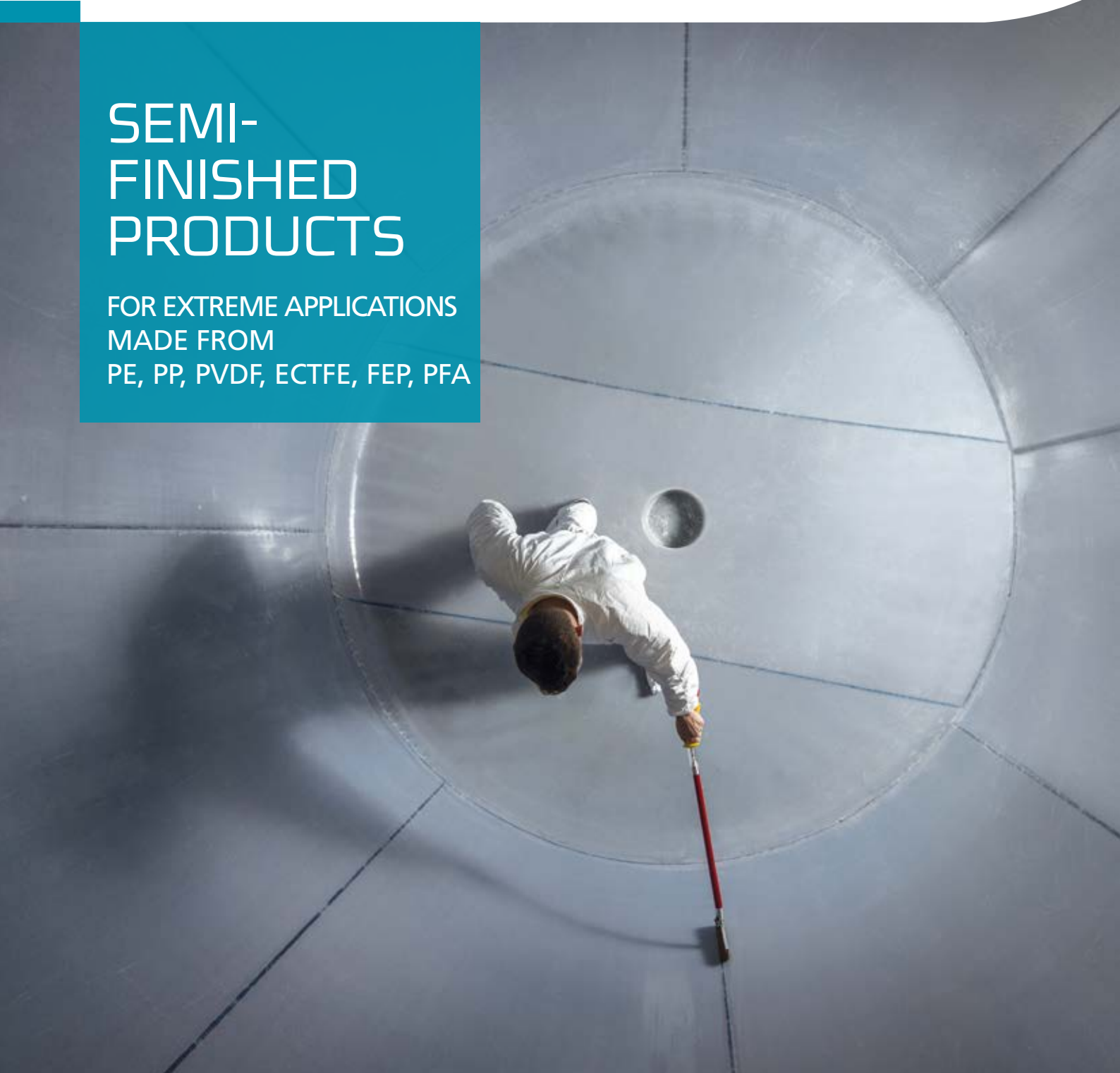




The Plastics Experts.

