

# INTERNATIONAL STANDARD

**ISO**  
**7181**

Second edition  
1991-10-01

---

---

## Hydraulic fluid power — Cylinders — Bore and rod area ratios

*Transmissions hydrauliques — Vérins — Rapports entre surfaces  
d'alésage et de tige*



Reference number  
ISO 7181:1991(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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 7181 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Sub-Committee SC 3, *Cylinders*.

This second edition cancels and replaces the first edition (ISO 7181:1982), which has been technically revised.

Annex A of this International Standard is for information only.

© ISO 1991

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization  
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

## Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit.

One component of such systems is the hydraulic cylinder. This is a device which 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.

STANDARDSISO.COM : Click to view the full PDF of ISO 7181:1991

This page intentionally left blank

STANDARDSISO.COM : Click to view the full PDF of ISO 7181:1997

## Hydraulic fluid power — Cylinders — Bore and rod area ratios

### 1 Scope

This International Standard specifies for each pair of diameters ( $AL$  = cylinder bore;  $MM$  = piston rod diameter) of hydraulic cylinders a corresponding standard ratio  $\phi$  between the useful areas  $A_1$  and  $A_2$ .

### 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

### 3 Definitions

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

### 4 Area ratios

Dimensions are shown on figure 1 and given in table 1.

#### NOTES

1 For each pair of diameters ( $AL$ ,  $MM$ ) there is a corresponding ratio  $\phi$  between the useful areas  $A_1$  and  $A_2$ .

$$A_1 = \frac{\pi}{4} AL^2$$

$$A_2 = \frac{\pi}{4} (AL^2 - MM^2)$$

2 Table 1 gives, for guidance, for each value of  $AL$  those standard values of  $MM$  that give ratios  $\phi$  approximately equal to one of the following preferred numbers:

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

3 Moreover, for each pair ( $AL$ ,  $MM$ ), table 1 gives calculated values of  $A_1$  and  $A_2$  and the corresponding effective value of  $\phi$ .

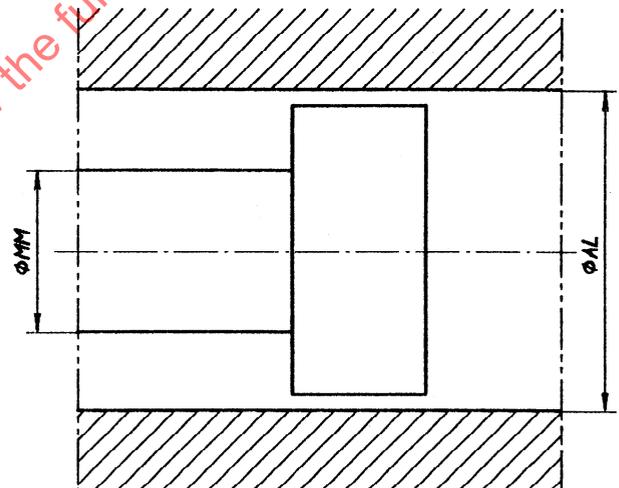


Figure 1

### 5 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:

"Hydraulic cylinder area ratios conform to ISO 7181, *Hydraulic fluid power — Cylinders — Bore and rod area ratios*."

