



# Group Presentation

[www.gmmpfaudler.com](http://www.gmmpfaudler.com)

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# Global Capabilities for the Process Industry

GMM Pfaudler is a global group offering a wide range of corrosion-resistant technologies, systems, and related services for the chemical, pharmaceutical, food, and energy sectors.

PFAUDLER, NORMAG, MAVAG, MIXION, INTERSEAL, EQUILLOY and EDLON are our Branded Product Lines. A broad portfolio, specialized and perfectly integrated to meet the most complex Client needs by delivering high-quality and sustainable solutions.

Technologies and process systems of our Group are installed in more than 100 countries and across 4 continents. Unique expertise and skills, 14 manufacturing locations, targeted investments in strategic markets, innovation and competitiveness allow the GMM Pfaudler group to be a landmark in the industry.

# Our Group

Corporate Brand



Branded Product Lines

**PFAUDLER** **NORMAG** **MAVAG** **MIXION** **INTERSEAL** **EQUILLOY** **EDLON**

Glass-Lined Technology

Lab & Process Glass

Filtration & Drying

Mixing Technology

Sealing Technology

Alloy Process Equipment

Fluoropolymers



## Our Business Functions



We design and build turn-key process systems.

Our system offering branch provides reaction systems, evaporation and distillation systems, acid recovery systems, filtration and drying systems, extraction systems, and more.



We provide 24/7 support for your entire plant.

Our services branch ranges from the provision of parts and maintenance to complete process solution delivery, including conception, design, and installation.



## Our Vision

To become the preferred partner of critical process technologies, systems and services for the pharmaceutical and chemical industries by delivering high quality and sustainable solutions.

## Our Mission

We use our corrosion-resistant expertise as a cornerstone for developing a broader portfolio offering while respecting the environment, uniting our people and creating value for all our stakeholders.

## Values

### Innovative

We provide unique and innovative technologies, systems and services that deliver high-value solutions to our customers.

### Inclusive

Our people are the force driving our ability to do and achieve more. We value diversity and provide a real opportunity to cultivate meaningful relationships.

### Reliable

We are committed to consistently delivering on our promise of expertise in the technologies, systems, and services we offer.

### Dynamic

We are always on the move, anticipating technology and customers' needs as they change

### Respectful

We use our expertise to strengthen our product portfolio while respecting our people, our communities, and the environment, creating value for all our stakeholders.

Creating behaviours and mindsets that are dynamic, being innovative with our offerings, putting inclusivity at the heart of our people practices, and being a trusted and respected partner are the values that drive us at GMM Pfaudler.

Our values are an attitude that defines our culture and will help us make big moves.

## Contents

**GMM**  
**Pfautler**

Overview &  
global footprint

**PFAUDLER**

— Glass-Lined Technology

**NORMAG**

— Lab & Process Glass

**MAVAG**

— Filtration & Drying

**MIXION**

— Mixing Technology

**INTERSEAL**

— Sealing Technology

**EQUILLOY**

— Alloy Process Equipment

**EDLON**

— Fluoropolymers

**GMM**  
**Pfautler**  
**Systems**

**GMM**  
**Pfautler**  
**Services**

**GMM**  
**Pfautler**



# Manufacturing sites worldwide

[www.gmmpfaudler.com](http://www.gmmpfaudler.com)

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## Group presence in Europe

Pfaunder GmbH  
Waghäusel, Germany



Glass lined equipment

Pfaunder S.r.l.  
Torre Di Mosto, Italy



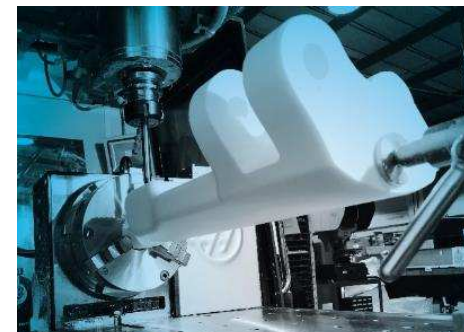
Glass lined equipment

Pfaunder Limited  
Leven, United Kingdom



Glass lined equipment  
& Fluoropolymers

Pfaunder Limited  
Bolton, United Kingdom



Gaskets & PTFE  
components



## Group presence in Europe

Mavag AG  
Neunkirch, Switzerland



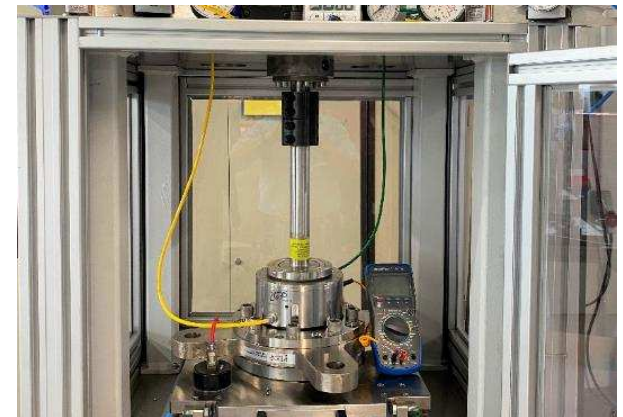
Filters, dryers & agitators

Pfaudler Normag Systems GmbH  
Ilmenau & Hofheim, Germany



Glassware Parts & Systems

Pfaudler interseal GmbH  
Hofheim-Wallau, Germany



Sealing Technology

## Group presence in the Americas

GMM Pfaudler US Inc.  
Rochester, NY, USA



Glass lined and alloy equipment

Edlon Inc.  
Avondale, Pennsylvania, USA



Fluoropolymers

Pfaudler Ltda.  
Taubaté, Sao Paulo, Brazil



Glass lined equipment

## Group presence in Asia

Pfaunder Process Equipment Co. Ltd.  
Li Yang City Jiang Su , PR China



Glass lined equipment

GMM Pfaunder Ltd.  
Mumbai, India



Glass lined & Alloy equipment

# PFAUDLER

— Glass-Lined Technology

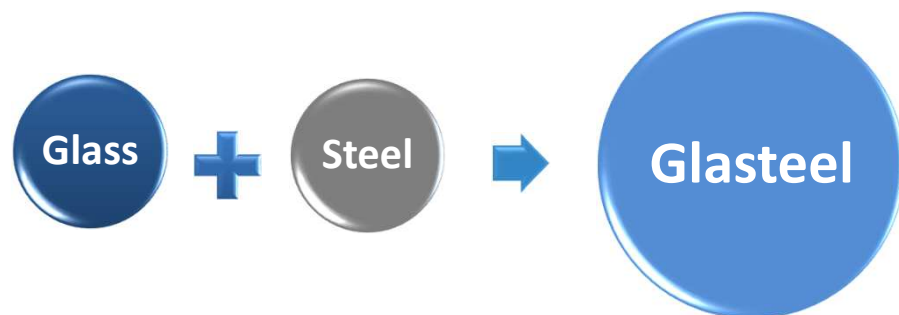
Worldwide  
leader  
of glass-lined  
equipment



