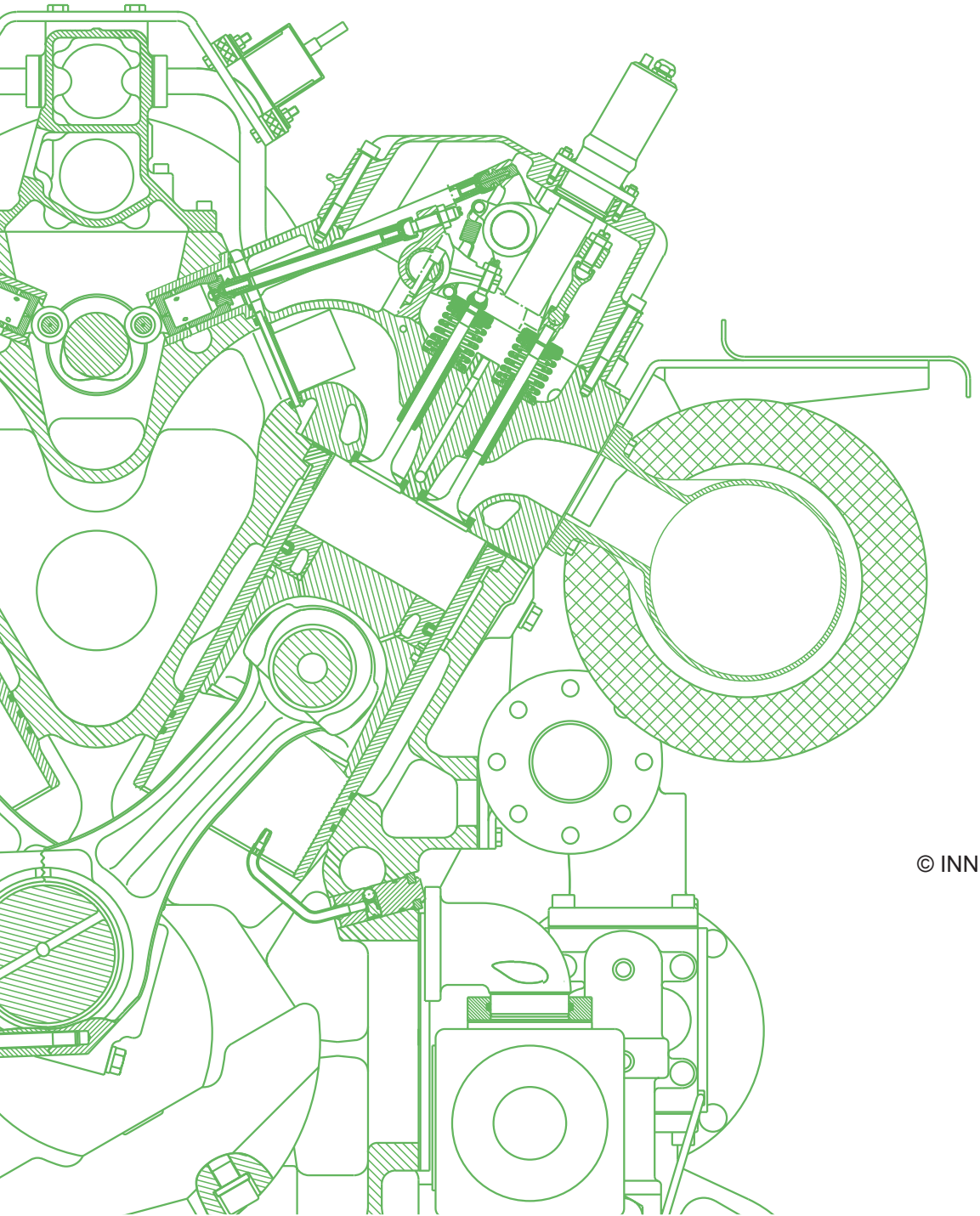
JENBACHER

TA 1400-0084

Technical Instruction

Rotary Shaft Seals



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1 Packing

The following methods have proved effective for packing rotary shaft seals:

- Packed in paper or plastic film in rolls (10-30 units depending on size) one on top of the other. The rolls have a cap on the front end in order to prevent damage by the packing material.
- Stacked on top of each other in suitable fibreboard cases or containers for large batches.
- Individually packed.

