FAG

Radial insert ball bearings

Radial insert ball bearings

Features of radial insert ball bearings, comparison of series

Series	Shaft diameter				Location
	mm		inch		
	from	to	from	to	
UC	12	90	$1/2$	$3\,1/2$	Grub screw
UK	20	80	–	–	Adapter sleeve to JIS B 1552

1) Attention!
Recommended operating temperature of bearing series.
If temperatures exceed +100 °C, relubrication must be carried out regularly.

2) Temperature peaks of up to +120 °C possible for short periods.

Seal	Compensation of misalignment	Internal clearance	Cage	Grease	Relubrication facility	Temperature[1] °C		Comments	Dimension table
						from	up to		Page
RSR	yes	C3	PA66	GA13	yes	–20	+100[2]	Corrosion-resistant	16
RSR	yes	C4	PA66	GA13	yes	–20	+100[2]	Corrosion-resistant	20

With grub screws in inner ring

Spherical outer ring

UC

With adapter sleeve

Spherical outer ring

UK

Radial insert ball bearings

Features

These radial insert ball bearings are based on single row deep groove ball bearings 62 and comprise a solid section outer ring and an inner ring extended on both sides.

The bearings have plastic cages and are sealed on both sides by single piece seals RSR with a vulcanised seal lip and an outer flinger shield.

The honed raceways of the bearing rings, in conjunction with the high ball grade, ensure quiet running and a reduced frictional torque.

The outer ring has a spherical outside surface. In combination with a housing matched to the design, bearings with a spherical outer ring can compensate static misalignments of the shaft, see page 11.

The radial insert ball bearings are pregreased and can be relubricated by means of two lubrication holes in the outer ring.

Inch size designs

The radial insert ball bearings are also available with inch size bore dimensions, see dimension table.

Anti-corrosion protection

The inner and outer rings as well as the flinger shields of the radial insert ball bearings are provided with the black Durotect BS coating in order to offer basic protection against corrosion.

Adapter sleeves have a Durotect BS or phosphate coating.

Location on shaft

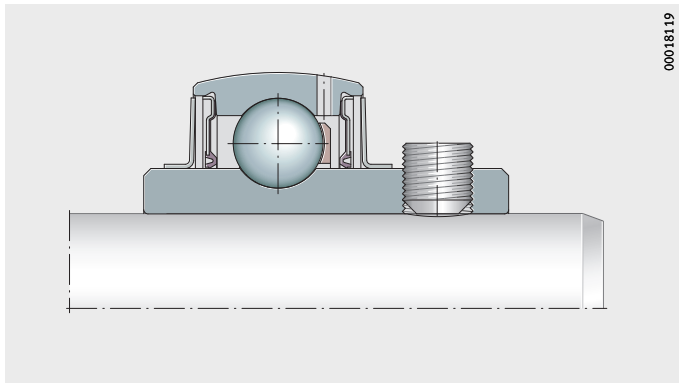
Radial insert ball bearings are particularly easy to fit and are preferentially suitable for drawn shafts with the tolerances h6 Ⓔ to h9 Ⓔ.

In the radial insert ball bearings UC, the inner ring is located on the shaft by means of two grub screws offset by 120°, *Figure 1*, page 10. They are suitable for bearing arrangements with a constant direction of rotation or, under low speed and load, for an alternating direction of rotation.

The grub screws are self-retaining and have a fine pitch thread with cup point for secure location of the bearings. In order to allow better differentiation, the metric grub screws have a Durotect BS coating while the inch size grub screws are zinc plated.

