INTERNATIONAL STANDARD

ISO 6194-3

Second edition
2009-11-15

Rotary shaft lip-type seals incorporating elastomeric sealing elements —

Part 3: Storage, handling and installation

Bagues d'étanchéité à lèvres pour arbres tournants incorporant des éléments d'étanchéité en élastomère —

Partie 3: Stockage, manipulation et montage

Reference number
ISO 6194-3:2009(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6194-3 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 7, *Sealing devices*.

This second edition cancels and replaces the first edition (ISO 6194-3:1988), which has been technically revised.

ISO 6194 consists of the following parts, under the general title *Rotary shaft lip-type seals incorporating elastomeric sealing elements*:

— *Part 1: Nominal dimensions and tolerances*

— *Part 2: Vocabulary*

— *Part 3: Storage, handling and installation*

— *Part 4: Performance test procedures*

— *Part 5: Identification of visual imperfections*

Introduction

Rotary shaft lip-type seals are used to retain fluid, e.g. lubricant, in equipment where the differential pressure is relatively low. Typically, the shaft rotates and the housing is stationary although, in some applications, the shaft is stationary and the housing rotates.

Dynamic sealing is normally the result of a designed interference fit between the shaft and a flexible element incorporated in the seal.

Similarly, a designed interference fit between the outside diameter of the seal and the diameter of the housing bore retains the seal and prevents static leakage.

Careful storage, handling and proper installation of all seals are necessary to avoid hazards, both prior to and during installation, which can adversely affect service life.

Rotary shaft lip-type seals incorporating elastomeric sealing elements —

Part 3:
Storage, handling and installation

1 Scope

This part of ISO 6194 describes seals utilizing elastomeric sealing elements. They are considered suitable for use under low-pressure conditions; see ISO 6194-1:2007, 6.1.

This part of ISO 6194 gives users of lip-type seals requirements and guidance on the careful storage, handling and proper installation of rotary shaft lip-type seals; attention is drawn to the hazards involved and ways of avoiding them.

NOTE ISO 6194 (all parts) is complementary to ISO 16589 (all parts), which covers seals incorporating thermoplastic sealing elements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2230, *Rubber products — Guidelines for storage*

ISO 5598, *Fluid power systems and components — Vocabulary*

ISO 6194-1, *Rotary shaft lip-type seals incorporating elastomeric sealing elements — Part 1: Nominal dimensions and tolerances*

ISO 6194-2, *Rotary shaft lip-type seals incorporating elastomeric sealing elements — Part 2: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and ISO 6194-2 apply.

4 General storage

4.1 Rotary shaft lip-type seals shall be stored with caution because any damage to them can adversely affect their life and, subsequently, the service life of bearings and/or other costly machined parts. They shall be stored in accordance with ISO 2230 plus the requirements and guidance listed in 4.2, 4.3 and 4.4.

4.2 Seals shall be protected from insects and rodents, some of which thrive on rubber products.

4.3 Lip seals should preferably be stored in a place other than a work area to avoid possible mechanical damage by equipment or falling objects. A closed container provides protection from mechanical damage, as well as from dust, grit and other contaminants.

4.4 When cartons of lip seals are stacked, care shall be taken to avoid damage to the cartons on the bottom due to excessive weight.

4.5 Storage-life guidelines for rotary shaft lip-type seals are given in Table 1. The values listed in Table 1 are based on the materials from which the seals are made and apply to seals stored in accordance with ISO 2230 and this part of ISO 6194. The storage time for seals made of materials other than those shown in Table 1 should be agreed between purchaser and supplier.

Table 1 — Guidelines for storage life of rotary shaft lip-type seals based on the materials used

Elastomer type (designation)	**Storage life guideline** years, max.
Fluorocarbon (FKM)	10
Polyacrylate (ACM or AEM)	7
Butadiene/Acrylonitrile (NBR)	7
Hydrogenated NBR (HNBR with some unsaturation)	7
NOTE See 4.5.	

5 Packaging

5.1 The seals shall be protected from damage and foreign material en route from the manufacturer to the user and during storage.

NOTE Several methods are used to package lip-type seals. Good commercial practice dictates that the best packaging is the least expensive that still affords the protection desired. It is preferable that this be assessed and agreed upon between the vendor and customer for each part shipped.

