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ISO 3601-1

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Fluid power systems — O-rings —

Part 1: Inside diameters, cross-sections, tolerances and designation codes

Transmissions hydrauliques et pneumatiques — Joints toriques —

Partie 1: Diamètres intérieurs, sections, tolérances et codes d'identification dimensionnelle

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 3601-1 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 7, *Sealing devices*.

This fifth edition cancels and replaces the fourth edition (ISO 3601-1:2008), which has been technically revised. It also incorporates the Technical Corrigenda ISO 3601-1:2008/Cor 1:2009 and ISO 3601-1:2008/Cor 2:2009.

ISO 3601 consists of the following parts, under the general title *Fluid power systems — O-rings*:

— *Part 1: Inside diameters, cross-sections, tolerances and designation codes*

— *Part 2: Housing dimensions for general applications*

— *Part 3: Quality acceptance criteria*

— *Part 4: Anti-extrusion rings (back-up rings)*

— *Part 5: Suitability of elastomeric materials for industrial applications*

Introduction

In fluid power systems, power is transmitted and controlled through a fluid (liquid or gas) under pressure within an enclosed circuit. To avoid leakage or to seal different chambers of a component from each other, sealing devices are used. O-rings are one type of sealing device.

Fluid power systems — O-rings —

Part 1: Inside diameters, cross-sections, tolerances and designation codes

1 Scope

This part of ISO 3601 specifies the inside diameters, cross-sections, tolerances and designation codes for O-rings used in fluid power systems for general industrial and aerospace applications.

The dimensions and tolerances specified in this part of ISO 3601 are suitable for any elastomeric material, provided that suitable tooling is available.

NOTE The tooling most commonly available is based on 70 IRHD NBR shrinkage rates (see ISO 48). For materials that shrink differently from this standard NBR compound, a special mould can be required to maintain the mean diameters and the tolerance limits listed.

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 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 3601-3, *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*

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

3 Terms and definitions

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

4 Symbols

The following symbols are used in this part of ISO 3601:

— d_1 O-ring inside diameter;

— d_2 O-ring cross-section diameter.

5 Configuration

The shape of the O-ring shall be toroidal, as shown in Figure 1.

