

# SEMI- FINISHED PRODUCTS

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



# The Plastics Experts.

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. Semi-finished products find uses in the chemical and heavy industries as well as 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.

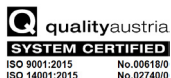
The AGRU success story already spans seven decades. Founded in 1948 by Alois Gruber Sr., the company is now counted among the most important comprehensive suppliers for piping systems, semi-finished products, protective liners for concrete and geomembranes made of engineering plastics. The fact that 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.



## Quality

AGRU maintains a quality management system according to the ISO 9001:2015 standard, as well as an environmental management system according to the ISO 14001:2015 standard. Additionally, 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. Several AGRU Semi-finished products comply with the EU-Regulations No. 10/2011 on plastic materials and articles intended to come in contact with food.





# SEMI-FINISHED PRODUCTS

## Chemical-Resistant Sheets, Pipes, Bars and Welding Rods

AGRU semi-finished products are made of thermoplastic materials and are distinguished by their high acid and alkali resistance, which lowers lifecycle costs by extending the intervals between maintenance and increasing service life. AGRU has a comprehensive portfolio of semi-finished products that provides solutions for applications functioning in temperatures ranging from -190°C to +260°C (-310°F to 500°F). Consistent high quality ensures the reliability and long service life of all components.

### High Chemical Resistance

**A stable polymer is available for most chemical applications, with optimized price-performance ratios**

- Receive consultation and material recommendations by The Plastics Experts
- Reduce lifecycle costs and increase operational reliability
- Improve service lifetimes with the right choice of product.

### Broad Semi-Finished Portfolio

**Comprehensive portfolio of in-house manufactured semi-finished products, with extensive stock keeping for quick turnaround.**

- Bar stock, sheets, welding rods, and lining products
- Available in a variety of dimensions and shapes
- Comes in PE, PP, PVDF, ECTFE, FEP, and PFA as well as flame-resistant and electric-conductive grades.

### Consistently High Quality

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

- Monitoring by ISO-certified quality and environmental management systems
- Adherence to national and international standards
- Regular audits and external monitoring.

### Fabric-Backed Polymer Sheets

**Chemically resistant fabrics made of various materials (polyester-, synthetic-, and glass fabric) offer solutions for a variety of applications.**

- Polyester fabrics offer a cost-effective solution for polyolefins
- Synthetic Fabrics offer excellent acid and hydrolysis resistance
- Glass fabrics offer the use of FEP and PFA
- AGRU utilizes a proven method for embedding fabrics in the plastic material to provide a consistent bond strength that conforms to ASME RTP1.

## SEMI-FINISHED PRODUCTS

### Sheets, Round Bars and Welding Rods

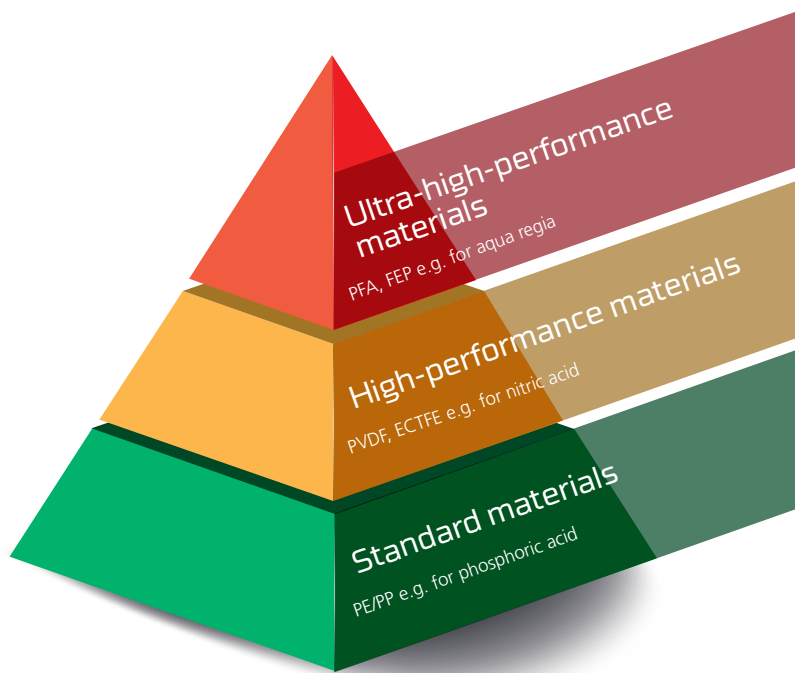
Semi-finished products made of thermoplastics are an excellent and durable solution for modern, high-quality apparatus and tank construction, and also for manufacturing wear-resistant products. In the chemical and heavy industries, and in plant construction, a variety of material requirements exist. These include resistance to acids and lyes, resistance in a wide temperature range, low static charging in potentially explosive atmospheres and many other things.

