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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Hydraulic fluid power — Cylinders — Housings for piston and rod seals in reciprocating applications — Dimensions and tolerances

Transmissions hydrauliques — Vérins — Logements de joints d'étanchéité pour pistons et tiges de piston — Dimensions et tolérances

Reference number
ISO 5597 : 1987 (E)

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 5597 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

This first edition of ISO 5597 cancels and replaces the first edition of ISO 5597-1 : 1980, of which it constitutes a technical revision [increase in the dimensional range of cylinders from 400 mm to 500 mm; inclusion of an additional range of seal housings to meet the reduced envelope requirements of the 160 bar (16 MPa) compact series of ISO 6020-2].

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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Hydraulic fluid power — Cylinders — Housings for piston and rod seals in reciprocating applications — Dimensions and tolerances

0 Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Sealing devices are used to contain the pressurized fluid with components having elements with linear motion, i.e. hydraulic cylinders. These sealing devices are used with both cylinder rod and piston seal housings.

This International Standard is one of a series of standards covering dimensions and tolerances of housings.

1 Scope and field of application

This International Standard establishes the preferred range of nominal dimensions and associated tolerances for a series of hydraulic cylinder rod and piston seal housings for reciprocating applications in the following range of dimensions :

— for cylinders of 16 to 500 mm;

— for rods of 6 to 360 mm.

An additional range of seal housings is detailed in this International Standard to meet the reduced envelope requirements of the 160 bar (16 MPa)[1)] compact series of ISO 6020-2; these smaller section seals require stricter piston rod and cylinder bore tolerances. The ranges of dimensions are as follows :

— for cylinders of 25 to 200 mm;

— for rods of 12 to 140 mm.

It does not give details of seal design, since the manner of construction of seals varies with each manufacturer. The design and material of the seal and any incorporated anti-extrusion component are determined by conditions such as temperature and pressure.

This International Standard only applies to the dimensional criteria of products manufactured in conformity with this International Standard; it does not apply to their functional characteristics.

2 References

ISO 286, *ISO system for limits and fits.*

ISO 883, *Indexable hardmetal (carbide) inserts with rounded corners, without fixing hole — Dimensions.*

ISO 3320, *Fluid power systems and components — Cylinder bores and piston rod diameters — Metric series.*

ISO 4394-1, *Fluid power systems and components — Cylinder barrels — Part 1: Requirements for steel tubes with specially finished bores.*

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

ISO 6020-2, *Hydraulic fluid power — Single rod cylinders — Mounting dimensions* — 160 bar (16 000 kPa) — *Part 2: Compact series.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 apply.

4 Letter symbols

Letter symbols used in this International Standard are as follows :

C = axial length of the lead-in chamfer

L = axial length (seal groove length) of the seal housing

d = inside diameter (rod diameter) of the seal housing

D = outside diameter (bore diameter) of the seal housing

1) 1 bar = 100 kPa = 10^5 Pa = 0,1 Mpa; 1 Pa = 1 N/m^2

d_3 = clearance diameter of the piston

d_4 = clearance diameter of the rod seal housing

d_5 = clearance diameter of the rod

$S = \frac{D - d}{2}$; radial depth (cross-section) of the seal housing

r = radius

5 Seal housings

5.1 General

5.1.1 Illustrated examples of typical hydraulic cylinder rod and piston seal housings covered by this International Standard are given in figures 1 to 4.

NOTE — These figures are diagrammatic only and do not represent recommendations of a particular housing design.

5.1.2 All sharp edges and burrs shall be removed from corners of supporting surfaces and rounded, although it should be borne in mind that these surfaces are required to provide maximum support against extrusion.

5.1.3 The seal manufacturer shall be consulted for details of housing design which are not specified in this International Standard.

5.2 Axial length

The short axial length, L, as given in tables 2 and 4, shall be adopted only after consultation with the manufacturer.

