EagleBurgmann

OPERATING MANUAL

EagleBurgmann Mechanical Seal (M.S.)

Cartex-DN(1)/dw-00	**Cartex-ABDN/dw-00**
Cartex-DN10/dw-00	**Cartex-ABDN32(33)(34)(35)/dw-00**
Cartex-DN20/dw-00	**Cartex-ASDN(20)/dw-00**
Cartex-DN29/dw-00	**Cartex-ASDN32(33)(34)(35)/dw-00**
Cartex-DN32(33)(34)(35)/dw-00	**Cartex-HSDN/dw-00**
Cartex-DN90/dw-00	**Cartex-LSDN/dw-00**

(dw = specified shaft diameter)

applies to all mechanical seals of the same series

These instructions are intended for the assembly, operating and supervising personnel and should be kept at hand on site.

PLEASE READ this manual carefully and OBSERVE the information contained as to:

- **Safety**
- **Transport / Storage**
- **Information about the product**
- **Installation**
- **Operation**
- **Servicing**

If there are any unclear points please contact EagleBurgmann by all means!

Table of Contents

Keywords and Symbols

Following symbols for particularly important information are used:

"Attention, please pay special attention to these sections of text"

DANGER! Draws attention to a direct hazard that will lead to injury or death of persons

WARNING! Draws attention to the risk that a hazard could lead to serious injury or death of persons

CAUTION! Draws attention to a hazard or unsafe method of working that could lead to personal injury or damage to equipment

ATTENTION! Identifies a potentially dangerous situation. If it is not avoided the product or something in its vicinity could be damaged

IMPORTANT! Identifies tips for use and other particularly useful information.

GENERAL SAFETY NOTES

Any person being involved in assembly, disassembly, start-up, operation and maintenance of the mechanical seal must have read and understood this operating manual and in particular the safety notes. We recommend the user having this confirmed.

EagleBurgmann mechanical seals are manufactured to a high quality level and they have a high working reliability. Yet, if they are not operated within their intended purpose or handled inexpertly they may create risks.

The machine has to be set up in such a way that seal leakage can be led off and disposed of properly and that any personal injury caused by spurting product in the event of a seal failure is avoided.

Any operation mode that affects the **operational safety** of the mechanical seal is not permitted.

Unauthorised modifications or alterations of the mechanical seal are **not permitted**.

Mechanical seals must be installed, operated, maintained and removed by **authorised**, **trained and supervised qualified personnel only**. In case the personnel has no long years of experience in handling with and operating of mechanical seals and their supply systems, for this purpose EagleBurgmann offers corresponding seminars for achieving of the required knowledge.

The **responsibilities** for the respective jobs to be done **have to be determined clearly and observed** in order to prevent ambiguous competencies from the point of **security**.

Any work to be done on the mechanical seal is **generally** only **permitted** when the seal is **neither operating nor pressurised**. The machine must be protected against accidental start-up.

WARNING! Seals that have been used with **hazardous substances must be properly cleaned** so that there is no possible **danger** to people or to the environment.

Apart from the notes given in this manual the general **regulations for worker's protection and those for prevention of accidents** have to be observed.

Instructions for worker's protection

WARNING! If the **medium to be sealed** and/or the **supply liquid** is subject to the **Hazardous Substances Regulation** (GefStoffV), the **instructions for handling dangerous substances** (safety data sheets to EU Directive 91/155/EEC) and the **accident prevention regulations** have be observed.

Medium to be sealed and/or **supply medium may escape** if the seal **fails**. Injury of persons and environment may be **prevented by the user** providing for splash protection and wearing of safety goggles. Care has to be taken by the user for **proper disposal** of the leakage. The user has to control these measures.

The **user** has to **check** what **effects a failure** of the mechanical seal might have and what safety measures have to be taken to prevent **personal** injury or damage to the environment.

Notes on explosion protection

Mechanical seals are **mechanical parts**, which are put in circulation for general technical purposes. They are not components within the meaning of Directive 2014/34/EU.

The respective probation as to explosion protection for the provided temperature class must be carried out during the conformity assessment of the machine, into which the mechanical seal is installed, by the machine manufacturer.

In case the assessment is carried out by the end user, the respective additional operating manual has to be requested from EagleBurgmann.

TRANSPORT / STORAGE

Transport

If not specified differently by contract the EagleBurgmann standard packaging is used which is suitable for dry transport by truck, train or plane. The warning signs and notes on the packaging must be observed.

In addition seaworthy packaging may become necessary.

Notes for income inspection:

- Check packaging for visible damage.
- Open packaging carefully. Do not damage or lose parts supplied separately.
- Check if consignment is complete (delivery note). Inform the supplier immediately in writing if parts are damaged or missing.

The mechanical seal has to be protected from damage during transport and storage. The transport case in which the seal is supplied is well suited for this purpose and should be kept for a possible return transport.

ATTENTION! If the machine as well as the mechanical seal installed into the machine are transported together, the shaft must be protected from deflection at all times, shocks and axial displacement by means of a suitable machine support.
Damage at the M.S. caused by insufficient protection during transport is excluded from the warranty.

Storage, "mothballing" (long term storage)

The following recommendations apply to all mechanical seals which have been supplied and stored in their **undamaged original packaging**, as well as to seals which have been installed in a machine (e.g. pump, compressor, agitator, etc.) but have not yet been put into operation.

Mechanical seals and spare parts are super finished and repeatedly tested machine elements. For storage special conditions have to be followed.

Sliding materials and elastomers are subject to material-specific and time-based alterations (distortion, ageing) which might reduce the full efficiency of the mechanical seals. Hence, this may be avoided by observing the storage instructions.