GMM  
Pfaudler



## Pfaudler Glasteel® - What is it?



← Composite  
Material



# Pfaudler - Excellence in Glass Lining

## 4 primary types of glasses



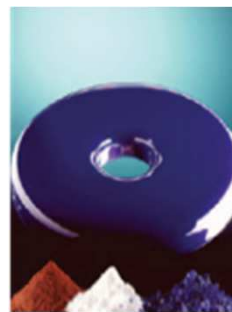
PPG  
Pfaudler  
Pharma Glass



ASG  
Anti Static  
Glass



ARG  
Abrasion  
Resistant  
Glass



WWG  
World Wide Glass  
(blue/white)

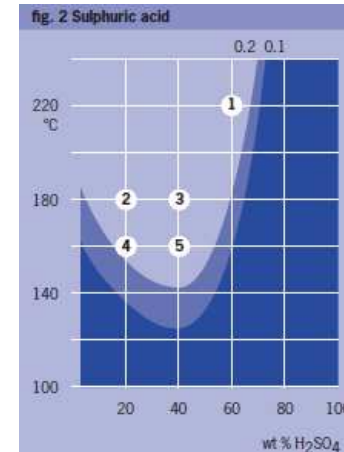


## And also special glasses

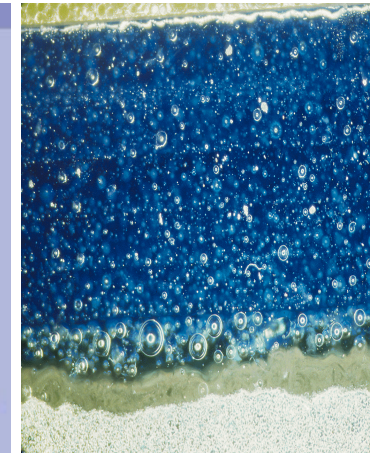
P31 polymerizer glass, extra smooth surface  
V132 Glass for Stainless steel substrat



## EXCELLENCE IN



corrosion resistance



manufacturing

# Pfaudler Glass-Lined Portfolio

## Glass-Lined Reactors

- DIN Reactors
- ASME Reactors
- Customized Reactors



## Mixing technology

- ProSol®
- Cryo-Lock®
- Drives
- Sealing units



Storage vessels and receivers  
Heat exchangers  
Columns  
Conical tumble dryers



## Probes, sensors

- Temperature
- pH / ORP
- Level indication
- Conductivity
- Corrosion monitoring



## Accessories

- Covers & Glasslook® & Sight Glasses Fillook®
- Pipes and fittings
- Sampling systems
- Valves



## Service

- Spare parts
- Repair service
- Reglassing





# Pfaudler Glass-Lined Reactors, Vessels and Equipment



Reactors



Storage Tanks and Receivers



Conical Dryer Blender CDBs

# Pfaudler Glass-Lined Mixing Systems

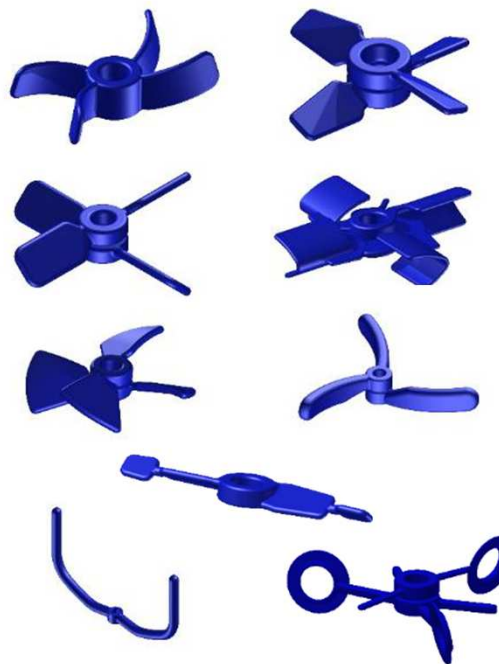
AR Drives



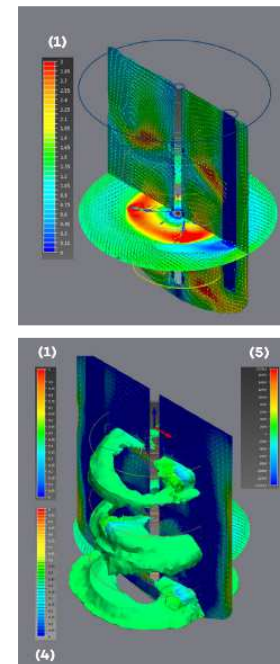
VSO Drives



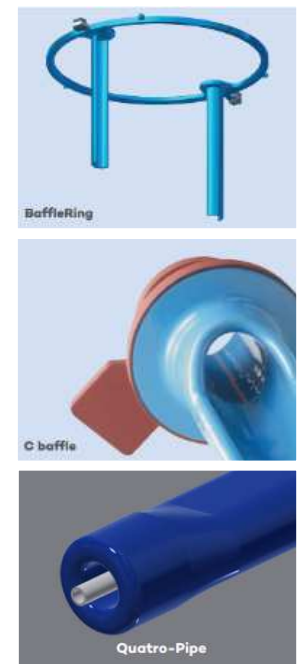
Impellers



Mixing reviews  
and CFDs



Baffling



# Pfaudler Glass-Lined Instrumentation

## Liquid analysis

- pH Sensors
  - Heavy duty
  - Hygienic design
- rH / Redox Sensors
- Combined pH/ ORP Sensors
- Conductivity Sensors



## Applications

Heavy duty (Chemical, Metal...) or hygienic processes (F&B, Pharma, others)

- High mechanical strength
- High temperatures and pressures
- Long life time, also @ CIP
- Low maintenance



## Temperature

- Temperature sensors
  - Pt100 inserted
  - Pt100 fused in the glass
  - Thermocouple fused in the glass



## Applications

Mainly in Glass Lined Apparatus such as reactors, tanks to monitor or control the temperatures.

# Pfaudler Glass-Lined Instrumentation

## Corrosion detection

- Inline monitoring system
- Portable control unit (CDP)
- CryCo-Lock technology



## Applications

Mainly in Glass Lined or coated Apparatus such as Reactors, tanks to monitor the integrity of the protecting layer.



