

Comadur is the worldwide leader in the production of small dimension bearings. It is the supplier to the biggest manufacturers of watchmaking and data processing material. The inside diameters range from 0,055 mm to about 10 mm and can be in a straight or olive shape. The following materials are available:

**Sapphire**, white, transparent, is a monocrystal.

**Ruby**, of red color, is also a monocrystal.

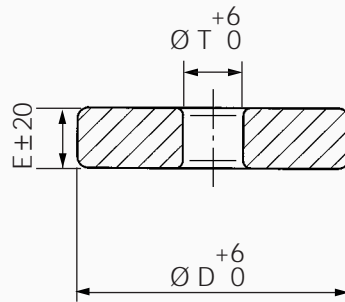
**Polyruby**, of red color, translucent, is a ceramic of alumina oxide, therefore polycrystalline.

**Zirconium oxide**, white, other colors on request, polycrystalline structure; this material is recommended for all new applications with high requirements.

Comadur will be pleased to advise you in the selection of material and the best shape to fit your application.

The majority of our standard products are available from stock and Comadur offers you its services for all customized applications.

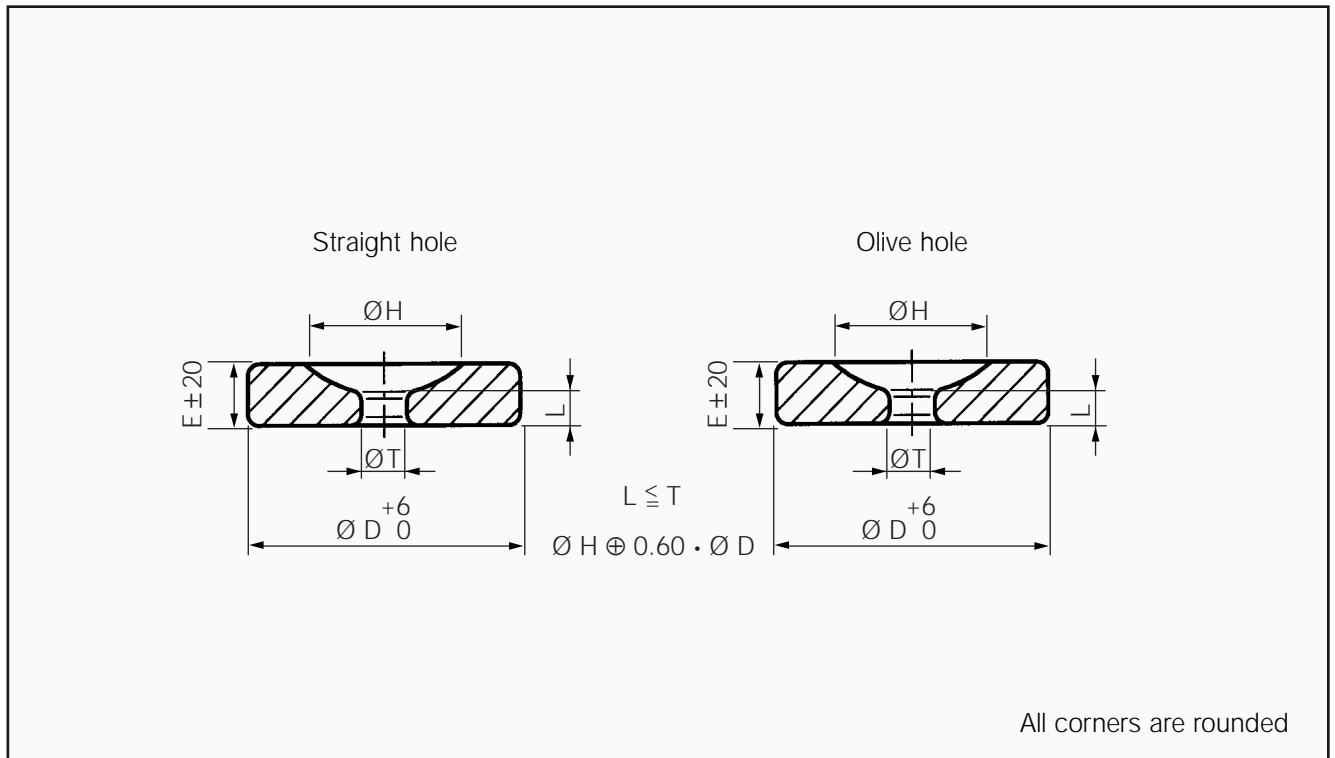
Reference: Comadur technical sheets.



