

KERAVERIN<sup>®</sup> - KERAPOLIN<sup>®</sup> - ALPHACOR<sup>®</sup>  
**FRP COMPOSITE MATERIALS  
FOR PIPING SYSTEMS**

# FRP PIPE SYSTEMS STATE OF THE ART MATERIALS



Glass-fibre reinforced composite materials are highly resistant to chemicals and do not require any additional corrosion protection measures, such as external coatings that may degrade and fail. As a composite system, they withstand extreme temperatures without the thermoplastic lining separating from the supporting FRP laminate. Composite materials can be easily adapted to the on-site conditions in terms of design and pipeline routing at low cost, without having to comply with standardised component dimensions. This allows flange connections to be minimised and the associated risk of leaks to be significantly reduced.

FRP components are designed with a higher safety factor than steel components – and at a significantly lower weight. Vacuum resistance and – on request – electrostatically dissipative design round off the product portfolio. These are just some of the reasons why modern and innovative FRP composite materials continue to displace metallic materials, especially in the chemical industry.

Plastics provide convincing alternatives to other materials wherever strict safety requirements must be met and large mechanical or chemical loads must be coped with. Due to their outstanding properties, FRP pipe systems are suitable for almost every area of application.

Thanks to our own application technology, engineering, production and assembly team, we deliver the highest quality and efficient solutions – with the added bonus of in-house project planning, static calculations, installation and maintenance. Individually tailored to your needs, our engineers and technicians design and construct FRP piping systems, process vessels, storage tanks and special components.

From the concept to the installation on site - everything from a single source.

## THE STEULER BENEFITS

- Comprehensive, practice-oriented consultation and service regarding material selection, detailed design and installation planning
- Steuler application technology and development, for the optimal material selection
- Engineering down to the last detail, with customised design
- Research, development, production and complete installation on site - end-to-end management of your project from a single source

## APPLICATIONS IN CORROSIVE ENVIRONMENTS

- Chemical processing industry
- Chlorine-alkali industry
- Acid production plants (sulphuric acid, phosphoric acid)
- Petrochemical industry
- Pharmaceutical industry
- Pulp and paper industry
- Power plants

## TYPE E – DIN 16965

# ALPHACOR® PURE FRP WITH OUTSTANDING PROPERTIES

ALPHACOR® is a special type of pipe laminate that is manufactured with a resin-rich inner layer and mainly reinforced with textile glass mats. The resin used is chosen according to the demands of the operating environment. Thanks to its special resin formulation, one typical area of application for the ALPHACOR® pipes is the chlorine-alkali electrolysis process.

### STANDARD RESIN SYSTEMS

#### UP RESIN (UNSATURATED POLYESTER RESIN)

Resin type: HET acid  
Resin product type: Viapal UP 797/59  
Viapal UP 797 special mixture

**Maximum approved application temperature: 100 °C**

#### VE RESIN (VINYL ESTER RESIN)

Resin type: Novolac epoxy  
Resin product type: Derakane Momentum 470-300

**Maximum approved application temperature: 130 °C**

Type E is also available as electrically conductive. Other resins are available upon request.

## TYPE D – DIN 16965

# KERAPOLIN® CLASSICAL MATERIALS TAKEN TO THE NEXT LEVEL

KERAPOLIN® is our durable branded material that consists of a chemical protection layer according to DIN or customer requirements and a supporting laminate made from glass-fibre-reinforced unsaturated polyester or vinyl ester resins. Suitable thermosetting resins are selected according to requirements and the operating environment. The laminate achieves adhesive shear strengths of up to 42 N/mm<sup>2</sup>.

