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## Fluid systems — Sealing devices — O-rings

### Part 3 : Quality acceptance criteria

*Systèmes de fluids — Joints d'étanchéité — Joints toriques —*

*Partie 3: Critères de qualité*

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3601-3 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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# Fluid systems — Sealing devices — O-rings —

## Part 3 : Quality acceptance criteria

### 0 Introduction

This International Standard has been developed as a multi-part component standard for O-rings; it will comprise the following parts :

Part 1 : Inside diameters, cross-sections, tolerances and size identification code.

Part 2 : Design criteria for standard applications.

Part 3 : Quality acceptance criteria.

### 1 Scope and field of application

This part of ISO 3601 lays down the quality acceptance criteria for O-rings used in fluid systems the dimensions of which are standardized in ISO 3601-1.

This part of ISO 3601 defines and classifies surface imperfections on O-rings and specifies maximum acceptable limits for these imperfections.

This part of ISO 3601 is also applicable to O-rings to be used in aerospace construction.

### 2 References

ISO 3601-1, *Fluid systems — Sealing devices — O-rings — Part 1: Inside diameters, cross-sections, tolerances and size identification code.*

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

### 3 Quality grades

**3.1 grade N (general purpose):** This grade identifies acceptance criteria for O-rings intended for general usage applications.

**3.2 grade S (special):** This grade identifies acceptance criteria for O-rings intended for applications requiring a higher level of quality with respect to dimensional tolerances of surface imperfections. Aerospace applications are covered by this grade.

### 4 Definitions

For the purposes of this part of ISO 3601, the definitions given in ISO 5598 and the following definitions apply.

NOTE — Throughout this part of ISO 3601, the term “O-ring” has been adopted although the correct technical term is “toroidal sealing ring”.

**4.1 offset:** Term used to describe O-ring halves that are off register or mismatched. (See figure 1.)

**4.1.1 off register:** Term used to describe misaligned O-ring halves. This defect is caused by the lateral shift of one mould cavity plate relative to the other.

**4.1.2 mismatch:** Term used to describe O-rings in which the cross-sectional radius of one ring-half is not equal to that of the other half. This defect is caused by the dimensional difference in mould halves.

**4.2 combined flash, offset and parting line projection:** The combination offset, flash and parting line projection.

**4.2.1 flash:** A film-like material, which extends from the parting line projection on the inner or outer diameter. This defect is caused by mould separation or is present owing to inadequate trim. (See figure 2.)

**4.2.2 parting line projection:** A continuous ridge of material situated on the parting line caused by worn or excessively rounded edges of the mould cavity.

**4.3 backrind:** A longitudinal imperfection in which the rubber adjacent to the flash line shrinks below the level of the moulding and has a “U”- or “W”-shaped cross-section with the flash frequently being ragged or torn. This defect can be caused by mould precure on the flash. (See figure 3.)

**4.4 parting line indentation:** A shallow saucer-like recess, sometimes triangular in shape, located on the parting line on the inner or outer diameters. This defect is caused by deformation of the mould edge at the parting line. (See figure 4.)

**4.5 excessive trimming:** A flattened and often roughened area around the inner or outer diameters of the O-ring caused by the trimming process.

**4.6 flow mark:** A thread-like recess, usually curved, of very slight depth in the unflexed state, with normal surface texture and rounded edge. This defect is caused by incomplete flow and knit in the material. (See figure 5.)

**4.7 non-fill:** A randomly spaced, irregularly shaped surface indentation having a coarser texture than the normal O-ring surface. This defect is caused by incomplete filling of the mould cavity and by air trapping. (See figure 6.)

**4.8 indentation:** A recess in the surface, usually irregular in form, caused by the removal of inclusions from the surface or the build-up of hardened deposits on the surface of the mould cavity. (See figure 7.)

**4.9 foreign material:** Any extraneous matter embedded in the surface of the O-ring, e.g. contamination, dirt, etc. (See figure 8.)

## 5 Surface condition

**5.1** The O-ring surfaces shall be free from cracks, ruptures, blisters and other imperfections except as allowed by the table

when viewed under magnification not greater than X2 with adequate illumination.

**5.2** Flow marks, non-fills and indentations within the limits specified in the table shall not be allowed if

- a) there are more than three in any 25 mm length of circumference;
- b) they interconnect;
- c) there are more than three imperfections separated from each other by a distance less than the maximum allowed width of the imperfection.