## Level control & Sampling sys.

- Level indication
  - Radar
  - Capacitive
- Limit level switch
  - Contacting
  - Capacitive
- Sampling systems



## Applications

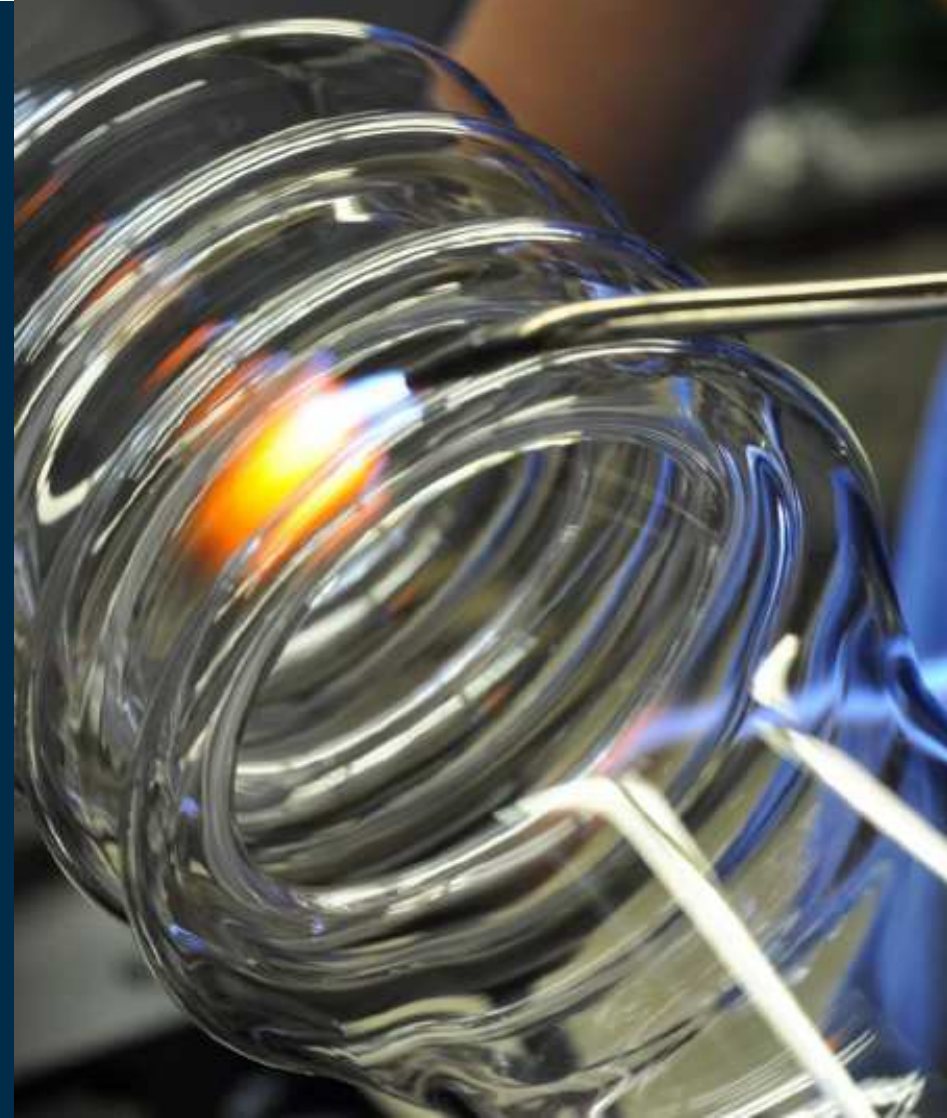
Mainly in Glass Lined Apparatus such as Reactors, tanks to monitor or control the level, the product quality and to detect phase separations (aqueous/organic) when emptying.

# NORMAG

— Lab & Process Glass

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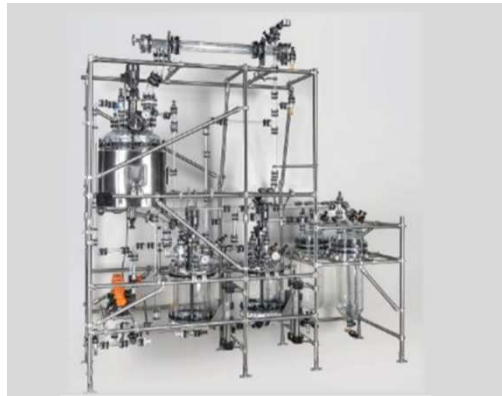
The  
borosilicate 3.3  
glass specialist





# NORMAG Lab and Process Systems in Borosilicate Glass

High quality NORMAG glass components, apparatuses and units for the chemical and pharmaceutical industry and research, from the laboratory to the production scale.



## Process Units - Pre-assembled process units

- Reactor
- Evaporators
- Distillation
- Extraction
- Filter
- Crystallisation
- Absorption / scrubber



## Laboratory & Teaching Units Validated standard with many specific customized options

- Reactor
- Evaporators
- Distillation
- Extraction
- Filter
- Crystallisation
- Absorption / scrubber



## High quality Components for lab & process

- Pipes & connection,
- valves
- Reactors
- Columns
- Parts for distillation
- Parts for extraction
- customized products

## A process unit example: Glass-lined reactor with Borosilicate Glass 3.3 distillation top



Example: 2500 liters G/L reactor with glass top

- Glass-lined reactor for pharma application with jacket and insulation
- Allowable operating conditions (FV/+6bar; - 60°C/ +200°C)
- Agitator drive, ATEX-compliant, with frequency converter, double acting gas lubricated mechanical seal, glass lined single or multi stage stirrer – customized to process
- Bottom outlet valve, fully drainable, with Customer-specific adapter
- Condenser in borosilicate glass 3.3
- Distillation top DN 200 in borosilicate glass 3.3
- Feed vessels, cylindrical in borosilicate glass
- Vacuum and nitrogen distributors
- Instrumentation and bursting discs
- Stainless steel frame



# MAVAG

— Filtration & Drying

## Competence in filtration & drying



GMM  
Pfaudler

# MAVAG Filtration, Drying and Mixing

MAVAG provides filtration, drying, vessel and mixing technology.

The supply of equipment and services include design, fabrication and installation, combined with efficient systems for pharmaceutical and biotech industries.