Designation			Article No.
Ruby bearings			
$\varnothing T$	$\varnothing D$	E	
0.50	0.90	0.28	11940.186
0.70	1.40	0.40	14940.007
0.50	1.00	0.25	14940.016
0.12	0.80	0.16	14940.018
0.32	0.60	0.16	14940.020
0.60	1.00	0.30	14940.129
0.30	0.90	0.25	14940.130
0.45	0.90	0.25	14940.134
0.61	1.00	0.25	14940.141
Zircon bearings			
0.45	0.90	0.25	56940.012
Polyruby bearings			
0.42	0.80	0.16	38940.001
0.70	1.40	0.40	38940.003

dimensions in mm  
tolerances in  $\mu\text{m}$

Other dimensions and materials available.

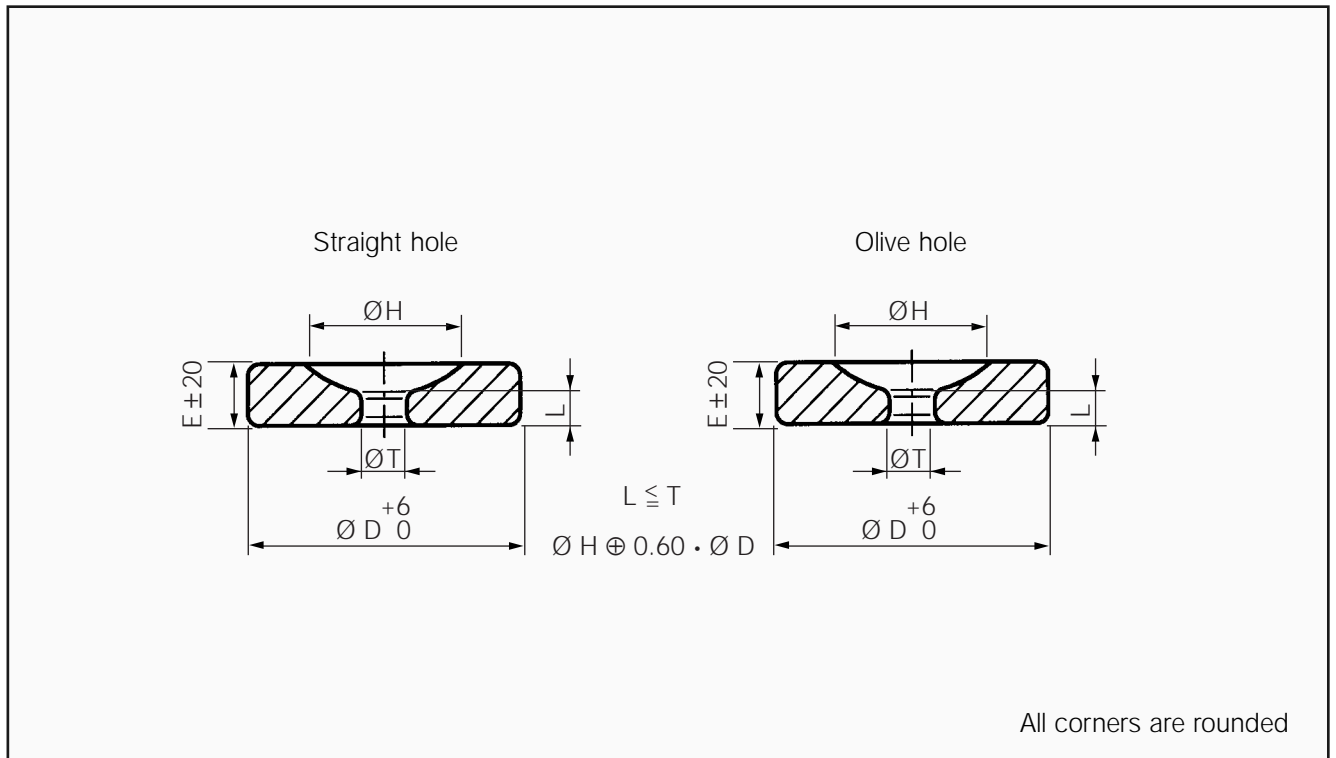


Designation Ruby bearings			Article No.
Ø T	Ø D	E	
0.10	0.90	0.16	14942.008
0.10	0.90	0.18	14942.009
0.11	1.00	0.25	14942.021
0.14	0.60	0.18	14942.039
0.14	0.60	0.22	14942.040
0.14	0.70	0.18	14942.041
0.14	0.90	0.18	14942.043
0.14	1.00	0.14	14942.045
0.14	1.00	0.18	14942.048
0.16	0.50	0.16	14942.056
0.16	0.60	0.14	14942.058
0.16	0.70	0.14	14942.060
0.16	0.60	0.18	14942.063
0.16	0.70	0.22	14942.066
0.16	0.80	0.22	14942.069
0.25	0.70	0.18	14942.093
1.10	1.80	0.30	14942.095