The AGRU product range is distinguished by a unique variety of products and materials. All our sheets, round bars, welding rods, and liner pipes are available in everything from standard up to high-performance plastics. Solutions and finished parts for any application can be realized with our pressed and extruded sheets, round bars and hollow bars, laminated pipes, and welding rods made of PE, PP, PVDF, ECTFE, FEP, and PFA. In addition to our standard portfolio, many specialized products are also available upon request.

DVS and AWS codes provide information about established joining methods and welding parameters. Users can choose from various proven methods, such as extrusion welding, hot-gas welding, and butt welding. Established procedures are also available for machining, thermoforming, and tank constructions.

#### AGRU Material Pyramid

The respective industrial application determines which material provides the optimal cost-effectiveness and operational reliability. The Plastics Experts will help you select the best polymer for your application. AGRU semi-finished products made of PFA and FEP are resistant to even the most aggressive media, meaning that almost every corrosion problem can be solved.



# Polyethylene

Semi-finished products made of polyethylene (PE 100 and PE 100-RC) are characterized by high toughness and very good chemical resistance and can be used from -40°C to +60°C (-40°F to 140°F). Other characteristics of semi-finished products made of PE 100 and PE 100-RC include the following:

- Good resistance to wear;
- Very good electrical insulation;
- High vibration damping.

For decades now, semi-finished products made of PE 100 and PE 100-RC black have proven to be reliable when used outdoors. The addition of special carbon black types (approximately 2%) ensures light and weather resistance. Semi-finished products made of PE 100 and PE 100-RC black are unaffected by natural UV radiation.

The development of polyethylene materials and their use as material for semi-finished products has reached its current peak with a design stress (minimum strength) of 10 N/mm<sup>2</sup> in terms of mechanical stress resistance. In recent years, further development has focused on resistance to stress cracking. These raw materials are referred to as PE 100-RC. The development of the PE 100 type into an RC material is not only being used in and benefiting the pressure pipe sector, but also tank construction.

The main technical advantage of PE 100-RC is that it is significantly more resistant to crack growth. This is reflected by the failure time measured by the FNCT (full notch creep test), which is >8,760 h compared with 300 h for PE 100 materials. Semi-finished products made of PE 100-RC materials therefore exhibit significant advantages for applications with media that cause stress cracks. As a result, it is possible to develop new applications involving PE 100-RC and to increase the service life considerably. Furthermore, expensive materials can be avoided.

**Electrically conductive** polyethylene (HDPE-el ESD) is a material that conducts electrical charges, because conductive particles (carbon black) have been added to it. Semi-finished products made of this special material have integrated stabilizers that counteract the effects of natural UV light and are therefore also suitable for outdoor applications. Due to their special electrical properties, these semi-finished products are particularly well suited to transporting highly flammable media or dusts. HDPE-el ESD can also be used in areas where sparking from electrostatic charging needs to be prevented due to explosion protection requirements.

To comply with purity requirements, AGRU offers sheets made of **natural** HDPE as well.

