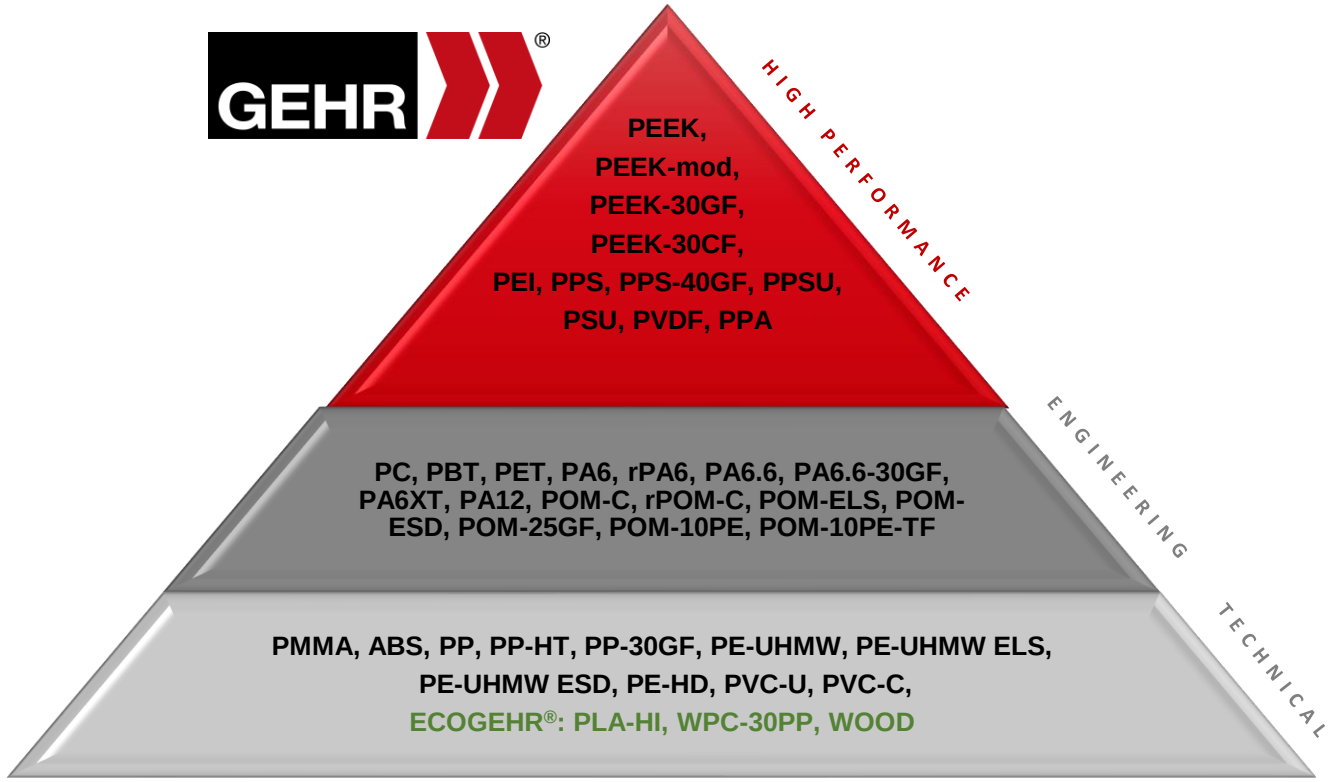

MADE TO ORDER

GEHR EXPERTISE

EXTRUDED RODS, SHEETS, TUBES, PROFILES AND FILAMENTS

- Rods up to 700 mm diameter
- Thick plates up to 300 mm thickness
- Calendered sheets from 1 mm
- Decorative precision tubes
- Semi-finished products for medical applications
- Filaments for professional 3D printing





ENVIRONMENTAL PROTECTION AND SUSTAINABILITY

CO_2-NEUTRAL PRODUCTION

- Conversion to green electricity and green gas in Mannheim and Philadelphia.
- Achievement of the implementation packages of Katowice Scope1 and Katowice Scope1 and 2