For the stock keeping of elastomers special conditions are required. For all rubber-elastic parts the rules of DIN 7716 resp. of ISO 2230-1973 (E) are valid.

Optimum conditions for storing of mechanical seals
- dust free
- moderately ventilated
- constant temperature
  - relative air humidity below 65 %,
  - temperature between 15 °C and 25 °C.

Protect the mechanical seal from
- direct exposure to heat (sun, heating)
- **ultraviolet light** (halogen or fluorescent lamps, sunlight, arc welding)
- presence or development of **ozone** (arc welding, mercury vapour lamps, high-voltage devices, electric motors)

➢ **risk of embrittlement** of elastomeric materials

It must be recognised that a difference exists between:
- **M.S. stored** in the stock room
- **M.S. installed** in the machine, but not yet in operation.

☐ **M.S. in the stock**

IMPORTANT! Store the **seal in the original packaging** lying on a **flat surface**.

- Check the packaging periodically for damage.
- Sealings packed in plastic-foil with humidity indicators have to be checked every 8 weeks. The check has to be recorded.

➢ Packagings **exceeding 50 % rel. humidity** values have to be sent to the manufacturer or the **nearest EagleBurgmann service centre** for inspection and new packaging.

Unused stored mechanical seal under optimum conditions:

- For reasons of safety, after 3 years from delivery of the mechanical seal the M.S. should be returned to EagleBurgmann resp. nearest EagleBurgmann Service centre for

➢ Exchange of all secondary seals and springs
➢ Verification of the flatness of the faces
➢ Perhaps static pressure test.

☐ **M.S. installed into the machine:**

ATTENTION! **”Mothballing”** (long term storage) of the mechanical seals is **not allowed**.

In case of a "mothballing" (long term storage) of complete machines with mechanical seals installed EagleBurgmann has to be contacted.

- **Do not** use corrosion protection agents.

➢ Risk of deposition and possibly chemical attack of the secondary seals.

Due to longer erecting times of newly designed plant the period between delivery of the mechanical seal and its installation and start-up in the machine may exceed a period of 2-3 years.

After 3 years at the latest and in good time before the planned start-up of the plant the seal has to be dismantled sent to the manufacturer or the nearest EagleBurgmann service centre where it can be checked and reconditioned, if necessary.

EagleBurgmann does **not accept any warranty** for damage caused by **improper** storage.

INFORMATION ABOUT THE PRODUCT

All technical information given is based on the results of extensive testing and on our long term practical experience. However, in view of the great diversity of possible applications the technical data can only be taken as being of approximate nature. We can only guarantee the safe and efficient functioning in individual cases if we have been comprehensively informed of the operating conditions to which they will be subject, and if this has been confirmed in a separate written agreement.

Manufacturer and country of origin

EagleBurgmann Germany GmbH & Co. KG
Äußere Sauerlacher Str. 6-10
D - 82515 Wolfratshausen

Germany

Type designation

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dw = specified shaft diameter

Materials

The materials of the mechanical seal depend on the application and are bound to the customer order. They can be found on the drawing, and/or in the parts lists attached to the documentation.

Designated use

This mechanical seal is **exclusively** designed for the use in the specified application. A **different utilisation** or usage of the seal going beyond the specification is considered **contrary to its designated use** and excludes a liability for possible consequences by the manufacturer.

Operation of the seal under conditions lying **outside** the limits stated in paragraph **"Operating limits"** is considered **contrary to its designated use**.

Should the mechanical seal be operated under different conditions or in a different application EagleBurgmann must confirm that such a change is safe in advance of subsequent operation.

- **Changes** to operating conditions **have to** be documented.

Operating limits

ATTENTION! Operating limits depending on the materials used.

Shaft diameter (dw)	**25 mm … 100 mm (1" ... 4")**	
Material combination	**carbon graphite / SiC**	**SiC / SiC**
Temperature to be sealed (t1)	-40 ... +220 °C	
Pressure to be sealed (p1)	max. 25 bar g [1)]	max. 20 bar g [1)]
Sliding speed (vg)	max. 16 m/s	max. 10 m/s
Barrier pressure (p3)	max. 25 bar g [2) 3)]	max. 20 bar g [2) 3)]
Pressure difference (p3-p1)	normally 2 … 3 bar (7 bar [4)]) [5)]	
Pressure difference (p3-p1) max.	25 bar [6)]	20 bar [6)]

Shaft diameter (dw)	**>100 … 150 mm (>4" ... 6")**	
Material combination	**carbon graphite / SiC**	**SiC / SiC**
Temperature to be sealed (t1)	-40 ... +220 °C	
Pressure to be sealed (p1)	max. 20 bar g [1)]	max. 10 bar g [1)]
Sliding speed (vg)	max. 16 m/s	max. 10 m/s
Barrier pressure (p3)	max. 20 bar g [2) 3)]	max. 10 bar g [2) 3)]
Pressure difference (p3-p1)	normally 2 … 3 bar (7 bar [4)]) [5)]	
Pressure difference (p3-p1) max.	20 bar [6)]	10 bar [6)]

Shaft diameter (dw)	**>150 mm (>6")**	
Material combination	**carbon graphite / SiC**	**SiC / SiC**
Temperature to be sealed (t1)	-40 ... +220 °C	
Pressure to be sealed (p1)	max. 16 bar g [1)]	max. 10 bar g [1)]
Sliding speed (vg)	max. 16 m/s	max. 10 m/s
Barrier pressure (p3)	max. 16 bar g [2) 3)]	max. 10 bar g [2) 3)]
Pressure difference (p3-p1)	normally 2 … 3 bar (7 bar [4)]) [5)]	
Pressure difference (p3-p1) max.	16 bar [6)]	10 bar [6)]

[1)] Operation with supply liquid p1>p3 (API, plan 52)
[2)] Operation with pressurised supply liquid p3>p1 (API, plan 53 / 54)
[3)] Observe the pressure difference!
[4)] Only in case of poor lubricating supply media!
[5)] Observe the barrier pressure!
[6)] Only admissible when the machine is started!