**6 Identification statement** (Reference to this International Standard)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this part of ISO 3601:

"Quality acceptance criteria are in accordance with ISO 3601-3, *Fluid systems — Sealing devices — O-rings — Part 3: Quality acceptance criteria.*"

Table — Maximum acceptable limits for surface imperfections of O-rings

Dimensions in millimetres

Category of surface imperfection	Schematic illustration of surface imperfection	Letter symbol for surface imperfection	Maximum acceptable limits											
			Grade N O-rings						Grade S O-rings					
			Section diameter, $d_2$ , of											
			1,8	2,65	3,55	5,3	7	1,8	2,65	3,55	5,3	7		
<b>Offset</b> (Off register and mismatch)		e	0,08	0,1	0,13	0,15	0,15	0,08	0,08	0,1	0,12	0,13		
<b>Combined flash, offset and parting line projection</b>		f	0,1	0,12	0,14	0,16	0,18	0,1	0,1	0,13	0,15	0,15		
<b>Backrind</b>		g	0,18	0,27	0,36	0,53	0,7	0,1	0,15	0,2	0,2	0,3		
<b>Excessive trimming</b>		h	0,08	0,08	0,1	0,1	0,13	0,05	0,08	0,1	0,1	0,13		
		—	Departure from a circular cross-section due to trimming is allowed provided that the resultant surface is smoothly blended and is within the size tolerance limits for $d_2$											
<b>Flow marks</b> (Radial orientation of flow marks is not permissible)		i	1,5	1,5	6,5	6,5	6,5	1,5	1,5	1,5	5	5	5	
		k	0,08	0,08	0,08	0,08	0,08	0,05	0,05	0,05	0,05	0,05	0,05	
<b>Non-fills and indentations</b> (including parting line indentations)		l	0,6	0,8	1	1,3	1,7	0,15	0,25	0,4	0,63	1		
		m	0,08	0,08	0,1	0,1	0,13	0,08	0,08	0,1	0,1	0,13		
<b>Foreign material</b>		—	Not permitted											

\*  $d_1$  = inside diameter

\*\* The value which is the greater.

## Annex

### Examples of surface imperfections

(Magnification X10)

(This annex does not form an integral part of the standard.)