SINCE 2016: 100% RENEWABLE ELECTRICITY

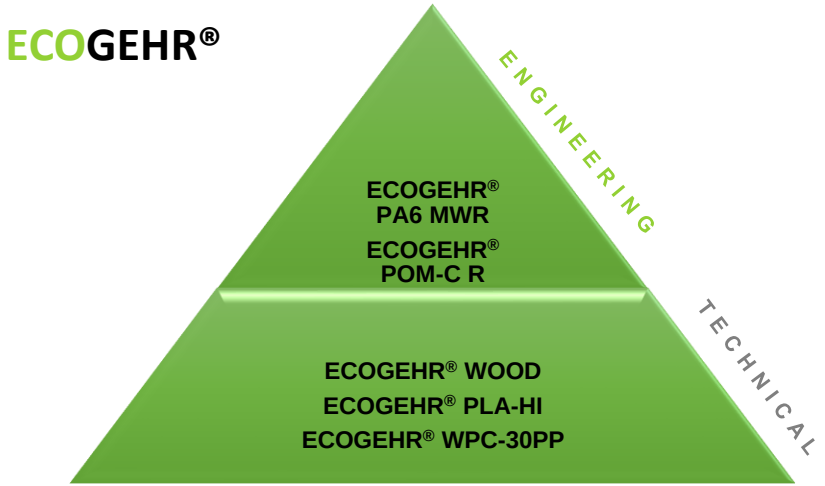
Since 2016, total electricity requirements covered by renewable energies - mainly from hydropower in Norway.

COOLING PROCESS OPTIMIZED

In order to sustainably conserve water as a resource, we have also made mechanical adjustments to our plants. This has enabled us to significantly reduce the amount of water required in the cooling system as well as the supply of fresh water.

RECYCLING CONCEPT FOR THE AVOIDANCE OF PRODUCTION WASTE

The returned material is sorted, ground, recycled and reused in production wherever possible and permitted.



SUSTAINABILITY REPORT 2024

CERTIFICATIONS
» ISO 9001, ISO 13485, ISO 14001, ISO 50001, ISO 45001
» ISCC Plus
» ECOVADIS Rating 2023: Silver

CORPORATE PHILOSOPHY
» Long-term independence
» Extensive sustainable portfolio
» Quality leadership
» Innovation
» Corporate social responsibility in terms of sustainable management, CSR responsibility

REDUCTION OF ENERGY CONSUMPTION
Since 2013 10% reduction of eneregy per kg extruded material thru:
» new efficient extruders
» optimized annealing processes
» new compressed air systems
» energetic refurbishment of buildings
» new photovoltaic system to be installed in 2023 that will cover approx. 15% of demand

SOCIAL RESPONSIBILITY
» Below industry average for „1000-man quota“ (accident rate per 1000 full-time workers)
» Cooperation with the University of Mannheim
» Flexible working hours / mobile working stations
» Sponsoring local sport events / teams

RECYCLING
» Recycling rate increased to 7,8%
» Reduced scrap rate by 2%
» Strategic partnership with plastic recovery company

LIFECYCLE ASSESMENT
» Status Quo carbon footprint analysis based on GHG protocol
» Currently emissions are 2145t CO_2 eq.

GREENHOUSE GAS EMISSIONS
» Scope 1: 7% Scope 2: 1% Scope 3: 92%
» **Reduction of 30% in 2024** (compared to 2023)

ACCOMPLISHED ACTIONS
» ECOGEHR® & ECO FIL-A-GEHR®
» Since 2016: green electricity
» Since 2020: green gas
» ECOVADIS Rating 2022/2023/2024: Silver
» ISCC+ biocircular PP for writing instruments
» Member of Mannheim climate protection alliance

CORPORATE GOVERNANCE
» Corporate Environment, culture, leadership
» Dealing with business partners, customers, suppliers
» Supply chains
» Anti Trust, compliance, confidentiality
» Whistleblowing

MOBILITY OF THE FUTURE

TUM HYPERLOOP

In collaboration with TU Munich and Evonik, we are ensuring that the Hyperloop project moves into the next phase. Hyperloop - originally developed as the Space X Hyperloop concept by Elon Musk- is a new concept for transporting goods and people at almost the speed of sound. The train travels like a maglev train in a low-pressure tube above the earth's surface.

In this team, we produced sheets made of VESTAMID® (PA12 filled with glass fibers + special additive) for a 24-m-long test track. After extrusion, these sheets are machined before installation to hold the magnetic coils in position for the train.