	PE 100 Black		PE 100-RC Black		PE-HD Natural		PE-HD el Black	
	mm	in	mm	in	mm	in	mm	in
<b>Extruded Sheets</b>								
2000 x 1000	2-30	0.08-1.18	35-40	1.38-1.57	3-10	0.11-0.39	4-20	0.16-0.79
3000 x 1500	3-30	0.11-1.18	3-50	0.11-1.97	3-25	0.11-0.98	5-15	0.2-0.71
4000 x 2000	3-30	0.11-1.18	12-40	0.47-1.57				
<b>Pressed Sheets</b>								
2000 x 1000	10-120	0.39-4.72	10-120	0.39-4.72	10-80	0.39-3.12	25-60	0.98-2.36
4000 x 2000	15-60	0.59-2.36			15-60	0.59-2.36		
<b>Laminated / Polyester-backed Sheets</b>								
3000 x 1500	4-5	0.16-0.2						
<b>Round Bar</b>	15-640	0.59-25.2					50-160	1.97-6.3
<b>Welding Rod Round, 3kg roll (6.61 lb)</b>	3-5	0.11-0.2	3-5	0.11-0.2	3-4	0.11-0.16	3-4	0.11-0.16
<b>Welding Rod Round, 10kg roll (22.04 lb)</b>	3-5	0.11-0.2						
<b>Welding Rod Triangular Rounded, 3kg roll</b>	5x3	0.2x0.11						

# Polypropylene

Polypropylene (PP) is a semi-crystalline thermoplastic similar to HDPE, but with higher stiffness, strength, and hardness levels. It is also characterized by a very good chemical resistance. Polypropylene can be used in temperatures of up to 95°C (203°F). However, below freezing point PP is very sensitive to impact (use at temperatures below -5°C [23°F] should be avoided). Semi-finished products made of PP are also characterized by the following:

PP is the ideal material for use in pickling plants, the chemical industry, waste water treatment, and other processes that uses chemicals at high temperatures. The AGRU product range includes three PP polymer types:

- PP homopolymer (PP-H), made with propylene molecules;
- PP random copolymers (PP-R), made with statistically distributed ethylene monomers that are integrated into the molecular chain;
- PP copolymer (PP-C, PP-B), made with ethylene monomers in block form that are integrated into the molecular chain.

All three propylene types are thermally stable, perfectly compatible, and can be welded according to standard welding procedures as per DVS 2207. Semi-finished products made of gray polypropylene are not UV-stabilized and therefore need to be protected accordingly.

Low-flammability PP (PPs) is a type of PP-H that is equipped with a flame retardant. Consequently, PPs can be classified as a material with higher flame resistance according to DIN 4102 and UL94. Low-flammability and electrically conductive (PPs-el ESD) polypropylene is made of PP-C and is equipped with both flame-resistant and electrically conductive/anti-static properties. The surface resistance of PPs-el ESD is  $\leq 10^6$  Ohm, which prevents electrostatic charging. Semi-finished products made of polypropylene natural and white (made of PP-H) complete our extensive range of PP semi-finished products and possess the following physical properties:

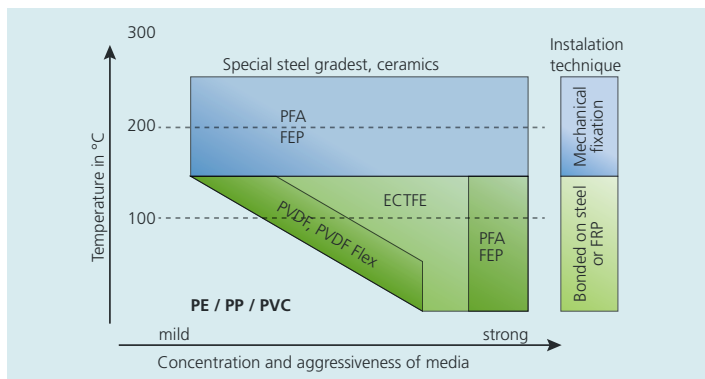
- A low density of 0.91 g/cm<sup>3</sup>
- Relatively high surface hardness
- Electrical insulation properties
- High creep strength.

