

Accuracy

The main dimensions of the bearings conform to DIN 635-1.

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620-2.

Radial internal clearance of bearings with cylindrical bore

Radial internal clearance to DIN 620-4

| Bore d mm | | Radial internal clearance | | | | | | | |
|-----------------|-------|---------------------------|------|----------|------|----------|------|----------|------|
| | | C2 μm | | CN μm | | C3 μm | | C4 μm | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. | max. |
| - | 30 | 2 | 9 | 9 | 17 | 17 | 28 | 28 | 40 |
| 30 | 40 | 3 | 10 | 10 | 20 | 20 | 30 | 30 | 45 |
| 40 | 50 | 3 | 13 | 13 | 23 | 23 | 35 | 35 | 50 |
| 50 | 65 | 4 | 15 | 15 | 27 | 27 | 40 | 40 | 55 |
| 65 | 80 | 5 | 20 | 20 | 35 | 35 | 55 | 55 | 75 |
| 80 | 100 | 7 | 25 | 25 | 45 | 45 | 65 | 65 | 90 |
| 100 | 120 | 10 | 30 | 30 | 50 | 50 | 70 | 70 | 95 |
| 120 | 140 | 15 | 35 | 35 | 55 | 55 | 80 | 80 | 110 |
| 140 | 160 | 20 | 40 | 40 | 65 | 65 | 95 | 95 | 125 |
| 160 | 180 | 25 | 45 | 45 | 70 | 70 | 100 | 100 | 130 |
| 180 | 225 | 30 | 50 | 50 | 75 | 75 | 105 | 105 | 135 |
| 225 | 250 | 35 | 55 | 55 | 80 | 80 | 110 | 110 | 140 |
| 250 | 280 | 40 | 60 | 60 | 85 | 85 | 115 | 115 | 145 |

Radial internal clearance of bearings with tapered bore

Radial internal clearance to DIN 620-4

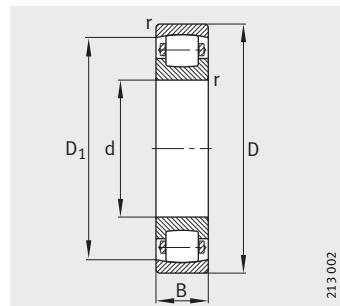
| Bore d mm | | Radial internal clearance | | | | | | | |
|-----------------|-------|---------------------------|------|----------|------|----------|------|----------|------|
| | | C2 μm | | CN μm | | C3 μm | | C4 μm | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. | max. |
| - | 30 | 9 | 17 | 17 | 28 | 28 | 40 | 40 | 55 |
| 30 | 40 | 10 | 20 | 20 | 30 | 30 | 45 | 45 | 60 |
| 40 | 50 | 13 | 23 | 23 | 35 | 35 | 50 | 50 | 65 |
| 50 | 65 | 15 | 27 | 27 | 40 | 40 | 55 | 55 | 75 |
| 65 | 80 | 20 | 35 | 35 | 55 | 55 | 75 | 75 | 95 |
| 80 | 100 | 25 | 45 | 45 | 65 | 65 | 90 | 90 | 120 |
| 100 | 120 | 30 | 50 | 50 | 70 | 70 | 95 | 95 | 125 |
| 120 | 140 | 35 | 55 | 55 | 80 | 80 | 110 | 110 | 140 |
| 140 | 160 | 40 | 65 | 65 | 95 | 95 | 125 | 125 | 155 |
| 160 | 180 | 45 | 70 | 70 | 100 | 100 | 130 | 130 | 160 |
| 180 | 225 | 50 | 75 | 75 | 105 | 105 | 135 | 135 | 165 |
| 225 | 250 | 55 | 80 | 80 | 110 | 110 | 140 | 140 | 170 |
| 250 | 280 | 60 | 85 | 85 | 115 | 115 | 145 | 145 | 175 |



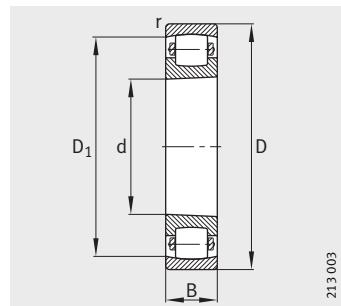
Bearings with a tapered bore have the internal clearance group C3.

Barrel roller bearings

With cylindrical or tapered bore



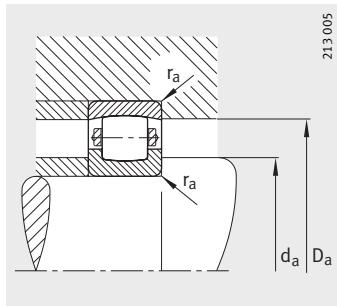
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | |
|-----------------------|------------------|------------|-----|----|-----------|---------------------|
| | | d | D | B | r min. | D ₁ ≈ |
| 20204-TVP | 0,114 | 20 | 47 | 14 | 1 | 39 |
| 20304-TVP | 0,152 | 20 | 52 | 15 | 1,1 | 43,5 |
| 20205-K-TVP-C3 | 0,132 | 25 | 52 | 15 | 1 | 43,9 |
| 20205-TVP | 0,134 | 25 | 52 | 15 | 1 | 43,9 |
| 20305-TVP | 0,243 | 25 | 62 | 17 | 1,1 | 51,9 |
| 20206-K-TVP-C3 | 0,203 | 30 | 62 | 16 | 1 | 53 |
| 20206-TVP | 0,207 | 30 | 62 | 16 | 1 | 53 |
| 20306-TVP | 0,37 | 30 | 72 | 19 | 1,1 | 60,7 |
| 20207-K-TVP-C3 | 0,296 | 35 | 72 | 17 | 1,1 | 62,3 |
| 20207-TVP | 0,301 | 35 | 72 | 17 | 1,1 | 62,3 |
| 20307-TVP | 0,493 | 35 | 80 | 21 | 2,5 | 67,4 |
| 20208-K-TVP-C3 | 0,38 | 40 | 80 | 18 | 1,1 | 70,1 |
| 20208-TVP | 0,386 | 40 | 80 | 18 | 1,1 | 70,1 |
| 20308-TVP | 0,671 | 40 | 90 | 23 | 1,5 | 76,8 |
| 20209-K-TVP-C3 | 0,433 | 45 | 85 | 19 | 1,1 | 74,6 |
| 20209-TVP | 0,441 | 45 | 85 | 19 | 1,1 | 74,6 |
| 20309-TVP | 0,914 | 45 | 100 | 25 | 1,5 | 85,2 |
| 20210-K-TVP-C3 | 0,489 | 50 | 90 | 20 | 1,1 | 79,5 |
| 20210-TVP | 0,499 | 50 | 90 | 20 | 1,1 | 79,5 |
| 20310-TVP | 1,17 | 50 | 110 | 27 | 2 | 94,4 |
| 20211-K-TVP-C3 | 0,642 | 55 | 100 | 21 | 1,5 | 89,2 |
| 20211-TVP | 0,653 | 55 | 100 | 21 | 1,5 | 89,2 |
| 20311-K-TVP-C3 | 1,49 | 55 | 120 | 29 | 2 | 101,7 |
| 20311-TVP | 1,53 | 55 | 120 | 29 | 2 | 101,7 |
| 20212-K-TVP-C3 | 0,822 | 60 | 110 | 22 | 1,5 | 97,8 |
| 20212-TVP | 0,836 | 60 | 110 | 22 | 1,5 | 97,8 |
| 20312-K-TVP-C3 | 1,89 | 60 | 130 | 31 | 2,1 | 111,2 |
| 20312-TVP | 1,92 | 60 | 130 | 31 | 2,1 | 111,2 |
| 20213-K-TVP-C3 | 1,07 | 65 | 120 | 23 | 1,5 | 105,1 |
| 20213-TVP | 1,08 | 65 | 120 | 23 | 1,5 | 105,1 |
| 20313-K-MB-C3 | 2,14 | 65 | 140 | 33 | 1,5 | 120,6 |
| 20313-MB | 2,18 | 65 | 140 | 33 | 1,5 | 120,6 |



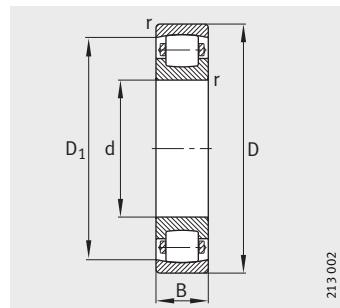
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ |
|---------------------|---------------|---------------|--------------------|------------------------|-------------------------------------|--|
| d_a min. | D_a max. | r_a max. | dyn. C_r N | stat. C_{0r} N | | |
| 25,6 | 41,4 | 1 | 20 400 | 19 300 | 1 700 | 7 500 |
| 27 | 45 | 1 | 27 000 | 24 500 | 2 300 | 7 000 |
| 30,6 | 46,4 | 1 | 24 000 | 25 000 | 2 190 | 6 700 |
| 30,6 | 46,4 | 1 | 24 000 | 25 000 | 2 190 | 6 700 |
| 32 | 55 | 1 | 36 000 | 34 500 | 3 000 | 6 000 |
| 35,6 | 56,4 | 1 | 27 500 | 28 500 | 2 850 | 5 600 |
| 35,6 | 56,4 | 1 | 27 500 | 28 500 | 2 850 | 5 600 |
| 37 | 65 | 1 | 49 000 | 49 000 | 4 250 | 5 000 |
| 42 | 65 | 1 | 40 500 | 43 000 | 4 900 | 4 800 |
| 42 | 65 | 1 | 40 500 | 43 000 | 4 900 | 4 800 |
| 44 | 71 | 1,5 | 58 500 | 61 000 | 5 400 | 4 500 |
| 47 | 73 | 1 | 49 000 | 53 000 | 5 400 | 4 300 |
| 47 | 73 | 1 | 49 000 | 53 000 | 5 400 | 4 300 |
| 49 | 81 | 1,5 | 76 500 | 81 500 | 7 200 | 4 000 |
| 52 | 78 | 1 | 52 000 | 57 000 | 5 900 | 4 000 |
| 52 | 78 | 1 | 52 000 | 57 000 | 5 900 | 4 000 |
| 54 | 91 | 1,5 | 86 500 | 95 000 | 8 500 | 3 600 |
| 57 | 83 | 1 | 58 500 | 68 000 | 7 000 | 3 600 |
| 57 | 83 | 1 | 58 500 | 68 000 | 7 000 | 3 600 |
| 61 | 99 | 2 | 108 000 | 118 000 | 10 600 | 3 400 |
| 64 | 91 | 1,5 | 73 500 | 85 000 | 9 300 | 3 400 |
| 64 | 91 | 1,5 | 73 500 | 85 000 | 9 300 | 3 400 |
| 66 | 109 | 2 | 120 000 | 137 000 | 12 400 | 3 000 |
| 66 | 109 | 2 | 120 000 | 137 000 | 12 400 | 3 000 |
| 69 | 101 | 1,5 | 85 000 | 100 000 | 10 900 | 3 200 |
| 69 | 101 | 1,5 | 85 000 | 100 000 | 10 900 | 3 200 |
| 72 | 118 | 2,1 | 146 000 | 170 000 | 15 200 | 2 800 |
| 72 | 118 | 2,1 | 146 000 | 170 000 | 15 200 | 2 800 |
| 74 | 111 | 1,5 | 95 000 | 116 000 | 12 700 | 3 000 |
| 74 | 111 | 1,5 | 95 000 | 116 000 | 12 700 | 3 000 |
| 77 | 128 | 2,1 | 170 000 | 196 000 | 17 900 | 2 800 |
| 77 | 128 | 2,1 | 170 000 | 196 000 | 17 900 | 2 800 |

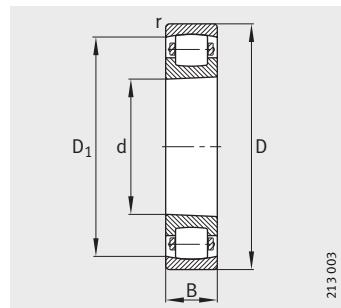


Barrel roller bearings

With cylindrical or tapered bore



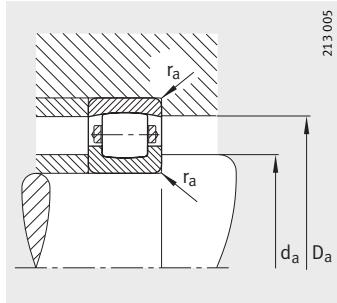
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | |
|-----------------------|------------------|------------|-----|----|-----------|---------------------|
| | | d | D | B | r min. | D ₁ ≈ |
| 20214-TVP | 1,17 | 70 | 125 | 24 | 1,5 | 111 |
| 20314-MB | 3,15 | 70 | 150 | 35 | 2,1 | 128,7 |
| 20215-K-TVP-C3 | 1,25 | 75 | 130 | 25 | 1,5 | 115,9 |
| 20215-TVP | 1,28 | 75 | 130 | 25 | 1,5 | 115,9 |
| 20315-MB | 3,76 | 75 | 160 | 37 | 2,1 | 138,1 |
| 20216-K-TVP-C3 | 1,56 | 80 | 140 | 26 | 2 | 124,5 |
| 20216-TVP | 1,58 | 80 | 140 | 26 | 2 | 124,5 |
| 20316-MB | 4,58 | 80 | 170 | 39 | 2,1 | 147,5 |
| 20217-K-MB-C3 | 2,19 | 85 | 150 | 28 | 2 | 133,9 |
| 20217-MB | 2,22 | 85 | 150 | 28 | 2 | 133,9 |
| 20317-MB | 5,25 | 85 | 180 | 41 | 3 | 156,9 |
| 20218-K-MB-C3 | 2,68 | 90 | 160 | 30 | 2 | 143,8 |
| 20218-MB | 2,72 | 90 | 160 | 30 | 2 | 143,8 |
| 20318-K-MB-C3 | 6,17 | 90 | 190 | 43 | 3 | 165,1 |
| 20318-MB | 6,25 | 90 | 190 | 43 | 3 | 165,1 |
| 20219-MB | 3,19 | 95 | 170 | 32 | 2,1 | 152,7 |
| 20319-MB | 7,29 | 95 | 200 | 45 | 3 | 174,5 |
| 20220-K-MB-C3 | 3,9 | 100 | 180 | 34 | 2,1 | 160,8 |
| 20220-MB | 3,96 | 100 | 180 | 34 | 2,1 | 160,8 |
| 20320-K-MB-C3 | 8,58 | 100 | 215 | 47 | 3 | 186,6 |
| 20320-MB | 8,69 | 100 | 215 | 47 | 3 | 186,6 |
| 20221-MB | 4,74 | 105 | 190 | 36 | 2,1 | 169,2 |
| 20222-K-MB-C3 | 5,45 | 110 | 200 | 38 | 2,1 | 178,6 |
| 20222-MB | 5,53 | 110 | 200 | 38 | 2,1 | 178,6 |
| 20322-MB | 11,6 | 110 | 240 | 50 | 3 | 208,1 |
| 20224-K-MB-C3 | 6,51 | 120 | 215 | 40 | 2,1 | 191,1 |
| 20224-MB | 6,6 | 120 | 215 | 40 | 2,1 | 191,1 |
| 20324-MB | 15,2 | 120 | 260 | 55 | 3 | 222,3 |
| 20226-K-MB-C3 | 7,21 | 130 | 230 | 40 | 3 | 205,7 |
| 20226-MB | 7,31 | 130 | 230 | 40 | 3 | 205,7 |
| 20326-MB | 18,4 | 130 | 280 | 58 | 4 | 240,3 |
| 20228-K-MB-C3 | 8,98 | 140 | 250 | 42 | 3 | 223,9 |
| 20228-MB | 9,09 | 140 | 250 | 42 | 3 | 223,9 |
| 20328-MB | 22,5 | 140 | 300 | 62 | 4 | 257,9 |



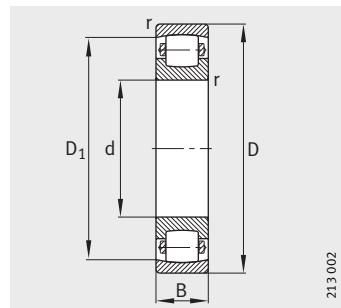
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Fatigue limit load C_{ur} | Limiting speed n_G min ⁻¹ |
|---------------------|---------------|---------------|--------------------|------------------------|--------------------------------|--|
| d_a min. | D_a max. | r_a max. | dyn. C_r N | stat. C_{or} N | N | |
| 79 | 116 | 1,5 | 106 000 | 134 000 | 14 100 | 2 800 |
| 82 | 138 | 2,1 | 183 000 | 216 000 | 19 600 | 2 600 |
| 84 | 121 | 1,5 | 112 000 | 143 000 | 16 100 | 2 800 |
| 84 | 121 | 1,5 | 112 000 | 143 000 | 16 100 | 2 800 |
| 87 | 148 | 2,1 | 216 000 | 255 000 | 22 400 | 2 200 |
| 91 | 129 | 2 | 125 000 | 163 000 | 17 100 | 2 600 |
| 91 | 129 | 2 | 125 000 | 163 000 | 17 100 | 2 600 |
| 92 | 158 | 2,1 | 245 000 | 285 000 | 25 500 | 2 000 |
| 96 | 139 | 2 | 156 000 | 200 000 | 20 400 | 2 400 |
| 96 | 139 | 2 | 156 000 | 200 000 | 20 400 | 2 400 |
| 99 | 166 | 2,5 | 270 000 | 320 000 | 28 500 | 1 900 |
| 101 | 149 | 2 | 173 000 | 220 000 | 22 000 | 2 000 |
| 101 | 149 | 2 | 173 000 | 220 000 | 22 000 | 2 000 |
| 104 | 176 | 2,5 | 300 000 | 360 000 | 30 500 | 1 900 |
| 104 | 176 | 2,5 | 300 000 | 360 000 | 30 500 | 1 900 |
| 107 | 158 | 2,1 | 208 000 | 265 000 | 26 000 | 1 900 |
| 109 | 186 | 2,5 | 335 000 | 400 000 | 34 000 | 1 800 |
| 112 | 168 | 2,1 | 224 000 | 290 000 | 28 000 | 1 900 |
| 112 | 168 | 2,1 | 224 000 | 290 000 | 28 000 | 1 900 |
| 114 | 201 | 2,5 | 365 000 | 440 000 | 38 000 | 1 700 |
| 114 | 201 | 2,5 | 365 000 | 440 000 | 38 000 | 1 700 |
| 117 | 178 | 2,1 | 245 000 | 315 000 | 30 500 | 1 800 |
| 122 | 188 | 2,1 | 285 000 | 375 000 | 34 500 | 1 700 |
| 122 | 188 | 2,1 | 285 000 | 375 000 | 34 500 | 1 700 |
| 124 | 226 | 2,5 | 430 000 | 520 000 | 45 500 | 1 500 |
| 132 | 203 | 2,1 | 305 000 | 415 000 | 38 000 | 1 600 |
| 132 | 203 | 2,1 | 305 000 | 415 000 | 38 000 | 1 600 |
| 134 | 246 | 2,5 | 490 000 | 630 000 | 52 000 | 1 400 |
| 144 | 216 | 2,5 | 335 000 | 450 000 | 42 500 | 1 500 |
| 144 | 216 | 2,5 | 335 000 | 450 000 | 42 500 | 1 500 |
| 147 | 263 | 3 | 550 000 | 720 000 | 59 000 | 1 400 |
| 154 | 236 | 2,5 | 390 000 | 530 000 | 50 000 | 1 400 |
| 154 | 236 | 2,5 | 390 000 | 530 000 | 50 000 | 1 400 |
| 157 | 283 | 3 | 640 000 | 850 000 | 66 000 | 1 300 |

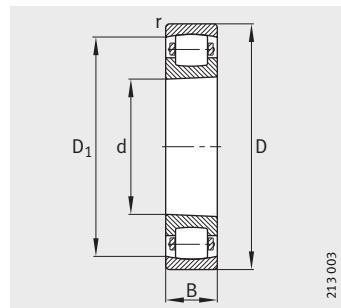


Barrel roller bearings

With cylindrical or tapered bore



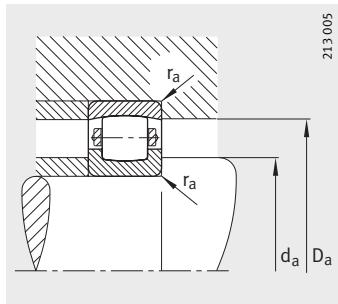
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | |
|----------------------|------------------|------------|-----|----|-----------|---------------------|
| | | d | D | B | r min. | D ₁ ≈ |
| 20230-K-MB-C3 | 11,6 | 150 | 270 | 45 | 3 | 238,6 |
| 20230-MB | 11,7 | 150 | 270 | 45 | 3 | 238,6 |
| 20330-MB | 26,9 | 150 | 320 | 65 | 4 | 275,8 |
| 20232-K-MB-C3 | 14,4 | 160 | 290 | 48 | 3 | 256,5 |
| 20232-MB | 14,5 | 160 | 290 | 48 | 3 | 256,5 |
| 20234-MB | 17,9 | 170 | 310 | 52 | 4 | 273,1 |
| 20236-MB | 18,4 | 180 | 320 | 52 | 4 | 284,3 |
| 20238-MB | 22,5 | 190 | 340 | 55 | 4 | 301,2 |
| 20240-MB | 26,7 | 200 | 360 | 58 | 4 | 319 |
| 20244-MB | 37,4 | 220 | 400 | 65 | 4 | 353,5 |
| 20248-MB | 50,5 | 240 | 440 | 72 | 4 | 388 |
| 20252-MB | 68,2 | 260 | 480 | 80 | 5 | 421,3 |



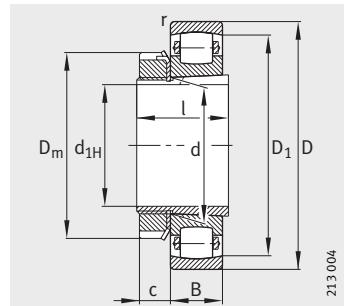
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Fatigue limit load C_{ur} | Limiting speed n_G min ⁻¹ |
|---------------------|---------------|---------------|--------------------|------------------------|--------------------------------|--|
| d_a min. | D_a max. | r_a max. | dyn. C_r N | stat. C_{0r} N | N | |
| 164 | 256 | 2,5 | 430 000 | 610 000 | 55 000 | 1 300 |
| 164 | 256 | 2,5 | 430 000 | 610 000 | 55 000 | 1 300 |
| 167 | 303 | 3 | 720 000 | 950 000 | 74 000 | 1 200 |
| 174 | 276 | 2,5 | 500 000 | 720 000 | 64 000 | 1 200 |
| 174 | 276 | 2,5 | 500 000 | 720 000 | 64 000 | 1 200 |
| 187 | 293 | 3 | 570 000 | 830 000 | 70 000 | 1 100 |
| 197 | 303 | 3 | 585 000 | 850 000 | 74 000 | 1 000 |
| 207 | 323 | 3 | 640 000 | 950 000 | 81 000 | 950 |
| 217 | 343 | 3 | 735 000 | 1 080 000 | 91 000 | 950 |
| 237 | 383 | 3 | 880 000 | 1 320 000 | 109 000 | 850 |
| 257 | 423 | 3 | 1 060 000 | 1 600 000 | 129 000 | 750 |
| 280 | 460 | 4 | 1 270 000 | 1 930 000 | 148 000 | 700 |



Barrel roller bearings

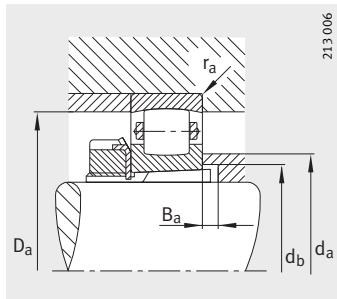
With adapter sleeve



With adapter sleeve

Dimension table · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | |
|----------------|----------------|-------------|--------------------|-----------------|-----|-----|----|--------|------------------|------------------|
| Bearing | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ ≈ | D _m ≈ |
| 20205-K-TVP-C3 | H205 | 0,132 | 0,069 | 20 | 25 | 52 | 15 | 1 | 43,9 | 38 |
| 20206-K-TVP-C3 | H206 | 0,203 | 0,091 | 25 | 30 | 62 | 16 | 1 | 53 | 45 |
| 20207-K-TVP-C3 | H207 | 0,296 | 0,129 | 30 | 35 | 72 | 17 | 1,1 | 62,3 | 57 |
| 20208-K-TVP-C3 | H208 | 0,38 | 0,17 | 35 | 40 | 80 | 18 | 1,1 | 70,1 | 58 |
| 20209-K-TVP-C3 | H209 | 0,433 | 0,216 | 40 | 45 | 85 | 19 | 1,1 | 74,6 | 65 |
| 20210-K-TVP-C3 | H210 | 0,489 | 0,264 | 45 | 50 | 90 | 20 | 1,1 | 79,5 | 70 |
| 20211-K-TVP-C3 | H211 | 0,642 | 0,292 | 50 | 55 | 100 | 21 | 1,5 | 89,2 | 75 |
| 20311-K-TVP-C3 | H311 | 1,49 | 0,35 | 50 | 55 | 120 | 29 | 2 | 101,7 | 75 |
| 20212-K-TVP-C3 | H212 | 0,822 | 0,325 | 55 | 60 | 110 | 22 | 1,5 | 97,8 | 80 |
| 20312-K-TVP-C3 | H312 | 1,89 | 0,373 | 55 | 60 | 130 | 31 | 2,1 | 111,2 | 80 |
| 20213-K-TVP-C3 | H213 | 1,07 | 0,393 | 60 | 65 | 120 | 23 | 1,5 | 105,1 | 92 |
| 20313-K-MB-C3 | H313 | 2,14 | 0,452 | 60 | 65 | 140 | 33 | 1,5 | 120,6 | 92 |
| 20215-K-TVP-C3 | H215 | 1,25 | 0,693 | 65 | 75 | 130 | 25 | 1,5 | 115,9 | 98 |
| 20216-K-TVP-C3 | H216 | 1,56 | 0,876 | 70 | 80 | 140 | 26 | 2 | 124,5 | 105 |
| 20217-K-MB-C3 | H217 | 2,19 | 0,995 | 75 | 85 | 150 | 28 | 2 | 133,9 | 110 |
| 20218-K-MB-C3 | H218 | 2,68 | 1,17 | 80 | 90 | 160 | 30 | 2 | 143,8 | 126 |
| 20318-K-MB-C3 | H318 | 6,17 | 1,36 | 80 | 90 | 190 | 43 | 3 | 165,1 | 126 |
| 20220-K-MB-C3 | H220 | 3,9 | 1,48 | 90 | 100 | 180 | 34 | 2,1 | 160,8 | 130 |
| 20320-K-MB-C3 | H320 | 8,58 | 1,69 | 90 | 100 | 215 | 47 | 3 | 186,6 | 130 |
| 20222-K-MB-C3 | H222 | 5,45 | 1,9 | 100 | 110 | 200 | 38 | 2,1 | 178,6 | 145 |
| 20224-K-MB-C3 | H3024 | 6,51 | 1,95 | 110 | 120 | 215 | 40 | 2,1 | 191,1 | 145 |
| 20226-K-MB-C3 | H3026 | 7,21 | 2,9 | 115 | 130 | 230 | 40 | 3 | 205,7 | 155 |
| 20228-K-MB-C3 | H3028 | 8,98 | 3,25 | 125 | 140 | 250 | 42 | 3 | 223,9 | 165 |
| 20230-K-MB-C3 | H3030 | 11,6 | 3,98 | 135 | 150 | 270 | 45 | 3 | 238,6 | 180 |
| 20232-K-MB-C3 | H3032 | 14,4 | 5,33 | 140 | 160 | 290 | 48 | 3 | 256,5 | 190 |

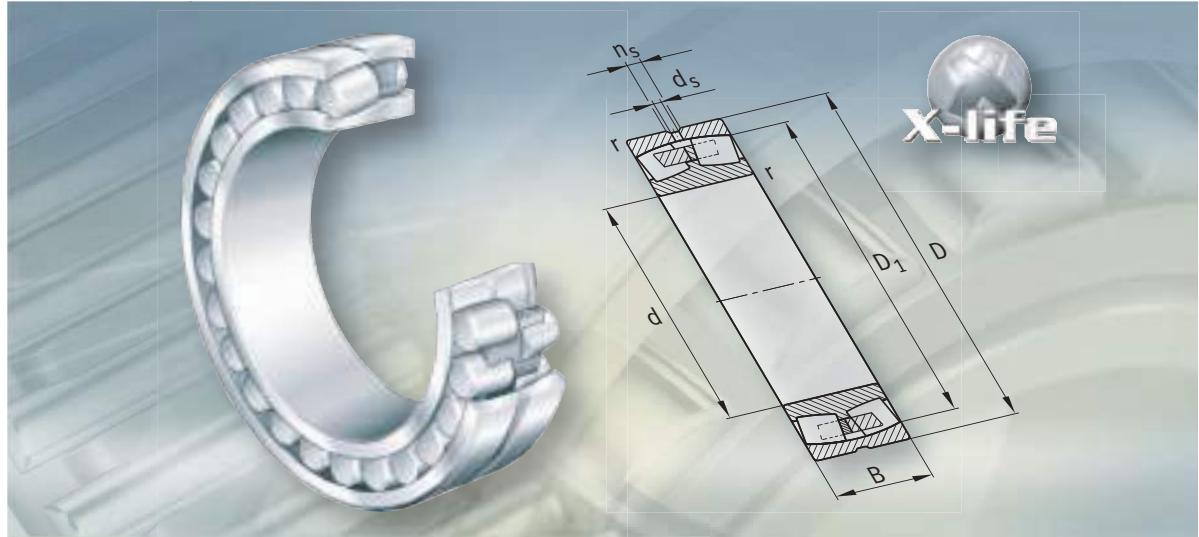


Mounting dimensions

| | | Mounting dimensions | | | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ |
|----|----|------------------------|------------------------|------------------------|------------------------|------------------------|--------------------|------------------------|-------------------------------------|--|
| l | c | d _a max. | D _a max. | d _b min. | B _a min. | r _a max. | dyn. C_r N | stat. C_{0r} N | | |
| 26 | 9 | 33 | 46,4 | 28 | 6 | 1 | 24 000 | 25 000 | 2 190 | 6 700 |
| 27 | 9 | 39 | 56,4 | 33 | 5 | 1 | 27 500 | 28 500 | 2 850 | 5 600 |
| 29 | 10 | 45 | 65 | 38 | 5 | 1 | 40 500 | 43 000 | 4 900 | 4 800 |
| 31 | 11 | 51 | 73 | 43 | 5 | 1 | 49 000 | 53 000 | 5 400 | 4 300 |
| 33 | 12 | 56 | 78 | 48 | 5 | 1 | 52 000 | 57 000 | 5 900 | 4 000 |
| 35 | 13 | 61 | 83 | 53 | 5 | 1 | 58 500 | 68 000 | 7 000 | 3 600 |
| 37 | 13 | 68 | 91 | 60 | 6 | 1,5 | 73 500 | 85 000 | 9 300 | 3 400 |
| 45 | 13 | 72 | 109 | 60 | 6 | 2 | 120 000 | 137 000 | 12 400 | 3 000 |
| 38 | 13 | 73 | 101 | 64 | 6 | 1,5 | 85 000 | 100 000 | 10 900 | 3 200 |
| 47 | 13 | 78 | 118 | 65 | 5 | 2,1 | 146 000 | 170 000 | 15 200 | 2 800 |
| 40 | 14 | 80 | 111 | 70 | 5 | 1,5 | 95 000 | 116 000 | 12 700 | 3 000 |
| 50 | 14 | 84 | 128 | 70 | 5 | 2,1 | 170 000 | 196 000 | 17 900 | 2 800 |
| 43 | 15 | 90 | 121 | 80 | 5 | 1,5 | 112 000 | 143 000 | 16 100 | 2 800 |
| 46 | 17 | 96 | 129 | 85 | 5 | 2 | 125 000 | 163 000 | 17 100 | 2 600 |
| 50 | 18 | 102 | 139 | 90 | 6 | 2 | 156 000 | 200 000 | 20 400 | 2 400 |
| 52 | 18 | 108 | 149 | 95 | 6 | 2 | 173 000 | 220 000 | 22 000 | 2 000 |
| 65 | 18 | 113 | 176 | 96 | 6 | 2,5 | 300 000 | 360 000 | 30 500 | 1 900 |
| 58 | 20 | 120 | 168 | 106 | 7 | 2,1 | 224 000 | 290 000 | 28 000 | 1 900 |
| 71 | 20 | 127 | 201 | 108 | 7 | 2,5 | 365 000 | 440 000 | 38 000 | 1 700 |
| 63 | 21 | 132 | 188 | 116 | 7 | 2,1 | 285 000 | 375 000 | 34 500 | 1 700 |
| 72 | 22 | 143 | 203 | 127 | 13 | 2,1 | 305 000 | 415 000 | 38 000 | 1 600 |
| 80 | 23 | 154 | 216 | 137 | 20 | 2,5 | 335 000 | 450 000 | 42 500 | 1 500 |
| 82 | 24 | 166 | 236 | 147 | 19 | 2,5 | 390 000 | 530 000 | 50 000 | 1 400 |
| 87 | 26 | 181 | 256 | 158 | 19 | 2,5 | 430 000 | 610 000 | 55 000 | 1 300 |
| 93 | 28 | 193 | 276 | 168 | 20 | 2,5 | 500 000 | 720 000 | 64 000 | 1 200 |



FAG



Spherical roller bearings

Spherical roller bearings

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Product overview Spherical roller bearings

With cylindrical bore

222, 223, 230, 231, 232, 233..-A, 239, 240, 241



213 04/4a

X-life grade

213..-E1, 222..-E1, 223..-E1, 230..-E1, 230..-E1A, 231..-E1, 231..-E1A, 232..-E1, 232..-E1A, 240..-E1, 241..-E1



213 04/2a

With tapered bore

222..-K, 223..-K, 230..-K, 231..-K, 232..-K, 239..-K, 240..-K30, 241..-K30



213 04/3a

X-life grade

213..-E1-K, 222..-E1-K, 223..-E1-K, 230..-E1-K, 230..-E1A-K, 231..-E1(A)-K, 232..-E1(A)-K, 240..-E1-K30, 241..-E1-K30



213 04/5a

With adapter sleeve

**222..-K + H, 223..-K + H, 230..-K + H, 231..-K + H,
232..-K + H, 239..-K + H**



213 035a

X-life grade

**213..-E1-K + H, 222..-E1-K + H, 223..-E1-K + H,
230..-E1(A)-K + H, 231..-E1(A)-K + H, 232..-E1(A)-K + H**



213 038a

With extraction sleeve

**222..-K + AH, 223..-K + AH, 230..-K + AH, 231..-K + AH,
232..-K + AH, 239..-K + AH, 240..-K30 + AH, 241..-K30 + AH**



213 034a

X-life grade

**213..-E1-K + AH, 222..-E1-K + AH, 223..-E1-K + AH,
230..-E1(A)-K + AH, 231..-E1(A)-K + AH, 232..-E1(A)-K + AH,
240..-E1-K30 + AH, 241..-E1-K30 + AH**



213 037a

Spherical roller bearings

| | |
|---|---|
| Features | Spherical roller bearings are double row, self-retaining units comprising solid outer rings with a concave raceway, solid inner rings and barrel rollers with cages. The inner rings have cylindrical or tapered bores. The symmetrical barrel rollers orient themselves freely on the concave outer ring raceway. As a result, shaft flexing and misalignment of the bearing seats are compensated, see Compensation of angular misalignments, page 515. |
| Radial and axial load capacity | Spherical roller bearings can support axial forces in both directions and high radial forces. They are designed for very high load carrying capacity and, since they have the maximum possible number of large and particularly long barrel rollers, are also suitable for the heaviest loads. Due to the narrow osculation between the rollers and raceways, uniform stress distribution is achieved in the bearing. |
| X-life | Many sizes of spherical roller bearings are classified as X-life products. These bearings do not have a central rib on the inner ring and therefore have longer barrel rollers as well as improved kinematics, optimised surfaces and are made from higher performance materials. As a result, the basic dynamic load rating and, under identical operating conditions, the basic rating life of the bearings is significantly improved. In certain applications, this means that a smaller bearing arrangement can be designed. X-life spherical roller bearings have the suffix E1 and are indicated in the dimension tables. |
| With cylindrical bore | Spherical roller bearings of all series are available with inner rings having a cylindrical bore. |
| With tapered bore | Spherical roller bearings are also available, with the exception of series 233..A, with inner rings having a tapered bore. Bearings with the suffix K have a bore taper 1:12, bearings of series 240 and 241 have a bore taper 1:30 and the suffix K30. |
| With adapter sleeve or extraction sleeve | Spherical roller bearings with a tapered bore are also available with an adapter sleeve, locknut and tab washer. Adapter and extraction sleeves must be ordered in addition to the bearing. |
| Sealing/lubrication | Spherical roller bearings are not sealed and not greased. They can be lubricated using oil or grease. Most spherical roller bearings have a circumferential groove and three lubrication holes in the outer ring for lubrication. In bearings of series 239, 240 and 241 with an outside diameter < 320 mm, this can be identified by the suffix S. Bearings of series 213 with a bore diameter up to 35 mm do not have either a lubrication groove or lubrication holes. |
| Caution! | If shafts with a vertical axis are supported using spherical roller bearings, particular attention must be paid to ensuring the reliable provision of lubricant. In such cases, oil lubrication should be used. |

Compensation of angular misalignments

Spherical roller bearings compensate for angular misalignments. The permissible adjustment angle is given in the table for loads $P < 0,1 \cdot C_r$.

The adjustment angles are permissible under the following conditions:

- constant angular deviation (static angular misalignment)
- rotating inner ring.

Bearing series and adjustment angle

| Series | Adjustment angle ° |
|--|--------------------|
| 213..-E1, 222, 222..-E1, 230, 230..-E1(E1A), 239, 240, 240..-E1 | 1,5 |
| 223, 223..-E1, 231, 231..-E1(E1A), 232, 232..-E1(E1A), 233..-A, 241, 241..-E1 | 2 |

If the outer ring rotates, the inner ring undergoes tumbling motion or the load or adjustment angle is larger than stated in the table, the angular adjustment facility is smaller. If such applications are present, please contact us.

Operating temperature

Spherical roller bearings are dimensionally stable up to +200 °C. Bearings with metal cages can be used at operating temperatures from -30 °C to +200 °C.

Caution!

Bearings with cages made from glass fibre reinforced polyamide are suitable up to +120 °C.

Cages

The standard cages for spherical roller bearings are shown in the table Cage/bore code, page 516.

Spherical roller bearings with a rigid central rib on the inner ring (design without suffix E1) have solid cages or sheet metal cages made from brass. The bearings with sheet metal cages do not have a cage suffix.

In bearings with the suffix MB, the solid brass cages are guided on the inner ring, while bearings with the suffix MA are guided on the outer ring. Bearings with the suffix M have a solid brass cage guided by the rollers.



With X-life grade

Bearings of series 222..-E1 and 223..-E1 without a cage suffix have sheet steel cages. The two cage halves are retained by a guiding ring in the outer ring. In bearings of series 223..-E1, all the cage parts are protected against wear by surface hardening or coating.

The other E1 design bearings have solid cages made from glass fibre reinforced polyamide 66 with the suffix TVPB or solid brass cages with the suffix M.

Caution!

Check the chemical resistance of polyamide to synthetic greases and lubricants with EP additives.

Aged oil and additives in the oil can impair the operating life of plastic cages at high temperatures.

The oil change intervals must be observed.

Spherical roller bearings

| Cage/bore code | Series | Sheet metal cage made from | | Solid cage made from | | | |
|-----------------|----------|----------------------------|----------------------|----------------------|----------------------|------------------------------|------------------------------|
| | | Steel | Brass | Poly- amide | Brass | | |
| | | Bore code | | | Guided by rollers | Guidance on inner ring | Guidance on outer ring |
| 213..-E1 | 08 to 18 | — | 04 to 07 19 to 22 | — | — | — | — |
| 222 | — | — | — | — | from 38 | — | — |
| 222..-E1 | up to 36 | — | — | — | — | — | — |
| 223 | — | — | — | — | from 32 | — | — |
| 223..-A (T41A) | — | — | — | — | — | from 32 | — |
| 223..-E1 | up to 30 | — | — | — | — | — | — |
| 223..-E1 (T41A) | up to 30 | — | — | — | — | — | — |
| 230 | — | — | — | — | from 44 | — | — |
| 230..-E1 | — | — | up to 40 | — | — | — | — |
| 230..-E1A | — | — | — | up to 40 | — | — | — |
| 231 | — | — | — | — | from 40 | — | — |
| 231..-E1 | — | — | up to 38 | — | — | — | — |
| 231..-E1A | — | — | — | up to 38 | — | — | — |
| 232 | — | — | — | — | from 38 | — | — |
| 232..-E1 | — | — | up to 36 | — | — | — | — |
| 232..-E1A | — | — | — | up to 36 | — | — | — |
| 233..-A (T41A) | — | — | — | — | — | from 20 | — |
| 239 | — | — | — | — | from 36 | — | — |
| 240 | — | — | — | — | from 24 | — | — |
| 240..-E1 | — | — | up to 32 | — | — | — | — |
| 241 | — | up to 88 | — | — | from 92 | — | — |
| 241..-E1 | — | — | up to 28 | — | — | — | — |

Suffixes

Suffixes for available designs: see table.

Available designs

| Suffix | Description |
|--------|--|
| A | Modified internal construction |
| B | Modified internal construction |
| E1 | Increased capacity design |
| K | Tapered bore, taper 1:12 |
| K30 | Tapered bore, taper 1:30 |
| M | Solid brass cage, guided by rollers |
| MA | Solid brass cage, guidance on outer ring |
| MB | Solid brass cage, guidance on inner ring |
| S | Lubrication groove and lubrication holes in outer ring |
| T41A | For oscillating load with restricted diameter tolerances, radial internal clearance C4 |
| TVPB | Solid window cage made from glass fibre reinforced polyamide, guidance on inner ring |

Design and safety guidelines

Equivalent dynamic bearing load

For bearings under dynamic loading, the following applies:

| Load ratio | Equivalent dynamic load |
|--------------------------|--------------------------------------|
| $\frac{F_a}{F_r} \leq e$ | $P = F_r + Y_1 \cdot F_a$ |
| $\frac{F_a}{F_r} > e$ | $P = 0,67 \cdot F_r + Y_2 \cdot F_a$ |

P N
Equivalent dynamic bearing load for combined load

F_a N
Axial dynamic bearing load

F_r N
Radial dynamic bearing load

e, Y_1, Y_2 –
Factors from dimension tables.

Equivalent static bearing load

For bearings under static loading, the following applies:

$$P_0 = F_{0r} + Y_0 \cdot F_{0a}$$

P_0 N
Equivalent static bearing load for combined load

F_{0a} N
Axial static bearing load

F_{0r} N
Radial static bearing load

Y_0 –
Factor from dimension tables.

Axial load carrying capacity

Spherical roller bearings are suitable for axial loads. If very high loads occur in combination with very high speeds, the increased friction and bearing temperature must be taken into consideration.

Minimum load

The minimum load on the spherical roller bearings should be:

- $P = 0,02 \cdot C_r$
- $P = 0,015 \cdot C_r$ for bearings of E1 design.



Speed Caution!

The limiting speeds n_G in the dimension tables must be observed.

Mounting dimensions

In bearings without the suffix E1 or with E1A, the mounting dimensions must be not less than D_1 according to the dimension tables.

X-life bearings

In bearings with the suffix E1, the mounting dimensions must be not less than D_1 and not more than d_2 according to the dimension tables.

Location of bearings with tapered bore

Bearings with a tapered inner ring bore are:

- located directly on a tapered shaft seat
- located on cylindrical shaft seats by means of adapter sleeves or
- located on cylindrical shaft seats by means of extraction sleeves.

If high axial forces occur, a support ring can be used for adapter sleeves. For fitting, the support ring dimensions in the dimension table must be observed.

Spherical roller bearings

Reduced radial internal clearance in fitting

When bearings with a tapered bore are fitted, there is a reduction in the radial internal clearance. The values given in the table ensure firm seating on the shaft, table Reduction in radial internal clearance/displacement on taper 1:12 or 1:30, page 518 and page 519.

Reduction in radial internal clearance and displacement on taper 1:12

| Nominal bearing bore diameter d mm | Reduction in radial internal clearance mm | | Displacement on taper 1:12 | | | | Control value for minimum radial internal clearance after fitting | | | |
|--|--|-------|----------------------------|------|-----------|------|---|------------|------------|-------|
| | | | Shaft mm | | Sleeve mm | | CN mm min. | C3 mm min. | C4 mm min. | |
| | over | incl. | min. | max. | min. | max. | | | | |
| 24 | 30 | 0,015 | 0,02 | 0,3 | 0,35 | 0,3 | 0,4 | 0,015 | 0,02 | 0,035 |
| 30 | 40 | 0,02 | 0,025 | 0,35 | 0,4 | 0,35 | 0,45 | 0,015 | 0,025 | 0,04 |
| 40 | 50 | 0,025 | 0,03 | 0,4 | 0,45 | 0,45 | 0,5 | 0,02 | 0,03 | 0,05 |
| 50 | 65 | 0,03 | 0,04 | 0,45 | 0,6 | 0,5 | 0,7 | 0,025 | 0,035 | 0,055 |
| 65 | 80 | 0,04 | 0,05 | 0,6 | 0,75 | 0,7 | 0,85 | 0,025 | 0,04 | 0,07 |
| 80 | 100 | 0,045 | 0,06 | 0,7 | 0,9 | 0,75 | 1 | 0,035 | 0,05 | 0,08 |
| 100 | 120 | 0,05 | 0,07 | 0,7 | 1,1 | 0,8 | 1,2 | 0,05 | 0,065 | 0,1 |
| 120 | 140 | 0,065 | 0,09 | 1,1 | 1,4 | 1,2 | 1,5 | 0,055 | 0,08 | 0,11 |
| 140 | 160 | 0,075 | 0,1 | 1,2 | 1,6 | 1,3 | 1,7 | 0,055 | 0,09 | 0,13 |
| 160 | 180 | 0,08 | 0,11 | 1,3 | 1,7 | 1,4 | 1,9 | 0,06 | 0,1 | 0,15 |
| 180 | 200 | 0,09 | 0,13 | 1,4 | 2 | 1,5 | 2,2 | 0,07 | 0,1 | 0,16 |
| 200 | 225 | 0,1 | 0,14 | 1,6 | 2,2 | 1,7 | 2,4 | 0,08 | 0,12 | 0,18 |
| 225 | 250 | 0,11 | 0,15 | 1,7 | 2,4 | 1,8 | 2,6 | 0,09 | 0,13 | 0,2 |
| 250 | 280 | 0,12 | 0,17 | 1,9 | 2,6 | 2 | 2,9 | 0,1 | 0,14 | 0,22 |
| 280 | 315 | 0,13 | 0,19 | 2 | 3 | 2,2 | 3,2 | 0,11 | 0,15 | 0,24 |
| 315 | 355 | 0,15 | 0,21 | 2,4 | 3,4 | 2,6 | 3,6 | 0,12 | 0,17 | 0,26 |
| 355 | 400 | 0,17 | 0,23 | 2,6 | 3,6 | 2,9 | 3,9 | 0,13 | 0,19 | 0,29 |
| 400 | 450 | 0,2 | 0,26 | 3,1 | 4,1 | 3,4 | 4,4 | 0,13 | 0,2 | 0,31 |
| 450 | 500 | 0,21 | 0,28 | 3,3 | 4,4 | 3,6 | 4,8 | 0,16 | 0,23 | 0,35 |
| 500 | 560 | 0,24 | 0,32 | 3,7 | 5 | 4,1 | 5,4 | 0,17 | 0,25 | 0,36 |
| 560 | 630 | 0,26 | 0,35 | 4 | 5,4 | 4,4 | 5,9 | 0,2 | 0,29 | 0,41 |
| 630 | 710 | 0,3 | 0,4 | 4,6 | 6,2 | 5,1 | 6,8 | 0,21 | 0,31 | 0,45 |
| 710 | 800 | 0,34 | 0,45 | 5,3 | 7 | 5,8 | 7,6 | 0,23 | 0,35 | 0,51 |
| 800 | 900 | 0,37 | 0,5 | 5,7 | 7,8 | 6,3 | 8,5 | 0,27 | 0,39 | 0,57 |

**Reduction in
radial internal clearance and
displacement on taper 1:30**

| Nominal bearing bore diameter d mm | | Reduction in radial internal clearance mm | | Displacement on taper 1:30 | | | | Control value for minimum radial internal clearance after fitting | | |
|--|-------|--|-------|----------------------------|------|--------------|------|---|------------------|------------------|
| | | | | Shaft mm | | Sleeve mm | | CN mm min. | C3 mm min. | C4 mm min. |
| over | incl. | min. | max. | min. | max. | min. | max. | | | |
| 24 | 30 | 0,015 | 0,02 | — | — | — | — | 0,015 | 0,02 | 0,035 |
| 30 | 40 | 0,02 | 0,025 | — | — | — | — | 0,015 | 0,025 | 0,04 |
| 40 | 50 | 0,025 | 0,03 | — | — | — | — | 0,02 | 0,03 | 0,05 |
| 50 | 65 | 0,03 | 0,04 | — | — | — | — | 0,025 | 0,035 | 0,055 |
| 65 | 80 | 0,04 | 0,05 | — | — | — | — | 0,025 | 0,04 | 0,07 |
| 80 | 100 | 0,045 | 0,06 | 1,7 | 2,2 | 1,8 | 2,4 | 0,035 | 0,05 | 0,08 |
| 100 | 120 | 0,05 | 0,07 | 1,9 | 2,7 | 2 | 2,8 | 0,05 | 0,065 | 0,1 |
| 120 | 140 | 0,065 | 0,09 | 2,7 | 3,5 | 2,8 | 3,6 | 0,055 | 0,08 | 0,11 |
| 140 | 160 | 0,075 | 0,1 | 3 | 4 | 3,1 | 4,2 | 0,055 | 0,09 | 0,13 |
| 160 | 180 | 0,08 | 0,11 | 3,2 | 4,2 | 3,3 | 4,6 | 0,06 | 0,1 | 0,15 |
| 180 | 200 | 0,09 | 0,13 | 3,5 | 4,5 | 3,6 | 5 | 0,07 | 0,1 | 0,16 |
| 200 | 225 | 0,1 | 0,14 | 4 | 5,5 | 4,2 | 5,7 | 0,08 | 0,12 | 0,18 |
| 225 | 250 | 0,11 | 0,15 | 4,2 | 6 | 4,6 | 6,2 | 0,09 | 0,13 | 0,2 |
| 250 | 280 | 0,12 | 0,17 | 4,7 | 6,7 | 4,8 | 6,9 | 0,1 | 0,14 | 0,22 |
| 280 | 315 | 0,13 | 0,19 | 5 | 7,5 | 5,2 | 7,7 | 0,11 | 0,15 | 0,24 |
| 315 | 355 | 0,15 | 0,21 | 6 | 8,2 | 6,2 | 8,4 | 0,12 | 0,17 | 0,26 |
| 355 | 400 | 0,17 | 0,23 | 6,5 | 9 | 6,8 | 9,2 | 0,13 | 0,19 | 0,29 |
| 400 | 450 | 0,2 | 0,26 | 7,7 | 10 | 8 | 10,4 | 0,13 | 0,2 | 0,31 |
| 450 | 500 | 0,21 | 0,28 | 8,2 | 11 | 8,4 | 11,2 | 0,16 | 0,23 | 0,35 |
| 500 | 560 | 0,24 | 0,32 | 9,2 | 12,5 | 9,6 | 12,8 | 0,17 | 0,25 | 0,36 |
| 560 | 630 | 0,26 | 0,35 | 10 | 13,5 | 10,4 | 14 | 0,2 | 0,29 | 0,41 |
| 630 | 710 | 0,3 | 0,4 | 11,5 | 15,5 | 12 | 16 | 0,21 | 0,31 | 0,45 |
| 710 | 800 | 0,34 | 0,45 | 13,3 | 17,5 | 13,6 | 18 | 0,23 | 0,35 | 0,51 |
| 800 | 900 | 0,37 | 0,5 | 14,3 | 19,5 | 14,8 | 20 | 0,27 | 0,39 | 0,57 |



Spherical roller bearings

Accuracy

The main dimensions of the bearings conform to DIN 635-2.