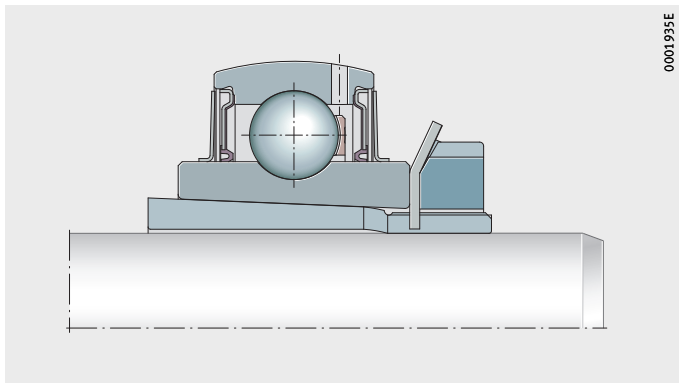
In the case of radial insert ball bearings UK, the inner ring is located on the shaft by means of a concentric adapter sleeve in accordance with JIS B 1552, *Figure 2*, page 10. The roughness of the adapter sleeve on the inside and outside is Ra 2,5. They are suitable for bearing arrangements with an alternating direction of rotation, even under high speed and load.

Radial insert ball bearings



UC

Figure 1
Location by grub screws in the inner ring



UK

Figure 2
Location by adapter sleeve

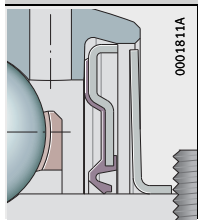
Tightening torques

Tightening torques for metric and inch size grub screws, see table, page 34.
Tightening torques for locknuts, see table, page 35.

Sealing

FAG Black Series radial insert ball bearings are supplied with seals RSR, see table.

Seal types

Seal RSR	
	Single piece, zinc plated sheet steel washer with vulcanised and radially preloaded seal lip made from NBR and additional flinger shield

Operating temperature

The insert bearings are suitable for operating temperatures of –20 °C to +100 °C. Temperature peaks of up to +120 °C are possible for short periods.

In the case of temperatures over ϑ = +100 °C, relubrication must be carried out regularly.

Design and safety guidelines
Compensation of static misalignments

Bearings with a spherical outer ring, fitted in housings with a concave bore, can compensate for static misalignment of the shaft, *Figure 3*:

For units with a lubrication groove in the housing and a lubrication hole in the radial insert ball bearing, the following applies:

- Up to ±2,5°, the units can be relubricated.
- Between ±2,5° and ±5°, the facility for relubrication is dependent on the specific unit. Please contact us in this case.
- Above ±5°, relubrication is no longer possible.

The units must not be used to support swivelling or tumbling motion.

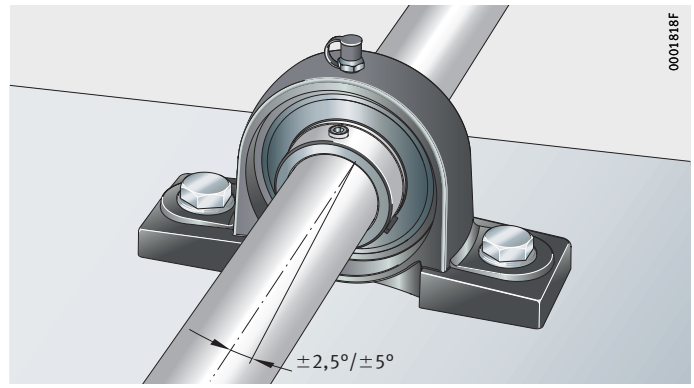


Figure 3
Compensation of static shaft misalignment

Minimum radial load

In order to ensure slippage-free operation, the bearings must be subjected to a minimum radial load. This applies particularly in the case of high speeds and high accelerations. In continuous operation, a minimum radial load of the order of $P \geqq 0{,}01 \cdot C_r$ is necessary for ball bearings with cage.

Speed limits for radial insert ball bearings

The speed limits are dependent on the load, the clearance between the bearing bore and shaft and the friction of the seals in the case of bearings with contact seals.

Guide values for the permissible speeds can be derived from the diagram, *Figure 4*.

In the case of load ratios $C_r/P > 13$, the speeds can be increased. At $C_r/P < 5$, location by means of a fit is recommended, see section Conditions of rotation, chapter Technical principles, Catalogue HR 1, Rolling Bearings. For both types of applications, please contact us.

