INTERNATIONAL STANDARD

ISO 16589-3

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Rotary shaft lip-type seals incorporating thermoplastic sealing elements —

Part 3: Storage, handling and installation

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

Partie 3: Stockage, manipulation et montage

Reference number
ISO 16589-3:2001(E)

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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 3.

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 part of ISO 16589 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16589-3 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 7, *Sealing devices*.

ISO 16589 consists of the following parts, under the general title *Rotary shaft lip-type seals incorporating thermoplastic 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 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 would adversely affect service life.

Rotary shaft lip-type seals incorporating thermoplastic sealing elements —

Part 3:
Storage, handling and installation

1 Scope

ISO 16589 describes seals utilizing sealing elements manufactured from suitably formulated compounds, based on thermoplastic materials, such as polytetrafluoroethylene (PTFE).

NOTE ISO 16589 is complementary to ISO 6194 which covers elastomeric seals.

This part of ISO 16589 gives users guidance on the careful storage, handling and proper installation of the seals. Attention is drawn to the hazards involved and to ways of avoiding them.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 16589. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 16589 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 5598:1985, *Fluid power systems and components — Vocabulary*

ISO 16589-1:2001, *Rotary shaft lip-type seals incorporating thermoplastic sealing elements — Part 1: Nominal dimensions and tolerances*

ISO 16589-2:2001, *Rotary shaft lip-type seals incorporating thermoplastic sealing elements — Part 2: Vocabulary*

3 Terms and definitions

For the purposes of this part of ISO 16589, the terms and definitions given in ISO 5598 and ISO 16589-2 apply.

4 General storage

4.1 Rotary shaft lip-type seals shall be stored with caution because the service life of bearings and/or other costly machined parts may depend on how well the lip seal performs. Hazards which may be encountered include:

— temperature (see 4.2),

— humidity (see 4.2),

— radioactive materials (see 4.6),

— fumes (see 4.6),

— insects (see 4.7),

— rodents (see 4.7),

— dust (see 4.8),

— grit (see 4.8),

— mechanical damage (see 4.8).

4.2 The storage area shall be kept at a temperature between − 10 °C and 25 °C, with an average humidity of 40 % to 70 %.

4.3 During storage, rubber-coated or semi-rubber-covered seals shall be protected against light, especially sunlight.

4.4 Seals shall be stored on a “first in, first out” basis for stock rotation purposes only.

4.5 Rotary shaft seals incorporating thermoplastic sealing elements can be supplied assembled on mandrels for ease of transport and storage. These mandrels have the advantage of protecting the sealing lip and preventing relaxation of the lip, which could result in increased interference. When this is the case, the seals shall remain on mandrels until immediately prior to installation. In some cases, the seals are supplied with individual mandrels that can be used as assembly tools.

NOTE The seal manufacturer should ensure that the seal/seals are assembled onto mandrels backside first, unless individual mandrels are supplied. The user should withdraw the seal from the mandrel backside first.

4.6 Seals shall be protected from radioactive materials and fumes that can cause deterioration of the seal.

4.7 Seals shall be protected from insects and rodents.

4.8 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 will provide protection from mechanical damage, as well as from dust, grit and other contaminants.

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

5 Packaging

5.1 The product 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 seals. Good commercial practice dictates that the best packaging is the least expensive which still affords the protection desired. This should be assessed and agreed on by 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 element with sharp instruments, such as knives, screwdrivers, etc., brought about by improperly unpacking bulk packs, roll packs and individually wrapped or boxed packs.

NOTE Seals should not be removed from their packaging until they are ready for installation. This method will ensure better 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.

NOTE Small nicks can even be caused by a fingernail.

6.2 Seals should never be threaded on wires or string, 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 which may damage other seals, especially if metal edges can come into contact with sealing edges.

6.4 The seal surfaces shall be free of grit, chips and other abrasives.

6.5 If it becomes necessary to clean the lip seals, the manufacturer shall be requested to recommend a suitable cleaning solution, e.g. dry-cleaning benzine or alcohol if the contact period is short.

Abrasive cleaners shall never be used on lip seals as they can remove thermoplastic material and metal, causing flat spots and operating deficiencies.

Improper solutions which can also cause a breakdown in the rubber/thermoplastic/metal bond between the elements and case or damage the metal case shall not be used.

In case of doubt as to the compatibility of the cleaning solution, the manufacturer of the seal should be contacted.

