

PFAUDLER

— Glass-Lined Technology

Mechanical Seals Flexal®



GMM
Pfaudler

PFAUDLER

— Glass-Lined Technology

For over 130 years, Pfaudler is the leader in developing new technologies to meet the highly specific chemical processing needs of its clients. One reason why our glass-lined equipment is trusted by over 90% of the world's top chemical companies is the sheer reliability of our reaction technologies and comprehensiveness of our glass-lined accessories. These technologies are critical to the safe containment of corrosive contents, maintaining the vessel pressure and ensuring the final batch quality.

In short, our glass-lined technologies are absolutely integral to an effective process.

PRODUCTS & EQUIPMENT

Glass Lined Reactors

Glass Lined Mixing Systems

Baffling Technologies

Storage Tanks & Receivers

Glass Lined Columns

Accessories

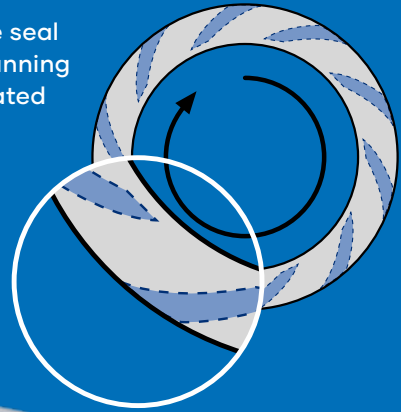
Glass Lined Instrumentation

Glass Lined Heat & Mass Transfer

50/5/50t



Grooves on the seal face in a dry running gas film lubricated seal type



flexeal®

DIN mechanical seals

flexeal® mechanical seals are an advanced sealing solution within the Pfaudler product portfolio.

Advantages:

- Further increase in operational reliability
- Longer life, less maintenance
- Efficient operation
- Higher flexibility in practical use through modular system

Function:

Pfaudler-flexeal mechanical seals are preferably designed for glasslined reactors to DIN 28136 with top-mounted drive. They are used as dynamic seals between the agitator shaft and the environment. At the same time, they serve as agitator shaft bearings. Their metal-free product side makes them optimally suited for the application ranges of DIN glasslined reactors.

- Pfaudler flexeal mechanical seals to DIN are available for shaft diameters of 40, 50, 60, 80, 100, 125, 140 and 160 mm.

- flexeal mechanical seals to DIN are in compliance with DIN 28138-2 and match shaft ends to DIN 28159 and agitator flanges to DIN 28137-2.
- Pfaudler flexeal mechanical seals are double-acting. They consist of two sets of primary/mating rings.
- In addition, a separate emergency seal is provided which takes effect upon failure of the sealing pressure (reverse pressure principle).
- The number of seals on the product side is reduced to a minimum.
- Integrated cooling jacket – the cooling and sealing functions can be separated. Cooling is also guaranteed if the seal runs dry – an important condition for satisfying requirements on explosion protection.
- The output of the agitator drive is transmitted almost completely due to low friction losses.
- A low leakage rate ensures pure products without sealing liquid contaminations.
- All flexeal seals have been prepared for the installation of a speed sensor.



Seal Types and Codes

Increased flexibility – reduced maintenance

Pfaunder fleXeal – the mechanical seal that grows together with your demands

- Pfaunder-fleXeal mechanical seals are characterized by low maintenance requirements, thus achieving long lifetimes. They ensure continuous and efficient production processes.
- The glasslined intermediate flange needs not be removed for replacing the mechanical seal.
- Pfaunder fleXeal mechanical seals are equipped with a ceramic sleeve. Therefore, the pressure test can be performed without the shaft.
- Full latitude of a "modular system": The individual types are interchangeable among each other and with previous models.
- The basic types can be modified if necessary, i.e. the existing version can be adapted to a different application. In certain cases, a seal may even be converted by replacing individual components.