NOTE

Rotary shaft seals must not be damaged during unpacking, storage or transport. Storage is described in Section 2.

2 Storage

2.1 Scope

The requirements described in Sections 2.3 - 2.4.4 apply first and foremost to long-term storage (generally more than six months). Except for the general requirements for the storage room, the standards set out in Sections 2.3 and 2.3.1 also apply in the case of short-term storage (less than six months).

2.2 General

The physical properties of most products made of natural or synthetic rubber will change if subjected to unsuitable storage conditions or incorrect handling. This can shorten the service life of the products concerned and they could become unusable, e.g. due to excessive hardening, softening or permanent deformation or flaking, cracking or other surface damage. The changes can be caused by the effect of factors including oxygen, ozone, heat, light, moisture, solvents or storage under tension.

2.3 Storage conditions

The storage room should be cool, dry, dust-free and moderately well ventilated.

Outdoor storage in weather-protected enclosures is not permitted.

2.3.1 Temperature

Rotary shaft seals should not be stored below -10°C or above +15°C, but the upper limit may be exceeded up to +25°C. Temperatures above this level are permitted only for short periods.

Temperatures above the upper limit must be avoided and those below the lower limit should be avoided.

Rotary shaft seals exposed to low temperatures during storage and transport are at risk of stiffening. You should bring these products up to a temperature of +20°C over a prolonged period before using them. This is best done inside the packing unit to prevent condensation forming on the product itself.

2.3.2 Heating

In heated storage rooms, make sure that the rotary shaft seals are shielded from the heat source. The distance between the heat source and the stored product must at least 1 m.

A greater distance is required in rooms heated by a fan heater.

2.3.3 Humidity

Avoid storing the products in damp storage rooms. Make sure that no condensation forms. The best conditions are provided by a relative humidity below 65%.

2.3.4 Lighting

Rotary shaft seals should be protected from light, especially direct sunlight and strong artificial light with a high ultraviolet content. For this reason, any windows in the storage room must be provided with a protective coat of red or orange (under no circumstances, blue) paint. The preferred option is lighting with ordinary light bulbs.

2.3.5 Oxygen and ozone

Protect rotary shaft seals from air changes, especially draughts, with the use of wrappings, storage in air-tight containers or by other means. As ozone is particularly harmful, ensure that storage rooms do not contain any ozone-producing devices, such as electric motors or other devices which can produce sparks or other electrical discharges. Remove any combustion gases and vapours that could result in ozone formation as a result of photochemical processes.

2.4 Important

1. Do not keep solvents, fuels, lubricants, chemicals, acids, disinfectants, etc. in the storage room.
   In accordance with official regulations on the storage and transportation of flammable liquids, rubber solutions must be kept in a separate room.
2. Make sure that rotary shaft seals are stored in stress-free conditions, i.e. not subject to tension, pressure or other types of strain, as stresses are conducive to both permanent deformation and crack formation.
   Certain metals, especially copper and manganese, have a harmful effect on rubber products. You should not therefore store rotary shaft seals with these metals but protect them with packing material or by covering them with a layer of suitable material. Suitable materials include antistatic film or bags made from paper, polyethylene or polyamides (nylon).
3. The materials used in the containers of the packing and covering material must not contain any components harmful to the products, e.g. copper or alloys containing copper, petrol, oil, etc. Do not use films containing plasticisers as packing material.
4. Rotary shaft seals should be kept in storage for as short a time as possible. Where long-term storage is required, make sure that new products being added to the stock are stored separately from those already in store.

3 Installation instructions

1. Before installation, inspect the locating bore for the rotary shaft seal and the counterface surface of the sealing lip for damage (rubbing marks, scratches, rust scars, etc.) or dirt.
   If you discover an area of damage, write a complaint report and present it to the responsible department which will tell you how to proceed.
2. Before installing the rotary shaft seal, subject it to a visual inspection for possible damage due to improper storage, transport, etc. Remove any particles of dirt from the rotary shaft seal and/or the counterface surface prior to installation.
3. Smear the rotary shaft seals and the running surface with oil prior to installation to prevent the sealing lip from dry running on the running surface.

