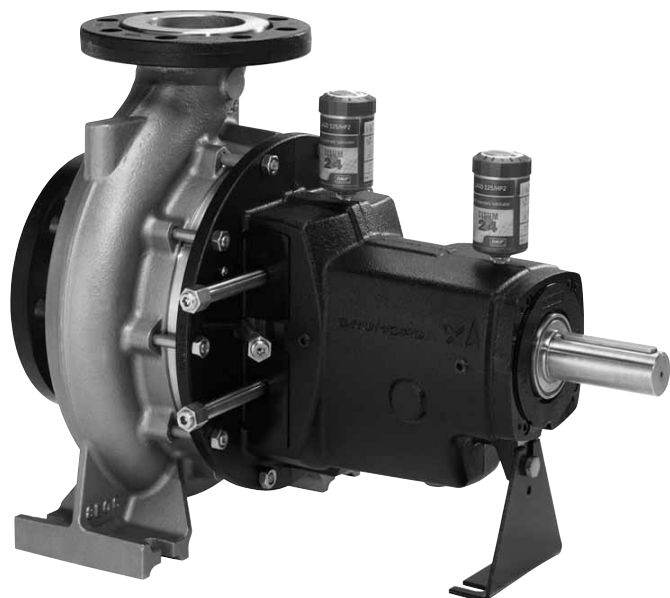


# NKG

Double seal (tandem)

安装和使用说明书





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**Warning**

*Before beginning installation procedures, these installation and operating instructions should be studied carefully. The installation and operation should also be in accordance with local regulations and accepted codes of good practice.*

## 1. Symbols used in this document

**Warning**

*If these safety instructions are not observed, it may result in personal injury!*

**Caution**

*If these safety instructions are not observed, it may result in malfunction or damage to the equipment!*

**Note**

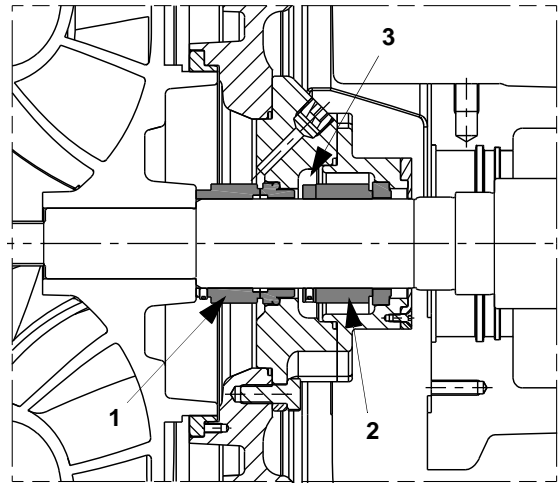
*Notes or instructions that make the job easier and ensure safe operation.*

## 2. General information

These installation and operating instructions are a supplement to installation and operating instructions for NK, NKG.

## 3. Product description

This type of double seal consists of two shaft seals mounted in a tandem arrangement in a separate seal chamber or of a cartridge seal.



TM04 6059 4709

**Fig. 1** Tandem seal arrangement consisting of two shaft seals

Pos.	Description
1	Primary shaft seal
2	Secondary shaft seal
3	Seal chamber, containing flushing fluid

Pumps with a tandem shaft seal arrangement require a flushing system providing the correct flushing fluid to the seal chamber.

The pressure in the seal chamber/cartridge seal **must** be lower than the pumped liquid pressure. Consequently, a small quantity of the pumped liquid will seep through the primary shaft seal and be mixed with the flushing fluid. The pumped liquid leaking via the primary seal will be flushed away by the flushing fluid.

As the primary shaft seal is in contact with liquid on both sides, there is no evaporation zone in the seal gap. This prevents build-up of crystallising deposits on the seal faces of the primary shaft seal. Deposits might otherwise lead to a failing primary shaft seal.

In hot applications, the flushing fluid additionally removes heat from the system both during operation and standstill, and thus cools the seal faces of the shaft seal.