5.2 During unpacking, care shall be exercised so as not to cut or tear the seal with sharp instruments, such as knives, screwdrivers, etc., by improperly unpacking bulk packs, roll packs and individually wrapped or boxed packs.

5.3 Seals shall never be removed from their packaging until they are ready for installation; this ensures their protection and identification.

6 Handling of loose parts

6.1 After seals have been removed from their packaging, they shall be handled carefully to prevent damage prior to installation. It shall be borne in mind that seal lips are extremely vulnerable to damage and that the smallest nick can provide a potential leak path.

6.2 Seals shall never be threaded on wires or strings or be hung on nails or pegs. Mishandling seals in this way can lead to the lip being distorted or even cut.

6.3 Care shall be exercised when handling seals with metal outside surfaces that can damage other seals, especially if the metal edges come into contact with the rubber parts of adjacent seals.

6.4 The seal surfaces shall be free of grit, chips and other abrasives, since lip seals that are dumped onto surfaces such as work benches are subject to contamination. Seals that have been pre-lubricated are particularly susceptible to this hazard.

6.5 If it becomes necessary to clean seals, the manufacturer shall be asked to recommend a suitable cleaning solution. These cleaning materials vary with the type of compound used for the seal element. Commonly used solvents include high-flash naphthas and fluorocarbon solvents.

Abrasive cleaners shall never be used as they can remove rubber and metal, causing flat spots and operating deficiencies.

Solvents, corrosive liquids and chemical cleaners shall not be allowed to come into contact with the seals. These materials can be absorbed by the seal element, causing it to swell, disintegrate or otherwise lose its physical properties.

Solutions that can cause a breakdown in the rubber-to-metal bond between the element and case or that can damage the metal case and spring shall not be used.

7 Seal installation

7.1 The seal shall be examined before installation to ensure that it is clean and undamaged.

7.2 A light application of a suitable, clean lubricant should be applied on the sealing lips. The amount and type should be agreed between purchaser and suppliers.

7.3 A light application of a suitable, clean lubricant should be made to the outside surface of rubber-covered seals. The amount and type should be agreed between purchaser and suppliers.

NOTE The installed squareness is a significant factor in the performance of a lip-type seal. Squareness is obtained by pressing the seal even with the front face of the bore or bottoming against the shoulder of the bore.

7.4 The end of the shaft and the mouth of the housing bore shall be provided with lead-in chamfers in accordance with ISO 6194-1.

7.5 Installation tools, such as illustrated in Figure 1, shall be used to press the seal into place.

7.6 The seal shall always be aligned with a machined surface, whether the seal is installed even with the housing bore front or bottomed against a shoulder; see Figures 1 and 2. Unfinished surfaces shall not be used because of the danger of misalignment of the seal. Care shall be taken not to deform the seal case by applying excessive pressure.

7.7 Methods for installing a seal into a housing with the seal reversed are illustrated in Figure 4.

7.8 Any surfaces over which it is necessary for the seal lip to slide during installation shall be smooth and free from rough spots.

7.9 Special installation tools (see Figure 5) shall be used to prevent seal-lip damage if the seal element slides over splines, keyways or holes.

Tools of this type shall not be allowed to become nicked, otherwise they can cause lip damage themselves.

Soft metals, such as aluminium, shall never be used for this purpose since they nick very easily.

7.10 If it is necessary to force press-fitted components over the running area of the seal, the shaft diameter shall be reduced by 0,2 mm in the running area. The particular rotary shaft lip-type seal designed for the shaft may be used without any negative effect on the sealing action; see Figure 6.

7.11 When using rubber-covered seals, a light application of suitable clean lubricant should be applied on the outside surface. Assembly into the housing shall be carried out by pressing with uniform speed and pressure to its intended position and holding briefly to prevent any spring-back.

7.12 If it is necessary to assemble elastomeric seals at low temperatures, flexibility of the sealing lip may be restored by placing the seal for 10 min to 15 min in a clean, compatible fluid at a temperature not to exceed 50 °C.