NOTES

1 This International Standard includes a choice of axial length for every nominal piston and rod diameter, the exception being cylinders conforming to ISO 6020-2 in which case only one length is provided (see clause 1 and tables 3 and 5).

2 Consultation with the manufacturer is recommended when making the appropriate selection from the available choices.

5.3 Radial depth

The wider radial depth (cross-section) of the seal housing, S, shall be chosen where higher stresses or wider tolerances are involved.

NOTES

1 This International Standard includes an alternative seal housing radial depth (cross-section) for most piston and rod diameters, the exceptions being at the upper and lower extremities of the diameter range as well as cylinder seal housings conforming to ISO 6020-2 in which case only one radial depth is provided.

2 Consultation with the manufacturer is recommended when making the appropriate selection from the available choices.

6 Dimensions and tolerances[1)]

6.1 Piston seal housing dimensions

6.1.1 Illustrated examples of piston seal housing dimensions are given in figures 1 and 2.

6.1.2 Piston seal housing dimensions (except in the case of cylinders conforming to ISO 6020-2) shall be selected from table 2.

6.1.3 Piston seal housing dimensions for use with cylinders conforming to ISO 6020-2 shall be selected from tabie 3.

6.2 Rod seal housing dimensions

6.2.1 Illustrated examples of rod seal housing dimensions are given in figures 3 and 4.

6.2.2 Rod seal housing dimensions (except in the case of cylinders conforming to ISO 6020-2) shall be selected from table 4.

6.2.3 Rod seal housing dimensions for use with cylinders conforming to ISO 6020-2 shall be selected from table 5.

6.3 Radial seal space tolerances

6.3.1 Reference shall be made to table 6 for radial seal space tolerances.

6.3.2 References shall be made to notes 1 and 2 of table 6 for the formulae for calculating tolerances on d (see figures 1 and 2) and D (see figures 3 and 4).

NOTES

1 Generally, the formulae and values as shown in table 6, when used in conjunction with ISO 286 limits of D H9 and d_3 f8 (for the piston case) or d f8 and d_5 H9 (for the rod case), in most cases will result in tolerances within the span of d h10 and D H10, respectively.

2 If alternative limits to those given by example in note 1 are selected for D and d_3 (for the piston case) or d and d_5 (for the rod case), then the use of the formulae will maintain the necessary radial seal space limits, i.e. any relaxation of tolerance on one housing diameter will be compensated by a tighter tolerance on the other diameter.

6.4 Housing length

A factor of $^{+\ 0,25}_{\ 0}$ mm shall be used for the tolerances on the length of the housing.

7 Extrusion gap

The extrusion gap is determined by the diameter (d_4 or d_3) of the adjacent metal components behind the seal.

1) See ISO 4394-1 and ISO 3320.

NOTES

1 Maximum value for the extrusion gap is achieved when the piston or piston rod is in contact with one side of the cylinder or bearing, respectively.

2 The extrusion gap for piston seals is further widened by the expansion of the cylinder due to internal pressure.

3 It is recommended that details concerning d_3 (see figures 1 and 2) and d_4 (see figures 3 and 4) be subject to consultations between the housing designer and seal manufacturer.

8 Surface finish

The requirements for the surface finish of the component in contact with the seal are dependent on the application and its life requirement and should be subject to agreement between manufacturer and user.

9 Lead-in chamfer

9.1 Reference shall be made to figures 1 to 4 for the location of the lead-in chamfer, C.

9.2 The chamfer shall make an angle of between 20° and 30° with the axis.

9.3 The length of the chamfer shall not be less than that given in table 1.

9.4 As an alternative, in the case of cylinders conforming to ISO 6020-2 only, the end of the cylinder bore shall be rounded to a minimum radius of 0,4 mm.

NOTE — In such cases, special attention may be necessary when assembling seals into the cylinder.

