

Installation, Operation and Maintenance instructions for Pump type:

Venus1-300.410	(Electric Motor Driven)
PROJECT	Jetpumps PUR-214.3063
Pump serial Nr	57942 Single shaft end 57943 Double shaft end

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1. INTRODUCTION

1.1. FOREWORD

These installation, operation, safety and maintenance instructions are meant to give information about correct installing and intended use of the pump set.

Note: It is of great importance that the electrician and the operating personnel, before starting any activities, are fully aware of the contents of these instructions.

It is the responsibility of the owner/user to take care that only adequately trained personnel works on the pump and that all instructions are actually being carried out. Operating instructions are to be kept as reference near to the pump set.

1.2. SAFETY INSTRUCTIONS

Places where there are potential risks for injury are marked with pictograms on the pump set. These pictograms comply with the European directive EEG 92/58 and are not to be removed.

The pictograms are divided in **warning signs** having a triangular shape with black overprint on a yellow background and **mandatory signs** having a round shape with white overprint on a blue background.

Unreadable or missing pictograms can be ordered by spare parts order form. When relevant, complementary safety instructions will be given in this manual, also see chapter 2.

Below follows an overview of indication symbols and their meaning used in this manual.

Symbol designation



This symbol is used to indicate important messages.

Danger: Denotes the most serious hazard, and is used when serious injury of the user will result from misuse or failure to follow specific instructions.

Caution: This is to warn you that serious damage to equipment may result from misuse or failure to follow specific instructions.

Note: This is to draw your attention; there is no immediate danger for equipment or personnel.

1.3. TESTING

Every pump is tested on the test stand at NIJHUIS POMPEN B.V. The inspection and test reports can be filed in the appendix of this manual.

1.4. SERVICE

Nijhuis Services is the service organisation of NIJHUIS POMPEN B.V. You can always contact our service organisation for questions concerning installation, maintenance and spare parts as well as advice and support.

1.5. GUARANTEE

The terms of guarantee applicable to this pump are stated in the sales conditions. The period of guarantee starts at the moment of delivery. Nijhuis Pompen does not accept any liability for any damage, material nor physical, arising from:

- Disregarding the relevant installation and / or operating instructions.
- Normal wear.
- The use of parts and / or modifications without the written approval of Nijhuis Pompen.

Note:

All claims for guarantee resulting from modifications, other use than intended use, or changes in performance without written approval of Nijhuis Pompen will be rejected. The legal product liability will also be rejected when changes are made without our approval.

1.6. DESCRIPTION OF THE PUMP TYPE VENUS

The VENUS is a horizontal split case pump. The pump casing is split horizontally over the centre line. By raising the upper half of the pump casing, access can be gained for inspection or maintenance work. The inlet and outlet flanges are situated on the lower half of the pump. The pump casing is equipped with interchangeable wear rings.

The impellers are standard balanced in accordance with **ISO 1940/1**.

The pump shaft has been made out of stainless steel, with shaft sleeves, which protect the pump shaft against abrasion.

A mechanical seal or stuffing box is used for shaft sealing and is normally provided with a flushing connection.

The bearing is protected against spray water. Grease is used to lubricate the bearings.

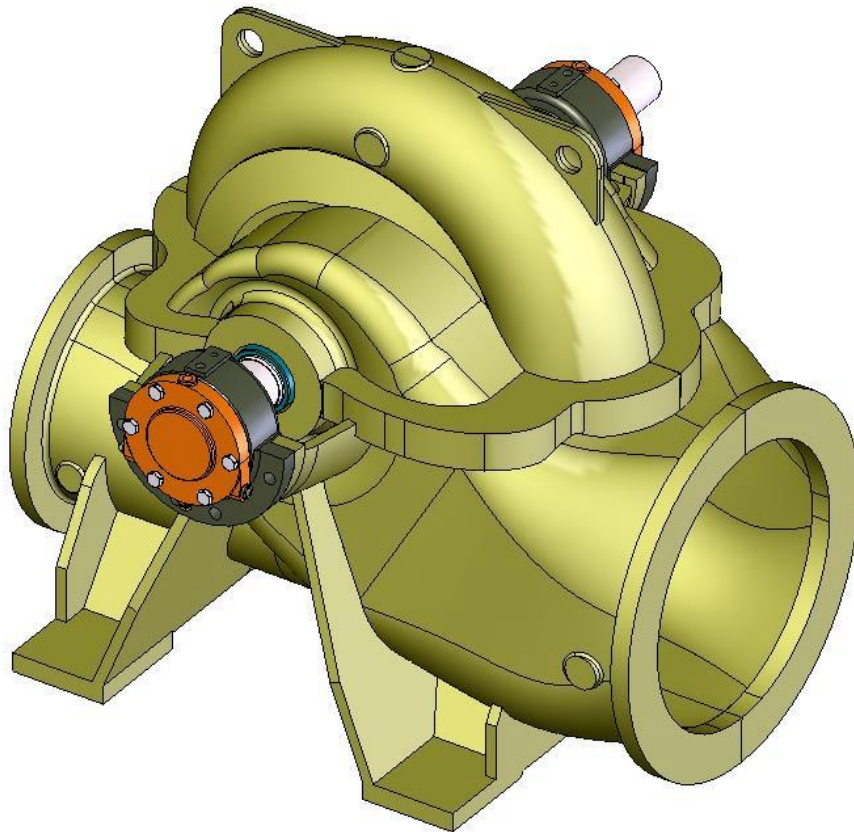


Fig 1.1 Pump type VENUS 1

2. SAFETY INSTRUCTION

2.1. GENERAL

This chapter gives an overview of the risks involved when working on the pump set. It is of great importance that before working on the pump (unit) this manual is attentively read. When working all relevant safety precautions have to be met. To ensure the safety of the user all instructions as mentioned in this manual have to be met without any restriction. By observing the instructions there is no danger in working on the pump set.