Seal types and their codes:

Wet-running water/oil UF 8

Dry-running, with contact BF 7

Dry-running, gas film lubrication GF 7

1st letter: Type of seal face load

U: unbalanced

B: balanced

G: dry-running, gas film lubrication

2nd letter: Casing material,

F: stainless steel

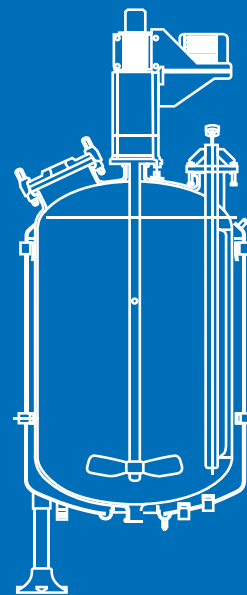
1st digit: Lubrication

7: dry-running, 8: wet-running:

Special designs

In addition to the standard configuration, Pfaunder also offer mechanical seals specifically adapted to your application. These include:

- Primary/mating rings made of different materials
- Secondary seals made of different materials
- Secondary seals made of FDA-approved materials



GLASTEEL

—
ANTI CORROSION

ANTI STICK

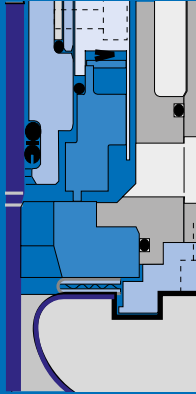
ANTI STATIC

ION SENSITIVE

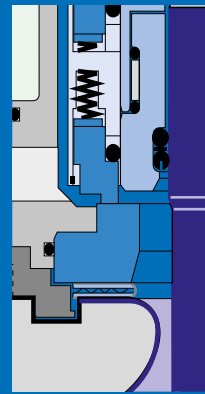
pH Value 2.0



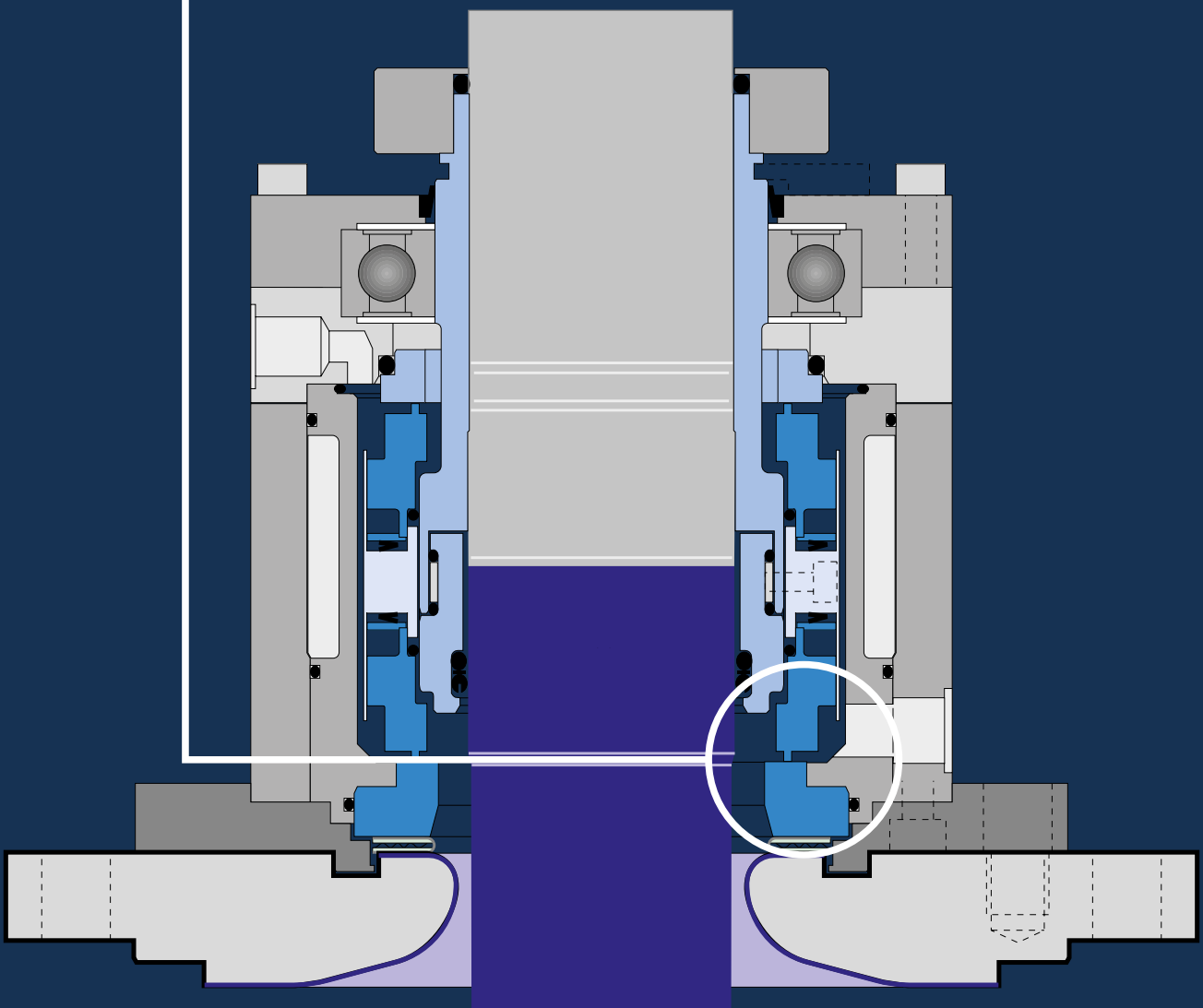
Dry running gas film lubrication (GF7)