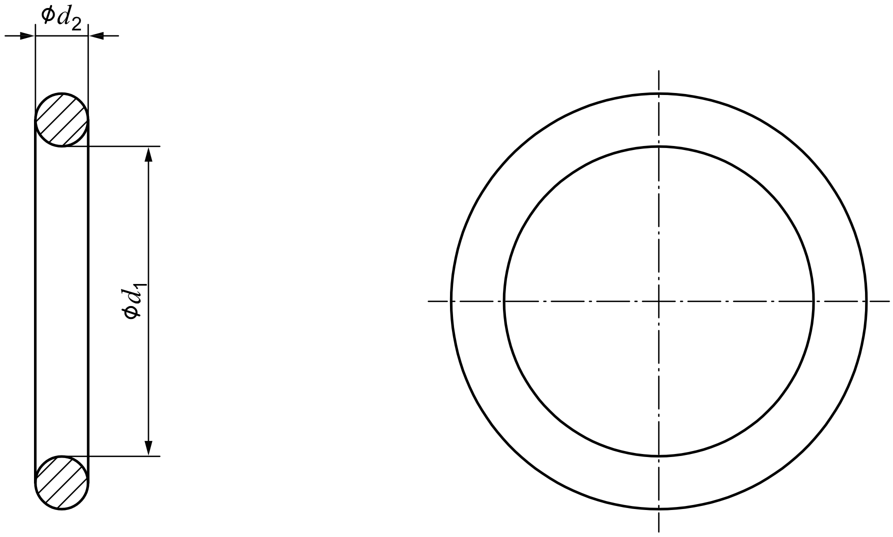


Figure 1 — Typical O-ring configuration

6 Inside diameters, d_1, cross-sections (section diameter), d_2, and tolerances

6.1 The combinations of inside diameters and cross-section diameters shall be chosen depending on the application:

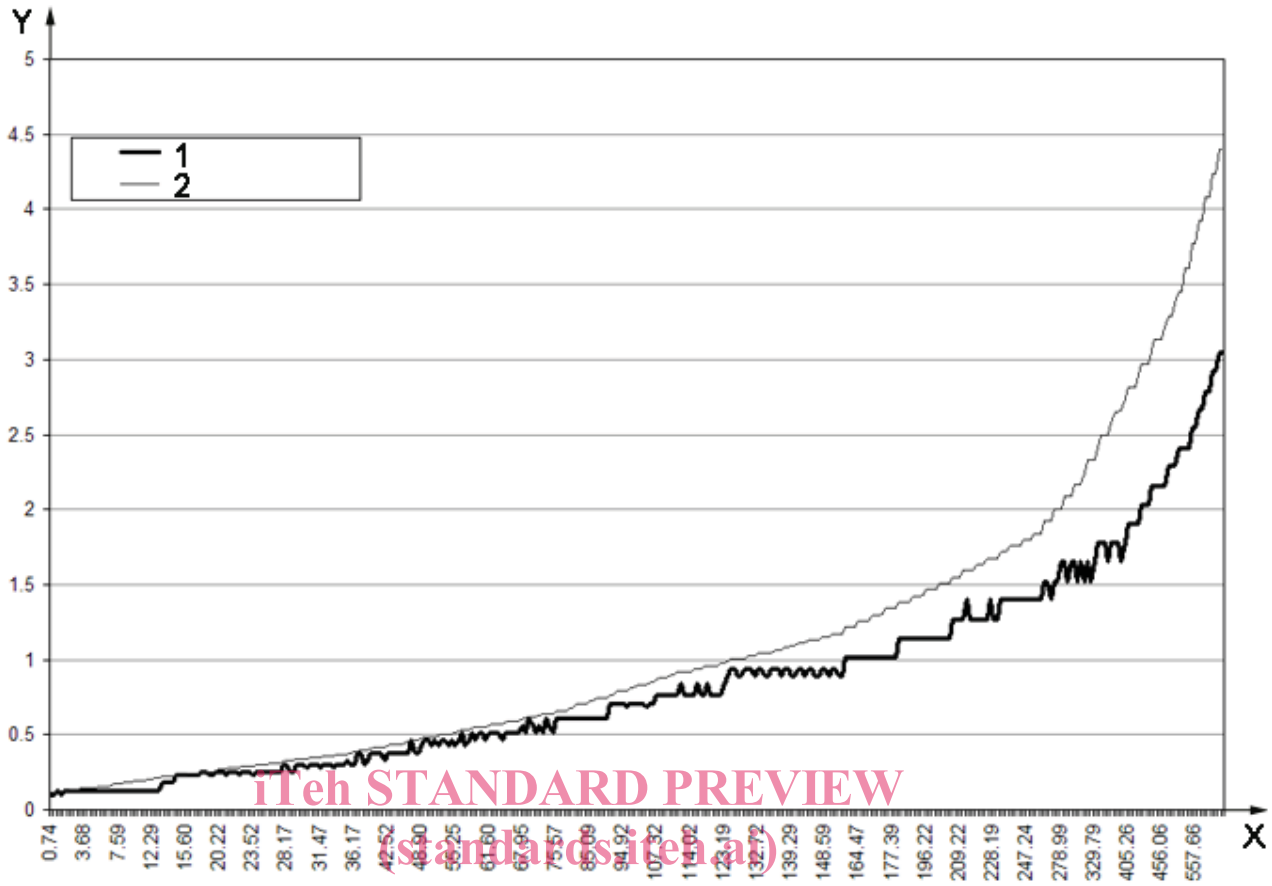
— from Tables 1 through 6 for general industrial applications;

— from Tables 7 through 11 for aerospace applications.

6.2 For industrial applications, two classes of inside diameter tolerances, class A and class B, are specified. The tolerance of class B O-rings is based on Equation (A.1). Class A O-rings have tighter inside diameter tolerances than class B O-rings and are suitable for industrial or aerospace applications when the application or the housing require tighter tolerances. Class B O-rings have dimensions and tolerances suitable for general-purpose applications. The inside diameter tolerances are based on Equation (A.1). For information, Figure 2 shows a graphical comparison of the inside-diameter tolerances for class A and class B O-rings.

6.3 Cross-section tolerances for non-standard (custom) O-rings for general industrial applications not listed in Tables 1 through 6 can be chosen from Table A.1. Tolerances for inside diameters for non-standard (custom) class A O-rings are listed in Table A.2. Equation (A.1) can be used to calculate inside diameter tolerances for non-standard (custom) class B O-rings.

