INTERNATIONAL STANDARD

ISO 7904-1

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Plain bearings — Symbols —

Part 1:
Basic symbols

Paliers lisses — Symboles —

Partie 1: Symboles de base

Reference number
ISO 7904-1:1995(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 7904-1 was prepared by Technical Committee ISO/TC 123, *Plain bearings*.

ISO 7904 consists of the following parts, under the general title *Plain bearings — Symbols*:

— *Part 1: Basic symbols*

— *Part 2: Applications*

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Introduction

In the field of plain bearings there is a great number of multiple designations, thus considerable errors are possible in the interpretation of standards and technical literature. Because of this uncertainty, further designations are continuously added which increase the confusion. This part of ISO 7904 is an attempt to elaborate a uniform basic system of symbols for the future.

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Plain bearings — Symbols —

Part 1:
Basic symbols

1 Scope

This part of ISO 7904 defines basic symbols for use in the field of plain bearings. Additional signs are also defined for use as superscripts and subscripts.

The system is founded on characters of the Latin and Greek alphabets, Arabic figures and other signs, e.g. points, commas, horizontal lines or asterisks. In the simplest case, a symbol consists of the basic character alone; in the most complex, of the basic character with subscripts and superscripts (additional signs).

For the purpose of international applicability, all symbols have been derived from English words, and designations used in technical literature up to now have been adopted as far as possible. Wide conformity of the symbols for all types of bearings has been attempted.

The present classification may be used in calculations and technological and geometrical determinations as well as in the quality assurance of plain bearings. It may be enlarged according to circumstances.

Quantities which have a fixed value for a certain construction are designated by capital letters, where possible. Depending on the special field of application, the basic characters can be appropriately combined with secondary signs. These signs, however, should only be used if there is a risk of confusion; multiple designations can be avoided by suitable indexing with secondary signs.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 7904. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7904 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 7904-2:1994, *Plain bearings — Symbols — Part 2: Applications.*

3 Basic characters

Basic characters consist of one or, in exceptional cases, of two or three capital or lower-case letters.

Variables shall be in italic typeface; abbreviations shall be in Roman typeface.

EXAMPLES

N = rotational frequency; So = Sommerfeld number; HRC = Rockwell hardness.

4 Additional signs

4.1 Subscripts

Subscripts may consist of one, two or three letters, digits or letter/digit combinations. In general, the first letter of a subscript corresponds to the first letter of

the English concept which is referred to by the subscript. Subsequent letters shall also follow this concept. The expressions used should be as short as possible.

When the signs correspond to a variable, they shall be in italic typeface; when they refer to an abbreviation, they shall be in Roman typeface.

EXAMPLES

c = circular; cr = critical; cal = calculated.

If subscripts are combined, they shall be separated by means of commas but without a space between. For example, the permissible minimum lubricant film thickness at the transition to boundary lubrication would then be designated as $h_{lim,tr}$. As such expressions are rather awkward, use of substitute expressions in these cases is also permitted, such as one single letter or (better still) one digit as subscript which has not yet been used; e.g. h_1 instead of $h_{lim,tr}$.

4.2 Superscripts

Superscripts shall consist of points, lines, commas, asterisks or other characteristic signs. Only two superscripts are permitted per letter symbol.

EXAMPLE

$\overline{C}^*$

5 Application and distinction by means of basic characters, subscripts and superscripts

Angles and directions of rotation are defined positively as rotating left-hand (counter-clockwise); the same applies to rotational frequencies, peripheral and angular velocities.

A parameter is represented by the basic character with an asterisk (*); e.g. F^* for the bearing capacity parameter. If the bearing capacity parameter of a journal bearing is to be distinguished from that of a thrust bearing, this can be done by the designation F_r^* or F_{ax}^*. However, if several different bearing capacity parameters are used, they can be distinguished in the relevant standard or publication by appropriate subscripts; e.g. 1, 2, 3.

EXAMPLE

The letter C may be used to designate the bearing clearance in general, C_{ax} the wedge depth of thrust bearings, C_r the radial clearance and C_D the diametral clearance.

6 Symbols and terms

6.1 Basic characters (Roman alphabet)

A	area; elongation at fracture; heat-emitting surface
a	distance; acceleration; thermal diffusivity
B	(breadth); nominal width (at right angles to the direction of motion); effective bearing width
b	width
C	nominal clearance; concentration; chamfer
c	specific heat capacity; stiffness coefficient
D	nominal bearing diameter
d	diameter; damping coefficient
E	modulus of elasticity
e	eccentricity
F	bearing force (nominal load); force
f	coefficient of friction; function
G	shear modulus
g	acceleration due to gravity
H	nominal height
HB	Brinell hardness
HRB	Rockwell hardness (ball)
HRC	Rockwell hardness (cone)
HV	Vickers hardness
h	height; film thickness; local lubricant film thickness; lining thickness
I	moment of inertia; definite integral
i	—
J	—
j	$\sqrt{-1}$
K	coefficient; constant; auxiliary variable
k	heat transmission coefficient
L	nominal length; length of sliding surface in direction of motion; length of pad in circumferential direction