	PP-H Grey RAL 7032		PP-R Grey RAL 7032		PP-C (B) Grey RAL 7032		PP Natural		PP White		PPs Grey RAL 7037		PPs el Black	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
<b>Extruded Sheets</b>														
2000 x 1000	1-40	0.04-1.57					2-6	0.08-0.24			3-10	0.11-0.39	3-20	0.11-0.79
3000 x 1500	3-50	0.11-1.97			3-20	0.11-0.79	3-25	0.11-0.98	6-20	0.24-0.79	3-20	0.11-0.79	4-15	0.16-0.59
4000 x 2000	3-40	0.11-1.57	40-50	1.57-1.97										
<b>Pressed Sheets</b>														
2000 x 1000	10-60	0.39-2.36	70-120	2.76-4.72			10-60	0.39-2.36			25-40	0.98-1.57		
4000 x 2000	15-60	0.59-2.36					15-60	0.59-2.36						
<b>Laminated / Polyester-backed Sheets</b>														
2000 x 1000	3-6	0.11-0.24												
3000 x 1500	3-6	0.11-0.24												
25000 x 1000	3-4	0.11-0.16												
25000 x 1500	3-4	0.11-0.16												
<b>Laminated / Glass-backed Sheets</b>														
3000x1500			5	0.2										
<b>Polypropylene-backed Sheets</b>														
25000 x 1500	3-4	0.11-0.16												
<b>Round Bar</b>			15-640	0.59-25.2					70-150	2.76-5.91			20-100	0.79-3.94
<b>Welding Rod Round, 3 kg roll</b>	3-5	0.11-0.2	3-5	0.11-0.2	3-4	0.11-0.16	3-4	0.11-0.16	3-4	0.11-0.16	3-4	0.11-0.16	3-4	0.11-0.16
<b>Welding Rod Round, 10 kg roll</b>	3-4	0.11-0.16												
<b>Welding Rod Round, 1m bar</b>	3-4	0.11-0.16												
<b>Welding Rod Triangular Rounded, 3kg roll</b>	5x3	0.2x0.11									5x3	0.2x0.11		
	6x4	0.24x0.16												
<b>Welding Rod Oval, 3kg roll</b>	5x3	0.2x0.11												
	6x4	0.24x0.16												

Other dimensions and colours available on request

# Fluoropolymers

Semi-finished products made of fluoropolymers (PVDF, ECTFE, FEP, and PFA) possess the highest corrosion resistance in the plastics sector, with a number of products available according to application temperature, media, and concentration. These fluoropolymer products can be used as structural materials or as corrosion protection lining. In addition to the polymer, the type of installation plays a role in determining the maximum operating conditions.



Fluoropolymers are developed for extreme temperatures, capable of maintaining temperature stability between -190°C and +260°C (-310°F to 500°F). Fluoropolymers also demonstrate excellent low-temperature flexibility and exceptional weathering and UV-resistance. The combination of chemical and temperature stability makes AGRU fluoropolymers ideal for high-purity applications using ultrapure water and highly purified chemicals as well as for cleanroom work. To further enhance its fluoropolymers for high-purity applications, AGRU improves the minimal leaching behavior of PVDF and PFA through a careful selection of raw materials and a highly optimized production process.



Fluoropolymers are also distinguished by their extremely low surface tension and thus their antiadhesive qualities. In contrast, fluids have a higher surface tension and will revert to a spherical shape as they attempt to minimize their surface area. These fluid beads will pearl off the hydrophobic surface of fluoropolymers, taking dirt particles with them. Ultimately, it is possible to empty tanks and pipework that are lined with fluoropolymers with minimal residues, simplifying the cleaning process.





# High-End Materials Product Range

## PVDF

PVDF is a highly crystalline non-reinforced plastic that combines good mechanical, thermal, and electrical properties with excellent chemical resistance. In addition, it possesses good radiation resistance, which makes it ideal for high-end applications in the semiconductor, pharmaceutical, life science, and photovoltaic industry as well as applications requiring high media purity and leaching behavior standards.

AGRU produces PVDF blocks with a maximum product thickness of 100 mm for the production of customized machined parts. Thick PVDF sheets are usually produced discontinuously in a compression molding process. The peculiarity of the PVDF blocks lies in the production process. AGRU is using the continuous extrusion process also used for round bars. This allows faster production of thick semi-finished products. To reduce the internal stresses, all AGRU PVDF blocks are annealed.

For the production of these blocks, standard AGRU PVDF resins are used. All resins and sheets are compliant with the current EU regulations NO 10/2011, FDA Regulation 21 CFR, and NSF 51 certification, which means that these sheets can be also used for food applications.

Thick PVDF sheets are typically used to produce customized machined parts for the apparatus and tank construction. Sheets are available in standard dimensions of 1000 x 610 mm and a maximum length of 3000 mm.