In marginal cases, the compliance with the limits of the shape deviations and surface imperfections should be considered besides the dimensional tolerances. See ISO 3601-3.



Key

X O-ring inside diameter, d_1, expressed in millimetres

Y ± tolerances, expressed in millimetres

1 class A tolerance

2 class B tolerance

Figure 2 — Graphical comparison of inside diameter tolerances for class A and class B O-rings

7 Designation codes

7.1 O-rings for general industrial applications that conform to this part of ISO 3601 shall be designated as follows:

a) the word “O-ring” followed by a hyphen;

b) “ISO3601-1” followed by a hyphen;

c) the size code from the relevant table (see Tables 1 through 6) and “A” or “B” for the inside diameter tolerance class, followed by a hyphen;

d) the nominal inside diameter and cross-section dimensions, separated by an “×” and followed by a hyphen;

e) the grade letter (N, S or CS), in accordance with ISO 3601-3.

EXAMPLE 1 O-ring-ISO3601-1-011A-7,65×1,78-S

EXAMPLE 2 O-ring-ISO3601-1-125B-32,99×2,62-N

7.2 O-rings for aerospace applications that conform to this part of ISO 3601 shall be designated as follows:

a) the word “O-ring” followed by a hyphen;

b) “ISO3601-1” followed by the letter “A” (to designate an aerospace application), followed by a hyphen;

c) the size code from the relevant table (see Tables 7 through 11), followed by a hyphen;

d) the nominal inside diameter and cross-section dimensions, separated by an “×” and followed by a hyphen;

e) the grade letter (N, S or CS), in accordance with ISO 3601-3.

EXAMPLE 1 O-ring-ISO3601-1A-C0545-54,5×3,55-S

EXAMPLE 2 O-ring-ISO3601-1A-D1250-125×5,3-CS

8 Methods of measuring for receiving inspection

When it is necessary to inspect O-rings that conform to this part of ISO 3601 at the time of customer receipt, the inspection procedure shall be agreed upon by the supplier and purchaser at the time of order. Annex B provides possible methods for such a procedure for information.

9 Identification statement (reference to this part of ISO 3601)

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 3601:

“O-ring inside diameters, cross-sections, tolerances and designation code are in accordance with ISO 3601-1:2011, *Fluid power systems — O-rings — Part 1: Inside diameters, cross-sections, tolerances and designation codes.*”

Table 1 — Size code, size, inside diameter and inside diameter tolerances of class A and class B O-rings for general industrial applications — Cross-section diameter, d_2, of 1,02 mm, 1,27 mm and 1,52 mm

Size code	Size	Inside diameter						Cross-section diameter				Volume ref.	
		d_1 nom.	Tolerance mm		d_1 nom.	Tolerance in		d_2 nom.	Tol.	d_2 nom.	Tol.		
		mm	Class A	Class B	in	Class A	Class B	mm		in		cm^3	in^3
001	0,74 × 1,02	0,74	± 0,10	± 0,12	0,029	± 0,004	± 0,005	1,02	± 0,08	0,040	± 0,003	0,005	0,000 3
002	1,07 × 1,27	1,07			0,042			1,27		0,050		0,010	0,000 6
003	1,42 × 1,52	1,42			0,056			1,52		0,060		0,016	0,001 0

Table 2 — Size code, size, inside diameter and inside diameter tolerances of class A and class B O-rings for general industrial applications — Cross-section diameter, d_2, of 1,78 mm ± 0,08 mm (0,070 in ± 0,003 in)