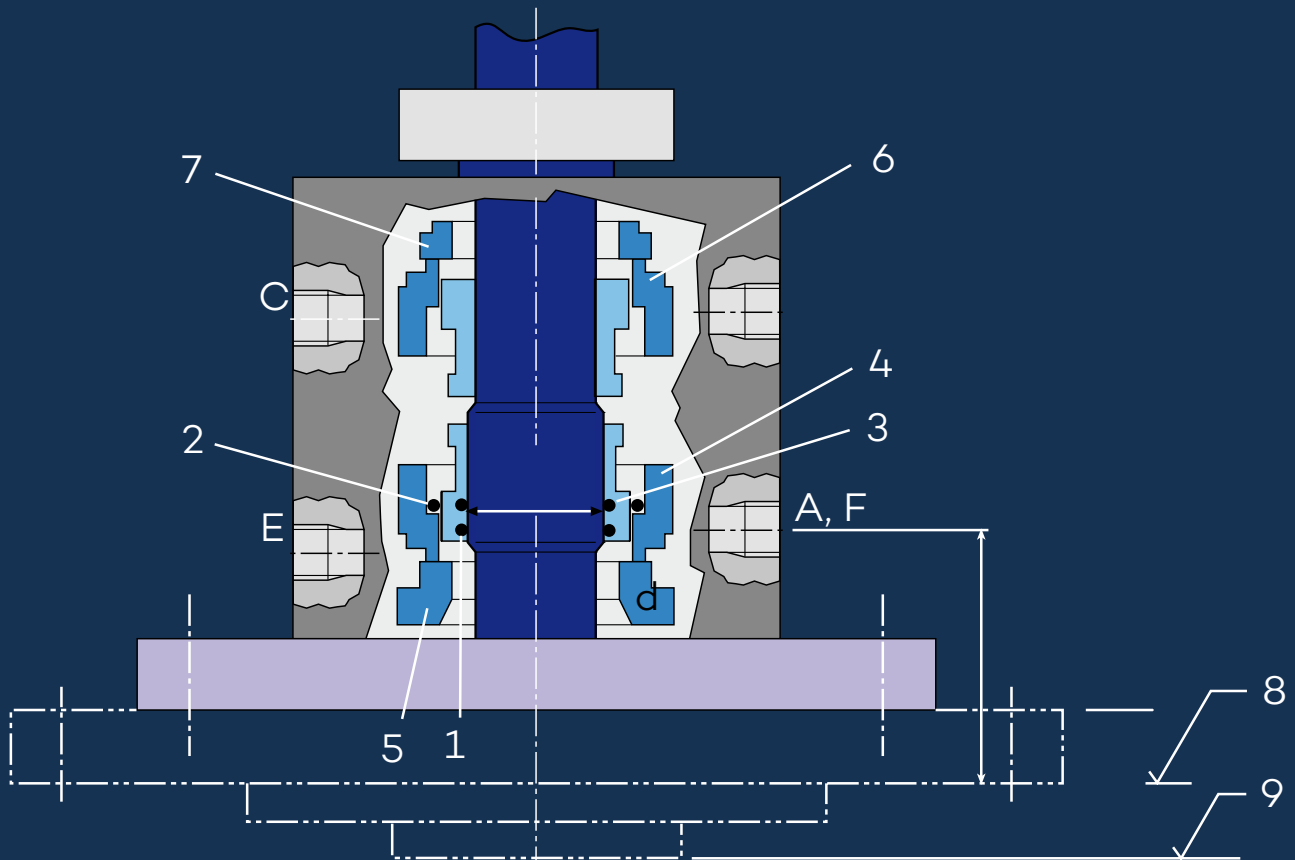


Dry running gas film lubrication (BF7)