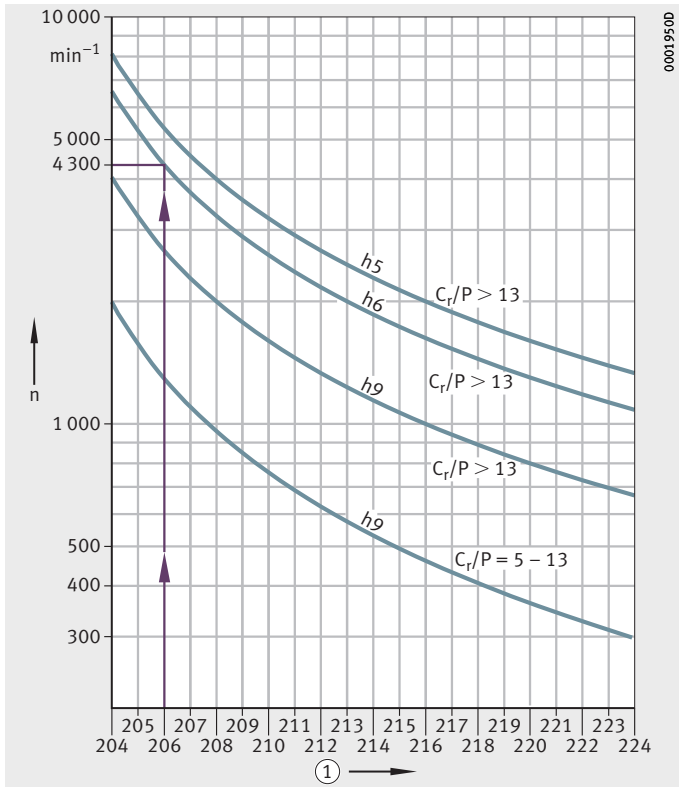
Example of permissible speed calculation

Given:

- Shaft tolerance — h6 Ⓔ
- Radial insert ball bearing — UC206
- Basic dynamic load rating C_r — 20 700 N
- Load P — 1 300 N
- Sealing — Seals RSR.

Required:

- Load ratio $C_r/P = 20\,700\ N/1\,300\ N$ — $C_r/P > 13$
- Permissible speed — $n \approx 4\,300\ min^{-1}$, *Figure 4*.



n = permissible speed
h5, h6, h9 = shaft tolerance (this is subject to the envelope requirement Ⓔ)
C_r/P = load ratio

① Ball set (bearings of sizes 201, 202, 203 and 204 all have the ball set 204)

Figure 4
Permissible speeds for radial insert ball bearings with seals RSR

Shaft tolerances for radial insert ball bearings

The permissible shaft tolerance is dependent on the speed and load. Tolerances h6 Ⓔ to h9 Ⓔ are recommended.

Conventional drawn shafts will suffice for most applications.

Accuracy
Standard tolerances of radial insert ball bearings

The outside diameter tolerances of the bearings conform to the tolerances in accordance with JIS B 1558. The inner ring bore has a plus tolerance to allow easier mounting of the bearing, see tables.

Inner ring tolerances

Nominal bearing bore diameter d mm		Variation[1] Δ_{dmp} µm		Width deviation Δ_{Bs} µm	
over	incl.	min.	max.	min.	max.
10	18	0	+15	–120	0
18	31,75	0	+18	–120	0
31,75	50,8	0	+21	–120	0
50,8	80,962	0	+24	–150	0
80,962	120	0	+28	–200	0

1) This corresponds to the arithmetic mean value derived from the largest and smallest diameters (measured using a two-point measuring device).

Outer ring tolerances

Nominal outside diameter D_{sp} mm		Variation[1] Δ_{Dm} µm	
over	incl.	min.	max.
30	50	–11	0
50	80	–13	0
80	120	–15	0
120	150	–18	0
150	180	–25	0
180	250	–30	0

1) In the case of sealed bearings, the largest and smallest values of the outside diameter can deviate from the mean value by approx. 0,03 mm.

