



# ***INSTALLATION, OPERATING, AND MAINTENANCE INSTRUCTIONS***

## ***Chemiepac***

*955, 956, 958, 970, 971, 978*



To seal\*

Machine manufacturer:

Machine type :

End user :

Plant :

Works standard :

Drawing number : see details based on the order

Article ident. number : see details based on the order

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## **IMPORTANT!**

**CAREFULLY READ AND OBSERVE THESE INSTRUCTIONS AND THE INFORMATION ON SAFETY BEFORE HANDLING OR STARTUP**

### **FIELD OF OPERATIONS AND PERMITTED USE**

The FLOWSERVE CHEMIEPAC is intended exclusively for the sealing of liquids in pumps. All other instances of use are not permissible. The manufacturer is not liable for any damage incurred through non-permitted use; the risk is borne by the user alone.

\* Should details based on the order not be given, the user shall be responsible for the assignment according to permitted use.

## **1.0 BRIEF DESCRIPTION, FUNCTION**

1.1 Specifications for the operations described herein:

### **Application limits**

Product pressure  $p$  (bar) depending on temperature see catalogue

Speed  $v$  (m/s) 8

Product temperature  $t$  (°C) to 125° C type 970...  
to 100° C type 950...

The application limits specified are maximum load values and assist in preselection.

The application limits must be checked for every application.

A warranty in an individual case is possible only when FLOWSERVE knows the exact application conditions and these have been confirmed in a separate agreement.

1.2 Surface temperature of seal faces:

The temperature class as per EN 13463-1 is based on the expected surface temperature of the faces. The difference between the medium temperature and the surface temperature of the faces depends on various factors.

The annexed diagram shows how the temperature class can be calculated on the basis of a temperature difference obtained in practice.

1.3 Brief description

The CHEMIEPAC is a partially assembled mechanical seal system designed to seal rotating shafts with respect to stationary housings, e.g. a pump shaft with respect to the housing.

The CHEMIEPAC consists of two units:

The stationary unit is the mating ring (4) with corresponding flat gasket (5). One face of the mating ring is designed as a seal face, the opposite face is marked "no seal face". The mating ring and flat gasket must be connected tightly to the pump housing. The rotating unit comprises the components 1-3, 6-10, 14 and 15 for the CHEMIEPAC 955, 956 and 958, and 1-3, 6-15 for the CHEMIEPAC 970, 971 and 978. The main component is the elastic bellows of PTFE that the two-part drive bolts tightly and free of twisting to the shaft. The face of the bellows is designed as a seal face.

Near the seal face the mechanical properties of the PTFE material are enhanced by additives. An exchangeable seal ring is available for the CHEMIEPAC 970,971 and 978. A spring plate (6) is locked along the axis and free of twisting with the bellows and has built-in springs (3) that are supported in the axial direction against the drive. In the installed state, the seal faces of the stationary mating ring and the seal face of the bellows form the seal gap through mutual elastic contact. The medium is sealed from the atmosphere at the seal gap. The sealing effect is generated by the bellows' spring pretension and reinforced by the hydraulic closing force arising from the pressure exerted by the sealing medium.

## 1.4 Function

The MS is supplied with liquid from the product.

There must always be liquid at the seal gap to generate a seal film. The seal film also exists when the shaft is stationary.

When the shaft is rotating the seal faces of the seal and mating rings are separated from each other by the seal film, and so operate in a virtually non-contacting and non-wearing state.

## 1.5 Function conditions

The function of the MS is obtained only when the following conditions are fulfilled:

- the seal gap is supplied with clean, solids-free fluid only (solids size < 5µm).

! The product pressure may not exceed the specifications under Item 1.1.

- plane-lapped seal faces.

- perpendicularity between the seal face and the shaft axis.

- unforced freedom of movement of the rotating parts within the specified tolerances.

- prevention of sedimentation on the surfaces of the shaft or shaft sleeve by e.g. crystallization or polymerization.

- prevention of the product from adhering in the area of the seal gap.

- permanent seal film in the seal gap.

- adherence to the specified operating data as per § 1.1 and/or the data sheet.

If these operating requirements are not fulfilled the consumption of product, for example, is increased or product constituents can escape into the atmosphere. Other effects can include high component temperatures.