2.2. RISKS

When working on the pump set one is exposed to several potential dangers. When not observing the instructions the potential dangers are:

- getting jammed by falling parts
- flooded pump sump
- getting jammed by moving parts
- burning by hot surfaces
- touching parts of the electrical system

Danger: Before starting any activities on the pump set the discharge valve and suction valve have to be closed and secured against opening. Electric controlled valves have to be shut off in such a manner that they cannot be operated during the activities.

Take the correct measures in order to prevent the pump from being switched on, depending on the type of electrical cabinet. Remove the fuses and place a warning sign at the electrical cabinet. For this the local safety regulations must be applied.

Note: Subsequently the pump casing has to be drained.

Danger: Take care that during the activities no one can fill the pump or can start the motor.

2.3. APPLIED PICTOGRAMS AND SAFETY INSTRUCTIONS

There are several pictograms on the pump (unit). These pictograms are shown at relevant spots in the manual. The overview below shows the most frequently used pictograms together with their explanation.



General danger



Safety helmet mandatory



Danger of voltage



Danger of squeezing by rotating parts



Hearing protection required



Only personnel with the right skills are allowed to work on the pump unit.

It is of great importance that safety of people is secured when working on the pump unit. Before starting any activities, attentively read the manual and observe all instructions.

ALWAYS ENSURE:

- proper illumination of the working area
- proper clothing
- gloves and safety goggles
- spilled oil to be removed at once
- observing the safety precautions as mentioned in “safety instructions”
- no smoking in the working area
- not to start the pump without the mandatory safety guards
- maximum safety

3.INSPECTION, STORAGE AND TRANSPOTR

3.1. GENERAL

This chapter contains information related to the inspection after receipt and horizontal and vertical transport of the pump (set).

3.2. INSPECTION

Upon receipt of the pump (set) immediately check if all parts are present, some parts can be packed separately. Any damages shall be reported to the transport company and to Nijhuis Pompen B.V. Nijhuis pompen cannot be held liable for transport damages when not immediately reported.

3.3. STORAGE

3.3.1. GENERAL

The pumps are delivered ready for installation and use. If the pump has to be (temporary) stored, below mentioned instructions have to be observed.

3.3.2. REQUIREMENTS FOR STORAGE

The storage space must be dry, free of dust and frost-proof. To avoid damage to the bearings during storage resulting from vibrations, the pump may not be exposed to vibrations exceeding V_{eff} 0,2 mm/sec.

Storage period less than 1 month:

- Fully cover the pump (unit) with canvas to avoid penetration of dirt and dust.
- Rotate the pump shaft 1½ turn every week
- Check the pump every week.

Storage period longer than 1 month:

- If the pump is equipped with a gland packing, remove the packing rings in order to avoid corrosion and pitting on the shaft sleeve.
- Uncoated parts have to be preserved with a preserving agent, e.g. Shell Ensis Fluid G.
- Fully cover the pump (unit) with canvas or plastic to avoid penetration of dirt and dust.
- Rotate the pump shaft 1½ turn every week.
- Check the pump every week.

3.4. TRANSPORT

3.4.1. HOISTING

The various components of the pump set like pump, electric motor, diesel engine or electrical cabinet are equipped with bolted-on or cast-on lifting eyes. These lifting eyes are **only** to be used to lift the component itself.

Danger: *It is strictly forbidden to lift the complete pump set with these lifting eyes.
Check the weight of the pump before lifting*

Lifting the pump set has to be done according the lifting instructions on the unit, using appropriate lifting devices.

The pump set has to be lifted according below mentioned lifting instruction. This lifting instruction is also shown on the pump set. Hoisting is only allowed strictly in compliance, with these instructions, approved equipment, local regulations and qualified personnel.

Danger: *It is required to wear a helmet and safety shoes during hoisting. It is strictly forbidden to dwell or stay under a lifted load*

Danger: *Be sure never to come under the lifted component of pump set.*

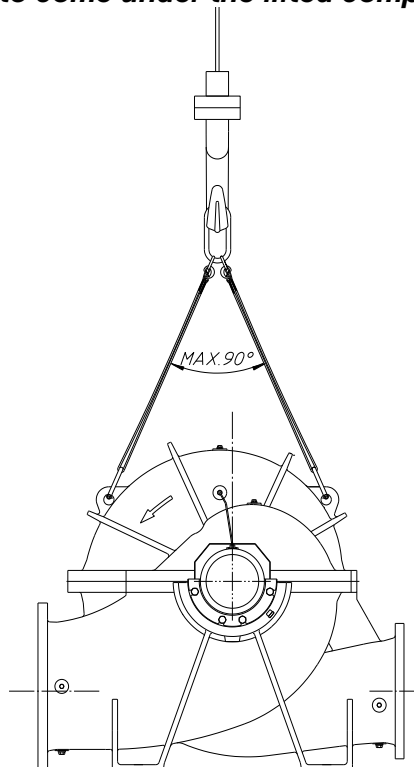


Fig. 3.1 Hoisting of the pump with the hoisting hooks

4. INSTALLATION AND COMMISSIONING

4.1. SAFETY

It is of great importance always to observe the safety of persons and installation when operating or working on the installation. Before starting any activities, attentively read the manual and observe all instructions.

4.1.1. SAFETY PRECAUTION

Danger: *Ensure that the motor can not be started when working on the pump set. When there is a risk for causing static electricity the pump set must be earthed. Also ensure that the suction and discharge valve stay shut when the pump is in maintenance. Refer to chapter 2 Safety.*

At an electric motor driven pump set it is necessary to:

- switch off and secure the main switch
- close the suction and discharge valve
- depressurise the pump and line system
- put a label on the main switch reading:



OUT OF ORDER BECAUSE OF MAINTENANCE!!