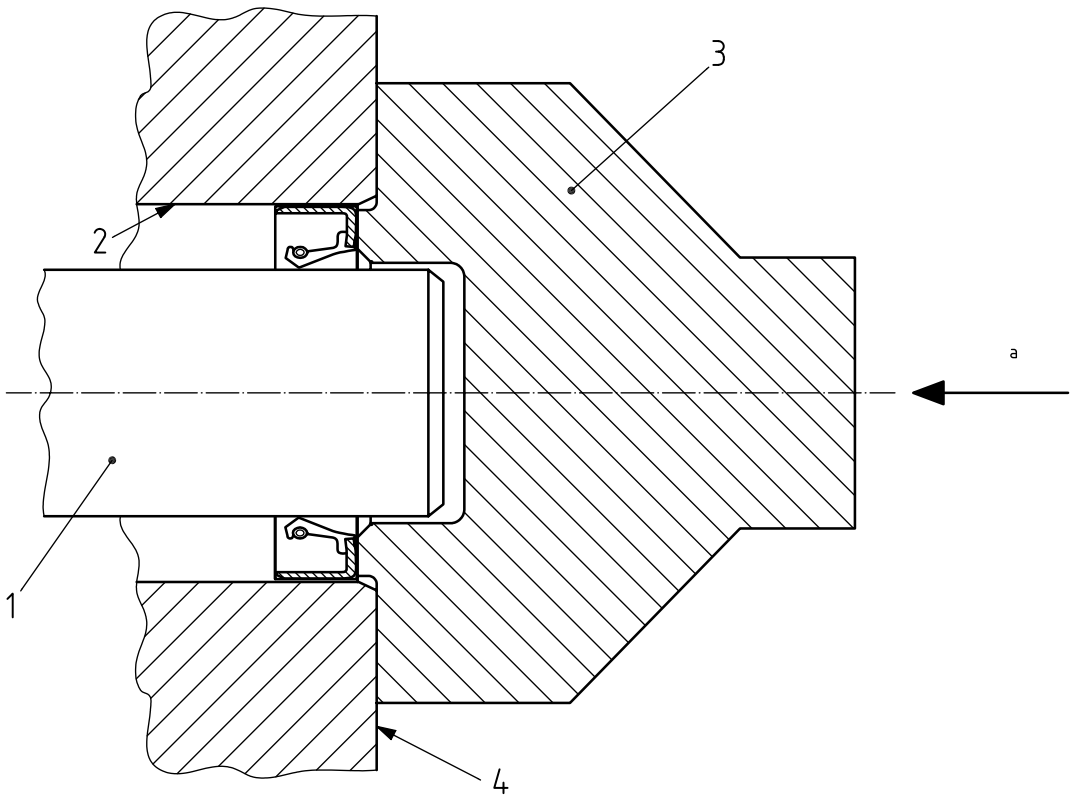
7.13 In case of replacement, a new rotary shaft lip-type seal shall always be used. The sealing lip of the new seal shall not be allowed to engage with the previous track of rotation; it shall be shifted to the fluid side. This can be achieved by fitting spacers or exchanging the shaft bushes or the race rings or by varying the depth to which the seal is pressed into the bore.

The sealing surfaces (shaft and bore) shall be thoroughly cleaned, care being taken not to damage them.

8 Identification statement (Reference to this part of ISO 6194)

It is strongly recommended to manufacturers who have chosen to conform to this part of ISO 6194 that the following statement be used in test reports, catalogues and sales literature:

"Storage, handling and installation procedures conform to ISO 6194-3:2009, *Rotary shaft lip-type seals incorporating elastomeric sealing elements — Part 3 : Storage, handling and installation*."