Radial insert ball bearings

Radial internal clearance of radial insert ball bearings

The radial internal clearance in accordance with JIS B 1520 is C3 for radial insert ball bearings UC and C4 for radial insert ball bearings UK. It is thus larger than in the case of normal deep groove ball bearings, see table.

The larger internal clearance allows better support of misalignments and shaft deflection.

Radial internal clearance

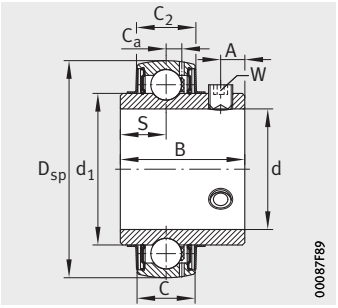
Bore d		Ball set	Outside diameter D	Radial internal clearance			
				C3 µm		C4 µm	
mm	inch		mm	min.	max.	min.	max.
12	–	204	47	13	28	20	36
12,7	1/2						
14,288	9/16						
15	–						
15,875	5/8						
17	–						
17,462	11/16						
19,05	3/4						
20	–						
20,638	13/16	205	52	13	28	23	41
22,225	7/8						
23,812	15/16						
25	–						
25,4	1						
26,988	1 1/16	206	62				
28,575	1 1/8						
30	–						
30,162	1 3/16						
31,75	1 1/4						
31,75	1 1/4	207	72	15	33	28	46
33,338	1 5/16						
34,925	1 3/8						
35	–						
36,512	1 7/16						
38,1	1 1/2	208	80				
39,688	1 9/16						
40	–						
41,275	1 5/8	209	85	18	36	30	51
42,862	1 11/16						
44,45	1 3/4						
45	–						
46,038	1 13/16	210	90				
47,625	1 7/8						
49,212	1 15/16						
50	–						
50,8	2						

Radial internal clearance (continued)

Bore d		Ball set	Outside diameter D	Radial internal clearance			
				C3		C4	
mm	inch		mm	µm		µm	
				min.	max.	min.	max.
50,8	2	211	100	23	43	38	61
52,388	$2^{1}/_{16}$						
53,975	$2^{1}/_{8}$						
55	–						
55,562	$2^{3}/_{16}$						
57,15	$2^{1}/_{4}$	212	110				
58,738	$2^{5}/_{16}$						
60	–						
60,325	$2^{3}/_{8}$						
61,912	$2^{7}/_{16}$						
63,5	$2^{1}/_{2}$	213	120				
65	–						
65,09	$2^{9}/_{16}$						
66,675	$2^{5}/_{8}$	214	125	25	51	46	71
68,262	$2^{11}/_{16}$						
69,85	$2^{3}/_{4}$						
70	–						
71,438	$2^{13}/_{16}$	215	130				
73,025	$2^{7}/_{8}$						
74,612	$2^{15}/_{16}$						
75	–						
76,2	3						
77,787	$3^{1}/_{16}$	216	140				
79,375	$3^{1}/_{8}$						
80	–						
80,962	$3^{3}/_{16}$						
82,55	$3^{1}/_{4}$	217	150	30	58	53	84
84,137	$3^{5}/_{16}$						
85	–						
87,312	$3^{7}/_{16}$						
88,9	$3^{1}/_{2}$	218	160				
90	–						
93,662	$3^{11}/_{16}$	219	170				
95	–						
100	–	220	180				
100,012	$3^{15}/_{16}$						
101,6	4						

Radial insert ball bearings with grub screws in inner ring

Spherical outer ring



UC

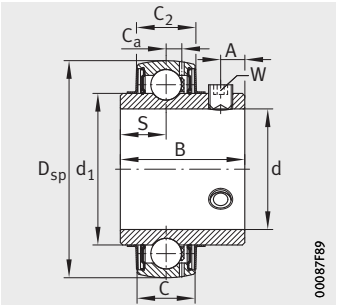
Dimension table · Dimensions in mm and inch