## Filtration

MAVAZWAG Filters & Filter-Dryers

MAVALAB Pre-Engineered Filters

FUNDA Centrifugal disc filters



# MAVAG Filtration, Drying and Mixing

## DRYING



MAVASPHERE Spherical Dryer  
MAVADRY Horizontal Dryer  
MAVAPAD Paddle Dryer



# MAVAG Filtration, Drying and Mixing

## MIXING



MDB Magnetic Agitators  
MTF Turbofoam Foam Separator  
MFR & MRGH Sterile Agitators





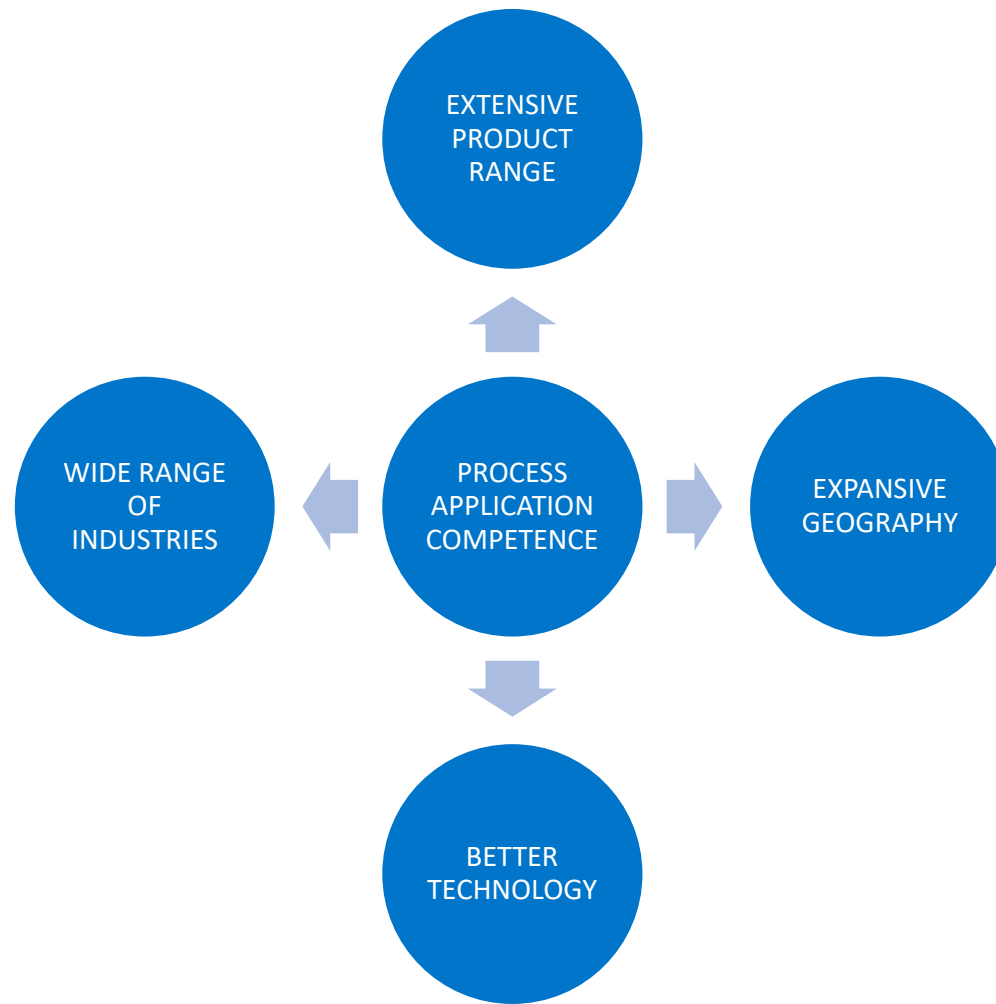
# MIXION

## — Mixing Technology

- Business vertical with focus on the Industrial Mixing space
- Premier Mixing Systems company catering to worldwide requirement
- Offer customers innovative mixing technologies that improve efficiencies and reduce cost
- State of the art facility



# A whole new experience with MIXION



# Stirring Across Industries



**CHEMICAL**



**MINING**



**PAINTS, RESINS &  
INKS**



**PHARMA &  
BIOTECH**



**POWER  
GENERATION**



**FOOD &  
BEVERAGES**



**PULP & PAPER**



**PETROCHEMICALS &  
REFINERIES**

...and many more



# The Perfect Blend of Products

**MIXION – TEMI**

Top Entry Agitators

**MIXION – SMIX**

Static Mixers

**MIXION – COAX**

Co-Axial Drives

**MIXION – SDMI**

Side Entry Mixers

**MIXION – HISD**

High Speed Dispersers

**MIXION – HEGI**

High Efficiency Gas Induction  
Impeller

**MIXION – SLRY**

Slurry Agitators

**MIXION – MPAC**

Mechanical Pan Circulators

**MAVADRIVE**

Bottom Entry Magnetic Mixers

## MIXION - TEMI

Top Entry Agitators



## MIXION - COAX

Co-Axial Drives



## MIXION - HISD

High Speed Dispersers



## MIXION - SLRY

Slurry Agitators



## MIXION - SMIX

Static Mixer



## MIXION - SDMI

Side Entry Mixers



## MIXION - HEGI

High-Efficiency Gas  
Induction Impeller



## MIXION - MPAC

Mechanical Pan Circulators



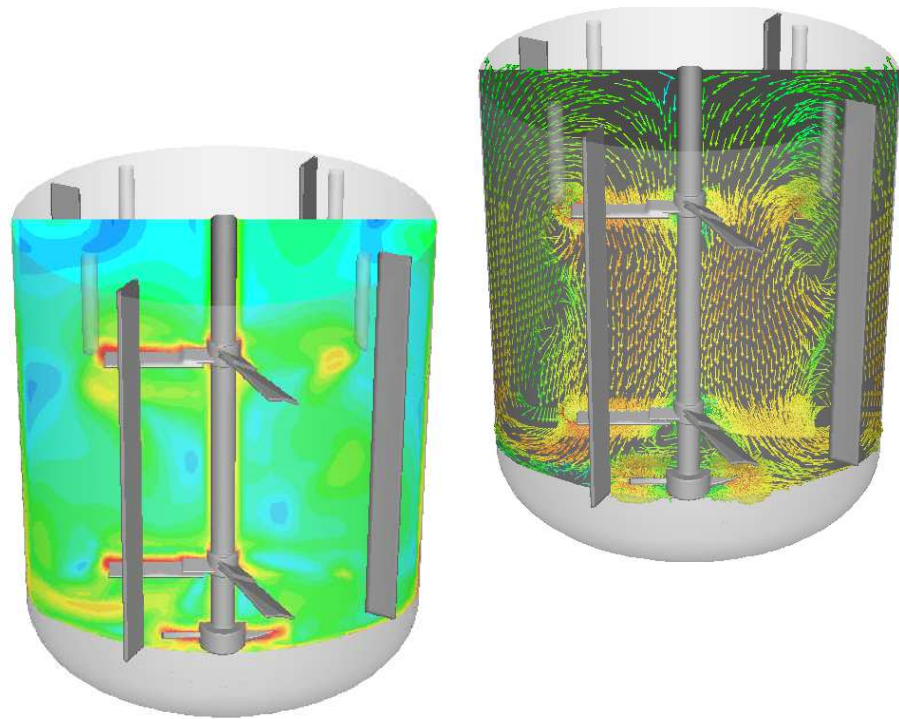
## MAVADRIVE

Bottom Entry Magnetic  
Mixers



## CFD

Computational Fluid Dynamics



# INTERSEAL

— Sealing Technology

## Innovation in sealing technology





# Sealing Technology Innovative Products

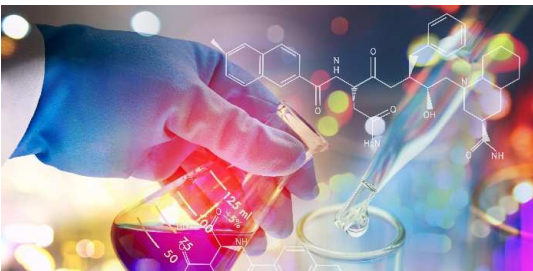
The dry9000® is a maintenance-free shaft seal applicable for the following industries