Please observe that the given operating limits interact, and therefore not all extreme values can be called on simultaneously.

Beyond that, the range of application of the respective product depends on the diameter, the materials used, the operation mode and the media to be sealed.

If there are any unclear points please contact EagleBurgmann.

Operating conditions

The exact operating data for the respective application, e.g. medium to be sealed, operating pressure, operating temperature, speed, etc., are listed in the operating manuals and the specification sheets of the machine manufacturer and/or the end user.

The **selection** of the mechanical seal (type, suitability, materials) should be done **by EagleBurgmann staff** or other **authorised** persons. A wrong selection by unauthorised persons is **not covered by** EagleBurgmann's **warranty**.

Drawings, diagrams

The original assembly drawing in its latest edition (latest revision) only is decisive for both the design of M.S. as well as the utilisation of this manual.

In the following description all figures in parentheses, e.g. (2) define the respective part item no. in fig. 1. The part item no. may vary from those stated on the corresponding assembly drawing.

Description

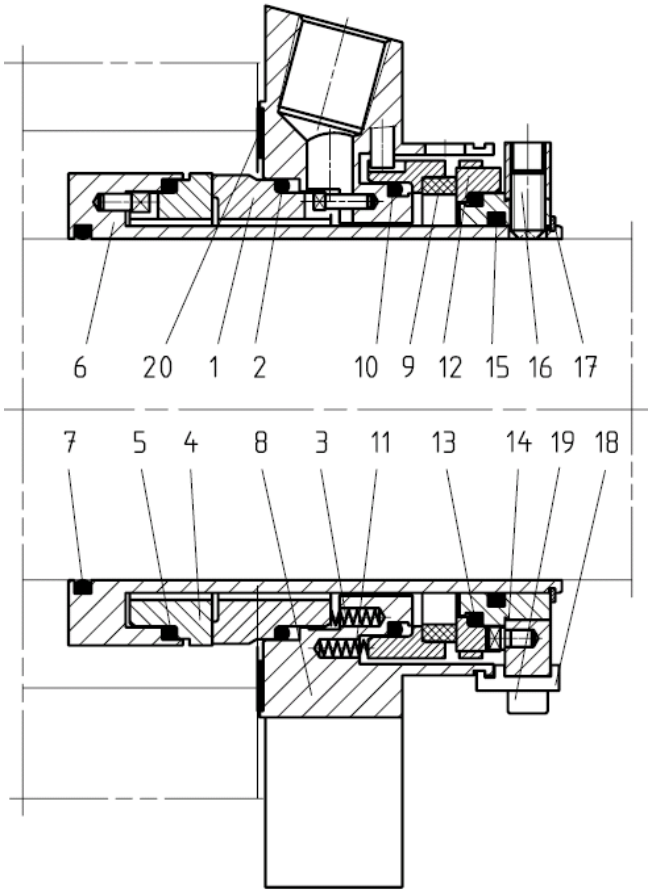


Fig. 1

- **cartridge design** with shaft sleeve (6), cover (8), assembly fixtures (18)
- **installation** horizontal / vertical
- **dual seal**
- **double pressure balanced**
- **bi-directional**

➢ Use the fluid connections depending on the direction of rotation.

- **rotating seats** (4; 12)
- **stationary seal faces** (1; 9)
- **multiple springs** (3; 11)
- **axial movability**

dw < 75 mm	±1 mm	(dw < 2.750"	±0.039")
dw ≥ 75 mm	±1.5 mm	(dw ≥ 2.750"	±0.059")

- **integrated pumping device**

➢ Observe the viscosity of the supply fluid!

- **supply connections** (C) in the cover (8)
- **assembly fixtures** (18) for optimum adjustment at works
- **torque transmission** to the shaft by means of set screws with cup point (16)
- **operation with barrier fluid** (pressurised supply fluid) (p3>p1)
- **alternative operation with quench** (pressureless supply fluid) (p1>p3)

Required space, connecting dimensions

The available installation space is decisive for the design of the housing parts. All connecting dimensions have to be checked with regard to the EagleBurgmann drawing before mounting the mechanical seal.

Supply of M.S.

- **Operating the seal with barrier pressure (p3>p1)**

When **operating as a dual seal** a **barrier pressure system** (API, plan 53 / 54) is required (where both seals are pressurised).

- **Operating the seal with pressureless supply liquid (p1>p3)**

When **operating** with a pressureless supply (buffer) liquid a **supply system** (API, Plan 52) is required (with the product-side seal pressurised externally).

Forced circulation of the supply fluid is effected by means of:
- a pumping device in the M.S., if the shaft rotates,
- a suitable circulating pump

ATTENTION! A circulating pump is always required at:
a shaft speed <1000 rpm
a viscosity >5 mm^2/s

If there are any unclear points please contact EagleBurgmann by all means!

Emissions

A mechanical seal is a **dynamic seal** that **cannot be free of leakage** due to physical and technical reasons. Seal design, manufacture tolerances, operating conditions, running quality of the machine, etc. mainly define the leakage value. In fact, compared to other sealing systems there is **few leakage**.