### STANDARD RESIN SYSTEMS

#### UP RESIN (UNSATURATED POLYESTER RESIN)

Resin type: HET acid  
Resin product type: Viapal UP 797/59

**Maximum approved application temperature: 100 °C**

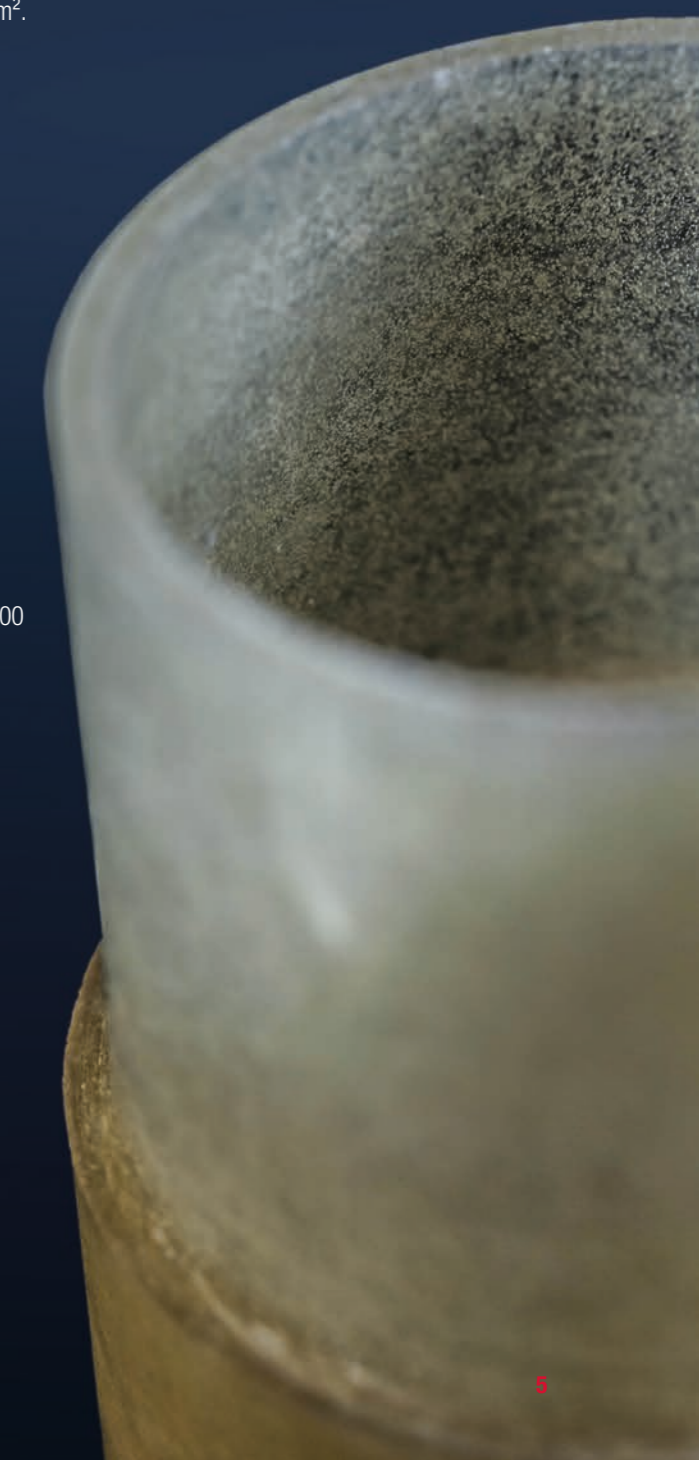
#### VE RESIN (VINYL ESTER RESIN)

Resin type: Novolac epoxy  
Resin product type: Derakane Momentum 470-300

**Maximum approved application temperature: 130 °C**

Type D is also available as electrically conductive.

Other resins are available upon request.



## TYPE B – DIN 16965

# KERAVERIN® CHEMICAL RESISTANCE TAKEN TO EXTREMES

KERAVERIN® is a proven composite material made from glass-fibre-reinforced unsaturated vinyl ester resin with a thermoplastic inner liner. The key component and main advantage of the system is the inner liner, which is precisely tailored to the specific chemical and thermal stresses. It is available in a variety of different materials. Our special bonding bridge between the inner liner and the FRP support laminate, which withstands different pressure situations and high temperature fluctuations, enables permanent system operation.