Wet running water oil (UF8)





- 1 O-ring no. 1, product side
- 2 O-ring no. 2, product side
- 3 O-ring no. 3, product side
- 4 Primary ring, product side
- 5 Mating ring, product side
- 6 Primary ring, atmosphere side
- 7 Mating ring, atmosphere side
- 8 Top edge of agitator flange
- 9 Bottom edge of glasslined intermediate flange



ACID
CONCENTRATION
H₂SO₄ | HNO₃

HIGH
QUALITY
COMPONENTS

Pfaunder fleXeal® DIN

Safety and Efficiency

Selection of the mechanical seal

The selection of the proper mechanical seal depends on a number of factors, including speed, pressure, temperature, chemical composition, etc. Most of the standard mechanical seals of the fleXeal series are kept on stock and can be delivered shortly, including spare parts. In addition to our standard range, we also develop special designs.



Gas pressure distribution on structured mating ring

Functional description of wet-running seals – fleXeal UF 8

A sealing liquid assembly generates a counterpressure in the mechanical seal. The hydraulic pressure and the spring force press the rotating, axially movable primary rings to the mating rings. Lubrication is by means of the sealing liquid. A very thin lubricating film in the sealing gap minimizes wear. Cooling of the mechanical seals to DIN is achieved by the integrated cooling jacket or optionally by a thermosiphon. Sealing liquids Oil, white oil, demineralized water, alcohol.

Functional description of dry-running seals with contact – fleXeal BF 7

The function of dry-running mechanical seals with contact is based on the selflubricating properties of the seal materials.

The sealing space is filled with a sealing gas (nitrogen). A novel, FDA-conformant dry-running carbon material ensures a long life with minimum sealing gas leakage, even without moistening of the sealing gas.

Functional description of dryrunning seals, non contacting gas film lubrication – fleXeal GF 7

The non contacting, gas film-lubricated fleXeal GF7 is a further development of the dry-running version BF7. The principle underlying this type of mechanical seal is directly derived from fast-running non contacting mechanical seals for pumps and compressors. In order to achieve contact-free operation, the rings are grooved. The sealing gas entering the grooves together with effects of gas dynamics produce a thin aerodynamic gas cushion on which the mating rings „float“. To minimize wear during start-up, the mating rings are equipped with a very hard diamond-type surface finish. In order to minimize the sealing gas consumption, the fleXeal GF 7 mechanical seal may also be equipped with a dryrunning pair of primary/mating rings with contact on the atmosphere side. The sealing gap on the product side can be adjusted to a constant value using an active regulator. The fleXeal GF7 mechanical seal is the ideal design for all applications where highly pure products are crucial – without any wear particles or sealing liquid contamination. Pharmaceutical (FDA/GMP requirements) and fine chemical applications can be easily met.

Type	UF8	BF7	GF7
Primary ring on product side	Carbon*	MoS ₂ carbon	MoS ₂ carbon*
Mating ring on product side	SiC	SiC	SiC structured
Primary ring/atmosphere side	Carbon	MoS ₂ carbon	MoS ₂ carbon
Mating ring/atmosphere side	SiC	SiC	SiC
O-Ring #1	PTFE grooved	PTFE grooved	PTFE grooved
O-Ring #2	FEP	PTFE lip seal	PTFE lip seal
O-Ring #3	FEP	FEP	FEP
Housing parts	Stainless steel	Stainless steel	Stainless steel

* The types UF8 and GF7 are also available with two SiC rings on the product side. More variants available on request.

Legend

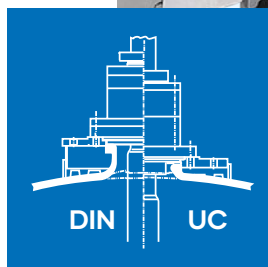
FEP : Polytetrafluorethylene/propyleneplastics (PFEP) - PTFE : Polytetrafluorethylene - SiC : Silicon carbide

Pfaunder fleXeal® Ultra Clean

Pure Processes



Grooves on the seal face



Dimensional comparison of a fleXeal Ultra Clean on a welded pad vs. a fleXeal DIN on a conventional agitator nozzle.

fleXeal Ultra Clean

Pfaunder sets new standards for GMP-conformant production - with fleXeal Ultra-Clean.

