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

*Transmissions et composants hydrauliques et pneumatiques —  
Alésages des vérins et diamètres des tiges de piston et rapports de  
surface — Série métrique*





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# Contents

	Page
Foreword .....	iv
Introduction .....	v
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Symbols and units .....</b>	<b>1</b>
<b>5 Dimensions .....</b>	<b>2</b>
<b>6 Area ratios .....</b>	<b>3</b>
<b>7 Identification statement (reference to this International Standard) .....</b>	<b>3</b>

## 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.

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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

## 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.



# 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](#).

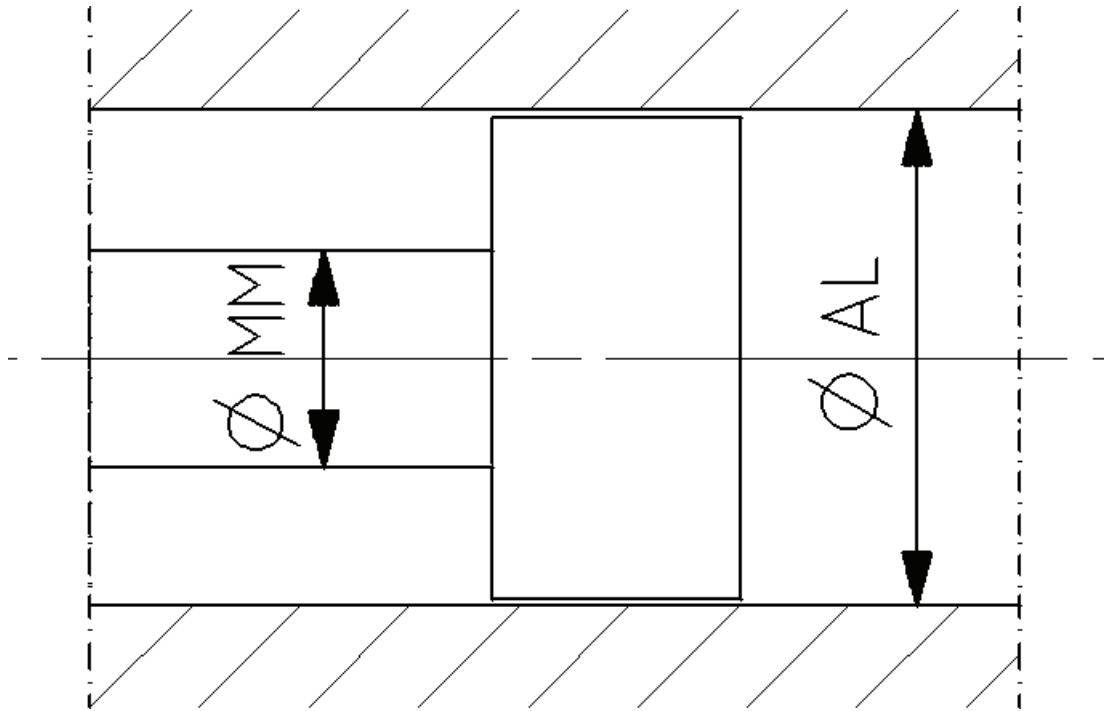
**Table 1 — Symbols and units**

Symbol	Designation	Unit
AL <sup>a</sup>	Cylinder bore diameter	mm
MM <sup>a</sup>	Piston rod diameter	mm
$A_1 = \frac{\pi}{4} \cdot AL^2$	Area cylinder cap side	cm <sup>2</sup>
$A_2 = \frac{\pi}{4} \cdot (AL^2 - MM^2)$	Area cylinder rod side	cm <sup>2</sup>
$\phi = \frac{A_1}{A_2}$	Area ratio	-
<sup>a</sup> Letter codes are in accordance with ISO 6099.		

## 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

<b>AL</b>	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

<b>MM</b>	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.



## 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  $\phi$ .

## 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.”*