4.1.2. NOISE PROTECTION

Note: **Wear noise protection when working near a pump set in operation.**

4.2. INSTALLATION

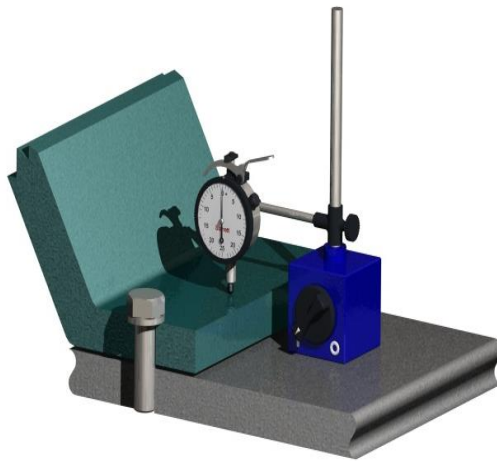
The pump and motor are mounted on a joint frame. The frame is not to be twisted when being positioned onto the foundation. The foundation under the pump set must be able to carry the weight of the pump and to absorb any dynamic loads.

4.3. ALIGNMENT OF THE PUMP SET

For testing purposes pump and electric drive were aligned when manufactured. During transport this alignment will not have been unchanged and thus has to be redone before and after fixing the anchor bolts. Check and align the pump set according below stated procedure. Vertically installed pumps direct driven by the electric motor, are provided with a face of close fit. Installing can be done without aligning the pump shaft and motor. Nevertheless, It is recommended to check the alignment of the coupling as described in chapter 4.4.

4.3.1. FILLING OUT THE PUMP

Previously check whether the contact areas of the foundation plate are clean and even. Then check whether the pump foot is in correct contact with the steel foundation at all four corners. This check has to be made before the fixing bolts are fastened. If necessary fill out one of the corners using a correct sized filling plate.



fastened.

The thickness of the filling plate can be measured with a calliper gauge. The thickness can also be determined according figure 4.3.

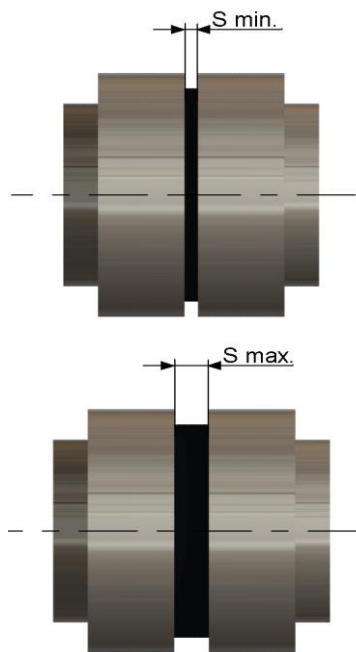
When fastening the hex. head screw, by measuring the displacement of the pump foot, the thickness can also be determined using a dial gauge.

After placing the filling plate the pump fixing bolts can be

Fig.4.3 Determining filling plate thickness pump

4.3. ALIGNMENT OF THE COUPLING

Normally, the pump set is engineered with a flexible pin type coupling. Any other executions are mentioned in the specified appendix. The rubber coupling buffers absorb vibrations and are capable of meting a limited tolerance in the alignment. One should be aware that misaligning leads to increased loads on the bearings of pump and motor, and also on the coupling itself. Therefore below mentioned allowable deviations may not be exceeded. Aligning the coupling must be done after installing the suction and the discharge line. Before aligning the coupling next dimensions have to be accurately measured in order to determine whether the deviation is allowable.



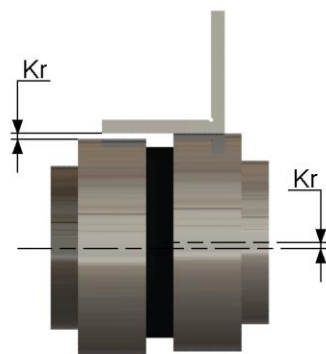
Axial alignment:

the drawing of the pump unit. Depending on The nominal dimension S between the two coupling halves is shown on the size of the coupling this dimension is 4-10 mm.

The maximum allowable deviation on the nominal dimension is shown in the appendix "Alignment of the coupling"

Dimension "S" is best measured with a digital sliding gauge.

Fig.4.5

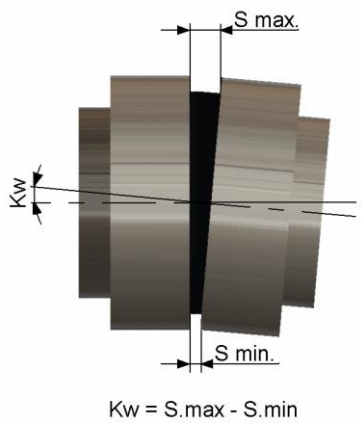


Radial alignment:

Radial deviation "Kr" between both coupling halves is to be executed at the complete circumference of 360°.

Determine maximal deviation. The maximal allowable deviation is shown in appendix "Alignment of the coupling"

Fig. 4.6



Angular deviation:

The angular deviation between both coupling halves is to be determined at the complete circumference of 360° using a dial gauge or sliding gauge.

Determine the deviation, maximal (Smax) and minimal (Smin) and calculate the difference of the two (Kw). The maximal allowable dimension for Kw is shown in appendix "Alignment of the coupling"

Fig. 4.7

4.5. COMMISSIONING

4.5.1. PRIOR TO COMMISSIONING

This chapter gives an overview of all checks to be made when putting into operation

CHECK prior to starting:

Pump:

- whether the pump rotor can rotate freely.

Motor:

- whether the electric motor is correctly connected to the electrical system with the correct circuit breakers.
- whether the motor power data match with the voltage of the electrical system.