Size code	Size	Inside diameter						Volume ref.	
		d_1 nom.	Tolerance mm		d_1 nom.	Tolerance in			
		mm	Class A	Class B	in	Class A	Class B	cm^3	in^3
004	1,78 × 1,78	1,78	± 0,13	± 0,13	0,070	± 0,005	± 0,005	0,028	0,001 7
005	2,57 × 1,78	2,57			0,101			0,034	0,002 1
006	2,90 × 1,78	2,90			0,114			0,036	0,002 2
007	3,68 × 1,78	3,68		± 0,14	0,145		± 0,006	0,043	0,002 6
008	4,47 × 1,78	4,47		± 0,15	0,176			0,049	0,003 0
009	5,28 × 1,78	5,28			0,208			0,056	0,003 4
010	6,07 × 1,78	6,07		± 0,16	0,239			0,061	0,003 7
011	7,65 × 1,78	7,65		± 0,17	0,301		± 0,007	0,074	0,004 5
012	9,25 × 1,78	9,25		± 0,18	0,364			0,085	0,005 2
013	10,82 × 1,78	10,82		± 0,20	0,426		± 0,008	0,098	0,006 0
014	12,42 × 1,78	12,42		± 0,21	0,489			0,111	0,006 8
015	14,00 × 1,78	14,00	± 0,18	± 0,22	0,551	± 0,007	± 0,009	0,123	0,007 5
016	15,60 × 1,78	15,60		± 0,23	0,614			0,136	0,008 3
017	17,17 × 1,78	17,17		± 0,24	0,676		± 0,010	0,147	0,009 0
018	18,77 × 1,78	18,77	± 0,23	± 0,26	0,739	± 0,009		0,161	0,009 8
019	20,35 × 1,78	20,35		± 0,27	0,801		± 0,011	0,172	0,010 5
020	21,95 × 1,78	21,95		± 0,28	0,864			0,185	0,011 3
021	23,52 × 1,78	23,52		± 0,29	0,926			0,197	0,012 0
022	25,12 × 1,78	25,12	± 0,25	± 0,30	0,989	± 0,010	± 0,012	0,210	0,012 8
023	26,70 × 1,78	26,70		± 0,31	1,051			0,223	0,013 6
024	28,30 × 1,78	28,30		± 0,33	1,114		± 0,013	0,234	0,014 3
025	29,87 × 1,78	29,87	± 0,28	± 0,34	1,176	± 0,011		0,247	0,015 1
026	31,47 × 1,78	31,47		± 0,35	1,239		± 0,014	0,259	0,015 8
027	33,05 × 1,78	33,05		± 0,36	1,301			0,272	0,016 6
028	34,65 × 1,78	34,65	± 0,33	± 0,37	1,364	± 0,013	± 0,015	0,283	0,017 3
029	37,82 × 1,78	37,82		± 0,39	1,489		± 0,016	0,308	0,018 8
030	41,00 × 1,78	41,00		± 0,42	1,614			0,334	0,020 4
031	44,17 × 1,78	44,17	± 0,38	± 0,44	1,739	± 0,015	± 0,017	0,359	0,021 9
032	47,35 × 1,78	47,35		± 0,46	1,864		± 0,018	0,383	0,023 4

Table 2 (*continued*)

Size code	Size	Inside diameter						Volume ref.	
		d_1 nom.	Tolerance mm		d_1 nom.	Tolerance in			
		mm	Class A	Class B	in	Class A	Class B	cm^3	in^3
033	50,52 × 1,78	50,52	± 0,46	± 0,48	1,989	± 0,018	± 0,019	0,408	0,024 9
034	53,70 × 1,78	53,70		± 0,51	2,114		± 0,020	0,433	0,026 4
035	56,87 × 1,78	56,87		± 0,53	2,239		± 0,021	0,457	0,027 9
036	60,05 × 1,78	60,05		± 0,55	2,364		± 0,022	0,482	0,029 4
037	63,22 × 1,78	63,22		± 0,57	2,489		± 0,023	0,506	0,030 9
038	66,40 × 1,78	66,40	± 0,51	± 0,59	2,614	± 0,020		0,533	0,032 5
039	69,57 × 1,78	69,57		± 0,62	2,739		± 0,024	0,557	0,034 0
040	72,75 × 1,78	72,75		± 0,64	2,864		± 0,025	0,582	0,035 5
041	75,92 × 1,78	75,92	± 0,61	± 0,66	2,989	± 0,024	± 0,026	0,606	0,037 0
042	82,27 × 1,78	82,27		± 0,70	3,239		± 0,028	0,655	0,040 0
043	88,62 × 1,78	88,62		± 0,75	3,489		± 0,029	0,705	0,043 0
044	94,97 × 1,78	94,97	± 0,69	± 0,79	3,739	± 0,027	± 0,031	0,755	0,046 1
045	101,32 × 1,78	101,32		± 0,83	3,989		± 0,033	0,805	0,049 1
046	107,67 × 1,78	107,67	± 0,76	± 0,88	4,239	± 0,030	± 0,035	0,854	0,052 1
047	114,02 × 1,78	114,02		± 0,92	4,489		± 0,036	0,903	0,055 1
048	120,37 × 1,78	120,37		± 0,96	4,739		± 0,038	0,952	0,058 1
049	126,72 × 1,78	126,72	± 0,94	± 1,01	4,989	± 0,037	± 0,040	1,003	0,061 2
050	133,07 × 1,78	133,07		± 1,05	5,239		± 0,041	1,052	0,064 2
051 through 101	unassigned	—	—	—	—	—	—	—	—