Table 1 — Lead-in chamfer

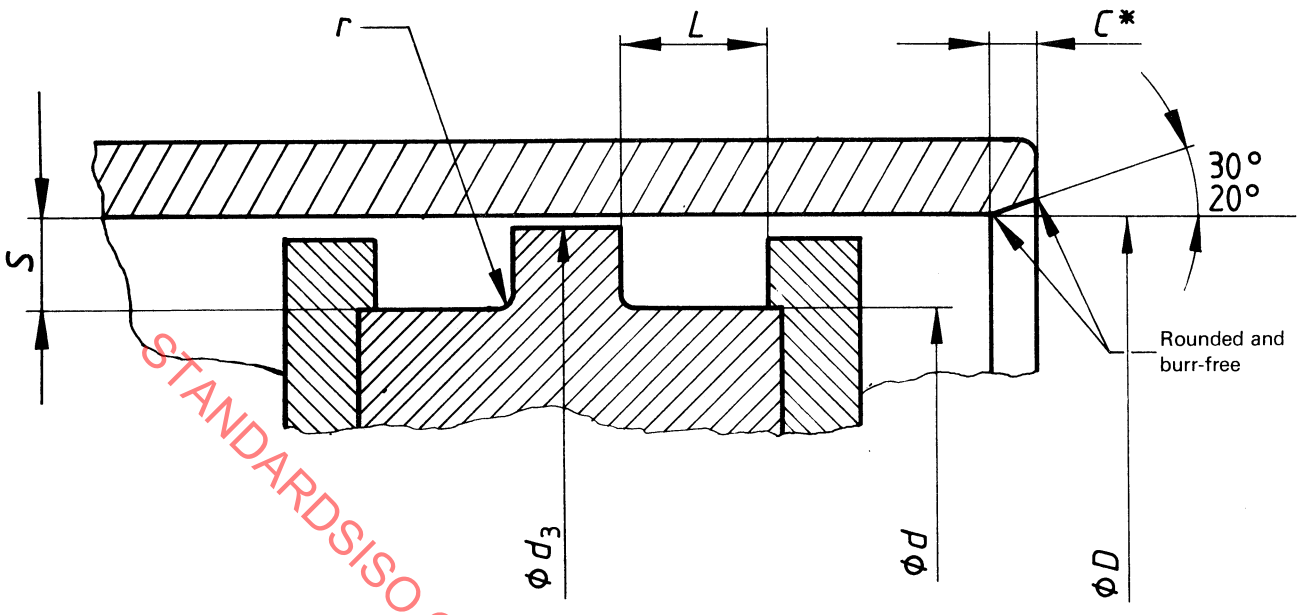
Dimensions in millimetres

Radial depth of seal housing, S	3,5	4	5	7,5	10	12,5	15	20
Minimum axial length of lead-in chamfer, C	2	2	2,5	4	5	6,5	7,5	10

