POLYFLURON® PTFE lined columns/vessels and internals

Dr. Schnabel GmbH, a wholly owned subsidiary of SGL Carbon SE, has more than 60 years of experience in the manufacture of POLYFLURON-lined steel columns, vessels and internals in hundreds of plants. POLYFLURON is a PTFE polymer that offers the highest chemical resistance and is therefore the material of choice for corrosion protection.

Our unique offer includes the development, engineering and manufacture of POLYFLURON-lined equipment and components as well as complete packages with process internals. Internals are available from our broad material scope of PFA/PTFE, graphite or carbon fiber-reinforced carbon (CFRC). This allows us to offer our customers cost efficient solutions that utilize the advantages of extraordinary material properties.

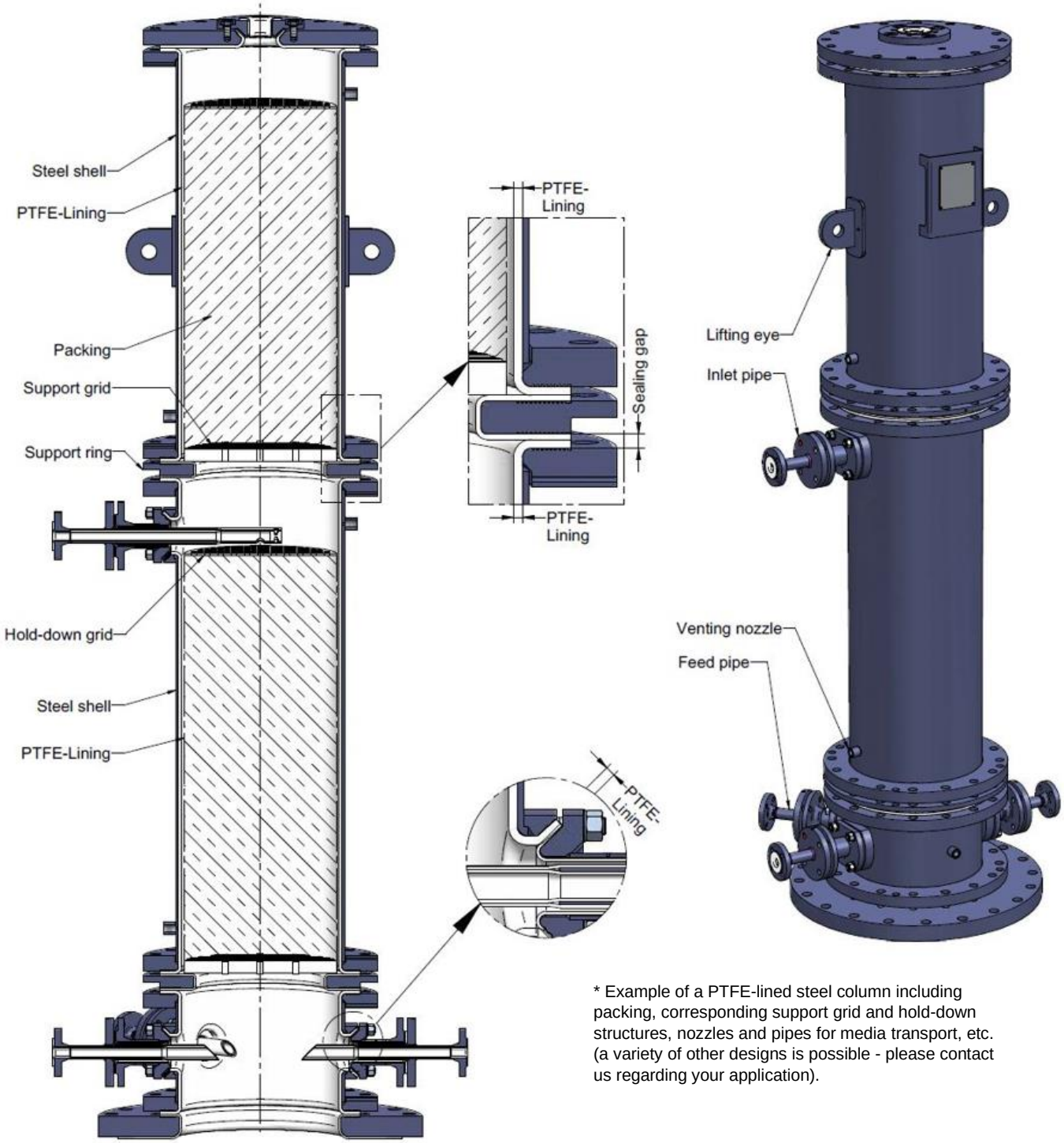
Application examples

Steel columns lined with POLYFLURON PTFE can be used for distilling, rectifying (evaporating, condensing), absorbing, quenching, washing or desorbing liquids or liquid mixtures. These liquids can be extremely corrosive media such as hydrofluoric acid (HF), hydrochloric acid (HCl), sulfuric acid (H_2SO_4), phosphoric acid (H_3PO_4) as well as their intermediate products and derivatives, which result directly or indirectly during their production or processing.

In addition, we also offer PTFE-lined containers such as storage tanks and reactors. Due to the excellent chemical resistance of POLYFLURON PTFE, our devices are used, in particular, in the chemical and pharmaceutical industries as well as in the agrochemical, food, electronics, solar and environmental industries and many other further areas of application.