1.01	2.00	0.45	14942.096
0.50	1.20	0.30	14942.116
0.40	1.20	0.25	14942.124
0.40	1.00	0.30	14942.126
0.31	1.20	0.30	14942.138
0.30	1.00	0.30/A	14942.141
0.30	1.00	0.25/A	14942.142
0.26	2.00	0.36	14942.146
0.26	1.20	0.30	14942.147
0.25	1.00	0.25	14942.152

Designation Ruby bearings			Article No.
Ø T	Ø D	E	
0.25	0.90	0.22	14942.154
0.25	0.80	0.25	14942.156
0.20	0.90	0.18	14942.172
0.20	0.80	0.22	14942.174
0.20	0.70	0.22	14942.179
0.11	0.70	0.14	14942.180
0.16	1.00	0.22	14942.181
0.25	1.00	0.22	14942.182
0.14	0.70	0.22	14942.186
0.20	0.90	0.22/A	14942.196
0.10	0.70	0.16	14942.215
0.40	1.20	0.35	14942.227
0.14	0.61	0.18	14942.228
0.60	1.40	0.30	14942.229
0.22	0.60	0.30	14942.244
0.20	0.90	0.22	14942.245
0.11	1.80	0.36	14942.247
0.14	0.61	0.22	14942.248
0.14	1.80	0.36	14942.252
0.10	0.70	0.16	14943.003
0.10	0.90	0.16	14943.006
0.10	0.90	0.18	14943.007
0.14	1.00	0.25	14943.043
0.11	1.00	0.25	14943.064
0.10	0.70	0.16	14943.049
0.16	1.00	0.25	14944.008
0.61	1.00	0.25	14944.009

Other dimensions and materials available.