# SEMI-FINISHED PRODUCTS

FOR EXTREME APPLICATIONS  
MADE FROM  
PE, PP, PVDF, ECTFE, FEP, PFA





## The Plastics Experts.

The AGRU success story already spans seven decades. Founded in 1948 by Alois Gruber Sen., the company is now counted among the most important comprehensive suppliers for piping systems, semi-finished products, protective liners for concrete and geomembranes made of engineering plastics. The fact that we provide everything as a single source supplier distinguishes us from many competitors. We process exclusively high-quality thermoplastic materials. And when it comes to problem-solving expertise for material selection and installation, we are your best partner.

### Universal scope of applications

AGRU semi-finished products made of thermoplastics are an excellent and durable solution for modern, premium apparatus and tank construction, and for manufacturing wear-resistant products. In the chemical and heavy industries, and in plant construction, a variety of requirements exist for semi-finished products in terms of acid and alkali resistance, application temperature and low static charge in areas with a risk of explosion.

Users can work with various processing methods, including diverse proven joining technologies such as extrusion welding, hot gas welding, and butt welding. Customer satisfaction is the first priority for AGRU. Technical consultation, seminars, welding training and expert on-site instruction form the foundation for achieving this.



### Quality

AGRU maintains a quality management system according to the ISO 9001:2008 standard, as well as an environmental management system according to the ISO 14001:2004 standard. Thus the products comply with international standards and are monitored and evaluated by independent testing agencies on a regular basis.

The start-to-finish attention to quality ensures that the products meet the strictest technical specifications and ensure the safe operation of equipment and tanks.

# SEMI-FINISHED PRODUCTS

## Chemical-resistant sheets, pipes, bars and welding rods

The semi-finished products made of thermoplastic materials from AGRU are distinguished by their high acid and alkali resistance, resulting in lower life cycle costs due to extended maintenance intervals and the long service life of the products. Our comprehensive programme of semi-finished products provides solutions for a temperature range from -200 °C to +260 °C. Consistent high quality ensures the reliability and long service life of all our components.

### Highest media resistance

#### **A stable polymer is for each chemical application available**

Optimised price-performance ratio for each application

- thanks to consultation and material recommendations by plastics experts
- due to the operational reliability provided by AGRU solutions
- resulting from longer-than-average service lifetime

### One stop shopping

#### **Comprehensive semi-finished product portfolio and extensive stock-keeping**

Since all semi-finished products are manufactured in-house, we can

- deliver a broad range of products for diverse applications
- fabricate custom parts for specific customer needs
- process special materials (flame retardant, electrically conductive, foamed)

### Consistently high quality

#### **Raw material specifications, cutting-edge production and quality assurance**

Reliable products with consistent properties

- monitored by ISO-certified quality and environmental management systems
- due to conformity to national and international standards
- ensured by regular audits and external monitoring

