INTERNATIONAL STANDARD

ISO 12240-4

First edition
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Spherical plain bearings —

Part 4:
Spherical plain bearing rod ends

Rotules lisses —

Partie 4: Embouts à rotule

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ISO 12240-4:1998(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standard 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 12240-4 was prepared by Technical Committee ISO/TC 4, *Rolling bearings*, Subcommittee SC 7, *Spherical plain bearings*.

This first edition cancels and replaces ISO 6126:1987 of which it constitutes a technical revision.

ISO 12240 consists of the following parts, under the general title *Spherical plain bearings*:

— *Part 1: Radial spherical plain bearings*

— *Part 2: Angular contact radial spherical plain bearings*

— *Part 3: Thrust spherical plain bearings*

— *Part 4: Spherical plain bearing rod ends*

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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Spherical plain bearings —

Part 4:
Spherical plain bearing rod ends

1 Scope

This part of ISO 12240 specifies dimensions, tolerances and radial internal clearances for various dimension series of spherical plain bearing rod ends.

The dimensions and tolerances specified in this part of ISO 12240 have been selected to permit the design and use of spherical plain bearing rod ends which incorporate radial spherical plain bearings having various sliding material combinations.

The specified tolerance values apply for finished spherical plain bearing rod ends before any coating, plating, ring splitting or fracturing.

Spherical plain bearing rod ends need not conform to the designs illustrated but compliance is required as regards dimensions, tolerances and radial internal clearances specified.

NOTE — Spherical plain bearing rod ends for airframe applications and specific spherical plain baring rod ends for direct connection to hydraulic cylinders are not covered by this part of ISO 12240.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12240. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12240 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 582:1995, *Rolling bearings – Chamfer dimensions – Maximum values*.

ISO 965-1:1992, *ISO general purpose metric screw threads – Tolerances – Part 1: Principles and basic data*.

ISO 1132-1: —[1], *Rolling bearings – Tolerances – Part 1: Terms and definitions*.

ISO 6811:1998, *Spherical plain bearings – Vocabulary*.

ISO 12240-1:1998, *Spherical plain bearings – Part 1: Radial spherical plain bearings*.

1) To be published. (Revision of ISO 1132:1980)

3 Definitions and symbols

For the purposes of this part of ISO 12240, the definitions given in ISO 1132-1 and ISO 6811 apply. The symbols (except those for tolerances) shown in the figures and the values given in the tables denote nominal dimensions unless specified otherwise.

B	Inner ring width
C	Outer ring width
C_1	Width of rod end eye
D	Outside diameter of bearing outer ring
d	Bore diameter of inner ring
d_1	Outside diameter of inner ring face
d_2	Outside diameter of rod end eye
d_3	Rod end shank diameter
d_4	Rod end shank shoulder diameter
d_5	Rod end shank diameter with welding end
d_6	Centre pin diameter
d_k	Sphere diameter
G	Diameter of thread
h, h_1, h_2	Centre height of rod end
l_1, l_3	Thread length
l_2, l_4, l_6	Overall length of rod end
l_5	Length of shoulder on rod end shank
l_7	Length of the flat surface from the bearing bore centre to the shank
l_8	Length of the locating pin
$r_{s\,min}$[2)]	Smallest single chamfer dimension, inner ring
$r_{1s\,min}$[2)]	Smallest single chamfer dimension, outer ring
V_{dmp}	Variation of mean bore diameter
V_{dp}	Variation of bore diameter in a single radial plane
W	Width across flats
α	Angle of tilt
Δ_{Bs}	Deviation of a single inner ring width
Δ_{dmp}	Deviation of mean bore diameter in a single plane

2) The corresponding maximum chamfer dimensions are given in table 1 of ISO 582:1995.

4 Dimension series for spherical plain bearing rod ends

A distinction is made between two basic dimension series in the case of spherical plain bearing rod ends.

Dimension series E and G have been designed so as to permit the insertion of dimension series E or G radial spherical plain bearings into the cylindrical bore of a rod end eye.

In dimension series E and G a distinction is also made between different spherical plain bearing rod end types according to the shank design, i.e. external or internal thread, normal or strengthened form, or welding end type.

Dimension series K has been designed so as to permit the insertion of dimension series K radial spherical plain bearings into the cylindrical or sphered bore of a rod end eye.

In dimension series K a distinction is made between different spherical plain bearing rod end types according to the shank design, i.e. external or internal thread. A choice of sliding material combination is provided for a two piece (integral design, see figure 5) spherical plain bearing rod end.

5 Angles of tilt α

The specified angles of tilt (approximate values) represent the angles by which the axes of the inner ring and of the outer ring may be inclined in relation to each other without reducing the projected theoretical contact area of the two bearing rings when the two ring axes are parallel to each other.