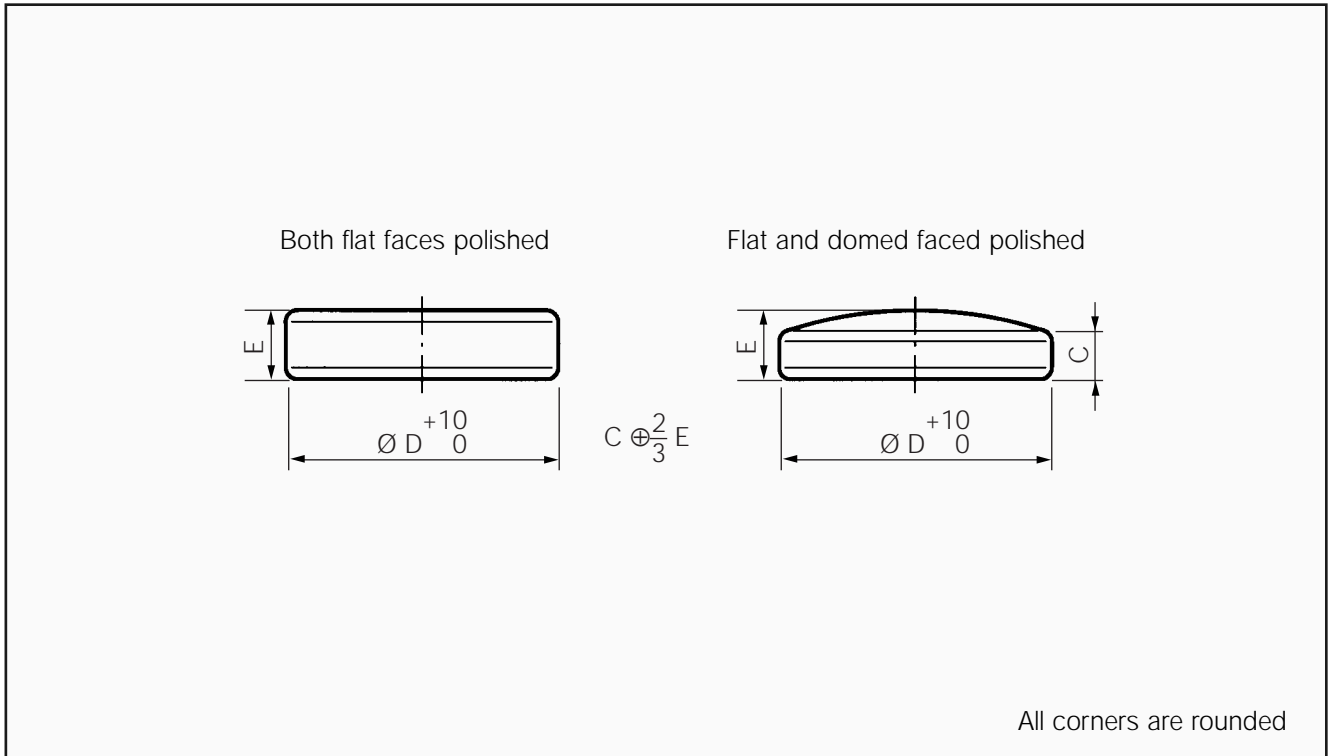
dimensions in mm  
tolerances in µm



Designation			
Polyrubby bearings			
$\varnothing T$	$\varnothing D$	E	Article No.
0.16	0.70	0.18	38942.001
0.11	0.70	0.18	38942.002
0.18	0.70	0.22	38942.004
0.18	0.70	0.22/S	38942.005
0.25	0.80	0.20	38942.006
0.30	1.20	0.30	38942.007
0.70	1.20	0.25	38942.008
0.16	0.70	0.22	38942.009
0.14	0.70	0.18	38942.015
0.14	1.00	0.18	38942.016
0.25	1.00	0.25	38942.018
0.10	0.90	0.18	38942.020
0.11	1.00	0.18	38942.022
0.30	1.00	0.25	38942.027
0.22	0.70	0.22	38942.028
0.25	0.80	0.25	38942.037
0.14	0.70	0.22	38942.039
0.20	0.70	0.22	38942.041
0.14	0.60	0.18	38942.047
0.10	0.90	0.16	38943.001
0.10	0.90	0.18	38943.002

dimensions in mm  
tolerances in  $\mu\text{m}$

Other dimensions and materials available.



Designation		
Zircon bearings		
$\varnothing D$	E	Article No.
1.04	0.19	14951.019
1.20	0.35	14951.028
1.20	0.30	14951.035
0.90	0.40	14951.036

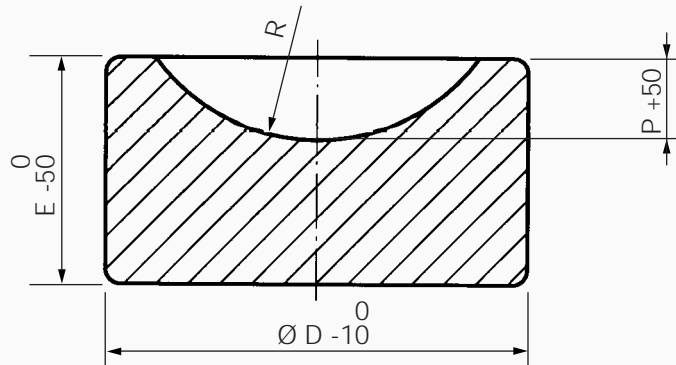
dimensions in mm  
tolerances in  $\mu\text{m}$

Tolerances ( $\mu\text{m}$ )	
E	
0.18 to 0.40	0.60 to 1.20
$\pm 20$	$\pm 30$

DIN 8258 | DIN 8263

- <sup>1)</sup> Dimensions to DIN 8258 and 8263. Tolerances and shapes per our own criteria.
- <sup>2)</sup> From  $\varnothing 2.50$  avoid domed type.

Other dimensions and materials available.