## 4. Applications

The tandem shaft seal is the optimum solution in these cases:

- The pump is pumping crystallising liquids, e.g. a caustic soda solution. Build-up of crystals on the atmospheric side will be avoided.
- Lubrication and cooling of shaft seals is necessary during standstill.
- Monitoring of the leakage rate from the primary shaft seal is required.
- Prevention of air ingress from the atmospheric side is necessary (for liquids which react with atmospheric oxygen).
- The pump is operating with a negative inlet pressure (vacuum) of 0 - 0.69 bar compared to the pressure in the flushing chamber.  
In this case the flushing fluid will provide the lubricating film for the primary shaft seal.

The tandem seal arrangement can handle a pumped liquid temperature up to 140 °C.

## 5. Operating conditions

The operating conditions stated in the installation and operating instructions for NK, NKG pumps also apply for tandem shaft seal pumps.

### 5.1 Flushing fluid

The flushing fluid must be clean.

#### Caution

**The flushing fluid should be selected according to the application and must not chemically attack the materials of the pump and the shaft seal.**

The flushing fluid must have a high boiling point, good lubricating and heat transmission properties.

The flushing-fluid flow should also be matched to the application (recommended flow rate 25-200 l/h).



#### Warning

**Never connect the flushing-fluid supply directly to the public water supply system. Local regulations must be observed.**

It is possible to connect the seal chamber/cartridge seal to a separate flushing-fluid tank. In such cases, the manufacturer's installation and operating instructions must be observed.

#### 5.1.1 Maximum flushing-fluid pressure and temperature

The pressure of the flushing fluid must always be lower than the pressure of the pumped liquid.

The maximum permissible temperature of the flushing fluid depends on the rubber material of the secondary shaft seal.

Shaft seal	Max. permissible temperature of the flushing fluid [°C]
EPDM	+120
FFKM	+140
FKM	+90
FXM	+140
HNBR	+90

These values apply to water as flushing fluid. If other flushing fluids are used, contact Grundfos for the max. permissible temperature of the flushing fluid.

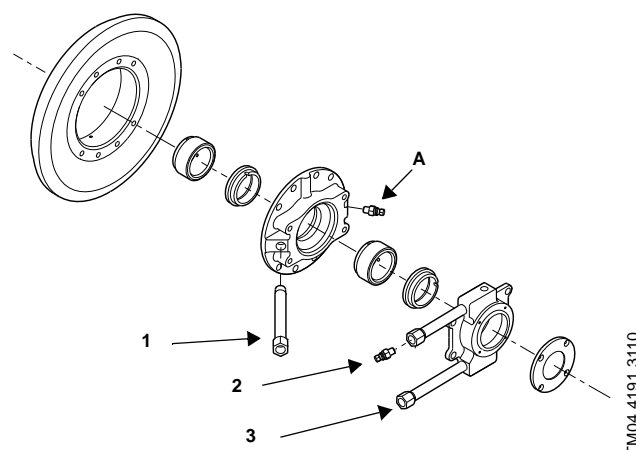
#### 5.1.2 Flushing fluid evaporation point

The tandem shaft seal arrangement can handle a pumped liquid temperature up to 140 °C. In order to ensure proper liquid lubrication in the the seal gap, it is very important that the evaporation point of the flushing fluid is at least 10-15 °C higher than the temperature of the pumped liquid.

## 6. Installation

### 6.1 Flushing fluid connection

#### 6.1.1 Tandem seal arrangement with two separate shaft seals in a seal chamber

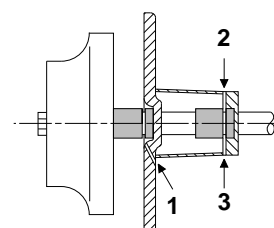


**Fig. 2** Tandem seal arrangement with two separate shaft seals in a seal chamber

Pos.	Description
A	Vent screw for pumped liquid
1	Primary shaft seal pipe connection -3/8"
2	Secondary shaft seal pipe connection with vent screw for venting of seal chamber -3/8"
3	Secondary shaft seal pipe connection -3/8"

In this tandem shaft seal arrangement, the seal chamber has three connections. See fig. 2 and fig. 3. Pos. 1 leads to the pumped liquid side of the shaft seal, and pos. 2 and 3 lead to the seal chamber. All connections are close to the seal faces of the shaft seals.

#### Connections



**Fig. 3** Flow direction of flushing liquid

#### Dead-end solutions (see 6.2 Flushing system)

Use only connection 3 as inlet and 2 for venting. Connection 1 must be plugged.