NOTE — Attention is drawn to the fact that after mounting a spherical plain bearing rod end on a shaft, the angle through which the rod end can tilt may be restricted by the design of the adjacent components.

6 Dimensions, tolerances and radial internal clearances

6.1 Dimensions

See figures 1 to 6 and tables 1 to 5.

The position of the lubricating nipple may vary according to the size of the spherical plain bearing rod end.

In case of type B, the lubricating nipple may be positioned at the shank.

The position and size of the lubricating nipple shall be the subject of agreement.

Type and design of lubricating nipple at manufacturer's discretion.

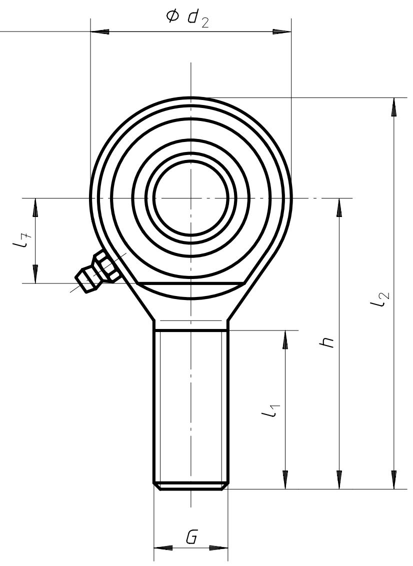
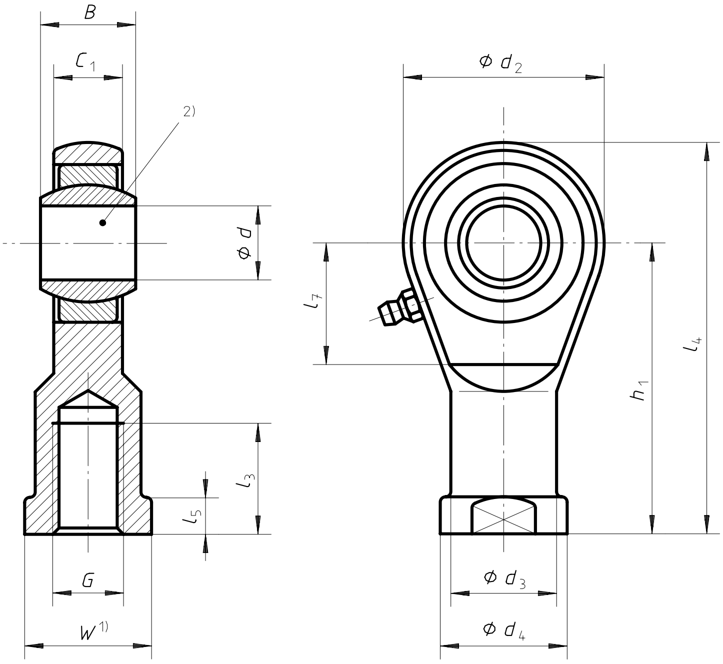
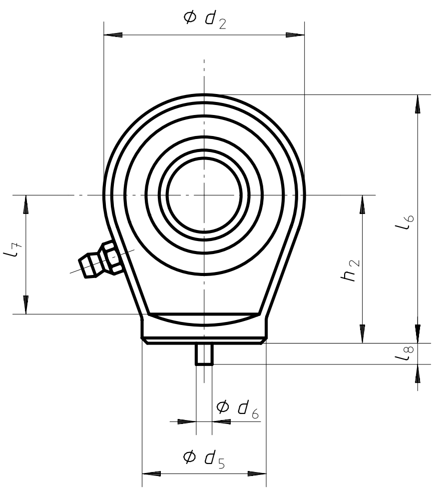


Figure 1 — Spherical plain bearing rod end with external thread type M



1) Values for widths across flats are not specified in this part of ISO 12240.
2) See figure 6.

Figure 2 — Spherical plain bearing rod end with internal thread type F



l_8 = 6 mm

Figure 3 — Spherical plain bearing rod end with welding shank type S

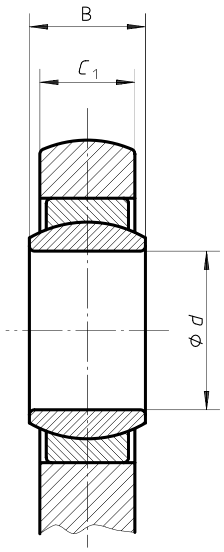


Figure 4 — Spherical plain bearing rod end with mounted spherical plain radial bearing (cartridge design)