All corners are rounded

Spherical recess and face fine polished

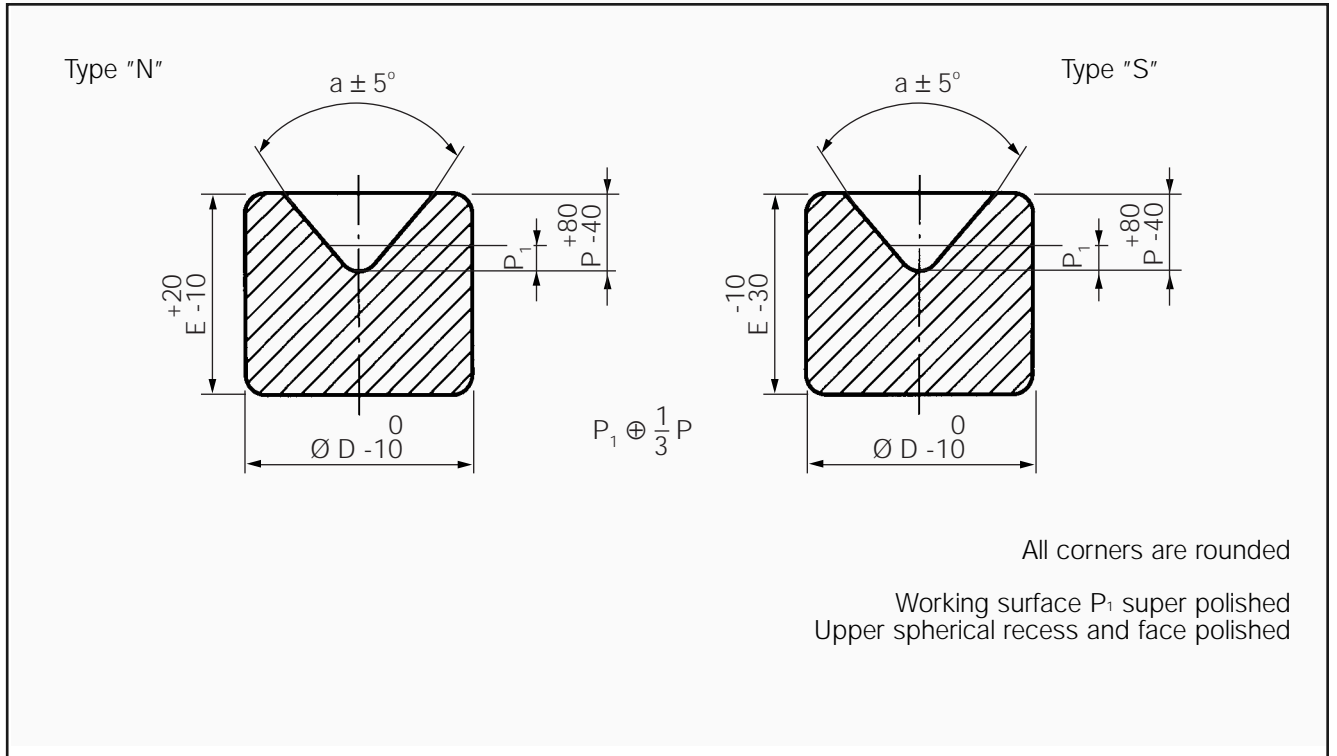
Dimensions (mm) / Material: sapphire					
	Ø D	E	P	R	Article No.
DIN 8274	1.80	1.20	0.30	0.75	11953.008
	1.80	0.60	0.10	3.00	11953.012
	2.54	1.25	0.20	2.30	11953.033
	3.00	2.00	1.10	0.50	11953.042
	2.50	1.40	0.50	1.20	11953.061
	2.00	1.00	0.33	1.00	11953.084
	1.60	1.20	0.35	1.10	11953.092

dimensions in mm  
tolerances in µm

Tolerances (µm)	
<b>R</b>	
0.65 and 0.75	0.95 to 2.30
+ 50 0	± 50

<sup>1)</sup> Dimensions to DIN 8274 and MS 27046. Tolerances per our own criteria.

Other dimensions and materials available.