General:

- if all bolted joints are fastened.

Danger: ***Pay attention to unprotected moving parts.***

- whether the correct suction and pressure gauges are installed.
- whether the non return valve has been installed correctly.
- the alignment of motor and pump.
- whether the bearings are lubricated.
- whether the room is adequately ventilated to eliminate the developed heat.

Direction of rotation



- **The direction of rotation of the electric motor with removed coupling elements.**
- **The direction of rotation of the pump. It is indicated by means of an arrow on the pump.**

Close the discharge valve and open the suction valve. Fill up the pump with water and check whether the flanged joints are tight. Open the discharge valve and check whether the discharge line is tight.

Now the coupling elements can be installed again and the pump can be started according paragraph 4.5.2.

4.5.2. FIRST START-UP



When starting the pump be sure that all protective measures are in place (safety guards etc.)

The next procedure must be followed when putting the pump in to operation for the first time as well as after major overhaul.

- Completely close the discharge valve.
- Open the suction valve and fill the pump.
- De-aerate the pump.
- Rotate the pump shaft by hand for a few turns and check whether it rotates freely.
- Check whether all valves are in the correct position.

Caution:

When driven by electric motor check the direction of rotation according paragraph 4.5.1.

- Start the pump and after pressure has built up open the discharge valve. The pump should now operate according its characteristics.
- Check the reading of the gauges on the suction and discharge lines.
- When the readings deviate strongly the pump must be stopped and the cause investigated (also see appendix: “trouble shooting list“).
- Check the leaking rate of the stuffing box according appendix: “gland packing instructions”.
- Operate the pump for some time and observe the operation with regard to:
 - steady output
 - abnormal sounds
 - vibrations
 - temperature increase of bearings etc.

5. OPERATION

5.1 DURING OPERATION

During operation the pump should operate according to its characteristics as stated in chapter 1, identification. If it appears that the pump does not operate according its characteristics the cause must be investigated and Nijhuis Pompen B.V. must be contacted. During operation regularly (daily or weekly) check whether the pump operates at its specified working point and record it in a logbook. Deviations exceeding 5% are a warning that changes are taken place. An investigation has to point out the cause. Noticed deviations have to be repaired immediately

5.2. TROUBLE SHOOTING DURING OPERATION

In chapter 8, a trouble-shooting list is included with possible causes. It is recommended to keep this trouble-shooting list and the manual accessible near to the pump.

5.3. STOPPING THE PUMP

The non-return valve must have a characteristic allowing no liquid to return after the pump has stopped. In general damped non-return valves should be used.

When the pump is stopped but will remain stand-by no specific precautions are necessary.

5.4. SHUT DOWN



If the pump has to be shutdown the discharge valve and suction valve have to be closed and secured against opening. Electric controlled valves have to be shut off in such a manner that they cannot be operated during the activities.

Take the correct measures in order to prevent the pump from being switched on, depending on the type of electrical cabinet. Remove the fuses and place a warning sign at the electrical cabinet.

During a longer stand-by period the functioning of the installation must be checked every week. It is recommended to make a procedure and keep a logbook. If the liquid contains crystals or other granulates that can form sediment it is recommended to rotate the shaft regularly in order to avoid blocking by the sediment.

At longer standstill and temperatures below 0°C the pump has to be drained. The drain plug at the bottom of the pump casing has to be used.

If the pump has been out of order for a longer period, the next start-up has to be executed according chapter 4.5.

Danger: Take care that during the activities no one can fill the pump or can start the motor

6. MAINTENANCE INSTRUCTIONS

6.1 GENERAL

Scheduled maintenance according instructions of the manufacturer increases reliability and lifetime of pump and installation and reduces costs in the long run. To maintain product quality and specification always use genuine spare parts when replacing. These parts are of the required design and are made according the latest revision of the original construction drawings. All described maintenance and repair activities can be done with tools available in hardware stores. A skilled person should do major overhaul, like disassembling and assembling of the pump.

6.2 SCHEDULED MAINTENANCE

Danger: *Ensure that by no means moisture gets in or comes near to the terminal box of the electric motor.*

Daily:

Check the pump set for leakage, vibrations and unusual sounds.
Regularly check the suction and discharge pressure.

Weekly:

- Check the shaft sealing. A mechanical seal has a very low leakage rate, normally the leaked water vaporises so it looks as if the seal is free of leakage. If the mechanical seal is visibly leaking the sealing surfaces will have to be checked. Also refer to appendix “mechanical seal instructions”.
- If adjusting does not help, the packing or shaft sleeve is worn out and has to be replaced.
- Check the bearing temperature. The change in temperature is an indication for the condition of the bearings.

Annual:

- Analyse the progress of the temperature of the bearings. If the temperature is rising, it is a sign that the bearings has to be changed. Under normal operating conditions the bearing lubricant will have life time of 15000 workhours or three years. Requirements regarding Oil and Oil level are specified in Appendix, ‘Lubricants Equivalents’.
- Check the alignment of the coupling and the condition of the rubber coupling elements. When distorted replace the coupling elements.
- Check the condition of the mechanical seal; when there is excessive leakage the sealing surfaces will have to be checked and replaced if necessary. Also refer to appendix “mechanical seal instructions”.

Every 5-year:

- Check the condition of the bearings, casing wear rings and impeller. If necessary replace the relevant parts

6.3 DISASSEMBLY AND ASSEMBLY

Refer: **Sectional drawing 352021* or 352014, VENUS-1.**

Execution: **Grease lubrication + mechanical seal**



WARNING
Before performing activities on the pump set:

- the pump casing has to be drained.
- the electric motor must be isolated from the electrical system.
- activities on the electrical system are to be performed by authorised personnel.
- remove scavenging lines and measuring devices like PT100 etc.