### STANDARD RESIN SYSTEMS

#### VE RESIN (VINYL ESTER RESIN)

Resin type: Bisphenol A epoxy  
Product name: Derakane Momentum 411-45

**Maximum approved application temperature: 85 °C**

#### VE RESIN (VINYL ESTER RESIN)

Resin type: Novolac epoxy  
Product name: Derakane Momentum 470-300

**Maximum approved application temperature: 130 °C**

#### VE RESIN (VINYL ESTER RESIN)

Resin type: Novolac epoxy  
Product name: Derakane 470HT-400

**Maximum approved application temperature: 160 °C**

#### THERMOPLASTIC LINER

Material	Notes	Material	Max. Temp. (°C)	bonding bridge (N/mm <sup>2</sup> )
PVC-U		Polyvinyl chloride	Max. 60 °C	7.0 N/mm <sup>2</sup>
PE	also electrically conductive	Polyethylene	Max. 60 °C	3.5 N/mm <sup>2</sup> *
PP		Polypropylene	Max. 95 °C	3.5 N/mm <sup>2</sup> *
PVC-C		Chlorinated polyvinyl chloride	Max. 95 °C	7.0 N/mm <sup>2</sup>
DEKADUR Plus		Modified PVC-U	Max. 90 °C	7.0 N/mm <sup>2</sup>

#### PARTIALLY FLUORINATED LINER

PVDF	also electrically conductive	Polyvinylidene fluoride	Max. 100 °C	5.0 N/mm <sup>2</sup> *
E-CTFE		Ethylene chlorotrifluoroethylene	Max. 110 °C	5.0 N/mm <sup>2</sup>

#### FLUORINATED LINER

PTFE-M	also electrically conductive; weldable	Modified Polytetrafluorethylene	Max. 160 °C	5.0 N/mm <sup>2</sup>
--------	--	---------------------------------	-------------	-----------------------

\* with SKC laminated fabric up to 7.0 N/mm<sup>2</sup>

	PE	PP	PVC	PVC-C	PVDF	E-CTFE	PTFE
<b>Non-oxidising acids:</b> Hydrochloric acid, hydrofluoric acid, phosphoric acid, acetic acid	+	+	+	+	+	+	+
<b>Oxidising acids:</b> Nitric acid, perchloric acid, hot concentrated sulfuric acid	0	0	+	+	+	+	+
<b>SiO<sub>2</sub>-dissolving acids:</b> Hydrofluoric acid	+	+	0	0	+	+	+
<b>Salts:</b> Sodium chloride, potassium chloride, iron chloride, copper sulphate, potassium cyanide	+	+	+	+	+	+	+
<b>Caustic solutions/bases:</b> Caustic soda solution, caustic potash solution, calcium hydroxide	+	+	+	+	-	+	+
<b>Aliphatic hydrocarbons:</b> Hexane, heptane, octane, isooctane	0	0	0	0	+	+	+
<b>Aromatic hydrocarbons:</b> Benzene, aniline, toluene, xylene	0	0	-	-	+	+	+
<b>Chlorinated hydrocarbons:</b> Carbon tetrachloride, dichlorobenzene, monochlorobenzene	0	0	-	-	+	+	+
<b>Esters:</b> Ethyl acetate, methyl acetate, isobutyl acetate	0	0	-	-	+	+	+
<b>Ketones:</b> Acetone, butanone	0	0	-	-	+	+	+
<b>Alcohols:</b> Ethanol, methanol, isopropyl alcohol	+	+	+	+	+	+	+
<b>Oils/fats</b>	0	0	+	+	+	+	+

+ resistant   0 conditionally resistant   - not resistant



Plant- and project-specific design and implementation is better than operating a complex production facility with the compromises of common standard solutions. Our customers have to meet high safety and environmental protection regulations, especially when transporting and handling highly corrosive, dangerous media.

## INDIVIDUALLY DESIGNED SYSTEMS

### PIPES, ELBOWS, T-PIECES, REDUCERS, FLANGES AND SPECIAL COMPONENTS

- Nominal sizes DN 25 to DN 600 – custom fabrication of other sizes on request
- Nominal pressure ratings of PN 1.6 to PN 16
- Temperature range -20 °C to 160 °C
- Standardised flange joints (according to DIN, COVESTRO or ASME) or laminated joints
- According to in-house standard (DIN compliant) or specific customer standard
- Safety requirements according to European PED

With every flanged connection, the risk of possible leakage increases. Creating long pipe sections only with flanged standard pipe lengths exponentially increases this risk. Because of this, Steuler has decided to eliminate these potential weak spots as far as possible in its designs and constructions. Flange connections are only used where they really make sense or are necessary. Long pipe sections are built with welded laminated joints. In this way, Steuler exploits the advantages associated with FRP pipes. The low weight of the pipe systems allows larger spans with reduced and lighter support structures. The high chemical resistance, high inherent stability and rigidity of FRP pipelines offer the possibility of building individually tailored and cost-effective systems.