#### Circulating solutions (see 6.2 Flushing system)

Use connection 3 as inlet and 2 as outlet. The flushing fluid lubricates and cools the secondary shaft seal. Connection 1 must be plugged.

### Separate circulation/cooling of primary shaft seal

Use connection 1. A pipe can be fitted between the pump discharge and connection 1. Alternatively, an external supply can be fitted to connection 1.

Circulation or cooling of the primary seal is commonly used in the following situations:

- to avoid accumulation of particles in the seal face area
- to increase the pressure in the seal face area resulting in a higher evaporation point
- to vent the shaft seal area in order to avoid dry running
- to provide cooling of the shaft seal. (The friction between the seal faces results in a temperature increase of 10-20 °C above the pumped liquid temperature. In this case the pumped liquid itself can provide cooling).

#### 6.1.2 Tandem seal arrangement with cartridge seal

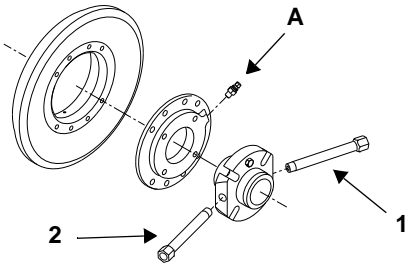


Fig. 4 Tandem seal arrangement with cartridge seal

Pos.	Description
A	Vent screw for pumped liquid
1	Cartridge seal inlet pipe connection -3/8"
2	Cartridge seal outlet pipe connections -3/8"

### 6.2 Flushing system

Typically, one of these methods of connecting the flushing fluid to the pump is used:

- circulation from a reservoir, see section 6.2.1
- dead end connection from a reservoir, see section 6.2.2
- external flushing fluid system, see section 6.2.3.

Common for these flushing solutions is that the pressure in the seal chamber is lower than the pressure of the pumped liquid around the shaft seal.

The flushing fluid acts as lubrication and cooling for the secondary seal and keeps a liquid phase for the primary seal in the seal chamber.

#### 6.2.1 Circulation from a reservoir

**Standard shaft seals:** The seal chamber is connected to a reservoir by means of two pipes.

Both the primary and secondary shaft seal generates heat during operation. This heat energy is transferred to the flushing fluid. Due to natural circulation, the heated flushing fluid rises from the seal chamber to the reservoir where it cools down. The cooled-down flushing fluid returns to the seal chamber, lubricates and cools the seal faces.

After a period of time the flushing fluid in the reservoir must be replaced due to contamination from the pumped liquid.

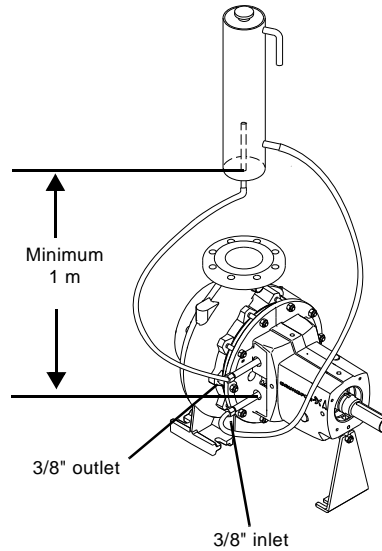


Fig. 5 Tandem seal arrangement with circulating flushing fluid

Circulation to a reservoir can also be forced by a separate pump.

**Cartridge seal:** A cartridge seal is connected to a reservoir by means of two pipes.

An internal pumping function in the shaft seal provides sufficient circulation of the flushing fluid to cool and lubricate the seal. The cartridge seal is self venting.

After a period of time the flushing fluid in the reservoir must be replaced due to contamination from the pumped liquid.

#### 6.2.2 Dead-end connection from a reservoir

**Standard shaft seals:** The seal chamber is connected to a reservoir by means of a single pipe.

The flushing fluid lubricates the seal faces, but cools them less than in the case of circulation. After a period of time the flushing fluid in the reservoir must be replaced due to contamination from the pumped liquid.