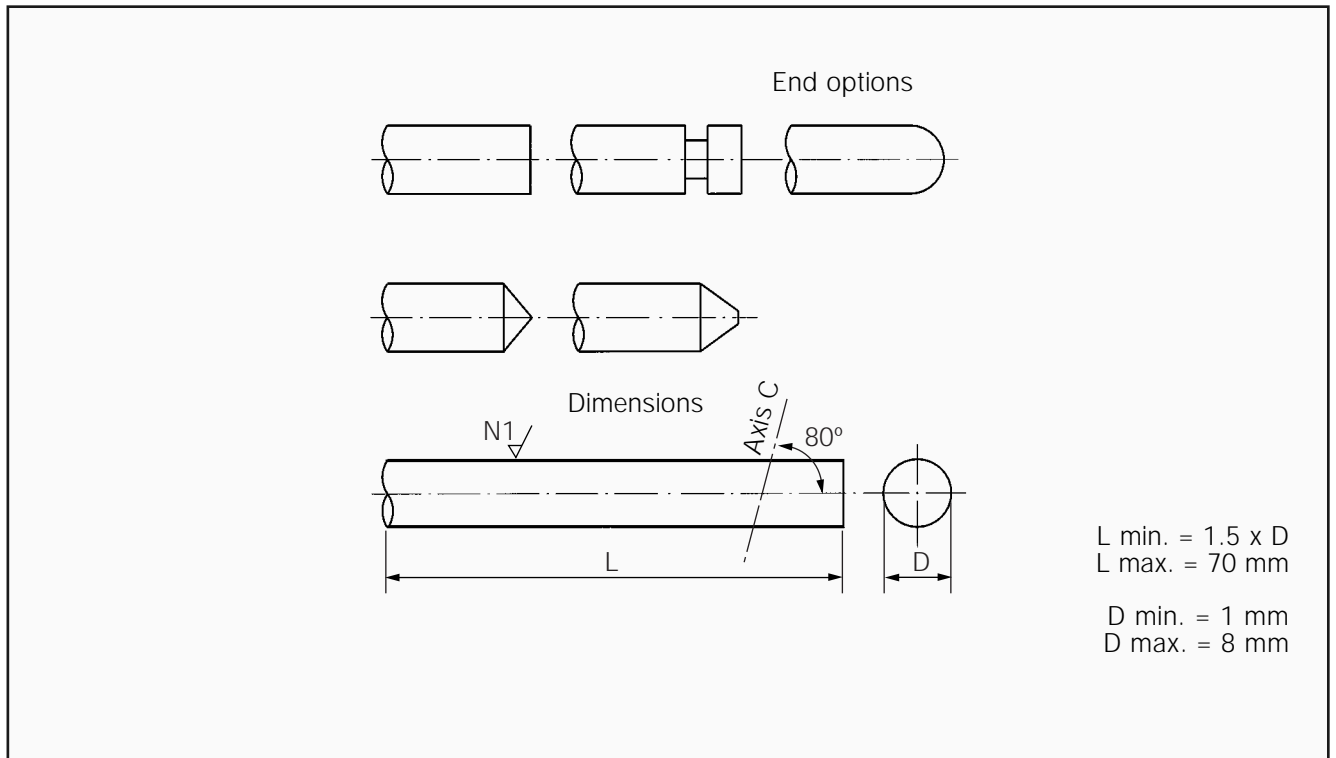


Dimensions mm / Material: $ZrO_2$					
$\varnothing D$	E	P	a	R ( $\mu m$ )	Article No.
$1.20 \begin{matrix} 0 \\ 10 \end{matrix}$	$1.00 \begin{matrix} +20 \\ -10 \end{matrix}$	$0.40 \begin{matrix} +80 \\ -40 \end{matrix}$	$80^\circ$	60 - 100	80530.515
$1.20 \begin{matrix} 0 \\ 10 \end{matrix}$	$1.00 \begin{matrix} +20 \\ -10 \end{matrix}$	$0.40 \begin{matrix} +80 \\ -40 \end{matrix}$	$80^\circ$	80 - 120	80530.732

dimensions in mm  
tolerances in  $\mu m$

<sup>1)</sup> Dimensions to MS 27045. Tolerances and types per our own criteria.

Other dimensions and materials available.



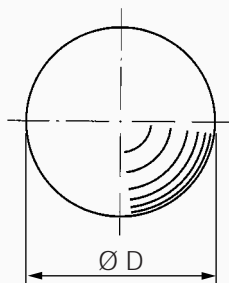
Standard tolerances				
Ø D	Length	Roundness	Parallelism	Surface finish Ra
± 0.002	± 0.1	0.001	0.002	0.02

tolerances in mm

Optical axis (C):  
80° to plunger axis.  
Other angles on request.

Other dimensions available.

## 2.1 Balls Ruby/sapphire, ceramic, tungsten carbide



Quality super "S"  
Quality precision "P"  
Quality normal "C"

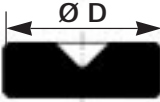
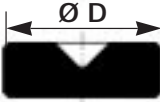
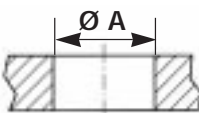
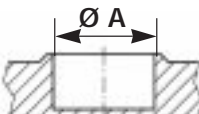


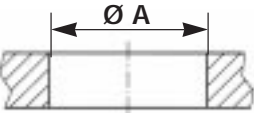
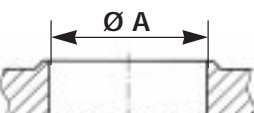