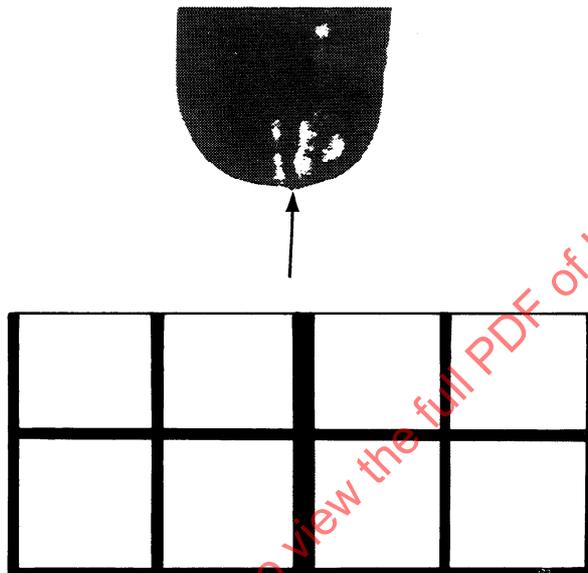


Figure 1 – Offset



Figure 2 – Flash

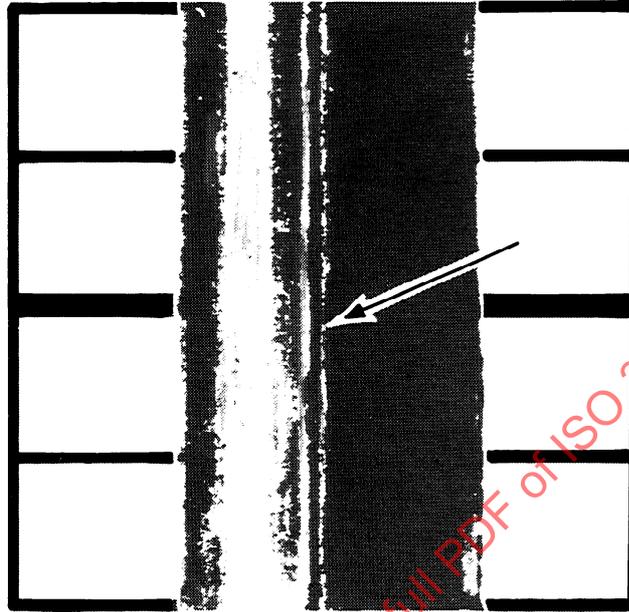


Figure 3 — Backrind

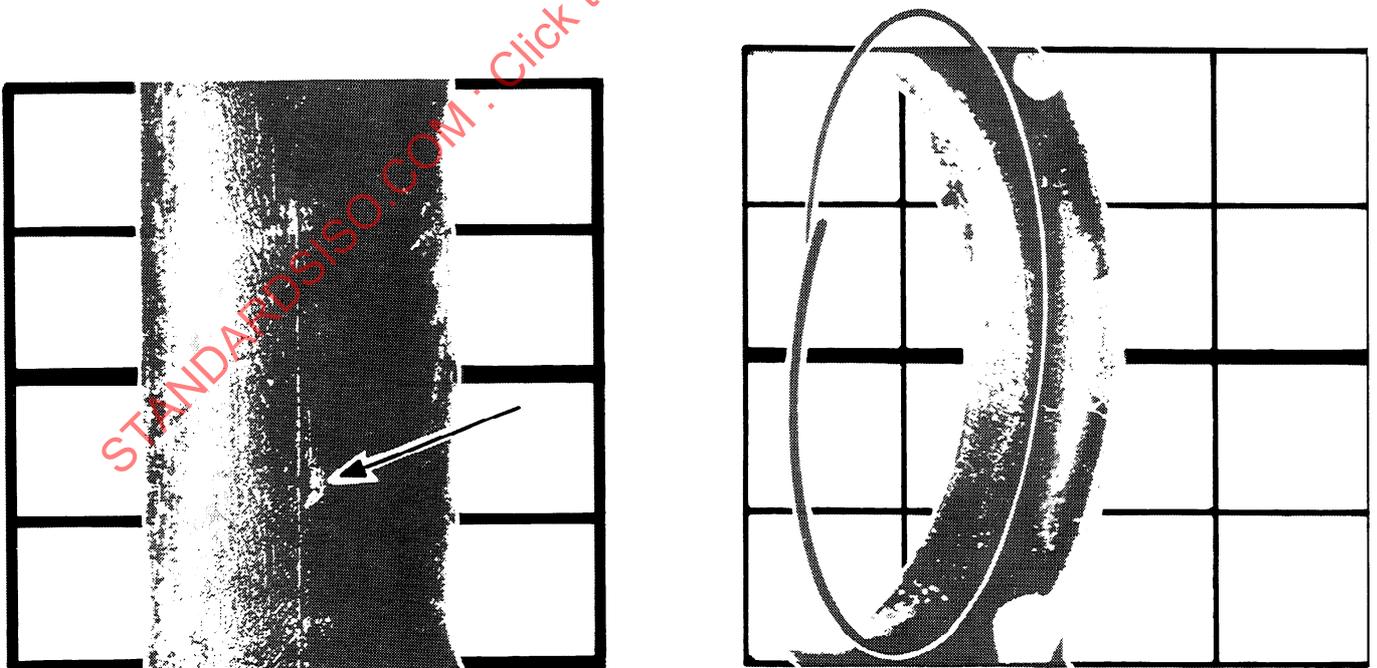


Figure 4 — Parting line indentation

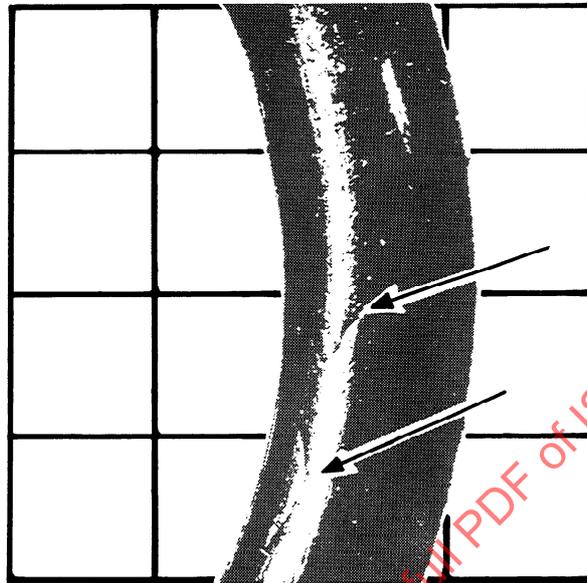


Figure 5 – Flow marks



Figure 6 – Non-fill



Figure 7 – Indentation

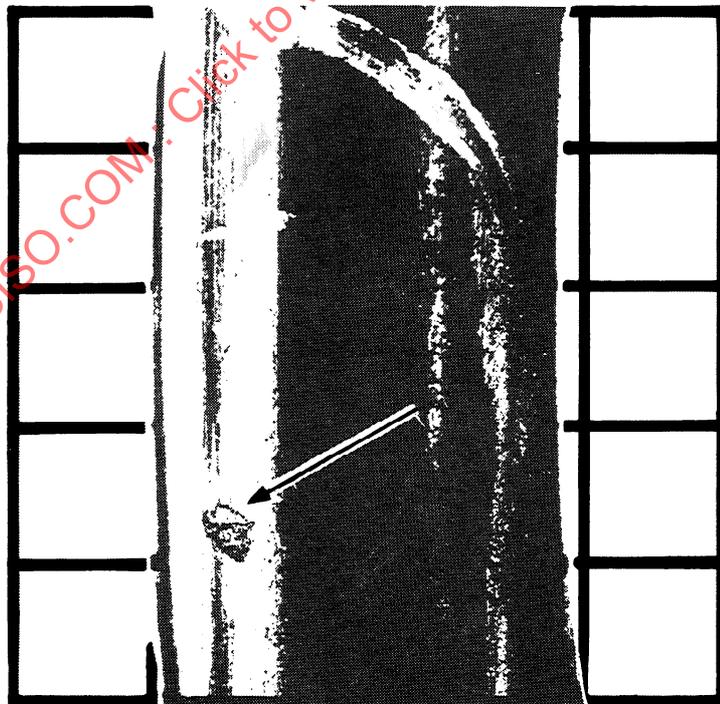


Figure 8 – Foreign material