10 Identification statement (Reference to this International Standard)

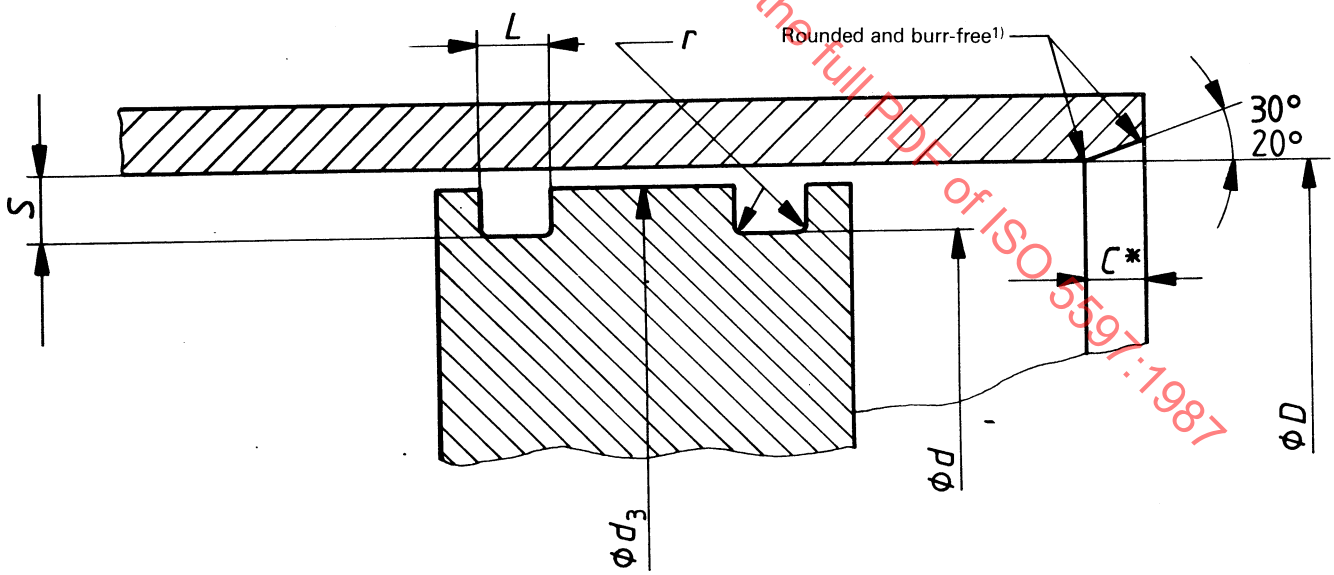
Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard :

"Dimensions and tolerances for hydraulic cylinder rod and piston seal housings selected in accordance with ISO 5597, *Hydraulic fluid power — Cylinders — Housings for piston and rod seals in reciprocating applications — Dimensions and tolerances*."



* See table 1.

Figure 1 — Example of piston seal housing
(except in the case of cylinders conforming to ISO 6020-2 — see figure 2)



* See table 1.

Figure 2 — Example of piston seal housing for use with cylinders conforming to ISO 6020-2

1) See also 9.4.

Table 2 — Nominal dimensions for piston seal housing
(except in the case of cylinders conforming to ISO 6020-2 — see table 3)

Dimensions in millimetres

Bore diameter[1] D	Radial depth S	Inside diameter d	Axial length[2] L			r
			short	medium	long	max.
16	4	8	5	6,3	—	0,3
20		12				
25		17				
	5	15	6,3	8	16	
32	4	24	5	6,3	—	
	5	22	6,3	8	16	
40	4	32	5	6,3	—	
	5	30	6,3	8	16	
50		40				
	7,5	35	9,5	12,5	25	0,4
63	5	53	6,3	8	16	0,3
	7,5	48	9,5	12,5	25	0,4
80		65				
	10	60	12,5	16	32	0,6
100	7,5	85	9,5	12,5	25	0,4
	10	80	12,5	16	32	0,6
125		105				
	12,5	100	16	20	40	0,8
160	10	140	12,5	16	32	0,6
	12,5	135	16	20	40	0,8
200		175				
	15	170	20	25	50	
250	12,5	225	16	20	40	
	15	220	20	25	50	
320		290				
400	20	360	25	32	63	1
500		460				

1) See ISO 3320

2) The application of the axial lengths specified in tables 2 and 4 (short, medium and long) depends upon the respective working conditions.