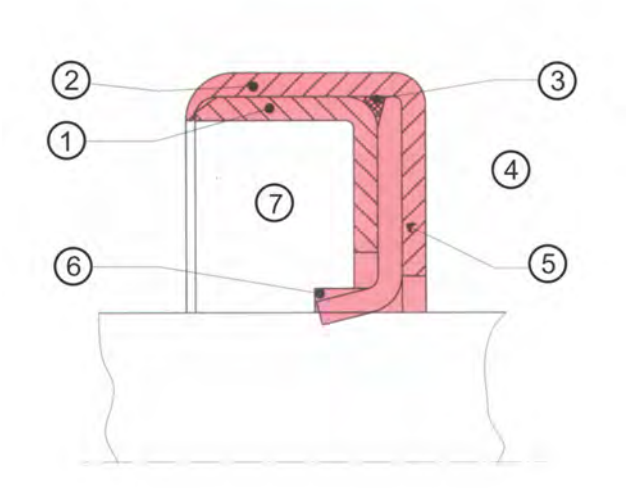

Figure 1: Rotary shaft seal with PTFE sealing lip after installation

1	Internal metal housing	5	Outside
2	External metal housing	6	PTFE sealing lip
3	O-Ring	7	Space to be sealed
4	Air space		

4. With all rotary shaft seals, the sealing lip must be directed towards the medium to be sealed (see Figure 1).

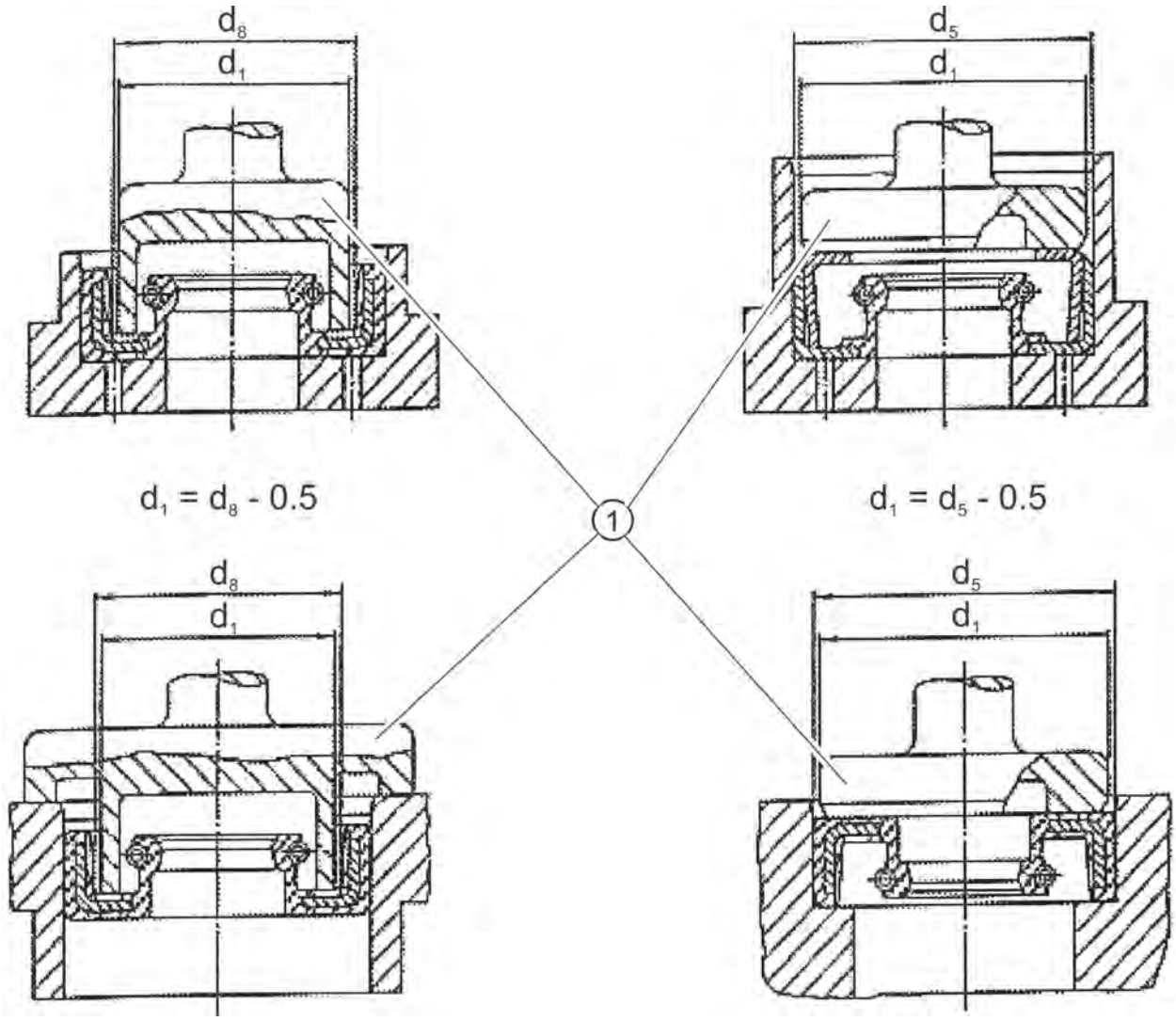

Figure 2: Press-in tool

1	Press-in tool

5. To install the rotary shaft seal, you will need a device with a light press and a suitable plunger (see Figure 2).
   When pressing in rotary shaft seals, hold the press-in tool at the lowest position for a sufficient length of time to reduce resilience. Basically, you have to ensure that the pressing force is exerted as close as possible to the outside diameter of the rotary shaft seal.