### Different fabric backings available

#### **Chemically resistant fabrics made of various materials**

We provide the optimal long-lasting solution for each application

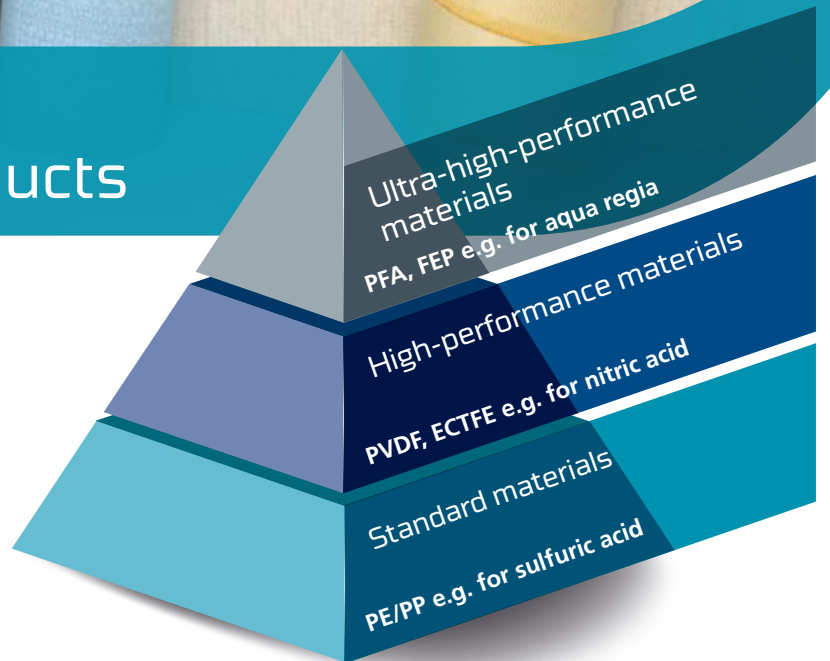
- through our production including PE, PP, PVDF, ECTFE, FEP, and PFA-fabric backed sheets
- thanks to the high acid and high hydrolysis resistance of the the synthetic fabric
- due to easy handling provided by thermoformability
- because AGRU utilises a proven method for adhering the fabrics in the plastic material



# Materials for semi-finished products

## AGRU material pyramid

The respective industrial application determines which material provides the optimal cost-effectiveness and operational reliability. AGRU semi-finished products made of PFA and FEP are resistant to even the most aggressive media.



## The range of AGRU semi-finished products

The AGRU product range is distinguished by a unique diversity of products and materials. Whether sheets, round bars, welding rods or liner pipes: We provide everything from standard up to high-performance plastics. You can realise any application with our pressed and extruded sheets, round bars and hollow bars, as well as laminated pipes and welding rods made of PE, PP, PVDF, ECTFE FEP and PFA material. In addition to our standard programme, many specialised products are also available upon request.

	PE	PP	PVDF	PVDF-FLEX	ECTFE	FEP	PFA
<b>Sheet material</b> Thickness [mm]	2-50	1-50	1-100		1.5-40	1-3	1-20
<b>Round bars</b> Diameter [mm]	15-640	15-640	10-315		20-100		20-100
<b>Hollow bars</b> Diameter [mm]			25-45				
<b>HV-Liner pipes</b> Diameter [mm]			25-355	on request			
<b>Pipes - fabric backed</b> Diameter [mm]			on request		20-160	32-110	32-110
<b>Sheets - fabric backed</b> Thickness [mm]	5	3-6	2-6	1.5-6	1.5-6	1.5-2.3	1.5-3.8

Electrically conductive material (el) and flame-resistant versions (s) are available upon request.

# Fluoroplastics

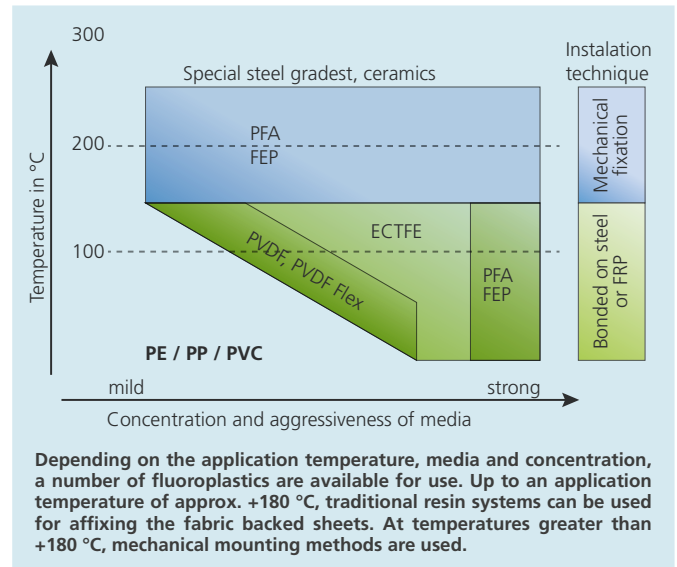
Maximum corrosion resistance in the plastics sector (PVDF, ECTFE, FEP, PFA)

