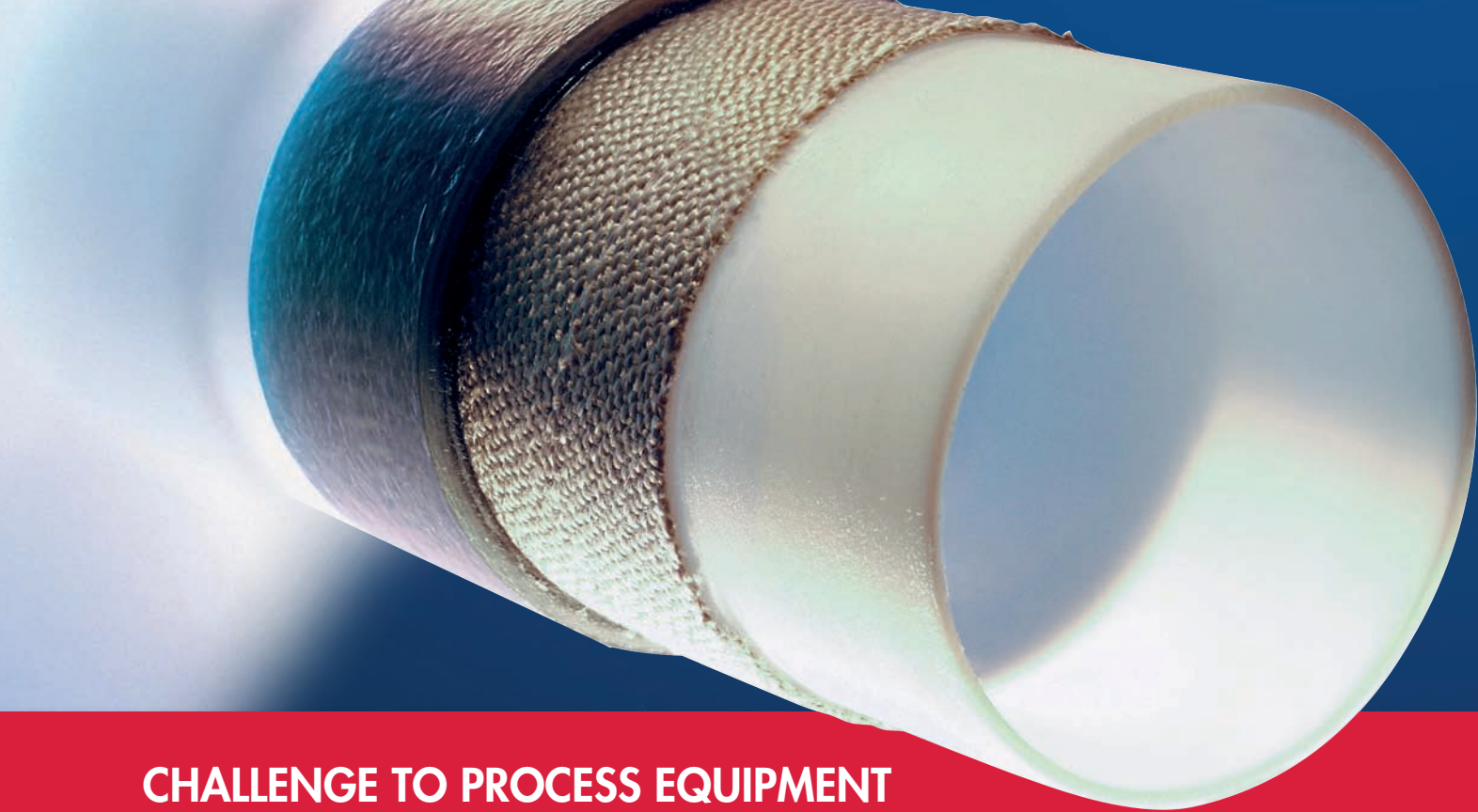




KERAVERIN® PTFE-M

Innovative dual laminate system meeting the highest standards



Areas of application:

- Production of complex and geometric shapes is possible, as the liner is also suitable for hot gas string bead and extrusion welding
- Significantly improved weldability
- Excellent weld factors
- Lower permeation than with conventional PTFE
- Bonding strengths at elevated temperatures above the characteristic value of composite systems
- Mechanical, thermal, and chemical stress tests with different prototypes showed that especially the adhesive strengths are above the characteristic values of composite systems with conventional liners

PTFE-M/GRP dual laminate structure of piping system

CHALLENGE TO PROCESS EQUIPMENT AND PIPING SYSTEMS

Due to the processes involved, process equipment and piping systems in chemical plants are exposed to extreme impact factors. As far as corrosion protection is concerned, aggressive media, different kinds of pressure, and high temperature fluctuations require solutions with properties that bolster chemical resistance and mechanical plus thermal constancy to ensure sustained safe plant operation.

These requirements can often be met by using fluoropolymers. We distinguish between partially and fully fluorinated plastics. Partially fluorinated plastics (e.g. PVDF or ECTFE) are common because they are relatively easy to process. Their chemical and thermal resistance is limited, however. Fully fluorinated plastics (e.g. FEP, PFA or PTFE), on the other hand, exceed the restrictions of the partially fluorinated plastics and possess nearly unlimited chemical resistance. From the group of fully fluorinated polymers, the extraordinary properties of modified polytetrafluorethylene (PTFE-M) make the material particularly suitable for corrosion protection in the modern chemical process industry.

Compared to classic PTFE, PTFE-M has almost always lower permeation values. Moreover, at temperatures above about 80°C, the permeation of modified PTFE is lower with technologically relevant media than that of PFA and FEP. At the same time, it has superior chemical resistance in limit ranges. Here is a list of the essential characteristics of modified PTFE at a glance:

- practically universal chemical resistance
- applications in a temperature range from –250° to 260°C
- no embrittlement, no ageing
- dense polymer structure, low permeability
- excellent dimensional stability and stress cracking resistance
- low stretch void index (SVI)
- low deformation under load
- good weldability
- very low foreign ion contamination (comparable to PFA high purity)

Conventional metallic equipment and piping systems are often found to be lacking in terms of sustainability and safety. For example, in glass- or PTFE-lined steel pipes, the flange joints are known to be weak and high-maintenance spots. Often permeation of media through the PTFE liner and the associated corrosion of the steel shell cannot be avoided. The so-called “loose” PTFE lining of the steel pipes is the reason why such systems have only limited vacuum resistance. Impact strength in glass-lined steel pipes in particular fails to meet expectations. Due to their high costs, pipework systems in exotic metals are used only for special applications.

Unique high-performance dual laminate material

With its KERAVERIN® PTFE-M materials system, STEULER-KCH is offering an innovative and trendsetting solution for piping systems and process equipment that is an alternative for conventional metallic constructions. Specifically in the field of piping systems, STEULER-KCH has managed to line a semi-finished pipe manufactured via paste extrusion from modified PTFE with a carbon fiber dual laminate fabric under special production conditions. Based on a patented method, the procedure is absolutely unique in its way. Along with the GRP reinforcement that is ultimately applied in the traditional way, the process yields a distinctive high-performance dual laminate piping system with bonding shear strengths of up to 10 N/mm². By employing the proper resin systems, it is possible to manufacture components that can be used up to a temperature of 200°C.

Moreover, complex geometric shapes can be created, as the liner made of modified PTFE is also suitable for hot gas string bead and extrusion welding. The weld factors achieved are excellent. Most notably, in addition to significantly improved weldability, a comparison with conventional PTFE shows that modified PTFE has much lower permeation.

In the past, the thermo-mechanical properties were determined for the system qualification and extensive prototype tests were performed with different piping elements under mechanical, thermal, and chemical stress. Specifically the bonding strengths at elevated temperatures were above the characteristic values of dual laminate systems with standard liners.