7 Seal installation

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

7.2 The sealing lip can be assembled onto the shaft unlubricated, unless otherwise specified by the supplier.

7.3 The sealing lip, normally, shall face the fluid to be sealed.

7.4 The end of the shaft and the mouth of the housing bore shall be provided with lead-in chamfers as specified in ISO 16589-1.

7.5 The seal shall always be aligned with a machined surface to ensure installed squareness. Typical installation assembly tools designed for this purpose shall be used (see Figures 1 and 2). Unfinished surfaces cannot be used because of the danger of misalignment of the seal.

7.6 Care shall be taken not to deform the seal case during the installation process by applying excessive pressure.

7.7 Any surfaces over which the seal lip has to slide during installation shall be smooth and free from rough spots.

7.8 Bullet-nosed assembly tools, of the type illustrated in Figure 3, provide a large lead-in chamfer to facilitate installation of the seal onto a shaft. Figure 4 illustrates a bullet which is used to prevent seal lip damage if it slides over splines, keyways, holes or other sharp edges.

7.9 The special bullet-nosed assembly tool shown in Figure 4 prevents damage to the sealing lip during installation of the seal over holes, splines or keyways in the shaft.

7.10 If press-fitted components have to be forced over the running area of the seal, the shaft diameter should 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 5.

7.11 When using rubber-covered seals, the outside surface shall be lubricated with a suitable lubricant to facilitate entry into the housing. Assembly into the housing shall be carried out by pressing with uniform speed and pressure to the assembled position and holding briefly to prevent any spring back.

7.12 If seals have to be assembled at very low temperatures, flexibility of the sealing lip may be restored by heating the seal for 10 min to 15 min at a temperature not exceeding 30 °C.

7.13 In the 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.

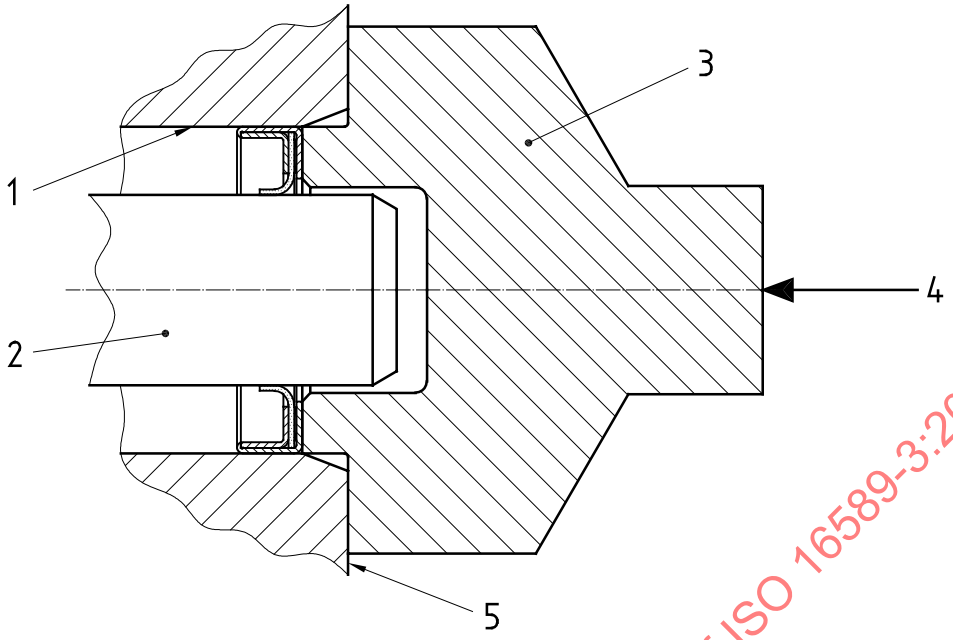
NOTE 1 Reusable bullet-nosed tools should not be allowed to become damaged, otherwise they will cause lip damage. Soft metals, such as aluminium, should not be used for this purpose.

NOTE 2 Disposable plastic tools can be used to advantage in some applications.