The dimensional and geometrical tolerances of the bearings correspond to tolerance class PN to DIN 620-2.

Restricted tolerance according to specification T41A: see following table. In bearings with a tapered bore, only the outside diameter has the restricted tolerance range.

Restricted tolerance according to specification T41A

| Inner ring | | | | Outer ring | | | |
|---|-------|---|-------|--|-------|---|-------|
| Nominal bearing bore diameter Dimensions in mm | | Deviation Δ_{dmp} Tolerances in μm | | Nominal outside diameter Dimensions in mm | | Deviation Δ_{Dmp} Tolerances in μm | |
| over | incl. | over | incl. | over | incl. | over | incl. |
| 30 | 50 | 0 | -7 | 80 | 150 | -5 | -13 |
| 50 | 80 | 0 | -9 | 150 | 180 | -5 | -18 |
| 80 | 120 | 0 | -12 | 180 | 315 | -10 | -23 |
| 120 | 180 | 0 | -15 | 315 | 400 | -13 | -28 |
| 180 | 250 | 0 | -18 | 400 | 500 | -13 | -30 |
| 250 | 315 | 0 | -21 | 500 | 630 | -15 | -35 |

Radial internal clearance of bearings with cylindrical bore

The radial internal clearance corresponds to internal clearance group CN.

Radial internal clearance of bearings with cylindrical bore to DIN 620-4

| Bore d mm | Radial internal clearance | | | | | | | |
|-----------------|---------------------------|------|---------------------|------|---------------------|------|---------------------|------|
| | C2 μm | | CN μm | | C3 μm | | C4 μm | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. |
| 18 | 24 | 10 | 20 | 20 | 35 | 35 | 45 | 45 |
| 24 | 30 | 15 | 25 | 25 | 40 | 40 | 55 | 55 |
| 30 | 40 | 15 | 30 | 30 | 45 | 45 | 60 | 60 |
| 40 | 50 | 20 | 35 | 35 | 55 | 55 | 75 | 100 |
| 50 | 65 | 20 | 40 | 40 | 65 | 65 | 90 | 90 |
| 65 | 80 | 30 | 50 | 50 | 80 | 80 | 110 | 110 |
| 80 | 100 | 35 | 60 | 60 | 100 | 100 | 135 | 135 |
| 100 | 120 | 40 | 75 | 75 | 120 | 120 | 160 | 160 |
| 120 | 140 | 50 | 95 | 95 | 145 | 145 | 190 | 190 |
| 140 | 160 | 60 | 110 | 110 | 170 | 170 | 220 | 220 |
| 160 | 180 | 65 | 120 | 120 | 180 | 180 | 240 | 240 |
| 180 | 200 | 70 | 130 | 130 | 200 | 200 | 260 | 260 |
| 200 | 225 | 80 | 140 | 140 | 220 | 220 | 290 | 290 |
| 225 | 250 | 90 | 150 | 150 | 240 | 240 | 320 | 320 |
| 250 | 280 | 100 | 170 | 170 | 260 | 260 | 350 | 350 |
| 280 | 315 | 110 | 190 | 190 | 280 | 280 | 370 | 370 |
| 315 | 355 | 120 | 200 | 200 | 310 | 310 | 410 | 410 |
| 355 | 400 | 130 | 220 | 220 | 340 | 340 | 450 | 450 |
| 400 | 450 | 140 | 240 | 240 | 370 | 370 | 500 | 500 |
| 450 | 500 | 140 | 260 | 260 | 410 | 410 | 550 | 550 |
| 500 | 560 | 150 | 280 | 280 | 440 | 440 | 600 | 600 |
| 560 | 630 | 170 | 310 | 310 | 480 | 480 | 650 | 650 |
| 630 | 710 | 190 | 350 | 350 | 530 | 530 | 700 | 700 |
| 710 | 800 | 210 | 390 | 390 | 580 | 580 | 770 | 770 |
| 800 | 900 | 230 | 430 | 430 | 650 | 650 | 860 | 860 |
| | | | | | | | | 1120 |

Radial internal clearance of bearings with tapered bore

The radial internal clearance corresponds to internal clearance group CN.

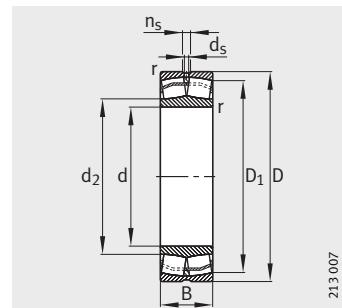
Radial internal clearance of bearings with tapered bore to DIN 620-4

| Bore d mm | | Radial internal clearance | | | | | | | |
|-----------------|-------|---------------------------|------|----------|------|----------|------|----------|------|
| over | incl. | C2 μm | | CN μm | | C3 μm | | C4 μm | |
| | | min. | max. | min. | max. | min. | max. | min. | max. |
| 18 | 24 | 15 | 25 | 25 | 35 | 35 | 45 | 45 | 60 |
| 24 | 30 | 20 | 30 | 30 | 40 | 40 | 55 | 55 | 75 |
| 30 | 40 | 25 | 35 | 35 | 50 | 50 | 65 | 65 | 85 |
| 40 | 50 | 30 | 45 | 45 | 60 | 60 | 80 | 80 | 100 |
| 50 | 65 | 40 | 55 | 55 | 75 | 75 | 95 | 95 | 120 |
| 65 | 80 | 50 | 70 | 70 | 95 | 95 | 120 | 120 | 150 |
| 80 | 100 | 55 | 80 | 80 | 110 | 110 | 140 | 140 | 180 |
| 100 | 120 | 65 | 100 | 100 | 135 | 135 | 170 | 170 | 220 |
| 120 | 140 | 80 | 120 | 120 | 160 | 160 | 200 | 200 | 260 |
| 140 | 160 | 90 | 130 | 130 | 180 | 180 | 230 | 230 | 300 |
| 160 | 180 | 100 | 140 | 140 | 200 | 200 | 260 | 260 | 340 |
| 180 | 200 | 110 | 160 | 160 | 220 | 220 | 290 | 290 | 370 |
| 200 | 225 | 120 | 180 | 180 | 250 | 250 | 320 | 320 | 410 |
| 225 | 250 | 140 | 200 | 200 | 270 | 270 | 350 | 350 | 450 |
| 250 | 280 | 150 | 220 | 220 | 300 | 300 | 390 | 390 | 490 |
| 280 | 315 | 170 | 240 | 240 | 330 | 330 | 430 | 430 | 540 |
| 315 | 355 | 190 | 270 | 270 | 360 | 360 | 470 | 470 | 590 |
| 355 | 400 | 210 | 300 | 300 | 400 | 400 | 520 | 520 | 650 |
| 400 | 450 | 230 | 330 | 330 | 440 | 440 | 570 | 570 | 720 |
| 450 | 500 | 260 | 370 | 370 | 490 | 490 | 630 | 630 | 790 |
| 500 | 560 | 290 | 410 | 410 | 540 | 540 | 680 | 680 | 870 |
| 560 | 630 | 320 | 460 | 460 | 600 | 600 | 760 | 760 | 980 |
| 630 | 710 | 350 | 510 | 510 | 670 | 670 | 850 | 850 | 1090 |
| 710 | 800 | 390 | 570 | 570 | 750 | 750 | 960 | 960 | 1220 |
| 800 | 900 | 440 | 640 | 640 | 840 | 840 | 1070 | 1070 | 1370 |

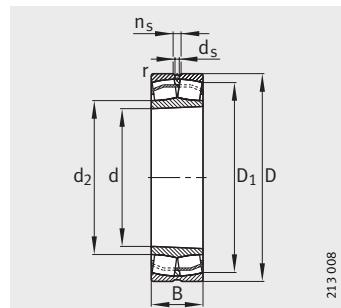


Spherical roller bearings

With cylindrical
or tapered bore



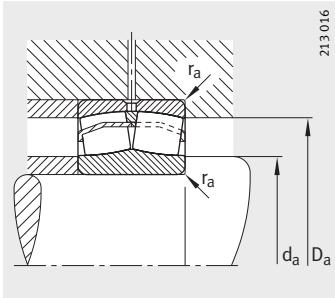
E1 design
Cylindrical bore



Tapered bore
K = taper 1:12

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|-----------------|------------------|------------|----|-----|-----------|----------------|----------------|----------------|----------------|-----|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 21304-E1-TVPB | XL | 0,16 | 20 | 52 | 15 | 1,1 | 43 | 28,9 | — | — |
| 22205-E1-K | XL | 0,175 | 25 | 52 | 18 | 1 | 44,5 | 31,3 | 3,2 | 4,8 |
| 22205-E1 | XL | 0,18 | 25 | 52 | 18 | 1 | 44,5 | 31,3 | 3,2 | 4,8 |
| 21305-E1-TVPB | XL | 0,254 | 25 | 62 | 17 | 1,1 | 51 | 35,2 | — | — |
| 22206-E1-K | XL | 0,269 | 30 | 62 | 20 | 1 | 53,7 | 37,9 | 3,2 | 4,8 |
| 22206-E1 | XL | 0,275 | 30 | 62 | 20 | 1 | 53,7 | 37,9 | 3,2 | 4,8 |
| 21306-E1-TVPB | XL | 0,386 | 30 | 72 | 19 | 1,1 | 59,9 | 41,5 | — | — |
| 22207-E1-K | XL | 0,425 | 35 | 72 | 23 | 1,1 | 62,5 | 43,8 | 3,2 | 4,8 |
| 22207-E1 | XL | 0,434 | 35 | 72 | 23 | 1,1 | 62,5 | 43,8 | 3,2 | 4,8 |
| 21307-E1-K-TVPB | XL | 0,496 | 35 | 80 | 21 | 1,5 | 66,6 | 47,4 | — | — |
| 21307-E1-TVPB | XL | 0,503 | 35 | 80 | 21 | 1,5 | 66,6 | 47,4 | — | — |
| 22208-E1-K | XL | 0,517 | 40 | 80 | 23 | 1,1 | 70,4 | 48,6 | 3,2 | 4,8 |
| 22208-E1 | XL | 0,528 | 40 | 80 | 23 | 1,1 | 70,4 | 48,6 | 3,2 | 4,8 |
| 21308-E1 | XL | 0,701 | 40 | 90 | 23 | 1,5 | 80,8 | 59,7 | 3,2 | 4,8 |
| 21308-E1-K | XL | 0,702 | 40 | 90 | 23 | 1,5 | 80,8 | 59,7 | 3,2 | 4,8 |
| 22308-E1-K | XL | 1,03 | 40 | 90 | 33 | 1,5 | 76 | 52,4 | 3,2 | 4,8 |
| 22308-E1 | XL | 1,05 | 40 | 90 | 33 | 1,5 | 76 | 52,4 | 3,2 | 4,8 |
| 22308-E1-T41A | XL | 1,05 | 40 | 90 | 33 | 1,5 | 76 | 52,4 | 3,2 | 4,8 |
| 22209-E1-K | XL | 0,577 | 45 | 85 | 23 | 1,1 | 75,6 | 54,8 | 3,2 | 4,8 |
| 22209-E1 | XL | 0,589 | 45 | 85 | 23 | 1,1 | 75,6 | 54,8 | 3,2 | 4,8 |
| 21309-E1-K | XL | 0,845 | 45 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 |
| 21309-E1 | XL | 0,845 | 45 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 |
| 22309-E1-K | XL | 1,36 | 45 | 100 | 36 | 1,5 | 84,7 | 58,9 | 3,2 | 6,5 |
| 22309-E1 | XL | 1,39 | 45 | 100 | 36 | 1,5 | 84,7 | 58,9 | 3,2 | 6,5 |
| 22309-E1-T41A | XL | 1,39 | 45 | 100 | 36 | 1,5 | 84,7 | 58,9 | 3,2 | 6,5 |
| 22210-E1-K | XL | 0,608 | 50 | 90 | 23 | 1,1 | 80,8 | 59,7 | 3,2 | 4,8 |
| 22210-E1 | XL | 0,622 | 50 | 90 | 23 | 1,1 | 80,8 | 59,7 | 3,2 | 4,8 |
| 21310-E1-K | XL | 1,28 | 50 | 110 | 27 | 2 | 89,8 | 67,3 | 3,2 | 4,8 |
| 21310-E1 | XL | 1,28 | 50 | 110 | 27 | 2 | 89,8 | 67,3 | 3,2 | 4,8 |
| 22310-E1-K | XL | 1,86 | 50 | 110 | 40 | 2 | 92,6 | 63 | 3,2 | 6,5 |
| 22310-E1 | XL | 1,9 | 50 | 110 | 40 | 2 | 92,6 | 63 | 3,2 | 6,5 |
| 22310-E1-T41A | XL | 1,9 | 50 | 110 | 40 | 2 | 92,6 | 63 | 3,2 | 6,5 |
| 22211-E1-K | XL | 0,825 | 55 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 |
| 22211-E1 | XL | 0,851 | 55 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 |
| 21311-E1-K | XL | 1,19 | 55 | 120 | 29 | 2 | 98,3 | 71,4 | 3,2 | 6,5 |
| 21311-E1 | XL | 1,19 | 55 | 120 | 29 | 2 | 98,3 | 71,4 | 3,2 | 6,5 |



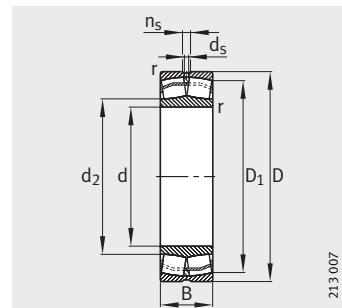
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 27 | 45 | 1 | 40 500 | 33 500 | 0,3 | 2,25 | 3,34 | 2,2 | 3 700 | 15 000 | 10 100 |
| 30,6 | 46,4 | 1 | 48 000 | 42 500 | 0,34 | 1,98 | 2,94 | 1,93 | 4 800 | 17 000 | 9 500 |
| 30,6 | 46,4 | 1 | 48 000 | 42 500 | 0,34 | 1,98 | 2,94 | 1,93 | 4 800 | 17 000 | 9 500 |
| 32 | 55 | 1 | 52 000 | 43 000 | 0,28 | 2,43 | 3,61 | 2,37 | 4 750 | 13 000 | 8 700 |
| 35,6 | 54,6 | 1 | 64 000 | 57 000 | 0,31 | 2,15 | 3,2 | 2,1 | 6 900 | 13 000 | 8 100 |
| 35,6 | 56,4 | 1 | 64 000 | 57 000 | 0,31 | 2,15 | 3,2 | 2,1 | 6 900 | 13 000 | 8 100 |
| 37 | 65 | 1 | 72 000 | 63 000 | 0,27 | 2,49 | 3,71 | 2,43 | 7 000 | 11 000 | 7 500 |
| 42 | 65 | 1 | 88 000 | 81 500 | 0,31 | 2,16 | 3,22 | 2,12 | 9 400 | 11 000 | 7 300 |
| 42 | 65 | 1 | 88 000 | 81 500 | 0,31 | 2,16 | 3,22 | 2,12 | 9 400 | 11 000 | 7 300 |
| 44 | 71 | 1,5 | 83 000 | 73 500 | 0,26 | 2,55 | 3,8 | 2,5 | 8 100 | 9 500 | 7 000 |
| 44 | 71 | 1,5 | 83 000 | 73 500 | 0,26 | 2,55 | 3,8 | 2,5 | 8 100 | 9 500 | 7 000 |
| 47 | 73 | 1 | 102 000 | 90 000 | 0,28 | 2,41 | 3,59 | 2,35 | 11 800 | 10 000 | 6 400 |
| 47 | 73 | 1 | 102 000 | 90 000 | 0,28 | 2,41 | 3,59 | 2,35 | 11 800 | 10 000 | 6 400 |
| 49 | 81 | 1,5 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 6 100 |
| 49 | 81 | 1,5 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 6 100 |
| 49 | 81 | 1,5 | 156 000 | 150 000 | 0,36 | 1,86 | 2,77 | 1,82 | 13 100 | 7 500 | 5 800 |
| 49 | 81 | 1,5 | 156 000 | 150 000 | 0,36 | 1,86 | 2,77 | 1,82 | 13 100 | 7 500 | 5 800 |
| 49 | 81 | 1,5 | 156 000 | 150 000 | 0,36 | 1,86 | 2,77 | 1,82 | 13 100 | 7 500 | 5 800 |
| 52 | 78 | 1 | 104 000 | 98 000 | 0,26 | 2,62 | 3,9 | 2,56 | 12 700 | 10 000 | 5 800 |
| 52 | 78 | 1 | 104 000 | 98 000 | 0,26 | 2,62 | 3,9 | 2,56 | 12 700 | 10 000 | 5 800 |
| 54 | 91 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 500 |
| 54 | 91 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 500 |
| 54 | 91 | 1,5 | 186 000 | 183 000 | 0,36 | 1,9 | 2,83 | 1,86 | 16 100 | 6 700 | 5 300 |
| 54 | 91 | 1,5 | 186 000 | 183 000 | 0,36 | 1,9 | 2,83 | 1,86 | 16 100 | 6 700 | 5 300 |
| 54 | 91 | 1,5 | 186 000 | 183 000 | 0,36 | 1,9 | 2,83 | 1,86 | 16 100 | 6 700 | 5 300 |
| 57 | 83 | 1 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 5 300 |
| 57 | 83 | 1 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 5 300 |
| 61 | 99 | 2 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 300 |
| 61 | 99 | 2 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 300 |
| 61 | 99 | 2 | 228 000 | 224 000 | 0,36 | 1,86 | 2,77 | 1,82 | 20 300 | 6 000 | 4 950 |
| 61 | 99 | 2 | 228 000 | 224 000 | 0,36 | 1,86 | 2,77 | 1,82 | 20 300 | 6 000 | 4 950 |
| 61 | 99 | 2 | 228 000 | 224 000 | 0,36 | 1,86 | 2,77 | 1,82 | 20 300 | 6 000 | 4 950 |
| 64 | 91 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 4 850 |
| 64 | 91 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 4 850 |
| 66 | 109 | 2 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 6 300 | 4 950 |
| 66 | 109 | 2 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 6 300 | 4 950 |

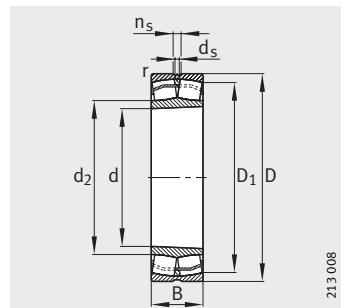


Spherical roller bearings

With cylindrical
or tapered bore



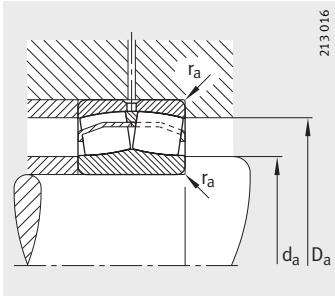
E1 design
Cylindrical bore



Tapered bore
 $K = \text{taper } 1:12$

Dimension table (continued) - Dimensions in mm

| Designation | X-life | Mass m ≈kg | Dimensions | | | | | | | | |
|-----------------|--------|------------------|------------|-----|----|-----------|----------------|----------------|----------------|----------------|--|
| | | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 22311-E1-K | XL | 2,22 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | |
| 22311-E1-K-T41A | XL | 2,22 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | |
| 22311-E1 | XL | 2,27 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | |
| 22311-E1-T41A | XL | 2,27 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | |
| 22212-E1-K | XL | 1,09 | 60 | 110 | 28 | 1,5 | 98,7 | 71,4 | 3,2 | 6,5 | |
| 22212-E1 | XL | 1,12 | 60 | 110 | 28 | 1,5 | 98,7 | 71,4 | 3,2 | 6,5 | |
| 21312-E1-K | XL | 1,78 | 60 | 130 | 31 | 2,1 | 112,5 | 84,4 | 3,2 | 6,5 | |
| 21312-E1 | XL | 1,78 | 60 | 130 | 31 | 2,1 | 112,5 | 84,4 | 3,2 | 6,5 | |
| 22312-E1-K | XL | 2,83 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | |
| 22312-E1-K-T41A | XL | 2,83 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | |
| 22312-E1 | XL | 2,89 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | |
| 22312-E1-T41A | XL | 2,89 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | |
| 22213-E1-K | XL | 1,52 | 65 | 120 | 31 | 1,5 | 107,3 | 79,1 | 3,2 | 6,5 | |
| 22213-E1 | XL | 1,55 | 65 | 120 | 31 | 1,5 | 107,3 | 79,1 | 3,2 | 6,5 | |
| 21313-E1-K | XL | 2,42 | 65 | 140 | 33 | 2,1 | 126,8 | 94,9 | 3,2 | 6,5 | |
| 21313-E1 | XL | 2,42 | 65 | 140 | 33 | 2,1 | 126,8 | 94,9 | 3,2 | 6,5 | |
| 22313-E1-K | XL | 3,49 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | |
| 22313-E1-K-T41A | XL | 3,49 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | |
| 22313-E1 | XL | 3,57 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | |
| 22313-E1-T41A | XL | 3,57 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | |
| 22214-E1-K | XL | 1,61 | 70 | 125 | 31 | 1,5 | 112,5 | 84,4 | 3,2 | 6,5 | |
| 22214-E1 | XL | 1,65 | 70 | 125 | 31 | 1,5 | 112,5 | 84,4 | 3,2 | 6,5 | |
| 21314-E1-K | XL | 3 | 70 | 150 | 35 | 2,1 | 126,2 | 94,9 | 3,2 | 6,5 | |
| 21314-E1 | XL | 3 | 70 | 150 | 35 | 2,1 | 126,2 | 94,9 | 3,2 | 6,5 | |
| 22314-E1-K | XL | 4,12 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | |
| 22314-E1-K-T41A | XL | 4,12 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | |
| 22314-E1 | XL | 4,21 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | |
| 22314-E1-T41A | XL | 4,21 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | |
| 22215-E1-K | XL | 1,68 | 75 | 130 | 31 | 1,5 | 117,7 | 89,8 | 3,2 | 6,5 | |
| 22215-E1 | XL | 1,72 | 75 | 130 | 31 | 1,5 | 117,7 | 89,8 | 3,2 | 6,5 | |
| 21315-E1-K | XL | 2,86 | 75 | 160 | 37 | 2,1 | 135,2 | 99,7 | 3,2 | 6,5 | |
| 21315-E1 | XL | 2,86 | 75 | 160 | 37 | 2,1 | 135,2 | 99,7 | 3,2 | 6,5 | |
| 22315-E1-K | XL | 5,06 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | |
| 22315-E1-K-T41A | XL | 5,06 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | |
| 22315-E1 | XL | 5,18 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | |
| 22315-E1-T41A | XL | 5,18 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | |



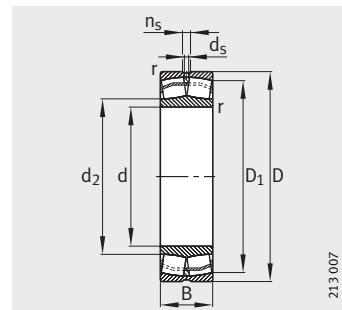
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 66 | 109 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| 66 | 109 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| 66 | 109 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| 66 | 109 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| 69 | 101 | 1,5 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 7 500 | 4 650 |
| 69 | 101 | 1,5 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 7 500 | 4 650 |
| 72 | 118 | 2,1 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 500 |
| 72 | 118 | 2,1 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 500 |
| 72 | 118 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| 72 | 118 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| 72 | 118 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| 72 | 118 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| 74 | 111 | 1,5 | 200 000 | 208 000 | 0,24 | 2,81 | 4,19 | 2,75 | 25 500 | 6 700 | 4 400 |
| 74 | 111 | 1,5 | 200 000 | 208 000 | 0,24 | 2,81 | 4,19 | 2,75 | 25 500 | 6 700 | 4 400 |
| 77 | 128 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 200 |
| 77 | 128 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 200 |
| 77 | 128 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| 77 | 128 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| 77 | 128 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| 77 | 128 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| 79 | 116 | 1,5 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 100 |
| 79 | 116 | 1,5 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 100 |
| 82 | 138 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 100 |
| 82 | 138 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 100 |
| 82 | 138 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| 82 | 138 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| 82 | 138 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| 82 | 138 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| 84 | 121 | 1,5 | 216 000 | 236 000 | 0,22 | 3,1 | 4,62 | 3,03 | 29 500 | 6 300 | 3 900 |
| 84 | 121 | 1,5 | 216 000 | 236 000 | 0,22 | 3,1 | 4,62 | 3,03 | 29 500 | 6 300 | 3 900 |
| 87 | 148 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 850 |
| 87 | 148 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 850 |
| 87 | 148 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |
| 87 | 148 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |
| 87 | 148 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |
| 87 | 148 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |

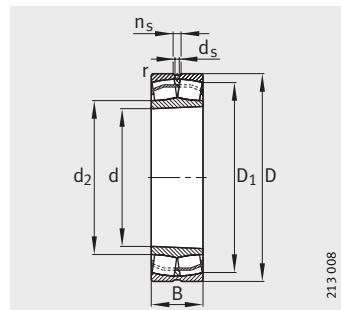


Spherical roller bearings

With cylindrical
or tapered bore



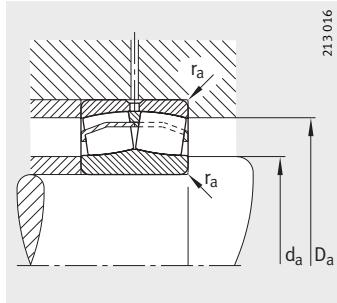
E1 design
Cylindrical bore



Tapered bore
 $K = \text{taper } 1:12$

Dimension table (continued) - Dimensions in mm

| Designation | X-life | Mass m ≈kg | Dimensions | | | | | | | |
|-----------------|--------|------------------|------------|-----|------|-----------|----------------|----------------|----------------|----------------|
| | | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s |
| 22216-E1-K | XL | 2,08 | 80 | 140 | 33 | 2 | 126,8 | 94,9 | 3,2 | 6,5 |
| 22216-E1 | XL | 2,13 | 80 | 140 | 33 | 2 | 126,8 | 94,9 | 3,2 | 6,5 |
| 21316-E1-K | XL | 2,65 | 80 | 170 | 39 | 2,1 | 135,4 | 99,8 | 3,2 | 6,5 |
| 21316-E1 | XL | 2,65 | 80 | 170 | 39 | 2,1 | 135,4 | 99,7 | 3,2 | 6,5 |
| 22316-E1-K | XL | 6,05 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 |
| 22316-E1-K-T41A | XL | 6,05 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 |
| 22316-E1 | XL | 6,27 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 |
| 22316-E1-T41A | XL | 6,27 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 |
| 22217-E1-K | XL | 2,59 | 85 | 150 | 36 | 2 | 135,4 | 99,7 | 3,2 | 6,5 |
| 22217-E1 | XL | 2,65 | 85 | 150 | 36 | 2 | 135,4 | 99,7 | 3,2 | 6,5 |
| 21317-E1-K | XL | 5,37 | 85 | 180 | 41 | 3 | 143,9 | 106,1 | 4,8 | 9,5 |
| 21317-E1 | XL | 5,37 | 85 | 180 | 41 | 3 | 143,9 | 106,1 | 4,8 | 9,5 |
| 22317-E1 | XL | 7,06 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 |
| 22317-E1-T41A | XL | 7,06 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 |
| 22317-E1-K | XL | 7,06 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 |
| 22317-E1-K-T41A | XL | 7,06 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 |
| 22218-E1-K | XL | 3,35 | 90 | 160 | 40 | 2 | 143,9 | 106,1 | 3,2 | 6,5 |
| 22218-E1 | XL | 3,43 | 90 | 160 | 40 | 2 | 143,9 | 106,1 | 3,2 | 6,5 |
| 23218-E1-K-TVPB | XL | 4,08 | 90 | 160 | 52,4 | 2 | 140 | 104,1 | 3,2 | 6,5 |
| 23218-E1-TVPB | XL | 4,27 | 90 | 160 | 52,4 | 2 | 140 | 104,1 | 3,2 | 6,5 |
| 23218-E1A-K-M | XL | 4,34 | 90 | 160 | 52,4 | 2 | 140 | - | 3,2 | 6,5 |
| 21318-E1-K | XL | 6,26 | 90 | 190 | 43 | 3 | 152,7 | 112,6 | 4,8 | 9,5 |
| 21318-E1 | XL | 6,26 | 90 | 190 | 43 | 3 | 152,7 | 112,6 | 4,8 | 9,5 |
| 22318-E1-K | XL | 8,33 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 |
| 22318-E1-K-T41A | XL | 8,33 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 |
| 22318-E1 | XL | 8,51 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 |
| 22318-E1-T41A | XL | 8,51 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 |
| 22219-E1-K | XL | 4,04 | 95 | 170 | 43 | 2,1 | 152,7 | 112,6 | 4,8 | 9,5 |
| 22219-E1 | XL | 4,13 | 95 | 170 | 43 | 2,1 | 152,7 | 112,6 | 4,8 | 9,5 |
| 21319-E1-K-TVPB | XL | 6,53 | 95 | 200 | 45 | 3 | 169,4 | 124,3 | 4,8 | 9,5 |
| 21319-E1-TVPB | XL | 6,63 | 95 | 200 | 45 | 3 | 169,4 | 124,3 | 4,8 | 9,5 |
| 22319-E1-K | XL | 9,46 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 |
| 22319-E1-K-T41A | XL | 9,46 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 |
| 22319-E1 | XL | 9,69 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 |
| 22319-E1-T41A | XL | 9,69 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 |
| 23120-E1-K-TVPB | XL | 4,06 | 100 | 165 | 52 | 2 | 146,3 | 113,9 | 3,2 | 6,5 |



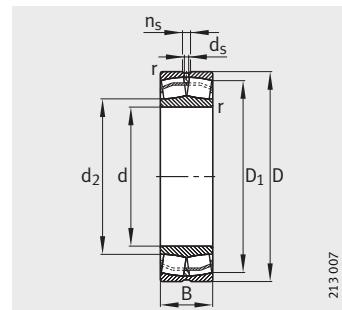
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} | Limiting speed n_G | Reference speed n_B |
|---------------------|---------------|---------------|--------------------|-------------------|---------------------|-------|-------|-------|--------------------------------|-------------------------|--------------------------|
| d_a min. | D_a max. | r_a max. | dyn. C_r | stat. C_{0r} | e | Y_1 | Y_2 | Y_0 | N | min ⁻¹ | min ⁻¹ |
| 91 | 129 | 2 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 600 | 3 700 |
| 91 | 129 | 2 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 600 | 3 700 |
| 92 | 158 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 750 |
| 92 | 158 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 750 |
| 92 | 158 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| 92 | 158 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| 92 | 158 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| 92 | 158 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| 96 | 139 | 2 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 5 300 | 3 550 |
| 96 | 139 | 2 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 5 300 | 3 550 |
| 99 | 166 | 2,5 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 550 |
| 99 | 166 | 2,5 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 550 |
| 99 | 166 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| 99 | 166 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| 99 | 166 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| 99 | 166 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| 101 | 149 | 2 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 500 |
| 101 | 149 | 2 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 500 |
| 101 | 149 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| 101 | 149 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| 101 | 149 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| 104 | 176 | 2,5 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 450 |
| 104 | 176 | 2,5 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 450 |
| 104 | 176 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| 104 | 176 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| 104 | 176 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| 104 | 176 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| 107 | 158 | 2,1 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 400 |
| 107 | 158 | 2,1 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 400 |
| 109 | 186 | 2,5 | 430 000 | 455 000 | 0,22 | 3,04 | 4,53 | 2,97 | 47 500 | 4 000 | 3 300 |
| 109 | 186 | 2,5 | 430 000 | 455 000 | 0,22 | 3,04 | 4,53 | 2,97 | 47 500 | 4 000 | 3 300 |
| 109 | 186 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| 109 | 186 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| 109 | 186 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| 109 | 186 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| 111 | 154 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |

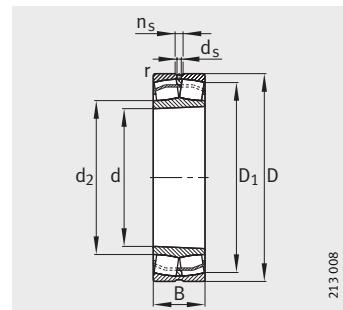


Spherical roller bearings

With cylindrical
or tapered bore



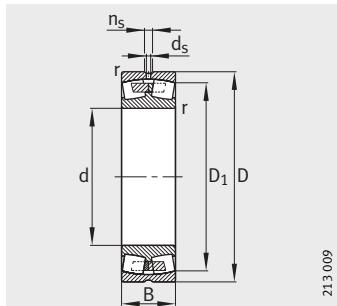
E1 design
Cylindrical bore



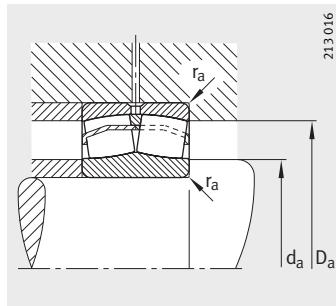
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

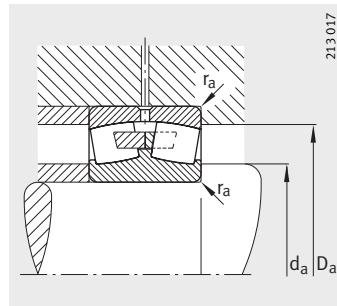
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|-------------------|------------------|------------|-----|-----|-----------|----------------|----------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 23120-E1-TVPB | XL | 4,22 | 100 | 165 | 52 | 2 | 146,3 | 113,9 | 3,2 | 6,5 |
| 23120-E1A-K-M | XL | 4,23 | 100 | 165 | 52 | 2 | 146,3 | — | 3,2 | 6,5 |
| 23120-E1A-M | XL | 4,37 | 100 | 165 | 52 | 2 | 146,3 | — | 3,2 | 6,5 |
| 22220-E1-K | XL | 4,91 | 100 | 180 | 46 | 2,1 | 161,4 | 119 | 4,8 | 9,5 |
| 22220-E1 | XL | 4,96 | 100 | 180 | 46 | 2,1 | 161,4 | 119 | 4,8 | 9,5 |
| 23220-E1-K-TVPB | XL | 6,13 | 100 | 180 | 60,3 | 2,1 | 156,7 | 116,7 | 4,8 | 9,5 |
| 23220-E1-TVPB | XL | 6,32 | 100 | 180 | 60,3 | 2,1 | 156,7 | 116,7 | 4,8 | 9,5 |
| 23220-E1A-K-M | XL | 6,33 | 100 | 180 | 60,3 | 2,1 | 156,7 | — | 4,8 | 9,5 |
| 23220-E1A-M | XL | 6,45 | 100 | 180 | 60,3 | 2,1 | 156,7 | — | 4,8 | 9,5 |
| 21320-E1-K-TVPB | XL | 8,08 | 100 | 215 | 47 | 3 | 182 | 132 | 4,8 | 9,5 |
| 21320-E1-TVPB | XL | 8,19 | 100 | 215 | 47 | 3 | 182 | 132 | 4,8 | 9,5 |
| 22320-E1 | XL | 13,1 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 |
| 22320-E1-T41A | XL | 13,1 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 |
| 22320-E1-K | XL | 13,1 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 |
| 22320-E1-K-T41A | XL | 13,1 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 |
| 23320-AS-MA-T41A | — | 15,5 | 100 | 215 | 82,6 | 3 | 179,5 | — | 4,8 | 9,5 |
| 23022-E1-TVPB | XL | 3,55 | 110 | 170 | 45 | 2 | 154,6 | 123,7 | 3,2 | 6,5 |
| 23022-E1A-M | XL | 3,67 | 110 | 170 | 45 | 2 | 154,6 | — | 3,2 | 6,5 |
| 23122-E1-K-TVPB | XL | 4,95 | 110 | 180 | 56 | 2 | 160 | 124,6 | 4,8 | 9,5 |
| 23122-E1A-K-M | XL | 5,1 | 110 | 180 | 56 | 2 | 160 | — | 4,8 | 9,5 |
| 23122-E1-TVPB | XL | 5,31 | 110 | 180 | 56 | 2 | 160 | 124,6 | 4,8 | 9,5 |
| 23122-E1A-M | XL | 5,51 | 110 | 180 | 56 | 2 | 160 | — | 4,8 | 9,5 |
| 24122-E1-K30-TVPB | XL | 6,69 | 110 | 180 | 69 | 2 | 154,8 | 125,1 | 3,2 | 6,5 |
| 24122-E1-TVPB | XL | 6,85 | 110 | 180 | 69 | 2 | 154,8 | 125,1 | 3,2 | 6,5 |
| 22222-E1-K | XL | 6,82 | 110 | 200 | 53 | 2,1 | 178,7 | 129,4 | 4,8 | 9,5 |
| 22222-E1 | XL | 6,99 | 110 | 200 | 53 | 2,1 | 178,7 | 129,4 | 4,8 | 9,5 |
| 23222-E1-K-TVPB | XL | 8,82 | 110 | 200 | 69,8 | 2,1 | 172,7 | 129,1 | 4,8 | 9,5 |
| 23222-E1-TVPB | XL | 9,18 | 110 | 200 | 69,8 | 2,1 | 172,7 | 129,1 | 4,8 | 9,5 |
| 23222-E1A-K-M | XL | 9,32 | 110 | 200 | 69,8 | 2,1 | 172,7 | — | 4,8 | 9,5 |
| 23222-E1A-M | XL | 9,54 | 110 | 200 | 69,8 | 2,1 | 172,7 | — | 4,8 | 9,5 |
| 21322-E1-K-TVPB | XL | 10,9 | 110 | 240 | 50 | 3 | 202,5 | 146,4 | 6,3 | 12,2 |
| 21322-E1-TVPB | XL | 11,1 | 110 | 240 | 50 | 3 | 202,5 | 146,4 | 6,3 | 12,2 |
| 22322-E1-K | XL | 17,4 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 |
| 22322-E1-K-T41A | XL | 17,4 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 |
| 22322-E1 | XL | 17,7 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 |
| 22322-E1-T41A | XL | 17,7 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 |



With central rib
Cylindrical bore



Mounting dimensions
E1 design



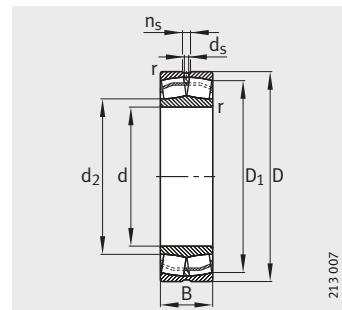
Mounting dimensions
With central rib

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 111 | 154 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| 111 | 154 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| 111 | 154 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| 112 | 168 | 2,1 | 430 000 | 475 000 | 0,24 | 2,84 | 4,23 | 2,78 | 52 000 | 4 300 | 3 300 |
| 112 | 168 | 2,1 | 430 000 | 475 000 | 0,24 | 2,84 | 4,23 | 2,78 | 52 000 | 4 300 | 3 300 |
| 112 | 168 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| 112 | 168 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| 112 | 168 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| 112 | 168 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| 114 | 201 | 2,5 | 490 000 | 530 000 | 0,22 | 3,14 | 4,67 | 3,07 | 61 000 | 3 600 | 3 100 |
| 114 | 201 | 2,5 | 490 000 | 530 000 | 0,22 | 3,14 | 4,67 | 3,07 | 61 000 | 3 600 | 3 100 |
| 114 | 201 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| 114 | 201 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| 114 | 201 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| 114 | 201 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| 114 | 201 | 2,5 | 680 000 | 900 000 | 0,43 | 1,57 | 2,34 | 1,53 | 69 000 | 2 800 | — |
| 118,8 | 161,2 | 2 | 400 000 | 530 000 | 0,23 | 2,9 | 4,31 | 2,83 | 52 000 | 4 300 | 3 050 |
| 118,8 | 161,2 | 2 | 400 000 | 530 000 | 0,23 | 2,9 | 4,31 | 2,83 | 52 000 | 4 300 | 3 050 |
| 121 | 169 | 2 | 530 000 | 680 000 | 0,28 | 2,39 | 3,56 | 2,34 | 61 000 | 4 000 | 2 600 |
| 121 | 169 | 2 | 530 000 | 680 000 | 0,28 | 2,41 | 3,59 | 2,35 | 61 000 | 4 000 | 2 600 |
| 121 | 169 | 2 | 530 000 | 680 000 | 0,28 | 2,41 | 3,56 | 2,34 | 61 000 | 4 000 | 2 600 |
| 121 | 169 | 2 | 530 000 | 680 000 | 0,28 | 2,41 | 3,59 | 2,35 | 61 000 | 4 000 | 2 600 |
| 121 | 169 | 2 | 620 000 | 900 000 | 0,35 | 1,94 | 2,88 | 1,89 | 67 000 | 2 600 | 1 820 |
| 121 | 169 | 2 | 620 000 | 900 000 | 0,35 | 1,94 | 2,88 | 1,89 | 67 000 | 2 600 | 1 820 |
| 122 | 188 | 2,1 | 550 000 | 600 000 | 0,25 | 2,71 | 4,04 | 2,65 | 62 000 | 4 000 | 3 100 |
| 122 | 188 | 2,1 | 550 000 | 600 000 | 0,25 | 2,71 | 4,04 | 2,65 | 62 000 | 4 000 | 3 100 |
| 122 | 188 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| 122 | 188 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| 122 | 188 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| 122 | 188 | 2,1 | 600 000 | 640 000 | 0,21 | 3,24 | 4,82 | 3,16 | 69 000 | 3 000 | 2 750 |
| 124 | 226 | 2,5 | 600 000 | 640 000 | 0,21 | 3,24 | 4,82 | 3,16 | 69 000 | 3 000 | 2 750 |
| 124 | 226 | 2,5 | 600 000 | 640 000 | 0,21 | 3,24 | 4,82 | 3,16 | 69 000 | 3 000 | 2 750 |
| 124 | 226 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |
| 124 | 226 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |
| 124 | 226 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |
| 124 | 226 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |

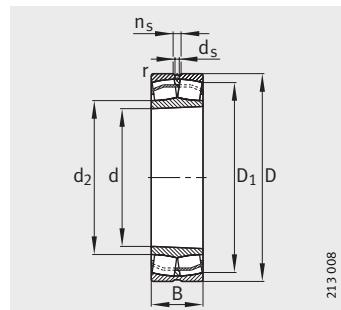


Spherical roller bearings

With cylindrical
or tapered bore



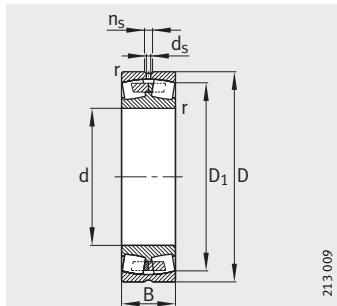
E1 design
Cylindrical bore



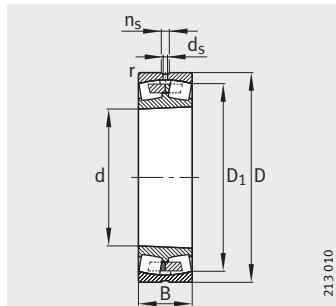
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

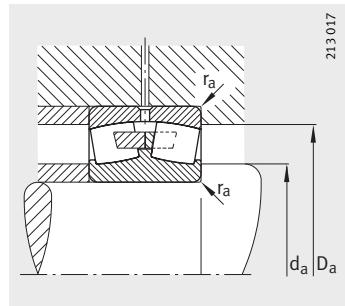
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|---------------------------|------------------|------------|------------|-----|-----------|----------------|----------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 23322-AS-MA-T41A | — | 21,3 | 110 | 240 | 92,1 | 3 | 199,6 | — | 6,3 | 12,2 |
| 23024-E1-K-TV PB | XL | 3,67 | 120 | 180 | 46 | 2 | 164,7 | 133 | 3,2 | 6,5 |
| 23024-E1-TV PB | XL | 3,86 | 120 | 180 | 46 | 2 | 164,7 | 133 | 3,2 | 6,5 |
| 23024-E1A-K-M | XL | 4,09 | 120 | 180 | 46 | 2 | 164,7 | — | 3,2 | 6,5 |
| 23024-E1A-M | XL | 4,17 | 120 | 180 | 46 | 2 | 164,7 | — | 3,2 | 6,5 |
| 24024-S-K30-MB | — | 5,35 | 120 | 180 | 60 | 2 | 159,8 | — | 3,2 | 6,5 |
| 24024-S-MB | — | 5,46 | 120 | 180 | 60 | 2 | 159,8 | — | 3,2 | 6,5 |
| 24024-E1-TV PB | XL | 5,65 | 120 | 180 | 60 | 2 | 160 | 132 | 3,2 | 6,5 |
| 24024-E1-K30-TV PB | XL | 6,11 | 120 | 180 | 60 | 2 | 160 | 132 | 3,2 | 6,5 |
| 23124-E1-K-TV PB | XL | 7,06 | 120 | 200 | 62 | 2 | 177,4 | 136,2 | 4,8 | 9,5 |
| 23124-E1-TV PB | XL | 7,39 | 120 | 200 | 62 | 2 | 177,4 | 136,2 | 4,8 | 9,5 |
| 23124-E1A-K-M | XL | 7,57 | 120 | 200 | 62 | 2 | 177,4 | — | 4,8 | 9,5 |
| 23124-E1A-M | XL | 7,7 | 120 | 200 | 62 | 2 | 177,4 | — | 4,8 | 9,5 |
| 24124-E1-K30-TV PB | XL | 11,5 | 120 | 200 | 80 | 2 | 170,6 | 136,3 | 3,2 | 6,5 |
| 24124-E1-TV PB | XL | 11,6 | 120 | 200 | 80 | 2 | 170,6 | 136,3 | 3,2 | 6,5 |
| 22224-E1 | XL | 8,84 | 120 | 215 | 58 | 2,1 | 192 | 141,8 | 6,3 | 12,2 |
| 22224-E1-K | XL | 8,84 | 120 | 215 | 58 | 2,1 | 192 | 141,8 | 6,3 | 12,2 |
| 23224-E1-K-TV PB | XL | 11,1 | 120 | 215 | 76 | 2,1 | 185,5 | 139 | 4,8 | 9,5 |
| 23224-E1A-K-M | XL | 11,4 | 120 | 215 | 76 | 2,1 | 185,5 | — | 4,8 | 9,5 |
| 23224-E1-TV PB | XL | 11,5 | 120 | 215 | 76 | 2,1 | 185,5 | 139 | 4,8 | 9,5 |
| 23224-E1A-M | XL | 12,1 | 120 | 215 | 76 | 2,1 | 185,5 | — | 4,8 | 9,5 |
| 22324-E1-K | XL | 22,1 | 120 | 260 | 86 | 3 | 222,4 | 150,7 | 8 | 15 |
| 22324-E1-K-T41A | XL | 22,1 | 120 | 260 | 86 | 3 | 222,4 | 150,7 | 8 | 15 |
| 22324-E1 | XL | 22,5 | 120 | 260 | 86 | 3 | 222,4 | 150,8 | 8 | 15 |
| 22324-E1-T41A | XL | 22,5 | 120 | 260 | 86 | 3 | 222,4 | 150,8 | 8 | 15 |
| 23324-AS-MA-T41A | — | 29,1 | 120 | 260 | 106 | 3 | 213,9 | — | 6,3 | 12,2 |
| 23026-E1-K-TV PB | XL | 5,42 | 130 | 200 | 52 | 2 | 182,3 | 145,9 | 4,8 | 9,5 |
| 23026-E1-TV PB | XL | 5,61 | 130 | 200 | 52 | 2 | 182,3 | 145,9 | 4,8 | 9,5 |
| 23026-E1A-K-M | XL | 5,7 | 130 | 200 | 52 | 2 | 182,3 | — | 4,8 | 9,5 |
| 23026-E1A-M | XL | 5,96 | 130 | 200 | 52 | 2 | 182,3 | — | 4,8 | 9,5 |
| 24026-S-MB | — | 7,97 | 130 | 200 | 69 | 2 | 175,6 | — | 3,2 | 6,5 |
| 24026-E1-K30-TV PB | XL | 7,57 | 130 | 200 | 69 | 2 | 176,9 | 144,7 | 3,2 | 6,5 |
| 24026-E1-TV PB | XL | 7,72 | 130 | 200 | 69 | 2 | 176,9 | 144,7 | 3,2 | 6,5 |
| 23126-E1-K-TV PB | XL | 7,82 | 130 | 210 | 64 | 2 | 187,3 | 146 | 4,8 | 9,5 |
| 23126-E1A-K-M | XL | 8,1 | 130 | 210 | 64 | 2 | 187,3 | — | 4,8 | 9,5 |
| 23126-E1-TV PB | XL | 8,11 | 130 | 210 | 64 | 2 | 187,3 | 146 | 4,8 | 9,5 |



With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30



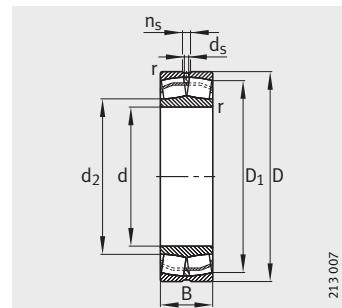
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a min. | D _a max. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 124 | 226 | 2,5 | 830 000 | 1 080 000 | 0,43 | 1,57 | 2,34 | 1,53 | 86 000 | 2 600 | — |
| 128,8 | 171,2 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| 128,8 | 171,2 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| 128,8 | 171,2 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| 128,8 | 171,2 | 2 | 405 000 | 710 000 | 0,32 | 2,09 | 3,11 | 2,04 | 40 000 | 2 600 | 2 380 |
| 128,8 | 171,2 | 2 | 405 000 | 710 000 | 0,32 | 2,09 | 3,11 | 2,04 | 40 000 | 2 600 | 2 380 |
| 128,8 | 171,2 | 2 | 540 000 | 800 000 | 0,29 | 2,3 | 3,42 | 2,25 | 72 000 | 3 000 | 2 290 |
| 128,8 | 171,2 | 2 | 540 000 | 800 000 | 0,29 | 2,3 | 3,42 | 2,25 | 72 000 | 3 000 | 2 290 |
| 131 | 189 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| 131 | 189 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| 131 | 189 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| 131 | 189 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| 131 | 189 | 2 | 780 000 | 1 120 000 | 0,37 | 1,84 | 2,74 | 1,8 | 85 000 | 2 200 | 1 610 |
| 131 | 189 | 2 | 780 000 | 1 120 000 | 0,37 | 1,84 | 2,74 | 1,8 | 85 000 | 2 200 | 1 610 |
| 132 | 203 | 2,1 | 640 000 | 735 000 | 0,25 | 2,71 | 4,04 | 2,65 | 71 000 | 3 400 | 2 800 |
| 132 | 203 | 2,1 | 640 000 | 735 000 | 0,25 | 2,71 | 4,04 | 2,65 | 71 000 | 3 400 | 2 800 |
| 132 | 203 | 2 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| 132 | 203 | 2 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| 132 | 203 | 2 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| 132 | 203 | 2 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| 134 | 246 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| 134 | 246 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| 134 | 246 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| 134 | 246 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| 134 | 246 | 2,5 | 1 020 000 | 1 430 000 | 0,45 | 1,5 | 2,23 | 1,46 | 103 000 | 2 400 | — |
| 138,8 | 191,2 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| 138,8 | 191,2 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| 138,8 | 191,2 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| 138,8 | 191,2 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| 138,8 | 191,2 | 2 | 500 000 | 900 000 | 0,34 | 1,99 | 2,96 | 1,94 | 53 000 | 2 600 | 2 140 |
| 138,8 | 191,2 | 2 | 680 000 | 1 020 000 | 0,31 | 2,21 | 3,29 | 2,16 | 85 000 | 2 600 | 2 050 |
| 138,8 | 191,2 | 2 | 680 000 | 1 020 000 | 0,31 | 2,21 | 3,29 | 2,16 | 85 000 | 2 600 | 2 050 |
| 141 | 199 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| 141 | 199 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| 141 | 199 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |

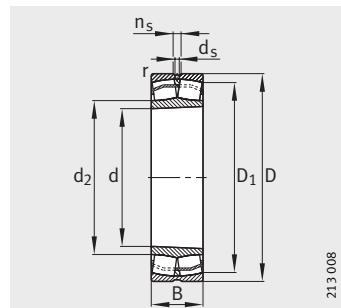


Spherical roller bearings

With cylindrical
or tapered bore



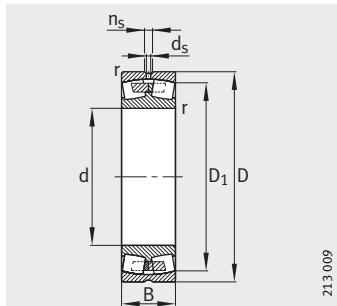
E1 design
Cylindrical bore



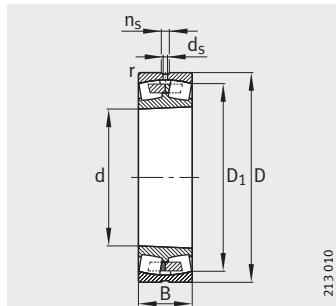
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

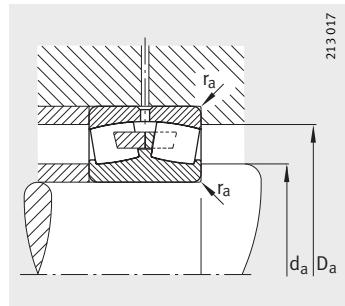
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|-------------------|------------------|------------|------------|-----|-----------|----------------|----------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 23126-E1A-M | XL | 8,45 | 130 | 210 | 64 | 2 | 187,3 | — | 4,8 | 9,5 |
| 24126-E1-K30-TVPB | XL | 10,1 | 130 | 210 | 80 | 2 | 181,1 | 146,4 | 3,2 | 6,5 |
| 24126-E1-TVPB | XL | 10,6 | 130 | 210 | 80 | 2 | 181,1 | 146,4 | 3,2 | 6,5 |
| 22226-E1-K | XL | 10,9 | 130 | 230 | 64 | 3 | 205 | 151,7 | 6,3 | 12,2 |
| 22226-E1 | XL | 11,3 | 130 | 230 | 64 | 3 | 205 | 151,7 | 6,3 | 12,2 |
| 23226-E1-K-TVPB | XL | 12,6 | 130 | 230 | 80 | 3 | 199,3 | 150 | 4,8 | 9,5 |
| 23226-E1-TVPB | XL | 13,4 | 130 | 230 | 80 | 3 | 199,3 | 150 | 4,8 | 9,5 |
| 23226-E1A-K-M | XL | 13,6 | 130 | 230 | 80 | 3 | 199,3 | — | 4,8 | 9,5 |
| 23226-E1A-M | XL | 14 | 130 | 230 | 80 | 3 | 199,3 | — | 4,8 | 9,5 |
| 22326-E1-K | XL | 27,4 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 |
| 22326-E1-K-T41A | XL | 27,4 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 |
| 22326-E1 | XL | 28 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 |
| 22326-E1-T41A | XL | 28 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 |
| 23326-AS-MA-T41A | — | 35,2 | 130 | 280 | 112 | 4 | 232,1 | — | 6,3 | 12,2 |
| 23028-E1-K-TVPB | XL | 5,81 | 140 | 210 | 53 | 2 | 192,3 | 155,4 | 4,8 | 9,5 |
| 23028-E1A-K-M | XL | 6 | 140 | 210 | 53 | 2 | 192,3 | — | 4,8 | 9,5 |
| 23028-E1-TVPB | XL | 6,04 | 140 | 210 | 53 | 2 | 192,3 | 155,4 | 4,8 | 9,5 |
| 23028-E1A-M | XL | 6,45 | 140 | 210 | 53 | 2 | 192,3 | — | 4,8 | 9,5 |
| 24028-S-K30-MB | — | 8,38 | 140 | 210 | 69 | 2 | 186,4 | — | 3,2 | 6,5 |
| 24028-S-MB | — | 8,52 | 140 | 210 | 69 | 2 | 186,4 | — | 3,2 | 6,5 |
| 24028-E1-K30-TVPB | XL | 7,96 | 140 | 210 | 69 | 2 | 187,2 | 154,2 | 3,2 | 6,5 |
| 24028-E1-TVPB | XL | 8,15 | 140 | 210 | 69 | 2 | 187,2 | 154,2 | 3,2 | 6,5 |
| 23128-E1A-K-M | XL | 7,78 | 140 | 225 | 68 | 2,1 | 201 | — | 4,8 | 9,5 |
| 23128-E1-K-TVPB | XL | 9,46 | 140 | 225 | 68 | 2,1 | 201 | 157,1 | 4,8 | 9,5 |
| 23128-E1-TVPB | XL | 9,81 | 140 | 225 | 68 | 2,1 | 201 | 157,1 | 4,8 | 9,5 |
| 23128-E1A-M | XL | 10,4 | 140 | 225 | 68 | 2,1 | 201 | — | 4,8 | 9,5 |
| 24128-E1-K30-TVPB | XL | 11,8 | 140 | 225 | 85 | 2,1 | 194,4 | 157 | 4,8 | 9,5 |
| 24128-E1-TVPB | XL | 12,8 | 140 | 225 | 85 | 2,1 | 194,4 | 157 | 4,8 | 9,5 |
| 22228-E1-K | XL | 13,7 | 140 | 250 | 68 | 3 | 223,4 | 164,9 | 6,3 | 12,2 |
| 22228-E1 | XL | 14,2 | 140 | 250 | 68 | 3 | 223,4 | 164,9 | 6,3 | 12,2 |
| 23228-E1-K-TVPB | XL | 17,1 | 140 | 250 | 88 | 3 | 216 | 162 | 6,3 | 12,2 |
| 23228-E1A-K-M | XL | 17,6 | 140 | 250 | 88 | 3 | 216 | — | 6,3 | 12,2 |
| 23228-E1-TVPB | XL | 17,7 | 140 | 250 | 88 | 3 | 216 | 162 | 6,3 | 12,2 |
| 23228-E1A-M | XL | 18,3 | 140 | 250 | 88 | 3 | 216 | — | 6,3 | 12,2 |
| 22328-E1-K | XL | 34,4 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 |
| 22328-E1-K-T41A | XL | 34,4 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 |



With central rib
Cylindrical bore



Tapered bore
 $K = \text{taper } 1:12, K30 = \text{taper } 1:30$



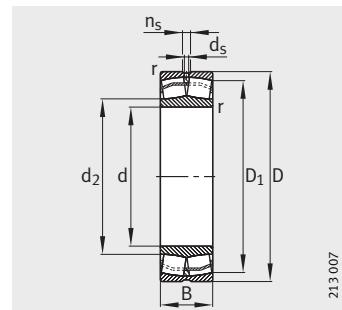
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a min. | D _a max. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 141 | 199 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| 141 | 199 | 2 | 815 000 | 1 200 000 | 0,34 | 1,96 | 2,92 | 1,92 | 93 000 | 2 200 | 1 480 |
| 141 | 199 | 2 | 815 000 | 1 200 000 | 0,34 | 1,96 | 2,92 | 1,92 | 93 000 | 2 200 | 1 480 |
| 144 | 216 | 2,5 | 750 000 | 900 000 | 0,26 | 2,62 | 3,9 | 2,56 | 79 000 | 3 000 | 2 550 |
| 144 | 216 | 2,5 | 750 000 | 900 000 | 0,26 | 2,62 | 3,9 | 2,56 | 79 000 | 3 000 | 2 550 |
| 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 148,8 | 201,2 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| 148,8 | 201,2 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| 148,8 | 201,2 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| 148,8 | 201,2 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| 148,8 | 201,2 | 2 | 510 000 | 915 000 | 0,32 | 2,1 | 3,13 | 2,06 | 56 000 | 2 400 | 2 000 |
| 148,8 | 201,2 | 2 | 510 000 | 915 000 | 0,32 | 2,1 | 3,13 | 2,06 | 56 000 | 2 400 | 2 000 |
| 148,8 | 201,2 | 2 | 720 000 | 1 100 000 | 0,29 | 2,33 | 3,47 | 2,28 | 93 000 | 2 600 | 1 880 |
| 148,8 | 201,2 | 2 | 720 000 | 1 100 000 | 0,29 | 2,33 | 3,47 | 2,28 | 93 000 | 2 600 | 1 880 |
| 152 | 213 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| 152 | 213 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| 152 | 213 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| 152 | 213 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| 152 | 213 | 2,1 | 930 000 | 1 370 000 | 0,34 | 1,98 | 2,94 | 1,93 | 104 000 | 2 000 | 1 340 |
| 152 | 213 | 2,1 | 930 000 | 1 370 000 | 0,34 | 1,98 | 2,94 | 1,93 | 104 000 | 2 000 | 1 340 |
| 154 | 236 | 2,5 | 880 000 | 1 040 000 | 0,25 | 2,67 | 3,97 | 2,61 | 97 000 | 2 400 | 2 320 |
| 154 | 236 | 2,5 | 880 000 | 1 040 000 | 0,25 | 2,67 | 3,97 | 2,61 | 97 000 | 2 400 | 2 320 |
| 154 | 236 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| 154 | 236 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| 154 | 236 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| 154 | 236 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| 157 | 283 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |
| 157 | 283 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |

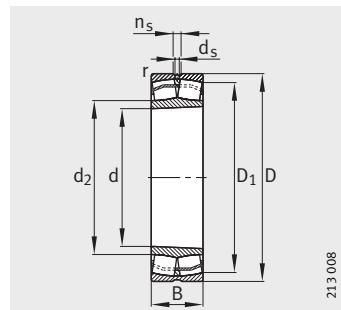


Spherical roller bearings

With cylindrical or tapered bore



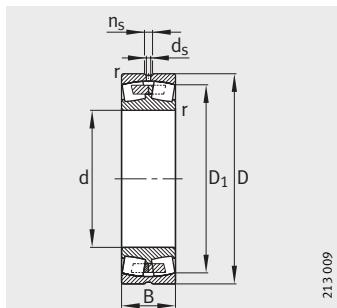
E1 design
Cylindrical bore



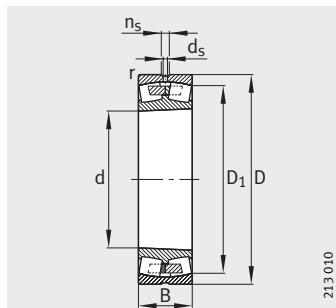
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

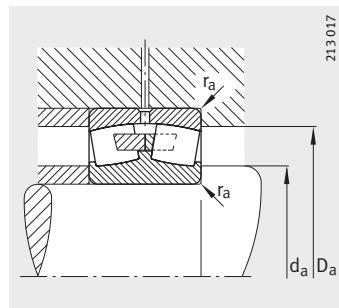
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|--------------------------|------------------|------------|------------|-----|-----------|----------------|----------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 22328-E1 | XL | 35,1 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 |
| 22328-E1-T41A | XL | 35,1 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 |
| 23328-AS-MA-T41A | – | 40,9 | 140 | 300 | 118 | 4 | 249,2 | – | 6,3 | 12,2 |
| 23030-E1-K-TVPB | XL | 7,29 | 150 | 225 | 56 | 2,1 | 206,3 | 166,6 | 4,8 | 9,5 |
| 23030-E1A-K-M | XL | 7,33 | 150 | 225 | 56 | 2,1 | 206,3 | – | 4,8 | 9,5 |
| 23030-E1-TVPB | XL | 7,63 | 150 | 225 | 56 | 2,1 | 206,3 | 166,6 | 4,8 | 9,5 |
| 23030-E1A-M | XL | 7,83 | 150 | 225 | 56 | 2,1 | 206,3 | – | 4,8 | 9,5 |
| 24030-S-MB | – | 10,4 | 150 | 225 | 75 | 2,1 | 199,1 | – | 4,8 | 9,5 |
| 24030-S-K30-MB | – | 10,7 | 150 | 225 | 75 | 2,1 | 199,1 | – | 4,8 | 9,5 |
| 24030-E1-K30-TVPB | XL | 10 | 150 | 225 | 75 | 2,1 | 200,2 | 165,2 | 4,8 | 9,5 |
| 24030-E1-TVPB | XL | 10,2 | 150 | 225 | 75 | 2,1 | 200,2 | 165,2 | 4,8 | 9,5 |
| 23130-E1-K-TVPB | XL | 14,5 | 150 | 250 | 80 | 2,1 | 220,8 | 170,1 | 6,3 | 12,2 |
| 23130-E1-TVPB | XL | 15 | 150 | 250 | 80 | 2,1 | 220,8 | 170,2 | 6,3 | 12,2 |
| 23130-E1A-K-M | XL | 15,8 | 150 | 250 | 80 | 2,1 | 220,8 | – | 6,3 | 12,2 |
| 23130-E1A-M | XL | 16,2 | 150 | 250 | 80 | 2,1 | 220,8 | – | 6,3 | 12,2 |
| 24130-BS-K30 | – | 19 | 150 | 250 | 100 | 2,1 | 211,3 | – | 4,8 | 9,5 |
| 24130-BS | – | 20 | 150 | 250 | 100 | 2,1 | 211,3 | – | 4,8 | 9,5 |
| 22230-E1-K | XL | 17,8 | 150 | 270 | 73 | 3 | 240,8 | 177,9 | 8 | 15 |
| 22230-E1 | XL | 18,2 | 150 | 270 | 73 | 3 | 240,8 | 177,9 | 8 | 15 |
| 23230-E1-K-TVPB | XL | 22,3 | 150 | 270 | 96 | 3 | 232,6 | 174 | 6,3 | 12,2 |
| 23230-E1A-K-M | XL | 22,9 | 150 | 270 | 96 | 3 | 232,6 | – | 6,3 | 12,2 |
| 23230-E1-TVPB | XL | 22,9 | 150 | 270 | 96 | 3 | 232,6 | 174 | 6,3 | 12,2 |
| 23230-E1A-M | XL | 23,7 | 150 | 270 | 96 | 3 | 232,6 | – | 6,3 | 12,2 |
| 22330-E1-K | XL | 41,2 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 |
| 22330-E1-K-T41A | XL | 41,2 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 |
| 22330-E1 | XL | 42,2 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 |
| 22330-E1-T41A | XL | 42,2 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 |
| 23330-A-MA-T41A | – | 49,8 | 150 | 320 | 128 | 4 | 264,5 | – | 8 | 15 |
| 23032-E1-K-TVPB | XL | 8,67 | 160 | 240 | 60 | 2,1 | 219,9 | 177 | 6,3 | 12,2 |
| 23032-E1-TVPB | XL | 8,97 | 160 | 240 | 60 | 2,1 | 219,9 | 177,5 | 6,3 | 12,2 |
| 23032-E1A-K-M | XL | 9,42 | 160 | 240 | 60 | 2,1 | 219,9 | – | 6,3 | 12,2 |
| 23032-E1A-M | XL | 9,71 | 160 | 240 | 60 | 2,1 | 219,9 | – | 6,3 | 12,2 |
| 24032-S-K30-MB | – | 12,8 | 160 | 240 | 80 | 2,1 | 211,2 | – | 4,8 | 9,5 |
| 24032-S-MB | – | 13 | 160 | 240 | 80 | 2,1 | 211,2 | – | 4,8 | 9,5 |
| 24032-E1-K30-TVPB | XL | 11,8 | 160 | 240 | 80 | 2,1 | 213,6 | 176 | 4,8 | 9,5 |
| 24032-E1-TVPB | XL | 12,3 | 160 | 240 | 80 | 2,1 | 213,6 | 176 | 4,8 | 9,5 |



With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30



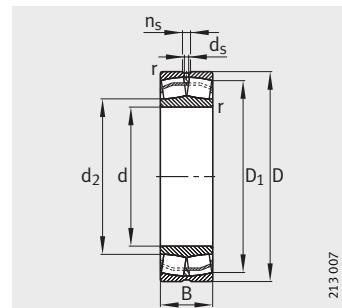
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 157 | 283 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |
| 157 | 283 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |
| 157 | 283 | 3 | 1 270 000 | 1 800 000 | 0,43 | 1,57 | 2,34 | 1,53 | 123 000 | 2 000 | – |
| 160,2 | 214,8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| 160,2 | 214,8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| 160,2 | 214,8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| 160,2 | 214,8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| 160,2 | 214,8 | 2,1 | 620 000 | 1 140 000 | 0,33 | 2,06 | 3,06 | 2,01 | 67 000 | 2 200 | 1 800 |
| 160,2 | 214,8 | 2,1 | 620 000 | 1 140 000 | 0,33 | 2,06 | 3,06 | 2,01 | 67 000 | 2 200 | 1 800 |
| 160,2 | 214,8 | 2,1 | 815 000 | 1 250 000 | 0,29 | 2,32 | 3,45 | 2,26 | 105 000 | 2 400 | 1 740 |
| 160,2 | 214,8 | 2,1 | 815 000 | 1 250 000 | 0,29 | 2,32 | 3,45 | 2,26 | 105 000 | 2 400 | 1 740 |
| 162 | 238 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| 162 | 238 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| 162 | 238 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| 162 | 238 | 2,1 | 915 000 | 1 560 000 | 0,4 | 1,68 | 2,5 | 1,64 | 100 000 | 2 000 | 1 260 |
| 162 | 238 | 2,1 | 915 000 | 1 560 000 | 0,4 | 1,68 | 2,5 | 1,64 | 100 000 | 2 000 | 1 260 |
| 164 | 256 | 2,5 | 1 000 000 | 1 220 000 | 0,25 | 2,69 | 4 | 2,63 | 111 000 | 2 600 | 2 110 |
| 164 | 256 | 2,5 | 1 000 000 | 1 220 000 | 0,25 | 2,69 | 4 | 2,63 | 111 000 | 2 600 | 2 110 |
| 164 | 256 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| 164 | 256 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| 164 | 256 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| 164 | 256 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| 167 | 303 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| 167 | 303 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| 167 | 303 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| 167 | 303 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| 167 | 303 | 3 | 1 500 000 | 2 120 000 | 0,44 | 1,52 | 2,26 | 1,49 | 135 000 | 2 000 | – |
| 170,2 | 229,8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| 170,2 | 229,8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| 170,2 | 229,8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| 170,2 | 229,8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| 170,2 | 229,8 | 2,1 | 670 000 | 1 250 000 | 0,32 | 2,09 | 3,11 | 2,04 | 71 000 | 2 000 | 1 680 |
| 170,2 | 229,8 | 2,1 | 670 000 | 1 250 000 | 0,32 | 2,09 | 3,11 | 2,04 | 71 000 | 2 000 | 1 680 |
| 170,2 | 229,8 | 2,1 | 915 000 | 1 430 000 | 0,29 | 2,3 | 3,42 | 2,25 | 117 000 | 2 200 | 1 600 |
| 170,2 | 229,8 | 2,1 | 915 000 | 1 430 000 | 0,29 | 2,3 | 3,42 | 2,25 | 117 000 | 2 200 | 1 600 |

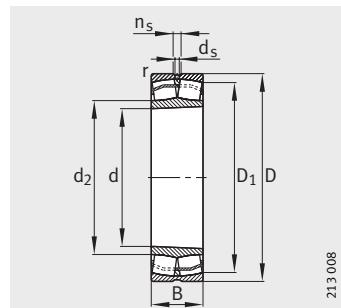


Spherical roller bearings

With cylindrical
or tapered bore



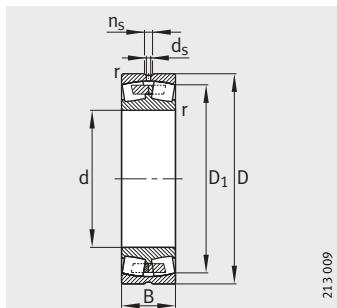
E1 design
Cylindrical bore



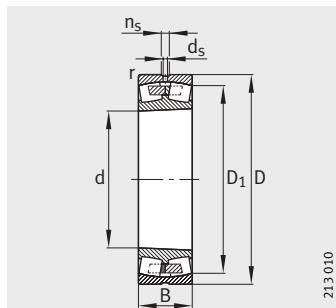
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

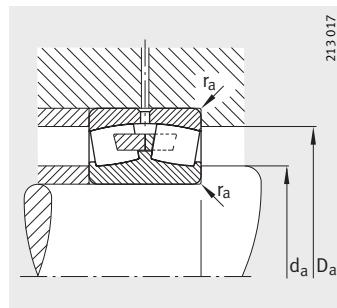
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|-----------------|------------------|------------|------------|-----|-----------|----------------|----------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 23132-E1-K-TVPB | XL | 18,4 | 160 | 270 | 86 | 2,1 | 238,3 | 183,2 | 8 | 15 |
| 23132-E1A-K-M | XL | 18,6 | 160 | 270 | 86 | 2,1 | 238,3 | — | 8 | 15 |
| 23132-E1-TVPB | XL | 19,1 | 160 | 270 | 86 | 2,1 | 238,3 | 183,2 | 8 | 15 |
| 23132-E1A-M | XL | 20 | 160 | 270 | 86 | 2,1 | 238,3 | — | 8 | 15 |
| 24132-BS | — | 23 | 160 | 270 | 109 | 2,1 | 230,2 | — | 4,8 | 9,5 |
| 24132-BS-K30 | — | 25 | 160 | 270 | 109 | 2,1 | 230,2 | — | 4,8 | 9,5 |
| 22232-E1-K | XL | 22,4 | 160 | 290 | 80 | 3 | 258,2 | 190,9 | 8 | 15 |
| 22232-E1 | XL | 23,3 | 160 | 290 | 80 | 3 | 258,2 | 190,9 | 8 | 15 |
| 23232-E1-K-TVPB | XL | 27,7 | 160 | 290 | 104 | 3 | 249,3 | 186,7 | 8 | 15 |
| 23232-E1A-K-M | XL | 28,5 | 160 | 290 | 104 | 3 | 249,3 | — | 8 | 15 |
| 23232-E1-TVPB | XL | 28,6 | 160 | 290 | 104 | 3 | 249,3 | 186,7 | 8 | 15 |
| 23232-E1A-M | XL | 29,8 | 160 | 290 | 104 | 3 | 249,3 | — | 8 | 15 |
| 22332-K-MB | — | 50,1 | 160 | 340 | 114 | 4 | 288,3 | — | 9,5 | 17,7 |
| 22332-MB | — | 51,1 | 160 | 340 | 114 | 4 | 288,3 | — | 9,5 | 17,7 |
| 22332-A-MA-T41A | — | 52,4 | 160 | 340 | 114 | 4 | 288,3 | — | 9,5 | 17,7 |
| 23332-A-MA-T41A | — | 61,3 | 160 | 340 | 136 | 4 | 280,6 | — | 9,5 | 17,7 |
| 23034-E1-K-TVPB | XL | 11,9 | 170 | 260 | 67 | 2,1 | 237,2 | 189,8 | 6,3 | 12,2 |
| 23034-E1A-K-M | XL | 12 | 170 | 260 | 67 | 2,1 | 237,2 | — | 6,3 | 12,2 |
| 23034-E1-TVPB | XL | 12,3 | 170 | 260 | 67 | 2,1 | 237,2 | 189,8 | 6,3 | 12,2 |
| 23034-E1A-M | XL | 13 | 170 | 260 | 67 | 2,1 | 237,2 | — | 6,3 | 12,2 |
| 24034-BS-K30-MB | — | 16,8 | 170 | 260 | 90 | 2,1 | 228,8 | — | 4,8 | 9,5 |
| 24034-BS-MB | — | 17,6 | 170 | 260 | 90 | 2,1 | 228,8 | — | 4,8 | 9,5 |
| 23134-E1A-K-M | XL | 19,5 | 170 | 280 | 88 | 2,1 | 248,1 | — | 8 | 15 |
| 23134-E1-K-TVPB | XL | 19,9 | 170 | 280 | 88 | 2,1 | 248,1 | 193,4 | 8 | 15 |
| 23134-E1-TVPB | XL | 20,7 | 170 | 280 | 88 | 2,1 | 248,1 | 193,4 | 8 | 15 |
| 23134-E1A-M | XL | 22,1 | 170 | 280 | 88 | 2,1 | 248,1 | — | 8 | 15 |
| 24134-BS-K30 | — | 25 | 170 | 280 | 109 | 2,1 | 239,6 | — | 4,8 | 9,5 |
| 24134-BS | — | 25,8 | 170 | 280 | 109 | 2,1 | 239,6 | — | 4,8 | 9,5 |
| 22234-E1-K | XL | 27,1 | 170 | 310 | 86 | 4 | 275,4 | 199,8 | 9,5 | 17,7 |
| 22234-E1 | XL | 27,8 | 170 | 310 | 86 | 4 | 275,4 | 199,8 | 9,5 | 17,7 |
| 23234-E1-K-TVPB | XL | 33,1 | 170 | 310 | 110 | 4 | 267,4 | 199,8 | 8 | 15 |
| 23234-E1A-K-M | XL | 34,6 | 170 | 310 | 110 | 4 | 267,4 | — | 8 | 15 |
| 23234-E1-TVPB | XL | 34,9 | 170 | 310 | 110 | 4 | 267,4 | 199,8 | 8 | 15 |
| 23234-E1A-M | XL | 36,5 | 170 | 310 | 110 | 4 | 267,4 | — | 8 | 15 |
| 22334-K-MB | — | 56,9 | 170 | 360 | 120 | 4 | 304,2 | — | 9,5 | 17,7 |
| 22334-A-MA-T41A | — | 59,5 | 170 | 360 | 120 | 4 | 304,2 | — | 9,5 | 17,7 |



With central rib
Cylindrical bore



Tapered bore
 $K = \text{taper } 1:12, K30 = \text{taper } 1:30$



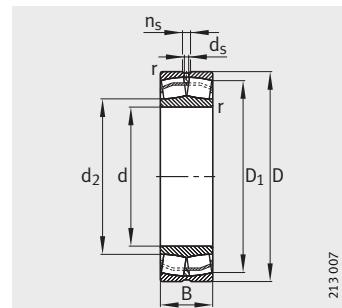
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 172 | 258 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| 172 | 258 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| 172 | 258 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| 172 | 258 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| 172 | 258 | 2,1 | 1 060 000 | 1 800 000 | 0,41 | 1,65 | 2,46 | 1,61 | 106 000 | 2 000 | 1 150 |
| 172 | 258 | 2,1 | 1 060 000 | 1 800 000 | 0,41 | 1,65 | 2,46 | 1,61 | 106 000 | 2 000 | 1 150 |
| 174 | 276 | 2,5 | 1 140 000 | 1 400 000 | 0,26 | 2,64 | 3,93 | 2,58 | 125 000 | 2 600 | 1 960 |
| 174 | 276 | 2,5 | 1 140 000 | 1 400 000 | 0,26 | 2,64 | 3,93 | 2,58 | 125 000 | 2 600 | 1 960 |
| 174 | 276 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| 174 | 276 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| 174 | 276 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| 174 | 276 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| 177 | 323 | 3 | 1 430 000 | 1 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 121 000 | 2 000 | 1 490 |
| 177 | 323 | 3 | 1 430 000 | 1 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 121 000 | 2 000 | 1 490 |
| 177 | 323 | 3 | 1 430 000 | 1 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 136 000 | 2 000 | 1 490 |
| 177 | 323 | 3 | 1 660 000 | 2 320 000 | 0,44 | 1,54 | 2,3 | 1,51 | 152 000 | 2 000 | – |
| 180,2 | 249,8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| 180,2 | 249,8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| 180,2 | 249,8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| 180,2 | 249,8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| 180,2 | 249,8 | 2,1 | 850 000 | 1 560 000 | 0,34 | 2 | 2,97 | 1,95 | 96 000 | 2 000 | 1 530 |
| 180,2 | 249,8 | 2,1 | 850 000 | 1 560 000 | 0,34 | 2 | 2,97 | 1,95 | 96 000 | 2 000 | 1 530 |
| 182 | 268 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| 182 | 268 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| 182 | 268 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| 182 | 268 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| 182 | 268 | 2,1 | 1 060 000 | 1 830 000 | 0,39 | 1,73 | 2,58 | 1,69 | 98 000 | 1 800 | 1 100 |
| 182 | 268 | 2,1 | 1 060 000 | 1 830 000 | 0,39 | 1,73 | 2,58 | 1,69 | 98 000 | 1 800 | 1 100 |
| 187 | 293 | 3 | 1 320 000 | 1 560 000 | 0,26 | 2,6 | 3,87 | 2,54 | 139 000 | 2 400 | 1 830 |
| 187 | 293 | 3 | 1 320 000 | 1 560 000 | 0,26 | 2,6 | 3,87 | 2,54 | 139 000 | 2 400 | 1 830 |
| 187 | 293 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| 187 | 293 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| 187 | 293 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| 187 | 343 | 3 | 1 600 000 | 2 120 000 | 0,37 | 1,83 | 2,72 | 1,79 | 134 000 | 1 800 | 1 380 |
| 187 | 343 | 3 | 1 600 000 | 2 120 000 | 0,37 | 1,83 | 2,72 | 1,79 | 144 000 | 1 800 | 1 380 |

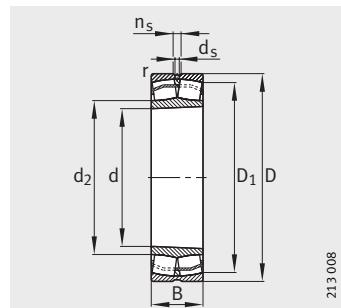


Spherical roller bearings

With cylindrical or tapered bore



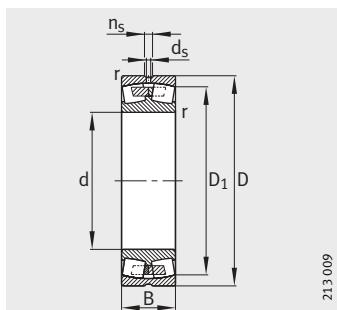
E1 design
Cylindrical bore



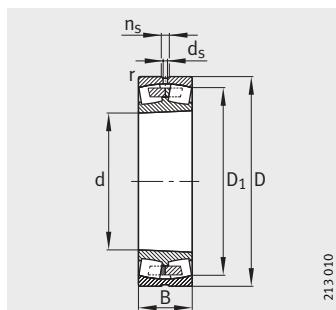
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

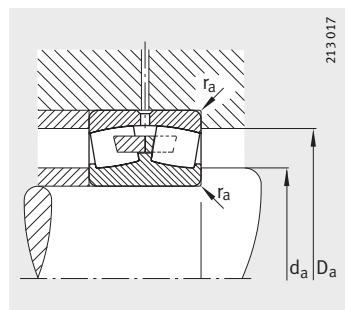
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|------------------------|------------------|------------|------------|-----|-----------|---------------------|---------------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ ≈ | d ₂ ≈ | d _s | n _s | |
| 22334-MB | – | 59,5 | 170 | 360 | 120 | 4 | 304,2 | – | 9,5 | 17,7 |
| 23936-S-K-MB | – | 7,76 | 180 | 250 | 52 | 2 | 230,9 | – | 4,8 | 9,5 |
| 23936-S-MB | – | 7,96 | 180 | 250 | 52 | 2 | 230,9 | – | 4,8 | 9,5 |
| 23036-E1-K-TVPB | XL | 15,6 | 180 | 280 | 74 | 2,1 | 254,3 | 201,8 | 8 | 15 |
| 23036-E1-TVPB | XL | 15,9 | 180 | 280 | 74 | 2,1 | 254,3 | 201,8 | 8 | 15 |
| 23036-E1A-K-M | XL | 16 | 180 | 280 | 74 | 2,1 | 254,3 | – | 8 | 15 |
| 23036-E1A-M | XL | 16,8 | 180 | 280 | 74 | 2,1 | 254,3 | – | 8 | 15 |
| 24036-BS-K30-MB | – | 22,3 | 180 | 280 | 100 | 2,1 | 244,2 | – | 4,8 | 9,5 |
| 24036-BS-MB | – | 22,6 | 180 | 280 | 100 | 2,1 | 244,2 | – | 4,8 | 9,5 |
| 23136-E1A-K-M | XL | 25,5 | 180 | 300 | 96 | 3 | 264,8 | – | 8 | 15 |
| 23136-E1-K-TVPB | XL | 25,9 | 180 | 300 | 96 | 3 | 264,8 | 204,1 | 8 | 15 |
| 23136-E1A-M | XL | 26,1 | 180 | 300 | 96 | 3 | 264,8 | – | 8 | 15 |
| 23136-E1-TVPB | XL | 27,3 | 180 | 300 | 96 | 3 | 264,8 | 204,1 | 8 | 15 |
| 24136-BS-K30 | – | 31,8 | 180 | 300 | 118 | 3 | 253,7 | – | 6,3 | 12,2 |
| 24136-BS | – | 32,2 | 180 | 300 | 118 | 3 | 253,7 | – | 6,3 | 12,2 |
| 22236-E1-K | XL | 28,5 | 180 | 320 | 86 | 4 | 285,9 | 211,3 | 9,5 | 17,7 |
| 22236-E1 | XL | 29,2 | 180 | 320 | 86 | 4 | 285,9 | 211,3 | 9,5 | 17,7 |
| 23236-E1-K-TVPB | XL | 36 | 180 | 320 | 112 | 4 | 277,3 | 210,6 | 8 | 15 |
| 23236-E1A-K-M | XL | 37 | 180 | 320 | 112 | 4 | 277,3 | – | 8 | 15 |
| 23236-E1-TVPB | XL | 37,2 | 180 | 320 | 112 | 4 | 277,3 | 210,6 | 8 | 15 |
| 23236-E1A-M | XL | 38,5 | 180 | 320 | 112 | 4 | 277,3 | – | 8 | 15 |
| 22336-A-MA-T41A | – | 71,7 | 180 | 380 | 126 | 4 | 323,4 | – | 12,5 | 23,5 |
| 22336-K-MB | – | 66,7 | 180 | 380 | 126 | 4 | 323,4 | – | 12,5 | 23,5 |
| 22336-MB | – | 69 | 180 | 380 | 126 | 4 | 323,4 | – | 12,5 | 23,5 |
| 23938-S-MB | – | 8,43 | 190 | 260 | 52 | 2 | 240,2 | – | 4,8 | 9,5 |
| 23038-E1-K-TVPB | XL | 16,3 | 190 | 290 | 75 | 2,1 | 264,5 | 211,9 | 8 | 15 |
| 23038-E1-TVPB | XL | 17,2 | 190 | 290 | 75 | 2,1 | 264,5 | 211,9 | 8 | 15 |
| 23038-E1A-K-M | XL | 17,7 | 190 | 290 | 75 | 2,1 | 264,5 | – | 8 | 15 |
| 23038-E1A-M | XL | 18,3 | 190 | 290 | 75 | 2,1 | 264,5 | – | 8 | 15 |
| 24038-BS-K30-MB | – | 24,2 | 190 | 290 | 100 | 2,1 | 255 | – | 4,8 | 9,5 |
| 24038-BS-MB | – | 24,5 | 190 | 290 | 100 | 2,1 | 255 | – | 4,8 | 9,5 |
| 23138-E1-K-TVPB | XL | 30,3 | 190 | 320 | 104 | 3 | 281,6 | 217 | 8 | 15 |
| 23138-E1-TVPB | XL | 32 | 190 | 320 | 104 | 3 | 281,6 | 217 | 8 | 15 |
| 23138-E1A-K-M | XL | 32,4 | 190 | 320 | 104 | 3 | 281,6 | – | 8 | 15 |
| 23138-E1A-M | XL | 33,9 | 190 | 320 | 104 | 3 | 281,6 | – | 8 | 15 |
| 24138-B-K30 | – | 41,5 | 190 | 320 | 128 | 3 | 270 | – | 6,3 | 12,2 |



With central rib
Cylindrical bore



Tapered bore
 $K = \text{taper } 1:12, K30 = \text{taper } 1:30$



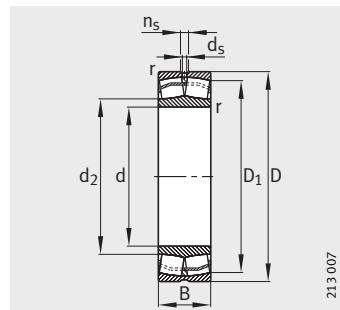
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a min. | D _a max. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 187 | 343 | 3 | 1 600 000 | 2 120 000 | 0,37 | 1,83 | 2,72 | 1,79 | 134 000 | 1 800 | 1 380 |
| 188,8 | 241,2 | 2 | 440 000 | 850 000 | 0,2 | 3,42 | 5,09 | 3,34 | 57 000 | 2 200 | 2 320 |
| 188,8 | 241,2 | 2 | 440 000 | 850 000 | 0,2 | 3,42 | 5,09 | 3,34 | 57 000 | 2 200 | 2 320 |
| 190,2 | 269,8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| 190,2 | 269,8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| 190,2 | 269,8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| 190,2 | 269,8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| 190,2 | 269,8 | 2,1 | 1 000 000 | 1 830 000 | 0,36 | 1,9 | 2,83 | 1,86 | 106 000 | 1 800 | 1 420 |
| 190,2 | 269,8 | 2,1 | 1 000 000 | 1 830 000 | 0,36 | 1,9 | 2,83 | 1,86 | 106 000 | 1 800 | 1 420 |
| 194 | 286 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| 194 | 286 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| 194 | 286 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| 194 | 286 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| 194 | 286 | 2,5 | 1 250 000 | 2 200 000 | 0,4 | 1,68 | 2,5 | 1,64 | 136 000 | 1 700 | 980 |
| 194 | 286 | 2,5 | 1 250 000 | 2 200 000 | 0,4 | 1,68 | 2,5 | 1,64 | 136 000 | 1 700 | 980 |
| 197 | 303 | 3 | 1 370 000 | 1 660 000 | 0,25 | 2,71 | 4,04 | 2,65 | 148 000 | 2 400 | 1 720 |
| 197 | 303 | 3 | 1 370 000 | 1 660 000 | 0,25 | 2,71 | 4,04 | 2,65 | 148 000 | 2 400 | 1 720 |
| 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 197 | 363 | 3 | 1 700 000 | 2 240 000 | 0,37 | 1,83 | 2,72 | 1,79 | 229 000 | 1 500 | 1 280 |
| 197 | 363 | 3 | 1 760 000 | 2 360 000 | 0,37 | 1,83 | 2,72 | 1,79 | 209 000 | 1 500 | 1 280 |
| 197 | 363 | 3 | 1 760 000 | 2 360 000 | 0,37 | 1,83 | 2,72 | 1,79 | 209 000 | 1 500 | 1 280 |
| 198,8 | 251,2 | 2 | 465 000 | 900 000 | 0,18 | 3,66 | 5,46 | 3,58 | 65 000 | 2 000 | 2 180 |
| 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 200,2 | 279,8 | 2,1 | 1 040 000 | 1 960 000 | 0,34 | 2 | 2,98 | 1,96 | 110 000 | 1 700 | 1 320 |
| 200,2 | 279,8 | 2,1 | 1 040 000 | 1 960 000 | 0,34 | 2 | 2,98 | 1,96 | 110 000 | 1 700 | 1 320 |
| 204 | 306 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| 204 | 306 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| 204 | 306 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| 204 | 306 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| 204 | 306 | 2,5 | 1 400 000 | 2 500 000 | 0,41 | 1,66 | 2,47 | 1,62 | 145 000 | 1 500 | 910 |

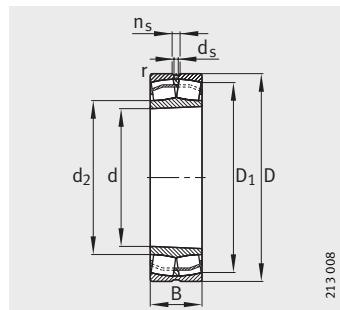


Spherical roller bearings

With cylindrical or tapered bore



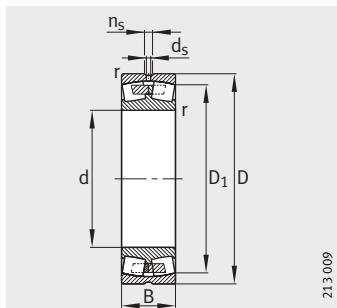
E1 design
Cylindrical bore



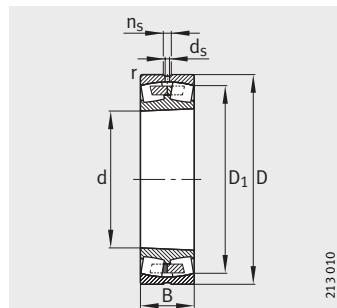
Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

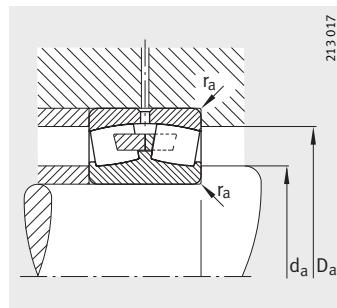
| Designation | Mass m ≈kg | Dimensions | | | | | | | | |
|-----------------|------------------|------------|-----|-----|-----------|----------------|----------------|----------------|----------------|------|
| | | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | |
| 24138-B | - | 42,2 | 190 | 320 | 128 | 3 | 270 | - | 6,3 | 12,2 |
| 22238-K-MB | - | 36,2 | 190 | 340 | 92 | 4 | 296 | - | 9,5 | 17,7 |
| 22238-MB | - | 37 | 190 | 340 | 92 | 4 | 296 | - | 9,5 | 17,7 |
| 23238-B-K-MB | - | 46 | 190 | 340 | 120 | 4 | 291,2 | - | 9,5 | 17,7 |
| 23238-B-MB | - | 48,4 | 190 | 340 | 120 | 4 | 291,2 | - | 9,5 | 17,7 |
| 22338-K-MB | - | 77,3 | 190 | 400 | 132 | 5 | 338,2 | - | 12,5 | 23,5 |
| 22338-A-MA-T41A | - | 80,5 | 190 | 400 | 132 | 5 | 338,2 | - | 12,5 | 23,5 |
| 22338-MB | - | 80,5 | 190 | 400 | 132 | 5 | 338,2 | - | 12,5 | 23,5 |
| 23338-A-MA-T41A | - | 97,1 | 190 | 400 | 155 | 5 | 331,6 | - | 9,5 | 17,7 |
| 23940-S-K-MB | - | 11,5 | 200 | 280 | 60 | 2,1 | 256,9 | - | 6,3 | 12,2 |
| 23940-S-MB | - | 11,8 | 200 | 280 | 60 | 2,1 | 256,9 | - | 6,3 | 12,2 |
| 23040-E1-K-TVPB | XL | 20,8 | 200 | 310 | 82 | 2,1 | 281,6 | 223,4 | 8 | 15 |
| 23040-E1A-K-M | XL | 21,4 | 200 | 310 | 82 | 2,1 | 281,6 | - | 8 | 15 |
| 23040-E1-TVPB | XL | 21,5 | 200 | 310 | 82 | 2,1 | 281,6 | 223,4 | 8 | 15 |
| 23040-E1A-M | XL | 22,8 | 200 | 310 | 82 | 2,1 | 281,6 | - | 8 | 15 |
| 24040-BS-K30-MB | - | 30 | 200 | 310 | 109 | 2,1 | 270,8 | - | 6,3 | 12,2 |
| 24040-BS-MB | - | 30,4 | 200 | 310 | 109 | 2,1 | 270,8 | - | 6,3 | 12,2 |
| 23140-B-K-MB | - | 41,7 | 200 | 340 | 112 | 3 | 293,3 | - | 9,5 | 17,7 |
| 23140-B-MB | - | 43 | 200 | 340 | 112 | 4 | 293,3 | - | 9,5 | 17,7 |
| 24140-B-K30 | - | 51,6 | 200 | 340 | 140 | 3 | 285,9 | - | 6,3 | 12,2 |
| 24140-B | - | 52,4 | 200 | 340 | 140 | 3 | 285,9 | - | 6,3 | 12,2 |
| 22240-B-K-MB | - | 42,3 | 200 | 360 | 98 | 4 | 312 | - | 9,5 | 17,7 |
| 22240-B-MB | - | 44,2 | 200 | 360 | 98 | 4 | 312 | - | 9,5 | 17,7 |
| 23240-B-K-MB | - | 55,8 | 200 | 360 | 128 | 4 | 307,5 | - | 9,5 | 17,7 |
| 23240-B-MB | - | 60,5 | 200 | 360 | 128 | 4 | 307,5 | - | 9,5 | 17,7 |
| 22340-K-MB | - | 89,5 | 200 | 420 | 138 | 5 | 357,4 | - | 12,5 | 23,5 |
| 22340-MB | - | 91 | 200 | 420 | 138 | 5 | 357,4 | - | 12,5 | 23,5 |
| 22340-A-MA-T41A | - | 92,4 | 200 | 420 | 138 | 5 | 357,4 | - | 12,5 | 23,5 |
| 23340-A-MA-T41A | - | 108 | 200 | 420 | 165 | 5 | 350,2 | - | 9,5 | 17,7 |
| 23944-S-MB | - | 12,3 | 220 | 300 | 60 | 2,1 | 277,4 | - | 6,3 | 12,2 |
| 23944-S-K-MB | - | 12,3 | 220 | 300 | 60 | 2,1 | 277,4 | - | 6,3 | 12,2 |
| 23044-K-MB | - | 29,9 | 220 | 340 | 90 | 3 | 301,8 | - | 8 | 15 |
| 23044-MB | - | 31,7 | 220 | 340 | 90 | 3 | 301,8 | - | 8 | 15 |
| 24044-B-K30-MB | - | 38,9 | 220 | 340 | 118 | 3 | 297,4 | - | 6,3 | 12,2 |
| 24044-B-MB | - | 39,5 | 220 | 340 | 118 | 3 | 297,4 | - | 6,3 | 12,2 |
| 23144-B-K-MB | - | 52 | 220 | 370 | 120 | 4 | 319,2 | - | 9,5 | 17,7 |



With central rib
Cylindrical bore



Tapered bore
 $K = \text{taper } 1:12, K30 = \text{taper } 1:30$



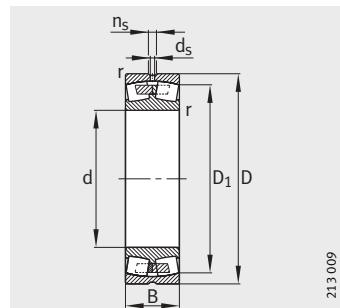
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a min. | D _a max. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 204 | 306 | 2,5 | 1 400 000 | 2 500 000 | 0,41 | 1,66 | 2,47 | 1,62 | 145 000 | 1 500 | 910 |
| 207 | 323 | 3 | 1 200 000 | 1 830 000 | 0,28 | 2,39 | 3,56 | 2,34 | 122 000 | 1 800 | 1 620 |
| 207 | 323 | 3 | 1 200 000 | 1 830 000 | 0,28 | 2,39 | 3,56 | 2,34 | 122 000 | 1 800 | 1 620 |
| 207 | 323 | 3 | 1 560 000 | 2 600 000 | 0,36 | 1,86 | 2,77 | 1,82 | 156 000 | 1 700 | 1 040 |
| 207 | 323 | 3 | 1 560 000 | 2 600 000 | 0,36 | 1,86 | 2,77 | 1,82 | 156 000 | 1 700 | 1 040 |
| 210 | 380 | 4 | 1 860 000 | 2 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 213 000 | 1 500 | 1 220 |
| 210 | 380 | 4 | 1 860 000 | 2 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 173 000 | 1 500 | 1 220 |
| 210 | 380 | 4 | 1 860 000 | 2 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 213 000 | 1 500 | 1 220 |
| 210 | 380 | 4 | 2 200 000 | 3 200 000 | 0,43 | 1,57 | 2,34 | 1,53 | 223 000 | 1 400 | — |
| 210,2 | 269,8 | 2,1 | 550 000 | 1 080 000 | 0,2 | 3,42 | 5,09 | 3,34 | 71 000 | 2 000 | 2 110 |
| 210,2 | 269,8 | 2,1 | 550 000 | 1 080 000 | 0,2 | 3,42 | 5,09 | 3,34 | 71 000 | 2 000 | 2 110 |
| 210,2 | 299,8 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| 210,2 | 299,8 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| 210,2 | 299,8 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| 210,2 | 299,8 | 2,1 | 1 270 000 | 2 280 000 | 0,35 | 1,94 | 2,88 | 1,89 | 122 000 | 1 500 | 1 220 |
| 210,2 | 299,8 | 2,1 | 1 270 000 | 2 280 000 | 0,35 | 1,94 | 2,88 | 1,89 | 122 000 | 1 500 | 1 220 |
| 214 | 326 | 2,5 | 1 320 000 | 2 280 000 | 0,35 | 1,95 | 2,9 | 1,91 | 131 000 | 1 700 | 1 240 |
| 214 | 326 | 2,5 | 1 320 000 | 2 280 000 | 0,35 | 1,95 | 2,9 | 1,91 | 131 000 | 1 700 | 1 240 |
| 214 | 326 | 2,5 | 1 700 000 | 3 000 000 | 0,42 | 1,62 | 2,42 | 1,59 | 190 000 | 1 400 | 810 |
| 214 | 326 | 2,5 | 1 700 000 | 3 000 000 | 0,42 | 1,62 | 2,42 | 1,59 | 190 000 | 1 400 | 810 |
| 217 | 343 | 3 | 1 320 000 | 2 000 000 | 0,29 | 2,35 | 3,5 | 2,3 | 123 000 | 1 700 | 1 530 |
| 217 | 343 | 3 | 1 320 000 | 2 000 000 | 0,29 | 2,35 | 3,5 | 2,3 | 123 000 | 1 700 | 1 530 |
| 217 | 343 | 3 | 1 660 000 | 2 750 000 | 0,37 | 1,83 | 2,72 | 1,79 | 163 000 | 1 500 | 1 000 |
| 217 | 343 | 3 | 1 660 000 | 2 750 000 | 0,37 | 1,83 | 2,72 | 1,79 | 163 000 | 1 500 | 1 000 |
| 220 | 400 | 4 | 2 080 000 | 2 800 000 | 0,36 | 1,87 | 2,79 | 1,83 | 189 000 | 1 400 | 1 130 |
| 220 | 400 | 4 | 2 080 000 | 2 800 000 | 0,36 | 1,87 | 2,79 | 1,83 | 189 000 | 1 400 | 1 130 |
| 220 | 400 | 4 | 2 080 000 | 2 800 000 | 0,36 | 1,87 | 2,79 | 1,83 | 189 000 | 1 400 | 1 130 |
| 220 | 400 | 4 | 2 450 000 | 3 600 000 | 0,43 | 1,55 | 2,31 | 1,52 | 238 000 | 1 300 | — |
| 230,2 | 289,8 | 2,1 | 600 000 | 1 250 000 | 0,18 | 3,76 | 5,59 | 3,67 | 72 000 | 1 800 | 1 880 |
| 230,2 | 289,8 | 2,1 | 600 000 | 1 250 000 | 0,18 | 3,76 | 5,59 | 3,67 | 72 000 | 1 800 | 1 880 |
| 232,4 | 327,6 | 2,5 | 1 060 000 | 1 900 000 | 0,26 | 2,55 | 3,8 | 2,5 | 132 000 | 1 700 | 1 470 |
| 232,4 | 327,6 | 2,5 | 1 060 000 | 1 900 000 | 0,26 | 2,55 | 3,8 | 2,5 | 132 000 | 1 700 | 1 470 |
| 232,4 | 327,6 | 2,5 | 1 400 000 | 2 700 000 | 0,34 | 1,96 | 2,92 | 1,92 | 139 000 | 1 300 | 1 080 |
| 232,4 | 327,6 | 2,5 | 1 400 000 | 2 700 000 | 0,34 | 1,96 | 2,92 | 1,92 | 139 000 | 1 300 | 1 080 |
| 237 | 353 | 3 | 1 630 000 | 2 900 000 | 0,33 | 2,03 | 3,02 | 1,98 | 165 000 | 1 400 | 1 070 |