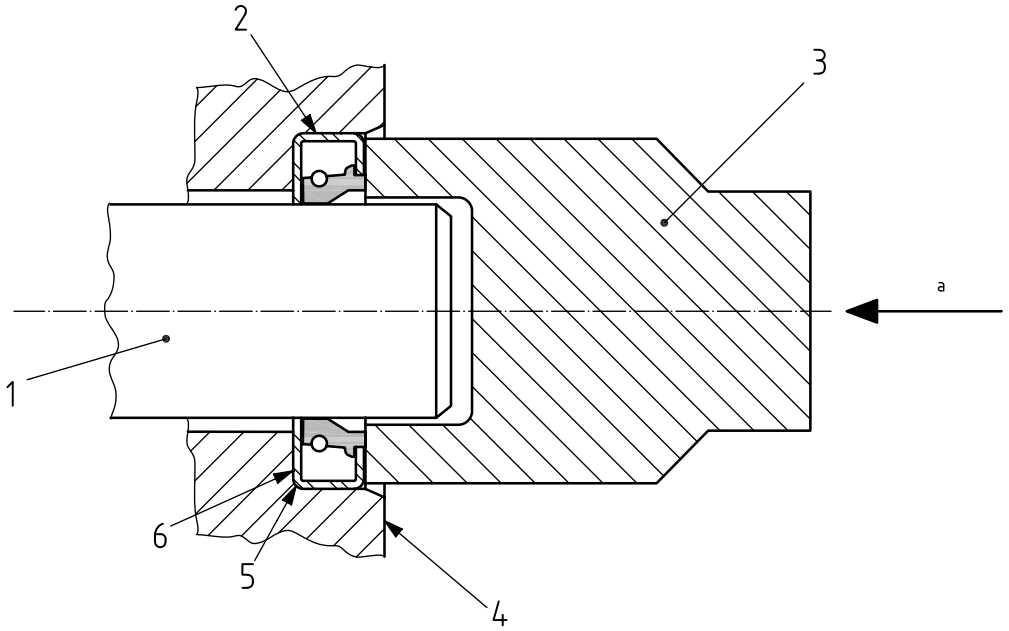


Key

1 shaft
2 housing bore
3 installation tool
4 face machined square with housing bore

a Load; see 7.5 and 7.6.

Figure 1 — Installation of seal — Through-bore
(installation tool bottoms on face machined square with bore)

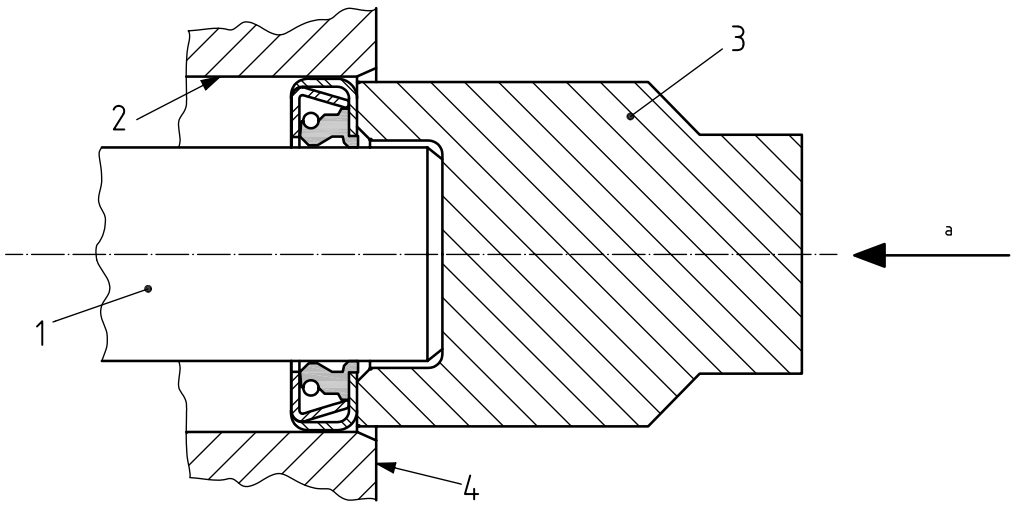


Key

1 shaft
2 housing bore
3 installation tool
4 as-cast housing bore front
5 back minimum radius
6 shoulder machined square with housing bore

[a] Load; see 7.6.

Figure 2 — Installation of seal — Bottom bore
(seal bottoms on machined bore shoulder)