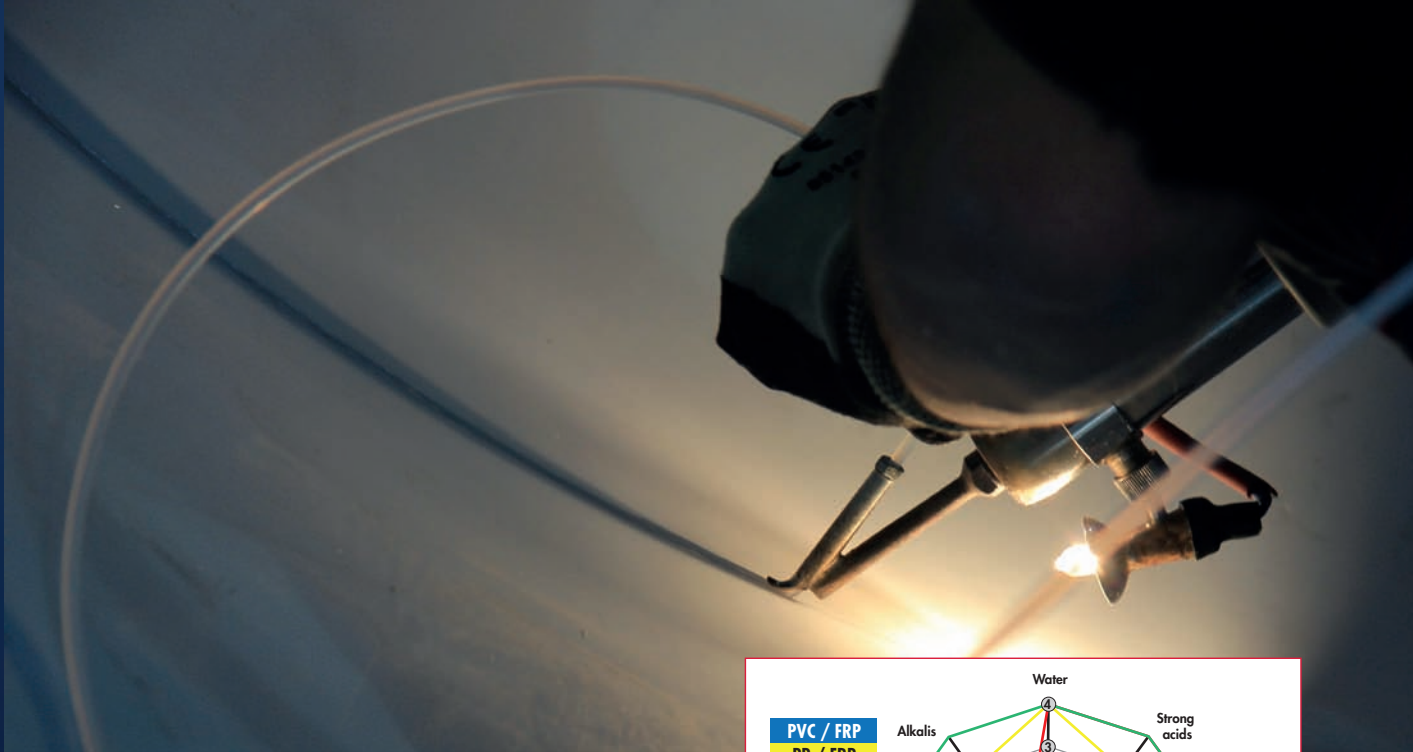
KERAVERIN® PTFE-M crosspiece after temperature change stress tests –50°C/+100°C