See the directive 94/4/EC and prEN 13463-5; issue 2002; section 4.4.3.

## 2.0 INFORMATION ON SAFETY

### 2.1



**DANGER:** This symbol means that failing to observe this information involves the risk of personal injury and / or considerable damage to property.







**IMPORTANT:** This symbol draws your particular attention to important information that is possibly not clear even to qualified personnel. This information, however, must be observed to prevent malfunctions that in turn could directly or indirectly give rise to serious injury and/or property damage.



**EXPLOSION PROTECTION:** This means that failure to observe these instructions will involve the risk of explosion in potentially explosive environments which can cause harm to persons and / or considerable damage to property.


2.2 The customer and / or the operator must ensure that all persons assigned to handle, assemble, and operate the mechanical seal have carefully read these operating instructions before they commence any installation, commissioning, or maintenance work. Personnel attending to the installation and operation must be fully acquainted with the layout and function of the MS and its supply system.

- 2.3  Damage may cause leakage in liquid or gaseous form. The hazardous effects correspond to those of the product, and there may be hazard to persons or the environment. The operator's regulations concerning work safety, accident prevention, and pollution for this plant section must be adhered to without exception.
- 2.4  Components coming into contact with the leakage must be corrosion-resistant or corrosion-proof.
- 2.5  All MSs sent to FLOWSERVE for servicing or repairs must be decontaminated.
- 2.6  When employing elastomers of EP (ethylene-propylene) or butyl rubber, do not use any grease or oil on a mineral basis as a lubricant.




### **3.0 GENERAL**

- 3.1 All illustrations and details in these operating instructions are subject to technical alterations that are necessary in improving the MS.
- 3.2 The copyright on these operating instructions is the property of FLOWSERVE. These operating instructions are intended for the assembly, operating, and supervisory personnel and contain regulations and drawings of a technical character that may not, in full or in part, be copied, distributed, used without authorization for competitive purposes, or given to others.
- 3.3 We point out that we accept no liability for any instances of damage or malfunctions incurred through nonadherence to these operating instructions.

### **4.0 TRANSPORT, STORAGE**

- 4.1 The MS must be transported and stored in the unopened original packaging. The storage site must be dry and free of dust. Influences through temperature or irradiation must be avoided.
- 4.2 Parts or complete MSs that have been dropped or otherwise subjected to heavy impacts during transport must not be installed. An inspection by FLOWSERVE becomes necessary.
- 4.3 After a storage period of three years the MS must be inspected for properties as new. This applies in particular to the secondary seals and seal faces. We recommend an inspection by FLOWSERVE.
- 4.4  If the machine is to be preserved with integrated MS the preserving medium must not impair the functions of the MS by e.g. fouling, hardening, or swelling the secondary seals.

## 5.0 PREPARING FOR INSTALLATION

- 5.1  The MS may be installed when there are no visible signs of damage to the MS. This applies in particular to the seats, centrings, and the static sealing elements.
- ! Before installing, consult the specifications on the accompanying documents to verify that the correct MS has been installed correctly and is suitable for the specified application. Do not exceed the design data.
  - ! Requisite for all assembly work are the installation drawing and parts list and the tools and aids required for the assembly.
-  Vibrations must be prevented from transferring to the installed MS during operation, e.g. through structural measures implemented on the machine.
- 5.2  The installation chamber for the MS must be checked against the corresponding drawing and table of dimensions. It must be ensured that all dimensions, surface qualities, and tolerances (e.g. concentricity, run-out, fits) are observed. The specifications under e.g. ISO 21049 or API 682, DIN 28 161, FLOWSERVE publication FSD 101, FLOWSERVE publication 127 must be observed.
- 5.3 Ensure the highest degree of cleanness. Force must not be used to install the CHEMIE-PAC. Use only suitable tools and aids.
- 5.4 The seal faces of the MS are important functional sites and may not be damaged.
- 5.5 All functional and assembly areas for the secondary seals (e.g. O-rings) must be dimensionally accurate, free of striae and burrs, chamfered, and radiused.
- 5.6 The locating surfaces of the MS and installation chamber must be undamaged and the feed pipes and ring channels dry.
- 5.7 A thin coat of product-compatible grease (e.g. DOW Chemical 111) is to be applied to the sealing elements (e.g. O-rings). Excess grease is to be avoided.
- 5.8 Depending on the installation direction, a lubricant, e.g. Molykote M55 or PTFE spray without solvent, must be applied to the shaft or shaft sleeve.
- ! The areas for the clamp connections must remain free of grease, otherwise the holding force will become inadequate for correct functioning.  
Inserting the installation plates.
  - ! Place the spring-loaded unit (1–3, 6–[14]15) on a clean surface. Compress the bellows by applying light, uniform pressure to the drive. The installation plates must not be inserted until just before the actual installation otherwise there will be a very high downtime leakage for the first 45 minutes. The setting dimension is obtained when the installation plates are inserted.