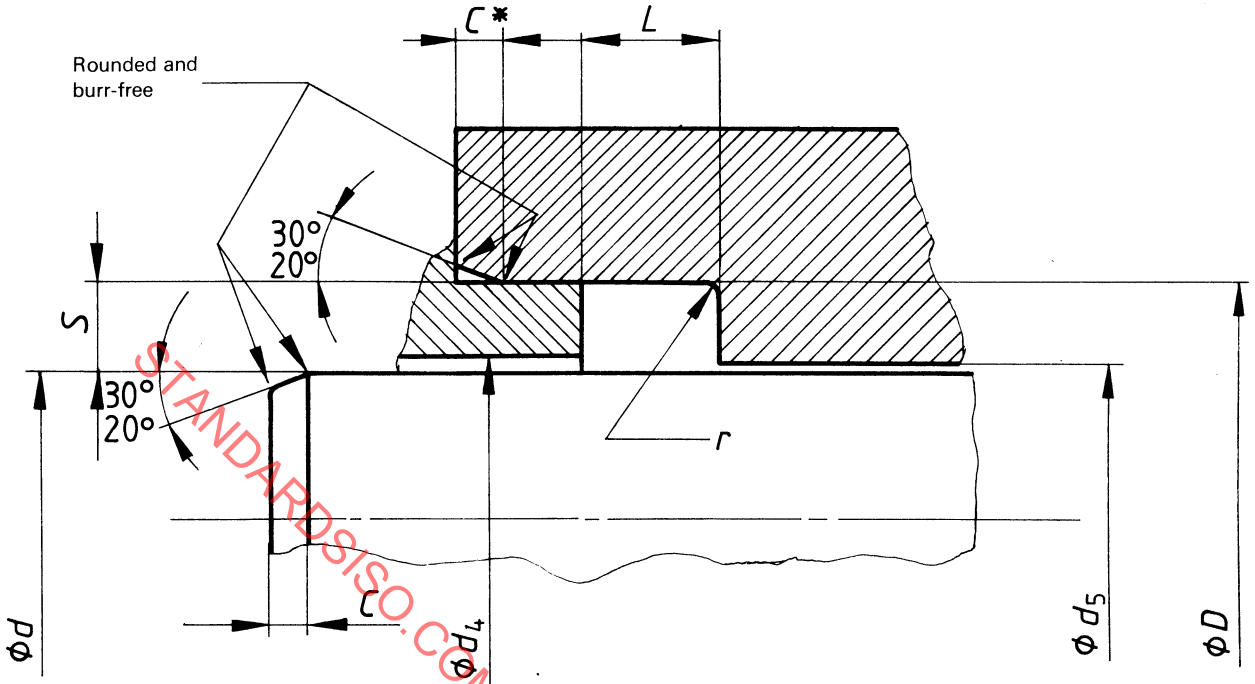
Table 3 — Nominal dimensions for piston seal housings for use with cylinders conforming to ISO 6020-2

Dimensions in millimetres

Bore diameter[1] D	Radial depth S	Inside diameter d	Axial length L	r[2] max.
25	3,5	18	5,6	0,5
32		25		
40	4	32	6,3	
50		42		
63		55		
80	5	70	7,5	
100		90		
125	7,5	110	10,6	
160		145		
200		185		