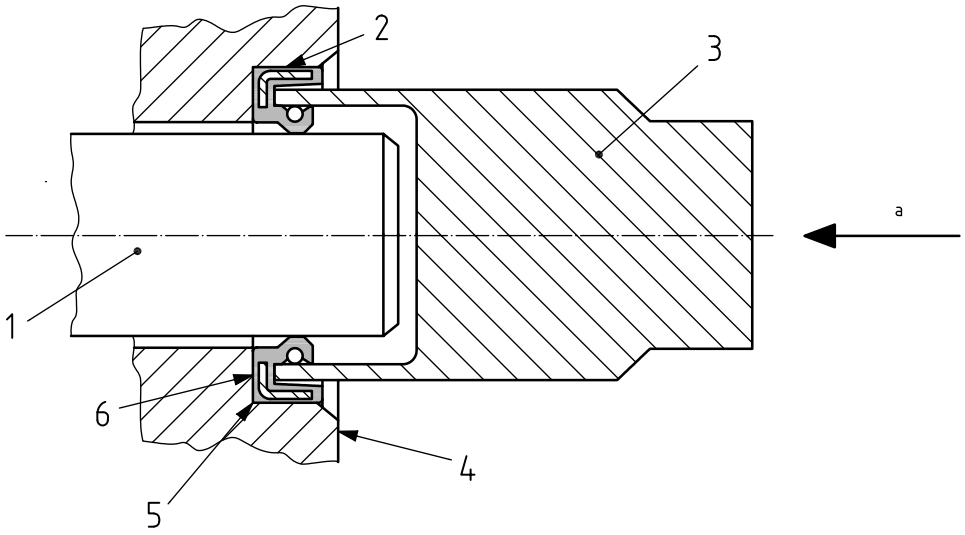


Key

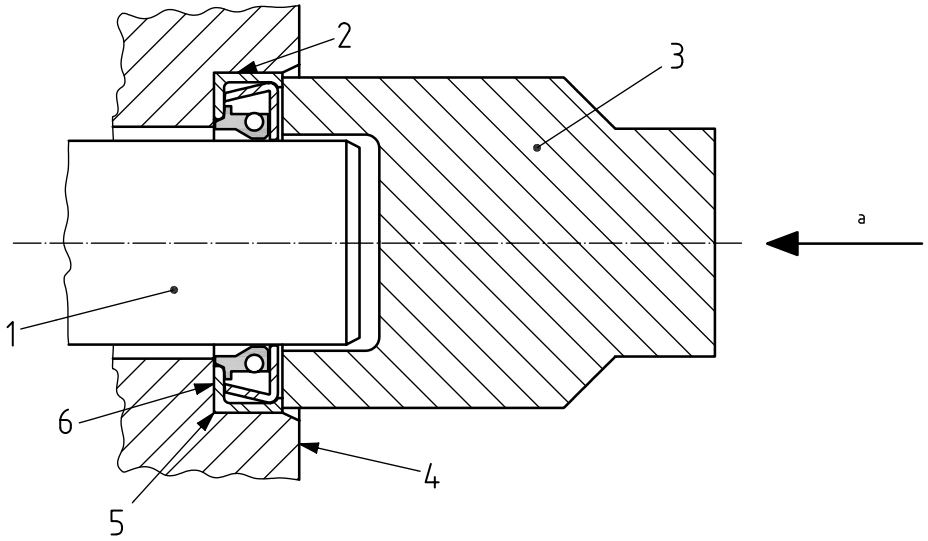
1 shaft
2 housing bore
3 installation tool
4 as-cast housing bore front

[a] Load; see 7.6.

Figure 3 — Installation of seal — Through-bore
(installation tool bottoms on shaft)

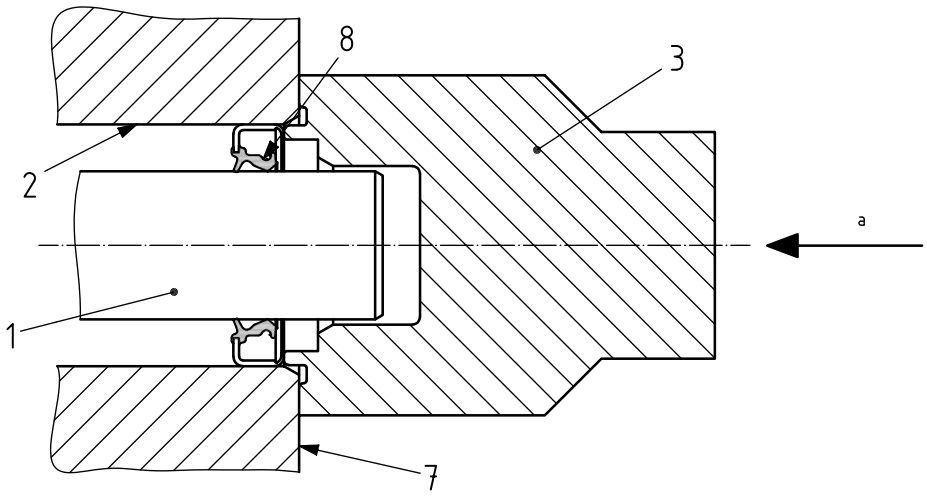


a) Bottom bore
(seal bottoms on machined bore shoulder)

