

GLASS-LINED
INSTRUMENTATION

FOR HIGHEST
STANDARDS

MAX



MIN

Pfautler Group

One single source responsibility with access to all Pfautler Technologies, Solutions, Services worldwide



Since 1884, Pfautler has grown to be a truly **global, multinational and diverse company** with approximately 1,400 employees and manufacturing facilities in nine countries on four continents, encompassing the Pfautler, Montz, Edlon, GMM Pfautler and Mavag brands.

Pfautler Technologies and Solutions can be found around the globe. They are installed in more than **100 countries and across six continents**. Chemical and pharmaceutical companies around the world rely on the quality, durability and performance of our Technologies to ensure their chemical process systems are efficient, reliable, profitable and safe.

The name Pfautler has become synonymous with chemical processing and corrosion resistance. You will find examples

of the results of our advanced thinking throughout all areas of typical chemical and pharmaceutical plants because our portfolio of technologies covers all chemical unit operations.

Years of experience and highly qualified services are the basis for innovative and economic solutions for your requirements in the area of process equipment and systems.



Pfautler Technologies
We help make the world around us. Much of what you see, taste and touch in the world was created or improved using Pfautler Technologies

Pfautler Services
We provide 24/7 support for your entire plant

Pfautler Solutions
We design and build turn-key process

Pfautler Innovation
Our innovative spirit continuously drives us to develop the next great technology

Sectors and Applications

Advantages of the glass-lined measurement technology

Sectors

In the **chemical and pharmaceutical industries**, Pfaudler has been synonymous with glass-lined vessels and components for decades. But glass-lined measurement technology offers **decisive benefits in other sectors** as well.

Applications

Did you know that many **daily consumer products** are made using Pfaudler technology? Here are just a few examples.

Beer · Yoghurt · Cheese · Rice · Sugar · Mayonnaise · Cheese spread · Herb butter · Ketchup · Mustard · Crème fraîche · Jam · Syrup · Paper · Glue · Cream · Shampoo / shower gel · Hair perming products · Plant protection products

Sectors	
Chemicals	Beverages
Petrochemicals	Water / wastewater
Pharma	Paper
Energy	Cosmetics
Food	Metal industry



Technology and Benefits

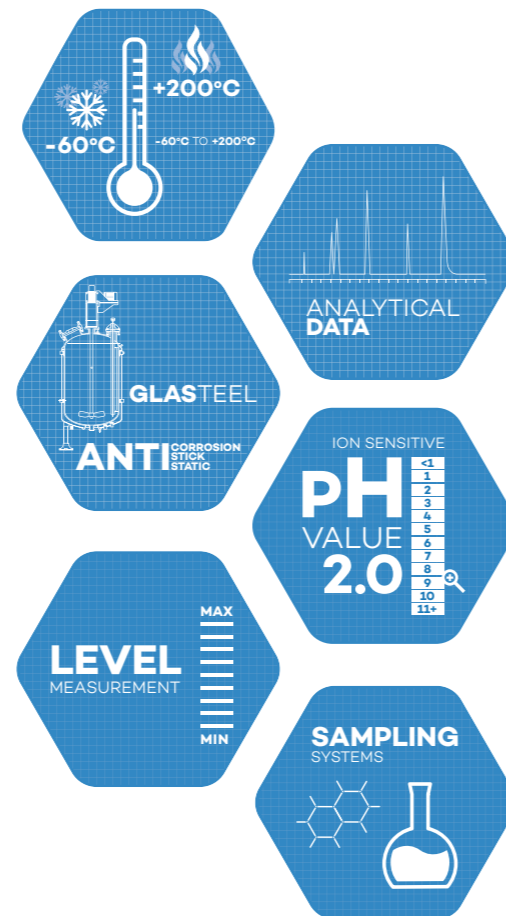
Advantages of the glass-lined measurement technology