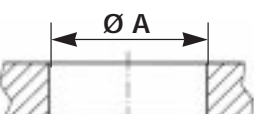

Dimensions (mm and fractions of inches)		
Ø D	Ø D	Ø D
0.30	2.50	7.50
0.35	2.778 (7/64")	7.938 (5/16")
0.397 (1/64")	3.00	8.00
0.40	3.175 (1/8")	8.50
0.50	3.50	8.731 (11/32")
0.60	3.969 (5/32")	9.00
0.70	4.00	9.525 (3/8")
0.794 (1/32")	4.50	10.00
1.00	4.762 (3/16")	10.319 (13/32")
1.20	5.00	11.00
1.25	5.50	11.112 (7/16")
1.50	5.556 (7/32")	11.906 (15/32")
1.588 (1/16")	6.00	12.00
1.75	6.35 (1/4")	12.70 (1/2")
2.00	6.50	13.00
2.25	7.00	13.494 (17/32")
2.381 (3/32")	7.144 (9/32")	14.00

Quality	Tolerances (µm)		Sphericity	
	Ø D		0.30 to 5.50	5.55 to 14.00
"S"	± 0.25	± 0.50	0.25	0.50
"P"	± 0.50	± 1.00	0.50	1.00
"C"	0.00 -5.00	0.00 -10.00	2.00	3.00

dimensions in mm  
tolerances in µm

Other dimensions available.

## 2.2 Mounted bearings

ISO-Tolerances, $\varnothing D$ and $A$ (in $\mu = 1/1000$ mm)		Tolerance limits $\mu$										
		20	15	10	5	0	5	10	15	20	25	
<b>Bearing <math>\varnothing D</math>: 1.00-3.00</b> 												
												
<b>Body</b>												
<b>C<sup>2</sup></b>												Min. fit: <b>6 <math>\mu</math></b> Max. fit: <b>22 <math>\mu</math></b>
<b>Body</b>												Min. circum. clearance: <b>20 <math>\mu</math></b> Max. circum. clearance: <b>4 <math>\mu</math></b>
	<b>Bearing: I,Y,X,A <math>\varnothing D</math>: 1.00-2.80</b> 											
												
<b>Body</b>												
<b>C<sup>2</sup></b>												Min. fit: <b>4 <math>\mu</math></b> Max. fit: <b>16 <math>\mu</math></b>
<b>Body</b>												Min. circum. clearance: <b>16 <math>\mu</math></b> Max. circum. clearance: <b>4 <math>\mu</math></b>
	<b>Bearing: I,Y,X,A <math>\varnothing D</math>: 3.20-5.00</b> 											
												
<b>Body</b>												
<b>C<sup>2</sup></b>												Min. fit: <b>6 <math>\mu</math></b> Max. fit: <b>22 <math>\mu</math></b>
<b>Body</b>												Min. circum. clearance: <b>21 <math>\mu</math></b> Max. circum. clearance: <b>5 <math>\mu</math></b>

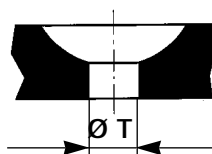
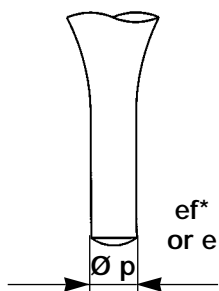
1: press fit

2: tolerance of diameter to be **10  $\mu$**  if diameter for bearing **D** is bigger than **3.00 mm**

## 2.3 Selection of pin in function of bearing

ISO-Tolerances  $\varnothing p$

ISO-Tolerances  $\varnothing T$



Straight hole

Oval hole



Hole diameter		25	20	15	10	5	0	5	10	15	Differences	Tolerances possibilities limits $\mu$
$\varnothing T: 0.09-0.20$											H 5 +4 0	7      5
	ef 5	-10									Min. circum. clearance: <b>10 <math>\mu</math></b> Max. circum. clearance: <b>18 <math>\mu</math></b>	
	e 5	-14									Min. circum. clearance: <b>14 <math>\mu</math></b> Max. circum. clearance: <b>22 <math>\mu</math></b>	
$\varnothing T: 0.22-1.00$											H 6 +6 0	8      5
	ef 6	-10									Min. circum. clearance: <b>10 <math>\mu</math></b> Max. circum. clearance: <b>22 <math>\mu</math></b>	
	e 6	-14									Min. circum. clearance: <b>14 <math>\mu</math></b> Max. circum. clearance: <b>26 <math>\mu</math></b>	
$\varnothing T: 1.10-2.50$											H 7 +10 0	9      6
	ef 7	-10									Min. circum. clearance: <b>10 <math>\mu</math></b> Max. circum. clearance: <b>30 <math>\mu</math></b>	
	e 7	-14									Min. circum. clearance: <b>14 <math>\mu</math></b> Max. circum. clearance: <b>34 <math>\mu</math></b>	