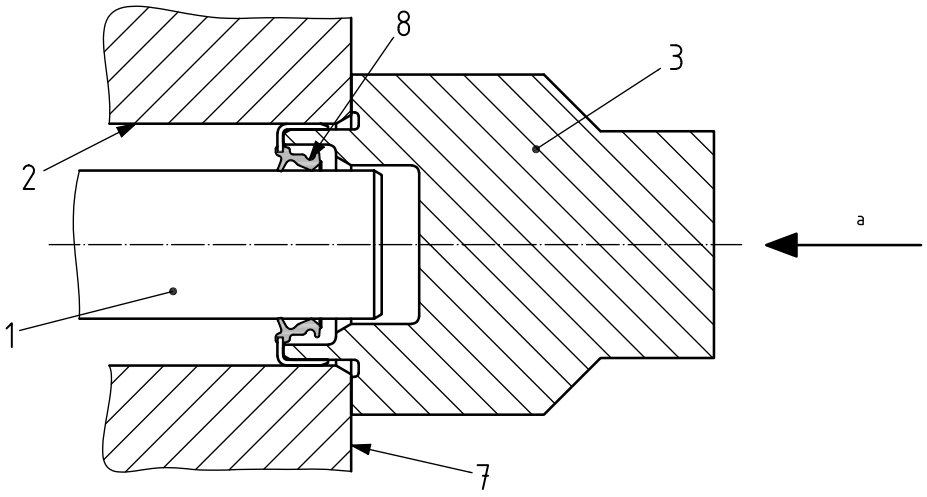


b) Bottom bore (alternative)
(seal bottoms on machined bore shoulder)

Figure 4 — Illustrated examples of methods for installing a seal into a housing with the seal reversed (*continued*)



c) Through-bore
(installation tool bottoms on face machined square with bore)



d) Through-bore (alternative) [b]
(installation tool bottoms on face machined square with bore)