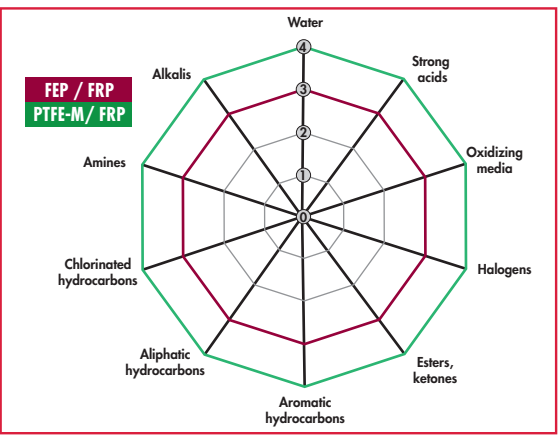
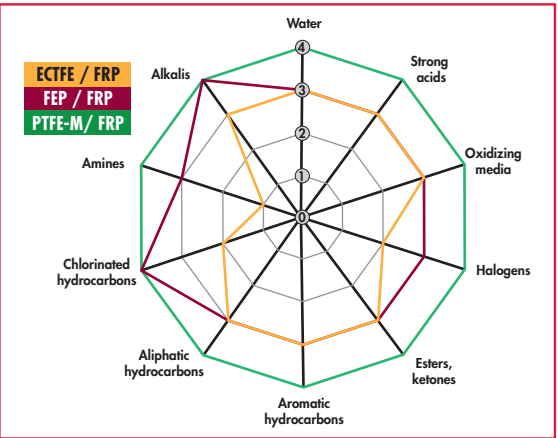
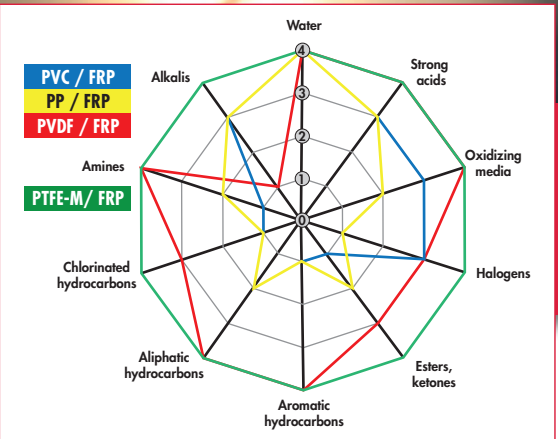
KERAVERIN® PTFE-M processing tank



KERAVERIN® PTFE-M pipe



KERAVERIN® PTFE-M Absorber





OUTSTANDING PROPERTIES

KERAVERIN® PTFE-M stands out for a wealth of exceptional properties.

Very economical thanks to

- long product life
- no maintenance
- simple processing and assembly
- excellent emergency operating properties

Wide range of application thanks to

- excellent chemical resistance
- high temperature resistance up to 200°C
- great mechanical strength
- high weather resistance
- individualized shaping
- optionally available: completely electrically conductive version

Placing great demands on the quality of production methods and materials is an integral part of STEULER-KCH's corporate philosophy. It is upheld by:

- certified quality assurance in all company divisions according to such standards as ISO 9001: 2008 and the Pressure Equipment Directive 2014/68/EU Module H/H1
- many years of experience
- own research and development

Ultimately this translates into a large degree of reliability and constancy to ensure sustained and safe plant operation. The innovative material is therefore particularly recommended when working with extremely corrosive media and high temperatures.

SYSTEM SOLUTIONS FROM ONE SOURCE

Materials-related competence and consultation, technological know-how, interdisciplinary development work on the one hand and design, production, and assembly on the other combine to form an unlimited full-service portfolio. STEULER-KCH thus covers the entire spectrum of industrial corrosion protection in piping system and apparatus construction from planning all the way to the finished product – with the obvious advantages for customers, who have a single contact for all questions and issues.

With the development of the PTFE-M/GRP systems, STEULER-KCH once again underscores its claim as a manufacturer of premium products, but also and especially as a committed partner and problem solver for its customers as well as an important innovator in the market.



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Together with its international subsidiaries and representatives, STEULER-KCH offers its customers a worldwide network which develops and implements comprehensive system solutions.

SURFACE PROTECTION

Lining and flooring systems
Cements, jointing materials,
brick and rubber linings

PLASTICS ENGINEERING

Equipment, piping and tanks made of
duroplastics and thermoplastics
Thermoplastic lining systems

REFRACTORY SYSTEMS

High temperature refractory linings

POOL CONSTRUCTION

STEULER-Q²-System



Siershahn site



Höhr-Grenzhausen site

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Focus on Progress