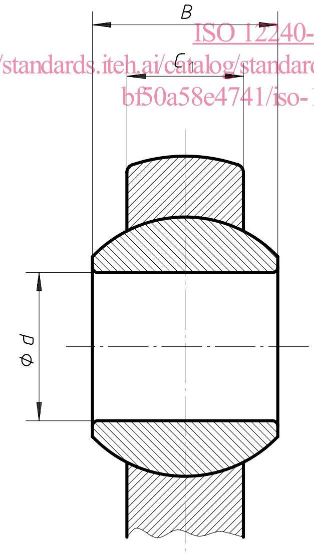


Figure 5 — Spherical plain bearing rod end with inner ring only (integral design) 3)

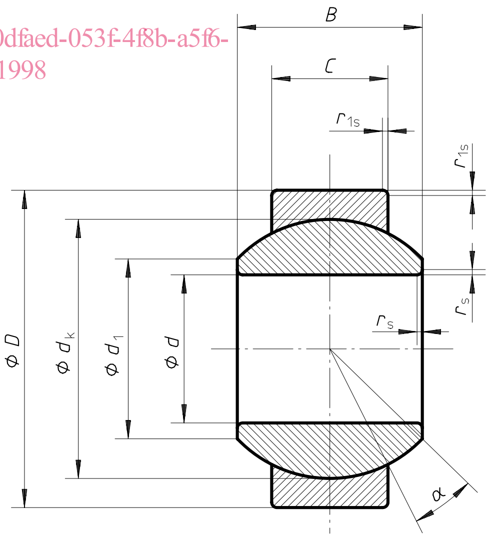


Figure 6 — Spherical plain radial bearing in accordance with ISO 12240-1

3) This design can apply for types M and F of the K-series.

Table 1 — Spherical plain bearing rod ends, dimension series E

	With external or internal thread or welding shank												With external thread			With internal thread						With welding shank			
d	D 1)	d_1	B	C 1)	d_k 2)	r_s	r_{1s} 1)	α	G	C_1	d_2	l_7	h	l_1	l_2	h_1	l_3	l_4	l_5	d_3	d_4	h_2	l_6	d_5	d_6
		≈				min.	min.	≈		max.	max.	min.		min.	max.		min.	max.	≈	≈	max.		max.	max.	
mm	mm	mm	mm	mm	mm	mm	mm	°		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
5 3)	14	8	6	4	10	0,3	0,3	13	M5	4,5	22	10	36	16	49	30	11	43	5	11	14	–	–	–	–
6 3)	14	8	6	4	10	0,3	0,3	13	M6	4,5	22	10	36	16	49	30	11	43	5	11	14	–	–	–	–
8 3)	16	10	8	5	13	0,3	0,3	15	M8	6,5	25	11	42	21	56	36	15	50	5	13	17	–	–	–	–
10 3)	19	13	9	6	16	0,3	0,3	12	M10	7,5	30	13	48	26	65	43	15	60	6,5	16	20	24	40	16	3
12 3)	22	15	10	7	18	0,3	0,3	10	M12	8,5	35	17	54	28	73	50	18	69	6,5	19	23	27	45	19	3
15 4)	26	18	12	9	22	0,3	0,3	8	M14	10,5	41	19	63	34	85	61	21	83	8	22	27	31	52	22	4
17 4)	30	20	14	10	25	0,3	0,3	10	M16	11,5	47	22	69	36	94	67	24	92	10	25	31	35	59	25	4
20 4)	35	24	16	12	29	0,3	0,3	9	M20×1,5	13,5	54	24	78	43	107	77	30	106	10	28	36	38	66	29	4
25	42	29	20	16	35	0,6	0,6	7	M24×2	18	65	30	94	53	128	94	36	128	12	35	44	45	78	35	4
30	47	34	22	18	40	0,6	0,6	6	M30×2	20	75	34	110	65	149	110	45	149	15	42	52	51	89	42	4
35	55	39	25	20	47	0,6	1	6	M36×3	22	84	40	140	82	184	125	60	169	15	47	60	61	104	49	4
40	62	45	28	22	53	0,6	1	7	M39×3	24	94	46	150	86	199	142	65	191	18	52	67	69	118	54	4
45	68	50	32	25	60	0,6	1	7	M42×3	28	104	50	163	92	217	145	65	199	20	58	72	77	132	60	6
50	75	55	35	28	66	0,6	1	6	M45×3	31	114	58	185	104	244	160	68	219	20	62	77	88	150	64	6
60	90	66	44	36	80	1	1	6	M52×3	39	137	73	210	115	281	175	70	246	20	70	90	100	173	72	6
70	105	77	49	40	92	1	1	6	M56×4	43	162	85	235	125	319	200	80	284	20	80	100	115	199	82	6
80	120	88	55	45	105	1	1	6	M64×4	48	182	98	270	140	364	230	85	324	25	95	112	141	237	97	6

1) Reference only; not for integral design.
2) Reference only.
3) These spherical plain bearing rod ends do not have provision for relubrication.
4) These spherical plain bearing rod ends have provision for relubrication through a lubrication hole and not through a lubricating nipple.