## 6.0 INSTALLATION

6.1 Observe the machine manufacturer's specifications and the following information when installing the MS in the machine.



The machine to take the MS must be earthed in accordance with the applicable regulations for electrical installations (e.g. VDE rules) to conduct away any electrostatic build-up and so prevent spark formation.

6.2 The mating ring with the installed flat gasket must be pressed into the mating ring mount uniformly by hand or under a press. The seal face is protected with a lapped plate or the seal ring. Use oil or grease as a lubricant (see Item 5.7).

Tighten the cover uniformly and flatly.



Under no circumstances may O-rings of EP rubber come into contact with mineral oil or grease (see item 5.7).

6.3 Push the spring-loaded unit (items 1 - 3, 6-[14] 15 ) on the shaft or shaft sleeve. Displace the drive (item 9) until the setting dimension is obtained, and bolt firmly to the shaft or shaft sleeve with (item 8).

Max. tightening torques (Nm) for item 8:

Thread (mm)	For material: 1.4571 / 2.4610
M5	2.3
M6	5
M8	9
M10	17
M12	51



When the shaft is of e.g. PTFE, PP, or elastomers the drive (9) must be secured in addition along the axis (packing gland).



After tightening the drive, the installation plates must always be removed.



Components provided by the customer for installing the MS, e.g. the pump cover or fastening bolts, must exhibit adequate properties and dimensions. It must not be possible to overstress these components, e.g. the max permitted tightening torque must not be exceeded.

6.4



To reduce friction forces during installation the shaft or shaft sleeve is lubricated with a thin coat of oil or grease in the area of the dynamic sealing element (see Item 5.7).

6.5



Conduct a static pressure test. Do not exceed the max pressures under item 1.1.

6.6 Should there be gas or air pockets in the sealing chamber, these can accumulate with the rotation at the outer diameter of the seal gap at machine start-up. As a consequence the machine runs dry at the seal gap for an undefined period and damage may be caused to the seal faces.

## **7.0 CONNECTING THE FLUID SUPPLY**

7.1 The MS is operated with a fluid supply system in accordance with the specifications from the machine manufacturer. To carry off the heat generated by friction and to prevent deposits in the area of the seal face, adequate liquid circulation must be ensured, e.g. feed from the discharge branch of the pump. The inlet of the circulation pipe (min. 1/4") in the seal cover must be in the area of the seal gap. The seal gap is supplied with clean, solids-free fluid only.



Escaping leakage must not form an explosive mixture.

Forced ventilation must be ensured in the sealing chamber when the circulation line is connected. Should there be gas or air pockets in the sealing chamber, these can accumulate with the rotation at the outer diameter of the seal gap at machine start-up. As a consequence the machine runs dry at the seal gap for an undefined period and damage may be caused to the seal faces.



Monitoring the liquid circulation is a recommended measure for ensuring that the MS operates properly.



Suitable measures must be implemented to prevent errors in the operation of shut-off and throttling devices installed in the fluid supply.

## **8.0 STARTING UP, OPERATION**

The MS is ready for operation after it has been installed, the fluid supply connected, and the sealing chamber carefully vented.



The Chemiepac 955-958 must not be operated with normal water. The addition of a wetting agent is recommended. Please wait for at least twenty minutes before starting up the seal.



It must be ensured that the machine is protected against penetration by dust and / or that dust deposits are removed at regular intervals so that they cannot exceed a thickness of 5 mm on the surfaces of the faces.