l	length
M	moment; mixing factor
m	mass
N	rotational frequency (revolutions per time unit)
n	number
O	—
o	—
P	power; heat flow
p	pressure; specific load
Q	flow rate; volume flow rate
q	—
R	nominal radius; roughness (surface finish); resistance; material strength
Re	Reynolds number
r	radius; repeatability
S	security
So	Sommerfeld number (special form of bearing force parameter F^*)
SP	switching period
s	wall thickness; displacement amplitude (mechanical oscillation)
T	temperature
t	time
U	surface velocity in x-direction; rotational velocity; flow velocity
u	velocity component in x-direction; deformation in x-direction; uncertainty of measurement
V	volume; surface velocity in y-direction; displacement velocity
VG	viscosity grade
VI	viscosity index
v	velocity component in y-direction; deformation in y-direction
W	surface velocity in z-direction; work (energy)
w	velocity component in z-direction; deformation in z-direction; air flow velocity (ambient)
X	—
x	Cartesian coordinate; distance
Y	—
y	Cartesian coordinate; distance
Z	number of sliding surfaces (pads) or pockets per bearing; necking after fracture
z	Cartesian coordinate; distance

6.2 Basic characters (Greek alphabet)

NOTE 1 As there is a risk of confusion with the corresponding Roman letters, some Greek capital letters have not been specified.

α	heat transfer coefficient; angle; coefficient of thermal expansion; pressure viscosity exponent
β	angle; temperature viscosity exponent
Γ	—
γ	angle
Δ	difference; Laplace operator
δ	angle
ε	relative eccentricity; relative elongation
ζ	hydraulic resistance coefficient
η	dynamic viscosity
θ	—
ϑ	—
ι	—
κ	resistance ratio
Λ	—
λ	thermal conductivity
μ	relative stiffness of the bearing
ν	kinematic viscosity; Poisson's ratio
Ξ	—
ξ	restrictor ratio
o	—
Π	product; parameter

π	Ludolf's number ($\pi = 3{,}141592$ ...)
ρ	density
$\sum$	sum
σ	normal stress; standard deviation
τ	shearing stress
υ	—
Φ	dissipation function; sliding surface utilization factor ($0 < \Phi < 1$)
φ	angle; angular coordinate
X	—
Ψ	—
ψ	relative bearing clearance
Ω	angular span of bearing sliding surface (segment)
ω	angular velocity ($\omega = 2 \cdot \pi \cdot N$)

7 Additional signs

7.1 Subscripts

A	area; amplitude
a	for surface finish C.L.A. (R_a)
amb	ambient
ax	axial
B	bearing; sliding surface; segment (pad)
b	spherical (ball); boundary lubrication
Cel	Celsius temperature
Ch	checking
c	circular; circumferential direction; stiffness
cal	calculation
cl	cooling
cor	correction
cp	capillary
cr	critical
cv	convection
D	diameter
d	depth
dam	damping
dr	dry
dyn	dynamic
E	elastic; elastohydrodynamic (EHD)
eff	effective
en	entrance
ex	exit
F	force
f	friction
fl	flange
G	groove
g	weight; gravity
g	glass
gr	grease
H	housing
h	hydrodynamic; horizontal
I	inertia; definite integral
i	count subscript
in	inside
J	shaft (rotor)
j	—
K	—
k	heat transmission
L	lubricant; lubrication
l	linear; length
lam	laminar
lan	land; load carrying area
lim	limiting value
lq	liquid
M	moment
m	mass

m	mixed lubrication
man	manufacturing requirement
max	maximum
me	metal
min	minimum
N	rotational frequency (revolutions per time unit)
n	normal; normal to surface (in normal direction)
nom	nominal value; nominal condition
O	—
o	outside; open
oi	oil
opt	optimum
P	pocket
p	pressure
pl	plastic
Q	—
q	—
R	radius; resistance
r	radial
red	reduced
rel	relative
rev	reversible
rot	rotation
rsl	resultant
rsn	resonance
S	cross-section
s	solid
sc	static
sl	sliding
sn	stationary
sq	displacement due to squeezing
st	start
stp	stop
T	temperature
Th	thrust collar (thrust bearing)
t	time
tan	tangential
th	thermal; heat
tot	total
tr	transition (e.g. transition to other types of lubrication)
tur	turbulent
U	—
u	—
V	volume
v	vertical
var	variable
vt	ventilation
W	—
w	wear
wav	waviness
wed	wedge
X	—
x	in x-direction
Y	—
y	in y-direction
Z	—
z	in z-direction
z	for surface finish (R_z)
0	—
1	—
2	—
3	—
4	—
5	—
6	—