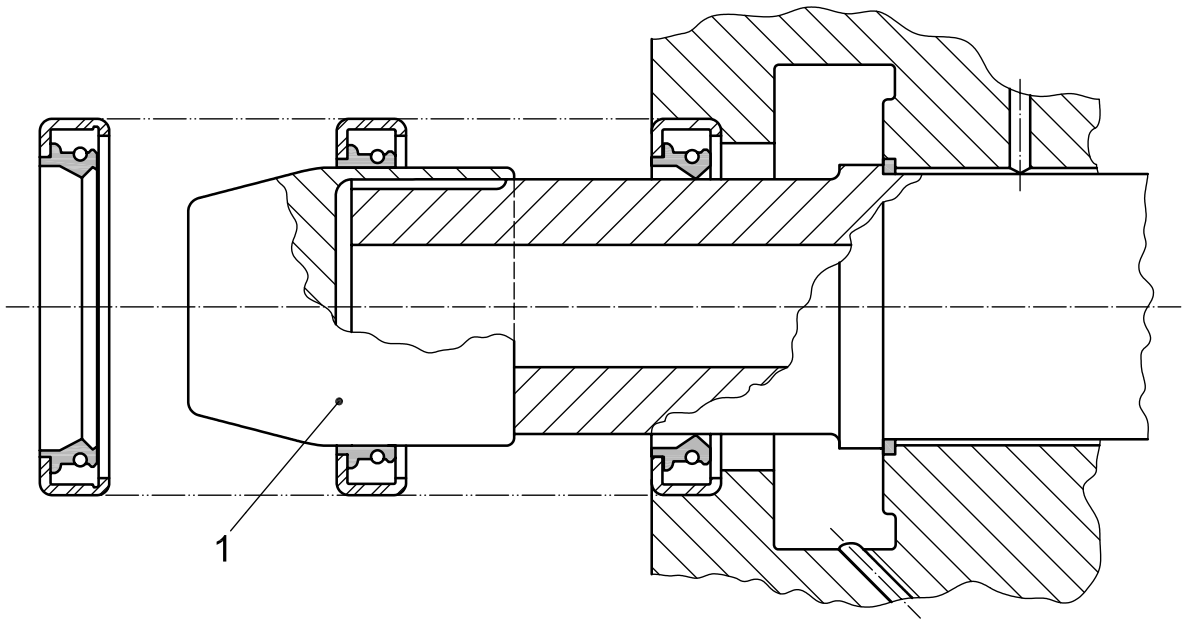
Key

1	shaft	5	back minimum radius
2	housing bore	6	shoulder machined square with housing bore
3	installation tool	7	face machined square with housing bore
4	as-cast housing bore front	8	garter spring

[a] Load; see 7.7.

[b] For prevention of metal case deformation, this tool design may be used.

Figure 4 — Illustrated examples of methods for installing a seal into a housing with the seal reversed

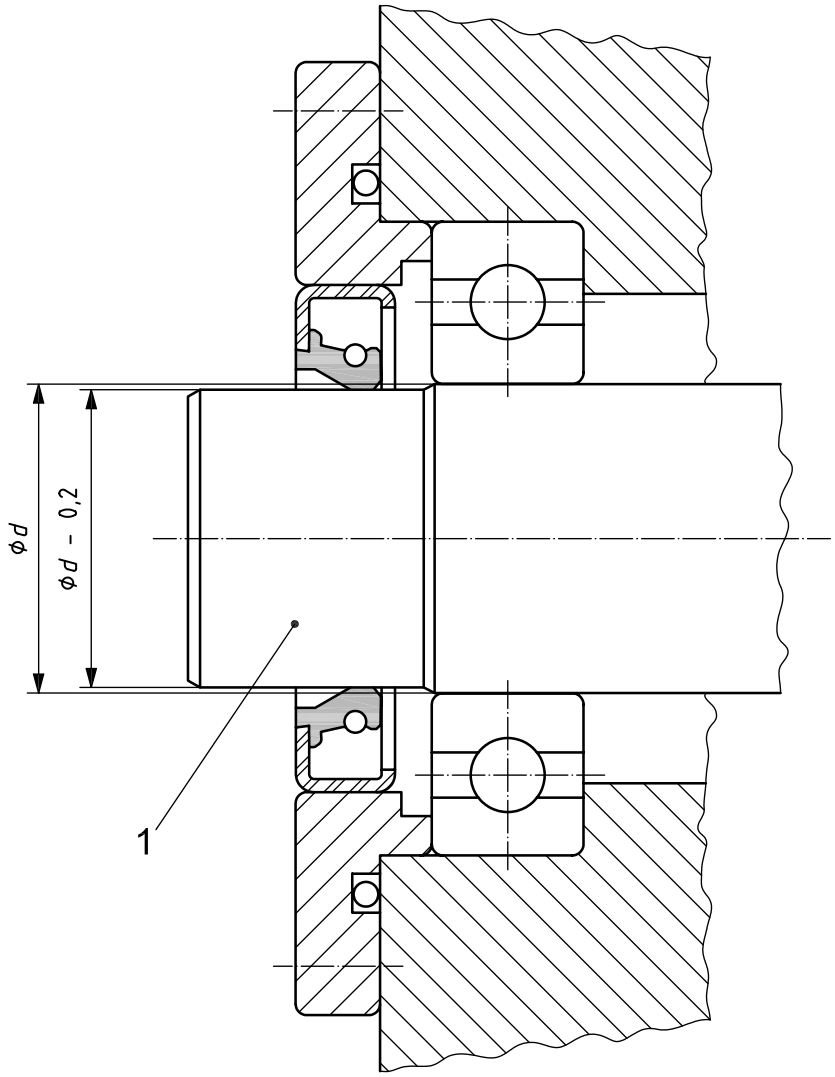


Key

1 bullet nose tool

Figure 5 — Special installation tool for use with seal elements that slide over splines, keyways or holes

Dimensions in millimetres



Key

1 shaft

Figure 6 — Installation of seal — Press-fitted components forced over running area of seal

Bibliography

[1] ISO 16589 (all parts), *Rotary shaft lip-type seals incorporating thermoplastic sealing elements*

ICS 23.100.60; 83.140.50

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