PVDF can also be manufactured with electrically conductive particles that are especially suited for the electrical industry and explosion-proof areas. The resulting conductive PVDF-el ESD (electrically conductive or electro-static discharge) can be manufactured in sheets, rods, pipes, and welding rods and features a lower surface resistance that prevents electrostatic charging.

PVDF Flex is an excellent alternative to well-known, conventional fluoropolymers. When it comes to processing, important rationalization effects can be achieved through increased flexibility, especially in the case of bonded to steel linings, but also in the case of confined spaces or small radii.

	PVDF		PVDF - Flex		PVDF el ESD	
	mm	in	mm	in	mm	in
<b>Extruded sheets</b>						
1000 x 610	50-100	1.97-3.94				
2000 x 1000	2-20	0.08-0.79				
2440 x 1220 (96 x 28 in)	3.18-25.4	0.12-1				
3000 x 1500	3-10	0.11-0.39	2.3	0.09	3 - 8	0.11-0.31
<b>Pressed sheets</b>						
2000 x 1000	10-40	0.39-1.57			10 - 40	0.39-1.57
<b>Laminated / polyester-backed sheets</b>						
2000 x 1000	2-5	0.08-0.2				
3000 x 1500	3-4	0.11-0.16				
25000 x 1000	2-3	0.08-0.11				
25000 x 1500	3-4	0.11-0.16				
<b>Backed sheets SK+</b>						
3000 x 1500	3-4	0.11-0.16	2.3 - 3	0.09-0.12	3 - 4	0.11-0.16
10000 x 1500	3-4	0.11-0.16	2.3 - 3	0.09-0.12		
<b>Round bar</b>	10-325	0.39-12.8			20 - 200	0.79-7.87
<b>Hollow rod</b>	25-45	0.98-1.77				
<b>Welding rod round</b>	3-4	0.11-0.16	3 - 4	0.11-0.16	3 - 4	0.11-0.16
<b>Welding rod triangular</b>	5x3	0.2x0.11				
<b>Pipe</b>					32 - 250	1.26-9.84
<b>HV-Liner</b>	20-355	0.79-13.9			32 - 250	1.26-9.84

Other dimensions and colours available on request



## ECTFE

ECTFE possesses a unique combination of properties that are the result of its chemical structure, which consists of a copolymer with ethylene and chlorotrifluoroethylene arranged alternately. ECTFE demonstrates excellent resistance to the corrosive influence of heat, strong radiation, and weathering. The material has high impact resistance and shows almost no property changes in a wide temperature range, making it particularly well-suited for demanding industrial applications. Furthermore, ECTFE is known for its good permeation barrier for many chemicals. Its excellent welding properties and thermoplastic formability also make simple and cost-saving processing possible, both in the workshop and on-site. Compared with PVDF, ECTFE has better chemical resistance, especially when exposed to lyes.

## FEP

FEP is a fully fluorinated plastic that offers outstanding corrosion resistance. It performs reliably between -190°C and +205°C (-310°F to 401°F) and can therefore be used in numerous industrial applications. Flexibility, thermoformability, and optimum welding properties mean AGRU FEP products can be manufactured reliably at low costs.

## PFA

PFA is the highest-grade plastic in the AGRU portfolio. It is suitable for an extremely broad spectrum of applications, thanks to its resistance to almost any medium and its temperature range of -190°C to +260°C (-310°F to 500°F). PFA can be offered as a solution even for extreme chemicals at high temperatures. The products made of PFA are also available in HP (High Purity) quality. The HP quality means it can be used for applications in the semiconductor, pharmaceutical, and food industries that require high purity levels.