Technology

Glass lining is a unique composite material that optimally combines the advantages of steel and glass. As a result, it not only offers outstanding protection against many aggressive media, but it is also abrasion-, pressure- and temperature-resistant. **This makes glass lining the perfect material for protecting measurement technology in demanding applications.**

But glass lining can do even more. Specially developed formulations react to H⁺ ions in liquid media, which makes them suitable for **pH measurement.**

Embedding sensors in the glass lining not only delivers **redox potential** and **conductivity measurements** but also ultra-fast reacting **temperature measurements** and **corrosion monitoring.**



Benefits

Highly resistant glass layer

- Resistant to aggressive acids, organic solvents and proteins
- Resistant to Cleaning In Place (CIP) and Sterilisation In Place (SIP) processes
- Resistant to abrasion
- Resistant to high temperatures
- Resistant to thermal shocks
- No catalytic or biological effects

Self-cleaning

- Prevents deposit formation with adequate flow velocity
- Suitable for adhesive products

Durable

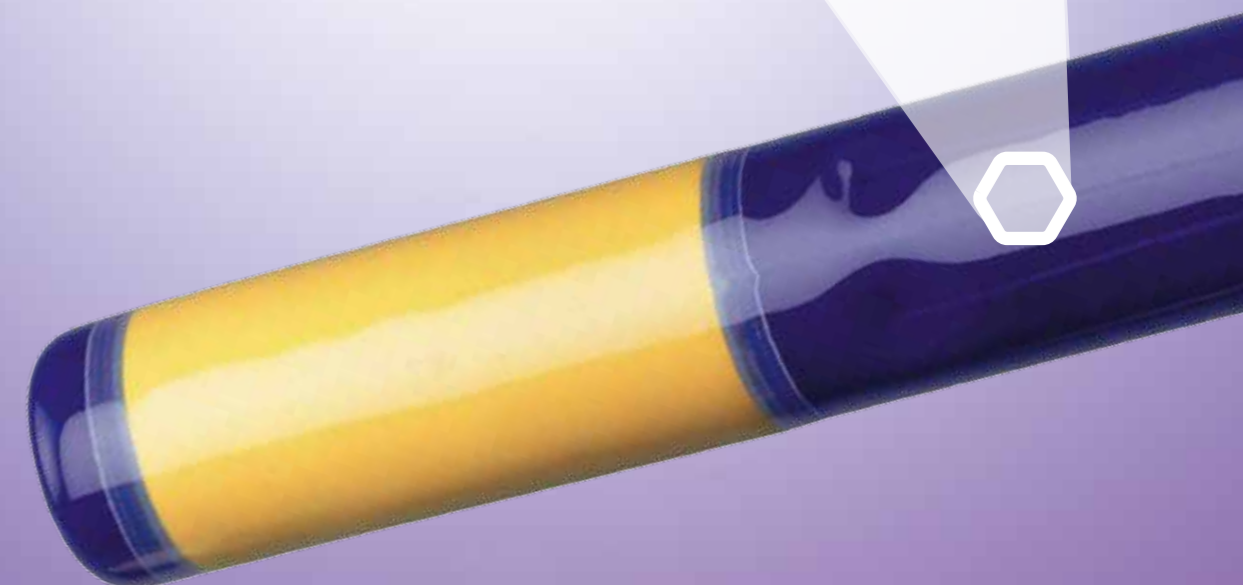
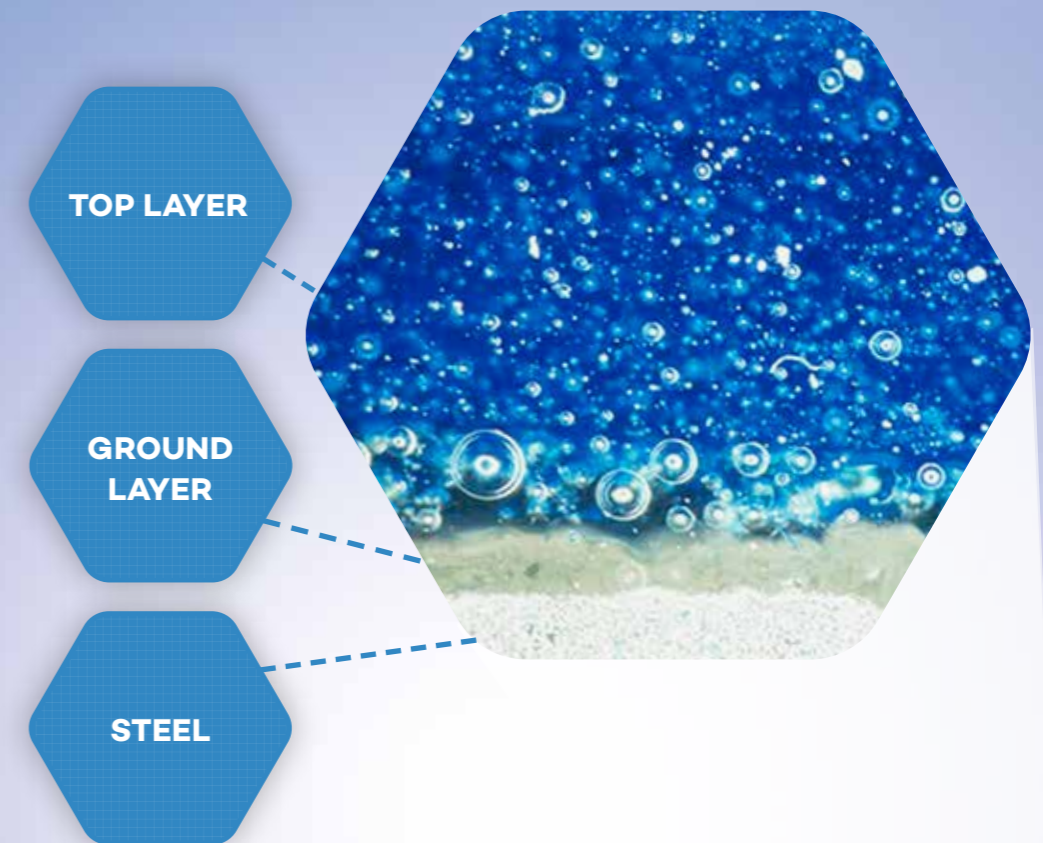
- Service life limited only by glass corrosion or abrasion