Table 3 — Size code, size, inside diameter and inside diameter tolerances of class A and class B O-rings for general industrial applications — Cross-section diameter, d_2, of 2,62 mm ± 0,08 mm (0,103 in ± 0,003 in) for class A O-rings and cross-section diameter, d_2, of 2,62 mm ± 0,09 mm (0,103 in ± 0,004 in) for class B O-rings

Size code	Size	Inside diameter						Volume ref.	
		d_1 nom. mm	Tolerance mm		d_1 nom. in	Tolerance in			
			Class A	Class B		Class A	Class B	cm^3	in^3
102	1,24 × 2,62	1,24	± 0,13	± 0,12	0,049	± 0,005	± 0,005	0,066	0,004 0
103	2,06 × 2,62	2,06		± 0,13	0,081			0,079	0,004 8
104	2,84 × 2,62	2,84			0,112			0,092	0,005 6
105	3,63 × 2,62	3,63		± 0,14	0,143		± 0,006	0,105	0,006 4
106	4,42 × 2,62	4,42		± 0,15	0,174			0,120	0,007 3
107	5,23 × 2,62	5,23			0,206			0,133	0,008 1
108	6,02 × 2,62	6,02		± 0,16	0,237			0,146	0,008 9
109	7,59 × 2,62	7,59		± 0,17	0,299		± 0,007	0,172	0,010 5
110	9,19 × 2,62	9,19		± 0,18	0,362			0,200	0,012 2
111	10,77 × 2,62	10,77		± 0,20	0,424		± 0,008	0,226	0,013 8
112	12,37 × 2,62	12,37		± 0,21	0,487			0,252	0,015 4
113	13,94 × 2,62	13,94	± 0,18	± 0,22	0,549	± 0,007	± 0,009	0,280	0,017 1
114	15,54 × 2,62	15,54		± 0,23	0,612			0,306	0,018 7
115	17,12 × 2,62	17,12	± 0,23	± 0,24	0,674	± 0,009	± 0,010	0,333	0,020 3
116	18,72 × 2,62	18,72		± 0,26	0,737			0,361	0,022 0
117	20,29 × 2,62	20,29	± 0,25	± 0,27	0,799	± 0,010	± 0,011	0,387	0,023 6
118	21,89 × 2,62	21,89		± 0,28	0,862			0,415	0,025 3
119	23,47 × 2,62	23,47		± 0,29	0,924			0,441	0,026 9
120	25,07 × 2,62	25,07		± 0,30	0,987		± 0,012	0,467	0,028 5
121	26,64 × 2,62	26,64		± 0,31	1,049			0,495	0,030 2
122	28,24 × 2,62	28,24		± 0,33	1,112		± 0,013	0,521	0,031 8
123	29,82 × 2,62	29,82	± 0,30	± 0,34	1,174	± 0,012		0,547	0,033 4
124	31,42 × 2,62	31,42		± 0,35	1,237		± 0,014	0,575	0,035 1
125	32,99 × 2,62	32,99		± 0,36	1,299			0,601	0,036 7
126	34,59 × 2,62	34,59		± 0,37	1,362		± 0,015	0,628	0,038 3
127	36,17 × 2,62	36,17		± 0,38	1,424			0,655	0,040 0
128	37,77 × 2,62	37,77		± 0,39	1,487			0,682	0,041 6
129	39,34 × 2,62	39,34	± 0,38	± 0,40	1,549	± 0,015	± 0,016	0,708	0,043 2
130	40,94 × 2,62	40,94		± 0,42	1,612			0,736	0,044 9
131	42,52 × 2,62	42,52		± 0,43	1,674		± 0,017	0,762	0,046 5
132	44,12 × 2,62	44,12		± 0,44	1,737			0,790	0,048 2
133	45,69 × 2,62	45,69		± 0,45	1,799		± 0,018	0,816	0,049 8
134	47,29 × 2,62	47,29		± 0,46	1,862			0,842	0,051 4