Designation	Mass	Dimensions						
	m	d		D_{sp}	C	C_2	B	S
	≈ kg	mm	inch					
UC201	0,2	**12**	–	47	17	16,8	31	12,7
UC201-08	0,2	**12,7**	***1/2***	47	17	16,8	31	12,7
UC202-09	0,19	**14,288**	***9/16***	47	17	16,8	31	12,7
UC202	0,18	**15**	–	47	17	16,8	31	12,7
UC202-10	0,18	**15,875**	***5/8***	47	17	16,8	31	12,7
UC203	0,17	**17**	–	47	17	16,8	31	12,7
UC203-11	0,17	**17,463**	***11/16***	47	17	16,8	31	12,7
UC204-12	0,16	**19,05**	***3/4***	47	17	16,8	31	12,7
UC204	0,15	**20**	–	47	17	16,8	31	12,7
UC205-13	0,24	**20,638**	***13/16***	52	17	17,6	34,1	14,3
UC205-14	0,22	**22,225**	***7/8***	52	17	17,6	34,1	14,3
UC205-15	0,21	**23,813**	***15/16***	52	17	17,6	34,1	14,3
UC205	0,2	**25**	–	52	17	17,6	34,1	14,3
UC205-16	0,19	**25,4**	***1***	52	17	17,6	34,1	14,3
UC206-17	0,35	**26,988**	***1 1/16***	62	19	19,6	38,1	15,9
UC206-18	0,33	**28,575**	***1 1/8***	62	19	19,6	38,1	15,9
UC206	0,31	**30**	–	62	19	19,6	38,1	15,9
UC206-19	0,31	**30,163**	***1 3/16***	62	19	19,6	38,1	15,9
UC206-20	0,29	**31,75**	***1 1/4***	62	19	19,6	38,1	15,9
UC207-20	0,52	**31,75**	***1 1/4***	72	20	20,6	42,9	17,5
UC207-21	0,5	**33,338**	***1 5/16***	72	20	20,6	42,9	17,5
UC207-22	0,47	**34,925**	***1 3/8***	72	20	20,6	42,9	17,5
UC207	0,47	**35**	–	72	20	20,6	42,9	17,5
UC207-23	0,44	**36,513**	***1 7/16***	72	20	20,6	42,9	17,5
UC208-24	0,66	**38,1**	***1 1/2***	80	21	21,6	49,2	19
UC208-25	0,63	**39,688**	***1 9/16***	80	21	21,6	49,2	19
UC208	0,62	**40**	–	80	21	21,6	49,2	19
UC209-26	0,79	**41,275**	***1 5/8***	85	22	22,6	49,2	19
UC209-27	0,75	**42,863**	***1 11/16***	85	22	22,6	49,2	19
UC209-28	0,71	**44,45**	***1 3/4***	85	22	22,6	49,2	19
UC209	0,69	**45**	–	85	22	22,6	49,2	19
UC210-29	0,92	**46,038**	***1 13/16***	90	24	24,6	51,6	19
UC210-30	0,87	**47,625**	***1 7/8***	90	24	24,6	51,6	19
UC210-31	0,82	**49,213**	***1 15/16***	90	24	24,6	51,6	19
UC210	0,8	**50**	–	90	24	24,6	51,6	19
UC210-32	0,77	**50,8**	***2***	90	24	24,6	51,6	19