SOLUTIONS ENGINEERED BY GEHR®

EVONIK Leading Beyond Chemistry

GENERAL INFORMATION ABOUT FIL-A-GEHR®

» Extremely close tolerances

» Filaments made of high-quality raw materials

» Compatible with all standard 3D printers

» Low-emission and odour free

» Shrinkage-free

» Good layer adhesion

» Optimal flow behavior while printing

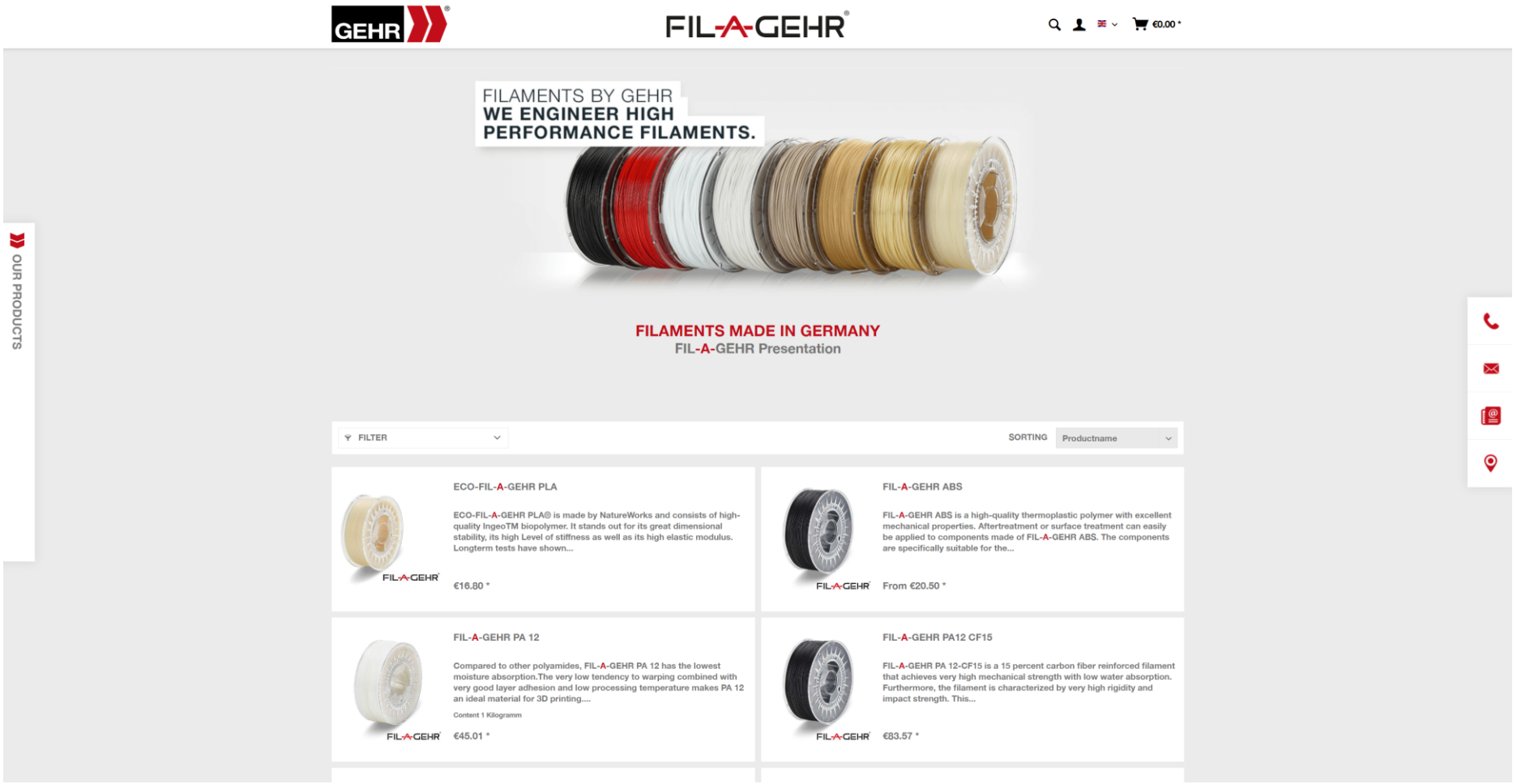
» Carefully spooled and packed in easy to use re-sealable zip bags

PRODUCT RANGE:

» Diameter: 1.75, 1.80 and 2.85 mm

» Spools from 200g up to 10kg (Standard: 1kg)