Take care that during the activities no one can fill the pump or can start the motor. Remove the fuses and place a warning sign at the electrical cabinet. The lifting equipment has to meet the national requirements and needs to be of adequate capacity to lift the pump. The weight of the pump is stated in chapter 1, identification.

If only the internals of the pump have to be inspected the pump can remain on its frame. If the rotor section has to be disassembled, remove the pump from the frame and disassemble it in the workshop. During disassembly it is recommended to put away the disassembled parts in a systematically order in order to simplify assembly.

6.3.1 Disassembling sequence

First disconnect the coupling halves, so the pump rotor is able to rotate free from the motor.

Remove the key (14). Remove screws and washers of the seal (55&54), so that the mechanical seal (50) can remain on the shaft and to avoid damaging the mechanical seal (**consult instructions mechanical seal**). Turn the nuts (86) on the taper pins (84) until it releases. Remove them. Remove all nuts (82) from the studs (81) located in the split flange and turn the jacking bolts, lift the upper casing half (80) away from the lower casing half. Lifting vertically, and taking care not to damage the impeller. Use the lifting hooks which are casted to the casing

Remove the bolts and washers (10&11) from the bearing housings (1&2) and take the entire shaft out of the lower casing half. Put it down carefully on a wooden floor to prevent damages.

Remove the sealing rings (73) of the impeller (70). Slide the V-ring (16) off the pump shaft (4), unscrew the bolts and washers (12&13) and draw the bearing housing covers (3) away from the bearing housings. Remove the bearing housings (1&2). With the help of a three-arm-puller the bearing* (6) (on the axle journal side) can be pulled from the pump shaft. Remove the bearing cover, the V-ring and the mechanical seal.

Press the fixture of the locking washer (8) back and remove the bearing nut (7) and lock washer. Remove in sequence: bearing (6) (with the help of a three-arm-puller), supporting ring (18), bearing cover (3), V-ring (17) and mechanical seal. Unscrew the set screws (27) in the lock ring (26) and remove the lock ring. Remove the O-ring (21) and the 2/2 rings (20), impeller (70) and the impeller key (15). The entire pump has now been dismantled.

6.3.2. After disassembling

- Protect all parts against damage.
- Clean all bearings with white spirit, kerosene or other suitable cleaning agent.
- Check the bearings and replace if necessary. When replacing the bearings is not necessary it is recommended to immediately cover the bearings with oil or grease in order to avoid corrosion.
- Check the ceramic bearing bushes and shaft sleeve for wear, replace if necessary.
- Check the clearance between casing wear rings and impeller.

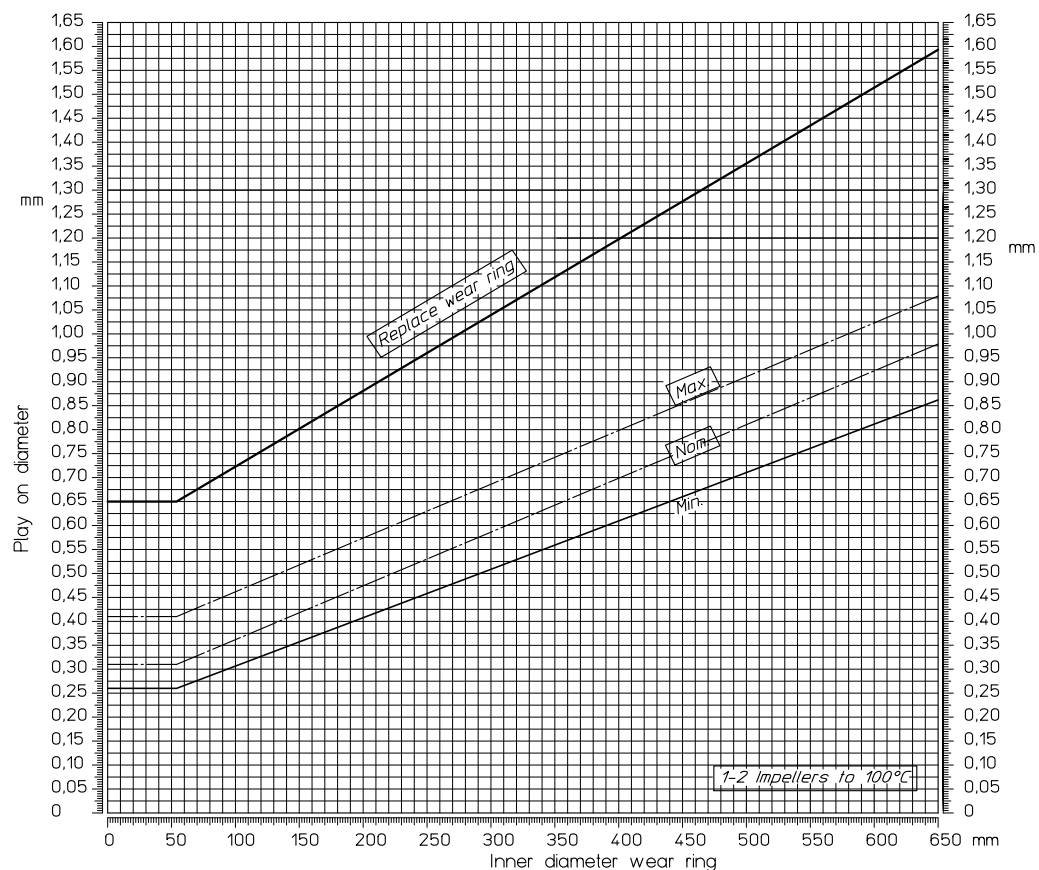


Fig. 6.1 Replacing wear rings

- Check wear rings, O-rings, "V"-rings etc. for damage and wear, replace if necessary.
- Clean the faces of both pump halves and check for damage. If the pump is not immediately assembled, cover all uncoated parts with a preserving agent, e.g. Shell Ensis.