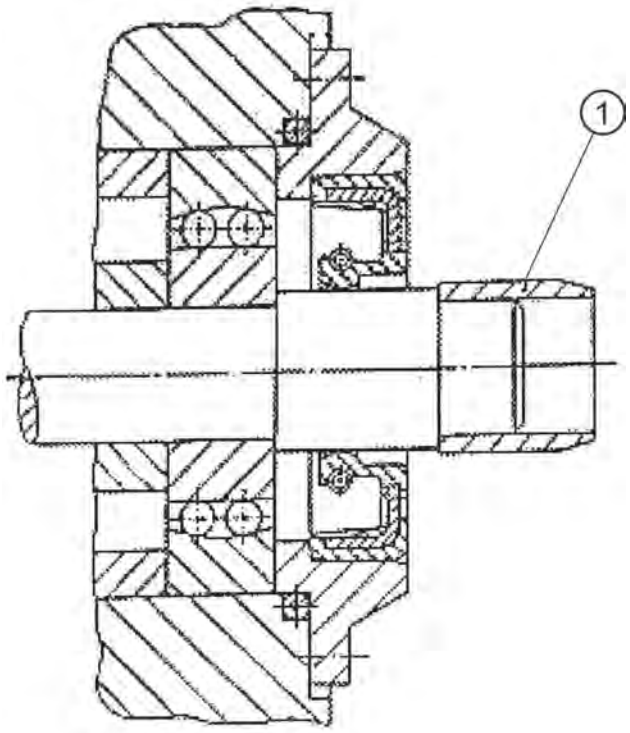

Figure 3: Assembly sleeve with chamfer

1	Assembly sleeve free from scratches, rubbing marks, impact marks and burrs

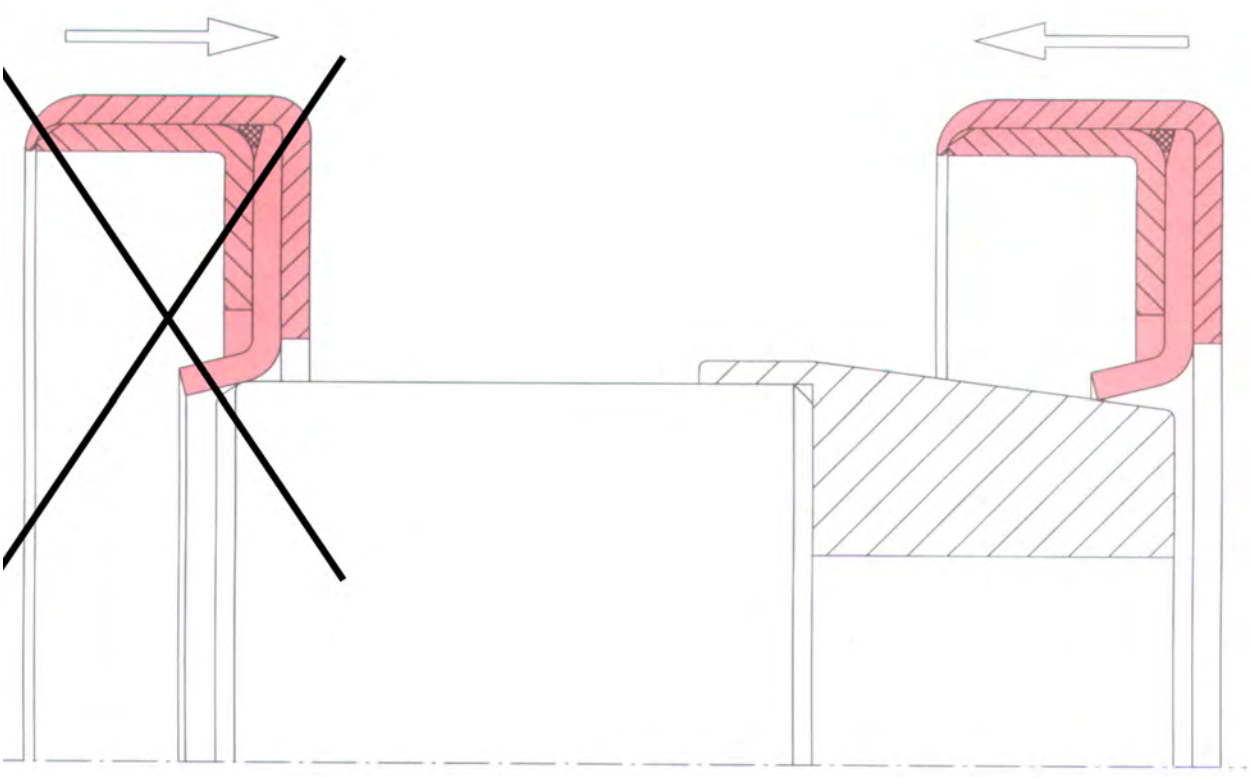

Figure 4: Installing rotary shaft seal with PTFE sealing lip

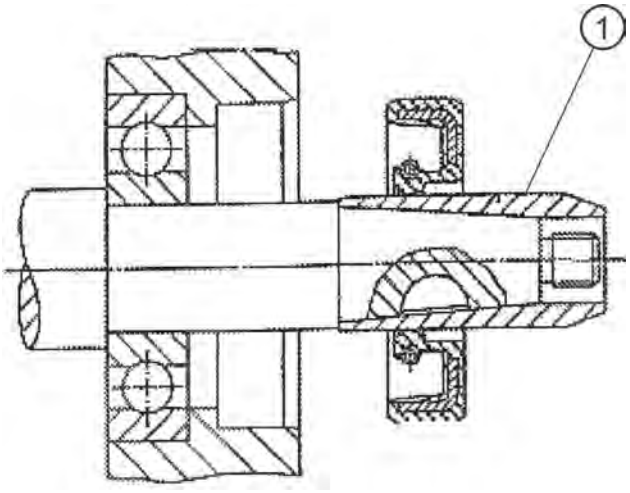

Figure 5: Assembly cover sleeve at keyway

1	Assembly sleeve free from scratches, rubbing marks, impact marks and burrs

6. If necessary, use mounting pins or assembly sleeves (e.g. V-engine at flywheel end, Figure 3), (for type 3 and type 6 engines, see Figure 4).You will need assembly sleeves if the sealing lip has to be fitted over a spline or shaft gearing (Figure 5). You have to use assembly sleeves In the case of silicon rubber or PTFE rotary shaft seals.
7. When installing the rotary shaft seal with PTFE sealing lip, make sure that it has been previously stretched for about one hour. A special pre-stretching sleeve or the assembly sleeve is used for this purpose. Before pulling the seal on to the sleeve, bend the sealing lip manually into the approximate setpoint position (Figure 4).