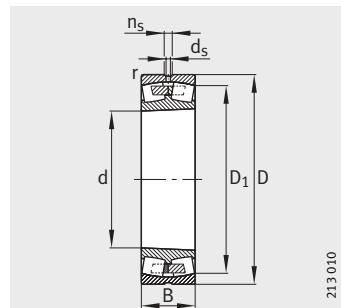


Spherical roller bearings

With cylindrical
or tapered bore



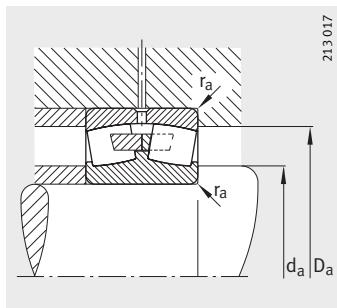
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|------------------------|------------------|------------|-----|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 23144-B-MB | 54,5 | 220 | 370 | 120 | 4 | 319,2 | 9,5 | 17,7 |
| 24144-B-K30 | 64,4 | 220 | 370 | 150 | 4 | 311,7 | 6,3 | 12,2 |
| 24144-B | 65,6 | 220 | 370 | 150 | 4 | 311,7 | 6,3 | 12,2 |
| 22244-B-K-MB | 59,6 | 220 | 400 | 108 | 4 | 348,7 | 9,5 | 17,7 |
| 22244-B-MB | 61,5 | 220 | 400 | 108 | 4 | 348,7 | 9,5 | 17,7 |
| 23244-K-MB | 79 | 220 | 400 | 144 | 4 | 337,6 | 9,5 | 17,7 |
| 23244-MB | 81,1 | 220 | 400 | 144 | 4 | 337,6 | 9,5 | 17,7 |
| 22344-K-MB | 114 | 220 | 460 | 145 | 5 | 391,2 | 12,5 | 23,5 |
| 22344-A-MA-T41A | 119 | 220 | 460 | 145 | 5 | 391,2 | 12,5 | 23,5 |
| 22344-MB | 119 | 220 | 460 | 145 | 5 | 391,2 | 12,5 | 23,5 |
| 23948-K-MB | 13,4 | 240 | 320 | 60 | 2,1 | 297,8 | 6,3 | 12,2 |
| 23948-MB | 13,9 | 240 | 320 | 60 | 2,1 | 297,8 | 6,3 | 12,2 |
| 23048-K-MB | 31,9 | 240 | 360 | 92 | 3 | 322,1 | 8 | 15 |
| 23048-MB | 34,8 | 240 | 360 | 92 | 3 | 322,1 | 8 | 15 |
| 24048-B-K30-MB | 43,2 | 240 | 360 | 118 | 3 | 318,9 | 6,3 | 12,2 |
| 24048-B-MB | 43,6 | 240 | 360 | 118 | 3 | 318,9 | 6,3 | 12,2 |
| 23148-B-K-MB | 65,3 | 240 | 400 | 128 | 4 | 346,2 | 9,5 | 17,7 |
| 23148-B-MB | 67,3 | 240 | 400 | 128 | 4 | 346,2 | 9,5 | 17,7 |
| 24148-B-K30 | 78,7 | 240 | 400 | 160 | 4 | 338 | 6,3 | 12,2 |
| 24148-B | 80,7 | 240 | 400 | 160 | 4 | 338 | 6,3 | 12,2 |
| 22248-B-K-MB | 81,2 | 240 | 440 | 120 | 4 | 380,7 | 12,5 | 23,5 |
| 22248-B-MB | 83,4 | 240 | 440 | 120 | 4 | 380,7 | 12,5 | 23,5 |
| 23248-B-K-MB | 105 | 240 | 440 | 160 | 4 | 371 | 12,5 | 23,5 |
| 23248-B-MB | 111 | 240 | 440 | 160 | 4 | 371 | 12,5 | 23,5 |
| 22348-K-MB | 145 | 240 | 500 | 155 | 5 | 420 | 12,5 | 23,5 |
| 22348-MB | 151 | 240 | 500 | 155 | 5 | 420 | 12,5 | 23,5 |
| 23952-K-MB | 22,4 | 260 | 360 | 75 | 2,1 | 330,5 | 8 | 15 |
| 23952-MB | 24,1 | 260 | 360 | 75 | 2,1 | 330,5 | 8 | 15 |
| 23052-K-MB | 46,2 | 260 | 400 | 104 | 4 | 357,2 | 9,5 | 17,7 |
| 23052-MB | 49,3 | 260 | 400 | 104 | 4 | 357,2 | 9,5 | 17,7 |
| 24052-B-K30-MB | 64,5 | 260 | 400 | 140 | 4 | 349,1 | 6,3 | 12,2 |
| 24052-B-MB | 67,2 | 260 | 400 | 140 | 4 | 349,1 | 6,3 | 12,2 |
| 23152-K-MB | 89,6 | 260 | 440 | 144 | 4 | 379,7 | 9,5 | 17,7 |
| 23152-MB | 92,5 | 260 | 440 | 144 | 4 | 379,7 | 9,5 | 17,7 |
| 24152-B-K30 | 112 | 260 | 440 | 180 | 4 | 370,3 | 8 | 15 |
| 24152-B | 114 | 260 | 440 | 180 | 4 | 370,3 | 8 | 15 |



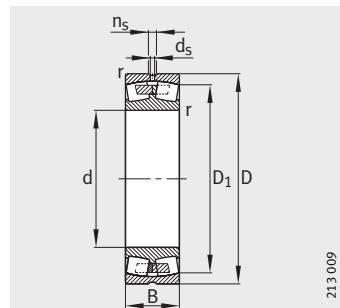
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} | Limiting speed n_G | Reference speed n_B |
|---------------------|---------------|---------------|--------------------|------------------------|---------------------|-------|-------|-------|--------------------------------|-------------------------|--------------------------|
| d_a min. | D_a max. | r_a max. | dyn. C_r N | stat. C_{or} N | e | Y_1 | Y_2 | Y_0 | N | min ⁻¹ | min ⁻¹ |
| 237 | 353 | 3 | 1 630 000 | 2 900 000 | 0,33 | 2,03 | 3,02 | 1,98 | 165 000 | 1 400 | 1 070 |
| 237 | 353 | 3 | 1 900 000 | 3 450 000 | 0,41 | 1,63 | 2,43 | 1,6 | 197 000 | 1 300 | 730 |
| 237 | 353 | 3 | 1 900 000 | 3 450 000 | 0,41 | 1,63 | 2,43 | 1,6 | 197 000 | 1 300 | 730 |
| 237 | 383 | 3 | 1 630 000 | 2 450 000 | 0,29 | 2,35 | 3,5 | 2,3 | 153 000 | 1 400 | 1 340 |
| 237 | 383 | 3 | 1 630 000 | 2 450 000 | 0,29 | 2,35 | 3,5 | 2,3 | 153 000 | 1 400 | 1 340 |
| 237 | 383 | 3 | 2 040 000 | 3 450 000 | 0,37 | 1,83 | 2,72 | 1,79 | 181 000 | 1 400 | 860 |
| 237 | 383 | 3 | 2 040 000 | 3 450 000 | 0,37 | 1,83 | 2,72 | 1,79 | 181 000 | 1 400 | 860 |
| 237 | 383 | 3 | 2 040 000 | 3 450 000 | 0,37 | 1,83 | 2,72 | 1,79 | 181 000 | 1 400 | 860 |
| 240 | 440 | 4 | 2 320 000 | 3 350 000 | 0,35 | 1,95 | 2,9 | 1,91 | 217 000 | 1 300 | 980 |
| 240 | 440 | 4 | 2 320 000 | 3 350 000 | 0,35 | 1,95 | 2,9 | 1,91 | 217 000 | 1 300 | 980 |
| 240 | 440 | 4 | 2 320 000 | 3 350 000 | 0,35 | 1,95 | 2,9 | 1,91 | 217 000 | 1 300 | 980 |
| 250,2 | 309,8 | 2,1 | 640 000 | 1 370 000 | 0,17 | 4,05 | 6,04 | 3,96 | 93 000 | 1 500 | 1 700 |
| 250,2 | 309,8 | 2,1 | 640 000 | 1 370 000 | 0,17 | 4,05 | 6,04 | 3,96 | 93 000 | 1 500 | 1 700 |
| 252,4 | 347,6 | 2,5 | 1 160 000 | 2 200 000 | 0,25 | 2,74 | 4,08 | 2,68 | 130 000 | 1 400 | 1 320 |
| 252,4 | 347,6 | 2,5 | 1 160 000 | 2 200 000 | 0,25 | 2,74 | 4,08 | 2,68 | 130 000 | 1 400 | 1 320 |
| 252,4 | 347,6 | 2,5 | 1 500 000 | 2 900 000 | 0,32 | 2,1 | 3,13 | 2,06 | 150 000 | 1 300 | 980 |
| 252,4 | 347,6 | 2,5 | 1 500 000 | 2 900 000 | 0,32 | 2,1 | 3,13 | 2,06 | 150 000 | 1 300 | 980 |
| 257 | 383 | 3 | 1 860 000 | 3 250 000 | 0,33 | 2,06 | 3,06 | 2,01 | 177 000 | 1 300 | 970 |
| 257 | 383 | 3 | 1 860 000 | 3 250 000 | 0,33 | 2,06 | 3,06 | 2,01 | 177 000 | 1 300 | 970 |
| 257 | 383 | 3 | 2 120 000 | 3 900 000 | 0,41 | 1,66 | 2,47 | 1,62 | 231 000 | 1 200 | 660 |
| 257 | 383 | 3 | 2 120 000 | 3 900 000 | 0,41 | 1,66 | 2,47 | 1,62 | 231 000 | 1 200 | 660 |
| 257 | 423 | 3 | 1 960 000 | 3 050 000 | 0,29 | 2,35 | 3,5 | 2,3 | 184 000 | 1 300 | 1 190 |
| 257 | 423 | 3 | 1 960 000 | 3 050 000 | 0,29 | 2,35 | 3,5 | 2,3 | 184 000 | 1 300 | 1 190 |
| 257 | 423 | 3 | 2 450 000 | 4 250 000 | 0,37 | 1,8 | 2,69 | 1,76 | 231 000 | 1 300 | 750 |
| 257 | 423 | 3 | 2 450 000 | 4 250 000 | 0,37 | 1,8 | 2,69 | 1,76 | 231 000 | 1 300 | 750 |
| 260 | 480 | 4 | 2 650 000 | 3 900 000 | 0,35 | 1,95 | 2,9 | 1,91 | 249 000 | 1 500 | 870 |
| 260 | 480 | 4 | 2 650 000 | 3 900 000 | 0,35 | 1,95 | 2,9 | 1,91 | 249 000 | 1 500 | 870 |
| 270,2 | 349,8 | 2,1 | 930 000 | 1 930 000 | 0,19 | 3,54 | 5,27 | 3,46 | 108 000 | 1 400 | 1 610 |
| 270,2 | 349,8 | 2,1 | 930 000 | 1 930 000 | 0,19 | 3,54 | 5,27 | 3,46 | 108 000 | 1 400 | 1 610 |
| 274,6 | 385,4 | 3 | 1 500 000 | 2 800 000 | 0,26 | 2,64 | 3,93 | 2,58 | 154 000 | 1 300 | 1 170 |
| 274,6 | 385,4 | 3 | 1 500 000 | 2 800 000 | 0,26 | 2,64 | 3,93 | 2,58 | 154 000 | 1 300 | 1 170 |
| 274,6 | 385,4 | 3 | 1 900 000 | 3 800 000 | 0,35 | 1,94 | 2,88 | 1,89 | 204 000 | 1 100 | 870 |
| 274,6 | 385,4 | 3 | 1 900 000 | 3 800 000 | 0,35 | 1,94 | 2,88 | 1,89 | 204 000 | 1 100 | 870 |
| 277 | 423 | 3 | 2 200 000 | 4 000 000 | 0,33 | 2,03 | 3,02 | 1,98 | 213 000 | 1 200 | 860 |
| 277 | 423 | 3 | 2 200 000 | 4 000 000 | 0,33 | 2,03 | 3,02 | 1,98 | 213 000 | 1 200 | 860 |
| 277 | 423 | 3 | 2 700 000 | 5 100 000 | 0,42 | 1,61 | 2,4 | 1,58 | 315 000 | 1 100 | 550 |
| 277 | 423 | 3 | 2 700 000 | 5 100 000 | 0,42 | 1,61 | 2,4 | 1,58 | 315 000 | 1 100 | 550 |

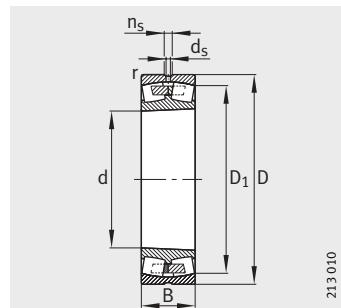


Spherical roller bearings

With cylindrical
or tapered bore



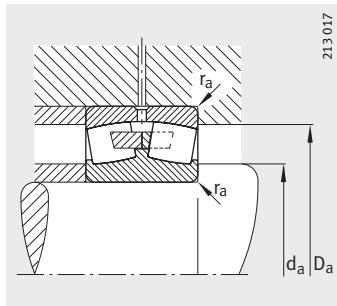
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|-----------------------|------------------|------------|-----|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 22252-B-K-MB | 106 | 260 | 480 | 130 | 5 | 415,3 | 12,5 | 23,5 |
| 22252-B-MB | 110 | 260 | 480 | 130 | 5 | 415,3 | 12,5 | 23,5 |
| 23252-B-K-MB | 136 | 260 | 480 | 174 | 5 | 405,4 | 12,5 | 23,5 |
| 23252-B-MB | 144 | 260 | 480 | 174 | 5 | 405,4 | 12,5 | 23,5 |
| 22352-K-MB | 177 | 260 | 540 | 165 | 6 | 452,1 | 12,5 | 23,5 |
| 22352-MB | 181 | 260 | 540 | 165 | 6 | 452,1 | 12,5 | 23,5 |
| 23956-K-MB | 24,7 | 280 | 380 | 75 | 2,1 | 350 | 8 | 15 |
| 23956-MB | 25,5 | 280 | 380 | 75 | 2,1 | 350 | 8 | 15 |
| 23056-B-K-MB | 50,3 | 280 | 420 | 106 | 4 | 376,5 | 9,5 | 17,7 |
| 23056-B-MB | 52,9 | 280 | 420 | 106 | 4 | 376,5 | 9,5 | 17,7 |
| 24056-B-K30-MB | 69,7 | 280 | 420 | 140 | 4 | 369,5 | 6,3 | 12,2 |
| 24056-B-MB | 70,8 | 280 | 420 | 140 | 4 | 369,5 | 6,3 | 12,2 |
| 23156-B-K-MB | 96,4 | 280 | 460 | 146 | 5 | 401,4 | 9,5 | 17,7 |
| 23156-B-MB | 99,5 | 280 | 460 | 146 | 5 | 401,4 | 9,5 | 17,7 |
| 24156-B-K30 | 118 | 280 | 460 | 180 | 5 | 392,8 | 8 | 15 |
| 24156-B | 119 | 280 | 460 | 180 | 5 | 392,8 | 8 | 15 |
| 22256-B-K-MB | 110 | 280 | 500 | 130 | 5 | 435,2 | 12,5 | 23,5 |
| 22256-B-MB | 113 | 280 | 500 | 130 | 5 | 435,2 | 12,5 | 23,5 |
| 23256-K-MB | 153 | 280 | 500 | 176 | 5 | 426,3 | 12,5 | 23,5 |
| 23256-MB | 157 | 280 | 500 | 176 | 5 | 426,3 | 12,5 | 23,5 |
| 22356-K-MB | 224 | 280 | 580 | 175 | 6 | 489,3 | 12,5 | 23,5 |
| 22356-MB | 233 | 280 | 580 | 175 | 6 | 489,3 | 12,5 | 23,5 |
| 23960-B-K-MB | 39,1 | 300 | 420 | 90 | 3 | 384,6 | 9,5 | 17,7 |
| 23960-B-MB | 40,6 | 300 | 420 | 90 | 3 | 384,6 | 9,5 | 17,7 |
| 23060-K-MB | 72,2 | 300 | 460 | 118 | 4 | 412,6 | 9,5 | 17,7 |
| 23060-MB | 73,8 | 300 | 460 | 118 | 4 | 412,6 | 9,5 | 17,7 |
| 24060-B-K30-MB | 97,7 | 300 | 460 | 160 | 4 | 401,5 | 8 | 15 |
| 24060-B-MB | 102 | 300 | 460 | 160 | 4 | 401,5 | 8 | 15 |
| 23160-B-K-MB | 123 | 300 | 500 | 160 | 5 | 434,7 | 9,5 | 17,7 |
| 23160-B-MB | 134 | 300 | 500 | 160 | 5 | 434,7 | 9,5 | 17,7 |
| 24160-B-K30 | 158 | 300 | 500 | 200 | 5 | 424,4 | 8 | 15 |
| 24160-B | 159 | 300 | 500 | 200 | 5 | 424,4 | 8 | 15 |
| 22260-K-MB | 136 | 300 | 540 | 140 | 5 | 468,8 | 12,5 | 23,5 |
| 22260-MB | 142 | 300 | 540 | 140 | 5 | 468,8 | 12,5 | 23,5 |
| 23260-K-MB | 192 | 300 | 540 | 192 | 5 | 458,7 | 12,5 | 23,5 |
| 23260-MB | 198 | 300 | 540 | 192 | 5 | 458,7 | 12,5 | 23,5 |



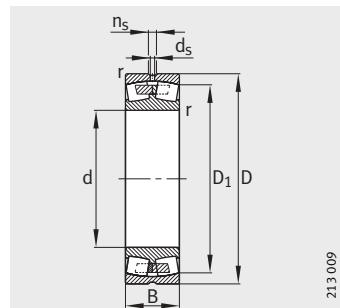
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} | Limiting speed n_G | Reference speed n_B |
|---------------------|---------------|---------------|--------------------|------------------------|---------------------|-------|-------|-------|--------------------------------|-------------------------|--------------------------|
| d_a min. | D_a max. | r_a max. | dyn. C_r N | stat. C_{or} N | e | Y_1 | Y_2 | Y_0 | N | min ⁻¹ | min ⁻¹ |
| 280 | 460 | 4 | 2 240 000 | 3 450 000 | 0,29 | 2,32 | 3,45 | 2,26 | 217 000 | 1 100 | 1 080 |
| 280 | 460 | 4 | 2 240 000 | 3 450 000 | 0,29 | 2,32 | 3,45 | 2,26 | 217 000 | 1 100 | 1 080 |
| 280 | 460 | 4 | 2 900 000 | 4 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 270 000 | 1 100 | 680 |
| 280 | 460 | 4 | 2 900 000 | 4 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 270 000 | 1 100 | 680 |
| 286 | 514 | 5 | 3 000 000 | 4 400 000 | 0,34 | 2 | 2,98 | 1,96 | 290 000 | 1 100 | 790 |
| 286 | 514 | 5 | 3 000 000 | 4 400 000 | 0,34 | 2 | 2,98 | 1,96 | 290 000 | 1 100 | 790 |
| 290,2 | 369,8 | 2,1 | 965 000 | 2 040 000 | 0,18 | 3,76 | 5,59 | 3,67 | 129 000 | 1 300 | 1 470 |
| 290,2 | 369,8 | 2,1 | 965 000 | 2 040 000 | 0,18 | 3,76 | 5,59 | 3,67 | 129 000 | 1 300 | 1 470 |
| 294,6 | 405,4 | 3 | 1 560 000 | 3 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 156 000 | 1 300 | 1 080 |
| 294,6 | 405,4 | 3 | 1 560 000 | 3 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 156 000 | 1 300 | 1 080 |
| 294,6 | 405,4 | 3 | 2 000 000 | 4 000 000 | 0,33 | 2,04 | 3,04 | 2 | 225 000 | 1 100 | 810 |
| 294,6 | 405,4 | 3 | 2 000 000 | 4 000 000 | 0,33 | 2,04 | 3,04 | 2 | 225 000 | 1 100 | 810 |
| 300 | 440 | 4 | 2 360 000 | 4 400 000 | 0,32 | 2,12 | 3,15 | 2,07 | 241 000 | 1 100 | 790 |
| 300 | 440 | 4 | 2 360 000 | 4 400 000 | 0,32 | 2,12 | 3,15 | 2,07 | 241 000 | 1 100 | 790 |
| 300 | 440 | 4 | 2 700 000 | 5 200 000 | 0,39 | 1,71 | 2,54 | 1,67 | 365 000 | 1 000 | 520 |
| 300 | 440 | 4 | 2 700 000 | 5 200 000 | 0,39 | 1,71 | 2,54 | 1,67 | 365 000 | 1 000 | 520 |
| 300 | 480 | 4 | 2 360 000 | 3 650 000 | 0,28 | 2,43 | 3,61 | 2,37 | 238 000 | 1 100 | 1 010 |
| 300 | 480 | 4 | 2 360 000 | 3 650 000 | 0,28 | 2,43 | 3,61 | 2,37 | 238 000 | 1 100 | 1 010 |
| 300 | 480 | 4 | 3 000 000 | 5 300 000 | 0,36 | 1,86 | 2,77 | 1,82 | 260 000 | 1 100 | 630 |
| 300 | 480 | 4 | 3 000 000 | 5 300 000 | 0,36 | 1,86 | 2,77 | 1,82 | 260 000 | 1 100 | 630 |
| 306 | 554 | 5 | 3 550 000 | 5 400 000 | 0,33 | 2,03 | 3,02 | 1,98 | 335 000 | 950 | 680 |
| 306 | 554 | 5 | 3 550 000 | 5 400 000 | 0,33 | 2,03 | 3,02 | 1,98 | 335 000 | 950 | 680 |
| 312,4 | 407,6 | 2,5 | 1 270 000 | 2 650 000 | 0,2 | 3,42 | 5,09 | 3,34 | 166 000 | 1 200 | 1 400 |
| 312,4 | 407,6 | 2,5 | 1 270 000 | 2 650 000 | 0,2 | 3,42 | 5,09 | 3,34 | 166 000 | 1 200 | 1 400 |
| 314,6 | 445,4 | 3 | 1 960 000 | 3 650 000 | 0,25 | 2,69 | 4 | 2,63 | 223 000 | 1 100 | 980 |
| 314,6 | 445,4 | 3 | 1 960 000 | 3 650 000 | 0,25 | 2,69 | 4 | 2,63 | 223 000 | 1 100 | 980 |
| 314,6 | 445,4 | 3 | 2 500 000 | 5 200 000 | 0,35 | 1,95 | 2,9 | 1,91 | 300 000 | 1 000 | 710 |
| 314,6 | 445,4 | 3 | 2 500 000 | 5 200 000 | 0,35 | 1,95 | 2,9 | 1,91 | 300 000 | 1 000 | 710 |
| 320 | 480 | 4 | 2 650 000 | 4 900 000 | 0,33 | 2,06 | 3,06 | 2,01 | 270 000 | 1 100 | 730 |
| 320 | 480 | 4 | 2 650 000 | 4 900 000 | 0,33 | 2,06 | 3,06 | 2,01 | 270 000 | 1 100 | 730 |
| 320 | 480 | 4 | 3 250 000 | 6 300 000 | 0,4 | 1,67 | 2,49 | 1,63 | 540 000 | 900 | 460 |
| 320 | 480 | 4 | 3 250 000 | 6 300 000 | 0,4 | 1,67 | 2,49 | 1,63 | 540 000 | 900 | 460 |
| 320 | 520 | 4 | 2 750 000 | 4 400 000 | 0,27 | 2,47 | 3,67 | 2,41 | 300 000 | 1 000 | 900 |
| 320 | 520 | 4 | 2 750 000 | 4 400 000 | 0,27 | 2,47 | 3,67 | 2,41 | 300 000 | 1 000 | 900 |
| 320 | 520 | 4 | 3 450 000 | 6 200 000 | 0,37 | 1,83 | 2,72 | 1,79 | 300 000 | 1 000 | 560 |
| 320 | 520 | 4 | 3 450 000 | 6 200 000 | 0,37 | 1,83 | 2,72 | 1,79 | 300 000 | 1 000 | 560 |

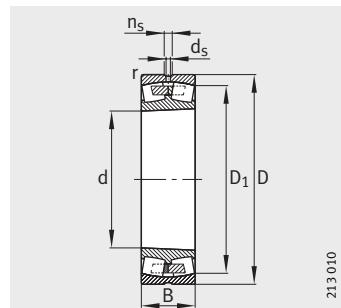


Spherical roller bearings

With cylindrical
or tapered bore



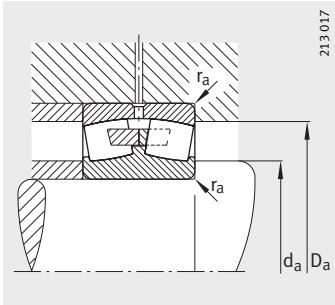
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|-----------------------|------------------|------------|-----|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 23964-K-MB | 41 | 320 | 440 | 90 | 3 | 406,2 | 9,5 | 17,7 |
| 23964-MB | 41,8 | 320 | 440 | 90 | 3 | 406,2 | 9,5 | 17,7 |
| 23064-K-MB | 77,1 | 320 | 480 | 121 | 4 | 432,6 | 9,5 | 17,7 |
| 23064-MB | 79,9 | 320 | 480 | 121 | 4 | 432,6 | 9,5 | 17,7 |
| 24064-B-K30-MB | 103 | 320 | 480 | 160 | 4 | 424 | 8 | 15 |
| 24064-B-MB | 107 | 320 | 480 | 160 | 4 | 424 | 8 | 15 |
| 23164-K-MB | 159 | 320 | 540 | 176 | 5 | 466,2 | 12,5 | 23,5 |
| 23164-MB | 170 | 320 | 540 | 176 | 5 | 466,2 | 12,5 | 23,5 |
| 24164-B-K30 | 197 | 320 | 540 | 218 | 5 | 456,1 | 9,5 | 17,7 |
| 24164-B | 204 | 320 | 540 | 218 | 5 | 456,1 | 9,5 | 17,7 |
| 22264-K-MB | 166 | 320 | 580 | 150 | 5 | 503,5 | 12,5 | 23,5 |
| 22264-MB | 177 | 320 | 580 | 150 | 5 | 503,5 | 12,5 | 23,5 |
| 23264-K-MB | 229 | 320 | 580 | 208 | 5 | 489,6 | 12,5 | 23,5 |
| 23264-MB | 242 | 320 | 580 | 208 | 5 | 489,6 | 12,5 | 23,5 |
| 23968-MB | 47,8 | 340 | 460 | 90 | 3 | 426,7 | 9,5 | 17,7 |
| 23068-K-MB | 101 | 340 | 520 | 133 | 5 | 464,6 | 12,5 | 23,5 |
| 23068-MB | 105 | 340 | 520 | 133 | 5 | 464,6 | 12,5 | 23,5 |
| 24068-B-K30-MB | 143 | 340 | 520 | 180 | 5 | 457,1 | 9,5 | 17,7 |
| 24068-B-MB | 146 | 340 | 520 | 180 | 5 | 457,1 | 9,5 | 17,7 |
| 23168-B-K-MB | 203 | 340 | 580 | 190 | 5 | 499,5 | 12,5 | 23,5 |
| 23168-B-MB | 215 | 340 | 580 | 190 | 5 | 499,5 | 12,5 | 23,5 |
| 24168-B-K30 | 260 | 340 | 580 | 243 | 5 | 481,1 | 9,5 | 17,7 |
| 24168-B | 266 | 340 | 580 | 243 | 5 | 481,1 | 9,5 | 17,7 |
| 23268-B-K-MB | 291 | 340 | 620 | 224 | 6 | 521,2 | 12,5 | 23,5 |
| 23268-B-MB | 309 | 340 | 620 | 224 | 6 | 521,2 | 12,5 | 23,5 |
| 23972-K-MB | 45 | 360 | 480 | 90 | 3 | 447,1 | 9,5 | 17,7 |
| 23972-MB | 46,5 | 360 | 480 | 90 | 3 | 447,1 | 9,5 | 17,7 |
| 23072-K-MB | 107 | 360 | 540 | 134 | 5 | 485,2 | 12,5 | 23,5 |
| 23072-MB | 112 | 360 | 540 | 134 | 5 | 485,2 | 12,5 | 23,5 |
| 24072-B-MB | 138 | 360 | 540 | 180 | 5 | 478,5 | 9,5 | 17,7 |
| 23172-K-MB | 217 | 360 | 600 | 192 | 5 | 520 | 12,5 | 23,5 |
| 23172-MB | 230 | 360 | 600 | 192 | 5 | 520 | 12,5 | 23,5 |
| 24172-B-K30 | 275 | 360 | 600 | 243 | 5 | 503,6 | 9,5 | 17,7 |
| 24172-B | 279 | 360 | 600 | 243 | 5 | 503,6 | 9,5 | 17,7 |
| 23272-B-K-MB | 328 | 360 | 650 | 232 | 6 | 548,3 | 12,5 | 23,5 |
| 23272-B-MB | 347 | 360 | 650 | 232 | 6 | 548,3 | 12,5 | 23,5 |



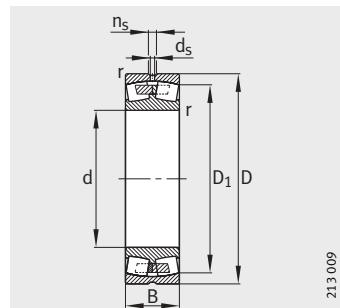
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|--------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} | n _G min ⁻¹ | n _B min ⁻¹ |
| 332,4 | 427,6 | 2,5 | 1 320 000 | 2 750 000 | 0,19 | 3,62 | 5,39 | 3,54 | 202 000 | 1 100 | 1 300 |
| 332,4 | 427,6 | 2,5 | 1 320 000 | 2 750 000 | 0,19 | 3,62 | 5,39 | 3,54 | 202 000 | 1 100 | 1 300 |
| 334,6 | 465,4 | 3 | 2 040 000 | 4 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 243 000 | 1 100 | 910 |
| 334,6 | 465,4 | 3 | 2 040 000 | 4 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 243 000 | 1 100 | 910 |
| 334,6 | 465,4 | 3 | 2 600 000 | 5 400 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 950 | 660 |
| 334,6 | 465,4 | 3 | 2 600 000 | 5 400 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 950 | 660 |
| 340 | 520 | 4 | 3 200 000 | 6 000 000 | 0,34 | 1,98 | 2,94 | 1,93 | 305 000 | 950 | 650 |
| 340 | 520 | 4 | 3 200 000 | 6 000 000 | 0,34 | 1,98 | 2,94 | 1,93 | 305 000 | 950 | 650 |
| 340 | 520 | 4 | 3 800 000 | 7 350 000 | 0,41 | 1,65 | 2,46 | 1,61 | 530 000 | 850 | 415 |
| 340 | 520 | 4 | 3 800 000 | 7 350 000 | 0,41 | 1,65 | 2,46 | 1,61 | 530 000 | 850 | 415 |
| 340 | 560 | 4 | 3 050 000 | 4 900 000 | 0,27 | 2,47 | 3,67 | 2,41 | 345 000 | 950 | 840 |
| 340 | 560 | 4 | 3 050 000 | 4 900 000 | 0,27 | 2,47 | 3,67 | 2,41 | 345 000 | 950 | 840 |
| 340 | 560 | 4 | 3 900 000 | 6 950 000 | 0,37 | 1,8 | 2,69 | 1,76 | 330 000 | 950 | 520 |
| 340 | 560 | 4 | 3 900 000 | 6 950 000 | 0,37 | 1,8 | 2,69 | 1,76 | 330 000 | 950 | 520 |
| 352,4 | 447,6 | 2,5 | 1 370 000 | 3 000 000 | 0,18 | 3,85 | 5,73 | 3,76 | 199 000 | 1 100 | 1 210 |
| 358 | 502 | 4 | 2 360 000 | 4 550 000 | 0,25 | 2,69 | 4 | 2,63 | 285 000 | 1 000 | 850 |
| 358 | 502 | 4 | 2 360 000 | 4 550 000 | 0,25 | 2,69 | 4 | 2,63 | 285 000 | 1 000 | 850 |
| 358 | 502 | 4 | 3 100 000 | 6 550 000 | 0,34 | 1,98 | 2,94 | 1,93 | 530 000 | 850 | 600 |
| 358 | 502 | 4 | 3 100 000 | 6 550 000 | 0,34 | 1,98 | 2,94 | 1,93 | 530 000 | 850 | 600 |
| 360 | 560 | 4 | 3 650 000 | 6 950 000 | 0,34 | 1,98 | 2,94 | 1,93 | 570 000 | 900 | 590 |
| 360 | 560 | 4 | 3 650 000 | 6 950 000 | 0,34 | 1,98 | 2,94 | 1,93 | 570 000 | 900 | 590 |
| 360 | 560 | 4 | 4 400 000 | 8 500 000 | 0,43 | 1,56 | 2,32 | 1,53 | 680 000 | 800 | 380 |
| 360 | 560 | 4 | 4 400 000 | 8 500 000 | 0,43 | 1,56 | 2,32 | 1,53 | 680 000 | 800 | 380 |
| 366 | 594 | 5 | 4 500 000 | 8 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 650 000 | 850 | 470 |
| 366 | 594 | 5 | 4 500 000 | 8 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 650 000 | 850 | 470 |
| 372,4 | 467,6 | 2,5 | 1 430 000 | 3 200 000 | 0,17 | 4,05 | 6,04 | 3,96 | 209 000 | 1 000 | 1 130 |
| 372,4 | 467,6 | 2,5 | 1 430 000 | 3 200 000 | 0,17 | 4,05 | 6,04 | 3,96 | 209 000 | 1 000 | 1 130 |
| 378 | 522 | 4 | 2 450 000 | 4 800 000 | 0,25 | 2,74 | 4,08 | 2,68 | 295 000 | 950 | 800 |
| 378 | 522 | 4 | 2 450 000 | 4 800 000 | 0,25 | 2,74 | 4,08 | 2,68 | 295 000 | 950 | 800 |
| 378 | 522 | 4 | 3 250 000 | 6 800 000 | 0,33 | 2,06 | 3,06 | 2,01 | 530 000 | 800 | 570 |
| 380 | 580 | 4 | 3 800 000 | 7 350 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 850 | 560 |
| 380 | 580 | 4 | 3 800 000 | 7 350 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 850 | 560 |
| 380 | 580 | 4 | 4 500 000 | 9 000 000 | 0,41 | 1,63 | 2,43 | 1,6 | 550 000 | 750 | 355 |
| 380 | 580 | 4 | 4 500 000 | 9 000 000 | 0,41 | 1,63 | 2,43 | 1,6 | 550 000 | 750 | 355 |
| 386 | 624 | 5 | 4 900 000 | 9 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 720 000 | 800 | 425 |
| 386 | 624 | 5 | 4 900 000 | 9 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 720 000 | 800 | 425 |

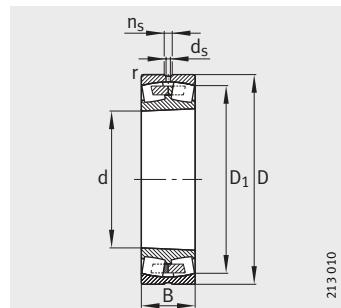


Spherical roller bearings

With cylindrical
or tapered bore



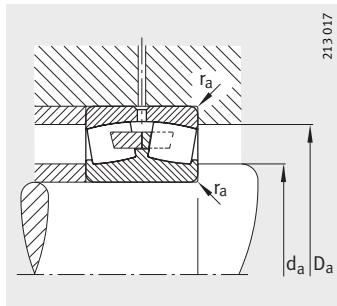
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|-----------------------|------------------|------------|-----|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 23976-K-MB | 66,3 | 380 | 520 | 106 | 4 | 477,6 | 9,5 | 17,7 |
| 23976-MB | 68,5 | 380 | 520 | 106 | 4 | 477,6 | 9,5 | 17,7 |
| 23076-B-K-MB | 113 | 380 | 560 | 135 | 5 | 505,6 | 12,5 | 23,5 |
| 23076-B-MB | 117 | 380 | 560 | 135 | 5 | 505,6 | 12,5 | 23,5 |
| 24076-B-K30-MB | 155 | 380 | 560 | 180 | 5 | 499 | 9,5 | 17,7 |
| 24076-B-MB | 158 | 380 | 560 | 180 | 5 | 499 | 9,5 | 17,7 |
| 23176-K-MB | 226 | 380 | 620 | 194 | 5 | 539,6 | 12,5 | 23,5 |
| 23176-MB | 241 | 380 | 620 | 194 | 5 | 539,6 | 12,5 | 23,5 |
| 24176-B-K30 | 277 | 380 | 620 | 243 | 5 | 525,8 | 9,5 | 17,7 |
| 24176-B | 279 | 380 | 620 | 243 | 5 | 525,8 | 9,5 | 17,7 |
| 23276-B-K-MB | 367 | 380 | 680 | 240 | 6 | 576,4 | 12,5 | 23,5 |
| 23276-B-MB | 390 | 380 | 680 | 240 | 6 | 576,4 | 12,5 | 23,5 |
| 23980-B-K-MB | 68,2 | 400 | 540 | 106 | 4 | 499 | 9,5 | 17,7 |
| 23980-B-MB | 72,9 | 400 | 540 | 106 | 4 | 499 | 9,5 | 17,7 |
| 23080-K-MB | 143 | 400 | 600 | 148 | 5 | 540,5 | 12,5 | 23,5 |
| 23080-MB | 151 | 400 | 600 | 148 | 5 | 540,5 | 12,5 | 23,5 |
| 24080-B-K30-MB | 196 | 400 | 600 | 200 | 5 | 530,9 | 12,5 | 23,5 |
| 24080-B-MB | 198 | 400 | 600 | 200 | 5 | 530,9 | 12,5 | 23,5 |
| 23180-B-K-MB | 261 | 400 | 650 | 200 | 6 | 567,2 | 12,5 | 23,5 |
| 23180-B-MB | 270 | 400 | 650 | 200 | 6 | 567,2 | 12,5 | 23,5 |
| 24180-B-K30 | 312 | 400 | 650 | 250 | 6 | 553,5 | 12,5 | 23,5 |
| 24180-B | 326 | 400 | 650 | 250 | 6 | 553,5 | 12,5 | 23,5 |
| 23280-B-K-MB | 442 | 400 | 720 | 256 | 6 | 609,8 | 12,5 | 23,5 |
| 23280-B-MB | 469 | 400 | 720 | 256 | 6 | 609,8 | 12,5 | 23,5 |
| 23984-K-MB | 78 | 420 | 560 | 106 | 4 | 519,5 | 9,5 | 17,7 |
| 23984-MB | 80,5 | 420 | 560 | 106 | 4 | 519,5 | 9,5 | 17,7 |
| 23084-B-K-MB | 155 | 420 | 620 | 150 | 5 | 560,7 | 12,5 | 23,5 |
| 23084-B-MB | 162 | 420 | 620 | 150 | 5 | 560,7 | 12,5 | 23,5 |
| 24084-B-K30-MB | 214 | 420 | 620 | 200 | 5 | 550,2 | 12,5 | 23,5 |
| 24084-B-MB | 217 | 420 | 620 | 200 | 5 | 550,2 | 12,5 | 23,5 |
| 23184-K-MB | 339 | 420 | 700 | 224 | 6 | 605,4 | 12,5 | 23,5 |
| 23184-MB | 360 | 420 | 700 | 224 | 6 | 605,4 | 12,5 | 23,5 |
| 24184-B-K30 | 407 | 420 | 700 | 280 | 6 | 590,3 | 12,5 | 23,5 |
| 24184-B | 442 | 420 | 700 | 280 | 6 | 590,3 | 12,5 | 23,5 |
| 23284-B-K-MB | 537 | 420 | 760 | 272 | 7,5 | 642,2 | 12,5 | 23,5 |
| 23284-B-MB | 558 | 420 | 760 | 272 | 7,5 | 642,2 | 12,5 | 23,5 |



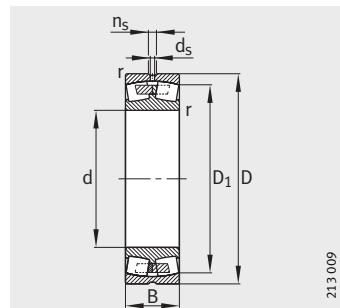
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} | Limiting speed n_G | Reference speed n_B |
|---------------------|---------------|---------------|--------------------|------------------------|---------------------|-------|-------|-------|--------------------------------|-------------------------|--------------------------|
| d_a min. | D_a max. | r_a max. | dyn. C_r N | stat. C_{or} N | e | Y_1 | Y_2 | Y_0 | N | min ⁻¹ | min ⁻¹ |
| 394,6 | 505,4 | 3 | 1 760 000 | 4 000 000 | 0,19 | 3,58 | 5,33 | 3,5 | 265 000 | 950 | 1 090 |
| 394,6 | 505,4 | 3 | 1 760 000 | 4 000 000 | 0,19 | 3,58 | 5,33 | 3,5 | 265 000 | 950 | 1 090 |
| 398 | 542 | 4 | 2 550 000 | 5 300 000 | 0,24 | 2,84 | 4,23 | 2,78 | 430 000 | 900 | 740 |
| 398 | 542 | 4 | 2 550 000 | 5 300 000 | 0,24 | 2,84 | 4,23 | 2,78 | 430 000 | 900 | 740 |
| 398 | 542 | 4 | 3 350 000 | 7 200 000 | 0,31 | 2,15 | 3,2 | 2,1 | 580 000 | 750 | 530 |
| 398 | 542 | 4 | 3 350 000 | 7 200 000 | 0,31 | 2,15 | 3,2 | 2,1 | 580 000 | 750 | 530 |
| 400 | 600 | 4 | 4 050 000 | 8 150 000 | 0,32 | 2,12 | 3,15 | 2,07 | 385 000 | 800 | 510 |
| 400 | 600 | 4 | 4 050 000 | 8 150 000 | 0,32 | 2,12 | 3,15 | 2,07 | 385 000 | 800 | 510 |
| 400 | 600 | 4 | 4 650 000 | 9 500 000 | 0,39 | 1,71 | 2,54 | 1,67 | 770 000 | 700 | 330 |
| 400 | 600 | 4 | 4 650 000 | 9 500 000 | 0,39 | 1,71 | 2,54 | 1,67 | 770 000 | 700 | 330 |
| 406 | 654 | 5 | 5 300 000 | 9 800 000 | 0,37 | 1,8 | 2,69 | 1,76 | 780 000 | 750 | 400 |
| 406 | 654 | 5 | 5 300 000 | 9 800 000 | 0,37 | 1,8 | 2,69 | 1,76 | 780 000 | 750 | 400 |
| 414,6 | 525,4 | 3 | 1 830 000 | 4 150 000 | 0,18 | 3,71 | 5,52 | 3,63 | 275 000 | 900 | 1 030 |
| 414,6 | 525,4 | 3 | 1 830 000 | 4 150 000 | 0,18 | 3,71 | 5,52 | 3,63 | 275 000 | 900 | 1 030 |
| 418 | 582 | 4 | 3 050 000 | 6 200 000 | 0,24 | 2,79 | 4,15 | 2,73 | 365 000 | 800 | 680 |
| 418 | 582 | 4 | 3 050 000 | 6 200 000 | 0,24 | 2,79 | 4,15 | 2,73 | 365 000 | 800 | 680 |
| 418 | 582 | 4 | 3 900 000 | 8 500 000 | 0,33 | 2,06 | 3,06 | 2,01 | 670 000 | 700 | 485 |
| 418 | 582 | 4 | 3 900 000 | 8 500 000 | 0,33 | 2,06 | 3,06 | 2,01 | 670 000 | 700 | 485 |
| 426 | 624 | 5 | 4 250 000 | 8 500 000 | 0,31 | 2,15 | 3,2 | 2,1 | 670 000 | 750 | 490 |
| 426 | 624 | 5 | 4 250 000 | 8 500 000 | 0,31 | 2,15 | 3,2 | 2,1 | 670 000 | 750 | 490 |
| 426 | 624 | 5 | 5 100 000 | 10 400 000 | 0,39 | 1,72 | 2,56 | 1,68 | 790 000 | 670 | 305 |
| 426 | 624 | 5 | 5 100 000 | 10 400 000 | 0,39 | 1,72 | 2,56 | 1,68 | 790 000 | 670 | 305 |
| 426 | 694 | 5 | 5 700 000 | 10 800 000 | 0,38 | 1,78 | 2,65 | 1,74 | 820 000 | 700 | 375 |
| 426 | 694 | 5 | 5 700 000 | 10 800 000 | 0,38 | 1,78 | 2,65 | 1,74 | 820 000 | 700 | 375 |
| 434,6 | 545,4 | 3 | 1 900 000 | 4 500 000 | 0,18 | 3,85 | 5,73 | 3,76 | 300 000 | 850 | 970 |
| 434,6 | 545,4 | 3 | 1 900 000 | 4 500 000 | 0,18 | 3,85 | 5,73 | 3,76 | 300 000 | 850 | 970 |
| 438 | 602 | 4 | 3 150 000 | 6 550 000 | 0,24 | 2,84 | 4,23 | 2,78 | 395 000 | 800 | 650 |
| 438 | 602 | 4 | 3 150 000 | 6 550 000 | 0,24 | 2,84 | 4,23 | 2,78 | 395 000 | 800 | 650 |
| 438 | 602 | 4 | 4 000 000 | 8 800 000 | 0,32 | 2,13 | 3,17 | 2,08 | 710 000 | 670 | 460 |
| 438 | 602 | 4 | 4 000 000 | 8 800 000 | 0,32 | 2,13 | 3,17 | 2,08 | 710 000 | 670 | 460 |
| 446 | 674 | 5 | 5 000 000 | 9 650 000 | 0,33 | 2,03 | 3,02 | 1,98 | 465 000 | 700 | 460 |
| 446 | 674 | 5 | 5 000 000 | 9 650 000 | 0,33 | 2,03 | 3,02 | 1,98 | 465 000 | 700 | 460 |
| 446 | 674 | 5 | 6 200 000 | 12 700 000 | 0,4 | 1,67 | 2,49 | 1,63 | 980 000 | 630 | 270 |
| 446 | 674 | 5 | 6 200 000 | 12 700 000 | 0,4 | 1,67 | 2,49 | 1,63 | 980 000 | 630 | 270 |
| 452 | 728 | 6 | 6 550 000 | 12 200 000 | 0,38 | 1,77 | 2,64 | 1,73 | 930 000 | 670 | 345 |
| 452 | 728 | 6 | 6 550 000 | 12 200 000 | 0,38 | 1,77 | 2,64 | 1,73 | 930 000 | 670 | 345 |

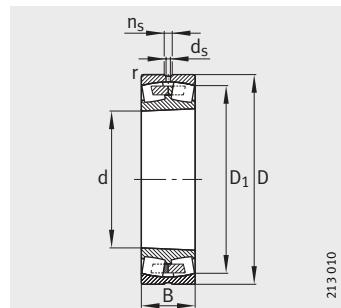


Spherical roller bearings

With cylindrical
or tapered bore



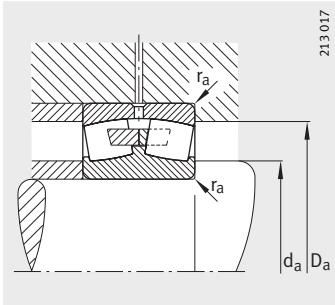
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|-----------------------|------------------|------------|-----|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 23988-K-MB | 98,3 | 440 | 600 | 118 | 4 | 552,8 | 12,5 | 23,5 |
| 23988-MB | 101 | 440 | 600 | 118 | 4 | 552,8 | 12,5 | 23,5 |
| 23088-K-MB | 177 | 440 | 650 | 157 | 6 | 586,8 | 12,5 | 23,5 |
| 23088-MB | 190 | 440 | 650 | 157 | 6 | 586,8 | 12,5 | 23,5 |
| 24088-B-K30-MB | 247 | 440 | 650 | 212 | 6 | 575,6 | 12,5 | 23,5 |
| 24088-B-MB | 250 | 440 | 650 | 212 | 6 | 575,6 | 12,5 | 23,5 |
| 23188-K-MB | 378 | 440 | 720 | 226 | 6 | 626 | 12,5 | 23,5 |
| 23188-MB | 381 | 440 | 720 | 226 | 6 | 626 | 12,5 | 23,5 |
| 24188-B-K30 | 451 | 440 | 720 | 280 | 6 | 612,4 | 12,5 | 23,5 |
| 24188-B | 453 | 440 | 720 | 280 | 6 | 612,4 | 12,5 | 23,5 |
| 23288-B-K-MB | 586 | 440 | 790 | 280 | 7,5 | 669,3 | 12,5 | 23,5 |
| 23288-B-MB | 615 | 440 | 790 | 280 | 7,5 | 669,3 | 12,5 | 23,5 |
| 23992-B-K-MB | 103 | 460 | 620 | 118 | 4 | 573,3 | 12,5 | 23,5 |
| 23992-B-MB | 111 | 460 | 620 | 118 | 4 | 573,3 | 12,5 | 23,5 |
| 23092-B-K-MB | 204 | 460 | 680 | 163 | 6 | 612,2 | 12,5 | 23,5 |
| 23092-B-MB | 208 | 460 | 680 | 163 | 6 | 612,2 | 12,5 | 23,5 |
| 24092-B-MB | 282 | 460 | 680 | 218 | 6 | 603,3 | 12,5 | 23,5 |
| 23192-K-MB | 420 | 460 | 760 | 240 | 7,5 | 661,4 | 12,5 | 23,5 |
| 23192-MB | 447 | 460 | 760 | 240 | 7,5 | 661,4 | 12,5 | 23,5 |
| 24192-B-K30-MB | 578 | 460 | 760 | 300 | 7,5 | 642,8 | 12,5 | 23,5 |
| 24192-B-MB | 582 | 460 | 760 | 300 | 7,5 | 642,8 | 12,5 | 23,5 |
| 23292-K-MB | 699 | 460 | 830 | 296 | 7,5 | 701,6 | 12,5 | 23,5 |
| 23292-MB | 700 | 460 | 830 | 296 | 7,5 | 701,6 | 12,5 | 23,5 |
| 23996-B-K-MB | 121 | 480 | 650 | 128 | 5 | 598,8 | 12,5 | 23,5 |
| 23996-B-MB | 126 | 480 | 650 | 128 | 5 | 598,8 | 12,5 | 23,5 |
| 23096-K-MB | 208 | 480 | 700 | 165 | 6 | 632,6 | 12,5 | 23,5 |
| 23096-MB | 222 | 480 | 700 | 165 | 6 | 632,6 | 12,5 | 23,5 |
| 24096-B-K30-MB | 289 | 480 | 700 | 218 | 6 | 625,4 | 12,5 | 23,5 |
| 24096-B-MB | 291 | 480 | 700 | 218 | 6 | 625,4 | 12,5 | 23,5 |
| 23196-K-MB | 470 | 480 | 790 | 248 | 7,5 | 688,3 | 12,5 | 23,5 |
| 23196-MB | 508 | 480 | 790 | 248 | 7,5 | 688,3 | 12,5 | 23,5 |
| 24196-B-K30-MB | 700 | 480 | 790 | 308 | 7,5 | 669,9 | 12,5 | 23,5 |
| 23296-K-MB | 806 | 480 | 870 | 310 | 7,5 | 734,8 | 12,5 | 23,5 |
| 23296-MB | 830 | 480 | 870 | 310 | 7,5 | 734,8 | 12,5 | 23,5 |
| 239/500-K-MB | 124 | 500 | 670 | 128 | 5 | 619,3 | 12,5 | 23,5 |
| 239/500-MB | 132 | 500 | 670 | 128 | 5 | 619,3 | 12,5 | 23,5 |