Robust steel body

- Withstands turbulences, shear forces and high process pressures
- Allows continuous inline monitoring
- No need for bypass lines, pumps, shutoff devices or retractable holders

Low maintenance

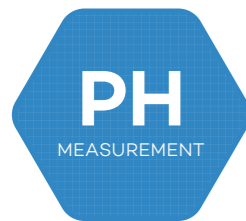
- No change in the pH characteristic curve over the entire service life
- Lower costs for recalibrations and cleaning processes
- Positive pressure effectively prevents diaphragm and electrolyte section contamination
- Maintenance intervals of up to one year
- Can be stored dry



Liquid Analysis

Because glass has its limits

Online liquid analysis permits automated monitoring and regulation of industrial processes in many sectors. In addition to pH, other important process control parameters include redox potential and conductivity. Pfaudler offers **solutions for challenging applications** in this field – because anyone can do the easy ones!



pH measurement

Whenever robustness and chemical resistance are key, Pfaudler's **low-maintenance and durable pH measurement systems** are your first choice. We supply probes in various designs for virtually all process engineering applications. For hygienic processes, we offer specially developed probes with EHEDG certification.

- High mechanical strength and suitable for use in high temperatures
- Proof against glass breakage
- Can be used without a retractable system or bypass installation
- CIP and SIP compliant
- Self-cleaning and low-maintenance



Redox potential measurement

The redox potential generated in oxidation and reduction processes can be determined by means of **robust glass-lined probes**. For this purpose, a rhodium electrode is embedded in the glass lining. By combining two measurement systems on one probe you can measure the pH and the redox potential concurrently.