			Width across flats		Basic load ratings		Fatigue limit load	Factor
d_1	C_a	A	W		dyn. C_r	stat. C_{0r}	C_{ur}	f_0
			mm	inch	N	N	N	
27,56	4,2	5	3	–	13 600	6 600	335	13,1
27,56	4,2	5	–	1/8	13 600	6 600	335	13,1
27,56	4,2	5	–	1/8	13 600	6 600	335	13,1
27,56	4,2	5	3	–	13 600	6 600	335	13,1
27,56	4,2	5	–	1/8	13 600	6 600	335	13,1
27,56	4,2	5	3	–	13 600	6 600	335	13,1
27,56	4,2	5	–	1/8	13 600	6 600	335	13,1
27,56	4,2	5	–	1/8	13 600	6 600	335	13,1
27,56	4,2	5	3	–	13 600	6 600	335	13,1
33,83	4,2	5	–	1/8	14 900	7 800	395	13,8
33,83	4,2	5	–	1/8	14 900	7 800	395	13,8
33,83	4,2	5	–	1/8	14 900	7 800	395	13,8
33,83	4,2	5	3	–	14 900	7 800	395	13,8
33,83	4,2	5	–	1/8	14 900	7 800	395	13,8
40,2	5	5	–	1/8	20 700	11 300	570	13,8
40,2	5	5	–	1/8	20 700	11 300	570	13,8
40,2	5	5	3	–	20 700	11 300	570	13,8
40,2	5	5	–	1/8	20 700	11 300	570	13,8
40,2	5	5	–	1/8	20 700	11 300	570	13,8
46,84	5,7	7	–	5/32	27 500	15 300	770	13,8
46,84	5,7	7	–	5/32	27 500	15 300	770	13,8
46,84	5,7	7	–	5/32	27 500	15 300	770	13,8
46,84	5,7	7	4	–	27 500	15 300	770	13,8
46,84	5,7	7	–	5/32	27 500	15 300	770	13,8
52,27	6,2	8	–	5/32	34 500	19 800	1 010	14
52,27	6,2	8	–	5/32	34 500	19 800	1 010	14
52,27	6,2	8	4	–	34 500	19 800	1 010	14
57,91	6,3	8	–	5/32	34 500	20 400	1 030	14,3
57,91	6,3	8	–	5/32	34 500	20 400	1 030	14,3
57,91	6,3	8	–	5/32	34 500	20 400	1 030	14,3
57,91	6,3	8	4	–	34 500	20 400	1 030	14,3
62,84	6,5	10	–	3/16	37 500	23 200	1 180	14,3
62,84	6,5	10	–	3/16	37 500	23 200	1 180	14,3
62,84	6,5	10	–	3/16	37 500	23 200	1 180	14,3
62,84	6,5	10	5	–	37 500	23 200	1 180	14,3
62,84	6,5	10	–	3/16	37 500	23 200	1 180	14,3

Radial insert ball bearings with grub screws in inner ring

Spherical outer ring



UC

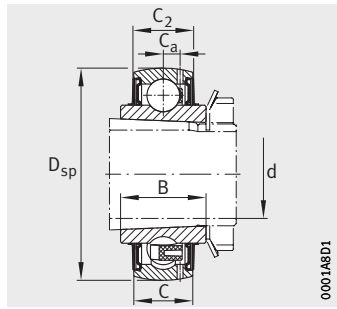
Dimension table (continued) · Dimensions in mm and inch