During the running-in phase of the M.S. an increased leakage may occur.

If the leakage amount does not decrease or if there are other malfunctions the mechanical seal has to be shut down, removed and checked for reasons of safety.

Leakage of the M.S. at outboard side has to be drained and disposed of properly.

IMPORTANT! Components which may have contact with the leakage have to be corrosion-resistant or have to be adequately protected.

WARNING! If the **medium to be sealed** and/or the **supply liquid** is subject to the **Hazardous Substances Regulation** (GefStoffV), the **instructions for handling dangerous substances** (safety data sheets to EU Directive 91/155/EEC) and the **accident prevention regulations** have be observed.

- **Operating the seal with barrier pressure (p3>p1)**

ATTENTION! If the barrier pressure falls **below** the pressure in the machine the **medium** to be sealed may penetrate through the sealing gap, **contaminating the barrier liquid**. Regular monitoring of the barrier pressure and exchange of the barrier liquid are important for the safe operation of the M.S.

- **Operating the seal with pressureless supply liquid (p1>p3)**

ATTENTION! Due to the overpressure in the stuffing box the **medium** to be sealed will penetrate through the sealing gap of the inboard seal **into the supply fluid** which will consequently be **contaminated**. For plan 52 EagleBurgmann recommend a regular control and **exchange** of the supply fluid.

INSTALLATION

General notes dealing with assembly utilities

For cleaning:
- ethyl alcohol
- cellulose-tissue (no rag, no cloth!)

For applications free from silicone:
- cotton-tissue (no rag, no cloth!)
- clean cotton gloves

For lubricating:
- suitable lubricants
- Lubricants must be compatible with all media (e.g. medium to be sealed, supply, flushing and/or cooling medium etc.), with those they get into contact with, and they must not corrode the secondary sealing elements.

ATTENTION! Secondary sealing elements made of **EP-rubber** must **never** come into contact **with mineral oil-based lubricants** (swelling, possibly decomposition).
- suitable synthetic lubricant for dynamic elastomeric secondary sealing elements e.g. **"TURMOPOL GREASE SH 2 D"** make: Lubricant Consult (LUBCON).
- suitable lubricants (conform with FDA)
  e.g. **"TURMSILON LMI 5000"** make: Lubricant Consult (LUBCON).
- chloride-free surfactants (e.g. sodium dodecyl sulphate (SDS)) or low-surface-tension water for elastomeric bellows seals and static elastomeric secondary sealing elements of seats

ATTENTION! For applications free from silicone:
- Lubricants must be free of silicones, fluorinated compounds which are able to migrate, and tensides.

For installation:
- set of hexagon keys
- set of open end or ring spanners
- torque wrench

Additional for single seals:
- o-ring lifter
- cardboard discs to cover the sliding faces during installation
- hand screw press (compulsory for shaft diameter ≥80 mm)
- press-in tool (as usual for radial rotary shaft seals)

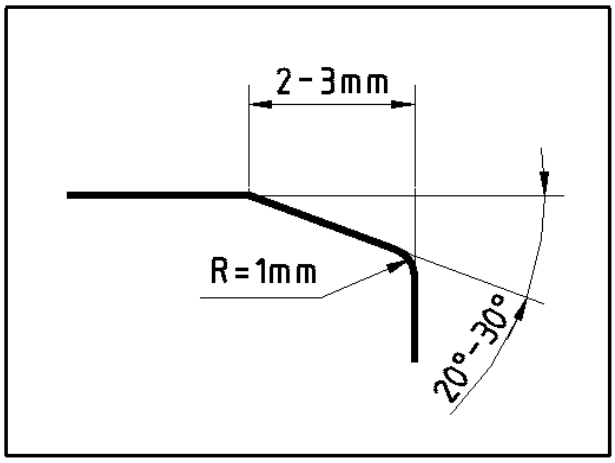
For sealing:
- Sealing agents for threads for pipe connections, e.g. **"LOCTITE® Nr. 266"** make: LOCTITE Corporation

For securing:
- for bolts, set screws etc. use liquid screw retention, e.g. **"LOCTITE® Nr. 243"** make: LOCTITE Corporation

Preparation for assembly

ATTENTION! To prevent **damage** to the seal, **do not remove it from its packaging** until all the work described below has been **completed**.

Check the parts of the machine for:



- **connecting dimensions**, if available tolerances of position and shape for the connecting parts (see drawing)
- **chamfered edges** (sliding cones i.e. 2 mm / 30° or in accordance with EN 12756)
- **radiused transitions**
- **mating fits** fine finished: **Rz 10 µm** (= N7 = CLA 63)
- **shaft surface** in the area of the mechanical seal: **Ra = 0,8 µm** (= N6 = CLA 32)
- **surface** in the area of the dynamically loaded o-ring roughness: **Rmax 5 µm** (= N6 = CLA 32) (e.g. component seals)
- **surfaces** for:
  - static secondary sealing elements fine finished: **Rz = 10 µm** (= N7 = CLA 63)
  - PTFE secondary sealing elements fine finished: **Rz = 5 µm** (= N6 = CLA 32)

Check on the machine:

- damage of connecting surfaces to the M.S.
- mating dimensions, rectangularity and concentricity to the shaft axis.
- Connections must be assigned according to direction of shaft rotation (see instruction **"INTEGRATED PUMP DEVICE"** on the drawing).

- Fix the machine shaft in centric and axial position.

Type and quality of the shaft bearing have a major influence on the well-functioning and the service life of the M.S.