- High mechanical strength and chemical resistance through the use of glassed steel and fused-in rhodium electrodes
- Suitable for high temperatures
- Dirt-resistant
- Combination with pH measurement possible



Conductivity measurement

The conductivity of a medium can be determined with a **durable glass-lined probe** in a 4-conductor circuit. To achieve this, four rhodium electrodes are arranged behind each other on a measuring probe and fused into the probe carrier's glass lining.

- Wide measurement range 0.01 mS to 2000 mS
- Suitable for high temperatures
- Standard use at up to 40 bar positive pressure
- Dirt-resistant
- Suitable as ring probe for phase separation and 'empty' signal

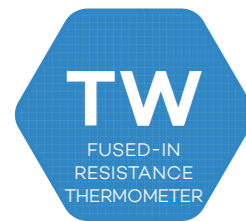


Temperature Measurement

Sometimes speed is key

Early recognition of process temperatures enables you to regulate it precisely and minimise fluctuations. Lower energy input and lower energy losses result in **well-balanced energy management** and therefore **lower costs**. Various technologies are available, depending on the application.

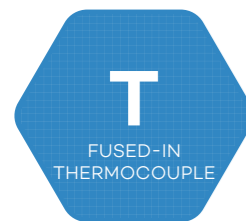
Quick measurement results are essential for optimal temperature control. Pfaudler's fused-in glass lining solutions offer a clear advantage – they are in contact with the medium. Sometimes speed is key!



Fused-in resistance thermometer

The functionality of Pfaudler's type TW temperature probe relies on the temperature dependence of the electric resistance of platinum. The platinum measuring unit, a PT 100 resistance thermometer, is fused into the glass lining of baffles or thermometer wells, providing an **optimal heat transfer**. Compared to conventional glass lined temperature measurements the heat transfer coefficient of fused-in sensors is lower, ensuring extremely low half-value times.

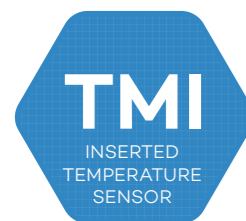
- **Fastest** glass-lined temperature probe
- **No sealing** elements
- **Long service life**, excellent long-term stability and maintenance free



Fused-in thermocouple

In the Pfaudler type T temperature probe, the temperature is measured exactly where it is needed. A Pallaplat thermocouple is fused into the glass lining of C-baffles or valve cones, providing an **optimal heat transfer**.