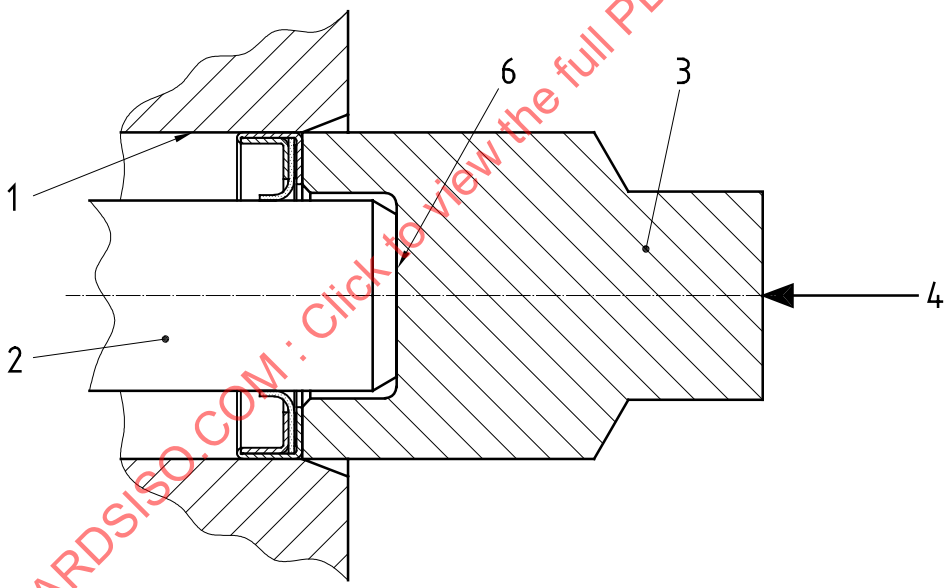
8 **Identification statement** (Reference to this part of ISO 16589)

Manufacturers are strongly recommended to use the following statement in test reports, catalogues and sales literature when electing to comply with this part of ISO 16589.

"Storage, handling and installation procedures in accordance with ISO 16589-3:2001, *Rotary shaft lip-type seals incorporating thermoplastic sealing elements — Part 3: Storage, handling and installation*."



a) Tool “bottoms” on housing

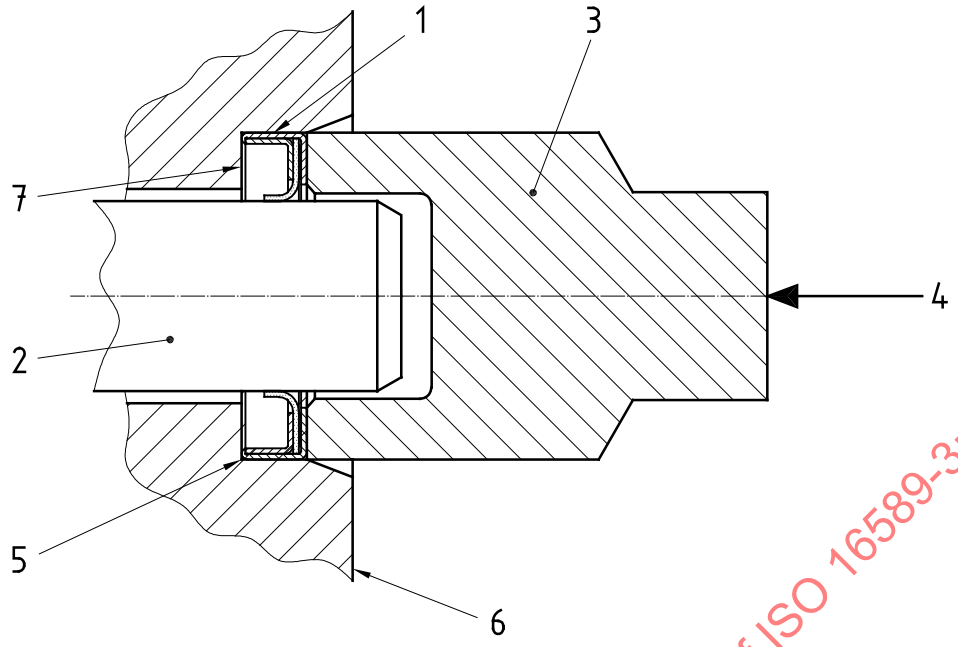


b) Tool “bottoms” on shaft end

Key

1 Housing bore
2 Shaft
3 Installation tool
4 Load
5 Face machined square with housing bore
6 Shaft end machine square with shaft axis