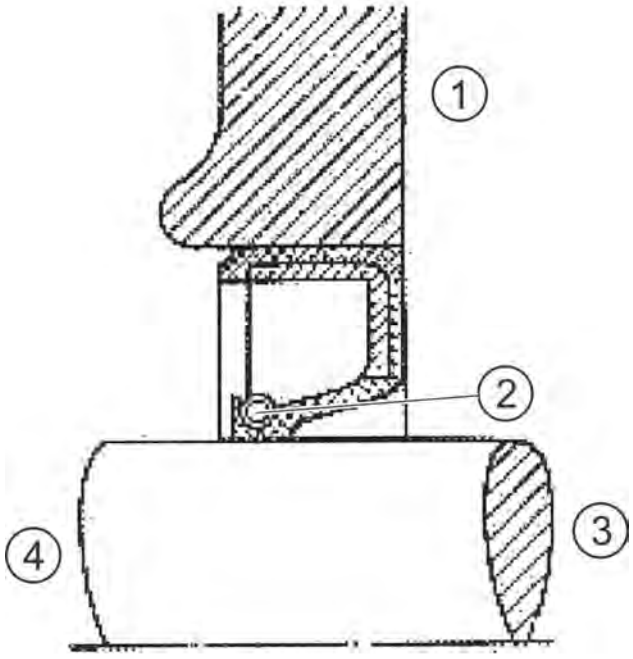

Figure 6: Installation position of a rotary shaft seal without limit stop

1	Cover surface	3	Air side (outside)
2	Sealing lip	4	Oil side (seal side)

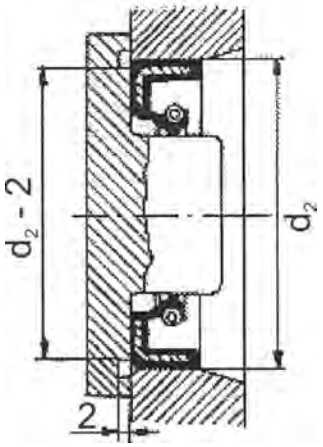

Figure 7: Installing a rotary shaft seal using a press

8. If the locating bore does not have a shoulder or retaining ring as a contact surface (e.g. on the damper side of an in-line engine), fit the rotary shaft seal after the stop on the finished plane face (Figures 6 and 7).
9. Make sure that no particles of dirt end up on the sealing faces during installation and that the arrow showing the direction of rotation corresponds to the actual direction of rotation of the shaft.
10. After the installation, re-measure to ensure that the rotary shaft seal is perpendicular to the shaft centre line in the locating bore. In installed condition, the perpendicularity tolerance in relation to the centre line must not exceed the values in the table below.

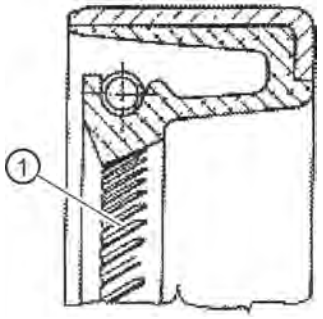

Figure 8: Rotary shaft seal with swirl rib on the sealing lip

1	Swirl rib

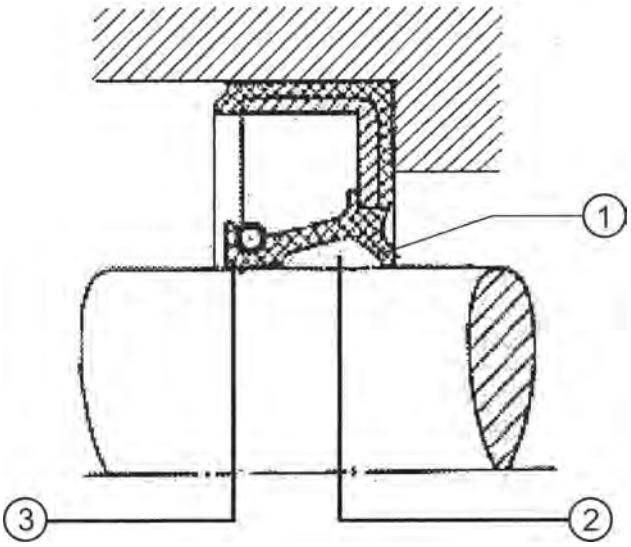

Figure 9: Rotary shaft seal with grease filling

1	Short sealing lip	3	Sealing lip
2	Grease filling (only in rotary shaft seal without swirl ribs)		

11. Caution: If a rotary shaft seal with a protective lip (Figure 9) is used, do not fill the space between the protective lip and the sealing lip with grease in a seal with swirl (Figure 8), as otherwise the hydrodynamic reverse conveyance mechanism will be disrupted.
    A grease filling is beneficial in rotary shaft seals without swirl ribs.
12. When painting the module, make sure that no paint comes into contact with the rotary shaft seal.