6.3.3 Assembling sequence

Starting with the shaft group, it is important to check the direction of rotation of the impeller. First the complete rotor group will be assembled.

Install the impeller key (15) and slide the impeller (70) onto the shaft (4). Then install the following components to the pump shaft: the 2/2 rings (20) with the O-ring and the lock ring (9). Tighten the sets screws! Install the seals (50), V-rings (17) and bearing housing covers (3). Install the inner retaining ring (18). Place the wear rings (73) round the impeller (70).

Heat the inner ring of the bearings (6) up to $\pm 80^{\circ}\text{C}$ (not with an open flame). Fit the bearings to the pump shaft, tapping carefully against the inner ring of the bearing. Fit the locking washer (8) and the lock nut (7), ensuring that the lip of the locking washer is located in the recess in the lock nut. Fill the bearings with new grease and refit both bearing housings (1 & 2) and attach the bearing housing covers (3) with the bolts and rings (12&13).

After cleaning (degrease) and inspecting the mechanical seal housing, the joint surfaces and the fitting recesses, position the complete shaft section. When the impeller is correctly assembled on the shaft, the impeller will be located exactly in the centre of the pump. Keep the seal out of the seal housing. Now put the assembled shaft group in the casing lower half.

Apply a line of liquid packing on the jointing surface of the lower half, ensuring that no gaps occur in the line of liquid packing. Also, apply liquid packing to the studs

Use for this purpose 'LOCTIE SUPERFAST' No.573

Position the loose cover, over the dowels, on the lower half. Fit the nuts on the studs, and tighten the pump halves together. Note that the nuts need to be **tightened crosswise**.

Secure the bearing housings with bolts and rings (10&11). Check if the pump shaft can rotate freely. If not step-by-step check above mentioned instructions. When the pump shaft rotates freely the installation of the mechanical seal is to be completed. Apply instructions as stated in chapter **MECHANICAL SEAL INSTRUCTIONS**.

If equipped, install scavenging line and PT100.

After installing the pump, check whether all bolts and nuts are firmly fastened.

AFTER THE PUMP IS ASSEMBLED, IT CAN BE PUT INTO OPERATION, ACCORDING THE INSTRUCTIONS IN CHAPTER 4.

7 WASTE / RECYCLING

During scheduled maintenance of the pump various parts will get into the waste disposal circuit. These products mainly consist of:

- Used lubricants (oil or grease).
- Worn out metal pump parts (bearings, wear rings, shaft sleeves etc.).
- Various synthetic parts (O-rings, packing rings).

All waste and rejected products have to be disposed off, worked up or recycled according to the applicable national legislation.


8 APPENDIX

8.1. TROUBLE SHOOTING LIST

In general malfunctioning always appears spontaneously and on an inconvenient moment. Malfunctioning is a situation in which the pump or pump set as a result of an instantaneous problem or a gradual process does not work, as it should.

Keeping a logbook in which all test data, maintenance and repair activities are recorded is an important source of information in investigating a problem. When investigating a problem it is essential to consider all possible causes related to the malfunctioning.

Never jump to a conclusion concerning the cause of the malfunctioning; all available information must be taken into consideration.

Before determining the cause of a malfunction, it is very important to take the necessary  precautions. The pump can be full and possibly under pressure. Also the bearing can be hot. Wear appropriate protective clothing, safety goggles etc.

In case of a malfunction always apply the applicable safety precautions as stated in paragraph 2 and 4

The most frequently occurring malfunctions and their possible causes are mentioned in the list following

Malfunctions	For cause refer to below mentioned numbers
Pump delivers no liquid	1-2-3-5-8-26-27-28-30-31-35-40
Pump has insufficient capacity	2-3-4-5-7-8-14-15-16-26-27-28-30-31-34-35-40
Pump has insufficient pressure	2-7-8-14-15-16-28-34-35
Pump stops after starting	1-2-3-4-5-6-27-30-35-40
Pump takes too much power	7-8-9-11-12-14-15-18-21-22-34
Pump vibrates and is noisy	1-5-8-9-10-11-12-13-14-15-19-20-22-23-24-25-27-30-32
Stuffing box is leaking excessively	9-11-17-18-19-20-33-40
Shaft seal has to be replaced too often	6-9-11-13-17-18-19-20-21-33-40
Bearings wear out too fast or get hot	9-11-12-19-20-22-23-24-25-38-39
Pump gets overheated and/or jams	9-12-13-19-20-22-23-24-25
Motor overloading	7-9-12-13-19-22-23-24-25-28-29-31-34-36-37-41

DESCRIPTION OF POSSIBLE CAUSES

1. Pump and suction pipe are not completely filled
2. Gas or air evades from the liquid
3. Air pocket in the suction pipe
4. Air leaking in through stuffing box
5. Suction pipe inlet not enough immersed
6. Flushing line is blocked
7. Wrong direction of rotation
8. Impeller blocked by strange object
9. Shafts not exactly in line
10. Alignment pump – motor not correct
11. Shaft is bended
12. Rotating parts hit stationary parts
13. Bearings are worn out
14. Wear rings, impeller or wear plates are worn out
15. Impeller is damaged
16. Casing gasket is leaking
17. Shaft or shaft sleeve worn out; possible packing damaged
18. Packing not correctly installed
19. The shaft rotates eccentrically because of worn out bearings or bad alignment
20. Rotating parts are out of balance
21. Gland is fastened too tight. Therefore no liquid between shaft and packing
22. Improper lubrication of bearings because of lack of lubricant or too much lubricant
23. Insufficient lubrication
24. Wrong or contaminated lubricant
25. Corrosion of bearings because of penetration of liquid
26. Discharge head is calculated too low
27. Available NPSH too low
28. Speed too low
29. Speed too high
30. Suction line is obstructed
31. Discharge line is obstructed
32. Pump is not running on correct working point
33. Wrong kind of packing used
34. The liquid is of a higher viscosity
35. Suction line is leaking
36. Mains voltage not according to data plate E-motor
37. Wrong impeller diameter
38. Axial forces too high because of worn out blades on the back side of the impeller or discharge pressure too high
39. Bearings not installed correctly
40. Lantern ring not correctly installed in the stuffing box
41. One phase down in power supply E-motor