## Almost unlimited chemical resistance

- Thanks to partially and fully fluorinated materials
- Fluorination provides extremely high corrosion resistance
- For each kind of chemical strain, we have the ideal material

## Developed for extreme temperatures

- Outstanding temperature stability between -200 °C and +260 °C
- Excellent low-temperature flexibility
- Exceptional weathering and UV-resistance



## Ideal for high-purity applications

The minimal leaching behaviour of PVDF and PFA is achieved by using carefully selected raw material and optimised production processes. Semi-finished products from AGRU are therefore ideal for applications with ultrapure water and highly purified chemicals, and for cleanroom use. From the raw materials all the way to the end product, the production process at AGRU also takes place under ISO class 05 cleanroom conditions. We always deliver ultra-clean, cutting-edge technology to our customers.



## Self-cleaning surfaces

Fluoroplastics are distinguished by their extremely low surface tension and thus their antiadhesive qualities. This makes it possible to empty tanks and pipework virtually residue-free, and cleaning is very easy. As a result of their surface tension, fluids have the tendency to minimise their surface area and try to revert to a spherical shape. They therefore pearl off of the hydrophobic surface of fluoroplastics, taking dirt particles with them.





# Applications

## Plant construction

AGRU semi-finished products are ideal construction materials for custom-built equipment. Because they are low in weight and easy to transport and process, it is possible to realise very complex geometrical forms with them.



## Tank construction

Tanks for diverse chemicals can be made quickly and reliably using AGRU semi-finished products. The comprehensive product range offered by AGRU provides significant advantages, because in addition to semi-finished products, pipes and diverse fittings are also used to construct a complete overall system. The operating conditions, such as the chemicals and temperatures involved, also play a significant role in the process.

The advantages of an AGRU solution are obvious:

- low tank weight in comparison to steel
- high chemical resistance
- easy processing of the semi-finished products



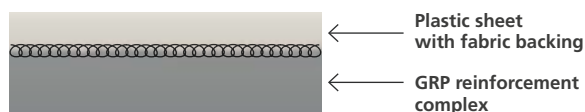
## Finished parts

As a leading company in the plastics industry, AGRU manufactures semi-finished products and also processes these further as needed to create a final product. Much expertise has been gathered, in particular in the area of special parts. Thus AGRU fabricates fittings up to a outer diameter of 2500 mm in its own CNC machining department.

# Lining material

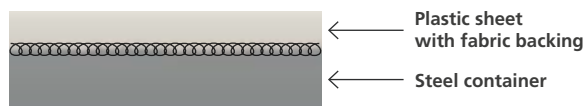
## GRP dual laminate

Tanks made of glass-fibre-reinforced plastic (GRP) are lined with laminated plastic film to maintain chemical resistance and leak-tightness. Such tanks, boilers, reactors and scrubbers are then suitable for operation under vacuum and pressure at up to 160 °C.