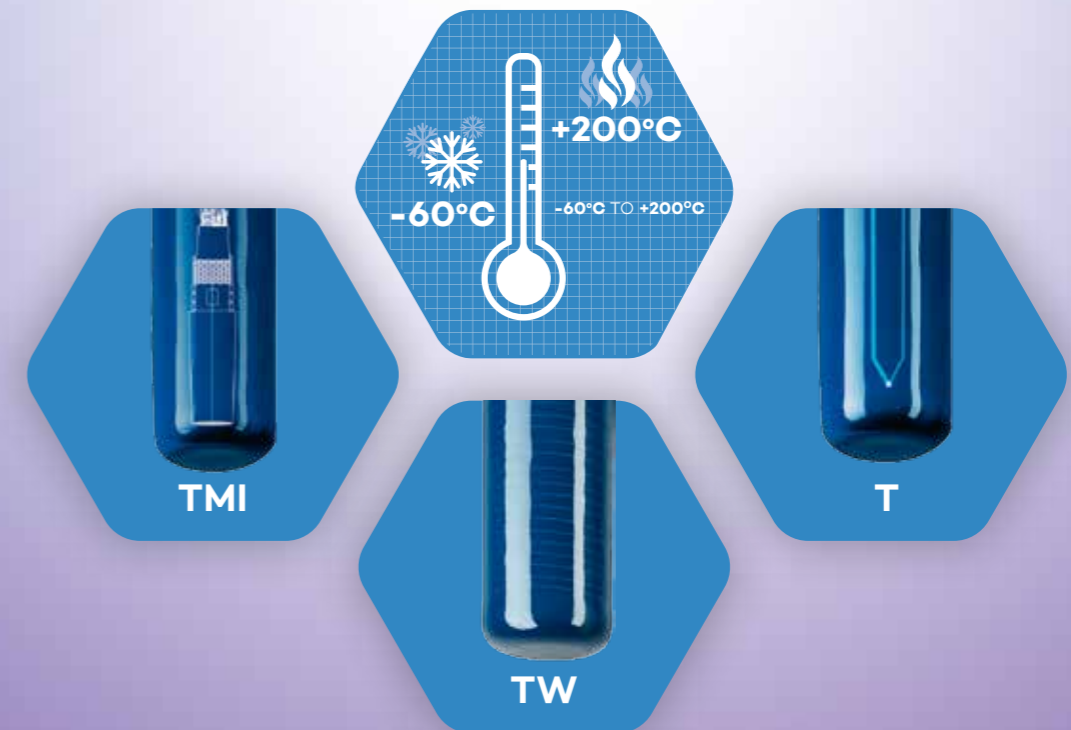
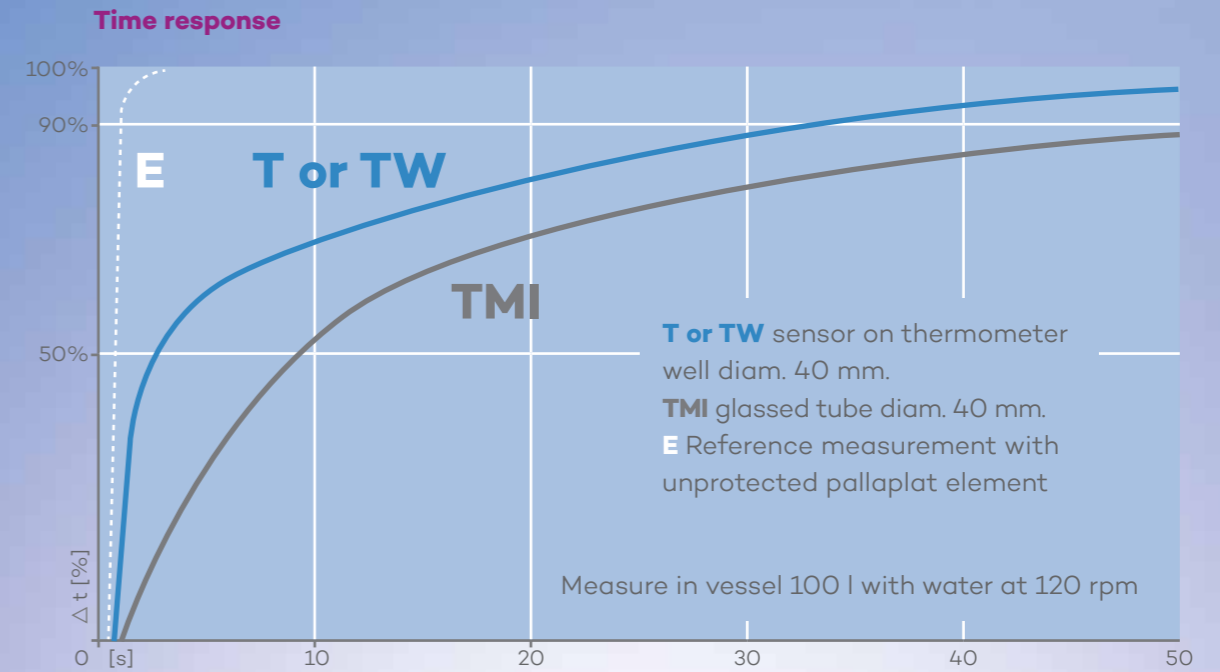
- Up to **six measurement points**
- **No sealing** elements
- **Long service life**, excellent long-term stability and maintenance free



Inserted temperature sensor

Pfaudler's type TMI temperature probe is a **robust, simple and cost-effective solution** for measuring temperature. The measuring insert – a resistance thermometer – is pressed by spring action to the bottom of the baffle or valve cone.