8.2. TORQUE VALUES BOLTS/NUTS

The list below shows the maximum recommended torque values for standard ISO bolts and nuts

There has assumed here, that new bolts/nuts are being used with the use of lubricants. (With Stainless steel bolts/nuts use lubricant on chlorine paraffin base to prevent wear)

Quality	4.6	5.6	8.8	10.9	12.9	F468-C63000	RVS A2-A4 Class 50	RVS A2-A4 Class 70	RVS A2-A4 Class 80
Moment	Nm	Nm	Nm	Nm	Nm	Nm	Nm	Nm	Nm
Nominal thread diameter in mm.						Rp 0.2 = 270 N/mm2	Rp 0.2 = 210 N/mm2	Rp 0.2 = 450 N/mm2	Rp 0.2 = 600 N/mm2
8	9	11	24	34	40	10	7	15	20
10	18	22	48	67	81	20	14	31	41
12	31	39	82	116	139	35	25	53	70
14	49	62	131	185	221	55	39	84	112
16	74	93	198	278	333	83	59	126	168
18	103	129	276	388	465	116	82	176	235
20	144	180	384	540	648	162	114	245	327
22	192	240	513	721	866	216	153	182 *	437
24	248	310	661	929	1115	279	197	234 *	563
27	361	451	963	1354	1624	406	286	341 *	-
30	492	615	1313	1846	2216	554	391	465 *	-
33	661	826	1762	2477	2973	743	524	-	-
36	853	1066	2275	3199	3839	960	677	-	-
39	1097	1371	2925	4113	4936	1234	869	-	-
42	1391	1738	3708	5215	6257	1564	1100		

* Rp 0.2= 250N/mm2

These torque values are only to be used for common purposes. Sometimes other values can be used. This of course depends on the material of which the bolts and nuts are made. When in doubt, do not hesitate and consult **Nijhuis Pompen B.V.**

8.3. LUBRICANT EQUIVALENTS

LUBRICANT		OIL		GREASE
		Ambient temp. ≤ 30° C	Ambient temp. > 30° C	
RECOMMEN- DED		Castrol Perfecto T 32	Castrol Perfecto T46	Texaco Multifak EP 2
EQUIVALENT	Shell	Tellus S2 V25	Tellus S2 V29	Retinax EP 2
	Mobil	DTE Oil Light	DTE Oil Medium	Mobilux EP 2 oder Mobil Grease HP222
	BP	Energol TH 65-HB	Energol TH 80-HB	Energrease LS-EP 2
	Esso	Teresso 43	Teresso 46	Beacon EP 2
	Texaco	Regal Oil A R & O (ISO VG 32)	Regal Oil B R & O (ISO VG 46)	
	Fina	Bakola R & O 32	Bakola R & O 34	Marson EP L2
	Gulf	Gulfcrest 44	Gulfcrest 47	Crowngrease EP 2
	Chevron	OC Turbine Oil 32	OC Turbine Oil 46	Dura-Lith EP 2
	Castrol			Spheerol EPL 2

8.4. CARTEX SN SEAL

OPERATING MANUAL

EagleBurgmann Mechanical Seal (M.S.)

Cartex-SN(O)/dw-00	Cartex-SN(O)32(33)(34)(35)/dw-00
Cartex-SNO2/dw-00	Cartex-ABPN/dw-00
Cartex-SN100/dw-00	Cartex-ABPN32(33)(34)(35)/dw-00
Cartex-SN21/dw-00	Cartex-ASPNDw-00
Cartex-SN(O)41/dw-00	Cartex-ASPNDw-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!

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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 to 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 94/9/EC.

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 do **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

EagleBurgmann Mechanical Seal (M.S.)	
Cartex-SN(O)/dw-00	Cartex-SN(O)32(33)(34)(35)/dw-00
Cartex-SNO2/dw-00	Cartex-ABPN/dw-00
Cartex-SN100/dw-00	Cartex-ABPN32(33)(34)(35)/dw-00
Cartex-SN21/dw-00	Cartex-ASP/dw-00
Cartex-SN(O)41/dw-00	Cartex-ASP32(33)(34)(35)/dw-00

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 has to 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	max. 12 bar g
Sliding speed (vg)	max. 16 m/s	max. 10 m/s

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	max. 10 bar g
Sliding speed (vg)	max. 16 m/s	max. 10 m/s

Shaft diameter (dw)	>150 ... 300 mm (>6" ... 12")	
Material combination	carbon graphite / SiC	SiC / SiC
Temperature to be sealed (t1)	-40 ... +220 °C	
Pressure to be sealed (p1)	max. 16 bar g	max. 10 bar g
Sliding speed (vg)	max. 16 m/s	max. 10 m/s

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.

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**.