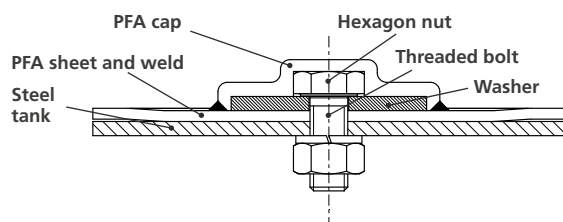
## Fully bonded lining for steel

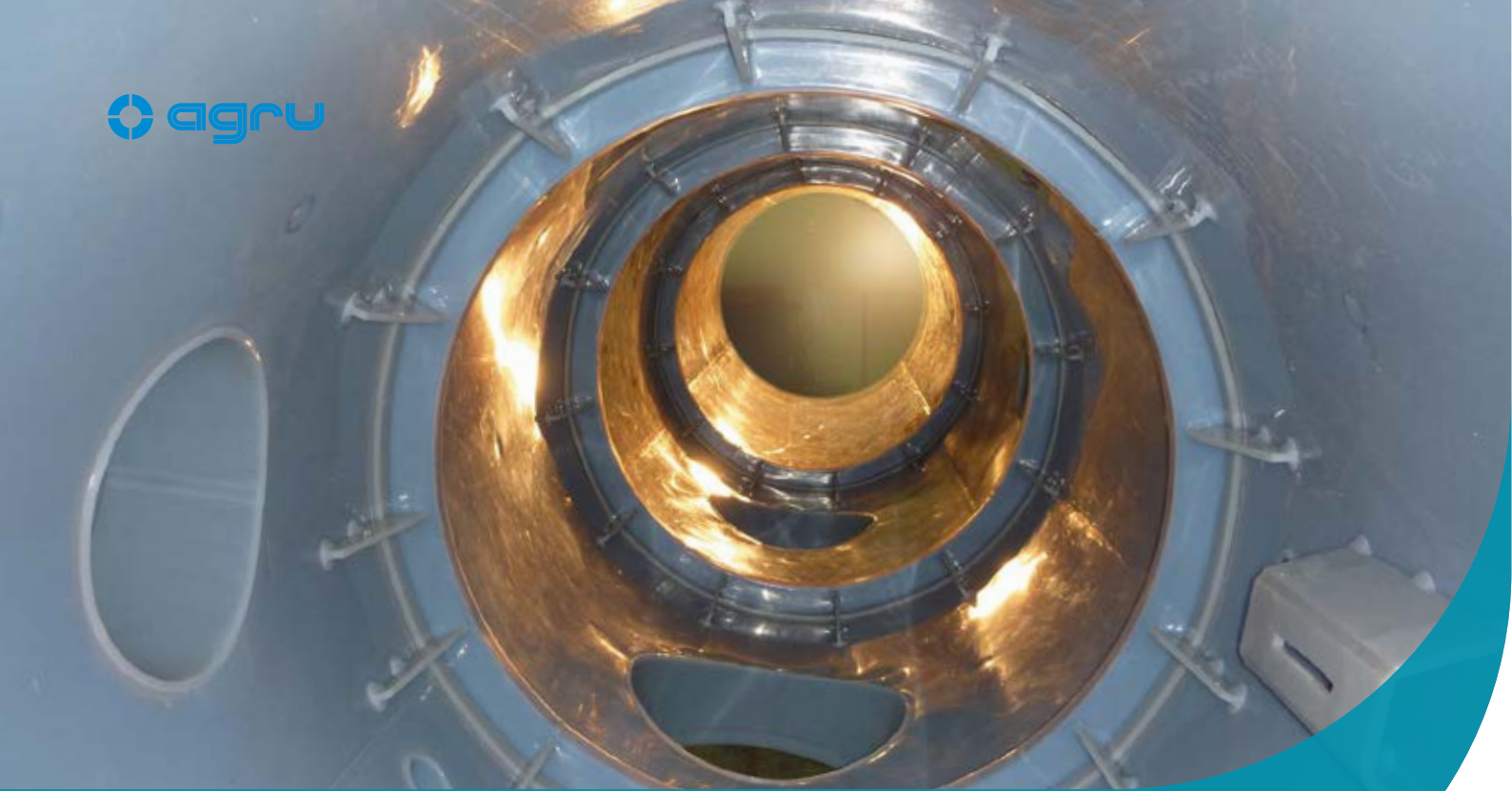
A fully bonded lining made of fabric backed sheet material applied to steel provides long-term chemical resistance at temperatures up to 120 °C for storage and shipping containers, reactors, centrifuges and related equipment. Suitable for operation with vacuum and pressure is available.



## Fixpoint lining

AGRU semi-finished sheet can also be fastened to steel substrate by mechanical means such as clamps, bolts or screws. This system is mainly used with PFA for flue gas applications and desulphurization systems at temperatures up to 260 °C.