FOOD INDUSTRY



PHARMACEUTICAL INDUSTRY



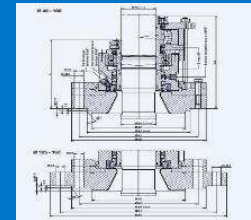
CHEMICAL INDUSTRY



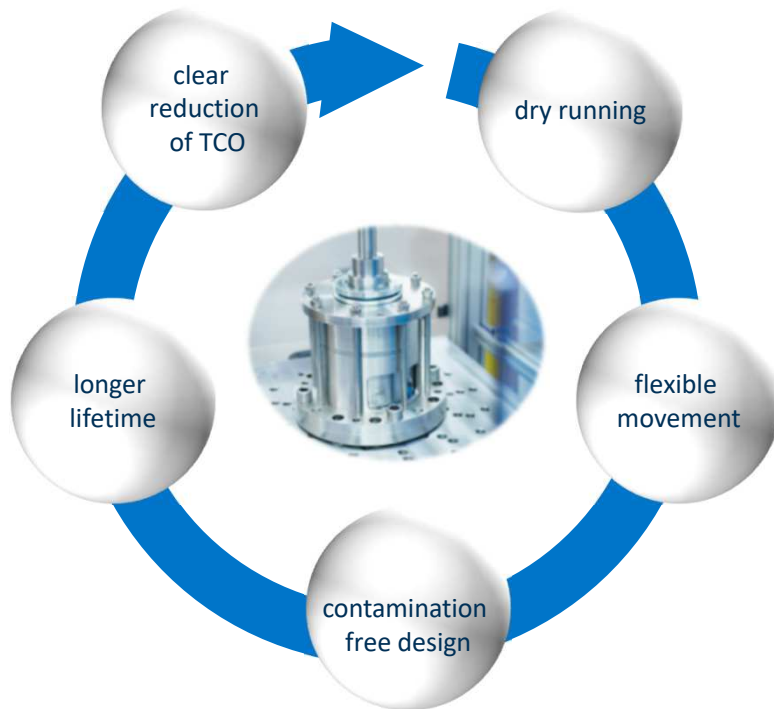
PETROCHEMICAL INDUSTRY

The dry9000® are designed for a great variety of requirements and ensure a 100% leak-tightness for agitators, mixers, dryers, filters and worm conveyors:

- dry9000
- dry9000 twin
- dry9000 twin+
- dry9000 twin E
- dry9000 twin E+
- dry9000 twin S
- dry9000 extend
- dry9000 steep



## Product benefits



### Advantages - dry9000®

- No additional cost: pharma design included in standard version
- No loss of product: contamination free production
- CIP: Easy cleaning/sterilization
- FDA-confirmation
- GMP-Design
- ATEX-conformity in all classes
- No-start up requirements
- Easier to plan a revision
- Reduced effort for installation
- Fulfills all safety and environmental standard

### Saves Cost & Time – dry9000®

- The lowest total cost of ownership (TCO) sealing technology for agitation & mixing
- No supply system needed
- No loss of product because of contamination
- No continuous cleaning of contaminated supply system
- No constant monitoring necessary due to dry running technology

# EQUILLOY

— Alloy Process Equipment

## High quality alloy process equipment



# Alloy Agitators and Vessels



Pressure Vessels



Agitated Reactors



Columns



Heat Exchangers

Alloy Agitators and Vessels are designed and made at the GMM Pfaudler factory in India

# Capabilities of our Factory in India

~30+ member  
design team

## Familiar with various design standards...

- ASME Sec. VIII Div. 1
- ASME Sec. VIII Div. 2
- AD Merkblätter 2000
- API 650 / 660
- EN 13445
- PD 5500
- PED – (Directive 2014/68/EU)
- ATEX – (Directive 2014/34/EU)
- TEMA
- JIS

## ... leveraging different software solutions

- Design Software:
- HTRI Xist (Thermal Design) -7.2
- PVElite 2017 SP1
- Compress 2017, Built 7700
- DIMY
- CAD & FEM Software:
- Autodesk Inventor - 2017
- (3D Drafting)
- AutoCAD - 2017
- Autodesk CFD - 2017
- Fatigue Analysis
- FEA Analysis
- Vibration Analysis

Design Engineering



# Factory Accreditations & Exotic Metallurgies

- DIN EN ISO 3834-2
- ISO 9001 : 2008
- U-stamp
- U2-stamp
- NB - Stamp
- R-Stamp
- IBR
- PDIL
- SELO
- Korean Stamp
- PED
- AD 2000 – Merkblatt HP0



We have qualified welding procedures and specifications for executing projects involving exotic metallurgies

Stainless Steel (316L/304L/904L/316Ti/410) Duplex Stainless Steel	Hastelloy (C276/C22/B3)-Alloy 59	Incoloy (600/800/825)	Cupro - Nickel
Monel 400	Chrome - Moly Steels	Low Alloy Steels	Clad Steels
Carbon Steel	Copper Alloys	Nickel Alloys	Titanium GR 2

## Tantalum Shell & Tube HEX and other process equipment

Tantec's competence in using Tantalum for pressure equipment, heat exchangers, plant components and other components is world renowned.

Pfautler & Tantec have formed a strategic partnership and are working together to supply tantalum process equipment in conjunction with glass-lined equipment and systems, for the chemical, pharmaceutical and process industry.

Tantalum is a complementary material of construction to glass-lined with similar corrosion resistant properties.

Shell & Tube Heat Exchangers



# EDLON

— Fluoropolymers

## Innovative Solutions using Fluoropolymers



# EDLON Fluoropolymers

## Applications

- High Corrosion Resistance (e.g. HF, Halogenated Chemicals)
- Ultra High Purity (range of ppt – „parts per trillion“)
- Low Friction and Non sticking

## Users (for instance)

- Chemical Process Industry
- Pharma Industry
- Electronics - Semiconductors
- Pulp & Paper and Converting
- Oil and Gas
- Nuclear energy



Rotolining



Rotomoulding



Roll Covers



Engineered  
Coatings



Column Internals



Lining: Loose or bonded -  
PureFusion™ Welding

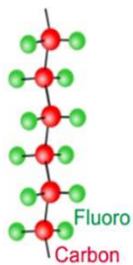
# Fluoropolymers – What are they?