It must be ensured, e.g. in the form of a level monitor, that the sealing chamber is completely vented and filled with liquid in all operating states if it is to minimise the heat generated by friction and therefore the surface temperature of the seal elements.



If the application limits for operations in accordance with these instructions cannot be observed, the temperature of the supply fluid and / or the installed



components must be monitored at all times by a device that shuts down the machine once a critical temperature is reached. This device can consist of resistance thermometers or thermoelements.

8.1 The installed MS is bi-directional.

8.2 The sealing chamber must be vented carefully before startup.

8.3 During the static pressure test on the pump the test pressure must not exceed the specifications (see § 1.1).

8.4 To carry off the heat generated by friction and to prevent deposits in the area of the seal faces, adequate circulation must be ensured for the supply fluid, e.g. forced circulation.



At all operating temperatures the product must not come within 20 K of its evaporating point. Should this not be the case during certain operating situations (e.g. shutdown, start-up) forced circulation or adequate cooling must be generated to promote heat removal.



Escaping leakage must not form an explosive mixture.

8.5 Pressure should be applied to the product in a step-by-step process, and not abruptly.



Exceeding the max pressures given under item 1.1 will cause damage to the MS.

8.6 Operation, malfunctions

<b>SYMPTOM</b>	<b>CAUSE</b>
Large loss of product	<ul style="list-style-type: none"> <li>- shaft eccentric.</li> <li>- pipe connection leaks.</li> <li>- damage to the MS (product exits into atmosphere)</li> </ul>
Fluid supply temperature too high	<ul style="list-style-type: none"> <li>- product pressure too high (higher friction)</li> <li>- lack of supply fluid</li> </ul>

8.7 The pump shaft may be stopped at any time.

## **9.0 SHUTTING DOWN, REMOVAL**

9.1 The machine may be shut down at any time under normal circumstances.

9.2 Before the MS is removed the machine must be shut down and depressurised.

9.3 The shaft may be shut down under pressure.

9.4 Remove the MS by following the instructions for installation in reverse order.

Removing the pressure transmitter may release medium! All information and



regulations regarding safety measures and protective clothing with respect to this plant section must be observed and strictly adhered to. The operator must ensure the proper disposal of the media collected when the machine is vented or drained.

9.5 Carefully replace the removed MS in the original packaging (e. g. wooden crate) and store or send this to FLOWSERVE for inspection.

## **10.0 SYSTEM CHECK**

Routine maintenance of the MS extends to the monitoring of the set values for pressure, temperature, and leakage quantity.



Routine maintenance must be conducted at suitable intervals to prevent soiling in or on shut-off and throttle devices installed in the fluid supply.

10.1 Removing the MS for an inspection becomes necessary when:

- the specified leakage values are exceeded and, after enquiries at FLOWSERVE, no other written agreement ensues.
- after an installation period of more than three years.
- an inspection of the pump is due, and a similarly long operating period is expected thereafter.

## **11.0 MAINTENANCE, REPLACEMENT PARTS, AFTERSALES SERVICE**

11.1 Repairs must be conducted by FLOWSERVE within the guarantee period. In special cases (emergencies) competent personnel may replace individual parts in situ after consultation with FLOWSERVE.

11.2 Replacement parts are to be ordered with the ID numbers given in the annexed parts list.

11.3 A warranty is given only for the original replacement parts delivered by FLOWSERVE. All parts of the MS meet with high-precision dimensional tolerances and are matched to one another. Only a part replacement as given in the FLOWSERVE quality assurance documentation ensures smooth operation.

11.4 We expressly point out that original replacement parts and accessories not delivered by FLOWSERVE are not tested or released by FLOWSERVE. Under certain circumstances therefore, using and / or installing such products may impair the properties given in the MS design and hence undermine the active and / or passive safety. All incidents of damage incurred through the use of nonoriginal replacement parts or appurtenances render all liabilities and warranties on the part of FLOWSERVE void.

Please note that special manufacturing and delivery specifications exist for all parts

of our products manufactured or procured by ourselves, and the replacement parts are always offered in accordance with the latest technology and with the most current regulations and laws.

The MS cannot function during all assembly and maintenance work.

**!**



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