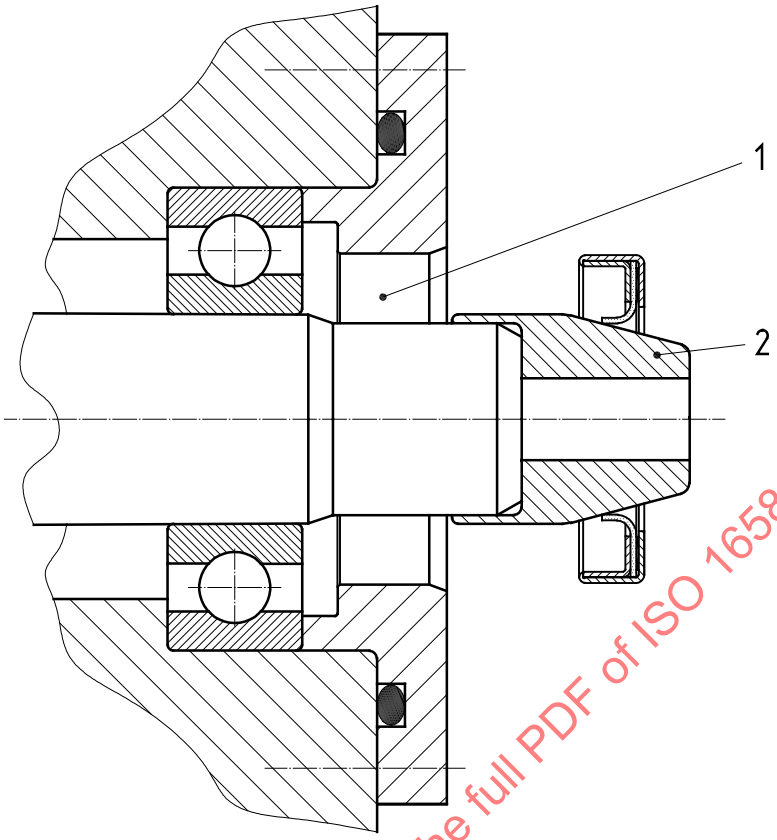
Figure 1 — Installation of seal into housing with through-bore



Key

1 Housing bore
2 Shaft
3 Installation tool
4 Load
5 Back minimum radius
6 As-cast face
7 Shoulder machined square with housing bore

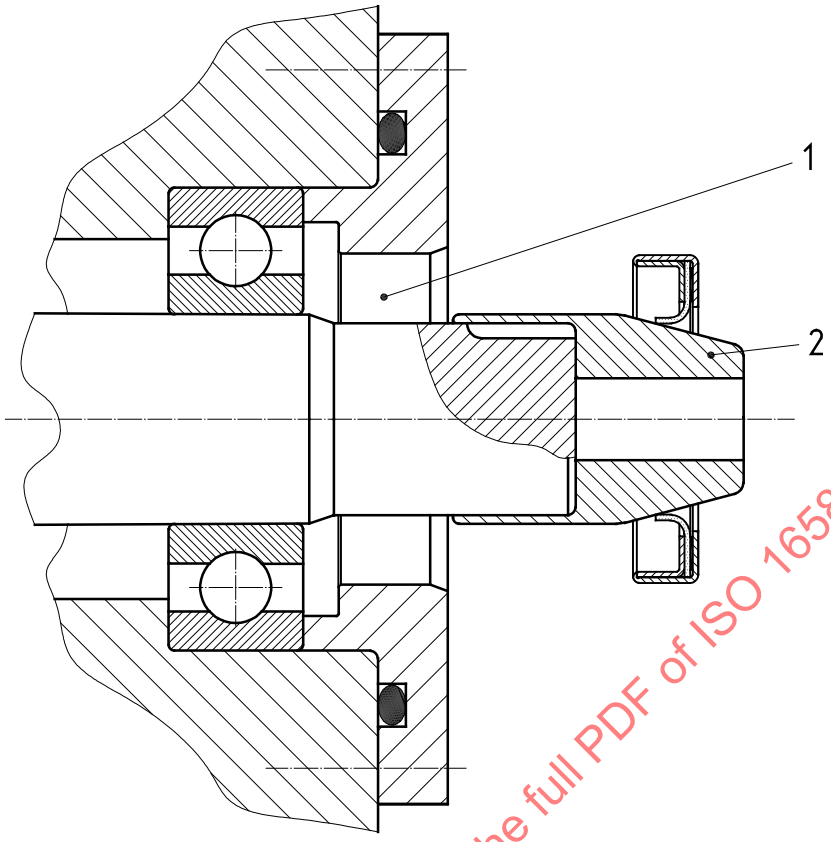
Figure 2 — Installation of seal into housing bore with machined shoulder



Key

1 Required seal position
2 Bullet-nosed assembly tool

Figure 3 — Typical installation using bullet-nosed assembly tool to assist assembly



Key

1 Required seal position
2 Bullet-nosed assembly tool

Figure 4 — Special bullet-nosed tool to cover holes, splines or keyways