FIL-A-GEHR® SHOP



[Filament | FIL-A-GEHR SHOP (filagehr.com)]

TECHNICAL DATASHEETS FIL-A-GEHR®

PLASTICS ENGINEERED BY GEHR

FIL-A-GEHR®

Filaments for professional 3D printing

PEEK

GEHR GmbH Casterfeldstraße 172 / D - 68219 Mannheim / T: +49 - 621/87 89 – 164 / 3D@gehr.de / www.filagehr.de

The semi-crystalline polyether ether ketone **FIL-A-GEHR® PEEK** offers outstanding mechanical, thermal and chemical resistance. Thanks to its well-balanced property profile, PEEK is one of the most capable high-performance thermoplastics available.

FEATURES FIL-A-GEHR®

- Highest precision in diameter and roundness
- Filaments made of high-quality raw materials
- Compatible with all open-system 3D printers
- Low-emission and odour free
- Void-free
- Good layer adhesion
- Ideal flow behaviour while printing
- Carefully spooled and packed in easy to use aluminium-laminated resealable zip bags

PRODUCT RANGE

diameter	1 kg spool (~2,2 lbs)
1.75 mm 0.07''	●

Colours: ● natural

DISTINCTIVE FEATURES FIL-A-GEHR® PEEK

- Excellent combination of strength, stiffness and toughness
- Low moisture absorption
- Exceptional chemical resistance
- Maximum continuous operating temperature 260 °C
- Excellent sterilisation and hydrolysis resistance
- Self-extinguishing, low smoke emission
- Pressure nozzle temperature 375°C, printing plate temperature 180°C
- Printing room temperatur 180°C

TYPICAL APPLICATIONS

- Aviation
- Transport
- Oil and gas (supporting rings and supply lines)

GEHR, Specialist In Plastics – Premium Quality Since 1932

We extrude thermoplastic semi-finished materials and rank amongst the global leading producers of technical semi-finished products. FIL-A-GEHR® expands our product range with plastic filaments for 3D printers. GEHR produces the filaments in Mannheim and has been representing innovation and premium quality since 1932.

GEHR GmbH Casterfeldstraße 172 / D - 68219 Mannheim / T: +49 - 621/87 89 – 164 / 3D@gehr.de / www.filagehr.de

TECHNICAL DATA FIL-A-GEHR® PEEK

Properties	Parameters	Units	Values
General Properties			
Specific gravity (ρ)	ISO 1183	g/cm³	1.32
Water absorption	ISO 62	%	0.
Moisture	ISO 62	%	0.07
Maximum permissible service temperature	UL746B	°C	260
Lower permissible service temperature	UL746B	°C	-40
Mechanical Properties			
Tensile strength at yield (σ_S)	ISO 527	MPa	115
Elongation at yield (ε_S)	ISO 527	%	7
Tensile strength at break (σ_R)	ISO 527	MPa	67
Elongation at break (ε_R)	ISO 527	%	16
Impact strength (a_n)	ISO 179	kJ/m²	no break
Notch impact strength (a_k)	ISO 179	kJ/m²	4
Ball indentation (H_k) / Rockwell hardness	ISO 2039-1	N/mm²	250 / M 99
Shore-D	ISO 868		90
Flexural strength ($\sigma_{B\,3.5\,\%}$)	ISO 178	MPa	170
Modulus of elasticity (E_t)	ISO 527	MPa	4210
Thermal Properties			
Vicat-softening point (VST/B/50)	ISO 306	°C	250
Heat deflection temperature (HDT/B)	ISO 75	°C	240
Coef. of linear thermal expansion (α)	ISO 11359	$K^{-1}*10^{-4}$	0.47
Thermal conductivity at 20 °C (λ)	ISO 22007-4	W/(m*K)	0.25
Glass transition temperature (T_G)	ISO 3146	°C	143
Melting temperature (T_m)	ISO 3146	°C	340
Printing Properties			
Pressure nozzle temperature		°C	370-410
Printing plate temperature		°C	130-140
Build chamber temperature		°C	>80
Nozzle diameter	(hardend steel)	mm	0.40
Print speed		mm/s	50
Fan speed	(activated on layer 4)	%	50
Predrying temperature		°C	120
Predrying time		h	8

All properties are measured under laboratory conditions using the analytical method shown. The limits in these specifications apply only to data obtained using the specified test methods. Different analysis methods or analysis conditions can lead to different values.