- **Reduced wall thickness** and coated contact point for improved heat transfer
- Measuring insert is **easy to replace** and recalibrate



Corrosion Monitoring

The right decision

The **Pfautler** technology not only enables you to monitor glass-lined surfaces but also other corrosion-resistant surfaces (e.g. **PTFE-coated**) of reactors including fittings. Thanks to the implemented logic, false alarms are ruled out and you can obtain reliable information about the condition of the reactor and the systems connected to it in all viable cases. Solutions are available for continuous corrosion monitoring and systems for periodical corrosion testing.

Continuous corrosion monitoring

Continuous corrosion monitoring can be carried out with measuring electrodes fused into the glass lining of baffles and valve cones – the **P-probe** – in conjunction with the associated electronics – the **Corrosion Detector**.

This not only enables you to monitor glass-lined surfaces but also other corrosion-resistant coatings (e.g. PTFE) of reactors and their fittings. Thanks to the implemented logic, **false alarms are ruled out** and you can obtain reliable information about the condition of the reactor and the systems connected to it in all viable cases.

Mobile corrosion testing

The **Corrosion Detector Portable** offers corrosion testing according to a maintenance plan or when required, and tolerates electrically conductive fittings. The hand-held device is supplied with a PTFE dip probe, a reference electrode and an earthing clamp. Measurements can be transmitted to a PC using the USB adapter cable provided. The associated software is provided on a USB stick.

- Principle of **decomposition voltage analysis**
- Measurement **not influenced by electrically conductive fittings**
- Control measurements **rule out false alarms**
- Certified for explosion zone 0

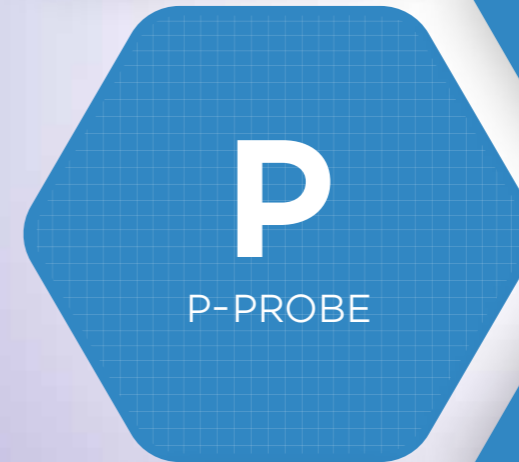
- Principle of **decomposition voltage analysis**
- Measurement **not influenced by electrically conductive fittings**
- Control measurements **rule out false alarms**
- Can store up to 10,000 measurements
- Certified for explosion zone 1



CORROSION DETECTOR PORTABLE



CORROSION DETECTOR



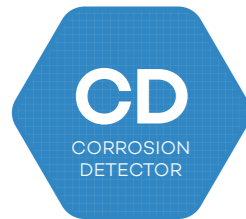
P
P-PROBE



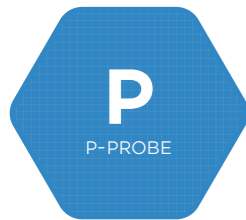
ON ROD-PROBE OR BAFFLE



ON VALVE STEM



CD
CORROSION DETECTOR



P
P-PROBE



CDP
CORROSION DETECTOR PORTABLE

Level Measurement

Fast, precise, durable

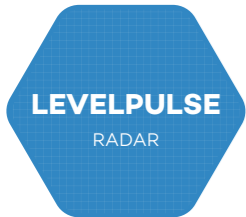


Continuous level measurement

Capacitive

Our FS probe type uses the capacitive method. A fused-in electrode strip forms a capacitor with the steel tube. If the probe comes into contact with product instead of air in the vicinity of the electrode, the capacitance changes.