Shaft diameter	Perpendicularity tolerance
Up to 25	0.1
Over 25 up to 80	0.2
Over 80	0.3

Table: Perpendicularity tolerances

4 Changing the rotary shaft seal

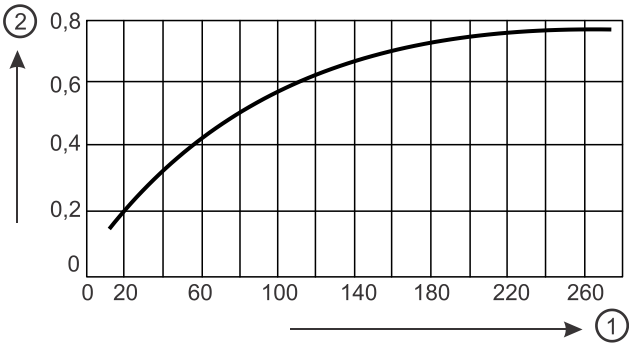

Figure 10: Coaxiality tolerance

1	Shaft diameter d_1 in mm	2	Coaxiality tolerance in mm

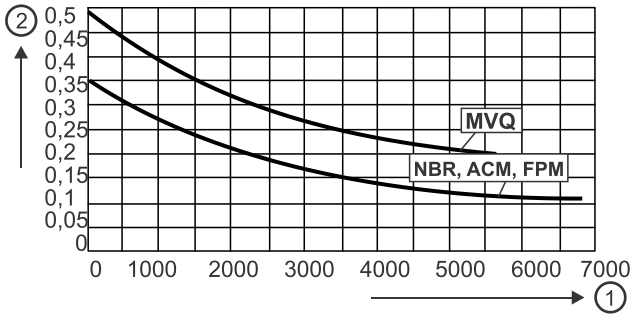

Figure 11: Radial runout tolerance

1	Shaft speed in min^{-1}	2	Radial runout tolerance of the shaft in mm

1. To remove the rotary shaft seal, you will need an extractor suitable for the seal so that you do not damage either the running surface or the locating bore.In the event of problems with the seal, check whether the maximum permissible values for the concentricity between the locating bore for the rotary shaft seal and the running surface of the shaft or for the radial runout of the shaft are being exceeded.You can determine the maximum permissible deviations from the diagrams (Figures 10 and 11).
2. Where repair work or similar operations necessitate the removal of the rotary shaft seal, you will in each case have to fit a new one.
3. Clean the locating bore and shaft without causing damage.

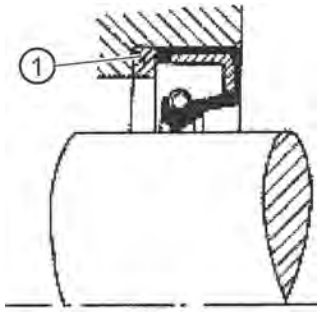

Figure 12: Inserting a spacer ring between the base of the bore and the rotary shaft seal

1	Spacer ring

4. Make sure that the sealing lip of the new rotary shaft seal does not rest on the same point on the running surface as the old seal.
   Different options:
   - Replace the splash ring.
   - Insert a spacer ring between the base of the bore and the rotary shaft seal (see Figure 12).
   - Press the seal to a different depth in the locating bore (e.g. damper side on in-line engine where there is no contact surface).
5. The above-mentioned installation instructions also apply to the installation of the new rotary shaft seal.