GEHR GmbH Casterfeldstraße 172 / D - 68219 Mannheim / T: +49 - 621/87 89 – 164 / 3D@gehr.de / www.filagehr.de

FIL-A-GEHR® MATERIALS

- » ECO FIL-A-GEHR® PA6 MWR ●
- » ECO FIL-A-GEHR® Wood ●
- » FIL-A-GEHR® PPSU ● ●
- » ULTEM™ AM1010F FILAMENT (PEI) ●
- » ULTEM™ 9085 FILAMENT (PEI) ● ●
- » FIL-A-GEHR® PEEK ●
- » MEDI FIL-A-GEHR® PEEK MG ●
- » MEDI FIL-A-GEHR® PPSU MG ●
- » MEDI FIL-A-GEHR® PC MG ⊕
- » MEDI FIL-A-GEHR® PET MG ⊕ ○

Support filaments:

- » LNP™ ELCRES™ AMS9085 Support for ULTEM™ FILAMENT ○

ULTEM is a registred trademark of Saudi Basic Industries Corporation (SABIC)

FIL-A-GEHR® FOOD CONTACT SUITABLE

Material	EU 10/2011 EU1245/2020	FDA
FIL-A-GEHR® PEEK	✓	✓
FIL-A-GEHR® PPSU	✓	✓
ULTEM™ AM1010F FILAMENT (PEI)	✓	✓
ULTEM™ 9085 FILAMENT (PEI)	✓	✓
ECO FIL-A-GEHR® Wood	✓	✓
ECO FIL-A-GEHR® PA6 MWR	–	–
MEDI FIL-A-GEHR® PEEK MG	✓	✓
MEDI FIL-A-GEHR® PPSU MG	✓	✓
MEDI FIL-A-GEHR® PC MG	✓	✓
MEDI FIL-A-GEHR® PET MG	✓	✓

All certifications exist for the raw material. Certifications for filaments are available upon request.
ULTEM is a registred trademark of Saudi Basic Industries Corporation (SABIC)

» ECO FIL-A-GEHR® Wood

» **ECO FIL-A-GEHR® Wood** consists of recycled wood fibers mixed with a recycled biopolymer. The raw material is made by Sulapac®.The printed material is haptic, visual and odor like wood. Nevertheless, it can be used to print extremely robust / stable parts.

» Filaments made of high-quality and renewable raw materials
» Haptic, visual and odor like wood
» Food contact approval on the raw material
» High dimensional stability
» High modulus of elasticity
» Pressure nozzle temperature 210°C, printing plate temperature 60°C

APPLICATION:

» Cosmetic jar
» Decorative components
» Sustainable Displays

PRODUCT RANGE:

» Colour: Natural
» Diameter: 1,75 mm and 2,85 mm
» Size: 1 kg

ECO FIL-A-GEHR® PA6 MWR

» **ECO FIL-A-GEHR® PA6 MWR** is made from marine waste recyclates (MWR). This is mainly obtained from fishing nets.

» Good mechanical properties
» Shrinkage values of approx. 0.3%
» Very good tribological properties
» High resistance to impacts, scratches and cracks
» Resistance to many chemicals
» Pressure nozzle temperature 260-280°C
» printing plate temperature 80°C
» Dry box highly recommended

APPLICATION:

» Automotive industry
» Gear wheels
» Sliding rails

PRODUCT RANGE:

» Colour: Natural
» Diameter: 1,75 mm and 2,85 mm
» Size: 1 kg

FIL-A-GEHR® PPSU

FIL-A-GEHR® PPSU is an amorphous material, with improved impact and hydrolysis resistance compared to PSU and PEI. The extremely high notch impact strength remains also after a heat aging.

» High strength and rigidity
» Very high toughness (also at low temperatures)
» Very good dimensional stability
» Very high chemical resistance
» High operating temperature (approx. +170 °C)
» Very good sterilizability
» Pressure nozzle temperature 390-410°C, printing plate temperature 220°C
» Printing room temperatur 170-210°C

APPLICATIONS:

» Instruments for microinvasive surgery
» Pump impellers, pump parts
» Sterilization cassettes
» Valves

PRODUCT RANGE:

» Colours: Black, natural
» Diameter: 1,75 mm
» 1 kg Spools

ULTEM™ AM1010F FILAMENT (PEI)

ULTEM™ AM1010F FILAMENT (PEI) is a polyetherimide product for 3D printing applications manufactured from ULTEM™ 1010 resin.