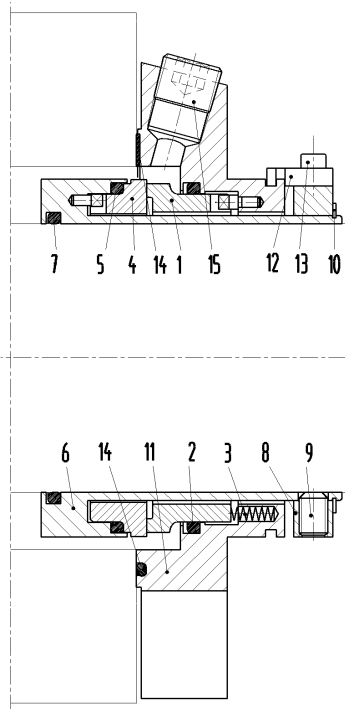
Drawings, diagrams

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

Cartex-SN., -ASPN, -ABPN (with supply connection for flushing / circulation)



Cartex-SNO (without supply connection)

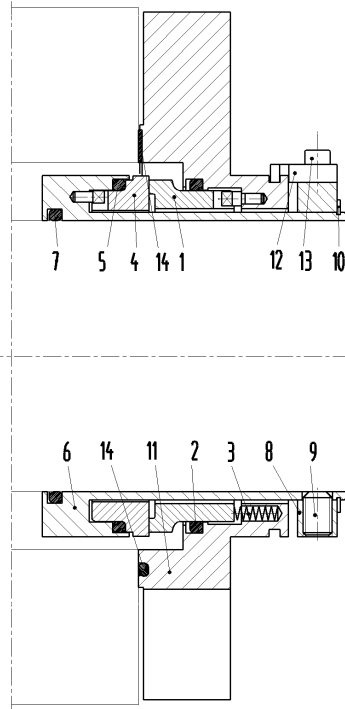


Fig. 1

- **cartridge design** with shaft sleeve (6), cover (11), assembly fixtures (12)
- **single seal**
- **balanced**
- **bi-directional**
- **installation** horizontal / vertical
- **rotating seat** (4)
- **stationary seal face** (1)
- **multiple springs** (3)
- **axial movability**

$dw < 75 \text{ mm}$	$\pm 1 \text{ mm}$	$(dw < 2.750''$	$\pm 0.039'')$
$dw \geq 75 \text{ mm}$	$\pm 1.5 \text{ mm}$	$(dw \geq 2.750''$	$\pm 0.059'')$
- **torque transmission** to the shaft by means of set screws with cup point (9)

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.

The mechanical seal has to be constantly wetted by liquid medium. The medium to be sealed must not damage the M.S. neither chemically (e.g. corrosion, embrittlement) nor physically (e.g. erosion, abrasion).

For a safe operation of the mechanical seal we recommend applying **at inboard** the most suitable **type of circulation** described in **API 610 / 682**. This measure protects the seal cavity from deposition of solids.

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 to be observed.

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

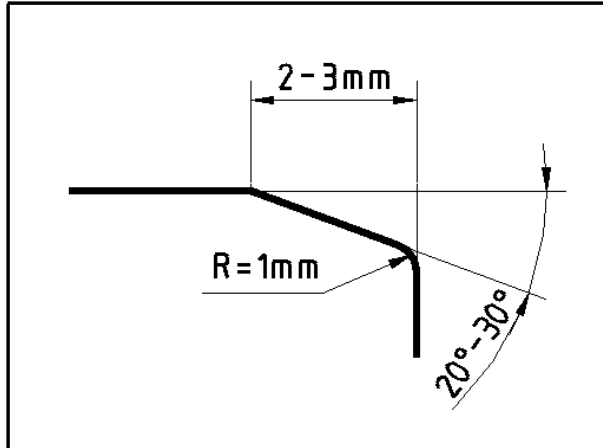
For securing:

- 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.
- 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

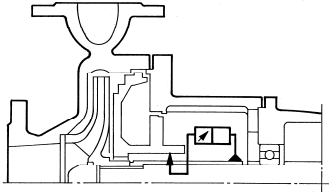
- concentricity accuracy of the shaft
 - and the run-out accuracy between shaft and machine housing
- have to be checked.

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):

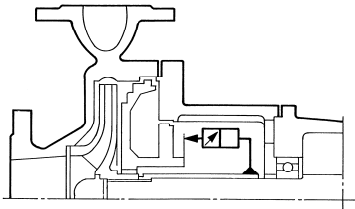
- Shaft diameters up to 50 mm: max. 0.05 mm
- Shaft diameters 50 mm - 100 mm: max. 0.08 mm
- Shaft diameters exceeding 100 mm: max. 0.10 mm

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.

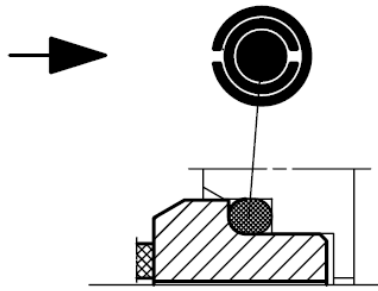
For installation the assembly drawing has to be observed.

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 (14) into the cover (11).
 - 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.

- Pay close attention to supply connections and make sure they are oriented as per 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 (9) 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 (12) 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.

Assignment of the connections:

- Circulation (flushing) **"IN"** at connection » **FLUSH** « (plugged with head screw plug #15)

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.

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.

For a single mechanical seal the **pressure in the seal chamber** (stuffing box pressure) has to be **higher** than the ambient pressure at the machine at any time. Otherwise the machine will **suck in air** via the sliding faces, which will result in **dry-running** and consequent **failure** of the mechanical seal.

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.

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.

Start-up

Safety checks before start-up

- Assembly fixtures (12) of the M.S. removed
- Torque transmission (set screws #9) between mechanical seal and shaft duly installed
- Supply connections tightened and pressure-sealed
- Disposal connections installed environmentally safe

For a safe operation of the mechanical seal we recommend applying **at inboard** the most suitable **type of circulation** described in **API 610 / 682**. This measure protects the seal cavity from deposition of solids.

- 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.

A duly operation includes a regular check of the following parameters:

- Temperature
- Leakage (drainage) of the 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**, a 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 (12) into the cover (11) and **fasten them**.

- Unscrew the set screws with cup point (9) 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:

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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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Technical Documentation Department

