BS ISO 3320:2013

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Fluid power systems and components — Cylinder bores and piston rod diameters and area ratios — Metric series

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National foreword

This British Standard is the UK implementation of ISO 3320:2013. It supersedes BS ISO 7181:1991 which is withdrawn.

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 131, *Fluid power systems*, Subcommittee SC 3, *Cylinders*.

This third edition of ISO 3320 cancels and replaces the second edition (ISO 3320:1987) and the second edition of ISO 7181:1991, which have been combined and technically revised.

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Introduction

In fluid power systems, power is transmitted and controlled through a liquid (for hydraulics) or a gas (for pneumatics) under pressure within an enclosed circuit.

One component of such systems is the fluid power cylinder. This is a device that converts power into linear mechanical force and motion. It consists of a movable element, i.e. a piston and piston rod, operating within a cylindrical bore.

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Fluid power systems and components — Cylinder bores and piston rod diameters and area ratios — Metric series

1 Scope

This International Standard establishes a metric series of cylinder bore and piston rod diameters for hydraulic and pneumatic cylinders, and specifies for each pair of diameters a corresponding standard ratio between the useful areas.

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

2 Normative references

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

ISO 3, *Preferred numbers — Series of preferred numbers*

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

ISO 6099, *Fluid power systems and components — Cylinders — Identification code for mounting dimensions and mounting types*

3 Terms and definitions

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

4 Symbols and units

Symbols and units used in this International Standard are shown in Table 1.

Table 1 — Symbols and units

Symbol	Designation	Unit
AL[a]	Cylinder bore diameter	mm
MM[a]	Piston rod diameter	mm
$A_1 = \frac{\pi}{4} \cdot AL^2$	Area cylinder cap side	cm^2
$A_2 = \frac{\pi}{4} \cdot \left(AL^2 - MM^2 \right)$	Area cylinder rod side	cm^2
$\phi = \frac{A_1}{A_2}$	Area ratio	-

[a] Letter codes are in accordance with ISO 6099.