5 Fitting PTFE shaft seals

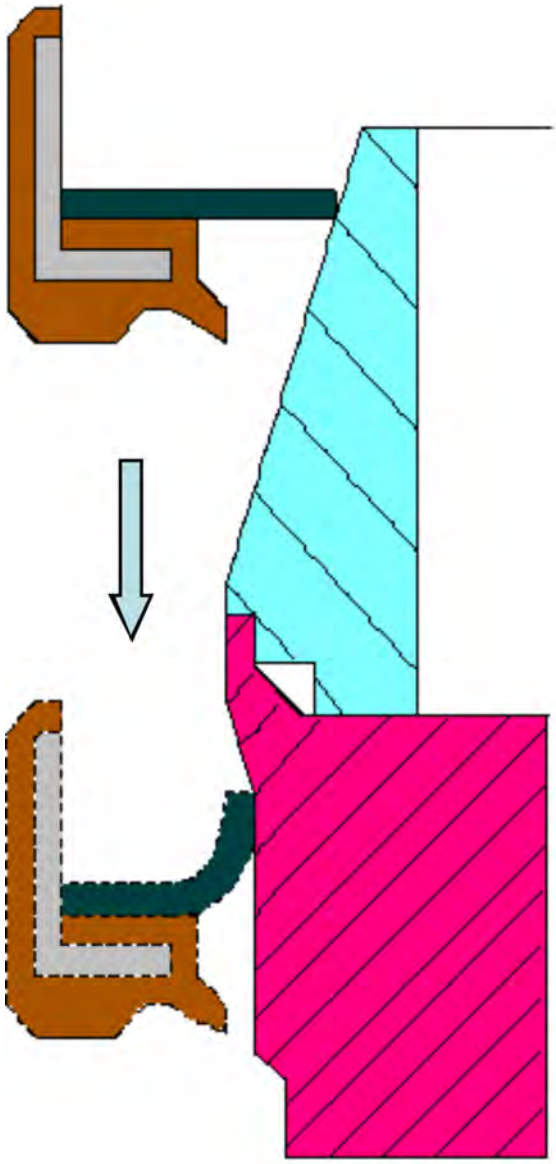

Figure 13: Using a cone to fit the seal on to the mounting pin

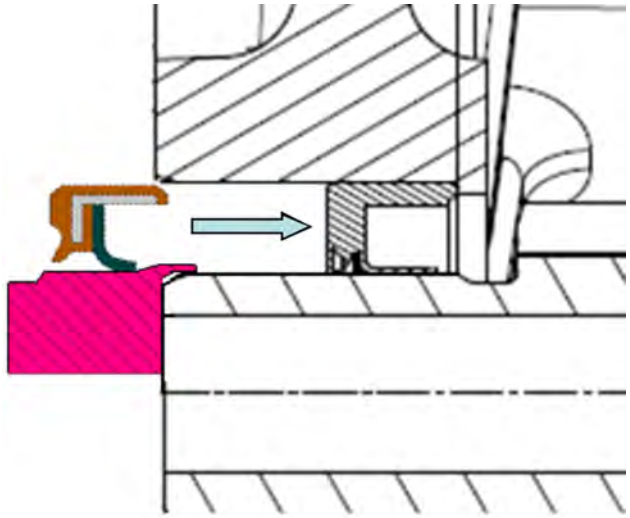

Figure 14: Using a mounting pin to fit the seal on to the crankshaft

- Use assembly tools with a specially large lead-in angle
- Do not grease or oil PTFE shaft seals
- Do not under any circumstances apply Molykote to the PTFE sleeve or the shaft
- Take care not to damage the reverse conveyance thread of the PTFE sleeve(PTFE flows, so a scratch with your fingernail is already too much!)
- Always fit PTFE shaft seals so that the open side of the housing faces the inner space of the engine and the reverse conveyance thread is resting on the shaft (do not fit the PTFE sleeve in the wrong direction!)

6 Revision code

Revision history

Index	Date	Description / Revision summary	Expert *Auditor*
3	09.04.2019	GE durch INNIO ersetzt / GE replaced by INNIO	**Opoku** *Pichler R.*
2	13.11.2013	PTFE-WDR ergänzt / PTFE shaft seals added	**Boxleitner** *Wolf S.*
1	19.10.2012	Umstellung auf CMS, ersetzt Index a / Change to Content Management System, replaces index a	**Boxleitner** *Provin*