- High mechanical strength and chemical resistance through the use of glassed steel
- No sealing elements



Radar

Levelpulse radar sensors emit microwave signals, and are used for continuous level monitoring of corrosive fluids in reactors.

- Low transmission frequency – insensitive to product deposits
- Accurate measurement even in the presence of temperature fluctuations
- Adjustment without filling or emptying the reactor



Limit level measurement

Capacitive

The FT measuring probes follow the capacitive principle. The electrode used for this purpose is annular. Applications range from full and empty alerts for vessels and detection of interlayers to protecting pumps from running dry.

- High mechanical strength and chemical resistance through the use of glassed steel
- No sealing elements



Vibration

Safety Swings rely on the tuning fork principle to achieve a limit level measurement that is accurate to the millimetre – regardless of the medium's density and viscosity. The probe can be used as a maximum limit switch, as an additional overfill safety device, as a minimum limit switch or as protection against running dry.

- High mechanical strength and chemical resistance through the use of glassed steel
- Works perfectly even in foam, bubbles and suspended particles
- Certified as an overfill safety device under WHG (German Water Management Act)



Sampling Systems

Reliable, maintenance free, variable

Generally, sampling systems are used as an alternative for the online liquid analysis. It is crucial here that the production process is not interrupted, that no contamination occurs and that surfaces which come into contact with the product are protected against aggressive media. Yet another area in which the glass lining from Pfaudler comes into its own.

The fleXampler loop used in combination with the Pfaudler Quatro-Pipe, for example, provides a complete measuring system with which samples are taken and temperature, pH value and corrosion monitoring are measured or monitored at the same time. And all of this with just one vessel nozzle.

FLEXAMPLER STANDARD

fleXampler

The fleXampler standard sampling system is the ideal solution for the reliable and closed sampling of fluid media from reactors and vessels. A Dip-Pipe or a Quatro-Pipe baffle is mounted on an available vessel nozzle. The sample can be taken by inserting the PTFE suction hose into the Quatro-Pipe or Dip-Pipe. The connection on the lower flange of the fleXampler sampling system enables the use of the Dip-Pipe or Quatro-Pipe to inject fluid media.

- Modular design
- Large outlet for sampling
- Parts with PFA internal coating (FDA-certified)
- TA Luft (Clean Air Act) compliant
- Options
 - Design with recirculating pump
 - Automatic control with motorised valves
 - Sampling flask cage

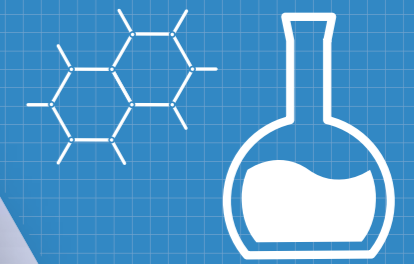
FLEXAMPLER LOOP

fleXampler loop

The fleXampler loop continuous sampling system really comes into its own when used with a Quatro-Pipe baffle, as this configuration only requires one vessel nozzle for two or more functionalities. The sample is taken near the agitator by means of an internal PTFE tube. All parts that come into contact with the product are metal-free. Thanks to the constant circulation (loop), there is no need to clean the sampling device. The loop circulation system also offers the option of integrating a pH-ring probe without any effort or expense.