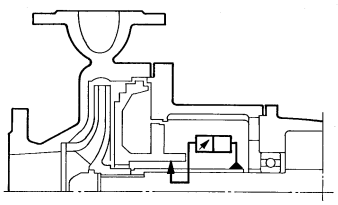
Before the M.S. is installed both the
- concentricity accuracy of the shaft
- and the run-out accuracy between shaft and machine housing

have to be checked.

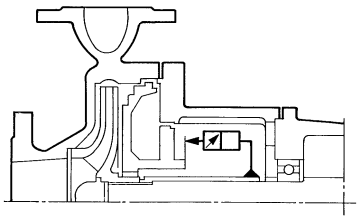
The maximum permitted axial displacements have to be considered, and the instructions of the manufacturer have to be observed.

Concentricity accuracy of the shaft (acc. to DIN ISO 5199):
- Shaft diameters up to 50 mm: max. 0.05 mm
- Shaft diameters 50 mm - 100 mm: max. 0.08 mm
- Shaft diameters exceeding 100 mm: max. 0.10 mm

Eccentricity and **run out** as specified by EagleBurgmann!



Eccentricity of the inner surface of the seal chamber to the shaft:
- max. 0.1 mm for seals **with** pumping screw
- max. 0.2 mm for seals **without** pumping screw



Run-out accuracy of the vertical contacting surface between seal chamber and shaft axis:
- Shaft speed ≤ 750 rpm: max. 0.2 mm
- Shaft speed 1000 rpm: max. 0.15 mm
- Shaft speed 1500 rpm: max. 0.08 mm
- Shaft speed 3000 rpm: max. 0.025 mm

In case of installation into other machines the shown values apply as directive.

- Prepare the assembly place, take away any un-required tool, cuttings, dirty cleaning wool etc.

- Cover the work bench with a piece of clean, non-fibrous cardboard.

Assembly / installation

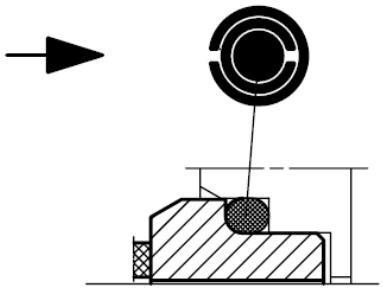
The mechanical seal is supplied as a precisely set cartridge unit, premounted at works, and does not require any adjustment during installation.

For installation the assembly drawing has to be observed.

The order of assembly to install the mechanical seal into the machine depends on the design of the machine and has to be determined by the machine manufacturer.

➢ If the machine manufacturer specified auxiliaries (jigs and fixtures) they have to be used in accordance with the specifications of the manufacturer.

- The mechanical seal has to be installed under the cleanest conditions and very carefully.
- Avoid unnecessary rotation of the shaft (damage of the sliding faces is possible).
- Never use force during installation.
- Avoid knocking! Damage to mechanical seals has an adverse effect on their safe operation.
- When fitting the PTFE-sealing elements in no case widen or compress them. Otherwise, their sealing function cannot be ensured.
- Observe the notes on the current drawing if necessary please contact EagleBurgmann.



- When using double-PTFE-wrapped o-rings care has to be taken that the joint on the outer wrapping faces against the assembly direction. Otherwise there is a risk of the wrapping opening and being pulled off, possibly resulting in seal leakage.

IMPORTANT! For the assembly of o-rings made of **solid PTFE considerable assembly forces** are required to compress them. Yet, these forces may result in permanent **deformations** of seal components, in particular of the assembly fixtures. To compress o-rings made of PTFE **little force over an extended period of time** has to be applied (force x time = constant). If necessary, the fastening screws have to be retightened several times.

ATTENTION! Sealing elements made of PTFE have to be used **only once**.

Possible installation order:

- Make sure that all sealing elements have been installed which contact the surrounding machine parts.

- Unpack the seal.
- ➢ If necessary, use suitable auxiliaries (e.g. crane, elevating machinery, lifting device, eye bolts etc.).

ATTENTION! The **regulations for the prevention of accidents** have to be followed.

If not described otherwise, the following parts have to be moistened slightly with suitable lubricant during installation:

- ▫ o-rings in sliding contact with other parts when mounting the mechanical seal,
- ▫ shafts in the area of the mechanical seal,
- ▫ centring seats (centring diameters) for housing parts.

- ➢ Lubricants must be compatible with the medium to be sealed, and they must not corrode the secondary sealing elements.
- ➢ Sealing elements made of **EP-rubber** must **never** come into contact **with mineral oil-based lubricants** (swelling, possibly decomposition).

- Insert the gasket (20) into the cover (8).
- ➢ To be inserted in with grease, if required.

- Check, if the o-ring (7) is installed.

- Feed the complete seal cartridge onto the shaft.

ATTENTION! **Avoid knocking!** Damage to mechanical seals has an adverse effect on their safe operation.

- Determine the direction of shaft rotation.
- Select the correct supply connections.
- ➢ Position of the supply connections in accordance with the instruction **"INTEGRATED PUMP DEVICE"** on the drawing.

- Bolt the cover of the M.S. to the machine housing.
- ➢ If necessary, use suitable washers.
- Attach the nuts and tighten them by hand.
- Tighten the nuts evenly with the specified tightening torque.
- ➢ The fitting dimension shown on the drawing must be observed **by all means**.

- Further assembly work and adjustments on the machine (e.g. bearing clearance etc.) in accordance with the operating manual of the machine manufacturer.

- Degrease the set screws (16) and screw them with 1 drop each of liquid screw retention, e.g. Loctite® 243, firmly crosswise to the shaft.

ATTENTION! Set screws with cup point must be used **only once**. Repeated fastening endangers the safety of force transmission.