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5 Dimensions

5.1 The cylinder bore diameter (AL) is shown in Figure 1 and values are specified in Table 2.

5.2 The cylinder rod diameter (MM) is shown in Figure 1 and values are specified in Table 3.

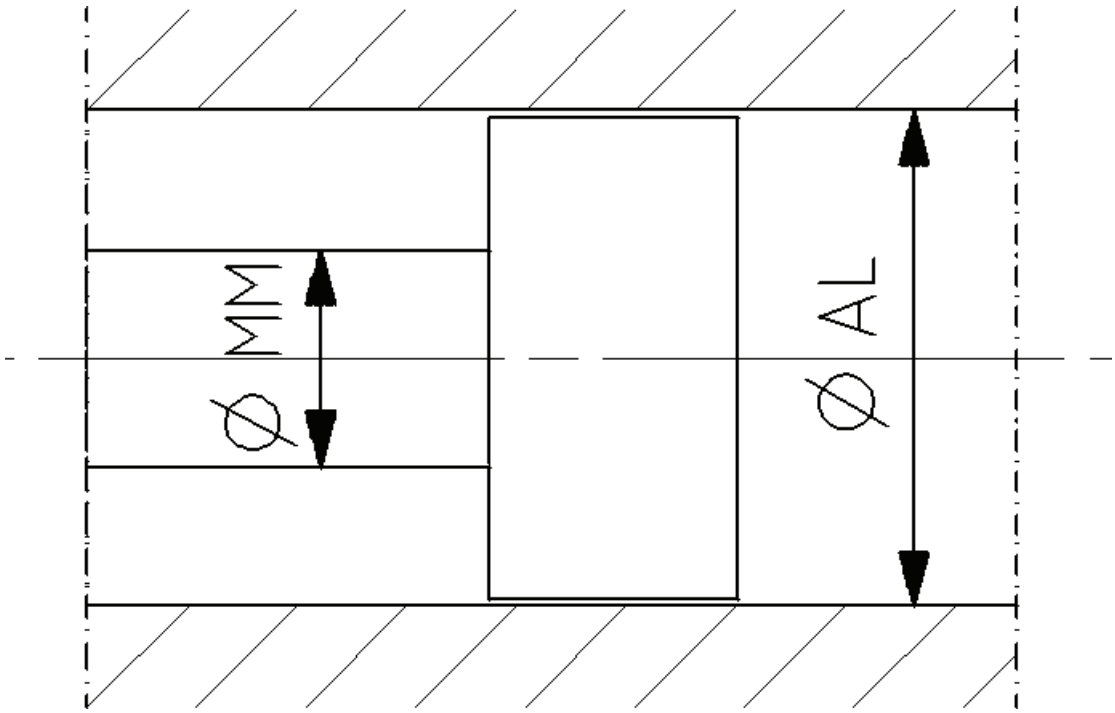

Figure 1 — Identification of bore and rod dimensions

Table 2 — Cylinder bore diameters (AL)

Dimensions in millimetres

AL	8	10	12	16	20	25	32	40	50	60	63	80	(90)	100
	(110)	125	(140)	160	(180)	200	(220)	250	(280)	320	(360)	400	(450)	500
NOTE 1 An extension upwards of the diameter ranges can be made using the series of preferred numbers given in ISO 3 (R10 for diameters up to bore diameter 100 mm and R20 for bore diameters larger than 100 mm).														
NOTE 2 Values in parentheses are non-preferred values and should be used for special applications only.														

Table 3 — Piston rod diameters (MM)

Dimensions in millimetres

MM	4	5	6	8	10	12	14	16	18	20	22	25	28	(30)
	32	36	40	45	50	56	(60)	63	70	80	90	100	110	(120)
	125	140	160	180	200	220	250	280	320	360	400	450	-	-
NOTE 1 An extension upwards of the diameter ranges can be made using the series of preferred numbers R20 given in ISO 3.														
NOTE 2 Values in parentheses are non-preferred values and should be used for special applications only.														

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6 Area ratios

6.1 For each pair of diameters of bore and piston rod, there is a corresponding ratio between the useful areas.

6.2 Ratios approximately equal to one of the following preferred numbers are shown in Table 4:

1,06 — 1,12 — 1,25 — 1,33 — 1,4 — 1,6 — 2 — 2,5 — 5

6.3 Moreover, for each pair of diameters of bore (AL) and piston rod (MM), Table 4 gives calculated values of A_1 and A_2 and their corresponding effective value ϕ.

7 **Identification statement** (reference to this International Standard)

It is recommended to manufacturers who have chosen to conform to this International Standard that the following statement be used in test reports, catalogues, and sales literature:

"Cylinder bores, piston rod diameters and ratios selected in accordance with ISO 3320, *Fluid power systems and components — Cylinder bores and piston rod diameters and area ratios — Metric series.*"

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Table 4 — Bore and piston rod area ratios