» Excellent combination of high heat resistance and dimensional stability
» High mechanical strength
» Continuous service temperature 170 °C
» High heat resistance
» Inherently flame retardant (UL94-V0)
» Print nozzle temperature 370-390°C
» Pressure plate temperature 150°C
» Pressure chamber temperature 90°C

PRODUCT RANGE:

» Colour: Natural
» Diameter: 1,75 mm, 1,80mm
» 1 kg (1,75mm) or 92ci (1,80mm) spools

APPROVALS OF THE RAW MATERIAL:

» Aerospace FAR25.853

ISCC International Sustainability & Carbon Certification

ULTEM™ 9085 FILAMENT (PEI)

ULTEM™ 9085 FILAMENT (PEI) is a high-performance filament based on the well-known raw material ULTEM™ 9085.

» Excellent combination of high heat resistance and mechanical strength.
» High dimensional stability
» Continuous service temperature 170 °C
» Resistant to high-energy radiation
» Inherently flame retardant (UL94-V0)
» Print nozzle temperature 360°C
» Pressure plate temperature 160°C
» Pressure chamber temperature 90°C

APPLICATIONS:

» Rail
» Aerospace
» Automotive

PRODUCT RANGE:

» Colour: Natural and black
» Diameter: 1,75 mm, 1,80mm
» 1kg and 2kg (1,75mm) or 92ci (1,80mm) spools

APPROVALS OF THE RAW MATERIAL:

» Aerospace FAR25.853 and OSU55/55
» Rail EN45545 R6-HL3

ISCC International Sustainability & Carbon Certification

LNP™ ELCRES™ AMS9085 Support for ULTEM™ FILAMENT

LNP™ ELCRES™ AMS9085 Support is SABIC's breakaway support filament for use with ULTEM™ 9085 filament. The material maintains rigidity during printing and provides exceptional pliability during post processing to help enable easier removal of structural supports at room temperature, which can reduce the time required to produce finished parts. AMS31F and ULTEM™ 9085 PEI filaments are compatible with Stratasys® Fortus® Classic printers and open format industrial printers, subject to user testing.

» Print nozzle temperature 380-420°C
» Pressure plate temperature 160-185°C
» Pressure chamber temperature 90-110°C

PRODUCT RANGE:
» Colour: Natural
» Diameter: 1,75 mm, 1,80mm
» 1 kg (1,75mm) or 92ci (1,80mm) spools

FIL-A-GEHR® PEEK

The semi-crystalline polyether ether ketone **FIL-A-GEHR® PEEK** offers outstanding mechanical, thermal and chemical resistance. Thanks to its well-balanced property profile, PEEK is one of the most capable high-performance thermoplastics available.

» Excellent combination of strength, stiffness and toughness
» Low moisture absorption
» Exceptional chemical resistance
» Maximum continuous operating temperature 260 °C
» Excellent sterilisation and hydrolysis resistance
» Self-extinguishing, low smoke emission
» Pressure nozzle temperature 375°C, printing plate temperature 180°C
» Printing room temperatur 180°C

APPLICATIONS:

» Aviation
» Transport
» Oil and gas (supporting rings and supply lines)

PRODUCT RANGE:

» Colour: Natural
» Diameter: 1,75 mm
» 1 kg Spools

MEDI FIL-A-GEHR®

MEDI FIL-A-GEHR® products are suitable for medical and pharmaceutical applications with direct body contact with tissue, bone, skin and mucosa for up to 24 hours. All materials meet the same requirements as the semi-finished products. Especially for our certificates and approvals:

FDA*, EU 10/2011*, ISO 10993-1, -5, -12, -18 and USP Class VI

* only for raw material

MATERIALS:

» MEDI FIL-A-GEHR® PET MG (white and transparent)
» MEDI FIL-A-GEHR® PC MG
» MEDI FIL-A-GEHR® PPSU MG
» MEDI FIL-A-GEHR® PEEK MG

MEDI FIL-A-GEHR® PPSU MG
Arthroscope prototype

MEDI FIL-A-GEHR® PEEK MG
Instrument holder prototype

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