FLUORINE containing polymers

Fully fluorinated Thermoplastic Fluoropolymers

Partially fluorinated Thermoplastic Fluoropolymers

- Fluorine gives the chemical resistance through Strong C-F bonds
- PTFE(Teflon®), PTFE(M) TFM™, PFA, FEP Partially fluorinated polymers
- ETFE (Tefzel®), ECTFE (Halar®), PVDF (Kynar®)



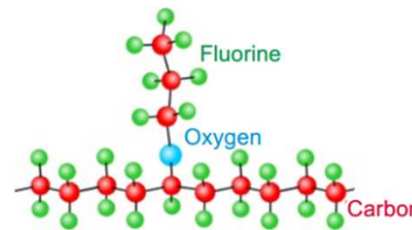
PTFE

Is a linear polymer

general formula

-  $[\text{CF}_2-\text{CF}_2]_n$  -

**Polytetrafluoroethylene (PTFE)**



PFA and Modified TFM

are branched PTFE polymers

general formula

-  $[(\text{CF}_2)_4 - \text{CF}(-\text{O}-\text{CF}_2-\text{CF}_2-\text{CF}_3)-(\text{CF}_2)_5]_n$  -

**Perfluoroalkoxy Polymer (PFA) & modified TFM™**





# Our Systems Capabilities

[www.gmmpfaudler.com](http://www.gmmpfaudler.com)

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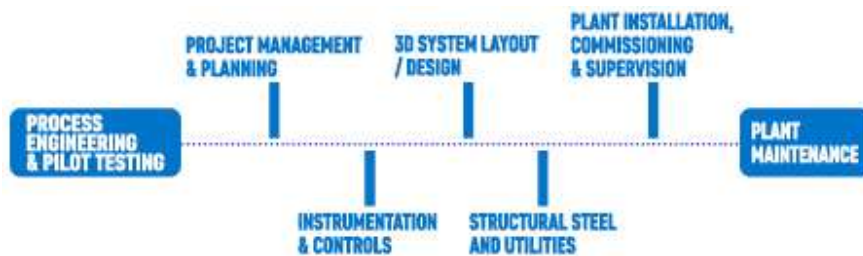


# Process Systems Packages

GMM Pfaudler's systems capabilities are not limited to the individual technologies themselves.

We can combine technologies and services into complete and efficiently operating process systems.

## FULL ENGINEERING PACKAGE



## DESIGN PROCESS TECHNOLOGY

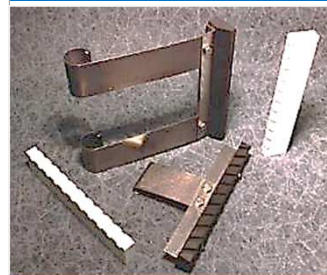


# Evaporating Units and Systems

Wiped Film Evaporators (WFE)  
glass lined or alloy



Entrainment Separators



Wipers

Wiped Film Evaporator Systems:  
Complete modular process systems,  
pre-assembled and tested



# Processes in Acid Recovery

## Our processes in Acid Recovery

- Spent Acids
- Nitric Acid
- Sulfuric Acid
- Organic Acids
- Hydrochloric Acid
- NOx Absorption
- Post treatment of Waste Water and Waste Gas streams

Our Glass-Lined, Glass and Fluoropolymer technologies, along with our Tantalum, Niobium, Zirconium and Silicon Carbide exchangers are the materials of choice for handling hot, concentrated acids safely.

Acids play many different roles in a large number of sectors of the chemical process industries.



Recovery of spent sulfuric and nitric acid helps to reduce operating costs compared to total raw material and disposal costs, and is an environmentally sound practice.



# Pilot Test Facility (Rochester, USA)

## Process Capabilities

- Multiple WFEs
- Jacketed/Agitated Feed Tank
- Circulated Flash Evaporation
- De-Gassers
- Distillation Column
- Reaction
- Condensers, Coolers and Heaters
- Multi Stage High Vacuum Equipment
- All Required Peripheral Equipment

Process Controlled via PLC/HMI

Utilities: Steam, Cooling Water, Tempered Water,  
Hot Oil On-site Sample Analysis



Guaranteed Performance of Commercial Scale  
System Based on Pilot Tests



# Test Facility (Germany)

## Process Capabilities

- Concentration by evaporation under atmospheric or vacuum conditions
- Concentration by rectification under atmospheric or vacuum conditions
- Process optimization with regard to product quality and/or emissions
- Selection of suitable chemical agents
- Development of new processes

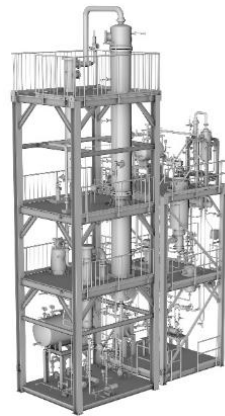
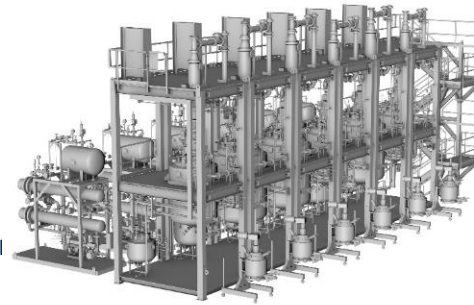
Guaranteed Process Performance



# Engineering Services

## Engineering Services

- Process and equipment design according customers specification
- Tailor Made Solutions for special applications
- Process optimization with regard to energy consumption, product quality and/or emissions
- Consulting services in regard to MOC and special applications
- Development of new processes in cooperation with customers from lab to pilot scale
- up to industrial world scale facilities
- All engineering services from feasibility studies up to complete 3D modelling of the plant





# Modular Units



Reactor Systems



Column Systems



Heat Exchangers  
Ex: Acid Boiler,  
GL Shell,  
Tantalum Tube Sheet  
+ Tubess,  
Alloy Heads