Diameters in millimetres, areas in square centimetres

φ	AL	25	32	40	50	63	80	(90)	100	(110)	125	(140)	160	(180)	200	(220)	250	(280)	320	(360)	400	(450)	500
≈	A_1	4,91	8,04	12,6	19,6	31,2	50,3	63,6	78,5	95,0	123	154	201	254	314	380	491	616	804	1 018	1 257	1 590	1 963
	MM	8	10	10	12	16	20	22	25	28	32	36	40	45	50	56	63	70	80	90	100	110	125
1,06	A_2	4,41	7,26	11,8	18,5	29,2	47,1	59,8	73,6	88,9	115	144	188	239	295	356	460	577	754	954	1 178	1 495	1 841
	φ	1,11	1,11	1,07	1,06	1,07	1,07	1,06	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,06	1,07
	MM	10	12	12	16	20	25	28	32	36	40	45	50	56	63	70	80	90	100	110	125	140	160
1,12	A_2	4,12	6,91	11,4	17,6	28,0	45,4	57,5	70,5	84,9	110	138	181	230	283	342	441	552	726	923	1 134	1 436	1 762
	φ	1,19	1,16	1,10	1,11	1,11	1,11	1,11	1,11	1,12	1,11	1,12	1,11	1,11	1,11	1,11	1,11	1,12	1,11	1,10	1,11	1,11	1,11
	MM	12	14	18	22	28	36	40	45	50	56	63	70	80	90	100	110	125	140	160	180	200	220
1,25	A_2	3,78	6,50	10,0	15,8	25,0	40,1	51,1	62,6	75,4	98,1	123	163	204	251	302	396	493	650	817	1 002	1 276	1 583
	φ	1,30	1,24	1,25	1,24	1,25	1,25	1,25	1,25	1,26	1,25	1,25	1,24	1,25	1,25	1,26	1,24	1,25	1,24	1,25	1,25	1,25	1,24
	MM	12	16	20	25	30	40	45	50	56	60	70	80	90	100	110	125	140	160	180	200	220	250
1,33	A_2	3,78	6,03	9,42	14,7	24,1	37,7	47,7	58,9	70,4	94,4	115	151	191	236	285	368	462	603	763	942	1 210	1 473
	φ	1,30	1,33	1,33	1,33	1,29	1,33	1,33	1,33	1,35	1,30	1,33	1,33	1,33	1,33	1,33	1,33	1,33	1,33	1,33	1,33	1,31	1,33
	MM	14	18	22	28	36	45	50	56	63	70	80	90	100	110	125	140	160	180	200	220	250	280
1,4	A_2	3,37	5,50	8,77	13,5	21,0	34,4	44,0	53,9	63,9	84,2	104	137	176	219	257	337	415	550	704	877	1 100	1 348
	φ	1,46	1,46	1,43	1,46	1,48	1,46	1,45	1,46	1,49	1,46	1,48	1,46	1,45	1,43	1,48	1,46	1,48	1,46	1,45	1,43	1,45	1,46
	MM	16	20	25	32	40	50	56	63	70	80	90	100	110	125	140	160	180	200	220	250	280	320
1,6	A_2	2,90	4,90	7,66	11,6	18,6	30,6	39,0	47,4	56,5	72,5	90,3	123	159	191	226	290	361	490	638	766	975	1 159
	φ	1,69	1,64	1,64	1,69	1,68	1,64	1,63	1,66	1,68	1,69	1,70	1,64	1,60	1,64	1,68	1,69	1,70	1,64	1,60	1,64	1,63	1,69
	MM	18	22	28	36	45	56	63	70	80	90	100	110	125	140	160	180	200	220	250	280	320	360
2	A_2	2,36	4,24	6,41	9,5	15,3	25,6	32,4	40,1	44,8	59,1	75,4	106	132	160	179	236	302	424	527	641	786	946
	φ	2,08	1,90	1,96	2,08	2,04	1,96	1,96	1,96	2,12	2,08	2,04	1,90	1,93	1,96	2,12	2,08	2,04	1,90	1,93	1,96	2,02	2,08
	MM	20	25	32	40	50	63	70	80	90	100	110	125	140	160	180	200	220	250	280	320	360	400
2,5	A_2	1,77	3,13	4,52	7,1	11,5	19,1	25,1	28,3	31,4	44,2	58,9	78,3	101	113	126	177	236	313	402	452	573	707
	φ	2,78	2,57	2,78	2,8	2,70	2,63	2,53	2,78	3,03	2,78	2,61	2,57	2,53	2,78	3,03	2,78	2,61	2,57	2,53	2,78	2,78	2,78
	MM	22	28	36	45	56	70	80	90	100	110	125	140	160	180	200	220	250	280	320	360	400	450
5	A_2	1,11	1,88	2,39	3,7	6,5	11,8	13,4	14,9	16,5	27,7	31,2	47,1	53,4	59,7	66,0	111	125	188	214	239	334	373
	φ	4,43	4,27	5,26	5,26	4,76	4,27	4,76	5,26	5,76	4,43	4,93	4,27	4,76	5,26	5,76	4,43	4,93	4,27	4,76	5,26	4,76	5,26

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