- Maintenance-free and self-cleaning for representative results
- Suitable for viscous substances
- Piston syringe with glass cylinder for quick visual inspection
- No escape of gas or product
- Compressed air diaphragm pump with diaphragm monitoring designed for zone 0
- Surfaces in contact with product have highly corrosion-resistant coating (glass lining, PFA, PTFE)

SAMPLING SYSTEMS



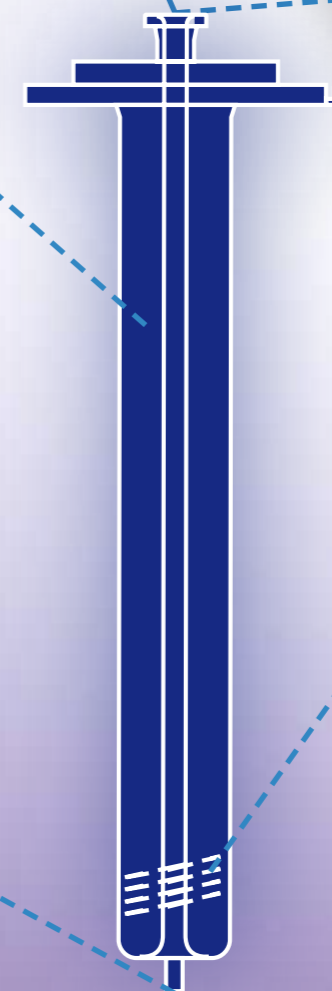
FLEXAMPLER LOOP



FLEXAMPLER STANDARD



QUATRO-PIPE BAFFLE



PROBE

DIP-PIPE

Global Services Capability



Pfaunder guarantees a global service during the whole process, pre and post sales, with the largest service organization in different sectors.

Our Service Centers are close to your site to guarantee fast and flexible services. More than 150 people are at your service. We are present in several countries with field engineers who can provide you with comprehensive support for installation, commissioning and maintenance of your facilities and plants.



Our Services

From comprehensive engineering and technical services to our rapid, reliable field services and aftermarket parts supply, you can count on us to keep your process system operating properly:

Engineering

- Consultancy Services
- Pilot testing / toll operation
- Process engineering

Installation, Commissioning, Start up

- Planning
- Project management
- Installations
- Lining measurement technologies

Maintenance and aftersales

- Maintenance & repair
- Troubleshooting
- Glass inspection, reglassing and repair
- Shutdown services
- Spare / Replacement parts
- Mechanical seal exchange

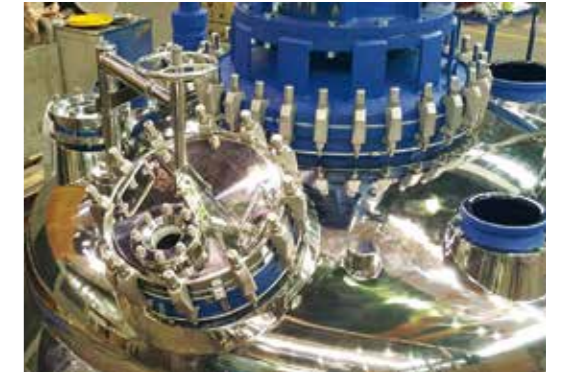
Pfaunder Safety First

Delivering excellent safety performance is necessary for any company operating in the process industries. Over the years, and all over the world, Pfaunder has provided security in its products and highly-qualified service teams.

We are committed to safety and our field service organization that provides installation and maintenance for your facility, has developed strict safety policies to ensure a safe working environment.

Pfaunder guarantees:

- skilled professionals properly prepared and qualified on security and risk management
- observance of international standards
- use of professional personal protective equipment
- reduced operating risks



Refurbishing, reglassing and inspection

In addition to its expertise in manufacturing and market products and engineered solutions, Pfaunder has core expertise in the service area of full equipment refurbishing. The reactors are completely reglassed, refurbished combined with a suitable retrofitting of all devices or accessories, producing an appropriate program to meet specific customer needs and timeframes. All this is in compliance with international and European standards. Our technicians provide a complete glass lining inspection program to ensure that your reactor is in proper condition for safe and efficient operation.

Our commitment to quality components means that our technologies are often in service for many years. However, our pioneering approach means that during this time we have developed new solutions. Whether your process is changing or you are looking to further optimise performance levels, an upgrade to our new technologies can improve the capabilities of your reactor.





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Pfaudler 
Defining the standard