ECTFE	mm	in
<b>Extruded Sheets</b>		
2000 x 1250	4-20	0.16-0.79
2440 x 1220	3.18-25.4	0.12-1
3000 x 1500	2.3-3	0.09-0.12
<b>Pressed Sheets</b>		
2000 x 1000	10-30	0.39-1.18
<b>Laminated / SK+ Sheets</b>		
3000 x 1500	2.3-3	0.09-0.12
15000 x 1500	2.3-3	0.09-0.12
<b>Laminated / GGS Sheets</b>		
3000 x 1500	2.3-3	0.09-0.12
15000 x 1500	2.3-3	0.09-0.12
<b>Round bars</b>	20-100	0.79-3.94
<b>Welding Rod Round</b>	3-4	0.11-0.16
<b>Pipes SK+ (1 m (3.3 ft) / 5 m (16.4 ft))</b>	20-160	0.79-6.3

Other dimensions and colours available on request

FEP	mm	in
<b>Laminated / GGS Sheets</b>		
2000 x 1250	0.8-2.3	0.03-0.09
10000 x 1250	2.3	0.09
15000 x 1250	1.5	0.06
<b>Welding Rod Round</b>	3.5-4	0.14-0.16
<b>Pipes</b>	32-160	1.26-6.3
<b>Pipes GGS (1 m / 5 m)</b>	32-160	1.26-6.3

Other dimensions and colours available on request

	PFA		PFA HP	
	mm	in	mm	in
<b>Extruded Sheets</b>				
2000 x 900	15 - 20	0.59-0.79	15 - 20	0.59-0.79
2000 x 920	10 - 12	0.39-0.47	10 - 12	0.39-0.47
2000 x 1250	2.3 - 6	0.9-0.24	4 - 6	0.16-0.24
10000 x 1250	2.3	0.09		
20000 x 1250	1.5	0.06		
<b>Laminated / GGS Sheets</b>				
2000 x 1250	0.8 - 2.3	0.03-0.09		
10000 x 1250	2.3	0.09	2.3	0.09
<b>Round bars</b>	20 - 100	0.79-3.94	20 - 100	0.79-3.94
<b>Welding Rod Round</b>			3.5 - 4	0.14-0.16
<b>Pipes</b>	32 - 110	1.26-4.33		
<b>Pipes GGS (1 m / 5 m)</b>	32 - 110	1.26-4.33		

# Applications



## 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 available for the construction a complete system. The advantages of the AGRU solution include:

- Low tank weight in comparison to steel
- High chemical resistance
- Easy processing of the semi-finished products
- Variety of materials



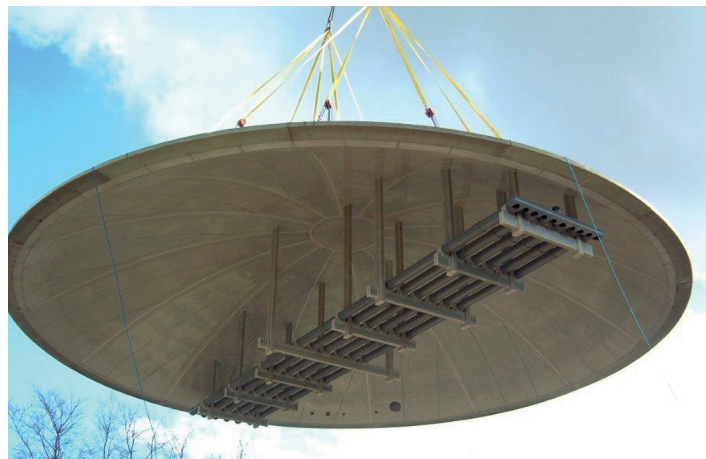
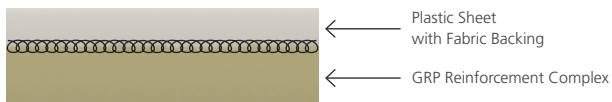
## Finished Parts

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

# Lining Materials

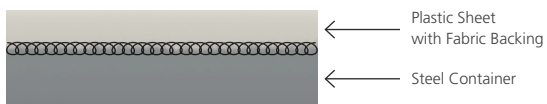
## FRP Dual Laminate

Tanks made of fiber-reinforced plastic (FRP) are lined with fabric backed sheets 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 180°C (356°F, depending on material and chemical).