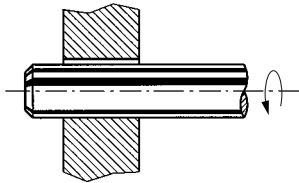
(in  $\mu = 1/1000$  mm)

Other dimensions available.

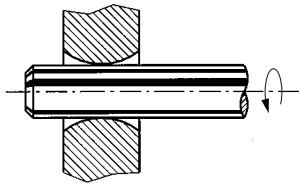
## 2.4 Choice of bearings

**M** = Moment of friction  
**C** = Pivot charge on the bearing  
**p** = Pivot diameter (or diameter of contact)  
**μ** = Coefficient of friction = 0.14 for dry steel friction on synthetic corundum  
 (0.01 may be obtained if surfaces are greasy)

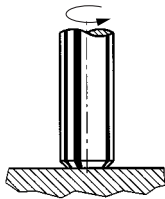
Practical moment of friction (approx. value)



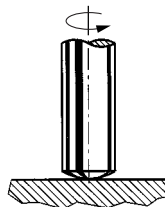
$$M = \frac{1}{3} \mu C.p.$$



$$M = \frac{1}{6} \mu C.p.$$



$$M = \frac{1}{2} \mu C.p.$$

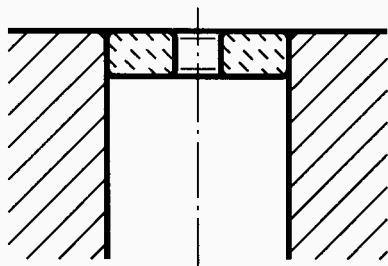


$$M = \frac{1}{50} \mu C.p.$$

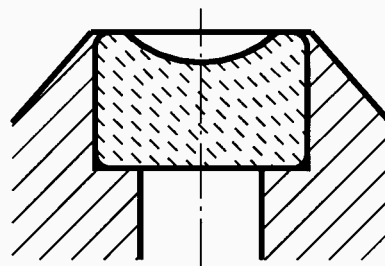
Other dimensions available.

## 2.5 Fixed bearings Examples of assemblies

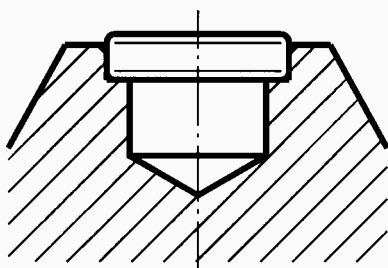
Force fitted bearings



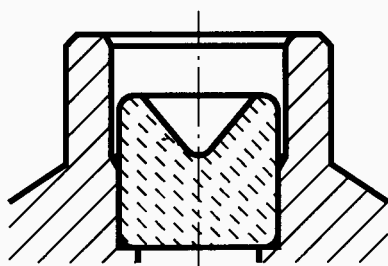
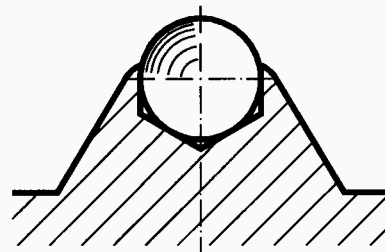
Set bearings



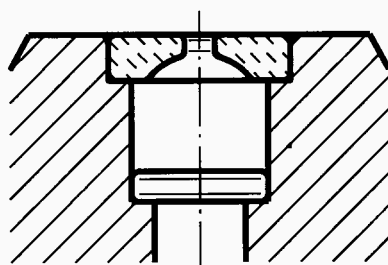
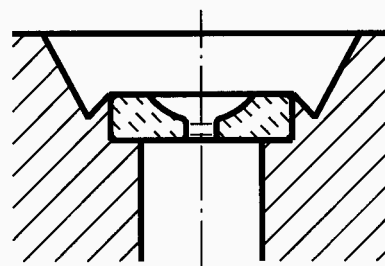
Flush fit



Proud fit



Recessed fit



With end bearing force fitted

## 2.6 Spring bearings Examples of assemblies