- GMP-conformant design. In connection with a pad flange, the primary/mating ring set on the product side is inside the reactor - a short design, no undercuts, sealing gap free for inspection, optimized gap geometry.
- Clearance volume optimization through GMP-conformant geometry - easy to clean, prevents encrustations.
- Conformant to SIP and CIP the optional use of FDA-approved materials guarantees suitability for sterilization and easy cleaning. Pfaunder fleXeal UC mechanical seals are available for shaft diameters of 40, 50, 60, 80, and 100 mm without a cooling jacket in two designs:

Pfaunder fleXeal BF8 UC the wetrunning Ultra-Clean mechanical seal. Identical function as UF8 - but the fleXeal BF8 UC is a balanced mechanical seal.

Pfaunder fleXeal GF7 UC the gas film-lubricated, dry-running Ultra-Clean mechanical seal. Due to its non contacting and „contamination-free“ technology, the fleXeal GF7 UC is excellently suited for all processes in which „purity“ is of utmost importance. The function of the fleXeal GF7 UC is the same as for the GF7. In connection with a pad flange, however, the UC geometry offers an entirely new dimension in GMP-conformant design.

Ultra Clean – the systematic solution

With a whole package of matching components, Pfaunder offers the optimum solution for pharmaceutical and sterile applications.

- UC reactors without a principal flange and an agitator nozzle designed as a pad flange
- Small BE reactors with a volume of 630 to 1000 liters for pharmaceutical applications
- CIP ring for CIP cleaning in the area of the nozzle neck
- Glasslook® – the fused-in sight glass
- Fillook® – GMP-conformant, CIP-adapted quick-opening cover
- Special Cryo-Lock® agitator systems for agitating minimal residual amounts
- Specific types of drives and bottom outlet valves

Type	BF8 UC	GF7 UC
Primary ring on product side	Carbon*	MoS ₂ carbon*
Mating ring on product side	SiC	SiC structured
Primary ring/atmosphere side	Carbon	MoS ₂ carbon
Mating ring/atmosphere side	SiC	SiC
Lip seals on product side	PTFE	PTFE
Housing parts	Stainless steel	Stainless steel

* The types BF8 UC and GF7 UC are also available with two SiC rings on the product side. More variants available on request.

Pfaunder fleXeal®

Systematic Sealing

With fleXeal, Pfaunder offers a broad range of mechanical seals for any type of application. The comprehensive Pfaunder accessory range ensures the individual adaptation of the fleXeal mechanical seals to specific requirements.

SAM 1/2

Static sealing pressure system for generating the sealing pressure of wet-running mechanical seals, for oily sealing liquids.

Thermosiphon

Sealing and cooling system according to the thermosiphon principle of circulation – also for aqueous sealing media. Different design variants are possible, e.g. manual refilling unit, level indicator, recirculating pumps, etc.

Barrier Gas System

Gas supply unit for connection to the sealing gas source (bottle or network). For monitoring and adjusting the gas consumption and sealing gas pressure of dry-running and gas film-lubricated mechanical seals.



Barrier Gas System



SAM 1/2 static sealing pressure system (figure, left)
Thermosiphon (figure, right)

Worldwide Presence



GMM Pfaudler is a global leader in corrosion-resistant technologies, systems, and services for the chemical, pharmaceutical, food and energy industry.

Our Branded Product Lines that include PFAUDLER, NORMAG, MAVAG, MIXION, INTERSEAL, EQUILLOY and EDLON, showcase our strength as a group, our capabilities, and our pursuit for constant innovation. With an end-to-end solutions-oriented approach, a global footprint, and a perfectly integrated offering system we are able to meet complex industry demands worldwide.

GMM Pfaudler is driven by 1500+ individuals across 4 continents and 14 global manufacturing facilities around the world. The Group's targeted investments in strategic markets, innovation and competitiveness paves the way forward for GMM Pfaudler's continued legacy.

100
Countries

1500 +
Employees

04
Continents

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