Customer benefits

- **Extreme corrosion resistance:** meets extreme demands for corrosion resistance by using materials of the highest quality
- **Reliability and safety:** very high operating reliability and safety, e.g. due to the lowest permeation and diffusion rates, by active permeation management with an advanced venting system and long segment lengths (less flange connections)
- **Robustness:** insensitive to thermal shocks and mechanical stress (clear advantage over e.g. enameled appliances)
- **Convenience:** cost-efficient overall solutions including high-performance internals such as distributors, grids, bubble cup/tunnel trays, raschig rings, packings etc. made of PTFE, PFA, graphite or innovative carbon fiber-based materials
- **Cleanliness:** fewer deposits due to anti-adhesive properties; no back diffusion of metal ions into the process medium, e.g. for high-purity sulfuric acid applications
- **Flexibility:** most advanced PTFE welding technologies on the market for e.g. complex geometries, on-site repairs, large dimensions, etc.



* Example of a PTFE-lined steel column including packing, corresponding support grid and hold-down structures, nozzles and pipes for media transport, etc. (a variety of other designs is possible - please contact us regarding your application).

Data on POLYFLURON® PTFE columns and containers

Typical properties	Units	POLYFLURON columns and vessels
Main application		Corrosive and/or high-purity applications (POLYFLURON PTFE can be supplied FDA-compliant)
Typical design		Steel shell with loose PTFE lining
Lining material option		Skived foil or paste-extruded (using Dr. Schnabel GmbH's proprietary process)
Available lining thickness	mm	4, 6 or 8
Liner base materials		PTFE white or antistatic (electrically conductive)
Typical section diameter*	mm	up to 3000 (seamless up to DN 600)
Typical section lengths	mm	up to 3500 (depending on diameter)
Special features		Complex geometries possible Robust designs with linings of up to 8 mm in thickness Easy to repair (e.g. repair options, relining on site, etc.) Antistatic PTFE possible Advanced welding techniques (automated and manual welding techniques)
Typical temperature range	°C	up to 250
Typical design pressure	barg	0/16
Active permeation management		Proprietary vent system integrated
Vacuum resistance		Options for vacuum stabilization of the lining: support rings/cylinders, counter vacuum
Internals options		Complete range of high-performance internals made of PTFE, graphite, CFRC, e.g. feed pipes, liquid (re)distributors, bubble cap or tunnel trays, support and hold down grids, etc.
Internals options - support rings		Internals are fitted via PTFE-lined support rings that are bolted to the upper section. This special design allows dismantling without the need to remove the packing above or the distributor.
Cover options		Flat, conical
Standard connections		DIN/ANSI/JIS
Shell materials		Carbon steel, special steels, stainless steels, carbon steel with coating, etc.
Typical regulations		PED 2014/68/EU / AD-Merkblatt; ASME; others on request

* larger diameter on request

SIGRABOND Chemical column internals

SIGRABOND Chemical is a modern, high-strength, temperature resistant composite material made of carbon fibers in a polymer or carbon matrix. It offers significant customer benefits in both technological and economic terms and outperforms most other conventional materials.

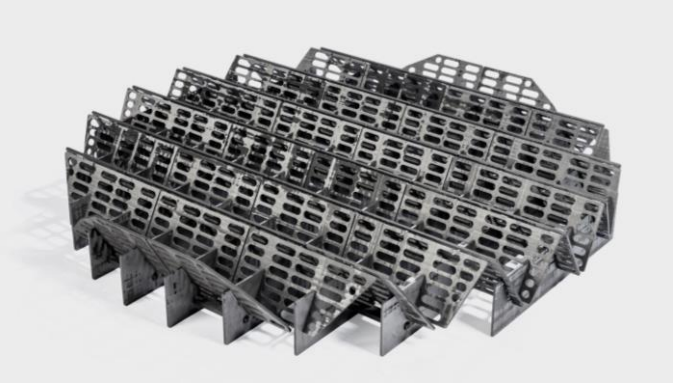
SGL Carbon has developed a whole range of innovative column internals:

- Liquid distributors
- Liquid collectors
- Structured packings
- Support grids
- Retaining grids
- Feed pipes for liquids and gases
- etc.

By working with leading global suppliers, SGL Carbon combines unique know-how in the areas of column internals and materials expertise.

Customer benefits

- Minimal pressure loss: free cross-sectional area >90% for support grids and >50% for distributors, even with high mechanical loads (up to 50t) and column diameters >3m
- Reliable performance: permanent dimensional stability at high temperatures up to 1000°C even with rapid changes in operation, important e.g. for liquid distributors
- Easy handling: carbon fiber-based composite material enables constructions with up to 10 times less weight than constructions made of conventional materials
- High degree of freedom in design: customer-specific segmentation of internals from individual components to fully assembled one-piece internal



↑ SIGRABOND (CFRC) support grid for packed columns

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Certified Service Partner
DIABON® I POLYFLURON®

sgl carbon

In addition to our global presence via service centers, we offer our lifecycle service through certified service partners. The objective is to ensure maximum availability and minimum response time for our customers worldwide. All external service partners are continuously trained and equipped to provide standard maintenance activities with the same quality as our service centers. In any case, our partners are always available to take care of your requirements and needs on site.

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