- Check the specified tightening torque (defined on the drawing of the M.S.) with a torque wrench.

ATTENTION! **Remove** the assembly fixtures (18) and keep them by all means for a later removal of the seal. In case of shipment of the machine with installed mechanical seal, the assembly fixtures must be included in the delivery to the end user **by all means**.

- Any further assembly of the machine must be in accordance with the instructions of the machine manufacturer.
- The screw plugs / plastic inserts which are used for protection against pollution must only be removed directly before the piping is connected.
- Close unused supply connections pressure-tight with threaded plugs.

Supply connections

The supply connections are designed as female threaded NPT connections in accordance with ANSI B1.20.1.

➢ The supply connections are marked on the mechanical seal and must not be interchanged during installation.

ATTENTION! Sealing agents for threads (PTFE-tape, etc.) endanger the safe function of the mechanical seal if they enter the seal chamber. When screwed connections are opened take care by all means that sealing agents **cannot** enter the mechanical seal.

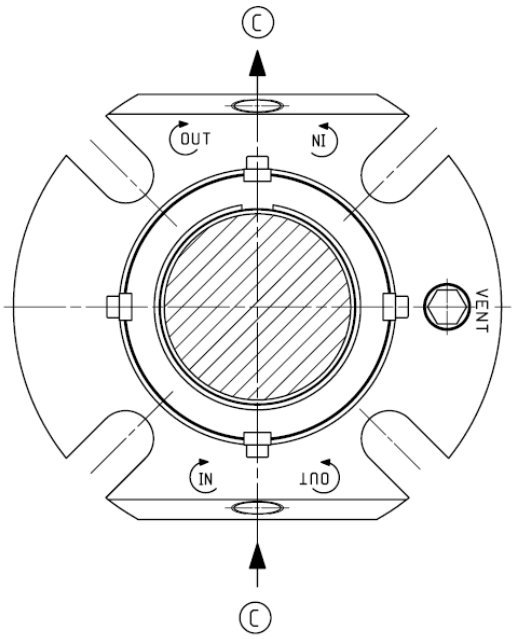
Supply piping:

- Use pipes of stainless steel or resistant material with a sufficient cross-section.
  - Supply piping for liquids: min. 18x1.5 mm
  - Supply piping for gases: min. 12x1.5 mm
  - Impulse piping: min. 12x1.5 mm
- Clean the piping **thoroughly**.
- Fasten all pipe connections **pressure-sealed**.
- Install the pipes **continuously rising**, as **short** and as **convenient** as possible for the flow to ensure **self-venting**.
- **Avoid air inclusions** and provide for venting connections, if necessary.
- For turns use pipe bends
- **Fasten** the pipes with appropriate pipe clips.

ATTENTION! If shutoffs in the piping to the seal are required, ball valves with torsion lock have to be used.

ATTENTION! The **operating manual** of the supply system must be observed.

Assignment of the connections for <u>vertical</u> arrangement of the connections:



- Determine the direction of shaft rotation. Select the correct supply connections.

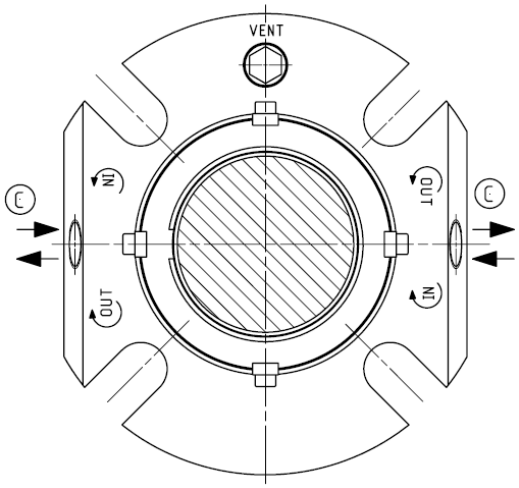
➢ **» IN « always at the bottom**
➢ **» OUT « always at the top**

➢ Connection **» VENT «** (plugged) is of no importance here.

▫ Supply fluid **"IN"** at **lower** connection **» IN «**
▫ Supply fluid **"OUT"** at **upper** connection **» OUT «**

▫ Only in case of seal versions with cast cover:
➢ Connection designation **» FLUSH «** is of no importance here.

Assignment of the connections for <u>horizontal</u> arrangement of the connections:



➢ Connection **» VENT «** (plugged) has to be positioned **on the top**.

▫ Vent at **upper** connection **» VENT «**
➢ For this purpose open plug (21).

▫ Only in case of seal versions with cast cover:
➢ Connection designation **» FLUSH «** is of no importance here.

Use the fluid connections depending on the direction of rotation:

■ **Direction of rotation: CCW, seen from the drive**

▫ Supply fluid **"IN"** at **left** connection **» IN «**
▫ Supply fluid **"OUT"** at **right** connection **» OUT «**

■ **Direction of rotation: CW, seen from the drive**

▫ Supply fluid **"IN"** at **right** connection **» IN «**
▫ Supply fluid **"OUT"** at **left** connection **» OUT «**

OPERATION

Safe operation

ATTENTION! If during an interruption of operation values deviating from the operating conditions / operating limits the mechanical seal must be removed and checked either at the manufacturer's or at the nearest service centre.

During every state of operation the mechanical seal has to be constantly wetted by the **medium** to be sealed **in its liquid form**, in particular when the machine is **started** or **stopped**. The machine design has to be such to take this necessity into consideration.

Damage due to dry-running is excluded from the warranty.