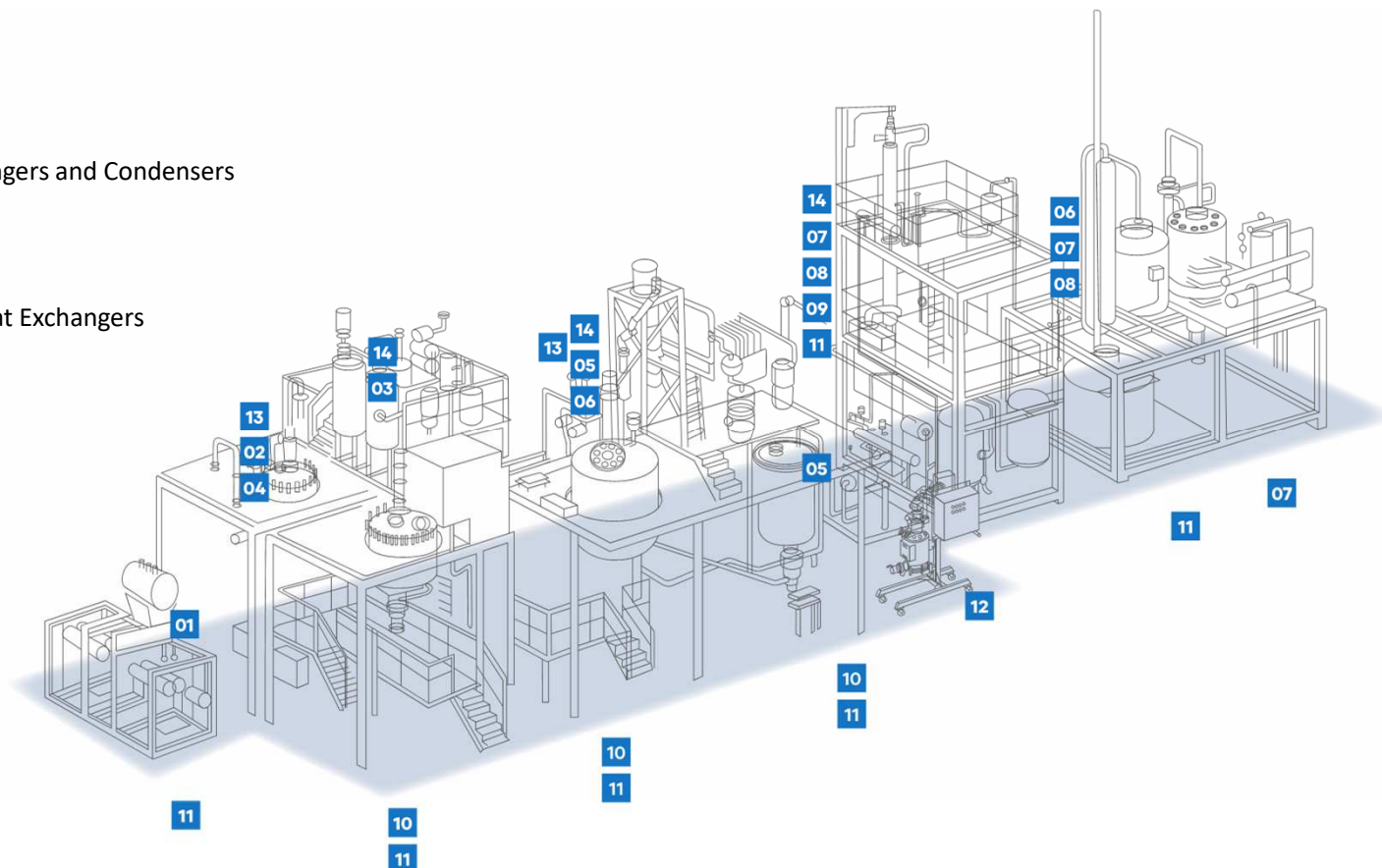
Thermal Control Units



Glass-Lined, Alloy &  
Borosilicate Glass

# Putting All Our Expertise Together...

- 01 Heat Transfer  
**Pfaudler** Thermal Control Units
- 02 Corrosion Resistance & Mixing  
**Pfaudler** Glass Steel Reactors, Tanks, Receivers
- 03 Heat Transfer  
**Pfaudler** Glass Steel & Silicon Carbide Heat Exchangers and Condensers
- 04 Instrumentation  
**Pfaudler** Glass Lined Sensors
- 05 Corrosion Resistance & Mixing  
**Equilloy** High Alloy Reactors, Receivers, Tanks, Heat Exchangers
- 06 Corrosion Resistance & Purity  
**Edlon** Fluoropolymers Reactors, Tanks, Internals
- 07 Heat and Mass Transfer  
**Pfaudler** Glass Lined Columns  
**Equilloy** Alloy Columns
- 08 Heat and Mass Transfer  
**Pfaudler** Columns System and Internals  
**Edlon** Fluoropolymers
- 09 Heat and Mass Transfer  
**Equilloy** Wiped Film Evaporators and Evaporation Systems
- 10 **Pfaudler** Reactor Systems
- 11 **Pfaudler** Modular Assemblies
- 12 **Mavag** Filtration and Drying Equipment  
**Edlon** Fluoropolymers
- 13 **Interseal** Sealing Technology
- 14 **Normag** Lab & Process Glass





# Global Services Capability

[www.gmmpfaudler.com](http://www.gmmpfaudler.com)

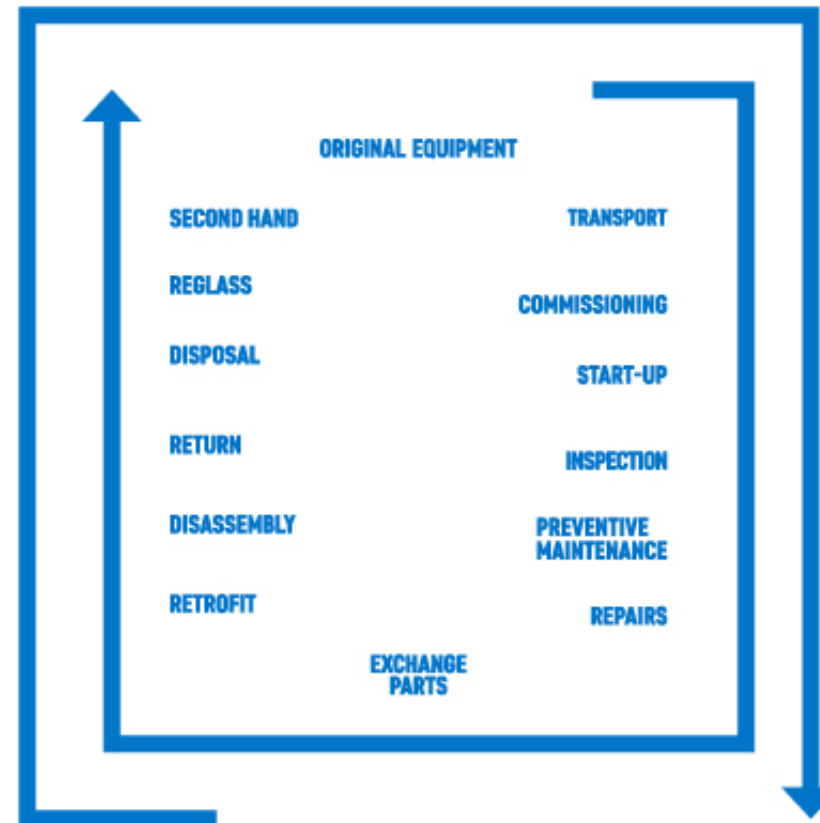




## GMM Pfaudler Services – Global technical support

Our **Services** guarantee **fast and flexible service** response to maximize your equipment availability.