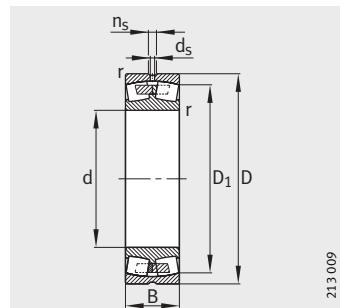
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|--------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} | n _G min ⁻¹ | n _B min ⁻¹ |
| 454,6 | 585,4 | 3 | 2 240 000 | 5 200 000 | 0,18 | 3,66 | 5,46 | 3,58 | 295 000 | 800 | 930 |
| 454,6 | 585,4 | 3 | 2 240 000 | 5 200 000 | 0,18 | 3,66 | 5,46 | 3,58 | 295 000 | 800 | 930 |
| 463 | 627 | 5 | 3 400 000 | 7 100 000 | 0,24 | 2,84 | 4,23 | 2,78 | 405 000 | 750 | 610 |
| 463 | 627 | 5 | 3 400 000 | 7 100 000 | 0,24 | 2,84 | 4,23 | 2,78 | 405 000 | 750 | 610 |
| 463 | 627 | 5 | 4 300 000 | 9 650 000 | 0,32 | 2,12 | 3,15 | 2,07 | 750 000 | 630 | 435 |
| 463 | 627 | 5 | 4 300 000 | 9 650 000 | 0,32 | 2,12 | 3,15 | 2,07 | 750 000 | 630 | 435 |
| 466 | 694 | 5 | 5 200 000 | 10 400 000 | 0,32 | 2,1 | 3,13 | 2,06 | 485 000 | 700 | 430 |
| 466 | 694 | 5 | 5 200 000 | 10 400 000 | 0,32 | 2,1 | 3,13 | 2,06 | 485 000 | 700 | 430 |
| 466 | 694 | 5 | 6 400 000 | 13 200 000 | 0,38 | 1,76 | 2,62 | 1,72 | 1 020 000 | 600 | 255 |
| 466 | 694 | 5 | 6 400 000 | 13 200 000 | 0,38 | 1,76 | 2,62 | 1,72 | 1 020 000 | 600 | 255 |
| 472 | 758 | 6 | 7 100 000 | 13 400 000 | 0,37 | 1,8 | 2,69 | 1,76 | 990 000 | 630 | 320 |
| 472 | 758 | 6 | 7 100 000 | 13 400 000 | 0,37 | 1,8 | 2,69 | 1,76 | 990 000 | 630 | 320 |
| 474,6 | 605,4 | 3 | 2 280 000 | 5 400 000 | 0,18 | 3,85 | 5,73 | 3,76 | 370 000 | 750 | 880 |
| 474,6 | 605,4 | 3 | 2 280 000 | 5 400 000 | 0,18 | 3,85 | 5,73 | 3,76 | 370 000 | 750 | 880 |
| 483 | 657 | 5 | 3 650 000 | 7 650 000 | 0,24 | 2,84 | 4,23 | 2,78 | 440 000 | 700 | 580 |
| 483 | 657 | 5 | 3 650 000 | 7 650 000 | 0,24 | 2,84 | 4,23 | 2,78 | 440 000 | 700 | 580 |
| 483 | 657 | 5 | 4 750 000 | 10 600 000 | 0,31 | 2,16 | 3,22 | 2,12 | 710 000 | 630 | 405 |
| 492 | 728 | 6 | 5 850 000 | 11 600 000 | 0,32 | 2,12 | 3,15 | 2,07 | 530 000 | 630 | 400 |
| 492 | 728 | 6 | 5 850 000 | 11 600 000 | 0,32 | 2,12 | 3,15 | 2,07 | 530 000 | 630 | 400 |
| 492 | 728 | 6 | 7 500 000 | 15 600 000 | 0,39 | 1,73 | 2,58 | 1,69 | 1 160 000 | 560 | 228 |
| 492 | 728 | 6 | 7 500 000 | 15 600 000 | 0,39 | 1,73 | 2,58 | 1,69 | 1 160 000 | 560 | 228 |
| 492 | 798 | 6 | 7 800 000 | 15 000 000 | 0,37 | 1,8 | 2,69 | 1,76 | 620 000 | 600 | 295 |
| 492 | 798 | 6 | 7 800 000 | 15 000 000 | 0,37 | 1,8 | 2,69 | 1,76 | 620 000 | 600 | 295 |
| 498 | 632 | 4 | 2 550 000 | 6 000 000 | 0,18 | 3,76 | 5,59 | 3,67 | 460 000 | 700 | 860 |
| 498 | 632 | 4 | 2 550 000 | 6 000 000 | 0,18 | 3,76 | 5,59 | 3,67 | 460 000 | 700 | 860 |
| 503 | 677 | 5 | 3 800 000 | 8 150 000 | 0,23 | 2,9 | 4,31 | 2,83 | 455 000 | 670 | 550 |
| 503 | 677 | 5 | 3 800 000 | 8 150 000 | 0,23 | 2,9 | 4,31 | 2,83 | 455 000 | 670 | 550 |
| 503 | 677 | 5 | 4 900 000 | 11 200 000 | 0,3 | 2,25 | 3,34 | 2,2 | 830 000 | 600 | 380 |
| 503 | 677 | 5 | 4 900 000 | 11 200 000 | 0,3 | 2,25 | 3,34 | 2,2 | 830 000 | 600 | 380 |
| 512 | 758 | 6 | 6 300 000 | 12 700 000 | 0,32 | 2,12 | 3,15 | 2,07 | 570 000 | 630 | 375 |
| 512 | 758 | 6 | 6 300 000 | 12 700 000 | 0,32 | 2,12 | 3,15 | 2,07 | 570 000 | 630 | 375 |
| 512 | 758 | 6 | 8 000 000 | 16 600 000 | 0,39 | 1,75 | 2,61 | 1,71 | 1 190 000 | 560 | 215 |
| 512 | 838 | 6 | 8 800 000 | 17 000 000 | 0,37 | 1,83 | 2,72 | 1,79 | 700 000 | 600 | 270 |
| 512 | 838 | 6 | 8 800 000 | 17 000 000 | 0,37 | 1,83 | 2,72 | 1,79 | 700 000 | 600 | 270 |
| 518 | 652 | 4 | 2 600 000 | 6 300 000 | 0,17 | 3,9 | 5,81 | 3,81 | 400 000 | 670 | 810 |
| 518 | 652 | 4 | 2 600 000 | 6 300 000 | 0,17 | 3,9 | 5,81 | 3,81 | 400 000 | 670 | 810 |

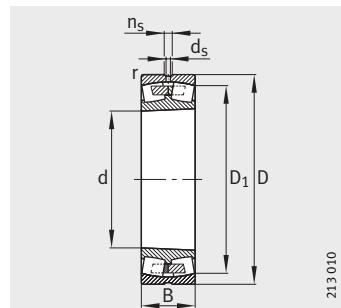


Spherical roller bearings

With cylindrical
or tapered bore



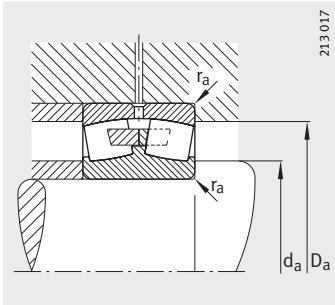
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|-------------------------|------------------|------------|-----|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 230/500-B-K-MB | 219 | 500 | 720 | 167 | 6 | 653,5 | 12,5 | 23,5 |
| 230/500-B-MB | 233 | 500 | 720 | 167 | 6 | 653,5 | 12,5 | 23,5 |
| 240/500-B-MB | 297 | 500 | 720 | 218 | 6 | 645,8 | 12,5 | 23,5 |
| 231/500-B-K-MB | 556 | 500 | 830 | 264 | 7,5 | 720,9 | 12,5 | 23,5 |
| 231/500-B-MB | 588 | 500 | 830 | 264 | 7,5 | 720,9 | 12,5 | 23,5 |
| 241/500-B-K30-MB | 717 | 500 | 830 | 325 | 7,5 | 701,8 | 12,5 | 23,5 |
| 241/500-B-MB | 725 | 500 | 830 | 325 | 7,5 | 701,8 | 12,5 | 23,5 |
| 239/530-K-MB | 146 | 530 | 710 | 136 | 5 | 656,4 | 12,5 | 23,5 |
| 239/530-MB | 160 | 530 | 710 | 136 | 5 | 656,4 | 12,5 | 23,5 |
| 230/530-K-MB | 291 | 530 | 780 | 185 | 6 | 703,7 | 12,5 | 23,5 |
| 230/530-MB | 321 | 530 | 780 | 185 | 6 | 703,7 | 12,5 | 23,5 |
| 240/530-B-MB | 415 | 530 | 780 | 250 | 6 | 691,9 | 12,5 | 23,5 |
| 231/530-K-MB | 643 | 530 | 870 | 272 | 7,5 | 756,3 | 12,5 | 23,5 |
| 241/530-B-K30-MB | 845 | 530 | 870 | 335 | 7,5 | 739,1 | 12,5 | 23,5 |
| 239/560-B-K-MB | 169 | 560 | 750 | 140 | 5 | 693,4 | 12,5 | 23,5 |
| 239/560-B-MB | 181 | 560 | 750 | 140 | 5 | 693,4 | 12,5 | 23,5 |
| 230/560-B-K-MB | 339 | 560 | 820 | 195 | 6 | 741,5 | 12,5 | 23,5 |
| 230/560-B-MB | 358 | 560 | 820 | 195 | 6 | 741,5 | 12,5 | 23,5 |
| 240/560-B-MB | 468 | 560 | 820 | 258 | 6 | 731,2 | 12,5 | 23,5 |
| 231/560-K-MB | 737 | 560 | 920 | 280 | 7,5 | 800,2 | 12,5 | 23,5 |
| 231/560-MB | 760 | 560 | 920 | 280 | 7,5 | 800,2 | 12,5 | 23,5 |
| 241/560-B-K30-MB | 974 | 560 | 920 | 355 | 7,5 | 785 | 12,5 | 23,5 |
| 239/600-B-K-MB | 210 | 600 | 800 | 150 | 5 | 740,5 | 12,5 | 23,5 |
| 239/600-B-MB | 224 | 600 | 800 | 150 | 5 | 740,5 | 12,5 | 23,5 |
| 230/600-B-K-MB | 388 | 600 | 870 | 200 | 6 | 791,9 | 12,5 | 23,5 |
| 230/600-B-MB | 409 | 600 | 870 | 200 | 6 | 791,9 | 12,5 | 23,5 |
| 240/600-B-MB | 540 | 600 | 870 | 272 | 6 | 773,3 | 12,5 | 23,5 |
| 231/600-K-MB | 901 | 600 | 980 | 300 | 7,5 | 852,6 | 12,5 | 23,5 |
| 231/600-MB | 929 | 600 | 980 | 300 | 7,5 | 852,6 | 12,5 | 23,5 |
| 241/600-B-K30-MB | 1170 | 600 | 980 | 375 | 7,5 | 833 | 12,5 | 23,5 |
| 241/600-B-MB | 1180 | 600 | 980 | 375 | 7,5 | 833 | 12,5 | 23,5 |
| 239/630-B-K-MB | 283 | 630 | 850 | 165 | 6 | 784,5 | 12,5 | 23,5 |
| 239/630-B-MB | 292 | 630 | 850 | 165 | 6 | 784,5 | 12,5 | 23,5 |
| 230/630-B-MB | 496 | 630 | 920 | 212 | 7,5 | 834,3 | 12,5 | 23,5 |
| 230/630-B-K-MB | 502 | 630 | 920 | 212 | 7,5 | 834,3 | 12,5 | 23,5 |
| 240/630-B-K30-MB | 649 | 630 | 920 | 290 | 7,5 | 817,9 | 12,5 | 23,5 |



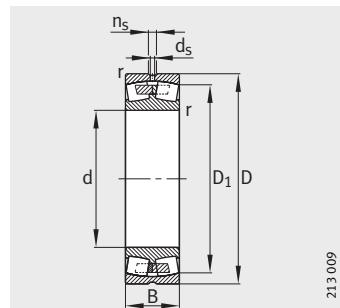
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 523 | 697 | 5 | 3 900 000 | 8 500 000 | 0,22 | 3,01 | 4,48 | 2,94 | 510 000 | 670 | 520 |
| 523 | 697 | 5 | 3 900 000 | 8 500 000 | 0,22 | 3,01 | 4,48 | 2,94 | 510 000 | 670 | 520 |
| 523 | 697 | 5 | 4 900 000 | 11 200 000 | 0,29 | 2,32 | 3,45 | 2,26 | 850 000 | 560 | 370 |
| 532 | 798 | 6 | 7 100 000 | 14 300 000 | 0,32 | 2,1 | 3,13 | 2,06 | 990 000 | 600 | 345 |
| 532 | 798 | 6 | 7 100 000 | 14 300 000 | 0,32 | 2,1 | 3,13 | 2,06 | 990 000 | 600 | 345 |
| 532 | 798 | 6 | 8 650 000 | 18 300 000 | 0,39 | 1,73 | 2,58 | 1,69 | 1 340 000 | 530 | 200 |
| 532 | 798 | 6 | 8 650 000 | 18 300 000 | 0,39 | 1,73 | 2,58 | 1,69 | 1 340 000 | 530 | 200 |
| 548 | 692 | 4 | 2 850 000 | 6 800 000 | 0,18 | 3,85 | 5,73 | 3,76 | 385 000 | 630 | 770 |
| 548 | 692 | 4 | 2 850 000 | 6 800 000 | 0,18 | 3,85 | 5,73 | 3,76 | 385 000 | 630 | 770 |
| 553 | 757 | 5 | 4 400 000 | 9 500 000 | 0,22 | 3,04 | 4,53 | 2,97 | 540 000 | 600 | 490 |
| 553 | 757 | 5 | 4 400 000 | 9 500 000 | 0,22 | 3,04 | 4,53 | 2,97 | 540 000 | 600 | 490 |
| 553 | 757 | 5 | 6 000 000 | 13 700 000 | 0,31 | 2,15 | 3,2 | 2,1 | 910 000 | 530 | 335 |
| 562 | 838 | 6 | 7 350 000 | 15 300 000 | 0,32 | 2,12 | 3,15 | 2,07 | 670 000 | 560 | 325 |
| 562 | 838 | 6 | 9 500 000 | 20 000 000 | 0,38 | 1,77 | 2,64 | 1,73 | 1 450 000 | 500 | 184 |
| 578 | 732 | 4 | 3 100 000 | 7 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 570 000 | 600 | 720 |
| 578 | 732 | 4 | 3 100 000 | 7 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 570 000 | 600 | 720 |
| 583 | 797 | 5 | 5 100 000 | 11 000 000 | 0,23 | 2,95 | 4,4 | 2,89 | 740 000 | 560 | 450 |
| 583 | 797 | 5 | 5 100 000 | 11 000 000 | 0,23 | 2,95 | 4,4 | 2,89 | 740 000 | 560 | 450 |
| 583 | 797 | 5 | 6 400 000 | 14 600 000 | 0,31 | 2,2 | 3,27 | 2,15 | 1 050 000 | 500 | 315 |
| 592 | 888 | 6 | 8 150 000 | 16 600 000 | 0,31 | 2,21 | 3,29 | 2,16 | 750 000 | 530 | 300 |
| 592 | 888 | 6 | 8 150 000 | 16 600 000 | 0,31 | 2,21 | 3,29 | 2,16 | 750 000 | 530 | 300 |
| 592 | 888 | 6 | 10 600 000 | 22 400 000 | 0,38 | 1,77 | 2,64 | 1,73 | 1 600 000 | 480 | 169 |
| 618 | 782 | 4 | 3 450 000 | 8 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 630 000 | 560 | 670 |
| 618 | 782 | 4 | 3 450 000 | 8 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 630 000 | 560 | 670 |
| 623 | 847 | 5 | 5 700 000 | 12 500 000 | 0,22 | 3,07 | 4,57 | 3 | 890 000 | 530 | 405 |
| 623 | 847 | 5 | 5 700 000 | 12 500 000 | 0,22 | 3,07 | 4,57 | 3 | 890 000 | 530 | 405 |
| 623 | 847 | 5 | 7 100 000 | 16 600 000 | 0,31 | 2,21 | 3,29 | 2,16 | 1 200 000 | 630 | 290 |
| 632 | 948 | 6 | 9 000 000 | 19 300 000 | 0,31 | 2,2 | 3,27 | 2,15 | 810 000 | 500 | 270 |
| 632 | 948 | 6 | 9 000 000 | 19 300 000 | 0,31 | 2,2 | 3,27 | 2,15 | 810 000 | 500 | 270 |
| 632 | 948 | 6 | 11 600 000 | 26 000 000 | 0,38 | 1,79 | 2,67 | 1,75 | 1 780 000 | 450 | 149 |
| 632 | 948 | 6 | 11 600 000 | 26 000 000 | 0,38 | 1,79 | 2,67 | 1,75 | 1 780 000 | 450 | 149 |
| 653 | 827 | 5 | 4 050 000 | 9 800 000 | 0,18 | 3,8 | 5,66 | 3,72 | 710 000 | 530 | 650 |
| 653 | 827 | 5 | 4 050 000 | 9 800 000 | 0,18 | 3,8 | 5,66 | 3,72 | 710 000 | 530 | 650 |
| 658 | 892 | 6 | 6 300 000 | 13 700 000 | 0,22 | 3,01 | 4,48 | 2,94 | 890 000 | 500 | 385 |
| 658 | 892 | 6 | 6 300 000 | 13 700 000 | 0,22 | 3,01 | 4,48 | 2,94 | 890 000 | 500 | 385 |
| 658 | 892 | 6 | 8 000 000 | 19 000 000 | 0,31 | 2,21 | 3,29 | 2,16 | 1 350 000 | 480 | 265 |

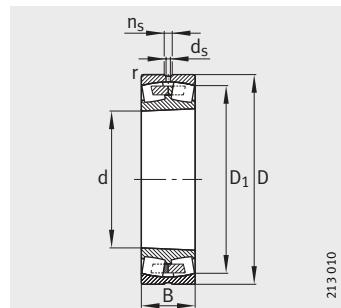


Spherical roller bearings

With cylindrical
or tapered bore



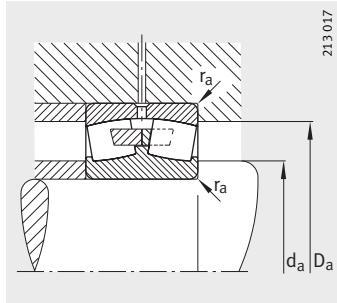
With central rib
Cylindrical bore



Tapered bore
K = taper 1:12, K30 = taper 1:30

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | |
|-------------------------|------------------|------------|-------|-----|-----------|---------------------|----------------|----------------|
| | | d | D | B | r min. | D ₁ ≈ | d _s | n _s |
| 240/630-B-MB | 660 | 630 | 920 | 290 | 7,5 | 817,9 | 12,5 | 23,5 |
| 241/630-B-K30-MB | 1 360 | 630 | 1 030 | 400 | 7,5 | 872,2 | 12,5 | 23,5 |
| 239/670-B-K-MB | 310 | 670 | 900 | 170 | 6 | 831,5 | 12,5 | 23,5 |
| 239/670-B-MB | 320 | 670 | 900 | 170 | 6 | 831,5 | 12,5 | 23,5 |
| 230/670-B-K-MB | 590 | 670 | 980 | 230 | 7,5 | 888,7 | 12,5 | 23,5 |
| 230/670-B-MB | 600 | 670 | 980 | 230 | 7,5 | 888,7 | 12,5 | 23,5 |
| 241/670-B-K30-MB | 1 540 | 670 | 1 090 | 412 | 7,5 | 929,4 | 12,5 | 23,5 |
| 239/710-K-MB | 336 | 710 | 950 | 180 | 6 | 877,5 | 12,5 | 23,5 |
| 239/710-MB | 355 | 710 | 950 | 180 | 6 | 877,5 | 12,5 | 23,5 |
| 230/710-B-K-MB | 650 | 710 | 1 030 | 236 | 7,5 | 938,8 | 12,5 | 23,5 |
| 230/710-B-MB | 674 | 710 | 1 030 | 236 | 7,5 | 938,8 | 12,5 | 23,5 |
| 240/710-B-K30-MB | 873 | 710 | 1 030 | 315 | 7,5 | 921,6 | 12,5 | 23,5 |
| 241/710-B-K30-MB | 1 820 | 710 | 1 150 | 438 | 9,5 | 982 | 12,5 | 23,5 |
| 241/710-B-MB | 1 830 | 710 | 1 150 | 438 | 9,5 | 982 | 12,5 | 23,5 |
| 239/750-K-MB | 394 | 750 | 1 000 | 185 | 6 | 923,2 | 12,5 | 23,5 |
| 239/750-MB | 426 | 750 | 1 000 | 185 | 6 | 923,2 | 12,5 | 23,5 |
| 230/750-K-MB | 792 | 750 | 1 090 | 250 | 7,5 | 990,9 | 12,5 | 23,5 |
| 230/750-MB | 806 | 750 | 1 090 | 250 | 7,5 | 990,9 | 12,5 | 23,5 |
| 240/750-B-K30-MB | 1 070 | 750 | 1 090 | 335 | 7,5 | 976,2 | 12,5 | 23,5 |
| 239/800-B-K-MB | 490 | 800 | 1 060 | 195 | 6 | 983,7 | 12,5 | 23,5 |
| 239/800-B-MB | 506 | 800 | 1 060 | 195 | 6 | 983,7 | 12,5 | 23,5 |
| 230/800-K-MB | 861 | 800 | 1 150 | 258 | 7,5 | 1 050,9 | 12,5 | 23,5 |
| 230/800-MB | 899 | 800 | 1 150 | 258 | 7,5 | 1 050,9 | 12,5 | 23,5 |
| 240/800-B-MB | 1 200 | 800 | 1 150 | 345 | 7,5 | 1 034,1 | 12,5 | 23,5 |
| 239/850-K-MB | 554 | 850 | 1 120 | 200 | 6 | 1 039,9 | 12,5 | 23,5 |
| 239/850-MB | 579 | 850 | 1 120 | 200 | 6 | 1 039,9 | 12,5 | 23,5 |
| 240/850-B-K30-MB | 1 420 | 850 | 1 220 | 365 | 7,5 | 1 092,9 | 12,5 | 23,5 |
| 239/900-K-MB | 641 | 900 | 1 180 | 206 | 6 | 1 098,8 | 12,5 | 23,5 |
| 239/900-MB | 653 | 900 | 1 180 | 206 | 6 | 1 098,8 | 12,5 | 23,5 |



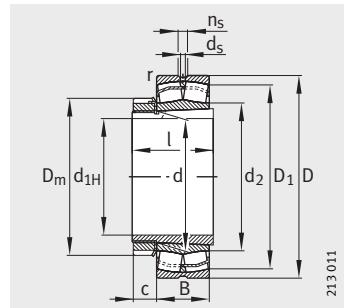
Mounting dimensions

| Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a min. | D _a max. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 658 | 892 | 6 | 8 000 000 | 19 000 000 | 0,31 | 2,21 | 3,29 | 2,16 | 1 350 000 | 480 | 265 |
| 662 | 998 | 6 | 12 900 000 | 29 000 000 | 0,38 | 1,78 | 2,65 | 1,74 | 1 960 000 | 450 | 138 |
| 693 | 877 | 5 | 4 300 000 | 10 600 000 | 0,17 | 3,95 | 5,88 | 3,86 | 750 000 | 500 | 600 |
| 693 | 877 | 5 | 4 300 000 | 10 600 000 | 0,17 | 3,95 | 5,88 | 3,86 | 750 000 | 500 | 600 |
| 698 | 952 | 6 | 7 200 000 | 16 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 100 000 | 480 | 350 |
| 698 | 952 | 6 | 7 200 000 | 16 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 100 000 | 480 | 350 |
| 702 | 1058 | 6 | 14 000 000 | 31 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 2 120 000 | 430 | 127 |
| 733 | 927 | 5 | 4 800 000 | 12 000 000 | 0,18 | 3,85 | 5,73 | 3,76 | 720 000 | 480 | 570 |
| 733 | 927 | 5 | 4 800 000 | 12 000 000 | 0,18 | 3,85 | 5,73 | 3,76 | 720 000 | 480 | 570 |
| 738 | 1002 | 6 | 7 650 000 | 17 000 000 | 0,22 | 3,07 | 4,57 | 3 | 1 140 000 | 480 | 330 |
| 738 | 1002 | 6 | 7 650 000 | 17 000 000 | 0,22 | 3,07 | 4,57 | 3 | 1 140 000 | 480 | 330 |
| 738 | 1002 | 6 | 9 500 000 | 22 800 000 | 0,3 | 2,26 | 3,37 | 2,21 | 1 550 000 | 430 | 226 |
| 750 | 1110 | 8 | 15 600 000 | 35 500 000 | 0,38 | 1,79 | 2,67 | 1,75 | 2 340 000 | 400 | 116 |
| 750 | 1110 | 8 | 15 600 000 | 35 500 000 | 0,38 | 1,79 | 2,67 | 1,75 | 2 340 000 | 400 | 116 |
| 773 | 977 | 5 | 5 200 000 | 12 900 000 | 0,17 | 3,95 | 5,88 | 3,86 | 790 000 | 480 | 540 |
| 773 | 977 | 5 | 5 200 000 | 12 900 000 | 0,17 | 3,95 | 5,88 | 3,86 | 790 000 | 480 | 540 |
| 778 | 1062 | 6 | 8 500 000 | 19 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 010 000 | 450 | 305 |
| 778 | 1062 | 6 | 8 500 000 | 19 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 010 000 | 450 | 305 |
| 778 | 1062 | 6 | 10 800 000 | 26 000 000 | 0,3 | 2,26 | 3,37 | 2,21 | 1 730 000 | 400 | 206 |
| 823 | 1037 | 5 | 5 850 000 | 15 000 000 | 0,17 | 4,05 | 6,04 | 3,96 | 1 010 000 | 450 | 500 |
| 823 | 1037 | 5 | 5 850 000 | 15 000 000 | 0,17 | 4,05 | 6,04 | 3,96 | 1 010 000 | 450 | 500 |
| 828 | 1122 | 6 | 9 300 000 | 21 200 000 | 0,22 | 3,07 | 4,57 | 3 | 1 430 000 | 430 | 280 |
| 828 | 1122 | 6 | 9 300 000 | 21 200 000 | 0,22 | 3,07 | 4,57 | 3 | 1 430 000 | 430 | 280 |
| 828 | 1122 | 6 | 11 600 000 | 28 500 000 | 0,29 | 2,33 | 3,47 | 2,28 | 1 810 000 | 360 | 189 |
| 873 | 1097 | 5 | 6 300 000 | 16 300 000 | 0,16 | 4,11 | 6,12 | 4,02 | 960 000 | 430 | 465 |
| 873 | 1097 | 5 | 6 300 000 | 16 300 000 | 0,16 | 4,11 | 6,12 | 4,02 | 960 000 | 430 | 465 |
| 878 | 1192 | 6 | 12 900 000 | 32 000 000 | 0,29 | 2,33 | 3,47 | 2,28 | 2 060 000 | 480 | 173 |
| 923 | 1157 | 5 | 6 550 000 | 17 300 000 | 0,16 | 4,28 | 6,37 | 4,19 | 1 010 000 | 400 | 440 |
| 923 | 1157 | 5 | 6 550 000 | 17 300 000 | 0,16 | 4,28 | 6,37 | 4,19 | 1 010 000 | 400 | 440 |



Spherical roller bearings

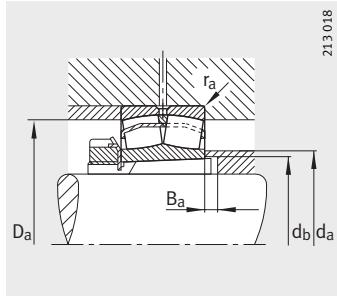
With adapter sleeve



E1 design

Dimension table · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | | | |
|-----------------|--------|----------------|---------|----------------|-----------------|----|-----|----|-----|----------------|----------------|----------------|----------------|----------------|----|----|---|
| Bearing | X-life | Adapter sleeve | Bearing | Adapter sleeve | d _{1H} | d | D | B | r | D ₁ | d ₂ | d _s | n _s | D _m | l | c | |
| | | | ≈kg | ≈kg | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | ≈ |
| 22205-E1-K | XL | H305 | 0,175 | 0,075 | 20 | 25 | 52 | 18 | 1 | 44,5 | 31,3 | 3,2 | 4,8 | 38 | 29 | 9 | |
| 22206-E1-K | XL | H306 | 0,269 | 0,099 | 25 | 30 | 62 | 20 | 1 | 53,7 | 37,9 | 3,2 | 4,8 | 45 | 31 | 9 | |
| 22207-E1-K | XL | H307 | 0,425 | 0,147 | 30 | 35 | 72 | 23 | 1,1 | 62,5 | 43,8 | 3,2 | 4,8 | 57 | 35 | 10 | |
| 21307-E1-K-TVPB | XL | H307 | 0,496 | 0,147 | 30 | 35 | 80 | 21 | 1,5 | 66,6 | 47,4 | — | — | 57 | 35 | 10 | |
| 22208-E1-K | XL | H308 | 0,517 | 0,185 | 35 | 40 | 80 | 23 | 1,1 | 70,4 | 48,6 | 3,2 | 4,8 | 58 | 36 | 11 | |
| 21308-E1-K | XL | H308 | 0,702 | 0,185 | 35 | 40 | 90 | 23 | 1,5 | 80,8 | 59,7 | 3,2 | 4,8 | 58 | 36 | 11 | |
| 22308-E1-K | XL | H2308 | 1,03 | 0,222 | 35 | 40 | 90 | 33 | 1,5 | 76 | 52,4 | 3,2 | 4,8 | 58 | 46 | 11 | |
| 22209-E1-K | XL | H309 | 0,577 | 0,246 | 40 | 45 | 85 | 23 | 1,1 | 75,6 | 54,8 | 3,2 | 4,8 | 65 | 39 | 12 | |
| 21309-E1-K | XL | H309 | 0,845 | 0,246 | 40 | 45 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 | 65 | 39 | 12 | |
| 22309-E1-K | XL | H2309 | 1,36 | 0,283 | 40 | 45 | 100 | 36 | 1,5 | 84,7 | 58,9 | 3,2 | 6,5 | 65 | 50 | 12 | |
| 22210-E1-K | XL | H310 | 0,608 | 0,301 | 45 | 50 | 90 | 23 | 1,1 | 80,8 | 59,7 | 3,2 | 4,8 | 70 | 42 | 13 | |
| 21310-E1-K | XL | H310 | 1,28 | 0,301 | 45 | 50 | 110 | 27 | 2 | 89,8 | 67,3 | 3,2 | 4,8 | 70 | 42 | 13 | |
| 22310-E1-K | XL | H2310 | 1,86 | 0,353 | 45 | 50 | 110 | 40 | 2 | 92,6 | 63 | 3,2 | 6,5 | 70 | 55 | 13 | |
| 22211-E1-K | XL | H311 | 0,825 | 0,35 | 50 | 55 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 | 75 | 45 | 13 | |
| 21311-E1-K | XL | H311 | 1,19 | 0,35 | 50 | 55 | 120 | 29 | 2 | 98,3 | 71,4 | 3,2 | 6,5 | 75 | 45 | 13 | |
| 22311-E1-K | XL | H2311 | 2,22 | 0,426 | 50 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | 75 | 59 | 13 | |
| 22311-E1-K-T41A | XL | H2311 | 2,22 | 0,426 | 50 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | 75 | 59 | 13 | |
| 22212-E1-K | XL | H312 | 1,09 | 0,373 | 55 | 60 | 110 | 28 | 1,5 | 98,7 | 71,4 | 3,2 | 6,5 | 80 | 47 | 13 | |
| 21312-E1-K | XL | H312 | 1,78 | 0,373 | 55 | 60 | 130 | 31 | 2,1 | 112,5 | 84,4 | 3,2 | 6,5 | 80 | 47 | 13 | |
| 22312-E1-K | XL | H2312 | 2,83 | 0,464 | 55 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | 80 | 62 | 13 | |
| 22312-E1-K-T41A | XL | H2312 | 2,83 | 0,464 | 55 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | 80 | 62 | 13 | |
| 22213-E1-K | XL | H313 | 1,52 | 0,452 | 60 | 65 | 120 | 31 | 1,5 | 107,3 | 79,1 | 3,2 | 6,5 | 92 | 50 | 14 | |
| 21313-E1-K | XL | H313 | 2,42 | 0,452 | 60 | 65 | 140 | 33 | 2,1 | 126,8 | 94,9 | 3,2 | 6,5 | 92 | 50 | 14 | |
| 22313-E1-K | XL | H2313 | 3,49 | 0,553 | 60 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | 92 | 65 | 14 | |
| 22313-E1-K-T41A | XL | H2313 | 3,49 | 0,553 | 60 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | 92 | 65 | 14 | |
| 22214-E1-K | XL | H314 | 1,61 | 0,715 | 60 | 70 | 125 | 31 | 1,5 | 112,5 | 84,4 | 3,2 | 6,5 | 92 | 52 | 14 | |
| 21314-E1-K | XL | H314 | 3 | 0,715 | 60 | 70 | 150 | 35 | 2,1 | 126,2 | 94,9 | 3,2 | 6,5 | 92 | 52 | 14 | |
| 22314-E1-K | XL | H2314 | 4,12 | 0,895 | 60 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | 98 | 68 | 14 | |
| 22314-E1-K-T41A | XL | H2314 | 4,12 | 0,895 | 60 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | 98 | 68 | 14 | |
| 22215-E1-K | XL | H315 | 1,68 | 0,826 | 65 | 75 | 130 | 31 | 1,5 | 117,7 | 89,8 | 3,2 | 6,5 | 104 | 55 | 15 | |
| 21315-E1-K | XL | H315 | 2,86 | 0,826 | 65 | 75 | 160 | 37 | 2,1 | 135,2 | 99,7 | 3,2 | 6,5 | 104 | 55 | 15 | |
| 22315-E1-K | XL | H2315 | 5,06 | 1,05 | 65 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | 98 | 73 | 15 | |
| 22315-E1-K-T41A | XL | H2315 | 5,06 | 1,05 | 65 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | 98 | 73 | 15 | |



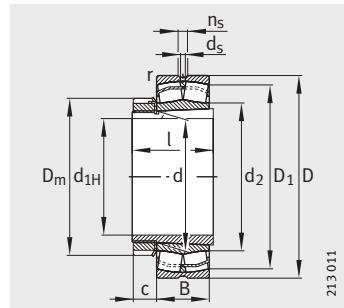
Mounting dimensions

| Mounting dimensions | | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C _{ur} | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|---------------------------------------|---|--|
| d _a max. | D _a max. | d _b min. | B _a min. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | | | |
| 31 | 46,4 | 28 | 5 | 1 | 48 000 | 42 500 | 0,34 | 1,98 | 2,94 | 1,93 | 4 800 | 17 000 | 9 500 |
| 37 | 54,6 | 33 | 5 | 1 | 64 000 | 57 000 | 0,31 | 2,15 | 3,2 | 2,1 | 6 900 | 13 000 | 8 100 |
| 43 | 65 | 39 | 5 | 1 | 88 000 | 81 500 | 0,31 | 2,16 | 3,22 | 2,12 | 9 400 | 11 000 | 7 300 |
| 47 | 71 | 39 | 8 | 1,5 | 83 000 | 73 500 | 0,26 | 2,55 | 3,8 | 2,5 | 8 100 | 9 500 | 7 000 |
| 48 | 73 | 44 | 5 | 1 | 102 000 | 90 000 | 0,28 | 2,41 | 3,59 | 2,35 | 11 800 | 10 000 | 6 400 |
| 59 | 81 | 44 | 5 | 1,5 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 6 100 |
| 52 | 81 | 45 | 5 | 1,5 | 156 000 | 150 000 | 0,36 | 1,86 | 2,77 | 1,82 | 13 100 | 7 500 | 5 800 |
| 54 | 78 | 50 | 8 | 1 | 104 000 | 98 000 | 0,26 | 2,62 | 3,9 | 2,56 | 12 700 | 10 000 | 5 800 |
| 67 | 91 | 50 | 5 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 500 |
| 58 | 91 | 50 | 5 | 1,5 | 186 000 | 183 000 | 0,36 | 1,9 | 2,83 | 1,86 | 16 100 | 6 700 | 5 300 |
| 59 | 83 | 55 | 10 | 1 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 5 300 |
| 67 | 99 | 55 | 5 | 2 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 300 |
| 63 | 99 | 56 | 5 | 2 | 228 000 | 224 000 | 0,36 | 1,86 | 2,77 | 1,82 | 20 300 | 6 000 | 4 950 |
| 67 | 91 | 60 | 10 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 4 850 |
| 71 | 109 | 60 | 6 | 2 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 6 300 | 4 950 |
| 67 | 109 | 61 | 6 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| 67 | 109 | 61 | 6 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| 71 | 101 | 65 | 8 | 1,5 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 7 500 | 4 650 |
| 84 | 118 | 65 | 5 | 2,1 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 500 |
| 74 | 118 | 66 | 5 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| 74 | 118 | 66 | 5 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| 79 | 111 | 70 | 8 | 1,5 | 200 000 | 208 000 | 0,24 | 2,81 | 4,19 | 2,75 | 25 500 | 6 700 | 4 400 |
| 94 | 128 | 70 | 5 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 200 |
| 83 | 128 | 72 | 5 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| 83 | 128 | 72 | 5 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| 84 | 116 | 75 | 11 | 1,5 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 100 |
| 94 | 138 | 75 | 6 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 100 |
| 86 | 138 | 77 | 5 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| 86 | 138 | 77 | 5 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| 89 | 121 | 80 | 12 | 1,5 | 216 000 | 236 000 | 0,22 | 3,1 | 4,62 | 3,03 | 29 500 | 6 300 | 3 900 |
| 99 | 148 | 80 | 5 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 850 |
| 92 | 148 | 82 | 5 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |
| 92 | 148 | 82 | 5 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |



Spherical roller bearings

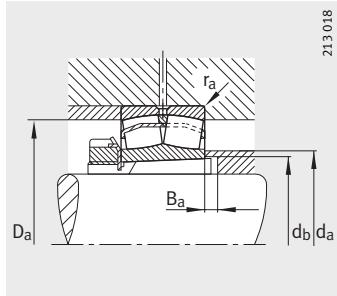
With adapter sleeve



E1 design

Dimension table (continued) · Dimensions in mm

| Designation | | | Mass m | | Dimensions | | | | | | | | | | | |
|------------------|--------|----------------|-------------|--------------------|-----------------|-----|-----|------|--------|------------------|------------------|----------------|----------------|----------------|-----|-----|
| Bearing | X-life | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ ≈ | d ₂ ≈ | d _s | n _s | D _m | l | c ≈ |
| 22216-E1-K | XL | H316 | 2,08 | 1,01 | 70 | 80 | 140 | 33 | 2 | 126,8 | 94,9 | 3,2 | 6,5 | 105 | 59 | 17 |
| 21316-E1-K | XL | H316 | 2,65 | 1,01 | 70 | 80 | 170 | 39 | 2,1 | 135,4 | 99,8 | 3,2 | 6,5 | 105 | 59 | 17 |
| 22316-E1-K | XL | H2316 | 6,05 | 1,27 | 70 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 | 105 | 78 | 17 |
| 22316-E1-K-T41A | XL | H2316 | 6,05 | 1,27 | 70 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 | 105 | 78 | 17 |
| 22217-E1-K | XL | H317 | 2,59 | 1,16 | 75 | 85 | 150 | 36 | 2 | 135,4 | 99,7 | 3,2 | 6,5 | 110 | 63 | 18 |
| 21317-E1-K | XL | H317 | 5,37 | 1,16 | 75 | 85 | 180 | 41 | 3 | 143,9 | 106,1 | 4,8 | 9,5 | 110 | 63 | 18 |
| 22317-E1-K | XL | H2317 | 7,06 | 1,44 | 75 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 | 110 | 82 | 18 |
| 22317-E1-K-T41A | XL | H2317 | 7,06 | 1,44 | 75 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 | 110 | 82 | 18 |
| 22218-E1-K | XL | H318 | 3,35 | 1,36 | 80 | 90 | 160 | 40 | 2 | 143,9 | 106,1 | 3,2 | 6,5 | 126 | 65 | 18 |
| 23218-E1A-K-M | XL | H2318 | 4,34 | 1,68 | 80 | 90 | 160 | 52,4 | 2 | 140 | – | 3,2 | 6,5 | 126 | 86 | 18 |
| 23218-E1-K-TV PB | XL | H2318 | 4,08 | 1,68 | 80 | 90 | 160 | 52,4 | 2 | 140 | 104,1 | 3,2 | 6,5 | 126 | 86 | 18 |
| 21318-E1-K | XL | H318 | 6,26 | 1,36 | 80 | 90 | 190 | 43 | 3 | 152,7 | 112,6 | 4,8 | 9,5 | 126 | 65 | 18 |
| 22318-E1-K | XL | H2318 | 8,33 | 1,68 | 80 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 | 126 | 86 | 18 |
| 22318-E1-K-T41A | XL | H2318 | 8,33 | 1,68 | 80 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 | 126 | 86 | 18 |
| 22219-E1-K | XL | H319 | 4,04 | 1,51 | 85 | 95 | 170 | 43 | 2,1 | 152,7 | 112,6 | 4,8 | 9,5 | 125 | 68 | 19 |
| 21319-E1-K-TV PB | XL | H319 | 6,53 | 1,51 | 85 | 95 | 200 | 45 | 3 | 169,4 | 124,3 | 4,8 | 9,5 | 125 | 68 | 19 |
| 22319-E1-K | XL | H2319 | 9,46 | 1,89 | 85 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 | 133 | 90 | 19 |
| 22319-E1-K-T41A | XL | H2319 | 9,46 | 1,89 | 85 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 | 133 | 90 | 19 |
| 23120-E1A-K-M | XL | H3120 | 4,23 | 1,78 | 90 | 100 | 165 | 52 | 2 | 146,3 | – | 3,2 | 6,5 | 130 | 76 | 20 |
| 23120-E1-K-TV PB | XL | H3120 | 4,06 | 1,78 | 90 | 100 | 165 | 52 | 2 | 146,3 | 113,9 | 3,2 | 6,5 | 130 | 76 | 20 |
| 22220-E1-K | XL | H320 | 4,91 | 1,69 | 90 | 100 | 180 | 46 | 2,1 | 161,4 | 119 | 4,8 | 9,5 | 130 | 71 | 20 |
| 23220-E1A-K-M | XL | H2320 | 6,33 | 2,17 | 90 | 100 | 180 | 60,3 | 2,1 | 156,7 | – | 4,8 | 9,5 | 142 | 97 | 20 |
| 23220-E1-K-TV PB | XL | H2320 | 6,13 | 2,17 | 90 | 100 | 180 | 60,3 | 2,1 | 156,7 | 116,7 | 4,8 | 9,5 | 142 | 97 | 20 |
| 21320-E1-K-TV PB | XL | H320 | 8,08 | 1,69 | 90 | 100 | 215 | 47 | 3 | 182 | 132 | 4,8 | 9,5 | 130 | 71 | 20 |
| 22320-E1-K | XL | H2320 | 13,1 | 2,17 | 90 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 | 142 | 97 | 20 |
| 22320-E1-K-T41A | XL | H2320 | 13,1 | 2,17 | 90 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 | 142 | 97 | 20 |
| 23122-E1A-K-M | XL | H3122 | 5,1 | 2,23 | 100 | 110 | 180 | 56 | 2 | 160 | – | 4,8 | 9,5 | 154 | 81 | 21 |
| 23122-E1-K-TV PB | XL | H3122 | 4,95 | 2,23 | 100 | 110 | 180 | 56 | 2 | 160 | 124,6 | 4,8 | 9,5 | 154 | 81 | 21 |
| 22222-E1-K | XL | H322 | 6,82 | 2,15 | 100 | 110 | 200 | 53 | 2,1 | 178,7 | 129,4 | 4,8 | 9,5 | 154 | 77 | 21 |
| 23222-E1A-K-M | XL | H2322 | 9,32 | 2,74 | 100 | 110 | 200 | 69,8 | 2,1 | 172,7 | – | 4,8 | 9,5 | 154 | 105 | 21 |
| 23222-E1-K-TV PB | XL | H2322 | 8,82 | 2,74 | 100 | 110 | 200 | 69,8 | 2,1 | 172,7 | 129,1 | 4,8 | 9,5 | 154 | 105 | 21 |
| 21322-E1-K-TV PB | XL | H322 | 10,9 | 2,15 | 100 | 110 | 240 | 50 | 3 | 202,5 | 146,4 | 6,3 | 12,2 | 154 | 77 | 21 |
| 22322-E1-K | XL | H2322 | 17,4 | 2,74 | 100 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 | 154 | 105 | 21 |
| 22322-E1-K-T41A | XL | H2322 | 17,4 | 2,74 | 100 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 | 154 | 105 | 21 |



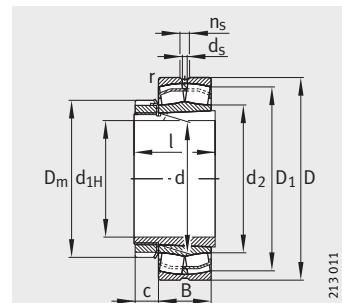
Mounting dimensions

| Mounting dimensions | | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C _{ur} N | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|--|---|--|
| d _a max. | D _a max. | d _b min. | B _a min. | r _a max. | dyn. C _r N | stat. C _{or} N | e | Y ₁ | Y ₂ | Y ₀ | | | |
| 94 | 129 | 85 | 12 | 2 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 600 | 3 700 |
| 99 | 158 | 85 | 5 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 750 |
| 98 | 158 | 88 | 5 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| 98 | 158 | 88 | 5 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| 99 | 139 | 91 | 12 | 2 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 5 300 | 3 550 |
| 106 | 166 | 91 | 6 | 2,5 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 550 |
| 104 | 166 | 94 | 6 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| 104 | 166 | 94 | 6 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| 106 | 149 | 96 | 10 | 2 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 500 |
| 107 | 149 | 100 | 18 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| 104 | 149 | 100 | 18 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| 112 | 176 | 96 | 6 | 2,5 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 450 |
| 110 | 176 | 100 | 6 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| 110 | 176 | 100 | 6 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| 112 | 158 | 102 | 9 | 2,1 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 400 |
| 124 | 186 | 102 | 7 | 2,5 | 430 000 | 455 000 | 0,22 | 3,04 | 4,53 | 2,97 | 47 500 | 4 000 | 3 300 |
| 115 | 186 | 105 | 7 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| 115 | 186 | 105 | 7 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| 115 | 154 | 107 | 7 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| 113 | 154 | 107 | 7 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| 118 | 168 | 108 | 8 | 2,1 | 430 000 | 475 000 | 0,24 | 2,84 | 4,23 | 2,78 | 52 000 | 4 300 | 3 300 |
| 120 | 168 | 110 | 19 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| 116 | 168 | 110 | 19 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| 131 | 201 | 108 | 7 | 2,5 | 490 000 | 530 000 | 0,22 | 3,14 | 4,67 | 3,07 | 61 000 | 3 600 | 3 100 |
| 129 | 201 | 110 | 7 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| 129 | 201 | 110 | 7 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| 127 | 169 | 117 | 7 | 2 | 530 000 | 680 000 | 0,28 | 2,41 | 3,59 | 2,35 | 61 000 | 4 000 | 2 600 |
| 124 | 169 | 117 | 7 | 2 | 530 000 | 680 000 | 0,28 | 2,39 | 3,56 | 2,34 | 61 000 | 4 000 | 2 600 |
| 129 | 188 | 118 | 6 | 2,1 | 550 000 | 600 000 | 0,25 | 2,71 | 4,04 | 2,65 | 62 000 | 4 000 | 3 100 |
| 130 | 188 | 121 | 17 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| 129 | 188 | 121 | 17 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| 146 | 226 | 118 | 9 | 2,5 | 600 000 | 640 000 | 0,21 | 3,24 | 4,82 | 3,16 | 69 000 | 3 000 | 2 750 |
| 135 | 226 | 121 | 7 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |
| 135 | 226 | 121 | 7 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |

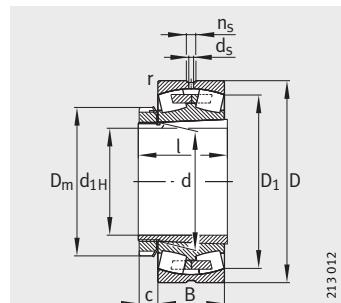


Spherical roller bearings

With adapter sleeve



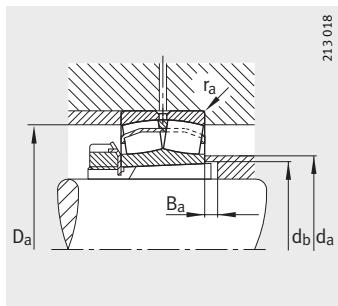
E1 design



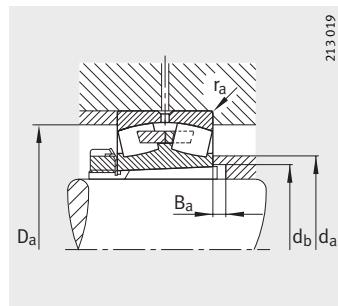
With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | | Mass m | | Dimensions | | | | | | | | | | | | |
|-----------------|--------|----------------|-------------|--------------------|-----------------|-----|-----|-----|--------|----------------|----------------|----------------|----------------|----------------|-----|----|--|
| Bearing | X-life | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | D _m | l | c | |
| 23024-E1A-K-M | XL | H3024 | 4,09 | 1,95 | 110 | 120 | 180 | 46 | 2 | 164,7 | - | 3,2 | 6,5 | 145 | 72 | 22 | |
| 23024-E1-K-TVPB | XL | H3024 | 3,67 | 1,95 | 110 | 120 | 180 | 46 | 2 | 164,7 | 133 | 3,2 | 6,5 | 145 | 72 | 22 | |
| 23124-E1A-K-M | XL | H3124 | 7,57 | 2,61 | 110 | 120 | 200 | 62 | 2 | 177,4 | - | 4,8 | 9,5 | 155 | 88 | 22 | |
| 23124-E1-K-TVPB | XL | H3124 | 7,06 | 2,61 | 110 | 120 | 200 | 62 | 2 | 177,4 | 136,2 | 4,8 | 9,5 | 155 | 88 | 22 | |
| 22224-E1-K | XL | H3124 | 8,84 | 2,61 | 110 | 120 | 215 | 58 | 2,1 | 192 | 141,8 | 6,3 | 12,2 | 155 | 88 | 22 | |
| 23224-E1A-K-M | XL | H2324 | 11,4 | 3,18 | 110 | 120 | 215 | 76 | 2,1 | 185,5 | - | 4,8 | 9,5 | 155 | 112 | 22 | |
| 23224-E1-K-TVPB | XL | H2324 | 11,1 | 3,18 | 110 | 120 | 215 | 76 | 2,1 | 185,5 | 139 | 4,8 | 9,5 | 155 | 112 | 22 | |
| 22324-E1-K | XL | H2324 | 22,1 | 3,18 | 110 | 120 | 260 | 86 | 3 | 222,4 | 150,7 | 8 | 15 | 155 | 112 | 22 | |
| 22324-E1-K-T41A | XL | H2324 | 22,1 | 3,18 | 110 | 120 | 260 | 86 | 3 | 222,4 | 150,7 | 8 | 15 | 155 | 112 | 22 | |
| 23026-E1A-K-M | XL | H3026 | 5,7 | 2,9 | 115 | 130 | 200 | 52 | 2 | 182,3 | - | 4,8 | 9,5 | 155 | 80 | 23 | |
| 23026-E1-K-TVPB | XL | H3026 | 5,42 | 2,9 | 115 | 130 | 200 | 52 | 2 | 182,3 | 145,9 | 4,8 | 9,5 | 155 | 80 | 23 | |
| 23126-E1A-K-M | XL | H3126 | 8,1 | 3,63 | 115 | 130 | 210 | 64 | 2 | 187,3 | - | 4,8 | 9,5 | 175 | 92 | 23 | |
| 23126-E1-K-TVPB | XL | H3126 | 7,82 | 3,63 | 115 | 130 | 210 | 64 | 2 | 187,3 | 146 | 4,8 | 9,5 | 175 | 92 | 23 | |
| 22226-E1-K | XL | H3126 | 10,9 | 3,63 | 115 | 130 | 230 | 64 | 3 | 205 | 151,7 | 6,3 | 12,2 | 175 | 92 | 23 | |
| 23226-E1A-K-M | XL | H2326 | 13,6 | 4,61 | 115 | 130 | 230 | 80 | 3 | 199,3 | - | 4,8 | 9,5 | 165 | 121 | 23 | |
| 23226-E1-K-TVPB | XL | H2326 | 12,6 | 4,61 | 115 | 130 | 230 | 80 | 3 | 199,3 | 150 | 4,8 | 9,5 | 165 | 121 | 23 | |
| 22326-E1-K | XL | H2326 | 27,4 | 4,61 | 115 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 | 165 | 121 | 23 | |
| 22326-E1-K-T41A | XL | H2326 | 27,4 | 4,61 | 115 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 | 165 | 121 | 23 | |
| 23028-E1A-K-M | XL | H3028 | 6 | 3,25 | 125 | 140 | 210 | 53 | 2 | 192,3 | - | 4,8 | 9,5 | 165 | 82 | 24 | |
| 23028-E1-K-TVPB | XL | H3028 | 5,81 | 3,25 | 125 | 140 | 210 | 53 | 2 | 192,3 | 155,4 | 4,8 | 9,5 | 165 | 82 | 24 | |
| 23128-E1A-K-M | XL | H3128 | 7,78 | 4,33 | 125 | 140 | 225 | 68 | 2,1 | 201 | - | 4,8 | 9,5 | 180 | 97 | 24 | |
| 23128-E1-K-TVPB | XL | H3128 | 9,46 | 4,33 | 125 | 140 | 225 | 68 | 2,1 | 201 | 157,1 | 4,8 | 9,5 | 180 | 97 | 24 | |
| 22228-E1-K | XL | H3128 | 13,7 | 4,33 | 125 | 140 | 250 | 68 | 3 | 223,4 | 164,9 | 6,3 | 12,2 | 180 | 97 | 24 | |
| 23228-E1A-K-M | XL | H2328 | 17,6 | 5,6 | 125 | 140 | 250 | 88 | 3 | 216 | - | 6,3 | 12,2 | 180 | 131 | 24 | |
| 23228-E1-K-TVPB | XL | H2328 | 17,1 | 5,6 | 125 | 140 | 250 | 88 | 3 | 216 | 162 | 6,3 | 12,2 | 180 | 131 | 24 | |
| 22328-E1-K | XL | H2328 | 34,4 | 5,6 | 125 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 | 180 | 131 | 24 | |
| 22328-E1-K-T41A | XL | H2328 | 34,4 | 5,6 | 125 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 | 180 | 131 | 24 | |
| 23030-E1A-K-M | XL | H3030 | 7,33 | 3,98 | 135 | 150 | 225 | 56 | 2,1 | 206,3 | - | 4,8 | 9,5 | 180 | 87 | 26 | |
| 23030-E1-K-TVPB | XL | H3030 | 7,29 | 3,98 | 135 | 150 | 225 | 56 | 2,1 | 206,3 | 166,6 | 4,8 | 9,5 | 180 | 87 | 26 | |
| 23130-E1A-K-M | XL | H3130 | 15,8 | 5,49 | 135 | 150 | 250 | 80 | 2,1 | 220,8 | - | 6,3 | 12,2 | 195 | 111 | 26 | |
| 23130-E1-K-TVPB | XL | H3130 | 14,5 | 5,49 | 135 | 150 | 250 | 80 | 2,1 | 220,8 | 170,1 | 6,3 | 12,2 | 195 | 111 | 26 | |
| 22230-E1-K | XL | H3130 | 17,8 | 5,49 | 135 | 150 | 270 | 73 | 3 | 240,8 | 177,9 | 8 | 15 | 195 | 111 | 26 | |
| 23230-E1A-K-M | XL | H2330 | 22,9 | 6,71 | 135 | 150 | 270 | 96 | 3 | 232,6 | - | 6,3 | 12,2 | 195 | 139 | 26 | |
| 23230-E1-K-TVPB | XL | H2330 | 22,3 | 6,71 | 135 | 150 | 270 | 96 | 3 | 232,6 | 174 | 6,3 | 12,2 | 195 | 139 | 26 | |
| 22330-E1-K | XL | H2330 | 41,2 | 6,71 | 135 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 | 195 | 139 | 26 | |
| 22330-E1-K-T41A | XL | H2330 | 41,2 | 6,71 | 135 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 | 195 | 139 | 26 | |



Mounting dimensions
E1 design



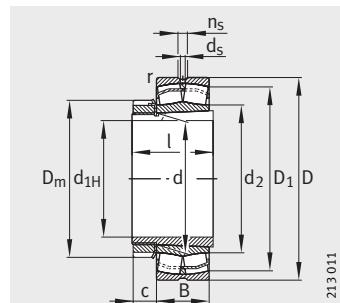
Mounting dimensions
With central rib

| Mounting dimensions | | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | d _b | B _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 133 | 171,2 | 127 | 7 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| 133 | 171,2 | 127 | 7 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| 139 | 189 | 128 | 7 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| 136 | 189 | 128 | 7 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| 141 | 203 | 128 | 11 | 2,1 | 640 000 | 735 000 | 0,25 | 2,71 | 4,04 | 2,65 | 71 000 | 3 400 | 2 800 |
| 141 | 203 | 131 | 17 | 2 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| 139 | 203 | 131 | 17 | 2 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| 150 | 246 | 131 | 7 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| 150 | 246 | 131 | 7 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| 146 | 191,2 | 137 | 8 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| 145 | 191,2 | 137 | 8 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| 149 | 199 | 138 | 8 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| 145 | 199 | 138 | 8 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| 151 | 216 | 138 | 8 | 2,5 | 750 000 | 900 000 | 0,26 | 2,62 | 3,9 | 2,56 | 79 000 | 3 000 | 2 550 |
| 152 | 216 | 142 | 21 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 150 | 216 | 142 | 21 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| 162 | 263 | 142 | 8 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 162 | 263 | 142 | 8 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| 155 | 201,2 | 147 | 8 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| 155 | 201,2 | 147 | 8 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| 159 | 213 | 149 | 8 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| 157 | 213 | 149 | 8 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| 164 | 236 | 149 | 8 | 2,5 | 880 000 | 1 040 000 | 0,25 | 2,67 | 3,97 | 2,61 | 97 000 | 2 400 | 2 320 |
| 162 | 236 | 152 | 22 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| 162 | 236 | 152 | 22 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| 169 | 283 | 152 | 8 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |
| 169 | 283 | 152 | 8 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |
| 166 | 214,8 | 158 | 8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| 166 | 214,8 | 158 | 8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| 170 | 238 | 160 | 8 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| 170 | 238 | 160 | 8 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| 177 | 256 | 160 | 15 | 2,5 | 1 000 000 | 1 220 000 | 0,25 | 2,69 | 4 | 2,63 | 111 000 | 2 600 | 2 110 |
| 174 | 256 | 163 | 20 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| 174 | 256 | 163 | 20 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| 185 | 303 | 163 | 8 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| 185 | 303 | 163 | 8 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |

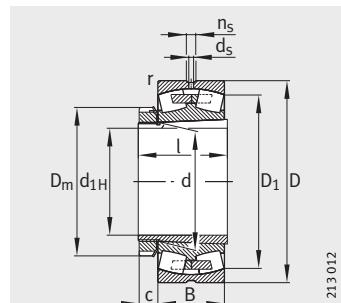


Spherical roller bearings

With adapter sleeve



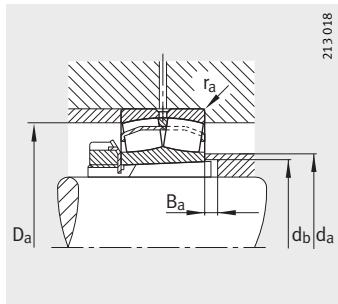
E1 design



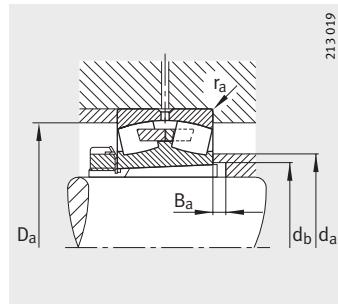
With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | | Mass m | | Dimensions | | | | | | | | | | | | ≈ |
|-----------------|--------|----------------|-------------|--------------------|-----------------|-----|-----|-----|--------|----------------|----------------|------|----------------|----------------|-----|----|---|
| Bearing | X-life | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ | d ₂ | ds | n _s | D _m | l | c | ≈ |
| 23032-E1A-K-M | XL | H3032 | 9,42 | 5,33 | 140 | 160 | 240 | 60 | 2,1 | 219,9 | — | 6,3 | 12,2 | 190 | 93 | 28 | |
| 23032-E1-K-TVPB | XL | H3032 | 8,67 | 5,33 | 140 | 160 | 240 | 60 | 2,1 | 219,9 | 177 | 6,3 | 12,2 | 190 | 93 | 28 | |
| 23132-E1A-K-M | XL | H3132 | 18,6 | 7,57 | 140 | 160 | 270 | 86 | 2,1 | 238,3 | — | 8 | 15 | 210 | 119 | 28 | |
| 23132-E1-K-TVPB | XL | H3132 | 18,4 | 7,57 | 140 | 160 | 270 | 86 | 2,1 | 238,3 | 183,2 | 8 | 15 | 210 | 119 | 28 | |
| 22232-E1-K | XL | H3132 | 22,4 | 7,57 | 140 | 160 | 290 | 80 | 3 | 258,2 | 190,9 | 8 | 15 | 210 | 119 | 28 | |
| 23232-E1A-K-M | XL | H2332 | 28,5 | 9,1 | 140 | 160 | 290 | 104 | 3 | 249,3 | — | 8 | 15 | 210 | 147 | 28 | |
| 23232-E1-K-TVPB | XL | H2332 | 27,7 | 9,1 | 140 | 160 | 290 | 104 | 3 | 249,3 | 186,7 | 8 | 15 | 210 | 147 | 28 | |
| 22332-K-MB | — | H2332 | 50,1 | 9,1 | 140 | 160 | 340 | 114 | 4 | 288,3 | — | 9,5 | 17,7 | 210 | 147 | 28 | |
| 23034-E1A-K-M | XL | H3034 | 12 | 6,13 | 150 | 170 | 260 | 67 | 2,1 | 237,2 | — | 6,3 | 12,2 | 211 | 101 | 29 | |
| 23034-E1-K-TVPB | XL | H3034 | 11,9 | 6,13 | 150 | 170 | 260 | 67 | 2,1 | 237,2 | 189,8 | 6,3 | 12,2 | 211 | 101 | 29 | |
| 23134-E1A-K-M | XL | H3134 | 19,5 | 8,35 | 150 | 170 | 280 | 88 | 2,1 | 248,1 | — | 8 | 15 | 220 | 122 | 29 | |
| 23134-E1-K-TVPB | XL | H3134 | 19,9 | 8,35 | 150 | 170 | 280 | 88 | 2,1 | 248,1 | 193,4 | 8 | 15 | 220 | 122 | 29 | |
| 22234-E1-K | XL | H3134 | 27,1 | 8,35 | 150 | 170 | 310 | 86 | 4 | 275,4 | 199,8 | 9,5 | 17,7 | 220 | 122 | 29 | |
| 23234-E1A-K-M | XL | H2334 | 34,6 | 10,2 | 150 | 170 | 310 | 110 | 4 | 267,4 | — | 8 | 15 | 232 | 154 | 29 | |
| 23234-E1-K-TVPB | XL | H2334 | 33,1 | 10,2 | 150 | 170 | 310 | 110 | 4 | 267,4 | 199,8 | 8 | 15 | 232 | 154 | 29 | |
| 22334-K-MB | — | H2334 | 56,9 | 10,2 | 150 | 170 | 360 | 120 | 4 | 304,2 | — | 9,5 | 17,7 | 232 | 154 | 29 | |
| 23936-S-K-MB | — | H3936 | 7,76 | 6,25 | 160 | 180 | 250 | 52 | 2 | 230,9 | — | 4,8 | 9,5 | 210 | 87 | 30 | |
| 23036-E1A-K-M | XL | H3036 | 16 | 7,01 | 160 | 180 | 280 | 74 | 2,1 | 254,3 | — | 8 | 15 | 221 | 109 | 30 | |
| 23036-E1-K-TVPB | XL | H3036 | 15,6 | 7,01 | 160 | 180 | 280 | 74 | 2,1 | 254,3 | 201,8 | 8 | 15 | 221 | 109 | 30 | |
| 23136-E1A-K-M | XL | H3136 | 25,5 | 9,46 | 160 | 180 | 300 | 96 | 3 | 264,8 | — | 8 | 15 | 230 | 131 | 30 | |
| 23136-E1-K-TVPB | XL | H3136 | 25,9 | 9,46 | 160 | 180 | 300 | 96 | 3 | 264,8 | 204,1 | 8 | 15 | 230 | 131 | 30 | |
| 22236-E1-K | XL | H3136 | 28,5 | 9,46 | 160 | 180 | 320 | 86 | 4 | 285,9 | 211,3 | 9,5 | 17,7 | 230 | 131 | 30 | |
| 23236-E1A-K-M | XL | H2336 | 37 | 11,4 | 160 | 180 | 320 | 112 | 4 | 277,3 | — | 8 | 15 | 230 | 161 | 30 | |
| 23236-E1-K-TVPB | XL | H2336 | 36 | 11,4 | 160 | 180 | 320 | 112 | 4 | 277,3 | 210,6 | 8 | 15 | 230 | 161 | 30 | |
| 22336-K-MB | — | H2336 | 66,7 | 11,4 | 160 | 180 | 380 | 126 | 4 | 323,4 | — | 12,5 | 23,5 | 230 | 161 | 30 | |
| 23038-E1A-K-M | XL | H3038 | 17,7 | 7,66 | 170 | 190 | 290 | 75 | 2,1 | 264,5 | — | 8 | 15 | 220 | 112 | 31 | |
| 23038-E1-K-TVPB | XL | H3038 | 16,3 | 7,66 | 170 | 190 | 290 | 75 | 2,1 | 264,5 | 211,9 | 8 | 15 | 220 | 112 | 31 | |
| 23138-E1A-K-M | XL | H3138 | 32,4 | 10,8 | 170 | 190 | 320 | 104 | 3 | 281,6 | — | 8 | 15 | 252 | 141 | 31 | |
| 23138-E1-K-TVPB | XL | H3138 | 30,3 | 10,8 | 170 | 190 | 320 | 104 | 3 | 281,6 | 217 | 8 | 15 | 252 | 141 | 31 | |
| 22238-K-MB | — | H3138 | 36,2 | 10,8 | 170 | 190 | 340 | 92 | 4 | 296 | — | 9,5 | 17,7 | 252 | 141 | 31 | |
| 23238-B-K-MB | — | H2338 | 46 | 12,7 | 170 | 190 | 340 | 120 | 4 | 291,2 | — | 9,5 | 17,7 | 240 | 169 | 31 | |
| 22338-K-MB | — | H2338 | 77,3 | 12,7 | 170 | 190 | 400 | 132 | 5 | 338,2 | — | 12,5 | 23,5 | 240 | 169 | 31 | |



Mounting dimensions
E1 design



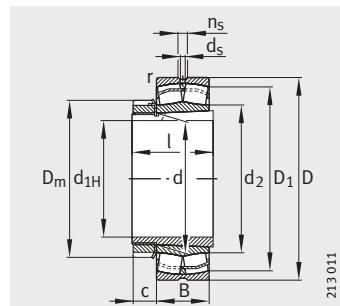
Mounting dimensions
With central rib

| Mounting dimensions | | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|--------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | d _b | B _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} | n _G min ⁻¹ | n _B min ⁻¹ |
| 177 | 229,8 | 168 | 8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| 177 | 229,8 | 168 | 8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| 183 | 258 | 170 | 8 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| 183 | 258 | 170 | 8 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| 190 | 276 | 170 | 14 | 2,5 | 1 140 000 | 1 400 000 | 0,26 | 2,64 | 3,93 | 2,58 | 125 000 | 2 600 | 1 960 |
| 186 | 276 | 174 | 18 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| 186 | 276 | 174 | 18 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| 191 | 323 | 174 | 8 | 3 | 1 430 000 | 1 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 121 000 | 2 000 | 1 490 |
| 190 | 249,8 | 179 | 8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| 189 | 249,8 | 179 | 8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| 193 | 268 | 180 | 8 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| 193 | 268 | 180 | 8 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| 199 | 293 | 180 | 10 | 3 | 1 320 000 | 1 560 000 | 0,26 | 2,6 | 3,87 | 2,54 | 139 000 | 2 400 | 1 830 |
| 199 | 293 | 185 | 18 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| 199 | 293 | 185 | 18 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| 204 | 343 | 185 | 8 | 3 | 1 600 000 | 2 120 000 | 0,37 | 1,83 | 2,72 | 1,79 | 134 000 | 1 800 | 1 380 |
| 198 | 241,2 | 188 | 8 | 2 | 440 000 | 850 000 | 0,2 | 3,42 | 5,09 | 3,34 | 57 000 | 2 200 | 2 320 |
| 201 | 269,8 | 189 | 8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| 201 | 269,8 | 189 | 8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| 204 | 286 | 180 | 8 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| 204 | 286 | 191 | 8 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| 211 | 303 | 191 | 18 | 3 | 1 370 000 | 1 660 000 | 0,25 | 2,71 | 4,04 | 2,65 | 148 000 | 2 400 | 1 720 |
| 210 | 303 | 195 | 22 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 210 | 303 | 195 | 22 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| 217 | 363 | 195 | 8 | 3 | 1 760 000 | 2 360 000 | 0,37 | 1,83 | 2,72 | 1,79 | 209 000 | 1 500 | 1 280 |
| 211 | 279,8 | 199 | 9 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 211 | 279,8 | 199 | 9 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| 216 | 306 | 202 | 9 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| 216 | 306 | 202 | 9 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| 223 | 323 | 202 | 21 | 3 | 1 200 000 | 1 830 000 | 0,28 | 2,39 | 3,56 | 2,34 | 122 000 | 1 800 | 1 620 |
| 222 | 323 | 206 | 21 | 3 | 1 560 000 | 2 600 000 | 0,36 | 1,86 | 2,77 | 1,82 | 156 000 | 1 700 | 1 040 |
| 228 | 380 | 206 | 9 | 4 | 1 860 000 | 2 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 213 000 | 1 500 | 1 220 |

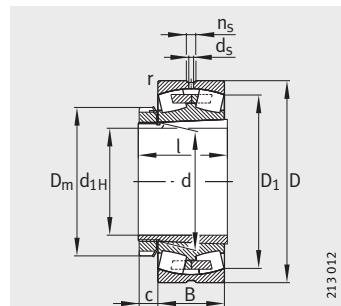


Spherical roller bearings

With adapter sleeve



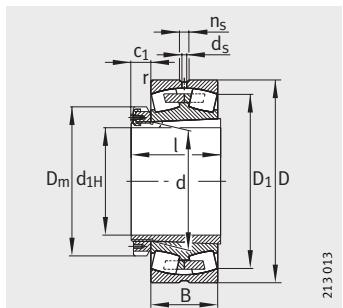
E1 design



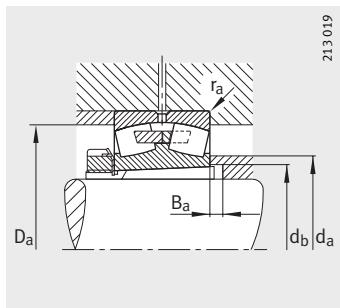
With central rib

Dimension table (continued) · Dimensions in mm

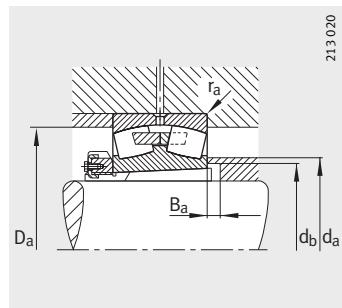
| Designation | | Mass m | | Dimensions | | | | | | | | | | | | |
|-------------------------|--------|----------------|-------------|--------------------|-----------------|-----|-----|-----|--------|------------------|----------------|----------------|----------------|----------------|-----|--|
| Bearing | X-life | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ ≈ | d ₂ | d _s | n _s | D _m | l | |
| 23940-S-K-MB | - | H3940 | 11,5 | 7,82 | 180 | 200 | 280 | 60 | 2,1 | 256,9 | - | 6,3 | 12,2 | 240 | 98 | |
| 23040-E1A-K-M | XL | H3040 | 21,4 | 9,22 | 180 | 200 | 310 | 82 | 2,1 | 281,6 | - | 8 | 15 | 240 | 120 | |
| 23040-E1-K-TV PB | XL | H3040 | 20,8 | 9,22 | 180 | 200 | 310 | 82 | 2,1 | 281,6 | 223,4 | 8 | 15 | 240 | 120 | |
| 23140-B-K-MB | - | H3140 | 41,7 | 12,1 | 180 | 200 | 340 | 112 | 3 | 293,3 | - | 9,5 | 17,7 | 250 | 150 | |
| 22240-B-K-MB | - | H3140 | 42,3 | 12,1 | 180 | 200 | 360 | 98 | 4 | 312 | - | 9,5 | 17,7 | 250 | 150 | |
| 23240-B-K-MB | - | H2340 | 55,8 | 14 | 180 | 200 | 360 | 128 | 4 | 307,5 | - | 9,5 | 17,7 | 250 | 176 | |
| 22340-K-MB | - | H2340 | 89,5 | 14 | 180 | 200 | 420 | 138 | 5 | 357,4 | - | 12,5 | 23,5 | 250 | 176 | |
| 23944-S-K-MB | - | H3944 | 12,3 | 8,27 | 200 | 220 | 300 | 60 | 2,1 | 277,4 | - | 6,3 | 12,2 | 260 | 96 | |
| 23044-K-MB | - | H3044X | 29,9 | 10,4 | 200 | 220 | 340 | 90 | 3 | 301,8 | - | 8 | 15 | 260 | 126 | |
| 23144-B-K-MB | - | H3144X | 52 | 15,4 | 200 | 220 | 370 | 120 | 4 | 319,2 | - | 9,5 | 17,7 | 292 | 161 | |
| 22244-B-K-MB | - | H3144X | 59,6 | 15,4 | 200 | 220 | 400 | 108 | 4 | 348,7 | - | 9,5 | 17,7 | 292 | 161 | |
| 23244-K-MB | - | H2344X | 79 | 17,5 | 200 | 220 | 400 | 144 | 4 | 337,6 | - | 9,5 | 17,7 | 280 | 186 | |
| 22344-K-MB | - | H2344X | 114 | 17,5 | 200 | 220 | 460 | 145 | 5 | 391,2 | - | 12,5 | 23,5 | 280 | 186 | |
| 23948-K-MB | - | H3948 | 13,4 | 10,9 | 220 | 240 | 320 | 60 | 2,1 | 297,8 | - | 6,3 | 12,2 | 290 | 101 | |
| 23048-K-MB | - | H3048 | 31,9 | 13,4 | 220 | 240 | 360 | 92 | 3 | 322,1 | - | 8 | 15 | 290 | 133 | |
| 23148-B-K-MB | - | H3148X | 65,3 | 18,1 | 220 | 240 | 400 | 128 | 4 | 346,2 | - | 9,5 | 17,7 | 312 | 172 | |
| 22248-B-K-MB | - | H3148X | 81,2 | 18,1 | 220 | 240 | 440 | 120 | 4 | 380,7 | - | 12,5 | 23,5 | 312 | 172 | |
| 23248-B-K-MB | - | H2348X | 105 | 20,6 | 220 | 240 | 440 | 160 | 4 | 371 | - | 12,5 | 23,5 | 300 | 199 | |
| 22348-K-MB | - | H2348X | 145 | 20,6 | 220 | 240 | 500 | 155 | 5 | 420 | - | 12,5 | 23,5 | 300 | 199 | |
| 23952-K-MB | - | H3952 | 22,4 | 13,1 | 240 | 260 | 360 | 75 | 2,1 | 330,5 | - | 8 | 15 | 310 | 116 | |
| 23052-K-MB | - | H3052X | 46,2 | 15,6 | 240 | 260 | 400 | 104 | 4 | 357,2 | - | 9,5 | 17,7 | 310 | 145 | |
| 23152-K-MB | - | H3152X | 89,6 | 22,9 | 240 | 260 | 440 | 144 | 4 | 379,7 | - | 9,5 | 17,7 | 330 | 190 | |
| 22252-B-K-MB | - | H3152X | 106 | 22,9 | 240 | 260 | 480 | 130 | 5 | 415,3 | - | 12,5 | 23,5 | 330 | 190 | |
| 23252-B-K-MB | - | H2352X | 136 | 25,1 | 240 | 260 | 480 | 174 | 5 | 405,4 | - | 12,5 | 23,5 | 330 | 211 | |
| 22352-K-MB | - | H2352X | 177 | 25,1 | 240 | 260 | 540 | 165 | 6 | 452,1 | - | 12,5 | 23,5 | 330 | 211 | |
| 23956-K-MB | - | H3956 | 24,7 | 15 | 260 | 280 | 380 | 75 | 2,1 | 350 | - | 8 | 15 | 330 | 121 | |
| 23056-B-K-MB | - | H3056 | 50,3 | 18 | 260 | 280 | 420 | 106 | 4 | 376,5 | - | 9,5 | 17,7 | 330 | 152 | |
| 23156-B-K-MB | - | H3156X | 96,4 | 25,4 | 260 | 280 | 460 | 146 | 5 | 401,4 | - | 9,5 | 17,7 | 362 | 195 | |
| 22256-B-K-MB | - | H3156X | 110 | 25,4 | 260 | 280 | 500 | 130 | 5 | 435,2 | - | 12,5 | 23,5 | 362 | 195 | |
| 23256-K-MB | - | H2356X | 153 | 28,8 | 260 | 280 | 500 | 176 | 5 | 426,3 | - | 12,5 | 23,5 | 350 | 224 | |
| 22356-K-MB | - | H2356X | 224 | 28,8 | 260 | 280 | 580 | 175 | 6 | 489,3 | - | 12,5 | 23,5 | 350 | 224 | |
| 23960-B-K-MB | - | H3960 | 39,1 | 20,3 | 280 | 300 | 420 | 90 | 3 | 384,6 | - | 9,5 | 17,7 | 360 | 140 | |
| 23060-K-MB | - | H3060 | 72,2 | 23,2 | 280 | 300 | 460 | 118 | 4 | 412,6 | - | 9,5 | 17,7 | 360 | 168 | |
| 23160-B-K-MB | - | H3160 | 123 | 29,9 | 280 | 300 | 500 | 160 | 5 | 434,7 | - | 9,5 | 17,7 | 380 | 208 | |
| 22260-K-MB | - | H3160 | 136 | 29,9 | 280 | 300 | 540 | 140 | 5 | 468,8 | - | 12,5 | 23,5 | 380 | 208 | |
| 23260-K-MB | - | H3260 | 192 | 34,1 | 280 | 300 | 540 | 192 | 5 | 458,7 | - | 12,5 | 23,5 | 380 | 240 | |



With central rib
Locknut with retaining bracket



Mounting dimensions
With central rib



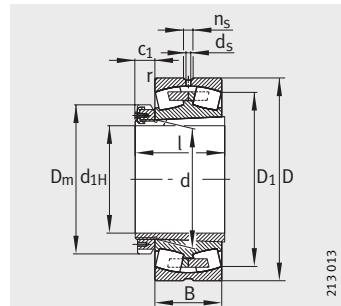
With central rib
Locknut with retaining bracket

| | | Mounting dimensions | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed | |
|----|----------------|---------------------|----------------|----------------|----------------|--------------------|-----------------------------|-------------------------------|------|----------------|----------------|--------------------|----------------------|-------------------------------------|-------------------------------------|
| c | c ₁ | d _a | D _a | d _b | B _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 32 | — | 220 | 269,8 | 210 | 9 | 2,1 | 550 000 | 1 080 000 | 0,2 | 3,42 | 5,09 | 3,34 | 71 000 | 2 000 | 2 110 |
| 32 | — | 223 | 299,8 | 210 | 10 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| 32 | — | 223 | 299,8 | 210 | 10 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| 32 | — | 231 | 326 | 212 | 10 | 2,5 | 1 320 000 | 2 280 000 | 0,35 | 1,95 | 2,9 | 1,91 | 131 000 | 1 700 | 1 240 |
| 32 | — | 234 | 343 | 212 | 24 | 3 | 1 320 000 | 2 000 000 | 0,29 | 2,35 | 3,5 | 2,3 | 123 000 | 1 700 | 1 530 |
| 32 | — | 237 | 343 | 216 | 20 | 3 | 1 660 000 | 2 750 000 | 0,37 | 1,83 | 2,72 | 1,79 | 163 000 | 1 500 | 1 000 |
| 32 | — | 240 | 400 | 216 | 10 | 4 | 2 080 000 | 2 800 000 | 0,36 | 1,87 | 2,79 | 1,83 | 189 000 | 1 400 | 1 130 |
| — | 40 | 241 | 289,8 | 230 | 9 | 2,1 | 600 000 | 1 250 000 | 0,18 | 3,76 | 5,59 | 3,67 | 72 000 | 1 800 | 1 880 |
| — | 40 | 247 | 327,6 | 231 | 12 | 2,5 | 1 060 000 | 1 900 000 | 0,26 | 2,55 | 3,8 | 2,5 | 132 000 | 1 700 | 1 470 |
| 35 | — | 253 | 353 | 233 | 10 | 3 | 1 630 000 | 2 900 000 | 0,33 | 2,03 | 3,02 | 1,98 | 165 000 | 1 400 | 1 070 |
| 35 | — | 258 | 383 | 233 | 22 | 3 | 1 630 000 | 2 450 000 | 0,29 | 2,35 | 3,5 | 2,3 | 153 000 | 1 400 | 1 340 |
| 35 | — | 259 | 383 | 236 | 11 | 3 | 2 040 000 | 3 450 000 | 0,37 | 1,83 | 2,72 | 1,79 | 181 000 | 1 400 | 860 |
| 35 | — | 272 | 440 | 236 | 10 | 4 | 2 320 000 | 3 350 000 | 0,35 | 1,95 | 2,9 | 1,91 | 217 000 | 1 300 | 980 |
| — | 45 | 261 | 309,8 | 250 | 11 | 2,1 | 640 000 | 1 370 000 | 0,17 | 4,05 | 6,04 | 3,96 | 93 000 | 1 500 | 1 700 |
| — | 45 | 268 | 347,6 | 251 | 11 | 2,5 | 1 160 000 | 2 200 000 | 0,25 | 2,74 | 4,08 | 2,68 | 130 000 | 1 400 | 1 320 |
| 37 | — | 276 | 383 | 254 | 11 | 3 | 1 860 000 | 3 250 000 | 0,33 | 2,06 | 3,06 | 2,01 | 177 000 | 1 300 | 970 |
| 37 | — | 283 | 423 | 254 | 19 | 3 | 1 960 000 | 3 050 000 | 0,29 | 2,35 | 3,5 | 2,3 | 184 000 | 1 300 | 1 190 |
| 37 | — | 284 | 423 | 257 | 6 | 3 | 2 450 000 | 4 250 000 | 0,37 | 1,8 | 2,69 | 1,76 | 231 000 | 1 300 | 750 |
| 37 | — | 296 | 480 | 257 | 11 | 4 | 2 650 000 | 3 900 000 | 0,35 | 1,95 | 2,9 | 1,91 | 249 000 | 1 500 | 870 |
| — | 45 | 285 | 349,8 | 270 | 11 | 2,1 | 930 000 | 1 930 000 | 0,19 | 3,54 | 5,27 | 3,46 | 108 000 | 1 400 | 1 610 |
| — | 45 | 291 | 385,4 | 272 | 13 | 3 | 1 500 000 | 2 800 000 | 0,26 | 2,64 | 3,93 | 2,58 | 154 000 | 1 300 | 1 170 |
| 39 | — | 302 | 423 | 276 | 11 | 3 | 2 200 000 | 4 000 000 | 0,33 | 2,03 | 3,02 | 1,98 | 213 000 | 1 200 | 860 |
| 39 | — | 308 | 460 | 276 | 25 | 4 | 2 240 000 | 3 450 000 | 0,29 | 2,32 | 3,45 | 2,26 | 217 000 | 1 100 | 1 080 |
| 39 | — | 309 | 460 | 278 | 2 | 4 | 2 900 000 | 4 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 270 000 | 1 100 | 680 |
| 39 | — | 322 | 514 | 278 | 11 | 5 | 3 000 000 | 4 400 000 | 0,34 | 2 | 2,98 | 1,96 | 290 000 | 1 100 | 790 |
| — | 49 | 303 | 369,8 | 290 | 12 | 2,1 | 965 000 | 2 040 000 | 0,18 | 3,76 | 5,59 | 3,67 | 129 000 | 1 300 | 1 470 |
| — | 49 | 310 | 405,4 | 292 | 12 | 3 | 1 560 000 | 3 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 156 000 | 1 300 | 1 080 |
| 39 | — | 321 | 440 | 296 | 12 | 4 | 2 360 000 | 4 400 000 | 0,32 | 2,12 | 3,15 | 2,07 | 241 000 | 1 100 | 790 |
| 39 | — | 324 | 480 | 296 | 28 | 4 | 2 360 000 | 3 650 000 | 0,28 | 2,43 | 3,61 | 2,37 | 238 000 | 1 100 | 1 010 |
| 41 | — | 329 | 480 | 299 | 11 | 4 | 3 000 000 | 5 300 000 | 0,36 | 1,86 | 2,77 | 1,82 | 260 000 | 1 100 | 630 |
| 41 | — | 349 | 554 | 299 | 12 | 5 | 3 550 000 | 5 400 000 | 0,33 | 2,03 | 3,02 | 1,98 | 335 000 | 950 | 680 |
| — | 53 | 329 | 407,6 | 311 | 12 | 2,5 | 1 270 000 | 2 650 000 | 0,2 | 3,42 | 5,09 | 3,34 | 166 000 | 1 200 | 1 400 |
| — | 53 | 337 | 445,4 | 313 | 12 | 3 | 1 960 000 | 3 650 000 | 0,25 | 2,69 | 4 | 2,63 | 223 000 | 1 100 | 980 |
| — | 53 | 347 | 480 | 318 | 12 | 4 | 2 650 000 | 4 900 000 | 0,33 | 2,06 | 3,06 | 2,01 | 270 000 | 1 100 | 730 |
| — | 53 | 352 | 520 | 318 | 32 | 4 | 2 750 000 | 4 400 000 | 0,27 | 2,47 | 3,67 | 2,41 | 300 000 | 1 000 | 900 |
| — | 53 | 353 | 520 | 321 | 12 | 4 | 3 450 000 | 6 200 000 | 0,37 | 1,83 | 2,72 | 1,79 | 300 000 | 1 000 | 560 |



Spherical roller bearings

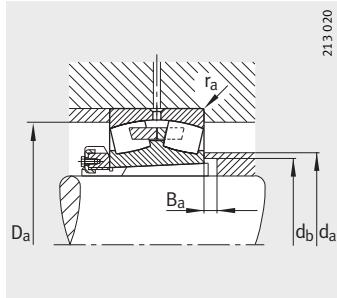
With adapter sleeve



With central rib
Locknut with retaining bracket

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | | |
|--------------|----------------|-------------|--------------------|------------|-----|-----|-----|-----|------|-------|-------|-------|-------|-----|-------|---|
| Bearing | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d_{1H} | d | D | B | r | min. | D_1 | d_s | n_s | D_m | l | c_1 | ≈ |
| 23964-K-MB | H3964 | 41 | 21,5 | 300 | 320 | 440 | 90 | 3 | | 406,2 | 9,5 | 17,7 | 380 | 140 | 56 | |
| 23064-K-MB | H3064 | 77,1 | 25,1 | 300 | 320 | 480 | 121 | 4 | | 432,6 | 9,5 | 17,7 | 380 | 171 | 56 | |
| 23164-K-MB | H3164 | 159 | 34,8 | 300 | 320 | 540 | 176 | 5 | | 466,2 | 12,5 | 23,5 | 400 | 226 | 56 | |
| 22264-K-MB | H3164 | 166 | 34,8 | 300 | 320 | 580 | 150 | 5 | | 503,5 | 12,5 | 23,5 | 400 | 226 | 56 | |
| 23264-K-MB | H3264 | 229 | 39,3 | 300 | 320 | 580 | 208 | 5 | | 489,6 | 12,5 | 23,5 | 400 | 258 | 56 | |
| 23068-K-MB | H3068 | 101 | 29,3 | 320 | 340 | 520 | 133 | 5 | | 464,6 | 12,5 | 23,5 | 400 | 187 | 57 | |
| 23168-B-K-MB | H3168 | 203 | 49,5 | 320 | 340 | 580 | 190 | 5 | | 499,5 | 12,5 | 23,5 | 440 | 254 | 70 | |
| 23268-B-K-MB | H3268 | 291 | 54,9 | 320 | 340 | 620 | 224 | 6 | | 521,2 | 12,5 | 23,5 | 440 | 288 | 70 | |
| 23972-K-MB | H3972 | 45 | 27,1 | 340 | 360 | 480 | 90 | 3 | | 447,1 | 9,5 | 17,7 | 420 | 144 | 57 | |
| 23072-K-MB | H3072 | 107 | 30,9 | 340 | 360 | 540 | 134 | 5 | | 485,2 | 12,5 | 23,5 | 420 | 188 | 57 | |
| 23172-K-MB | H3172 | 217 | 54,3 | 340 | 360 | 600 | 192 | 5 | | 520 | 12,5 | 23,5 | 460 | 259 | 73 | |
| 23272-B-K-MB | H3272 | 328 | 61,1 | 340 | 360 | 650 | 232 | 6 | | 548,3 | 12,5 | 23,5 | 460 | 299 | 73 | |
| 23976-K-MB | H3976 | 66,3 | 32,4 | 360 | 380 | 520 | 106 | 4 | | 477,6 | 9,5 | 17,7 | 450 | 164 | 62 | |
| 23076-B-K-MB | H3076 | 113 | 36,5 | 360 | 380 | 560 | 135 | 5 | | 505,6 | 12,5 | 23,5 | 450 | 193 | 62 | |
| 23176-K-MB | H3176 | 226 | 60,9 | 360 | 380 | 620 | 194 | 5 | | 539,6 | 12,5 | 23,5 | 490 | 264 | 75 | |
| 23276-B-K-MB | H3276 | 367 | 69,3 | 360 | 380 | 680 | 240 | 6 | | 576,4 | 12,5 | 23,5 | 490 | 310 | 75 | |
| 23980-B-K-MB | H3980 | 68,2 | 38,5 | 380 | 400 | 540 | 106 | 4 | | 499 | 9,5 | 17,5 | 470 | 168 | 66 | |
| 23080-K-MB | H3080 | 143 | 42,3 | 380 | 400 | 600 | 148 | 5 | | 540,5 | 12,5 | 23,5 | 470 | 210 | 66 | |
| 23180-B-K-MB | H3180 | 261 | 69,6 | 380 | 400 | 650 | 200 | 6 | | 567,2 | 12,5 | 23,5 | 520 | 272 | 81 | |
| 23280-B-K-MB | H3280 | 442 | 80,5 | 380 | 400 | 720 | 256 | 6 | | 609,8 | 12,5 | 23,5 | 520 | 328 | 81 | |
| 23984-K-MB | H3984 | 78 | 37,5 | 400 | 420 | 560 | 106 | 4 | | 519,5 | 9,5 | 17,7 | 490 | 168 | 66 | |
| 23084-B-K-MB | H3084X | 155 | 44,6 | 400 | 420 | 620 | 150 | 5 | | 560,7 | 12,5 | 23,5 | 490 | 212 | 66 | |
| 23184-K-MB | H3184 | 339 | 84,5 | 400 | 420 | 700 | 224 | 6 | | 605,4 | 12,5 | 23,5 | 540 | 304 | 89 | |
| 23284-B-K-MB | H3284 | 537 | 94,8 | 400 | 420 | 760 | 272 | 7,5 | | 642,2 | 12,5 | 23,5 | 540 | 352 | 89 | |
| 23988-K-MB | H3988 | 98,3 | 58,3 | 410 | 440 | 600 | 118 | 4 | | 552,8 | 12,5 | 23,5 | 520 | 189 | 75 | |
| 23088-K-MB | H3088 | 177 | 67 | 410 | 440 | 650 | 157 | 6 | | 586,8 | 12,5 | 23,5 | 520 | 228 | 75 | |
| 23188-K-MB | H3188 | 378 | 103 | 410 | 440 | 720 | 226 | 6 | | 626 | 12,5 | 23,5 | 560 | 307 | 89 | |
| 23288-B-K-MB | H3288 | 586 | 125 | 410 | 440 | 790 | 280 | 7,5 | | 669,3 | 12,5 | 23,5 | 560 | 361 | 89 | |
| 23992-B-K-MB | H3992 | 103 | 64,7 | 430 | 460 | 620 | 118 | 4 | | 573,3 | 12,5 | 23,5 | 540 | 189 | 75 | |
| 23092-B-K-MB | H3092 | 204 | 71,6 | 430 | 460 | 680 | 163 | 6 | | 612,2 | 12,5 | 23,5 | 540 | 234 | 75 | |
| 23192-K-MB | H3192 | 420 | 120 | 430 | 460 | 760 | 240 | 7,5 | | 661,4 | 12,5 | 23,5 | 580 | 326 | 94 | |
| 23292-K-MB | H3292 | 699 | 137 | 430 | 460 | 830 | 296 | 7,5 | | 701,6 | 12,5 | 23,5 | 580 | 382 | 94 | |
| 23996-B-K-MB | H3996 | 121 | 70,2 | 450 | 480 | 650 | 128 | 5 | | 598,8 | 12,5 | 23,5 | 560 | 200 | 75 | |
| 23096-K-MB | H3096 | 208 | 75,3 | 450 | 480 | 700 | 165 | 6 | | 632,6 | 12,5 | 23,5 | 560 | 237 | 75 | |
| 23196-K-MB | H3196 | 470 | 135 | 450 | 480 | 790 | 248 | 7,5 | | 688,3 | 12,5 | 23,5 | 620 | 335 | 94 | |
| 23296-K-MB | H3296 | 806 | 154 | 450 | 480 | 870 | 310 | 7,5 | | 734,8 | 12,5 | 23,5 | 620 | 397 | 94 | |



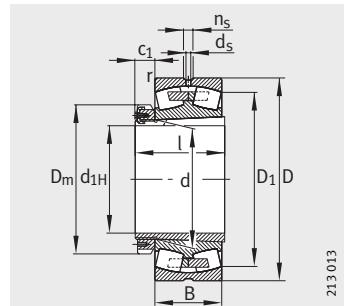
Mounting dimensions

| Mounting dimensions | | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C _{ur} | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|---------------------------------------|---|--|
| d _a max. | D _a max. | d _b min. | B _a min. | r _a max. | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | N | min ⁻¹ | min ⁻¹ |
| 349 | 427,6 | 332 | 12 | 2,5 | 1 320 000 | 2 750 000 | 0,19 | 3,62 | 5,39 | 3,54 | 202 000 | 1 100 | 1 300 |
| 357 | 465,4 | 334 | 13 | 3 | 2 040 000 | 4 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 243 000 | 1 100 | 910 |
| 369 | 520 | 338 | 13 | 4 | 3 200 000 | 6 000 000 | 0,34 | 1,98 | 2,94 | 1,93 | 305 000 | 950 | 650 |
| 378 | 560 | 338 | 39 | 4 | 3 050 000 | 4 900 000 | 0,27 | 2,47 | 3,67 | 2,41 | 345 000 | 950 | 840 |
| 378 | 560 | 343 | 13 | 4 | 3 900 000 | 6 950 000 | 0,37 | 1,8 | 2,69 | 1,76 | 330 000 | 950 | 520 |
| 382 | 502 | 355 | 14 | 4 | 2 360 000 | 4 550 000 | 0,25 | 2,69 | 4 | 2,63 | 285 000 | 1 000 | 850 |
| 395 | 560 | 360 | 14 | 4 | 3 650 000 | 6 950 000 | 0,34 | 1,98 | 2,94 | 1,93 | 570 000 | 900 | 590 |
| 402 | 594 | 364 | 14 | 5 | 4 500 000 | 8 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 650 000 | 850 | 470 |
| 389 | 467,6 | 372 | 14 | 2,5 | 1 430 000 | 3 200 000 | 0,17 | 4,05 | 6,04 | 3,96 | 209 000 | 1 000 | 1 130 |
| 402 | 522 | 375 | 14 | 4 | 2 450 000 | 4 800 000 | 0,25 | 2,74 | 4,08 | 2,68 | 295 000 | 950 | 800 |
| 416 | 580 | 380 | 14 | 4 | 3 800 000 | 7 350 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 850 | 560 |
| 424 | 624 | 385 | 14 | 5 | 4 900 000 | 9 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 720 000 | 800 | 425 |
| 415 | 505,4 | 393 | 15 | 3 | 1 760 000 | 4 000 000 | 0,19 | 3,58 | 5,33 | 3,5 | 265 000 | 950 | 1 090 |
| 422 | 542 | 396 | 15 | 4 | 2 550 000 | 5 300 000 | 0,24 | 2,84 | 4,23 | 2,78 | 430 000 | 900 | 740 |
| 436 | 600 | 401 | 15 | 4 | 4 050 000 | 8 150 000 | 0,32 | 2,12 | 3,15 | 2,07 | 385 000 | 800 | 510 |
| 447 | 654 | 405 | 15 | 5 | 5 300 000 | 9 800 000 | 0,37 | 1,8 | 2,69 | 1,76 | 780 000 | 750 | 400 |
| 435 | 525,4 | 413 | 15 | 3 | 1 830 000 | 4 150 000 | 0,18 | 3,71 | 5,52 | 3,63 | 275 000 | 900 | 1 030 |
| 448 | 582 | 417 | 15 | 4 | 3 050 000 | 6 200 000 | 0,24 | 2,79 | 4,15 | 2,73 | 365 000 | 800 | 680 |
| 457 | 624 | 421 | 15 | 5 | 4 250 000 | 8 500 000 | 0,31 | 2,15 | 3,2 | 2,1 | 670 000 | 750 | 490 |
| 473 | 694 | 427 | 15 | 5 | 5 700 000 | 10 800 000 | 0,38 | 1,78 | 2,65 | 1,74 | 820 000 | 700 | 375 |
| 455 | 545,4 | 433 | 15 | 3 | 1 900 000 | 4 500 000 | 0,18 | 3,85 | 5,73 | 3,76 | 300 000 | 850 | 970 |
| 468 | 602 | 437 | 16 | 4 | 3 150 000 | 6 550 000 | 0,24 | 2,84 | 4,23 | 2,78 | 395 000 | 800 | 650 |
| 483 | 674 | 443 | 16 | 5 | 5 000 000 | 9 650 000 | 0,33 | 2,03 | 3,02 | 1,98 | 465 000 | 700 | 460 |
| 495 | 728 | 449 | 16 | 6 | 6 550 000 | 12 200 000 | 0,38 | 1,77 | 2,64 | 1,73 | 930 000 | 670 | 345 |
| 482 | 585,4 | 454 | 17 | 3 | 2 240 000 | 5 200 000 | 0,18 | 3,66 | 5,46 | 3,58 | 295 000 | 800 | 930 |
| 488 | 627 | 458 | 17 | 5 | 3 400 000 | 7 100 000 | 0,24 | 2,84 | 4,23 | 2,78 | 405 000 | 750 | 610 |
| 504 | 694 | 463 | 17 | 5 | 5 200 000 | 10 400 000 | 0,32 | 2,1 | 3,13 | 2,06 | 485 000 | 700 | 430 |
| 516 | 758 | 469 | 17 | 6 | 7 100 000 | 13 400 000 | 0,37 | 1,8 | 2,69 | 1,76 | 990 000 | 630 | 320 |
| 500 | 605,4 | 474 | 17 | 3 | 2 280 000 | 5 400 000 | 0,18 | 3,85 | 5,73 | 3,76 | 370 000 | 750 | 880 |
| 509 | 657 | 478 | 17 | 5 | 3 650 000 | 7 650 000 | 0,24 | 2,84 | 4,23 | 2,78 | 440 000 | 700 | 580 |
| 533 | 728 | 484 | 17 | 6 | 5 850 000 | 11 600 000 | 0,32 | 2,12 | 3,15 | 2,07 | 530 000 | 630 | 400 |
| 541 | 798 | 490 | 17 | 6 | 7 800 000 | 15 000 000 | 0,37 | 1,8 | 2,69 | 1,76 | 620 000 | 600 | 295 |
| 523 | 632 | 496 | 18 | 4 | 2 550 000 | 6 000 000 | 0,18 | 3,76 | 5,59 | 3,67 | 460 000 | 700 | 860 |
| 529 | 677 | 499 | 18 | 5 | 3 800 000 | 8 150 000 | 0,23 | 2,9 | 4,31 | 2,83 | 455 000 | 670 | 550 |
| 554 | 758 | 505 | 18 | 6 | 6 300 000 | 12 700 000 | 0,32 | 2,12 | 3,15 | 2,07 | 570 000 | 630 | 375 |
| 568 | 838 | 512 | 18 | 6 | 8 800 000 | 17 000 000 | 0,37 | 1,83 | 2,72 | 1,79 | 700 000 | 600 | 270 |