IMPORTANT! If the medium to be sealed builds deposits or tends to solidify during cooling down or standstill of the machine the stuffing box has to be flushed with suitable clean liquid. The flow rate and the liquid should be determined by the user considering the chemical resistance of the seal materials.

ATTENTION! If the supply liquid **does not circulate**, the M.S. is **not cooled**. This can result in **damage** caused by excessive heating!

For **reasons of safety** the temperature values listed below should not be exceeded, depending on the supply fluid used.

Supply fluid	**Return temperature / temperature in seal chamber**
Oil (e.g. white oil)	80 °C
Demineralised water with oily lubricating additives (e.g. propylene glycol; glycerol; recommended mixing ratio 70:30) **ATTENTION!** Viscosity and freezing point depend largely on the mixing ratio!	70 °C
Demineralised water	60 °C
Other appropriate liquids	at least 40 °C below the boiling point at normal pressure

ATTENTION! On principle the respective operating conditions have to be observed. Coordination and/or consultation with EagleBurgmann is recommended.

- **Operating the seal with barrier pressure (p3>p1)**

The **barrier pressure** must be **higher than the product pressure** during every state of operation.

ATTENTION! If the barrier pressure falls **below** the pressure in the machine the **medium** to be sealed may penetrate through the sealing gap, **contaminating the barrier liquid**. Regular monitoring of the barrier pressure and exchange of the barrier liquid are important for the safe operation of the M.S.

- **Operating the seal with pressureless supply liquid (p1>p3)**

ATTENTION! Due to the overpressure in the stuffing box the **medium** to be sealed will penetrate through the sealing gap of the inboard seal **into the supply fluid** which will consequently be **contaminated**. For plan 52 EagleBurgmann recommend a regular control and **exchange** of the supply fluid.

If the operation limit values and the instructions given in this manual are followed a trouble-free operation of the mechanical seal can be expected.

Supply fluids

Supply fluid according to operating requirements.

➢ For supply fluid only such media should be used which are compatible with the product medium and may leak out to the atmosphere at the outboard side of the mechanical seal without any risk.

ATTENTION! **Never** use **supply fluids on the base of mineral oil**, if sealing elements made of **EP-rubber** are used (⇒ swelling, possibly decomposition).

ATTENTION! Supply fluids must not form residues on the sliding faces.

Supply fluids e.g.:

- oil of low viscosity without high-pressure additives
- water/ethylene glycol mixture without anti-corrosion additives
- steam-condensate; de-ionised water

The efficiency of the integrated pumping device depends on different parameters e.g.:

- the viscosity of supply liquid
- the shaft speed

Operating viscosity of the supply fluid:

- should not exceed 5 mm^2/s (~5 cSt) in case of circulation by means of a **pumping device in the mechanical seal**
- A circulating pump is always required at:
  a shaft speed <1000 rpm
  a viscosity >5 mm^2/s

ATTENTION! In case of an **operating viscosity >5 mm^2/s** and/or a **shaft speed <1000 rpm** please contact EagleBurgmann by all means.

Start-up

Safety checks before start-up

- Assembly fixtures (18) of the M.S. removed
- Torque transmission (set screws #16) between mechanical seal and shaft duly installed
- Supply connections tightened and pressure-sealed
- Disposal connections installed environmentally safe
- Connections must be assigned according to direction of shaft rotation (see instruction **"INTEGRATED PUMP DEVICE"** on the drawing).

To ensure a safe operation of the M.S. a supply fluid (pressureless / pressurised) is required.

Forced circulation of the supply fluid is effected by means of:

- a pumping device in the M.S., if the shaft rotates,
- a suitable circulating pump

ATTENTION! A circulating pump is always required at:
a shaft speed <1000 rpm
a viscosity >5 mm^2/s

If there are any unclear points please contact EagleBurgmann by all means!

- Fill mechanical seal and supply circuit with clean liquid (particle size ≤50 µm) and vent thoroughly.

IMPORTANT! To avoid dry run at the sliding faces the supply circuit has to be vented thoroughly several times **before** start-up.

In case of horizontal arrangement of the connections:

- Vent at upper connection **» VENT «**
- For this purpose open plug (VENT).
- After venting close connection **» VENT «** pressure tight.

In case of vertical arrangement:

- To ensure a complete venting of the M.S. carefully push down the outboard seal face with a suitable tool through the hole in cover for a short time.

IMPORTANT! The supply liquid has to be emitted free of blow holes.

- **Operating the seal with barrier pressure (p3>p1)**

IMPORTANT! **First** the barrier pressure has to be set, **then** the mechanical seal can be put into operation.

- Adjust the barrier pressure:
  - 2-3 bar above the pressure to be sealed (p1) at the inboard seal
  - at a constant level (appropriate for the outboard sliding faces)
  - ➢ Observe the max. pressure difference (p3-p1).
  - ➢ Observe the max. permitted barrier pressure (p3).
- **Check** before starting the machine:
  - barrier pressure has been applied
  - barrier liquid can circulate trouble-free

- **Operating the seal with pressureless supply liquid (p1>p3)**

When **operating** with a pressureless supply (buffer) liquid a **supply system** (API, Plan 52) is required (with the product-side seal pressurised externally).

- **Check** before starting the machine:
- supply liquid can circulate trouble-free

- Fill and vent the machine by all means in accordance with the instructions of the machine manufacturer.

- Now the seal is ready for operation.

SERVICING

Maintenance

The correctly operated mechanical seal needs **low maintenance**. Wear parts, however, have to be replaced, if necessary.