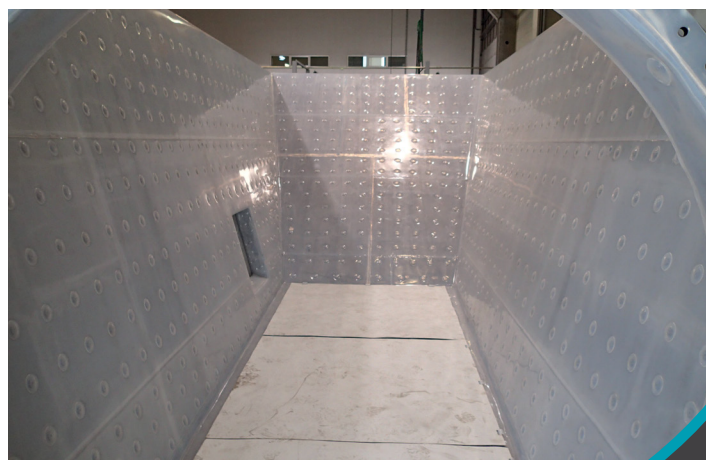
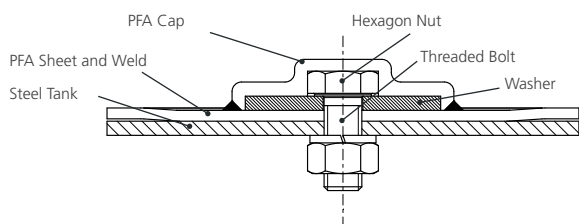
## Steel Lining (Fully Bonded)

A fully bonded lining made of fabric backed sheet material applied to steel provides long-term chemical resistance at temperatures up to 120°C (248°F, depending on material and chemical) for storage and shipping containers, reactors, centrifuges and related equipment. Suitable for operation with vacuum and pressure is available.



## Fixpoint Lining

AGRU PFA sheets can be fastened to steel tanks by using mechanically fix points such as clamps, bolts, or screws. This PFA lining system is mainly used for flue gas applications and desulphurization systems at temperatures up to 260°C (500°F).







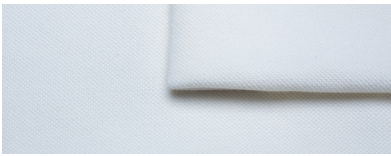
# Fabric Backing Systems

## Excellent Bonding with Steel Tanks and Fiber-Reinforced Plastics

With a great variety of materials (PE, PP, PVDF, ECTFE, FEP, and PFA) combined with different backing systems (polyester, glass, synthetics), AGRU is capable of realizing solutions across many applications. With a rich product catalog, AGRU always has the best product at hand for every task, whether it is for lining steel tanks or for use in dual-laminate constructions. The decisive factors for linings are the choice of fabric and the bond achieved between it and the plastic as well as the bond with the FRP and surface of the steel tank.

Benefits include:

- Optimized price-performance ratio for each application and long-lasting solutions thanks to acid-resistant fabrics made of different materials
- 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
<b>Polyester Fabric</b> 	<ul style="list-style-type: none"> <li>• Most economical and proven solution</li> <li>• Available for PE, PP and PVDF</li> </ul>
<b>GGS Glass Fabric</b> 	<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>
<b>SK+ Optimised Synthetic Fabric</b> 	<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>

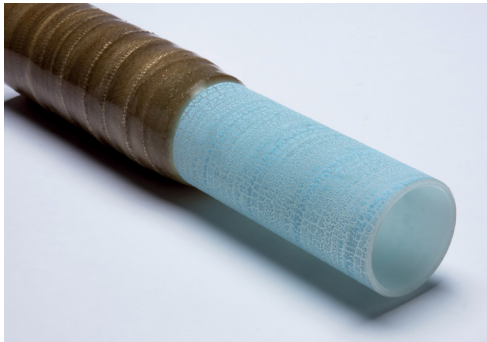
# HV-Liners and Fabric Backed Pipes

## Custom-tailored Piping Systems For Any Application

AGRU offers special liner pipes for FRP applications. While FRP pipe provides the necessary stiffness, liner pipes provide the chemical resistance for the application. The combination of FRP and liner pipes provides a way to custom-tailor pipes for any application. The benefits of this approach include:

- High bonding strength between the laminate and the FRP-resin system (DIN 16964) > 5 N/mm<sup>2</sup>
- Minimized maintenance costs with flangeless FRP pipe connections
- Low-weight piping system
- Material cost savings when compared with solid-wall piping