Table 2 — Spherical plain bearing rod ends, according to dimension series E, with strengthened shank, dimension series EH

d	With external or internal thread												With external thread			With internal thread				
	D 1)	d_1	B	C 1)	d_k 2)	r_s	r_{1s} 1)	α	G	C_1	d_2	l_7	h	l_1	l_2	h_1	l_3	l_4	l_5	d_3
		≈				min.	min.	≈		max.	max.	min.		min.	max.		min.	max.	≈	≈
mm	mm	mm	mm	mm	mm	mm	mm	°		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
35	55	39	25	20	47	0,6	1	6	M36×3	22	84	40	130	82	174	130	60	174	25	49
40	62	45	28	22	53	0,6	1	7	M42×3	24	94	46	145	90	194	145	65	194	25	58
45	68	50	32	25	60	0,6	1	7	M45×3	28	104	50	165	95	219	165	65	219	30	65
50	75	55	35	28	66	0,6	1	6	M52×3	31	114	58	195	110	254	195	68	254	30	70
60	90	66	44	36	80	1	1	6	M60×4	39	137	73	225	120	296	225	70	296	35	82
70	105	77	49	40	92	1	1	6	M72×4	43	162	85	265	132	349	265	80	349	40	92
80	120	88	55	45	105	1	1	6	M80×4	48	182	98	295	147	389	295	85	389	45	105

1) Reference only; not for integral design.
2) Reference only.

Table 3 — Spherical plain bearing rod ends, dimension series G

	With external or internal thread or welding shank												With external thread			With internal thread						With welding shank			
d mm	D 1) mm	d_1 ≈ mm	B mm	C 1) mm	d_k 2) mm	r_s min. mm	r_{1s} 1) min. mm	α ≈ °	G	C_1 max. mm	d_2 max. mm	l_7 min. mm	h mm	l_1 min. mm	l_2 max. mm	h_1 mm	l_3 min. mm	l_4 max. mm	l_5 ≈ mm	d_3 ≈ mm	d_4 max. mm	h_2 mm	l_6 max. mm	d_5 max. mm	d_6 mm
4 3)	14	7	7	4	10	0,3	0,3	20	M5	4,5	22	10	36	16	49	30	11	43	5	11	14	–	–	–	–
5 3)	14	7	7	4	10	0,3	0,3	20	M6	4,5	22	10	36	16	49	30	11	43	5	11	14	–	–	–	–
6 3)	16	9	9	5	13	0,3	0,3	21	M8	6,5	25	11	42	21	56	36	15	50	5	13	17	–	–	–	–
8 3)	19	11	11	6	16	0,3	0,3	21	M10	7,5	30	13	48	26	65	43	15	60	6,5	16	20	24	40	16	3
10 3)	22	13	12	7	18	0,3	0,3	18	M12	8,5	35	17	54	28	73	50	18	69	6,5	19	23	27	45	19	3
12 4)	26	16	15	9	22	0,3	0,3	18	M14	10,5	41	19	63	34	85	61	21	83	8	22	27	31	52	22	4
15 4)	30	19	16	10	25	0,3	0,3	16	M16	11,5	47	22	69	36	94	67	24	92	10	25	31	35	59	25	4
17 4)	35	21	20	12	29	0,3	0,3	19	M20×1,5	13,5	54	24	78	43	107	77	30	106	10	28	36	38	66	29	4
20	42	24	25	16	35	0,6	0,3	17	M24×2	18	65	30	94	53	128	94	36	128	12	35	44	45	78	35	4
25	47	29	28	18	40	0,6	0,6	17	M30×2	20	75	34	110	65	149	110	45	149	15	42	52	51	89	42	4
30	55	34	32	20	47	0,6	1	17	M36×3	22	84	40	140	82	184	125	60	169	15	47	60	61	104	49	4
35	62	39	35	22	53	0,6	1	16	M39×3	24	94	46	150	86	199	142	65	191	18	52	67	69	118	54	4
40	68	44	40	25	60	0,6	1	17	M42×3	28	104	50	163	92	217	145	65	199	20	58	72	77	132	60	6
45	75	50	43	28	66	0,6	1	15	M45×3	31	114	58	185	104	244	160	68	219	20	62	77	88	150	64	6
50	90	57	56	36	80	0,6	1	17	M52×3	39	137	73	210	115	281	175	70	246	20	70	90	100	173	72	6
60	105	67	63	40	92	1	1	17	M56×4	43	162	85	235	125	319	200	80	284	20	80	100	115	199	82	6
70	120	77	70	45	105	1	1	16	M64×4	48	182	98	270	140	364	230	85	324	25	95	112	141	237	97	6

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4) These spherical plain bearing rod ends have provision for relubrication through a lubrication hole and not through a lubricating nipple.