- **Operating the seal with barrier pressure (p3>p1)**

A correct operation of the M.S. includes a regular check of the following parameters:
- Pressure of the barrier liquid
- Temperature of the barrier liquid
- Quantity of the barrier liquid
- Tightness of the supply circuit
- Leakage quantity of the mechanical seal

- **Operating the seal with pressureless supply liquid (p1>p3)**

A duly operation includes a regular check of the following parameters:
- Temperature of supply fluid
- Quantity of supply fluid
- Leakage (drainage) of mechanical seal

An inspection of the mechanical seal should be carried out along with a revision of the complete plant. We recommend having this inspection performed by EagleBurgmann.

If the mechanical seal is removed during a revision of the plant the sliding faces should be refinished at the manufacturer and both, elastomeric seal rings and springs should be replaced.

Directives in case of failure

Try to define the kind of failure and document it.

- In the event of **excessive leakage** changes in the leakage amount **must** be monitored. If necessary the machine has to be switched off.
- If a constant amount is leaking in a steady flow the mechanical seal is damaged.
- In the event of an **inadmissible temperature rise** the machine **has to** be stopped for safety reasons.

If there is a **malfunction** which you cannot correct on your own, or if the cause of malfunction is not clearly recognisable please immediately contact the nearest **EagleBurgmann agency**, an EagleBurgmann service centre or the EagleBurgmann headquarters.

During the **warranty period** the mechanical seal must only be disassembled with approval of the manufacturer or when a representative is present.

After-sales service by EagleBurgmann

EagleBurgmann's customer service department offers a comprehensive service package covering consultancy, engineering, standardisation, installation, commissioning as well as damage analysis right through to seminars on sealing technology.

Addresses are listed in various EagleBurgmann brochures as well as under **www.eagleburgmann.com**.

Reconditioning (repair)

If **reconditioning** is necessary, the complete **seal** should be sent **to the manufacturer**, as this is the best way to find out which components can be reconditioned or which parts must be replaced in order to ensure an optimum tightness.

If, **for compelling reasons**, **a reconditioning** has to be carried out **on site** (e.g. no. spare seal on stock, long transport, problems with customs) the seal may be repaired in a clean room by **trained** personnel of the user under the direction of **EagleBurgmann mechanics**.

Disassembly / removal

- **Stop the machine** as instructed, allow to cool, depressurise it and ensure that pressure cannot build up again!
- **Work** on the M.S. **is only permitted** when the machine is at a **standstill** and **depressurised**.
- Depressurise and shut off (or drain) the **supply** of the M.S.
- **There must be no product in the M.S.** ⇒ if necessary drain the machine and rinse it out!
- **Isolate the machine** to prevent it starting up unexpectedly!
- **Observe the safety notes** (safety data sheets)!

IMPORTANT! When removing, please observe **by all means**:

- current accident prevention regulations
- regulations for handling hazardous substances

WARNING! Seals that have been used with **hazardous substances must be properly cleaned** so that there is no possible **danger** to people or to the environment.

IMPORTANT! The packaging used to transport the seal must

- be **identified** with the relevant **hazard symbol** and
- **include** the **safety data sheet** for the product and/or supply medium.

IMPORTANT! If the medium to be sealed builds deposits or tends to solidify during cooling down or standstill of the machine the stuffing box has to be flushed with suitable clean liquid. The flow rate and the liquid should be determined by the user considering the chemical resistance of the seal materials.

The order of disassembly to remove the mechanical seal out of the machine depends on the design of the machine and should be determined by the machine manufacturer.

➢ If the machine manufacturer specified auxiliaries (jigs and fixtures) they have to be used in accordance with the specifications of the manufacturer.

- Remove the supply piping to the mechanical seal. Collect drained liquid and dispose of properly.

- Drain the mechanical seal. Collect the drained liquid and dispose of properly.

IMPORTANT! **Insert** the assembly fixtures (18) into the cover (8) and **fasten them**.

- Unscrew the set screws with cup point (16) and dispose of.

ATTENTION! Set screws with cup point must be used **only once**. Repeated fastening endangers the safety of force transmission.

- Loosen all screw connections between seal cartridge and the respective machine parts.

- Remove the mechanical seal in the reverse sequence as described for assembly (set up).

ATTENTION! Sealing elements made of PTFE have to be used **only once**.

Spare parts

- Only EagleBurgmann original spare parts must be used. Otherwise
➢ **Risks** of a failure of the mechanical seal, **endangering** persons and environment.
➢ The EagleBurgmann guarantee for the seal **lapses**.
- For a quick exchange a complete **spare seal** should be on stock.

Required details for enquiries and orders

For enquiries and orders the following details are required:
- EagleBurgmann commission no.
- Drawing no. of mechanical seal
- Part item no., designation, material, number of pieces acc. to drawing.

Address of headquarters:

EagleBurgmann Germany GmbH & Co. KG
Postfach 1240
D - 82515 Wolfratshausen

Germany

☎ +49 (0) 81 71-23 0
Fax +49 (0) 81 71-23 12 14
www.eagleburgmann.com

Disposal of the mechanical seal

Usually, the mechanical seals can be easily disposed of after a thorough cleaning.
- Metal parts (steels, stainless steels, non-ferrous heavy metals) divided into the different groups and sent to scrap metal waste.
- Ceramic sliding materials (synthetic carbons, ceramics, carbides) belong to waste products. They can be separated from their housing materials, as are physiologically recognised as safe.
- Synthetic materials/plastics (elastomers, PTFE) belong to special waste.

CAUTION! Material containing fluorine must not be burnt.

IMPORTANT! Some of the synthetic materials, divided into the different groups can be recycled.

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April 28, 2016
Technical Documentation Department