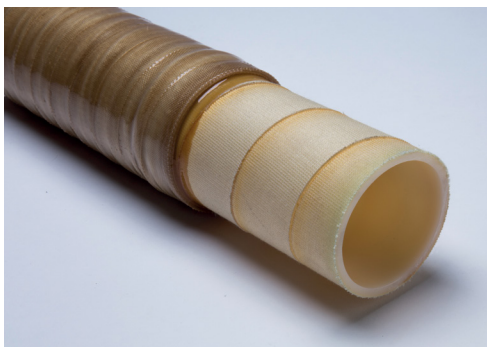
### HV-Liner



The PVDF HV-Liner from AGRU is an economical alternative to traditional fabric backed pipes. The surface-treated PVDF pipe has a three-dimensional surface structure which provides an optimal bonding to the FRP pipe. The piping systems are available in PVDF, PVDF-FLEX, and PVDF-el ESD. The pipes can be produced in diameters from 20–400 mm.

AGRU is now able to apply the special surface treatment of the pipes also to injection molded fittings (OD 20–200 mm).

### SK+ and GGS Laminated Pipes



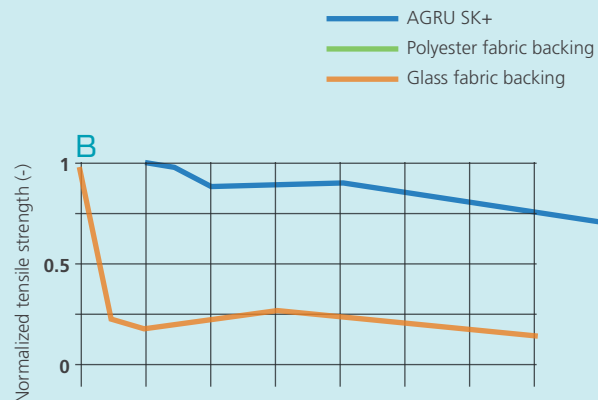
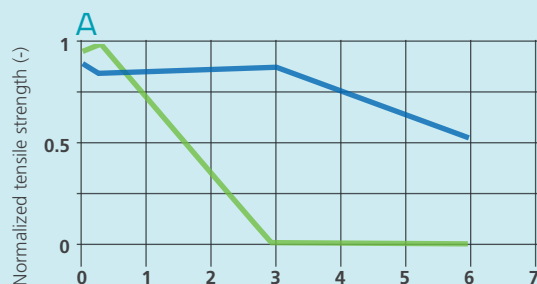
The fabric backed piping are available in ECTFE, FEP and PFA. AGRU GGS glass fabrics are the standard for FEP and PFA. For ECTFE, SK+ is the preferred solution.

## Immersion Test AGRU SK+

Fabrics were immersed directly (no polymer layer)

**A:** Boiling water (100 °C / 212 °F)

**B:** 20 % HCl at 40 °C / 104 °F



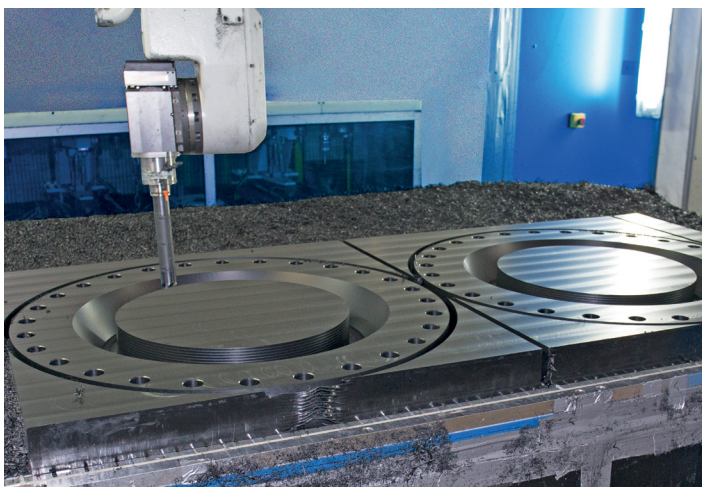


## Custom Tailored Solutions



### 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 realization of 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.



### Machining Expertise

Whether in the construction business or for semiconductor production: Intelligently machined 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 centers.









The Plastics Experts.



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