Designation	Mass	Dimensions						
	m	d		D_{sp}	C	C_2	B	S
	≈ kg	mm	inch					
UC211-32	1,22	**50,8**	***2***	100	25	25,6	55,6	22,2
UC211-33	1,17	**52,388**	***2 1/16***	100	25	25,6	55,6	22,2
UC211-34	1,11	**53,975**	***2 1/8***	100	25	25,6	55,6	22,2
UC211	1,07	**55**	–	100	25	25,6	55,6	22,2
UC211-35	1,05	**55,563**	***2 3/16***	100	25	25,6	55,6	22,2
UC212-36	1,62	**57,15**	***2 1/4***	110	27	27,6	65,1	25,4
UC212-37	1,55	**58,738**	***2 5/16***	110	27	27,6	65,1	25,4
UC212	1,49	**60**	–	110	27	27,6	65,1	25,4
UC212-38	1,48	**60,325**	***2 3/8***	110	27	27,6	65,1	25,4
UC212-39	1,4	**61,913**	***2 7/16***	110	27	27,6	65,1	25,4
UC213-40	1,79	**63,5**	***2 1/2***	120	28	29,4	65,1	25,4
UC213	1,72	**65**	–	120	28	29,4	65,1	25,4
UC213-41	1,71	**65,088**	***2 9/16***	120	28	29,4	65,1	25,4
UC214-42	2,17	**66,675**	***2 5/8***	125	30	31,4	74,6	30,2
UC214-43	2,07	**68,263**	***2 11/16***	125	30	31,4	74,6	30,2
UC214-44	1,97	**69,85**	***2 3/4***	125	30	31,4	74,6	30,2
UC214	1,96	**70**	–	125	30	31,4	74,6	30,2
UC215-45	2,39	**71,438**	***2 13/16***	130	32	33,4	77,8	33,3
UC215-46	2,28	**73,025**	***2 7/8***	130	32	33,4	77,8	33,3
UC215-47	2,17	**74,613**	***2 15/16***	130	32	33,4	77,8	33,3
UC215	2,14	**75**	–	130	32	33,4	77,8	33,3
UC215-48	2,06	**76,2**	***3***	130	32	33,4	77,8	33,3
UC216-49	2,88	**77,788**	***3 1/16***	140	33	34,4	82,6	33,3
UC216-50	2,76	**79,375**	***3 1/8***	140	33	34,4	82,6	33,3
UC216	2,71	**80**	–	140	33	34,4	82,6	33,3
UC216-51	2,63	**80,963**	***3 3/16***	140	33	34,4	82,6	33,3
UC217-52	3,62	**82,55**	***3 1/4***	150	35	36,4	85,7	34,1
UC217-53	3,48	**84,138**	***3 5/16***	150	35	36,4	85,7	34,1
UC217	3,41	**85**	–	150	35	36,4	85,7	34,1
UC217-55	3,2	**87,313**	***3 7/16***	150	35	36,4	85,7	34,1
UC218-56	4,2	**88,9**	***3 1/2***	160	38	39,4	96	39,7
UC218	4,08	**90**	–	160	38	39,4	96	39,7

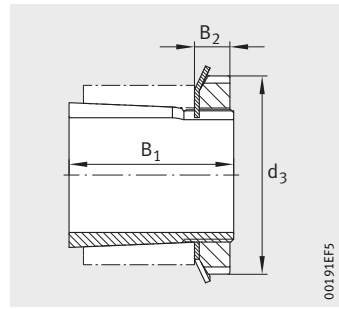
			Width across flats		Basic load ratings		Fatigue limit load	Factor
d_1	C_a	A	W		dyn. C_r	stat. C_{0r}	C_{ur}	f_0
			mm	inch	N	N	N	
69,77	7	10	–	3/16	46 000	29 000	1 480	14,3
69,77	7	10	–	3/16	46 000	29 000	1 480	14,3
69,77	7	10	–	3/16	46 000	29 000	1 480	14,3
69,77	7	10	5	–	46 000	29 000	1 480	14,3
69,77	7	10	–	3/16	46 000	29 000	1 480	14,3
76,48	7,4	10	–	3/16	56 000	36 000	1 820	14,3
76,48	7,4	10	–	3/16	56 000	36 000	1 820	14,3
76,48	7,4	10	5	–	56 000	36 000	1 820	14,3
76,48	7,4	10	–	3/16	56 000	36 000	1 820	14,3
76,48	7,4	10	–	3/16	56 000	36 000	1 820	14,3
80,85	8,2	12	–	1/4	61 000	40 000	2 030	14,3
80,85	8,2	12	6	–	61 000	40 000	2 030	14,3
80,85	8,2	12	–	1/4	61 000	40 000	2 030	14,3
85,2	8,5	12	–	1/4	66 000	44 000	2 230	14,4
85,2	8,5	12	–	1/4	66 000	44 000	2 230	14,4
85,2	8,5	12	–	1/4	66 000	44 000	2 230	14,4
85,2	8,5	12	6	–	66 000	44 000	2 230	14,4
90	8,5	12	–	1/4	66 000	44 500	2 240	14,7
90	8,5	12	–	1/4	66 000	44 500	2 240	14,7
90	8,5	12	–	1/4	66 000	44 500	2 240	14,7
90	8,5	12	6	–	66 000	44 500	2 240	14,7
90	8,5	12	–	1/4	66 000	44 500	2 240	14,7
97	9,3	14	–	1/4	76 000	54 000	2 600	14,6
97	9,3	14	–	1/4	76 000	54 000	2 600	14,6
97	9,3	14	6	–	76 000	54 000	2 600	14,6
97	9,3	14	–	1/4	76 000	54 000	2 600	14,6
104,09	10	14	–	1/4	88 000	64 000	2 950	14,7
104,09	10	14	–	1/4	88 000	64 000	2 950	14,7
104,09	10	14	6	–	88 000	64 000	2 950	14,7
104,09	10	14	–	1/4	88 000	64 000	2 950	14,7
109,4	11	15	–	1/4	102 000	72 000	3 250	14,5
109,4	11	15	6	–	102 000	72 000	3 250	14,5