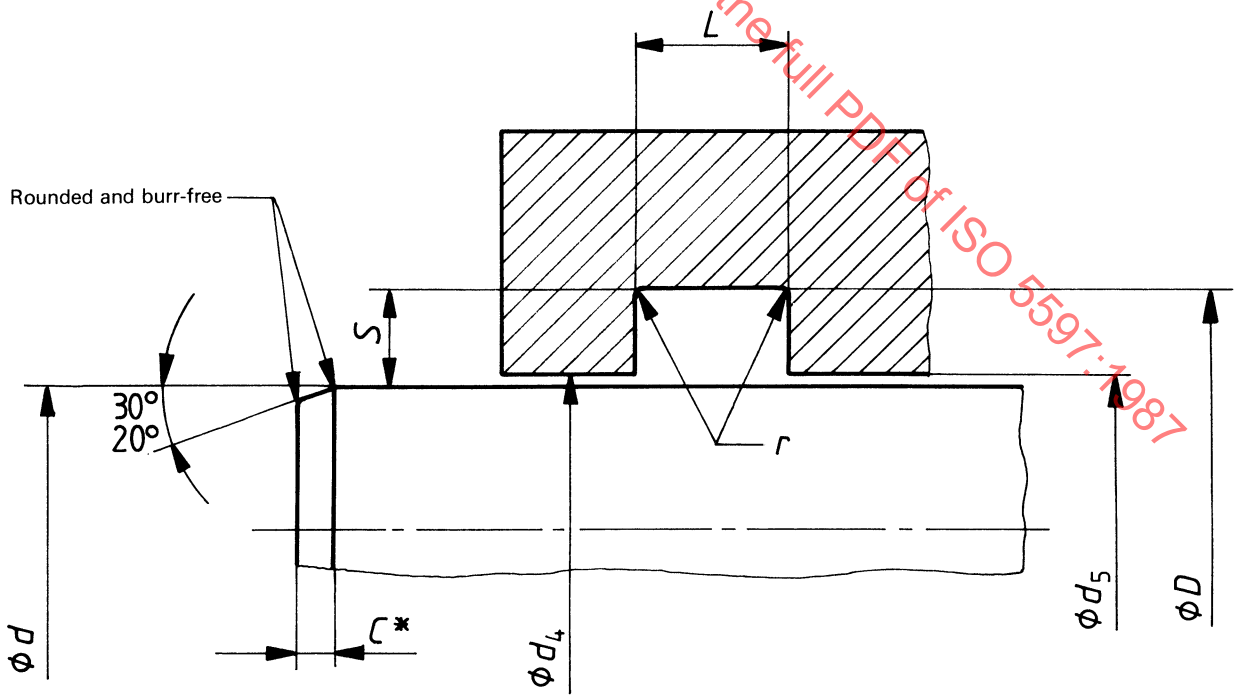
1) See ISO 6020-2.

2) This specific dimension permits the use of tools conforming to ISO 883.



* See table 1.

Figure 3 — Example of rod seal housing
(except in the case of cylinders conforming to ISO 6020-2 — see figure 4)



* See table 1.

Figure 4 — Example of rod seal housing for use with cylinders conforming to ISO 6020-2

Table 4 — Nominal dimensions for rod seal housings
(except in the case of cylinders conforming to ISO 6020-2 — see table 5)

Dimensions in millimetres

Rod diameter[1] d	Radial depth S	Outside diameter D	Axial length[2] L			r
			short	medium	long	max.
6	4	14	5	6,3	14,5	0,3
8		16				
10		18				
	5	20	—	8	16	
12	4		5	6,3	14,5	
	5	22	—	8	16	
14	4		5	6,3	14,5	
	5	24	—	8	16	
16	4		5	6,3	14,5	
	5	26	—	8	16	
18	4		5	6,3	14,5	
	5	28	—	8	16	
20	4		5	6,3	14,5	
	5	30	—	8	16	
22	4		5	6,3	14,5	
	5	32	—	8	16	
25	4	33	5	6,3	14,5	
	5	35	—	8	16	
28		38	6,3			
	7,5	43	—	12,5	25	0,4
32	5	42	6,3	8	16	0,3
	7,5	47	—	12,5	25	0,4
36	5	46	6,3	8	16	0,3
	7,5	51	—	12,5	25	0,4
40	5	50	6,3	8	16	0,3
	7,5	55	—	12,5	25	0,4
45	5	55	6,3	8	16	0,3
	7,5	60	—	12,5	25	0,4
50	5	60	6,3	8	16	0,3
	7,5	65	—	12,5	25	0,4
56		71	9,5			
	10	76	—	16	32	0,6
63	7,5	78	9,5	12,5	25	0,4
	10	83	—	16	32	0,6
70	7,5	85	9,5	12,5	25	0,4
	10	90	—	16	32	0,6
80	7,5	95	9,5	12,5	25	0,4
	10	100	—	16	32	0,6
90	7,5	105	9,5	12,5	25	0,4
	10	110	—	16	32	0,6
100		120	12,5			
	12,5	125	—	20	40	0,8
110	10	130	12,5	16	32	0,6
	12,5	135	—	20	40	0,8

1) See ISO 3320.

2) The application of the axial lengths specified in tables 2 and 3 (short, medium, and long) depends upon the respective working conditions.