# Fabric backing systems

## Excellent bonding with steel tanks and glass-fibre-reinforced plastics

The great variety of materials (PE, PP, PVDF, ECTFE, FEP and PFA) as well as different backing systems (polyester, glass, synthetics) make it possible to realise solutions for temperatures from -200 °C and +260 °C. We always have the best material for the respective task, whether for lining steel tanks, for dual-laminate containers, or for fix point linings. The decisive factors for linings is the choice of fabric and the bond achieved between it and the plastic as well as the bond with the GRP and surface of the steel substrate.

- Optimised price-performance ratio for each application and long-lasting solutions thanks to acid-resistant fabrics made of different materials
- Fabric backed sheets made of PE, PP, PVDF, ECTFE, FEP and PFA
- Easy handling due to the thermoformability of the fabrics
- Consistent fabric backing quality and optimal bonding between fabric and plastic thanks to proven fabrication processes

SHEET MATERIAL	PROPERTIES
Polyester fabric	<ul style="list-style-type: none"> <li>• Most economical and proven solution</li> <li>• Available for PE, PP and PVDF</li> </ul>
GGS Glass fabric	<ul style="list-style-type: none"> <li>• Available for all materials</li> <li>• Extreme temperature stability</li> <li>• Good thermoformability</li> <li>• Good bonding strength</li> </ul>
SK+ Optimised synthetic fabric	<ul style="list-style-type: none"> <li>• Very high hydrolysis resistance</li> <li>• Top resistance against acids</li> <li>• High bond strength at high operating temperatures</li> <li>• Available for PVDF and ECTFE</li> </ul>



# HV-Liners and fabric backed pipes

## Custom-tailored piping systems for any application

AGRU offers special liner pipes for GRP applications. While the GRP pipe provides the necessary stiffness, the inliner provides chemical resistance for the application. That way, custom-tailored pipes can be produced for any application:

- High bonding strength between the laminate and the GRP-resin system (DIN 16964) > 5 N/mm<sup>2</sup>
- Flangeless GRP pipe connections minimise maintenance costs
- Low weight of the entire piping system
- Saves material costs compared to solid-wall piping

### HV-Liner



The PVDF HV-Liner from AGRU is an economical alternative to traditional fabric backed pipe. The surface-treated PVDF pipe has a three-dimensional surface structure that provides for optimal bonding with the GRP pipe. The piping systems are available in PVDF, PVDF-FLEX and PVDF-el. The pipes can be produced in diameters from 20 – 355 mm.

### SK+ and GGS laminated pipes



The laminated piping systems are available in ECTFE, FEP and PFA. AGRU GGS glass fabrics are the standard for typical industrial applications. The GGS fabric backing is the standard for PFA and FEP materials with a high melting point.

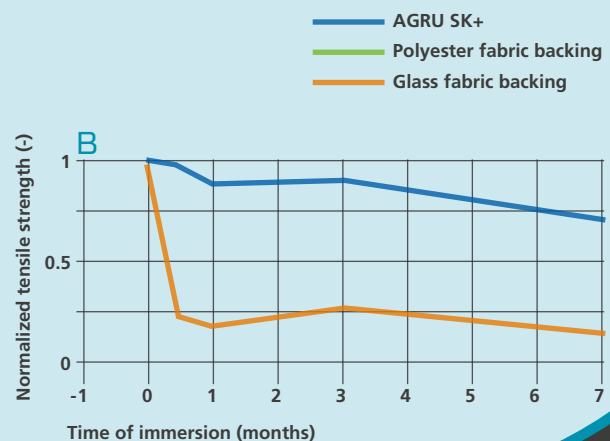
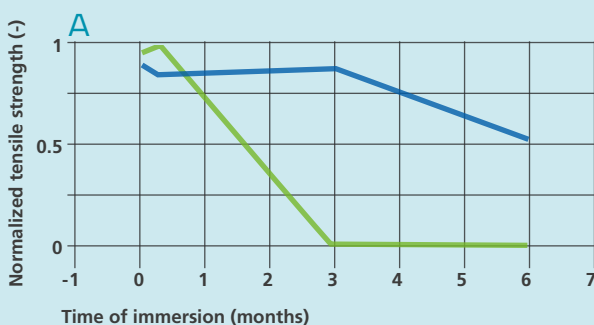
The SK+ laminated ECTFE pipes from AGRU is characterised by outstanding resistance to chemicals and hydrolysis, even at high temperatures. Due to the high resistance of the SK+ laminate, it is the preferred system for applications with hydrochloric acid (HCl) or hydrofluoric acid (HF).