### LOOSE FLANGES AND CONNECTING ELEMENTS

If flange joints are necessary, Steuler Plastic Linings uses loose flanges made from FRP or special steel grades to connect pipes in a sealed, but removable manner. Flanges for pipelines are designated according to their nominal pressure rating (PN) and standardised according to DIN EN 1092, Covestro company standard or ASME. In addition to very good chemical resistance, the connecting elements also have the best physical characteristics, such as high flexural strength, low specific weight and high impact strength.

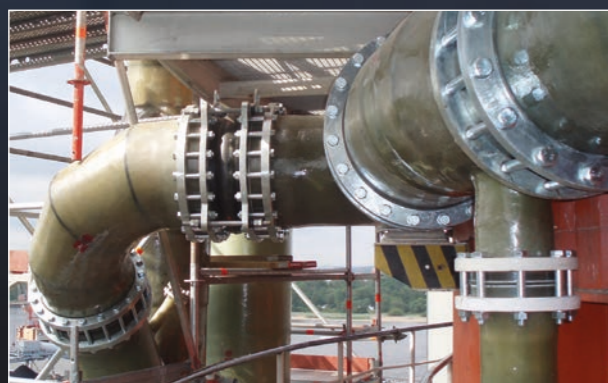


# PLANNING AND IMPLEMENTATION ACCORDING TO REQUIREMENTS AND ON CUSTOMER REQUEST

In addition to supplying materials, construction and static calculations, Steuler's range of services naturally includes on-time and safe project logistics, deliveries, site management and the professional assembly of all the necessary components and elements. Experienced Steuler fitters or technical advisors assemble, perform and document all necessary tests such as leakage, pressure and acceptance tests and supervise the commissioning on site.

- **Steuler is the one contact for all your requirements and wishes. Instead of involving and coordinating many service providers in your project, simply let us know what you need – Steuler will take care of the rest and ensure your project runs smoothly.**
- **Fast, flexible and on-time**
- **Our employees are SCC certified; welders and laminators are certified in accordance to DVS**
- **In many cases, it is not necessary to replace the entire component if it is damaged. A professional repair by Steuler is a cost-effective, efficient and safe alternative.**
- **We also offer service and framework agreements, reliable spare parts deliveries and regular inspections.**

As an international service provider of industrial corrosion protection solutions, Steuler is involved in tenders and major projects worldwide. Our engineers, fitters and technical advisors realise construction projects around the globe. We provide our customers with competent support at all times with our repair and maintenance service and offer specific solutions in order to keep their plants running and optimise production efficiency. You can rely on our support.



Ring piping made from PP/FRP for the flue gas scrubber in a power plant.



Stable, self-supporting pipelines made from KERA® with maximum chemical resistance.



Dekadur Plus header for use in chlorine-alkali electrolysis processes.



Piping system made from PTFE/FRP in the chemical industry.



# STEULER

Plastic | Linings

Together with its subsidiaries and representatives, Steuler offers a worldwide network that develops and implements comprehensive system solutions.

**Alphaplast, S.L.U.**

Spain

**CIMA S.r.l.**

Italy

**Ditescor S.A. de C.V.**

Mexico

**STEULER-KCH Polska Sp.z o.o.**

Poland

**Shanghai STEULER-KCH  
Anticorrosion Engineering  
Co., Ltd.**

China

**STEULER Chile SpA**

Chile

**STEULER-CTI N.V.**

Belgium

**STEULER-KCH Austria GmbH**

Austria

**STEULER-KCH France SARL**

France

**STEULER-KCH AUSTRALIA Pty. Ltd.**

Australia

**STEULER-KCH MAROC SARL**

Morocco

**Steuler-KCH Nordic AB**

Sweden

**STEULER-KCH SAUDI Co. Ltd.**

Kingdom of Saudi Arabia

**Steuler Técnica, S.L.**

Spain

**TECNICAS DE REFRACTARIOS, S.A.U.  
(TECRESA)**

Spain

**STEULER-KCH GmbH**

Plastic Linings

Berggarten 1

56427 Siershahn | GERMANY

+49 2623 600-341

plastics@steuler-kch.de

[www.steuler-linings.com](http://www.steuler-linings.com)