Table 1 — Bore and rod area ratios

Diameters in millimetres  
Areas in square centimetres

$\varphi^{1)}$	$AL$	25	32	40	50	63	80	90	100	(110)	125	(140)	160	(180)	200	(220)	250	(280)	320	(360)	400	(450)	500			
$\approx$	$A_1$	4,91	8,04	12,6	19,6	31,2	50,3	63,6	78,5	95	123	154	201	254	314	380	491	616	804	1 018	1 257	1 590	1 963			
1,06	$M/M$ $A_2$ $\varphi$				12 18,5 1,06	16 29,2 1,07	20 47,1 1,07	22 59,8 1,06	25 73,6 1,07	28 88,9 1,07	32 115 1,07	36 144 1,07	40 188 1,07	45 239 1,07	50 295 1,07	56 355 1,07	63 460 1,07	70 577 1,07	80 754 1,07	90 954 1,07	100 1 178 1,07	110 1 495 1,06	125 1 841 1,07	140 2 276 1,07	160 2 783 1,07	
1,12	$M/M$ $A_2$ $\varphi$				16 17,6 1,11	20 28,0 1,11	25 45,4 1,11	28 57,5 1,11	32 70,5 1,11	36 84,9 1,12	40 110 1,12	45 138 1,12	50 181 1,11	56 230 1,11	63 283 1,11	70 342 1,11	80 441 1,11	90 552 1,12	100 726 1,11	110 923 1,10	125 1 134 1,11	140 1 436 1,11	160 1 762 1,11	180 2 111 1,11	200 2 486 1,11	
1,25	$M/M$ $A_2$ $\varphi$				18 10,0 1,25	22 15,8 1,24	28 25,0 1,25	36 40,1 1,25	45 62,6 1,25	56 98,1 1,26	70 154 1,26	84,2 212 1,25	104 283 1,25	123 370 1,24	159 481 1,25	204 617 1,25	251 802 1,26	302 1 057 1,24	396 1 386 1,24	493 1 726 1,24	650 2 181 1,25	817 2 661 1,25	1 002 3 166 1,25	1 276 3 706 1,25	1 583 4 281 1,24	1 924 4 796 1,24
1,4	$M/M$ $A_2$ $\varphi$				22 8,77 1,43	28 13,5 1,46	36 21 1,48	45 34,4 1,46	56 53,9 1,46	70 84,2 1,49	84,2 119 1,49	104 159 1,48	123 212 1,48	159 283 1,48	204 370 1,45	251 481 1,43	302 617 1,48	396 1 057 1,46	493 1 386 1,48	650 1 726 1,46	817 2 181 1,45	1 002 2 661 1,43	1 276 3 166 1,45	1 583 3 651 1,46	1 924 4 136 1,46	2 281 4 641 1,46
1,6	$M/M$ $A_2$ $\varphi$				25 7,66 1,64	32 11,6 1,69	40 18,6 1,68	50 30,6 1,64	63 47,4 1,66	80 72,5 1,68	98,1 133 1,68	123 181 1,69	159 254 1,70	204 329 1,64	251 424 1,60	302 552 1,64	396 726 1,68	493 923 1,69	650 1 134 1,70	817 1 386 1,64	1 002 1 641 1,60	1 276 1 966 1,63	1 583 2 276 1,63	1 924 2 661 1,63	2 281 3 021 1,63	2 648 3 386 1,69
2	$M/M$ $A_2$ $\varphi$				28 6,41 1,96	36 9,46 2,08	45 15,3 2,04	56 25,6 1,96	70 40,1 1,96	84,2 59,1 2,12	104 84,2 2,08	123 119 2,08	159 212 2,04	204 283 1,90	251 370 1,93	302 424 1,96	396 552 2,12	493 650 2,08	650 817 2,04	817 923 1,93	1 002 1 134 1,96	1 276 1 436 2,02	1 583 1 762 2,08	1 924 2 111 2,08	2 281 2 486 2,02	2 648 2 843 2,08
2,5	$M/M$ $A_2$ $\varphi$				32 4,52 2,78	40 7,07 2,78	50 11,5 2,70	63 19,1 2,63	80 28,3 2,53	98,1 31,4 3,03	119 44,2 2,78	133 58,9 2,61	159 78,3 2,57	204 106 2,57	251 132 2,53	302 191 3,03	396 226 2,78	493 290 2,78	650 361 2,61	817 490 2,61	1 002 638 2,53	1 276 766 2,53	1 583 975 2,78	1 924 1 164 2,78	2 281 1 436 2,78	2 648 1 711 2,78
5	$M/M$ $A_2$ $\varphi$				45 3,73 5,26	56 6,54 4,76	70 11,8 4,27	84,2 14,9 4,27	104 14,9 5,26	123 16,5 5,76	133 27,7 4,43	159 31,2 4,93	204 47,1 4,27	251 53,4 4,76	302 60 5,26	396 66 5,76	493 111 4,43	650 177 4,43	817 236 4,93	1 002 313 4,27	1 276 402 4,76	1 583 529 4,76	1 924 638 4,76	2 281 766 4,76	2 648 923 4,76	3 021 1 100 4,76

NOTE — Values in parentheses are non-preferred values and should be used only for special applications.

1)  $\varphi = \frac{A_1}{A_2}$       $A_1 = \frac{\pi}{4} AL^2$       $A_2 = \frac{\pi}{4} (AL^2 - MM^2)$