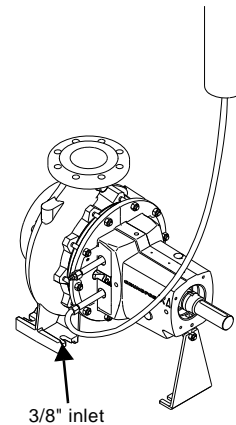


Fig. 6 Tandem seal arrangement with a dead-end flushing-liquid supply

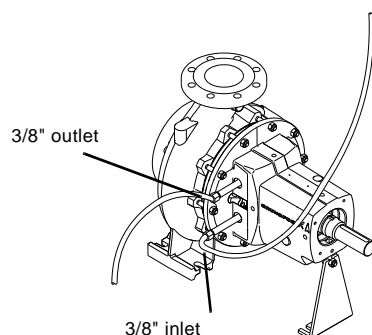
The flushing fluid enters the seal chamber via a pipe from an elevated reservoir.

No heat is dissipated from the system.

**Cartridge seal:** A cartridge seal is **not** for use with a dead-end connection.

### 6.2.3 External flushing fluid systems

**Standard shaft seals:** The flushing fluid flushes the seal chamber and is led to a drain. The flushing fluid cools and lubricates the seal faces effectively.



**Fig. 7** Tandem seal arrangement with flushing fluid being led away to a drain

The pumped liquid leaking through the primary seal is washed away to the drain by the flushing fluid.

For external flushing fluid systems note these conditions:

- The flow rate of the flushing fluid should match the application (recommended flow rate 25-200 l/h. A temperature increase of 20 °C of the flushing fluid could also be used as a control parameter).
- The pressure of the flushing fluid must always be lower than the pressure of the pumped liquid.

**Cartridge seal:** The flushing fluid flushes the cartridge seal and is led to a drain. If the external flushing fluid inlet pressure drops, the internal pumping function of the cartridge seal provides sufficient circulation of the flushing fluid to cool and lubricate the seal faces. The cartridge seal is self venting.

#### Note

**The flushing fluid supply must never be connected directly to the public water supply system. Local regulations must be observed.**

## 7. Start-up

See also installation and operating instructions for the standard pump.

#### Caution

**Before start-up, the seal chamber/cartridge seal and the pump must be completely filled with liquid and vented.**

1. Connect the inlet and outlet of the seal chamber/cartridge seal by means of a suitable pipe or hose connection. See figures 2 and 4.
2. Start the pump, and check the direction of rotation. See the correct direction of rotation on the motor fan cover.

#### Caution

**The seal chamber/cartridge seal must always be filled with flushing fluid during operation. Dry-running will destroy the shaft seal.**

## 8. Maintenance

See installation and operating instructions for NK, NKG pumps.

## 9. Operation

To ensure optimum function and performance, make sure that the flow of flushing fluid is always sufficient, and check that the elevated tank never runs dry of flushing fluid.

Depending on the pumped liquid, the quality of the flushing fluid must be checked at regular intervals to ensure optimum operation.

### 9.1 Periods of inactivity and frost protection

#### Warning

**Pay attention to the directions of the vent holes, and take care to ensure that the escaping liquid does not cause injury to persons or damage to the motor or other components.**

**When handling hot or hazardous liquids, special attention should be paid to the risk of injury caused by scalding hot liquid or hazardous liquid.**

**Local safety regulations must be observed.**



#### Pump

For general guidelines, see installation and operating instructions for NK, NKG pumps.

#### Seal chamber

Unscrew the two connections (pos. 2 and 3, fig. 2).

The lower flushing-liquid connection functions as drain.

#### Cartridge seal

1. Unscrew the connections for flushing fluid (pos. 1 and 2, fig. 4).
2. Empty the cartridge seal. This can be done in two ways:
  - Blow out remaining liquid by means of an air gun or a similar device. The pressure must not exceed the pressure rating of the cartridge seal.
  - Flush the cartridge seal by means of a glycol-water solution, if applicable for the application. The pressure must not exceed the pressure rating of the cartridge seal.

## 10. Service

When ordering spare parts, always state the pump nameplate data to ensure that the correct parts are delivered.

If Grundfos is requested to service the pump, Grundfos must be contacted with details about the pumped liquid, etc. before the pump is returned for service. Otherwise Grundfos can refuse to accept the pump for service.

### 10.1 Service kits and service instructions

See [www.grundfos.com](http://www.grundfos.com) (WebCAPS), WinCAPS or Service Kit Catalogue.

## 11. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

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