Spherical roller bearings

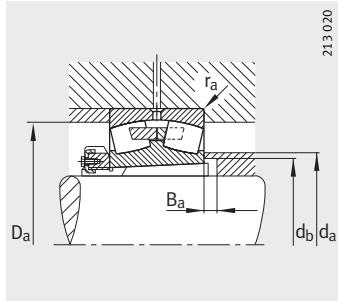
With adapter sleeve



With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | | |
|-----------------------|----------------|-------------|--------------------|------------|-----|------|-----|-----|------|--------|-------|-------|-------|-------|-----|-----------|
| Bearing | Adapter sleeve | Bearing ≈kg | Adapter sleeve ≈kg | d_{1H} | d | D | B | r | min. | D_1 | c_1 | n_s | d_s | D_m | l | \approx |
| 239/500-K-MB | H39/500 | 124 | 74,3 | 470 | 500 | 670 | 128 | 5 | | 619,3 | 12,5 | 23,5 | 580 | 208 | 83 | |
| 230/500-B-K-MB | H30/500 | 219 | 84,5 | 470 | 500 | 720 | 167 | 6 | | 653,5 | 12,5 | 23,5 | 580 | 247 | 83 | |
| 231/500-B-K-MB | H31/500 | 556 | 143 | 470 | 500 | 830 | 264 | 7,5 | | 720,9 | 12,5 | 23,5 | 630 | 356 | 99 | |
| 239/530-K-MB | H39/530 | 146 | 89,3 | 500 | 530 | 710 | 136 | 5 | | 656,4 | 12,5 | 23,5 | 630 | 216 | 89 | |
| 230/530-K-MB | H30/530 | 291 | 103 | 500 | 530 | 780 | 185 | 6 | | 703,7 | 12,5 | 23,5 | 630 | 265 | 89 | |
| 231/530-K-MB | H31/530 | 643 | 160 | 500 | 530 | 870 | 272 | 7,5 | | 756,3 | 12,5 | 23,5 | 670 | 364 | 102 | |
| 239/560-B-K-MB | H39/560 | 169 | 95,8 | 530 | 560 | 750 | 140 | 5 | | 693,4 | 12,5 | 23,5 | 650 | 227 | 96 | |
| 230/560-B-K-MB | H30/560 | 339 | 113 | 530 | 560 | 820 | 195 | 6 | | 741,5 | 12,5 | 23,5 | 650 | 282 | 96 | |
| 231/560-K-MB | H31/560 | 737 | 183 | 530 | 560 | 920 | 280 | 7,5 | | 800,2 | 12,5 | 23,5 | 710 | 377 | 107 | |
| 239/600-B-K-MB | H39/600 | 210 | 129 | 560 | 600 | 800 | 150 | 5 | | 740,5 | 12,5 | 23,5 | 700 | 239 | 96 | |
| 230/600-B-K-MB | H30/600 | 388 | 149 | 560 | 600 | 870 | 200 | 6 | | 791,9 | 12,5 | 23,5 | 700 | 289 | 96 | |
| 231/600-K-MB | H31/600 | 901 | 233 | 560 | 600 | 980 | 300 | 7,5 | | 852,6 | 12,5 | 23,5 | 750 | 399 | 107 | |
| 239/630-B-K-MB | H39/630 | 283 | 123 | 600 | 630 | 850 | 165 | 6 | | 784,5 | 12,5 | 23,5 | 730 | 254 | 96 | |
| 230/630-B-K-MB | H30/630 | 502 | 140 | 600 | 630 | 920 | 212 | 7,5 | | 834,3 | 12,5 | 23,5 | 730 | 301 | 96 | |
| 239/670-B-K-MB | H39/670 | 310 | 166 | 630 | 670 | 900 | 170 | 6 | | 831,5 | 12,5 | 23,5 | 780 | 264 | 101 | |
| 230/670-B-K-MB | H30/670 | 590 | 194 | 630 | 670 | 980 | 230 | 7,5 | | 888,7 | 12,5 | 23,5 | 780 | 324 | 101 | |
| 239/710-K-MB | H39/710 | 336 | 201 | 670 | 710 | 950 | 180 | 6 | | 877,5 | 12,5 | 23,5 | 830 | 286 | 111 | |
| 230/710-B-K-MB | H30/710 | 650 | 229 | 670 | 710 | 1030 | 236 | 7,5 | | 938,8 | 12,5 | 23,5 | 830 | 342 | 111 | |
| 239/750-K-MB | H39/750 | 394 | 215 | 710 | 750 | 1000 | 185 | 6 | | 923,2 | 12,5 | 23,5 | 870 | 291 | 111 | |
| 230/750-K-MB | H30/750 | 792 | 250 | 710 | 750 | 1090 | 250 | 7,5 | | 990,9 | 12,5 | 23,5 | 870 | 356 | 111 | |
| 239/800-B-K-MB | H39/800 | 490 | 263 | 750 | 800 | 1060 | 195 | 6 | | 983,7 | 12,5 | 23,5 | 920 | 303 | 111 | |
| 230/800-K-MB | H30/800 | 861 | 306 | 750 | 800 | 1150 | 258 | 7,5 | | 1050,9 | 12,5 | 23,5 | 920 | 366 | 111 | |
| 239/850-K-MB | H39/850 | 554 | 300 | 800 | 850 | 1120 | 200 | 6 | | 1039,9 | 12,5 | 23,5 | 980 | 308 | 112 | |
| 239/900-K-MB | H39/900 | 641 | 327 | 850 | 900 | 1180 | 206 | 6 | | 1098,8 | 12,5 | 23,5 | 1030 | 326 | 112 | |



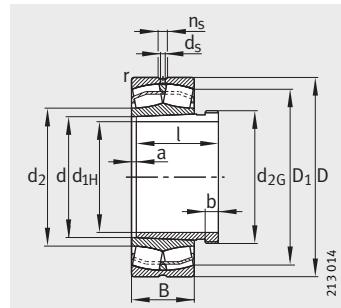
Mounting dimensions

| Mounting dimensions | | | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | d _b | B _a | r _a | dyn. C _r N | stat. C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 543 | 652 | 516 | 18 | 4 | 2 600 000 | 6 300 000 | 0,17 | 3,9 | 5,81 | 3,81 | 400 000 | 670 | 810 |
| 550 | 697 | 519 | 18 | 5 | 3 900 000 | 8 500 000 | 0,22 | 3,01 | 4,48 | 2,94 | 510 000 | 670 | 520 |
| 578 | 798 | 527 | 18 | 6 | 7 100 000 | 14 300 000 | 0,32 | 2,1 | 3,13 | 2,06 | 990 000 | 600 | 345 |
| 576 | 692 | 546 | 18 | 4 | 2 850 000 | 6 800 000 | 0,18 | 3,85 | 5,73 | 3,76 | 385 000 | 630 | 770 |
| 589 | 757 | 550 | 18 | 5 | 4 400 000 | 9 500 000 | 0,22 | 3,04 | 4,53 | 2,97 | 540 000 | 600 | 490 |
| 609 | 838 | 558 | 18 | 6 | 7 350 000 | 15 300 000 | 0,32 | 2,12 | 3,15 | 2,07 | 670 000 | 560 | 325 |
| 609 | 732 | 577 | 18 | 4 | 3 100 000 | 7 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 570 000 | 600 | 720 |
| 619 | 797 | 581 | 18 | 5 | 5 100 000 | 11 000 000 | 0,23 | 2,95 | 4,4 | 2,89 | 740 000 | 560 | 450 |
| 644 | 888 | 589 | 18 | 6 | 8 150 000 | 16 600 000 | 0,31 | 2,21 | 3,29 | 2,16 | 750 000 | 530 | 300 |
| 653 | 782 | 618 | 20 | 4 | 3 450 000 | 8 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 630 000 | 560 | 670 |
| 661 | 847 | 622 | 20 | 5 | 5 700 000 | 12 500 000 | 0,22 | 3,07 | 4,57 | 3 | 890 000 | 530 | 405 |
| 693 | 948 | 629 | 20 | 6 | 9 000 000 | 19 300 000 | 0,31 | 2,2 | 3,27 | 2,15 | 810 000 | 500 | 270 |
| 688 | 827 | 649 | 20 | 5 | 4 050 000 | 9 800 000 | 0,18 | 3,8 | 5,66 | 3,72 | 710 000 | 530 | 650 |
| 696 | 892 | 653 | 20 | 6 | 6 300 000 | 13 700 000 | 0,22 | 3,01 | 4,48 | 2,94 | 890 000 | 500 | 385 |
| 730 | 877 | 689 | 20 | 5 | 4 300 000 | 10 600 000 | 0,17 | 3,95 | 5,88 | 3,86 | 750 000 | 500 | 600 |
| 741 | 952 | 694 | 20 | 6 | 7 200 000 | 16 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 100 000 | 480 | 350 |
| 770 | 927 | 730 | 22 | 5 | 4 800 000 | 12 000 000 | 0,18 | 3,85 | 5,73 | 3,76 | 720 000 | 480 | 570 |
| 785 | 1 002 | 735 | 23 | 6 | 7 650 000 | 17 000 000 | 0,22 | 3,07 | 4,57 | 3 | 1 140 000 | 480 | 330 |
| 810 | 977 | 771 | 23 | 5 | 5 200 000 | 12 900 000 | 0,17 | 3,95 | 5,88 | 3,86 | 790 000 | 480 | 540 |
| 828 | 1 062 | 776 | 23 | 6 | 8 500 000 | 19 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 010 000 | 450 | 305 |
| 865 | 1 037 | 822 | 25 | 5 | 5 850 000 | 15 000 000 | 0,17 | 4,05 | 6,04 | 3,96 | 1 010 000 | 450 | 500 |
| 879 | 1 122 | 828 | 25 | 6 | 9 300 000 | 21 200 000 | 0,22 | 3,07 | 4,57 | 3 | 1 430 000 | 430 | 280 |
| 917 | 1 097 | 873 | 25 | 5 | 6 300 000 | 16 300 000 | 0,16 | 4,11 | 6,12 | 4,02 | 960 000 | 430 | 465 |
| 972 | 1 157 | 923 | 27 | 5 | 6 550 000 | 17 300 000 | 0,16 | 4,28 | 6,37 | 4,19 | 1 010 000 | 400 | 440 |



Spherical roller bearings

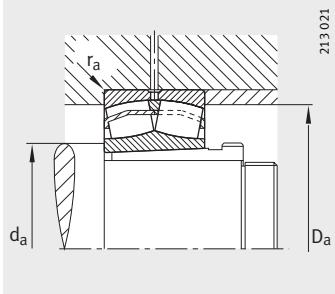
With extraction sleeve



E1 design

Dimension table · Dimensions in mm

| Designation | | | Mass m | | Dimensions | | | | | | | | | | |
|-----------------|--------|-------------------|-------------|-----------------------|-----------------|----|-----|----|--------|------------------|----------------|----------------|----------------|-----|----|
| Bearing | X-life | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ ≈ | d ₂ | d _s | n _s | a ≈ | b |
| 22208-E1-K | XL | AH308 | 0,517 | 0,089 | 35 | 40 | 80 | 23 | 1,1 | 70,4 | 48,6 | 3,2 | 4,8 | 3 | 6 |
| 21308-E1-K | XL | AH308 | 0,702 | 0,089 | 35 | 40 | 90 | 23 | 1,5 | 80,8 | 59,7 | 3,2 | 4,8 | 3 | 6 |
| 22308-E1-K | XL | AH2308 | 1,03 | 0,128 | 35 | 40 | 90 | 33 | 1,5 | 76 | 52,4 | 3,2 | 4,8 | 3 | 7 |
| 22209-E1-K | XL | AH309 | 0,577 | 0,108 | 40 | 45 | 85 | 23 | 1,1 | 75,6 | 54,8 | 3,2 | 4,8 | 3 | 6 |
| 21309-E1-K | XL | AH309 | 0,845 | 0,108 | 40 | 45 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 | 3 | 6 |
| 22309-E1-K | XL | AH2309 | 1,36 | 0,163 | 40 | 45 | 100 | 36 | 1,5 | 84,7 | 58,9 | 3,2 | 6,5 | 3 | 7 |
| 22210-E1-K | XL | AHX310 | 0,608 | 0,138 | 45 | 50 | 90 | 23 | 1,1 | 80,8 | 59,7 | 3,2 | 4,8 | 3 | 7 |
| 21310-E1-K | XL | AHX310 | 1,28 | 0,138 | 45 | 50 | 110 | 27 | 2 | 89,8 | 67,3 | 3,2 | 4,8 | 3 | 7 |
| 22310-E1-K | XL | AHX2310 | 1,86 | 0,213 | 45 | 50 | 110 | 40 | 2 | 92,6 | 63 | 3,2 | 6,5 | 3 | 9 |
| 22211-E1-K | XL | AHX311 | 0,825 | 0,164 | 50 | 55 | 100 | 25 | 1,5 | 89,8 | 67,3 | 3,2 | 4,8 | 3 | 7 |
| 21311-E1-K | XL | AHX311 | 1,19 | 0,164 | 50 | 55 | 120 | 29 | 2 | 98,3 | 71,4 | 3,2 | 6,5 | 3 | 7 |
| 22311-E1-K | XL | AHX2311 | 2,22 | 0,255 | 50 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | 3 | 10 |
| 22311-E1-K-T41A | XL | AHX2311 | 2,22 | 0,255 | 50 | 55 | 120 | 43 | 2 | 101,4 | 68,9 | 3,2 | 6,5 | 3 | 10 |
| 22212-E1-K | XL | AHX312 | 1,09 | 0,195 | 55 | 60 | 110 | 28 | 1,5 | 98,7 | 71,4 | 3,2 | 6,5 | 3 | 8 |
| 21312-E1-K | XL | AHX312 | 1,78 | 0,195 | 55 | 60 | 130 | 31 | 2,1 | 112,5 | 84,4 | 3,2 | 6,5 | 3 | 8 |
| 22312-E1-K | XL | AHX2312 | 2,83 | 0,3 | 55 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | 3 | 11 |
| 22312-E1-K-T41A | XL | AHX2312 | 2,83 | 0,3 | 55 | 60 | 130 | 46 | 2,1 | 110,1 | 74,8 | 3,2 | 6,5 | 3 | 11 |
| 22213-E1-K | XL | AH313G | 1,52 | 0,224 | 60 | 65 | 120 | 31 | 1,5 | 107,3 | 79,1 | 3,2 | 6,5 | 3 | 8 |
| 21313-E1-K | XL | AH313G | 2,42 | 0,224 | 60 | 65 | 140 | 33 | 2,1 | 126,8 | 94,9 | 3,2 | 6,5 | 3 | 8 |
| 22313-E1-K | XL | AH2313G | 3,49 | 0,4 | 60 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | 3 | 12 |
| 22313-E1-K-T41A | XL | AH2313G | 3,49 | 0,4 | 60 | 65 | 140 | 48 | 2,1 | 119,3 | 83,2 | 4,8 | 9,5 | 3 | 12 |
| 22214-E1-K | XL | AH314G | 1,61 | 0,25 | 65 | 70 | 125 | 31 | 1,5 | 112,5 | 84,4 | 3,2 | 6,5 | 4 | 8 |
| 21314-E1-K | XL | AH314G | 3 | 0,25 | 65 | 70 | 150 | 35 | 2,1 | 126,2 | 94,9 | 3,2 | 6,5 | 4 | 8 |
| 22314-E1-K | XL | AHX2314G | 4,12 | 0,407 | 65 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | 4 | 12 |
| 22314-E1-K-T41A | XL | AHX2314G | 4,12 | 0,407 | 65 | 70 | 150 | 51 | 2,1 | 128 | 86,7 | 4,8 | 9,5 | 4 | 12 |
| 22215-E1-K | XL | AH315G | 1,68 | 0,284 | 70 | 75 | 130 | 31 | 1,5 | 117,7 | 89,8 | 3,2 | 6,5 | 4 | 8 |
| 21315-E1-K | XL | AH315G | 2,86 | 0,284 | 70 | 75 | 160 | 37 | 2,1 | 135,2 | 99,7 | 3,2 | 6,5 | 4 | 8 |
| 22315-E1-K | XL | AHX2315G | 5,06 | 0,5 | 70 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | 4 | 12 |
| 22315-E1-K-T41A | XL | AHX2315G | 5,06 | 0,5 | 70 | 75 | 160 | 55 | 2,1 | 136,3 | 92,4 | 4,8 | 9,5 | 4 | 12 |
| 22216-E1-K | XL | AH316 | 2,08 | 0,366 | 75 | 80 | 140 | 33 | 2 | 126,8 | 94,9 | 3,2 | 6,5 | 4 | 8 |
| 21316-E1-K | XL | AH316 | 2,65 | 0,366 | 75 | 80 | 170 | 39 | 2,1 | 135,4 | 99,8 | 3,2 | 6,5 | 4 | 8 |
| 22316-E1-K | XL | AHX2316 | 6,05 | 0,6 | 75 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 | 4 | 12 |
| 22316-E1-K-T41A | XL | AHX2316 | 6,05 | 0,6 | 75 | 80 | 170 | 58 | 2,1 | 145,1 | 98,3 | 4,8 | 9,5 | 4 | 12 |



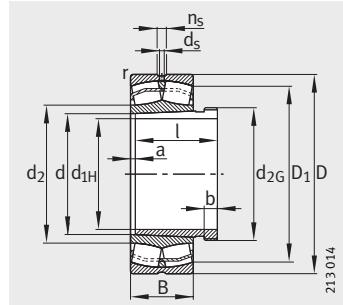
Mounting dimensions

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} | Limiting speed n_G | Reference speed n_B |
|--------------------|-----|---------------------|-------|-------|--------------------|----------|---------------------|-------|-------|-------|--------------------------------|-------------------------|--------------------------|
| Thread d_{2G} | l | d_a | D_a | r_a | C_r | C_{0r} | e | Y_1 | Y_2 | Y_0 | N | min ⁻¹ | min ⁻¹ |
| M45X1,5 | 29 | 47 | 73 | 1 | 102 000 | 90 000 | 0,28 | 2,41 | 3,59 | 2,35 | 11 800 | 10 000 | 6 400 |
| M45X1,5 | 29 | 49 | 81 | 1,5 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 6 100 |
| M45X1,5 | 40 | 49 | 81 | 1,5 | 156 000 | 150 000 | 0,36 | 1,86 | 2,77 | 1,82 | 13 100 | 7 500 | 5 800 |
| M50X1,5 | 31 | 52 | 78 | 1 | 104 000 | 98 000 | 0,26 | 2,62 | 3,9 | 2,56 | 12 700 | 10 000 | 5 800 |
| M50X1,5 | 31 | 54 | 91 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 500 |
| M50X1,5 | 44 | 54 | 91 | 1,5 | 186 000 | 183 000 | 0,36 | 1,9 | 2,83 | 1,86 | 16 100 | 6 700 | 5 300 |
| M55X2 | 35 | 57 | 83 | 1 | 108 000 | 106 000 | 0,24 | 2,81 | 4,19 | 2,75 | 14 300 | 9 500 | 5 300 |
| M55X2 | 35 | 61 | 99 | 2 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 5 300 |
| M55X2 | 50 | 61 | 99 | 2 | 228 000 | 224 000 | 0,36 | 1,86 | 2,77 | 1,82 | 20 300 | 6 000 | 4 950 |
| M60X2 | 37 | 64 | 91 | 1,5 | 129 000 | 129 000 | 0,23 | 2,92 | 4,35 | 2,86 | 17 300 | 8 500 | 4 850 |
| M60X2 | 37 | 66 | 109 | 2 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 6 300 | 4 950 |
| M60X2 | 54 | 66 | 109 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| M60X2 | 54 | 66 | 109 | 2 | 265 000 | 260 000 | 0,36 | 1,89 | 2,81 | 1,84 | 23 900 | 5 600 | 4 650 |
| M65X2 | 40 | 69 | 101 | 1,5 | 170 000 | 166 000 | 0,24 | 2,84 | 4,23 | 2,78 | 21 200 | 7 500 | 4 650 |
| M65X2 | 40 | 72 | 118 | 2,1 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 500 |
| M65X2 | 58 | 72 | 118 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| M65X2 | 58 | 72 | 118 | 2,1 | 310 000 | 310 000 | 0,35 | 1,91 | 2,85 | 1,87 | 28 000 | 5 000 | 4 300 |
| M70X2 | 42 | 74 | 111 | 1,5 | 200 000 | 208 000 | 0,24 | 2,81 | 4,19 | 2,75 | 25 500 | 6 700 | 4 400 |
| M70X2 | 42 | 77 | 128 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 200 |
| M70X2 | 61 | 77 | 128 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| M70X2 | 61 | 77 | 128 | 2,1 | 355 000 | 365 000 | 0,34 | 2 | 2,98 | 1,96 | 32 500 | 4 800 | 3 950 |
| M75X2 | 43 | 79 | 116 | 1,5 | 212 000 | 228 000 | 0,23 | 2,95 | 4,4 | 2,89 | 28 000 | 6 300 | 4 100 |
| M75X2 | 43 | 82 | 138 | 2,1 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 000 | 4 100 |
| M75X2 | 64 | 82 | 138 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| M75X2 | 64 | 82 | 138 | 2,1 | 390 000 | 390 000 | 0,34 | 2 | 2,98 | 1,96 | 36 500 | 4 500 | 3 850 |
| M80X2 | 45 | 84 | 121 | 1,5 | 216 000 | 236 000 | 0,22 | 3,1 | 4,62 | 3,03 | 29 500 | 6 300 | 3 900 |
| M80X2 | 45 | 87 | 148 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 850 |
| M80X2 | 68 | 87 | 148 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |
| M80X2 | 68 | 87 | 148 | 2,1 | 440 000 | 450 000 | 0,34 | 1,99 | 2,96 | 1,94 | 40 500 | 4 300 | 3 650 |
| M90X2 | 48 | 91 | 129 | 2 | 250 000 | 270 000 | 0,22 | 3,14 | 4,67 | 3,07 | 34 000 | 5 600 | 3 700 |
| M90X2 | 48 | 92 | 158 | 2,1 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 4 800 | 3 750 |
| M90X2 | 71 | 92 | 158 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |
| M90X2 | 71 | 92 | 158 | 2,1 | 500 000 | 510 000 | 0,34 | 1,99 | 2,96 | 1,94 | 45 000 | 4 300 | 3 450 |



Spherical roller bearings

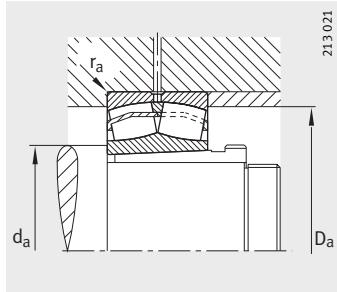
With extraction sleeve



E1 design

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | | |
|-------------------|--------|-------------------|---------|-------------------|-----------------|-----|-----|------|-----|----------------|----------------|----------------|----------------|----|----|----|
| Bearing | X-life | Extraction sleeve | Bearing | Extraction sleeve | d _{1H} | d | D | B | r | D ₁ | d ₂ | d _s | n _s | a | b | |
| | | | ≈kg | ≈kg | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm |
| 22217-E1-K | XL | AHX317 | 2,59 | 0,43 | 80 | 85 | 150 | 36 | 2 | 135,4 | 99,7 | 3,2 | 6,5 | 4 | 9 | |
| 21317-E1-K | XL | AHX317 | 5,37 | 0,43 | 80 | 85 | 180 | 41 | 3 | 143,9 | 106,1 | 4,8 | 9,5 | 4 | 9 | |
| 22317-E1-K | XL | AHX2317 | 7,06 | 0,7 | 80 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 | 4 | 13 | |
| 22317-E1-K-T41A | XL | AHX2317 | 7,06 | 0,7 | 80 | 85 | 180 | 60 | 3 | 154,2 | 104,4 | 4,8 | 9,5 | 4 | 13 | |
| 22218-E1-K | XL | AHX318 | 3,35 | 0,466 | 85 | 90 | 160 | 40 | 2 | 143,9 | 106,1 | 3,2 | 6,5 | 4 | 9 | |
| 23218-E1A-K-M | XL | AHX3218 | 4,34 | 0,6 | 85 | 90 | 160 | 52,4 | 2 | 140 | — | 3,2 | 6,5 | 4 | 10 | |
| 23218-E1-K-TVPB | XL | AHX3218 | 4,08 | 0,6 | 85 | 90 | 160 | 52,4 | 2 | 140 | 104,1 | 3,2 | 6,5 | 4 | 10 | |
| 21318-E1-K | XL | AHX318 | 6,26 | 0,466 | 85 | 90 | 190 | 43 | 3 | 152,7 | 112,6 | 4,8 | 9,5 | 4 | 9 | |
| 22318-E1-K | XL | AHX2318 | 8,33 | 0,8 | 85 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 | 4 | 14 | |
| 22318-E1-K-T41A | XL | AHX2318 | 8,33 | 0,8 | 85 | 90 | 190 | 64 | 3 | 162,5 | 110,2 | 6,3 | 12,2 | 4 | 14 | |
| 22219-E1-K | XL | AHX319 | 4,04 | 0,54 | 90 | 95 | 170 | 43 | 2,1 | 152,7 | 112,6 | 4,8 | 9,5 | 4 | 10 | |
| 21319-E1-K-TVPB | XL | AHX319 | 6,53 | 0,54 | 90 | 95 | 200 | 45 | 3 | 169,4 | 124,3 | 4,8 | 9,5 | 4 | 10 | |
| 22319-E1-K | XL | AHX2319 | 9,46 | 0,894 | 90 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 | 4 | 16 | |
| 22319-E1-K-T41A | XL | AHX2319 | 9,46 | 0,894 | 90 | 95 | 200 | 67 | 3 | 171,2 | 116 | 6,3 | 12,2 | 4 | 16 | |
| 23120-E1A-K-M | XL | AHX3120 | 4,23 | 0,654 | 95 | 100 | 165 | 52 | 2 | 146,3 | — | 3,2 | 6,5 | 4 | 11 | |
| 23120-E1-K-TVPB | XL | AHX3120 | 4,06 | 0,654 | 95 | 100 | 165 | 52 | 2 | 146,3 | 113,9 | 3,2 | 6,5 | 4 | 11 | |
| 22220-E1-K | XL | AHX320 | 4,91 | 0,595 | 95 | 100 | 180 | 46 | 2,1 | 161,4 | 119 | 4,8 | 9,5 | 4 | 10 | |
| 23220-E1A-K-M | XL | AHX3220 | 6,33 | 0,765 | 95 | 100 | 180 | 60,3 | 2,1 | 156,7 | — | 4,8 | 9,5 | 4 | 11 | |
| 23220-E1-K-TVPB | XL | AHX3220 | 6,13 | 0,765 | 95 | 100 | 180 | 60,3 | 2,1 | 156,7 | 116,7 | 4,8 | 9,5 | 4 | 11 | |
| 21320-E1-K-TVPB | XL | AHX320 | 8,08 | 0,595 | 95 | 100 | 215 | 47 | 3 | 182 | 132 | 4,8 | 9,5 | 4 | 10 | |
| 22320-E1-K | XL | AHX2320 | 13,1 | 1,01 | 95 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 | 4 | 16 | |
| 22320-E1-K-T41A | XL | AHX2320 | 13,1 | 1,01 | 95 | 100 | 215 | 73 | 3 | 184,7 | 130,2 | 6,3 | 12,2 | 4 | 16 | |
| 23122-E1A-K-M | XL | AHX3122 | 5,1 | 0,774 | 105 | 110 | 180 | 56 | 2 | 160 | — | 4,8 | 9,5 | 4 | 11 | |
| 23122-E1-K-TVPB | XL | AHX3122 | 4,95 | 0,774 | 105 | 110 | 180 | 56 | 2 | 160 | 124,6 | 4,8 | 9,5 | 4 | 11 | |
| 24122-E1-K30-TVPB | XL | AH24122 | 6,69 | 0,725 | 105 | 110 | 180 | 69 | 2 | 154,8 | 125,1 | 3,2 | 6,5 | 9 | 13 | |
| 22222-E1-K | XL | AHX3122 | 6,82 | 0,774 | 105 | 110 | 200 | 53 | 2,1 | 178,7 | 129,4 | 4,8 | 9,5 | 4 | 11 | |
| 23222-E1A-K-M | XL | AHX3222A | 9,32 | 0,974 | 105 | 110 | 200 | 69,8 | 2,1 | 172,7 | — | 4,8 | 9,5 | 4 | 11 | |
| 23222-E1-K-TVPB | XL | AHX3222A | 8,82 | 0,974 | 105 | 110 | 200 | 69,8 | 2,1 | 172,7 | 129,1 | 4,8 | 9,5 | 4 | 11 | |
| 21322-E1-K-TVPB | XL | AHX322 | 10,9 | 0,663 | 105 | 110 | 240 | 50 | 3 | 202,5 | 146,4 | 6,3 | 12,2 | 4 | 12 | |
| 22322-E1-K | XL | AHX2322G | 17,4 | 1,24 | 105 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 | 4 | 16 | |
| 22322-E1-K-T41A | XL | AHX2322G | 17,4 | 1,24 | 105 | 110 | 240 | 80 | 3 | 204,9 | 143,1 | 8 | 15 | 4 | 16 | |



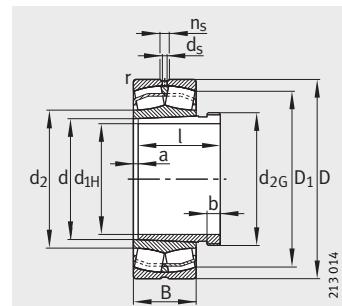
Mounting dimensions

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|--------------------|-----|---------------------|---------------|---------------|--------------------|---------------|---------------------|-------|-------|-------|--------------------|----------------------|----------------------|
| Thread d_{2G} | l | d_a min. | D_a max. | r_a max. | C_r N | C_{0r} N | e | Y_1 | Y_2 | Y_0 | C_{ur} N | n_G min $^{-1}$ | n_B min $^{-1}$ |
| M95X2 | 52 | 96 | 139 | 2 | 305 000 | 325 000 | 0,22 | 3,04 | 4,53 | 2,97 | 38 500 | 5 300 | 3 550 |
| M95X2 | 52 | 99 | 166 | 2,5 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 550 |
| M95X2 | 74 | 99 | 166 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| M95X2 | 74 | 99 | 166 | 2,5 | 540 000 | 560 000 | 0,33 | 2,04 | 3,04 | 2 | 50 000 | 4 000 | 3 300 |
| M100X2 | 53 | 101 | 149 | 2 | 345 000 | 375 000 | 0,23 | 2,9 | 4,31 | 2,83 | 42 500 | 4 800 | 3 500 |
| M100X2 | 63 | 101 | 149 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| M100X2 | 63 | 101 | 149 | 2 | 440 000 | 520 000 | 0,31 | 2,2 | 3,27 | 2,15 | 48 500 | 4 300 | 2 700 |
| M100X2 | 53 | 104 | 176 | 2,5 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 450 |
| M100X2 | 79 | 104 | 176 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| M100X2 | 79 | 104 | 176 | 2,5 | 610 000 | 630 000 | 0,33 | 2,03 | 3,02 | 1,98 | 55 000 | 3 600 | 3 100 |
| M105X2 | 57 | 107 | 158 | 2,1 | 380 000 | 415 000 | 0,24 | 2,87 | 4,27 | 2,8 | 47 000 | 4 500 | 3 400 |
| M105X2 | 57 | 109 | 186 | 2,5 | 430 000 | 455 000 | 0,22 | 3,04 | 4,53 | 2,97 | 47 500 | 4 000 | 3 300 |
| M105X2 | 85 | 109 | 186 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| M105X2 | 85 | 109 | 186 | 2,5 | 670 000 | 695 000 | 0,33 | 2,03 | 3,02 | 1,98 | 60 000 | 3 000 | 2 900 |
| M110X2 | 64 | 111 | 154 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| M110X2 | 64 | 111 | 154 | 2 | 450 000 | 570 000 | 0,28 | 2,37 | 3,53 | 2,32 | 52 000 | 4 300 | 2 800 |
| M110X2 | 59 | 112 | 168 | 2,1 | 430 000 | 475 000 | 0,24 | 2,84 | 4,23 | 2,78 | 52 000 | 4 300 | 3 300 |
| M110X2 | 73 | 112 | 168 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| M110X2 | 73 | 112 | 168 | 2,1 | 550 000 | 655 000 | 0,31 | 2,15 | 3,2 | 2,1 | 60 000 | 3 600 | 2 470 |
| M110X2 | 59 | 114 | 201 | 2,5 | 490 000 | 530 000 | 0,22 | 3,14 | 4,67 | 3,07 | 61 000 | 3 600 | 3 100 |
| M110X2 | 90 | 114 | 201 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| M110X2 | 90 | 114 | 201 | 2,5 | 815 000 | 915 000 | 0,33 | 2,03 | 3,02 | 1,98 | 75 000 | 3 000 | 2 550 |
| M120X2 | 68 | 121 | 169 | 2 | 530 000 | 680 000 | 0,28 | 2,41 | 3,59 | 2,35 | 61 000 | 4 000 | 2 600 |
| M120X2 | 68 | 121 | 169 | 2 | 530 000 | 680 000 | 0,28 | 2,39 | 3,56 | 2,34 | 61 000 | 4 000 | 2 600 |
| M115X2 | 82 | 121 | 169 | 2 | 620 000 | 900 000 | 0,35 | 1,94 | 2,88 | 1,89 | 67 000 | 2 600 | 1 820 |
| M120X2 | 68 | 122 | 188 | 2,1 | 550 000 | 600 000 | 0,25 | 2,71 | 4,04 | 2,65 | 62 000 | 4 000 | 3 100 |
| M120X2 | 82 | 122 | 188 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| M120X2 | 82 | 122 | 188 | 2,1 | 710 000 | 865 000 | 0,33 | 2,06 | 3,06 | 2,01 | 72 000 | 3 000 | 2 150 |
| M120X2 | 63 | 124 | 226 | 2,5 | 600 000 | 640 000 | 0,21 | 3,24 | 4,82 | 3,16 | 69 000 | 3 000 | 2 750 |
| M120X2 | 98 | 124 | 226 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |
| M120X2 | 98 | 124 | 226 | 2,5 | 950 000 | 1 060 000 | 0,33 | 2,07 | 3,09 | 2,03 | 91 000 | 2 600 | 2 250 |

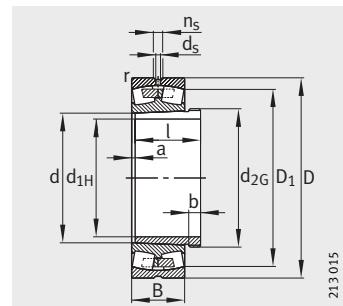


Spherical roller bearings

With extraction sleeve



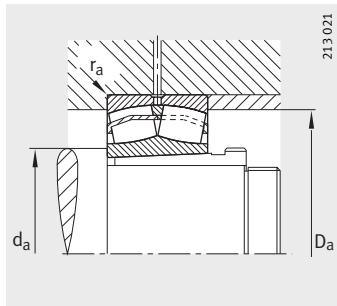
E1 design



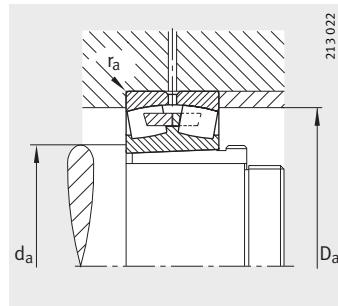
With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | | |
|-------------------|--------|-------------------|-------------|-----------------------|-----------------|-----|-----|-----|-----|---------------------|------------------|----------------|----------------|----------------|----|---|
| Bearing | X-life | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d _{1H} | d | D | B | r | D ₁ min. | D ₁ ≈ | d ₂ | d _s | n _s | a | b |
| 23024-E1A-K-M | XL | AHX3024 | 4,09 | 0,741 | 115 | 120 | 180 | 46 | 2 | 164,7 | — | 3,2 | 6,5 | 4 | 13 | |
| 23024-E1-K-TVPB | XL | AHX3024 | 3,67 | 0,741 | 115 | 120 | 180 | 46 | 2 | 164,7 | 133 | 3,2 | 6,5 | 4 | 13 | |
| 24024-E1-K30-TVPB | XL | AH24024 | 6,11 | 0,694 | 115 | 120 | 180 | 60 | 2 | 160 | 132 | 3,2 | 6,5 | 9 | 13 | |
| 24024-S-K30-MB | — | AH24024 | 5,35 | 0,694 | 115 | 120 | 180 | 60 | 2 | 159,8 | — | 3,2 | 6,5 | 9 | 13 | |
| 23124-E1A-K-M | XL | AHX3124 | 7,57 | 0,954 | 115 | 120 | 200 | 62 | 2 | 177,4 | — | 4,8 | 9,5 | 4 | 12 | |
| 23124-E1-K-TVPB | XL | AHX3124 | 7,06 | 0,954 | 115 | 120 | 200 | 62 | 2 | 177,4 | 136,2 | 4,8 | 9,5 | 4 | 12 | |
| 24124-E1-K30-TVPB | XL | AH24124 | 11,5 | 1 | 115 | 120 | 200 | 80 | 2 | 170,6 | 136,3 | 3,2 | 6,5 | 9 | 13 | |
| 22224-E1-K | XL | AHX3124 | 8,84 | 0,954 | 115 | 120 | 215 | 58 | 2,1 | 192 | 141,8 | 6,3 | 12,2 | 4 | 12 | |
| 23224-E1A-K-M | XL | AHX3224A | 11,4 | 1,2 | 115 | 120 | 215 | 76 | 2,1 | 185,5 | — | 4,8 | 9,5 | 4 | 13 | |
| 23224-E1-K-TVPB | XL | AHX3224A | 11,1 | 1,2 | 115 | 120 | 215 | 76 | 2,1 | 185,5 | 139 | 4,8 | 9,5 | 4 | 13 | |
| 22324-E1-K | XL | AHX2324G | 22,1 | 1,5 | 115 | 120 | 260 | 86 | 3 | 222,4 | 150,7 | 8 | 15 | 4 | 17 | |
| 22324-E1-K-T41A | XL | AHX2324G | 22,1 | 1,5 | 115 | 120 | 260 | 86 | 3 | 222,4 | 150,7 | 8 | 15 | 4 | 17 | |
| 23026-E1A-K-M | XL | AHX3026 | 5,7 | 0,916 | 125 | 130 | 200 | 52 | 2 | 182,3 | — | 4,8 | 9,5 | 4 | 14 | |
| 23026-E1-K-TVPB | XL | AHX3026 | 5,42 | 0,916 | 125 | 130 | 200 | 52 | 2 | 182,3 | 145,9 | 4,8 | 9,5 | 4 | 19 | |
| 24026-E1-K30-TVPB | XL | AH24026 | 7,57 | 0,875 | 125 | 130 | 200 | 69 | 2 | 176,9 | 144,7 | 3,2 | 6,5 | 10 | 14 | |
| 23126-E1A-K-M | XL | AHX3126 | 8,1 | 1,1 | 125 | 130 | 210 | 64 | 2 | 187,3 | — | 4,8 | 9,5 | 4 | 12 | |
| 23126-E1-K-TVPB | XL | AHX3126 | 7,82 | 1,1 | 125 | 130 | 210 | 64 | 2 | 187,3 | 146 | 4,8 | 9,5 | 4 | 12 | |
| 24126-E1-K30-TVPB | XL | AH24126 | 10,1 | 1,12 | 125 | 130 | 210 | 80 | 2 | 181,1 | 146,4 | 3,2 | 6,5 | 10 | 14 | |
| 22226-E1-K | XL | AHX3126 | 10,9 | 1,1 | 125 | 130 | 230 | 64 | 3 | 205 | 151,7 | 6,3 | 12,2 | 4 | 12 | |
| 23226-E1A-K-M | XL | AHX3226G | 13,6 | 1,5 | 125 | 130 | 230 | 80 | 3 | 199,3 | — | 4,8 | 9,5 | 4 | 15 | |
| 23226-E1-K-TVPB | XL | AHX3226G | 12,6 | 1,5 | 125 | 130 | 230 | 80 | 3 | 199,3 | 150 | 4,8 | 9,5 | 4 | 15 | |
| 22326-E1-K | XL | AHX3226G | 27,4 | 1,8 | 125 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 | 4 | 19 | |
| 22326-E1-K-T41A | XL | AHX3226G | 27,4 | 1,8 | 125 | 130 | 280 | 93 | 4 | 239,5 | 162,2 | 9,5 | 17,7 | 4 | 19 | |
| 23028-E1A-K-M | XL | AHX3028 | 6 | 1,01 | 135 | 140 | 210 | 53 | 2 | 192,3 | — | 4,8 | 9,5 | 5 | 14 | |
| 23028-E1-K-TVPB | XL | AHX3028G | 5,81 | 1,01 | 135 | 140 | 210 | 53 | 2 | 192,3 | 155,4 | 4,8 | 9,5 | 5 | 14 | |
| 24028-E1-K30-TVPB | XL | AH24028 | 7,96 | 0,944 | 135 | 140 | 210 | 69 | 2 | 187,2 | 154,2 | 3,2 | 6,5 | 10 | 14 | |
| 24028-S-K30-MB | — | AH24028 | 8,38 | 0,944 | 135 | 140 | 210 | 69 | 2 | 186,4 | — | 3,2 | 6,5 | 10 | 14 | |
| 23128-E1A-K-M | XL | AHX3128 | 7,78 | 1,28 | 135 | 140 | 225 | 68 | 2,1 | 201 | — | 4,8 | 9,5 | 5 | 14 | |
| 23128-E1-K-TVPB | XL | AHX3128 | 9,46 | 1,28 | 135 | 140 | 225 | 68 | 2,1 | 201 | 157,1 | 4,8 | 9,5 | 5 | 14 | |
| 24128-E1-K30-TVPB | XL | AH24128 | 11,8 | 1,28 | 135 | 140 | 225 | 85 | 2,1 | 194,4 | 157 | 4,8 | 9,5 | 10 | 14 | |
| 22228-E1-K | XL | AHX3128 | 13,7 | 1,28 | 135 | 140 | 250 | 68 | 3 | 223,4 | 164,9 | 6,3 | 12,2 | 5 | 14 | |
| 23228-E1A-K-M | XL | AHX3228G | 17,6 | 1,72 | 135 | 140 | 250 | 88 | 3 | 216 | — | 6,3 | 12,2 | 5 | 15 | |
| 23228-E1-K-TVPB | XL | AHX3228G | 17,1 | 1,72 | 135 | 140 | 250 | 88 | 3 | 216 | 162 | 6,3 | 12,2 | 5 | 15 | |
| 22328-E1-K | XL | AHX3228G | 34,4 | 2,21 | 135 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 | 5 | 20 | |
| 22328-E1-K-T41A | XL | AHX3228G | 34,4 | 2,21 | 135 | 140 | 300 | 102 | 4 | 255,7 | 173,5 | 9,5 | 17,7 | 5 | 20 | |



Mounting dimensions
E1 design



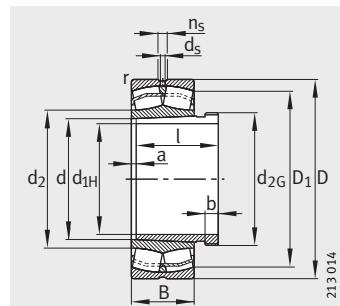
Mounting dimensions
With central rib

| Thread d_{2G} | l | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} N | Limiting speed n_G min^{-1} | Reference speed n_B min^{-1} |
|--------------------|-----|---------------------|-------|---------------|--------------------|---------------|---------------------|-------|-------|-------|-------------------------------------|--|---|
| | | d_a min. | D_a | r_a max. | C_r N | C_{0r} N | e | Y_1 | Y_2 | Y_0 | | | |
| M130X2 | 60 | 128,8 | 171,2 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| M130X2 | 60 | 128,8 | 171,2 | 2 | 430 000 | 585 000 | 0,22 | 3,04 | 4,53 | 2,97 | 58 000 | 4 300 | 2 850 |
| M125X2 | 73 | 128,8 | 171,2 | 2 | 540 000 | 800 000 | 0,29 | 2,3 | 3,42 | 2,25 | 72 000 | 3 000 | 2 290 |
| M125X2 | 73 | 128,8 | 171,2 | 2 | 405 000 | 710 000 | 0,32 | 2,09 | 3,11 | 2,04 | 40 000 | 2 600 | 2 380 |
| M130X2 | 75 | 131 | 189 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| M130X2 | 75 | 131 | 189 | 2 | 630 000 | 800 000 | 0,28 | 2,39 | 3,56 | 2,34 | 73 000 | 3 400 | 2 330 |
| M130X2 | 93 | 131 | 189 | 2 | 780 000 | 1 120 000 | 0,37 | 1,84 | 2,74 | 1,8 | 85 000 | 2 200 | 1 610 |
| M130X2 | 75 | 132 | 203 | 2,1 | 640 000 | 735 000 | 0,25 | 2,71 | 4,04 | 2,65 | 71 000 | 3 400 | 2 800 |
| M130X2 | 90 | 132 | 203 | 2,1 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| M130X2 | 90 | 132 | 203 | 2,1 | 815 000 | 1 020 000 | 0,33 | 2,03 | 3,02 | 1,98 | 80 000 | 2 800 | 1 940 |
| M130X2 | 105 | 134 | 246 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| M130X2 | 105 | 134 | 246 | 2,5 | 1 080 000 | 1 160 000 | 0,33 | 2,06 | 3,06 | 2,01 | 103 000 | 2 600 | 2 080 |
| M140X2 | 67 | 138,8 | 191,2 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| M140X2 | 67 | 138,8 | 191,2 | 2 | 540 000 | 735 000 | 0,23 | 2,95 | 4,4 | 2,89 | 70 000 | 3 600 | 2 650 |
| M135X2 | 83 | 138,8 | 191,2 | 2 | 680 000 | 1 020 000 | 0,31 | 2,21 | 3,29 | 2,16 | 85 000 | 2 600 | 2 050 |
| M140X2 | 78 | 141 | 199 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| M140X2 | 78 | 141 | 199 | 2 | 680 000 | 900 000 | 0,28 | 2,45 | 3,64 | 2,39 | 79 000 | 3 000 | 2 130 |
| M140X2 | 94 | 141 | 199 | 2 | 815 000 | 1 200 000 | 0,34 | 1,96 | 2,92 | 1,92 | 93 000 | 2 200 | 1 480 |
| M140X2 | 78 | 144 | 216 | 2,5 | 760 000 | 900 000 | 0,26 | 2,62 | 3,9 | 2,56 | 79 000 | 3 000 | 2 550 |
| M140X2 | 98 | 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| M140X2 | 98 | 144 | 216 | 2,5 | 900 000 | 1 140 000 | 0,33 | 2,07 | 3,09 | 2,03 | 89 000 | 2 600 | 1 780 |
| M140X2 | 115 | 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| M140X2 | 115 | 147 | 263 | 3 | 1 250 000 | 1 370 000 | 0,33 | 2,06 | 3,06 | 2,01 | 117 000 | 2 400 | 1 870 |
| M150X2 | 68 | 148,8 | 201,2 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| M150X2 | 68 | 148,8 | 201,2 | 2 | 570 000 | 800 000 | 0,22 | 3,07 | 4,57 | 3 | 76 000 | 3 600 | 2 440 |
| M145X2 | 83 | 148,8 | 201,2 | 2 | 720 000 | 1 100 000 | 0,29 | 2,33 | 3,47 | 2,28 | 93 000 | 2 600 | 1 880 |
| M145X2 | 83 | 148,8 | 201,2 | 2 | 510 000 | 915 000 | 0,32 | 2,1 | 3,13 | 2,06 | 56 000 | 2 400 | 2 000 |
| M150X2 | 83 | 152 | 213 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| M150X2 | 83 | 152 | 213 | 2,1 | 765 000 | 1 020 000 | 0,27 | 2,49 | 3,71 | 2,43 | 88 000 | 2 800 | 1 960 |
| M150X2 | 99 | 152 | 213 | 2,1 | 930 000 | 1 370 000 | 0,34 | 1,98 | 2,94 | 1,93 | 104 000 | 2 000 | 1 340 |
| M150X2 | 83 | 154 | 236 | 2,5 | 880 000 | 1 040 000 | 0,25 | 2,67 | 3,97 | 2,61 | 97 000 | 2 400 | 2 320 |
| M150X2 | 104 | 154 | 236 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| M150X2 | 104 | 154 | 236 | 2,5 | 1 080 000 | 1 400 000 | 0,33 | 2,04 | 3,04 | 2 | 112 000 | 2 400 | 1 580 |
| M150X2 | 125 | 157 | 283 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |
| M150X2 | 125 | 157 | 283 | 3 | 1 460 000 | 1 630 000 | 0,34 | 2 | 2,98 | 1,96 | 132 000 | 2 200 | 1 700 |