## Immersion test AGRU SK+

Fabrics were immersed directly (no polymer layer)

**A:** Boiling water (100 °C)

**B:** 20 % HCl at 40 °C





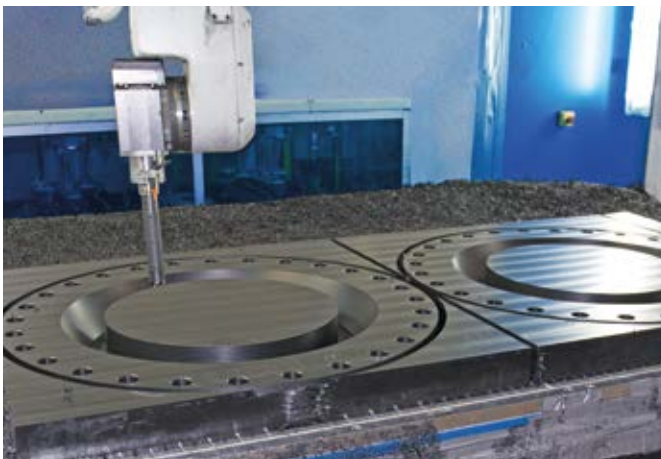
## Custom tailored solutions

In direct collaboration with our customers, we create state-of-the-art plastic solutions that reflect the latest technological developments in design, functionality and economic efficiency.



### Technical application consultation

Often it's nothing more than an idea on a piece of paper brought to us by a customer that AGRU's expertise in plastics technology turns into reality. AGRU design teams are constantly working on the realisation of concrete customer wishes. Ultimately, the economic efficiency and technical feasibility is determined by the choice of material, because it must fully meet all the requirements in the areas of chemical resistance and temperature stability, as well as physical durability. That's why the selection of the optimal material for the specific requirements of an application is one of AGRU's core competencies. Thanks to the extensive experience of our application engineers at AGRU, we create custom-tailored solutions that are perfectly adapted to the operating conditions.



### Manufacturing expertise

Whether in the construction business or for semiconductor production: Intelligently designed plastic parts from AGRU are used everywhere. A key factor for success is certainly the seamless process chain, consisting of our own fabrication with numerous technologies found in-house and our worldwide logistics capabilities. With a combination of expertise, automated technology and careful manual craftsmanship, we engineer products that are among the best in the industry. The necessary drilling, turning, milling and welding operations are done on state-of-the-art machining centres.

# Foamed sheets

## Developed for lightweight construction

Foamed sheets made of polypropylene are perfect for lightweight construction. The most common applications are in the areas of insulating linings for boat and shipbuilding, constructing tanks and apparatus construction, inner linings in the automotive, aircraft and model building industries. AGRU's range of products includes coextruded sheet material with a foamed core between compact, structured outer layers on both sides. Compared to a solid plastic plate, this results in a weight reduction of approx. 30 percent!

Foamed semi-finished sheets from AGRU are resistant against numerous chemicals and can be brought into the right form using common tools for working with plastics. Because they can easily be welded using extrusion or hot-gas welding methods and because of their good stability, they are the best choice for all structures where weight reduction and chemical resistance are particularly important.