Radial insert ball bearings with adapter sleeve

Spherical outer ring



UK



Complete adapter sleeve[1)]

Dimension table · Dimensions in mm

Designation	Mass	Dimensions						Basic load ratings		Fatigue limit load	Factor
	m	d	D_{sp}	C	C_2	B	C_a	dyn. C_r	stat. C_{0r}	C_{ur}	f_0
	≈ kg							N	N	N	
UK205	0,25	**20**	52	17	17,6	23	4,2	14 900	7 800	395	13,8
UK206	0,37	**25**	62	19	19,6	26	5	20 700	11 300	570	13,8
UK207	0,54	**30**	72	20	20,6	29	5,7	27 500	15 300	770	13,8
UK208	0,7	**35**	80	21	21,6	31	6,2	34 500	19 800	1 010	14
UK209	0,83	**40**	85	22	22,6	32	6,3	34 500	20 400	1 030	14,3
UK210	0,98	**45**	90	24	24,6	34	6,5	37 500	23 200	1 180	14,3
UK211	1,24	**50**	100	25	25,6	36	7	46 000	29 000	1 480	14,3
UK212	1,58	**55**	110	27	27,6	40	7,4	56 000	36 000	1 820	14,3
UK213	1,88	**60**	120	28	29,4	41	8,2	61 000	40 000	2 030	14,3
UK215	2,62	**65**	130	32	33,4	44,5	8,5	66 000	44 500	2 240	14,7
UK216	3,23	**70**	140	33	34,4	46	9,3	76 000	54 000	2 600	14,6
UK217	3,9	**75**	150	35	36,4	48	10	88 000	64 000	2 950	14,7
UK218	4,62	**80**	160	38	39,4	51	11	102 000	72 000	3 250	14,5

[1)] Radial insert ball bearings UK are supplied with an adapter sleeve H..X.

Designation					Mass	Dimensions		
Complete adapter sleeve	Sleeve	Locknut	Tab washer	Matching bearing	m ≈ kg	B_1	B_2	d_3 max.
H2305X	A2305X	AN05	AW05X	UK205	0,1	35	8	38
H2306X	A2306X	AN06	AW06X	UK206	0,13	38	8	45
H2307X	A2307X	AN07	AW07X	UK207	0,18	43	9	52
H2308X	A2308X	AN08	AW08X	UK208	0,23	46	10	58
H2309X	A2309X	AN09	AW09X	UK209	0,31	50	11	65
H2310X	A2310X	AN10	AW10X	UK210	0,38	55	12	70
H2311X	A2311X	AN11	AW11X	UK211	0,45	59	12	75
H2312X	A2312X	AN12	AW12X	UK212	0,5	62	13	80
H2313X	A2313X	AN13	AW13X	UK213	0,58	65	14	85
H2315X	A2315X	AN15	AW15X	UK215	1,1	73	15	98
H2316X	A2316X	AN16	AW16X	UK216	1,33	78	17	105
H2317X	A2317X	AN17	AW17X	UK217	1,51	82	18	110
H2318X	A2318X	AN18	AW18X	UK218	1,77	86	18	120