Our **highly-skilled engineers, technicians and sales team**, work with our clients upfront and during projects to optimize and improve the entire Lifecycle service support:



# GMM Pfaudler Services – Our complete service portfolio

We guarantee a global service during the whole process pre and post sales, with the largest service organization in our industry.

## Engineering

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



## Maintenance and after-sales

- Maintenance
- Troubleshooting
- Glass inspection, reglazing and repair
- Shutdown services
- Repair
- Spare / Replacement Parts
- Sealing technology exchange
- Upgrades and process improvements
- Renewal program



## Installation, Commissioning, Start up

- Planning
- Project management
- Installations



# Pfautler Glass-Lined Accessories

Pfautler has core expertise in the service area of full equipment refurbishing.

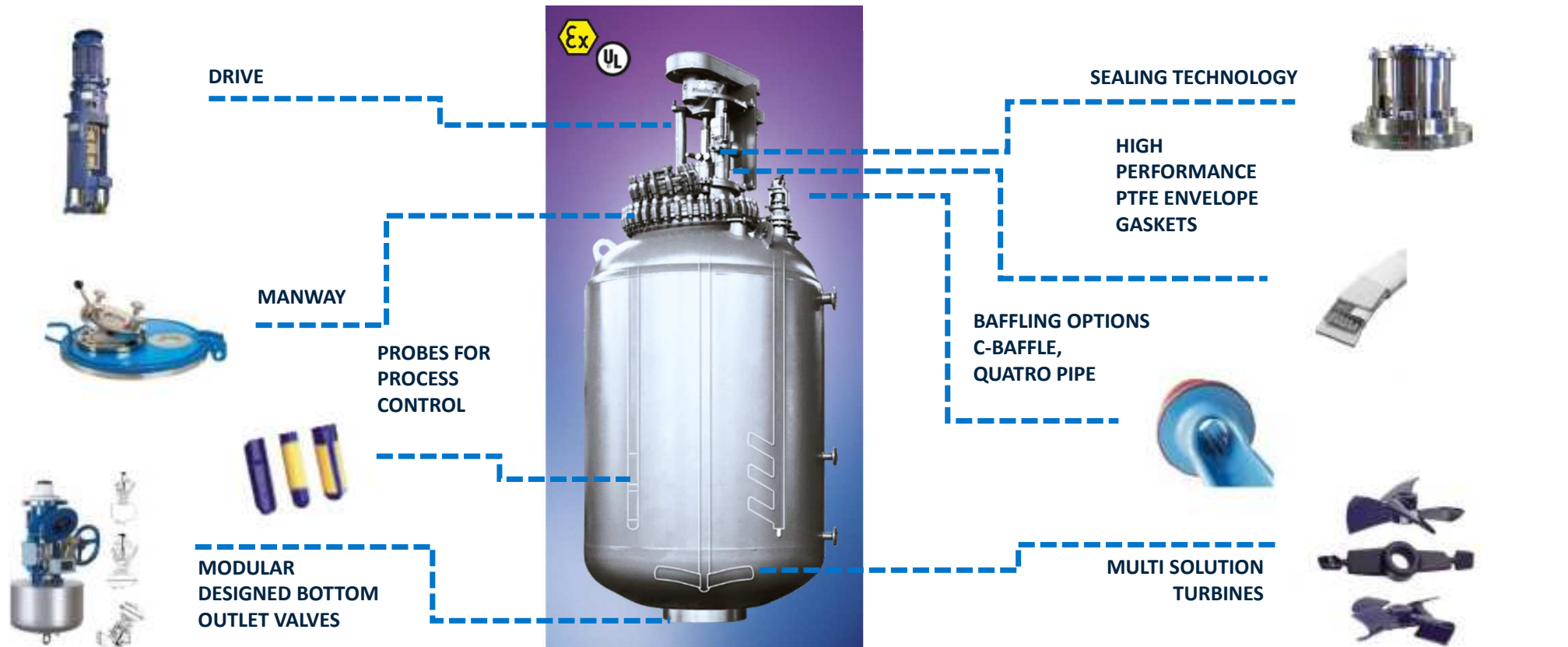
The reactors are completely reglassed, refurbished and comply with International and European regulations.

## Benefits

- ✓ Qualified damage assessment
- ✓ Long service life by the latest Pfautler glass
- ✓ Dismantling on site and transportation to Pfautler Reglass Center
- ✓ Upgrading easily possible
- ✓ Standard warranty as new vessels
- ✓ Reglassing of all glass-lined, including equipment from alternative suppliers



# Pfautler Glass-Lined Accessories



# Machined PTFE & Engineered Plastic

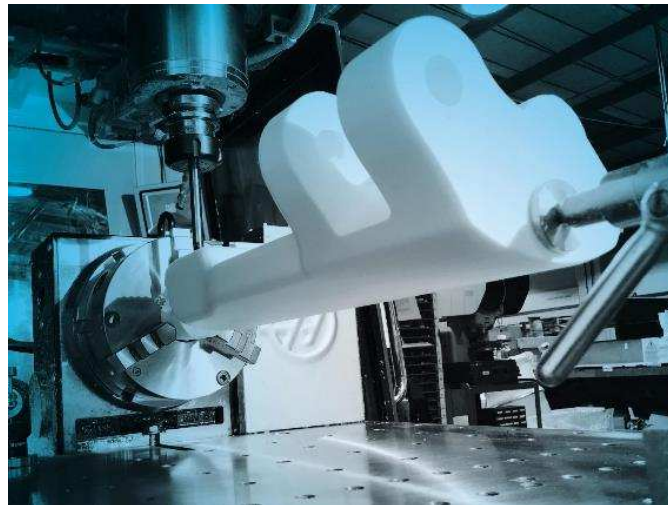
Specialist at the forefront of the technological machining of PTFE & Engineered Plastics.

We manufacture & stock a wide variety of high performance plastics including:

**Acrylic, Acetal, Nylon, Peek, Polyethylene, PTFE & more.**

## Product Range

- ✓ Bespoke Machined Components
- ✓ Semi-Finished Materials
- ✓ PTFE Envelopes
- ✓ PTFE Repair Sleeves
- ✓ Solid & Expanded PTFE Sheeting
- ✓ Soft-Cut Gaskets
- ✓ Spiral Wound Gaskets
- ✓ Gland Packing





# Access to our global – Technologies, Solutions & Services

Your «**Regional Sales Manager**»

is your primary contact for all projects with regards to:

- ✓ **Technologies & Equipment**
- ✓ **Systems processes**

Your «**Service Centre Manager**»

is close to your site for all:

- ✓ **Services capability**



**100**

Countries

**1500 +**

Employees

**04**

Countries

One  
single source of  
responsibility  
with access to  
GMM Pfaudler  
network  
worldwide

WorldWide Presence