### Product benefits in detail:

- Extremely low density and weight (0.65 g/cm<sup>3</sup>)
- Excellent insulating characteristics due to low thermal conductivity (0.10–0.15 W/mK)
- Outstanding sound attenuation
- Minimal water absorption

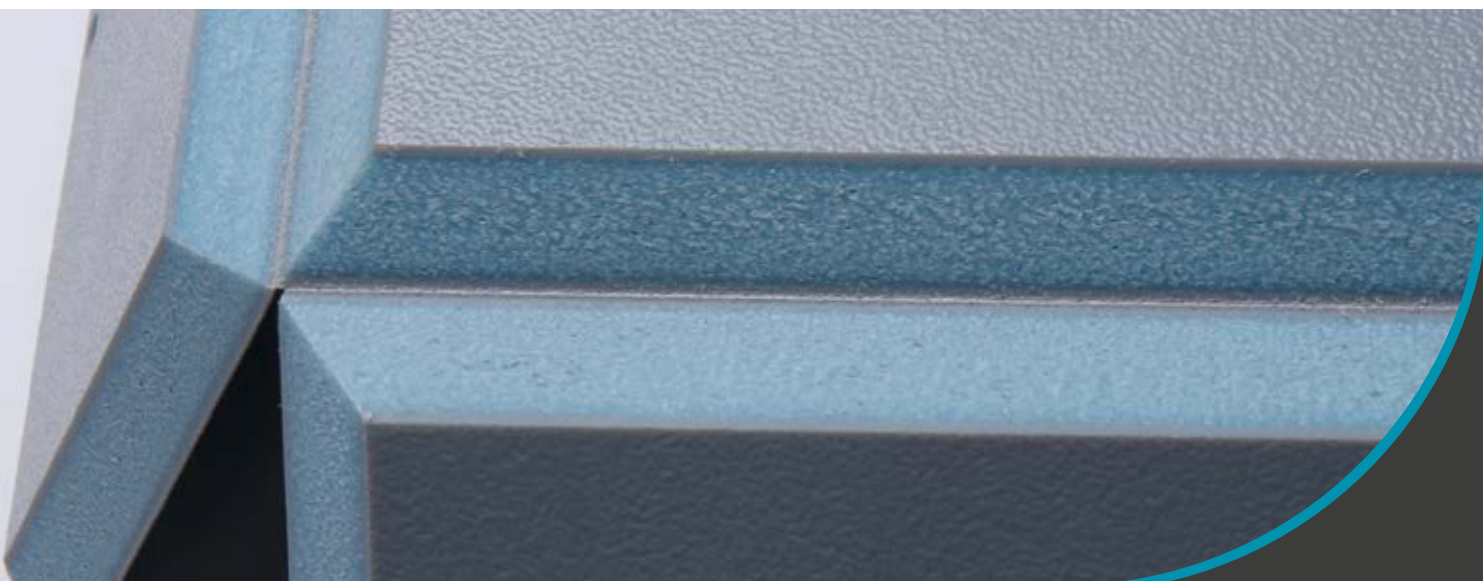
### PRODUCT RANGE

#### Foamed PP sheets in grey (similar to RAL 7040)

Thickness	Length x Width
8 mm	3000 x 1500 mm
10 mm	3000 x 1500 mm
12 mm	3000 x 1500 mm

Appropriate welding rod with diameters of 3 mm and 4 mm round out the product range.

Foamed sheets from AGRU have a light and airy core. That makes them the ideal lightweight construction material that also provides high chemical resistance.





The Plastics Experts.

Your distributor

Subject to errors of typesetting, misprints and modifications.  
Illustrations are generic and for reference only.

0916

**AGRU Kunststofftechnik GmbH**  
Ing.-Pesendorfer-Strasse 31  
4540 Bad Hall, Austria

T. +43 7258 7900  
F. +43 7258 790 - 2850  
office@agru.at



[www.agru.at](http://www.agru.at)