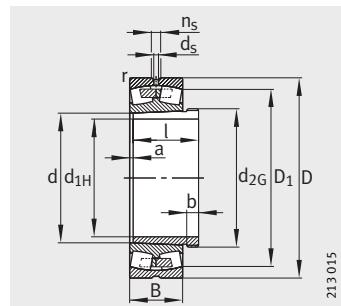


Spherical roller bearings

With extraction sleeve



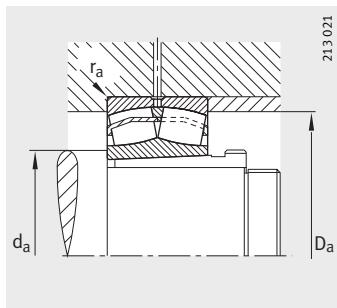
E1 design



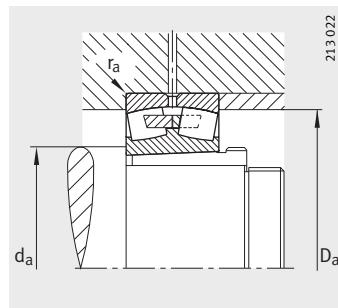
With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | |
|-------------------|--------|-------------------|---------|-------------------|-----------------|-----|-----|-----|-----|----------------|----------------|----------------|----------------|----|----|
| Bearing | X-life | Extraction sleeve | Bearing | Extraction sleeve | d _{1H} | d | D | B | r | D ₁ | d ₂ | d _s | n _s | a | b |
| 23030-E1A-K-M | XL | AHX3030 | 7,33 | 1,15 | 145 | 150 | 225 | 56 | 2,1 | 206,3 | — | 4,8 | 9,5 | 5 | 15 |
| 23030-E1-K-TVPB | XL | AHX3030 | 7,29 | 1,15 | 145 | 150 | 225 | 56 | 2,1 | 206,3 | 166,6 | 4,8 | 9,5 | 5 | 15 |
| 24030-E1-K30-TVPB | XL | AH24030 | 10 | 1,1 | 145 | 150 | 225 | 75 | 2,1 | 200,2 | 165,2 | 4,8 | 9,5 | 11 | 15 |
| 24030-S-K30-MB | — | AH24030 | 10,7 | 1,1 | 145 | 150 | 225 | 75 | 2,1 | 199,1 | — | 4,8 | 9,5 | 11 | 15 |
| 23130-E1A-K-M | XL | AHX3130G | 15,8 | 1,64 | 145 | 150 | 250 | 80 | 2,1 | 220,8 | — | 6,3 | 12,2 | 5 | 15 |
| 23130-E1-K-TVPB | XL | AHX3130G | 14,5 | 1,64 | 145 | 150 | 250 | 80 | 2,1 | 220,8 | 170,1 | 6,3 | 12,2 | 5 | 15 |
| 24130-BS-K30 | — | AH24130 | 19 | 1,61 | 145 | 150 | 250 | 100 | 2,1 | 211,3 | — | 4,8 | 9,5 | 11 | 15 |
| 22230-E1-K | XL | AHX3130G | 17,8 | 1,64 | 145 | 150 | 270 | 73 | 3 | 240,8 | 177,9 | 8 | 15 | 5 | 15 |
| 23230-E1A-K-M | XL | AHX3230G | 22,9 | 2,07 | 145 | 150 | 270 | 96 | 3 | 232,6 | — | 6,3 | 12,2 | 5 | 17 |
| 23230-E1-K-TVPB | XL | AHX3230G | 22,3 | 2,07 | 145 | 150 | 270 | 96 | 3 | 232,6 | 174 | 6,3 | 12,2 | 5 | 17 |
| 22330-E1-K | XL | AHX2330G | 41,2 | 2,6 | 145 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 | 5 | 24 |
| 22330-E1-K-T41A | XL | AHX2330G | 41,2 | 2,6 | 145 | 150 | 320 | 108 | 4 | 273,2 | 185,3 | 9,5 | 17,7 | 5 | 24 |
| 23032-E1A-K-M | XL | AH3032 | 9,42 | 2,04 | 150 | 160 | 240 | 60 | 2,1 | 219,9 | — | 6,3 | 12,2 | 5 | 16 |
| 23032-E1-K-TVPB | XL | AH3032 | 8,67 | 2,04 | 150 | 160 | 240 | 60 | 2,1 | 219,9 | 177 | 6,3 | 12,2 | 5 | 16 |
| 24032-E1-K30-TVPB | XL | AH24032 | 11,8 | 2,27 | 150 | 160 | 240 | 80 | 2,1 | 213,6 | 176 | 4,8 | 9,5 | 11 | 15 |
| 24032-S-K30-MB | — | AH24032 | 12,8 | 2,27 | 150 | 160 | 240 | 80 | 2,1 | 211,2 | — | 4,8 | 9,5 | 11 | 15 |
| 23132-E1A-K-M | XL | AH3132A | 18,6 | 2,87 | 150 | 160 | 270 | 86 | 2,1 | 238,3 | — | 8 | 15 | 5 | 16 |
| 23132-E1-K-TVPB | XL | AH3132A | 18,4 | 2,87 | 150 | 160 | 270 | 86 | 2,1 | 238,3 | 183,2 | 8 | 15 | 5 | 16 |
| 24132-BS-K30 | — | AH24132 | 25 | 3,02 | 150 | 160 | 270 | 109 | 2,1 | 230,2 | — | 4,8 | 9,5 | 11 | 15 |
| 22232-E1-K | XL | AH3132A | 22,4 | 2,87 | 150 | 160 | 290 | 80 | 3 | 258,2 | 190,9 | 8 | 15 | 5 | 16 |
| 23232-E1A-K-M | XL | AH3232G | 28,5 | 3,6 | 150 | 160 | 290 | 104 | 3 | 249,3 | — | 8 | 15 | 6 | 20 |
| 23232-E1-K-TVPB | XL | AH3232G | 27,7 | 3,6 | 150 | 160 | 290 | 104 | 3 | 249,3 | 186,7 | 8 | 15 | 6 | 20 |
| 22332-K-MB | — | AH2332G | 50,1 | 4,24 | 150 | 160 | 340 | 114 | 4 | 288,3 | — | 9,5 | 17,7 | 6 | 24 |
| 23034-E1A-K-M | XL | AH3034 | 12 | 2,43 | 160 | 170 | 260 | 67 | 2,1 | 237,2 | — | 6,3 | 12,2 | 5 | 17 |
| 23034-E1-K-TVPB | XL | AH3034 | 11,9 | 2,43 | 160 | 170 | 260 | 67 | 2,1 | 237,2 | 189,8 | 6,3 | 12,2 | 5 | 17 |
| 24034-BS-K30-MB | — | AH24034 | 16,8 | 2,7 | 160 | 170 | 260 | 90 | 2,1 | 228,8 | — | 4,8 | 9,5 | 11 | 16 |
| 23134-E1A-K-M | XL | AH3134A | 19,5 | 3,09 | 160 | 170 | 280 | 88 | 2,1 | 248,1 | — | 8 | 15 | 5 | 16 |
| 23134-E1-K-TVPB | XL | AH3134A | 19,9 | 3,09 | 160 | 170 | 280 | 88 | 2,1 | 248,1 | 193,4 | 8 | 15 | 5 | 16 |
| 24134-BS-K30 | — | AH24134 | 25 | 3,25 | 160 | 170 | 280 | 109 | 2,1 | 239,6 | — | 4,8 | 9,5 | 11 | 16 |
| 22234-E1-K | XL | AH3134A | 27,1 | 3,09 | 160 | 170 | 310 | 86 | 4 | 275,4 | 199,8 | 9,5 | 17,7 | 5 | 16 |
| 23234-E1A-K-M | XL | AH3234G | 34,6 | 4,25 | 160 | 170 | 310 | 110 | 4 | 267,4 | — | 8 | 15 | 6 | 24 |
| 23234-E1-K-TVPB | XL | AH3234G | 33,1 | 4,25 | 160 | 170 | 310 | 110 | 4 | 267,4 | 199,8 | 8 | 15 | 6 | 24 |
| 22334-K-MB | — | AH2334G | 56,9 | 4,76 | 160 | 170 | 360 | 120 | 4 | 304,2 | — | 9,5 | 17,7 | 6 | 24 |



Mounting dimensions
E1 design



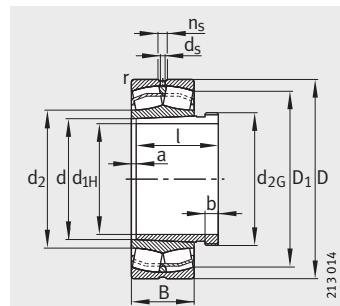
Mounting dimensions
With central rib

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|--------------------|-----|---------------------|---------------|---------------|--------------------|---------------|---------------------|-------|-------|-------|--------------------|----------------------------|----------------------------|
| Thread d_{2G} | l | d_a min. | D_a max. | r_a max. | C_r N | C_{0r} N | e | Y_1 | Y_2 | Y_0 | C_{ur} N | n_G min^{-1} | n_B min^{-1} |
| M160X3 | 72 | 160,2 | 214,8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| M160X3 | 72 | 160,2 | 214,8 | 2,1 | 630 000 | 880 000 | 0,22 | 3,1 | 4,62 | 3,03 | 85 000 | 3 400 | 2 260 |
| M155X3 | 90 | 160,2 | 214,8 | 2,1 | 815 000 | 1 250 000 | 0,29 | 2,32 | 3,45 | 2,26 | 105 000 | 2 400 | 1 740 |
| M155X3 | 90 | 160,2 | 214,8 | 2,1 | 620 000 | 1 140 000 | 0,33 | 2,06 | 3,06 | 2,01 | 67 000 | 2 200 | 1 800 |
| M160X3 | 96 | 162 | 238 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| M160X3 | 96 | 162 | 238 | 2,1 | 1 000 000 | 1 320 000 | 0,29 | 2,32 | 3,45 | 2,26 | 143 000 | 2 600 | 1 760 |
| M160X3 | 115 | 162 | 238 | 2,1 | 915 000 | 1 560 000 | 0,4 | 1,68 | 2,5 | 1,64 | 100 000 | 2 000 | 1 260 |
| M160X3 | 96 | 164 | 256 | 2,5 | 1 000 000 | 1 220 000 | 0,25 | 2,69 | 4 | 2,63 | 111 000 | 2 600 | 2 110 |
| M160X3 | 114 | 164 | 256 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| M160X3 | 114 | 164 | 256 | 2,5 | 1 270 000 | 1 660 000 | 0,33 | 2,02 | 3 | 1,97 | 129 000 | 2 200 | 1 420 |
| M160X3 | 135 | 167 | 303 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| M160X3 | 135 | 167 | 303 | 3 | 1 630 000 | 1 860 000 | 0,33 | 2,02 | 3 | 1,97 | 147 000 | 2 000 | 1 550 |
| M170X3 | 77 | 170,2 | 229,8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| M170X3 | 77 | 170,2 | 229,8 | 2,1 | 720 000 | 1 020 000 | 0,22 | 3,1 | 4,62 | 3,03 | 94 000 | 2 800 | 2 090 |
| M170X3 | 95 | 170,2 | 229,8 | 2,1 | 915 000 | 1 430 000 | 0,29 | 2,3 | 3,42 | 2,25 | 117 000 | 2 200 | 1 600 |
| M170X3 | 95 | 170,2 | 229,8 | 2,1 | 670 000 | 1 250 000 | 0,32 | 2,09 | 3,11 | 2,04 | 71 000 | 2 000 | 1 680 |
| M170X3 | 103 | 172 | 258 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| M170X3 | 103 | 172 | 258 | 2,1 | 1 160 000 | 1 560 000 | 0,29 | 2,32 | 3,45 | 2,26 | 164 000 | 2 400 | 1 590 |
| M170X3 | 124 | 172 | 258 | 2,1 | 1 060 000 | 1 800 000 | 0,41 | 1,65 | 2,46 | 1,61 | 106 000 | 2 000 | 1 150 |
| M170X3 | 103 | 174 | 276 | 2,5 | 1 140 000 | 1 400 000 | 0,26 | 2,64 | 3,93 | 2,58 | 125 000 | 2 600 | 1 960 |
| M170X3 | 124 | 174 | 276 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| M170X3 | 124 | 174 | 276 | 2,5 | 1 460 000 | 1 900 000 | 0,34 | 2 | 2,98 | 1,96 | 146 000 | 2 200 | 1 310 |
| M170X3 | 140 | 177 | 323 | 3 | 1 430 000 | 1 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 121 000 | 2 000 | 1 490 |
| M180X3 | 85 | 180,2 | 249,8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| M180X3 | 85 | 180,2 | 249,8 | 2,1 | 880 000 | 1 220 000 | 0,23 | 2,98 | 4,44 | 2,92 | 146 000 | 2 600 | 1 940 |
| M180X3 | 106 | 180,2 | 249,8 | 2,1 | 850 000 | 1 560 000 | 0,34 | 2 | 2,97 | 1,95 | 96 000 | 2 000 | 1 530 |
| M180X3 | 104 | 182 | 268 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| M180X3 | 104 | 182 | 268 | 2,1 | 1 220 000 | 1 700 000 | 0,28 | 2,37 | 3,53 | 2,32 | 174 000 | 2 400 | 1 480 |
| M180X3 | 125 | 182 | 268 | 2,1 | 1 060 000 | 1 830 000 | 0,39 | 1,73 | 2,58 | 1,69 | 98 000 | 1 800 | 1 100 |
| M180X3 | 104 | 187 | 293 | 3 | 1 320 000 | 1 560 000 | 0,26 | 2,6 | 3,87 | 2,54 | 139 000 | 2 400 | 1 830 |
| M180X3 | 134 | 187 | 293 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| M180X3 | 134 | 187 | 293 | 3 | 1 630 000 | 2 160 000 | 0,33 | 2,03 | 3,02 | 1,98 | 163 000 | 2 000 | 1 190 |
| M180X3 | 146 | 187 | 343 | 3 | 1 600 000 | 2 120 000 | 0,37 | 1,83 | 2,72 | 1,79 | 134 000 | 1 800 | 1 380 |

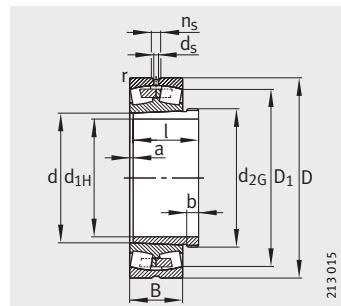


Spherical roller bearings

With extraction sleeve



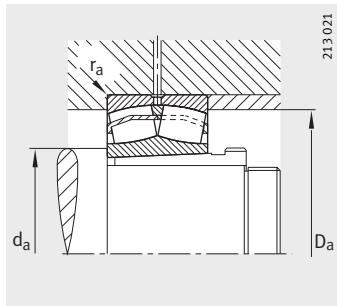
E1 design



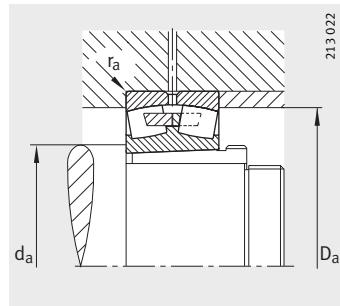
With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | | |
|-------------------------|--------|-------------------|-------------|-----------------------|-----------------|-----|-----|-----|--------|----------------|----------------|----------------|----------------|----|----|
| Bearing | X-life | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ | d ₂ | d _s | n _s | a | b |
| 23936-S-K-MB | - | AH3936 | 7,76 | 1,91 | 170 | 180 | 250 | 52 | 2 | 230,9 | - | 4,8 | 9,5 | 5 | 13 |
| 23036-E1A-K-M | XL | AH3036 | 16 | 2,84 | 170 | 180 | 280 | 74 | 2,1 | 254,3 | - | 8 | 15 | 6 | 17 |
| 23036-E1-K-TV PB | XL | AH3036 | 15,6 | 2,84 | 170 | 180 | 280 | 74 | 2,1 | 254,3 | 201,8 | 8 | 15 | 6 | 17 |
| 24036-BS-K30-MB | - | AH24036 | 22,3 | 3,18 | 170 | 180 | 280 | 100 | 2,1 | 244,2 | - | 4,8 | 9,5 | 11 | 16 |
| 23136-E1A-K-M | XL | AH3136A | 25,5 | 3,77 | 170 | 180 | 300 | 96 | 3 | 264,8 | - | 8 | 15 | 6 | 19 |
| 23136-E1-K-TV PB | XL | AH3136A | 25,9 | 3,77 | 170 | 180 | 300 | 96 | 3 | 264,8 | 204,1 | 8 | 15 | 6 | 19 |
| 24136-BS-K30 | - | AH24136 | 31,8 | 3,72 | 170 | 180 | 300 | 118 | 3 | 253,7 | - | 6,3 | 12,2 | 11 | 16 |
| 22236-E1-K | XL | AH2236G | 28,5 | 3,3 | 170 | 180 | 320 | 86 | 4 | 285,9 | 211,3 | 9,5 | 17,7 | 5 | 17 |
| 23236-E1A-K-M | XL | AH3236G | 37 | 4,8 | 170 | 180 | 320 | 112 | 4 | 277,3 | - | 8 | 15 | 6 | 25 |
| 23236-E1-K-TV PB | XL | AH3236G | 36 | 4,8 | 170 | 180 | 320 | 112 | 4 | 277,3 | 210,6 | 8 | 15 | 6 | 25 |
| 22336-K-MB | - | AH2336G | 66,7 | 5,4 | 170 | 180 | 380 | 126 | 4 | 323,4 | - | 12,5 | 23,5 | 6 | 26 |
| 23038-E1A-K-M | XL | AH3038G | 17,7 | 3,16 | 180 | 190 | 290 | 75 | 2,1 | 264,5 | - | 8 | 15 | 6 | 18 |
| 23038-E1-K-TV PB | XL | AH3038G | 16,3 | 3,16 | 180 | 190 | 290 | 75 | 2,1 | 264,5 | 211,9 | 8 | 15 | 6 | 18 |
| 24038-BS-K30-MB | - | AH24038 | 24,2 | 3,46 | 180 | 190 | 290 | 100 | 2,1 | 255 | - | 4,8 | 9,5 | 13 | 18 |
| 23138-E1A-K-M | XL | AH3138G | 32,4 | 4,4 | 180 | 190 | 320 | 104 | 3 | 281,6 | - | 8 | 15 | 6 | 20 |
| 23138-E1-K-TV PB | XL | AH3138G | 30,3 | 4,4 | 180 | 190 | 320 | 104 | 3 | 281,6 | 217 | 8 | 15 | 6 | 20 |
| 24138-B-K30 | - | AH24138 | 41,5 | 4,37 | 180 | 190 | 320 | 128 | 3 | 270 | - | 6,3 | 12,2 | 13 | 18 |
| 22238-K-MB | - | AH2238G | 36,2 | 3,8 | 180 | 190 | 340 | 92 | 4 | 296 | - | 9,5 | 17,7 | 5 | 18 |
| 23238-B-K-MB | - | AH3238G | 46 | 5,3 | 180 | 190 | 340 | 120 | 4 | 291,2 | - | 9,5 | 17,7 | 7 | 25 |
| 22338-K-MB | - | AH2338G | 77,3 | 6,04 | 180 | 190 | 400 | 132 | 5 | 338,2 | - | 12,5 | 23,5 | 7 | 26 |
| 23940-S-K-MB | - | AH3940 | 11,5 | 2,62 | 190 | 200 | 280 | 60 | 2,1 | 256,9 | - | 6,3 | 12,2 | 6 | 16 |
| 23040-E1A-K-M | XL | AH3040G | 21,4 | 3,57 | 190 | 200 | 310 | 82 | 2,1 | 281,6 | - | 8 | 15 | 6 | 19 |
| 23040-E1-K-TV PB | XL | AH3040G | 20,8 | 3,57 | 190 | 200 | 310 | 82 | 2,1 | 281,6 | 223,4 | 8 | 15 | 6 | 19 |
| 24040-BS-K30-MB | - | AH24040 | 30 | 3,93 | 190 | 200 | 310 | 109 | 2,1 | 270,8 | - | 6,3 | 12,2 | 13 | 18 |
| 23140-B-K-MB | - | AH3140 | 41,7 | 5,5 | 190 | 200 | 340 | 112 | 3 | 293,3 | - | 9,5 | 17,7 | 6 | 21 |
| 24140-B-K30 | - | AH24140 | 51,6 | 5 | 190 | 200 | 340 | 140 | 3 | 285,9 | - | 6,3 | 12,2 | 13 | 18 |
| 22240-B-K-MB | - | AH2240 | 42,3 | 4,73 | 190 | 200 | 360 | 98 | 4 | 312 | - | 9,5 | 17,7 | 5 | 19 |
| 23240-B-K-MB | - | AH3240 | 55,8 | 6,59 | 190 | 200 | 360 | 128 | 4 | 307,5 | - | 9,5 | 17,7 | 7 | 24 |
| 22340-K-MB | - | AH2340 | 89,5 | 7,6 | 190 | 200 | 420 | 138 | 5 | 357,4 | - | 12,5 | 23,5 | 7 | 30 |



Mounting dimensions
E1 design



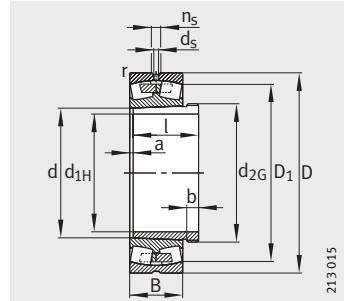
Mounting dimensions
With central rib

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|--------------------|-----|---------------------|---------------|---------------|--------------------|---------------|---------------------|-------|-------|-------|--------------------|----------------------------|----------------------------|
| Thread d_{2G} | l | d_a min. | D_a max. | r_a max. | C_r N | C_{0r} N | e | Y_1 | Y_2 | Y_0 | C_{ur} N | n_G min^{-1} | n_B min^{-1} |
| M190X3 | 66 | 188,8 | 241,2 | 2 | 440 000 | 850 000 | 0,2 | 3,42 | 5,09 | 3,34 | 57 000 | 2 200 | 2 320 |
| M190X3 | 92 | 190,2 | 269,8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| M190X3 | 92 | 190,2 | 269,8 | 2,1 | 1 040 000 | 1 460 000 | 0,23 | 2,9 | 4,31 | 2,83 | 170 000 | 2 600 | 1 790 |
| M190X3 | 116 | 190,2 | 269,8 | 2,1 | 1 000 000 | 1 830 000 | 0,36 | 1,9 | 2,83 | 1,86 | 106 000 | 1 800 | 1 420 |
| M190X3 | 116 | 194 | 286 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| M190X3 | 116 | 194 | 286 | 2,5 | 1 430 000 | 1 960 000 | 0,29 | 2,32 | 3,45 | 2,26 | 196 000 | 2 200 | 1 370 |
| M190X3 | 134 | 194 | 286 | 2,5 | 1 250 000 | 2 200 000 | 0,4 | 1,68 | 2,5 | 1,64 | 136 000 | 1 700 | 980 |
| M190X3 | 105 | 197 | 303 | 3 | 1 370 000 | 1 660 000 | 0,25 | 2,71 | 4,04 | 2,65 | 148 000 | 2 400 | 1 720 |
| M190X3 | 140 | 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| M190X3 | 140 | 197 | 303 | 3 | 1 700 000 | 2 360 000 | 0,33 | 2,07 | 3,09 | 2,03 | 173 000 | 2 000 | 1 110 |
| M190X3 | 154 | 197 | 363 | 3 | 1 760 000 | 2 360 000 | 0,37 | 1,83 | 2,72 | 1,79 | 209 000 | 1 500 | 1 280 |
| M200X3 | 96 | 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| M200X3 | 96 | 200,2 | 279,8 | 2,1 | 1 080 000 | 1 560 000 | 0,23 | 2,98 | 4,44 | 2,92 | 180 000 | 2 400 | 1 690 |
| M200X3 | 118 | 200,2 | 279,8 | 2,1 | 1 040 000 | 1 960 000 | 0,34 | 2 | 2,98 | 1,96 | 110 000 | 1 700 | 1 320 |
| M200X3 | 125 | 204 | 306 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| M200X3 | 125 | 204 | 306 | 2,5 | 1 600 000 | 2 240 000 | 0,3 | 2,28 | 3,39 | 2,23 | 218 000 | 2 000 | 1 270 |
| M200X3 | 146 | 204 | 306 | 2,5 | 1 400 000 | 2 500 000 | 0,41 | 1,66 | 2,47 | 1,62 | 145 000 | 1 500 | 910 |
| M200X3 | 112 | 207 | 323 | 3 | 1 200 000 | 1 830 000 | 0,28 | 2,39 | 3,56 | 2,34 | 122 000 | 1 800 | 1 620 |
| M200X3 | 145 | 207 | 323 | 3 | 1 560 000 | 2 600 000 | 0,36 | 1,86 | 2,77 | 1,82 | 156 000 | 1 700 | 1 040 |
| M200X3 | 160 | 210 | 380 | 4 | 1 860 000 | 2 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 213 000 | 1 500 | 1 220 |
| Tr210X4 | 77 | 210,2 | 269,8 | 2,1 | 550 000 | 1 080 000 | 0,2 | 3,42 | 5,09 | 3,34 | 71 000 | 2 000 | 2 110 |
| Tr210X4 | 102 | 210,2 | 299,8 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| Tr210X4 | 102 | 210,2 | 299,8 | 2,1 | 1 270 000 | 1 800 000 | 0,23 | 2,9 | 4,31 | 2,83 | 203 000 | 2 400 | 1 580 |
| Tr210X4 | 127 | 210,2 | 299,8 | 2,1 | 1 200 000 | 2 280 000 | 0,35 | 1,94 | 2,88 | 1,89 | 122 000 | 1 500 | 1 220 |
| Tr220X4 | 134 | 214 | 326 | 2,5 | 1 320 000 | 2 280 000 | 0,35 | 1,95 | 2,9 | 1,91 | 131 000 | 1 700 | 1 240 |
| Tr210X4 | 158 | 214 | 326 | 2,5 | 1 700 000 | 3 000 000 | 0,42 | 1,62 | 2,42 | 1,59 | 190 000 | 1 400 | 810 |
| Tr220X4 | 118 | 217 | 343 | 3 | 1 320 000 | 2 000 000 | 0,29 | 2,35 | 3,5 | 2,3 | 123 000 | 1 700 | 1 530 |
| Tr220X4 | 153 | 217 | 343 | 3 | 1 660 000 | 2 750 000 | 0,37 | 1,83 | 2,72 | 1,79 | 163 000 | 1 500 | 1 000 |
| Tr220X4 | 170 | 220 | 400 | 4 | 2 080 000 | 2 800 000 | 0,36 | 1,87 | 2,79 | 1,83 | 189 000 | 1 400 | 1 130 |



Spherical roller bearings

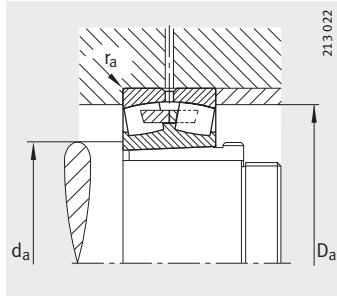
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | |
|-----------------------|-------------------|-------------|-----------------------|-----------------|-----|-----|-----|--------|------------------|----------------|----------------|-----|----|--|
| Bearing | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ ≈ | d _s | n _s | a ≈ | b | |
| 23944-S-K-MB | AH3944 | 12,3 | 4,74 | 200 | 220 | 300 | 60 | 2,1 | 277,4 | 6,3 | 12,2 | 6 | 16 | |
| 23044-K-MB | AH3044G | 29,9 | 7,13 | 200 | 220 | 340 | 90 | 3 | 301,8 | 8 | 15 | 6 | 20 | |
| 24044-B-K30-MB | AH24044 | 38,9 | 8,11 | 200 | 220 | 340 | 118 | 3 | 297,4 | 6,3 | 12,2 | 14 | 18 | |
| 23144-B-K-MB | AH3144 | 52 | 10,4 | 200 | 220 | 370 | 120 | 4 | 319,2 | 9,5 | 17,7 | 6 | 23 | |
| 24144-B-K30 | AH24144 | 64,4 | 3,61 | 200 | 220 | 370 | 150 | 4 | 311,7 | 6,3 | 12,2 | 14 | 20 | |
| 22244-B-K-MB | AH2244 | 59,6 | 9,1 | 200 | 220 | 400 | 108 | 4 | 348,7 | 9,5 | 17,7 | 6 | 20 | |
| 23244-K-MB | AH2344 | 79 | 13,6 | 200 | 220 | 400 | 144 | 4 | 337,6 | 9,5 | 17,7 | 8 | 30 | |
| 22344-K-MB | AH2344 | 114 | 13,6 | 200 | 220 | 460 | 145 | 5 | 391,2 | 12,5 | 23,5 | 8 | 30 | |
| 23948-K-MB | AH3948 | 13,4 | 5,29 | 220 | 240 | 320 | 60 | 2,1 | 297,8 | 6,3 | 12,2 | 6 | 16 | |
| 23048-K-MB | AH3048 | 31,9 | 8,8 | 220 | 240 | 360 | 92 | 3 | 322,1 | 8 | 15 | 7 | 21 | |
| 24048-B-K30-MB | AH24048 | 43,2 | 8,87 | 220 | 240 | 360 | 118 | 3 | 318,9 | 6,3 | 12,2 | 15 | 20 | |
| 23148-B-K-MB | AH3148 | 65,3 | 12,2 | 220 | 240 | 400 | 128 | 4 | 346,2 | 9,5 | 17,7 | 7 | 25 | |
| 24148-B-K30 | AH24148 | 78,7 | 12,4 | 220 | 240 | 400 | 160 | 4 | 338 | 6,3 | 12,2 | 15 | 20 | |
| 22248-B-K-MB | AH2248 | 81,2 | 11,2 | 220 | 240 | 440 | 120 | 4 | 380,7 | 12,5 | 23,5 | 6 | 21 | |
| 23248-B-K-MB | AH2348 | 105 | 15,6 | 220 | 240 | 440 | 160 | 4 | 371 | 12,5 | 23,5 | 8 | 30 | |
| 22348-K-MB | AH2348 | 145 | 15,6 | 220 | 240 | 500 | 155 | 5 | 420 | 12,5 | 23,5 | 8 | 30 | |
| 23952-K-MB | AH3952G | 22,4 | 7,58 | 240 | 260 | 360 | 75 | 2,1 | 330,5 | 8 | 15 | 6 | 18 | |
| 23052-K-MB | AH3052 | 46,2 | 10,7 | 240 | 260 | 400 | 104 | 4 | 357,2 | 9,5 | 17,7 | 7 | 23 | |
| 24052-B-K30-MB | AH24052 | 64,5 | 11,8 | 240 | 260 | 400 | 140 | 4 | 349,1 | 6,3 | 12,2 | 16 | 20 | |
| 23152-K-MB | AH3152G | 89,6 | 15,1 | 240 | 260 | 440 | 144 | 4 | 379,7 | 9,5 | 17,7 | 7 | 26 | |
| 24152-B-K30 | AH24152 | 112 | 15,4 | 240 | 260 | 440 | 180 | 4 | 370,3 | 8 | 15 | 16 | 22 | |
| 22252-B-K-MB | AH2252G | 106 | 13,3 | 240 | 260 | 480 | 130 | 5 | 415,3 | 12,5 | 23,5 | 6 | 23 | |
| 23252-B-K-MB | AH2352G | 136 | 18,7 | 240 | 260 | 480 | 174 | 5 | 405,4 | 12,5 | 23,5 | 8 | 30 | |
| 22352-K-MB | AH2352G | 177 | 18,7 | 240 | 260 | 540 | 165 | 6 | 452,1 | 12,5 | 23,5 | 8 | 30 | |
| 23956-K-MB | AH3956G | 24,7 | 8,19 | 260 | 280 | 380 | 75 | 2,1 | 350 | 8 | 15 | 6 | 18 | |
| 23056-B-K-MB | AH3056 | 50,3 | 11,9 | 260 | 280 | 420 | 106 | 4 | 376,5 | 9,5 | 17,7 | 8 | 24 | |
| 24056-B-K30-MB | AH24056 | 69,7 | 12,4 | 260 | 280 | 420 | 140 | 4 | 369,5 | 6,3 | 12,2 | 17 | 22 | |
| 23156-B-K-MB | AH3156G | 96,4 | 17,6 | 260 | 280 | 460 | 146 | 5 | 401,4 | 9,5 | 17,7 | 8 | 28 | |
| 24156-B-K30 | AH24156 | 118 | 16,6 | 260 | 280 | 460 | 180 | 5 | 392,8 | 8 | 15 | 17 | 22 | |
| 22256-B-K-MB | AH2256G | 110 | 14,4 | 260 | 280 | 500 | 130 | 5 | 435,2 | 12,5 | 23,5 | 8 | 24 | |
| 23256-K-MB | AH2356G | 153 | 21 | 260 | 280 | 500 | 176 | 5 | 426,3 | 12,5 | 23,5 | 8 | 30 | |
| 22356-K-MB | AH2356G | 224 | 21 | 260 | 280 | 580 | 175 | 6 | 489,3 | 12,5 | 23,5 | 8 | 30 | |



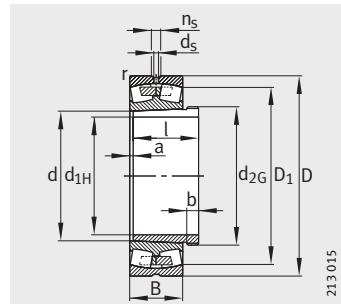
Mounting dimensions

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C_{ur} | Limiting speed n_G | Reference speed n_B |
|--------------------|-----|---------------------|---------------|---------------|--------------------|---------------|---------------------|-------|-------|-------|--------------------------------|-------------------------|--------------------------|
| Thread d_{2G} | l | d_a min. | D_a max. | r_a max. | C_r N | C_{0r} N | e | Y_1 | Y_2 | Y_0 | N | min ⁻¹ | min ⁻¹ |
| Tr230X4 | 77 | 230,2 | 289,8 | 2,1 | 600 000 | 1 250 000 | 0,18 | 3,76 | 5,59 | 3,67 | 72 000 | 1 800 | 1 880 |
| Tr230X4 | 111 | 232,4 | 327,6 | 2,5 | 1 060 000 | 1 900 000 | 0,26 | 2,55 | 3,8 | 2,5 | 132 000 | 1 700 | 1 470 |
| Tr230X4 | 138 | 232,4 | 327,6 | 2,5 | 1 400 000 | 2 700 000 | 0,34 | 1,96 | 2,92 | 1,92 | 139 000 | 1 300 | 1 080 |
| Tr240X4 | 145 | 237 | 353 | 3 | 1 630 000 | 2 900 000 | 0,33 | 2,03 | 3,02 | 1,98 | 165 000 | 1 400 | 1 070 |
| Tr230X4 | 170 | 237 | 353 | 3 | 1 900 000 | 3 450 000 | 0,41 | 1,63 | 2,43 | 1,6 | 197 000 | 1 300 | 730 |
| Tr240X4 | 130 | 237 | 383 | 3 | 1 630 000 | 2 450 000 | 0,29 | 2,35 | 3,5 | 2,3 | 153 000 | 1 400 | 1 340 |
| Tr240X4 | 181 | 237 | 383 | 3 | 2 040 000 | 3 450 000 | 0,37 | 1,83 | 2,72 | 1,79 | 181 000 | 1 400 | 860 |
| Tr240X4 | 181 | 240 | 440 | 4 | 2 320 000 | 3 350 000 | 0,35 | 1,95 | 2,9 | 1,91 | 217 000 | 1 300 | 980 |
| Tr250X4 | 77 | 250,2 | 309,8 | 2,1 | 640 000 | 1 370 000 | 0,17 | 4,05 | 6,04 | 3,96 | 93 000 | 1 500 | 1 700 |
| Tr260X4 | 116 | 252,4 | 347,6 | 2,5 | 1 160 000 | 2 200 000 | 0,25 | 2,74 | 4,08 | 2,68 | 130 000 | 1 400 | 1 320 |
| Tr250X4 | 138 | 252,4 | 347,6 | 2,5 | 1 500 000 | 2 900 000 | 0,32 | 2,1 | 3,13 | 2,06 | 150 000 | 1 300 | 980 |
| Tr260X4 | 154 | 257 | 383 | 3 | 1 860 000 | 3 250 000 | 0,33 | 2,06 | 3,06 | 2,01 | 177 000 | 1 300 | 970 |
| Tr260X4 | 180 | 257 | 383 | 3 | 2 120 000 | 3 900 000 | 0,41 | 1,66 | 2,47 | 1,62 | 231 000 | 1 200 | 660 |
| Tr260X4 | 144 | 257 | 423 | 3 | 1 960 000 | 3 050 000 | 0,29 | 2,35 | 3,5 | 2,3 | 184 000 | 1 300 | 1 190 |
| Tr260X4 | 189 | 257 | 423 | 3 | 2 450 000 | 4 250 000 | 0,37 | 1,8 | 2,69 | 1,76 | 231 000 | 1 300 | 750 |
| Tr260X4 | 189 | 260 | 480 | 4 | 2 650 000 | 3 900 000 | 0,35 | 1,95 | 2,9 | 1,91 | 249 000 | 1 500 | 870 |
| Tr280X4 | 94 | 270,2 | 349,8 | 2,1 | 930 000 | 1 930 000 | 0,19 | 3,54 | 5,27 | 3,46 | 108 000 | 1 400 | 1 610 |
| Tr280X4 | 128 | 274,6 | 385,4 | 3 | 1 500 000 | 2 800 000 | 0,26 | 2,64 | 3,93 | 2,58 | 154 000 | 1 300 | 1 170 |
| Tr270X4 | 162 | 274,6 | 385,4 | 3 | 1 900 000 | 3 800 000 | 0,35 | 1,94 | 2,88 | 1,89 | 204 000 | 1 100 | 870 |
| Tr280X4 | 172 | 277 | 423 | 3 | 2 200 000 | 4 000 000 | 0,33 | 2,03 | 3,02 | 1,98 | 213 000 | 1 200 | 860 |
| Tr280X4 | 202 | 277 | 423 | 3 | 2 700 000 | 5 100 000 | 0,42 | 1,61 | 2,4 | 1,58 | 315 000 | 1 100 | 550 |
| Tr280X4 | 155 | 280 | 460 | 4 | 2 240 000 | 3 450 000 | 0,29 | 2,32 | 3,45 | 2,26 | 217 000 | 1 100 | 1 080 |
| Tr280X4 | 205 | 280 | 460 | 4 | 2 900 000 | 4 900 000 | 0,37 | 1,8 | 2,69 | 1,76 | 270 000 | 1 100 | 680 |
| Tr280X4 | 205 | 286 | 514 | 5 | 3 000 000 | 4 400 000 | 0,34 | 2 | 2,98 | 1,96 | 290 000 | 1 100 | 790 |
| Tr300X4 | 94 | 290,2 | 369,8 | 2,1 | 965 000 | 2 040 000 | 0,18 | 3,76 | 5,59 | 3,67 | 129 000 | 1 300 | 1 470 |
| Tr300X4 | 131 | 294,6 | 405,4 | 3 | 1 560 000 | 3 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 156 000 | 1 300 | 1 080 |
| Tr290X4 | 162 | 294,6 | 405,4 | 3 | 2 000 000 | 4 000 000 | 0,33 | 2,04 | 3,04 | 2 | 225 000 | 1 100 | 810 |
| Tr300X4 | 175 | 300 | 440 | 4 | 2 360 000 | 4 400 000 | 0,32 | 2,12 | 3,15 | 2,07 | 241 000 | 1 100 | 790 |
| Tr300X4 | 202 | 300 | 440 | 4 | 2 700 000 | 5 200 000 | 0,39 | 1,71 | 2,54 | 1,67 | 365 000 | 1 000 | 520 |
| Tr300X4 | 155 | 300 | 480 | 4 | 2 360 000 | 3 650 000 | 0,28 | 2,43 | 3,61 | 2,37 | 238 000 | 1 100 | 1 010 |
| Tr300X4 | 212 | 300 | 480 | 4 | 3 000 000 | 5 300 000 | 0,36 | 1,86 | 2,77 | 1,82 | 260 000 | 1 100 | 630 |
| Tr300X4 | 212 | 306 | 554 | 5 | 3 550 000 | 5 400 000 | 0,33 | 2,03 | 3,02 | 1,98 | 335 000 | 950 | 680 |



Spherical roller bearings

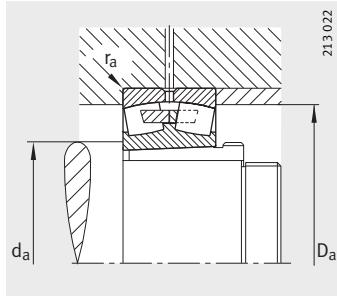
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | |
|-----------------------|-------------------|-------------|-----------------------|-----------------|-----|-----|-----|--------|----------------|----------------|----------------|----|----|--|
| Bearing | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ | d _s | n _s | a | b | |
| 23960-B-K-MB | AH3960G | 39,1 | 10,7 | 280 | 300 | 420 | 90 | 3 | 384,6 | 9,5 | 17,7 | 7 | 21 | |
| 23060-K-MB | AH3060 | 72,2 | 14,3 | 280 | 300 | 460 | 118 | 4 | 412,6 | 9,5 | 17,7 | 8 | 26 | |
| 24060-B-K30-MB | AH24060 | 97,7 | 15,3 | 280 | 300 | 460 | 160 | 4 | 401,5 | 8 | 15 | 18 | 24 | |
| 23160-B-K-MB | AH3160G | 123 | 19,9 | 280 | 300 | 500 | 160 | 5 | 434,7 | 9,5 | 17,7 | 8 | 30 | |
| 24160-B-K30 | AH24160 | 158 | 20 | 280 | 300 | 500 | 200 | 5 | 424,4 | 8 | 15 | 18 | 24 | |
| 22260-K-MB | AH2260G | 136 | 17,2 | 280 | 300 | 540 | 140 | 5 | 468,8 | 12,5 | 23,5 | 8 | 26 | |
| 23260-K-MB | AH3260G | 192 | 24,6 | 280 | 300 | 540 | 192 | 5 | 458,7 | 12,5 | 23,5 | 8 | 34 | |
| 23964-K-MB | AH3964G | 41 | 11,4 | 300 | 320 | 440 | 90 | 3 | 406,2 | 9,5 | 17,7 | 7 | 21 | |
| 23064-K-MB | AH3064G | 77,1 | 15,8 | 300 | 320 | 480 | 121 | 4 | 432,6 | 9,5 | 17,7 | 8 | 27 | |
| 24064-B-K30-MB | AH24064 | 103 | 16,6 | 300 | 320 | 480 | 160 | 4 | 424 | 8 | 15 | 18 | 24 | |
| 23164-K-MB | AH3164G | 159 | 23,6 | 300 | 320 | 540 | 176 | 5 | 466,2 | 12,5 | 23,5 | 8 | 31 | |
| 24164-B-K30 | AH24164 | 197 | 23,4 | 300 | 320 | 540 | 218 | 5 | 456,1 | 9,5 | 17,7 | 18 | 24 | |
| 22264-K-MB | AH2264G | 166 | 19,8 | 300 | 320 | 580 | 150 | 5 | 503,5 | 12,5 | 23,5 | 10 | 27 | |
| 23264-K-MB | AH3264G | 229 | 28,9 | 300 | 320 | 580 | 208 | 5 | 489,6 | 12,5 | 23,5 | 8 | 36 | |
| 23068-K-MB | AH3068G | 101 | 18,6 | 320 | 340 | 520 | 133 | 5 | 464,6 | 12,5 | 23,5 | 9 | 28 | |
| 24068-B-K30-MB | AH24068 | 143 | 21,7 | 320 | 340 | 520 | 180 | 5 | 457,1 | 9,5 | 17,7 | 19 | 26 | |
| 23168-B-K-MB | AH3168G | 203 | 27,6 | 320 | 340 | 580 | 190 | 5 | 499,5 | 12,5 | 23,5 | 9 | 33 | |
| 24168-B-K30 | AH24168 | 260 | 27,9 | 320 | 340 | 580 | 243 | 5 | 481,1 | 9,5 | 17,7 | 19 | 26 | |
| 23268-B-K-MB | AH3268G | 291 | 33,7 | 320 | 340 | 620 | 224 | 6 | 521,2 | 12,5 | 23,5 | 9 | 38 | |
| 23972-K-MB | AH3972G | 45 | 12,8 | 340 | 360 | 480 | 90 | 3 | 447,1 | 9,5 | 17,7 | 7 | 21 | |
| 23072-K-MB | AH3072G | 107 | 20,4 | 340 | 360 | 540 | 134 | 5 | 485,2 | 12,5 | 23,5 | 9 | 30 | |
| 23172-K-MB | AH3172G | 217 | 29,9 | 340 | 360 | 600 | 192 | 5 | 520 | 12,5 | 23,5 | 9 | 35 | |
| 24172-B-K30 | AH24172 | 275 | 29,6 | 340 | 360 | 600 | 243 | 5 | 503,6 | 9,5 | 17,7 | 20 | 26 | |
| 23272-B-K-MB | AH3272G | 328 | 37,5 | 340 | 360 | 650 | 232 | 6 | 548,3 | 12,5 | 23,5 | 9 | 40 | |
| 23976-K-MB | AH3976G | 66,3 | 16 | 360 | 380 | 520 | 106 | 4 | 477,6 | 9,5 | 17,7 | 8 | 22 | |
| 23076-B-K-MB | AH3076G | 113 | 22,1 | 360 | 380 | 560 | 135 | 5 | 505,6 | 12,5 | 23,5 | 10 | 31 | |
| 24076-B-K30-MB | AH24076 | 155 | 23,7 | 360 | 380 | 560 | 180 | 5 | 499 | 9,5 | 17,7 | 20 | 28 | |
| 23176-K-MB | AH3176G | 226 | 32,2 | 360 | 380 | 620 | 194 | 5 | 539,6 | 12,5 | 23,5 | 10 | 36 | |
| 24176-B-K30 | AH24176 | 277 | 31,3 | 360 | 380 | 620 | 243 | 5 | 525,8 | 9,5 | 17,7 | 20 | 28 | |
| 23276-B-K-MB | AH3276G | 367 | 41,5 | 360 | 380 | 680 | 240 | 6 | 576,4 | 12,5 | 23,5 | 10 | 42 | |
| 23980-B-K-MB | AH3980G | 68,2 | 16,9 | 380 | 400 | 540 | 106 | 4 | 499 | 9,5 | 17,7 | 8 | 22 | |
| 23080-K-MB | AH3080G | 143 | 25,4 | 380 | 400 | 600 | 148 | 5 | 540,5 | 12,5 | 23,5 | 10 | 33 | |
| 24080-B-K30-MB | AH24080 | 196 | 27,1 | 380 | 400 | 600 | 200 | 5 | 530,9 | 12,5 | 23,5 | 20 | 28 | |
| 23180-B-K-MB | AH3180G | 261 | 35,3 | 380 | 400 | 650 | 200 | 6 | 567,2 | 12,5 | 23,5 | 10 | 38 | |
| 24180-B-K30 | AH24180 | 312 | 34,3 | 380 | 400 | 650 | 250 | 6 | 553,5 | 12,5 | 23,5 | 20 | 28 | |
| 23280-B-K-MB | AH3280G | 442 | 47,4 | 380 | 400 | 720 | 256 | 6 | 609,8 | 12,5 | 23,5 | 10 | 44 | |



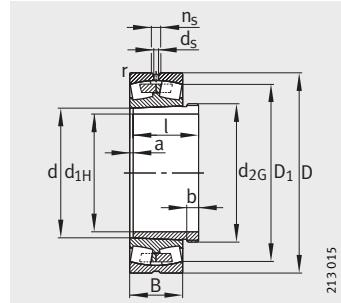
Mounting dimensions

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load C _{ur} | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|---------------------------|-----|------------------------|------------------------|------------------------|---------------------|----------------------|---------------------|----------------|----------------|----------------|---------------------------------------|---|--|
| Thread d _{2G} | l | d _a min. | d _a max. | r _a max. | C _r N | C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | | | |
| Tr320X5 | 112 | 312,4 | 407,6 | 2,5 | 1 270 000 | 2 650 000 | 0,2 | 3,42 | 5,09 | 3,34 | 166 000 | 1 200 | 1 400 |
| Tr320X5 | 145 | 314,6 | 445,4 | 3 | 1 960 000 | 3 650 000 | 0,25 | 2,69 | 4 | 2,63 | 223 000 | 1 100 | 980 |
| Tr310X4 | 184 | 314,6 | 445,4 | 3 | 2 500 000 | 5 200 000 | 0,35 | 1,95 | 2,9 | 1,91 | 300 000 | 1 000 | 710 |
| Tr320X5 | 192 | 320 | 480 | 4 | 2 650 000 | 4 900 000 | 0,33 | 2,06 | 3,06 | 2,01 | 270 000 | 1 100 | 730 |
| Tr320X5 | 224 | 320 | 480 | 4 | 3 250 000 | 6 300 000 | 0,4 | 1,67 | 2,49 | 1,63 | 540 000 | 900 | 460 |
| Tr320X5 | 170 | 320 | 520 | 4 | 2 750 000 | 4 400 000 | 0,27 | 2,47 | 3,67 | 2,41 | 300 000 | 1 000 | 900 |
| Tr320X5 | 228 | 320 | 520 | 4 | 3 450 000 | 6 200 000 | 0,37 | 1,83 | 2,72 | 1,79 | 300 000 | 1 000 | 560 |
| Tr340X5 | 112 | 332,4 | 427,6 | 2,5 | 1 320 000 | 2 750 000 | 0,19 | 3,62 | 5,39 | 3,54 | 202 000 | 1 100 | 1 300 |
| Tr340X5 | 149 | 334,6 | 465,4 | 3 | 2 040 000 | 4 000 000 | 0,25 | 2,74 | 4,08 | 2,68 | 243 000 | 1 100 | 910 |
| Tr330X5 | 184 | 334,6 | 465,4 | 3 | 2 600 000 | 5 400 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 950 | 660 |
| Tr340X5 | 209 | 340 | 520 | 4 | 3 200 000 | 6 000 000 | 0,34 | 1,98 | 2,94 | 1,93 | 305 000 | 950 | 650 |
| Tr340X5 | 242 | 340 | 520 | 4 | 3 800 000 | 7 350 000 | 0,41 | 1,65 | 2,46 | 1,61 | 530 000 | 850 | 415 |
| Tr340X5 | 180 | 340 | 560 | 4 | 3 050 000 | 4 900 000 | 0,27 | 2,47 | 3,67 | 2,41 | 345 000 | 950 | 840 |
| Tr340X5 | 246 | 340 | 560 | 4 | 3 900 000 | 6 950 000 | 0,37 | 1,8 | 2,69 | 1,76 | 330 000 | 950 | 520 |
| Tr360X5 | 162 | 358 | 502 | 4 | 2 360 000 | 4 550 000 | 0,25 | 2,69 | 4 | 2,63 | 285 000 | 1 000 | 850 |
| Tr360X5 | 206 | 358 | 502 | 4 | 3 100 000 | 6 550 000 | 0,34 | 1,98 | 2,94 | 1,93 | 530 000 | 850 | 600 |
| Tr360X5 | 225 | 360 | 560 | 4 | 3 650 000 | 6 950 000 | 0,34 | 1,98 | 2,94 | 1,93 | 570 000 | 900 | 590 |
| Tr360X5 | 269 | 360 | 560 | 4 | 4 400 000 | 8 500 000 | 0,43 | 1,56 | 2,32 | 1,53 | 680 000 | 800 | 380 |
| Tr360X5 | 264 | 366 | 594 | 5 | 4 500 000 | 8 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 650 000 | 850 | 470 |
| Tr380X5 | 112 | 372,4 | 467,6 | 2,5 | 1 430 000 | 3 200 000 | 0,17 | 4,05 | 6,04 | 3,96 | 209 000 | 1 000 | 1 130 |
| Tr380X5 | 167 | 378 | 522 | 4 | 2 450 000 | 4 800 000 | 0,25 | 2,74 | 4,08 | 2,68 | 295 000 | 950 | 800 |
| Tr380X5 | 229 | 380 | 580 | 4 | 3 800 000 | 7 350 000 | 0,33 | 2,06 | 3,06 | 2,01 | 360 000 | 850 | 560 |
| Tr380X5 | 269 | 380 | 580 | 4 | 4 500 000 | 9 000 000 | 0,41 | 1,63 | 2,43 | 1,6 | 550 000 | 750 | 355 |
| Tr380X5 | 274 | 386 | 624 | 5 | 4 900 000 | 9 150 000 | 0,38 | 1,78 | 2,65 | 1,74 | 720 000 | 800 | 425 |
| Tr400X5 | 130 | 394,6 | 505,4 | 3 | 1 760 000 | 4 000 000 | 0,19 | 3,58 | 5,33 | 3,5 | 265 000 | 950 | 1 090 |
| Tr400X5 | 170 | 398 | 542 | 4 | 2 550 000 | 5 300 000 | 0,24 | 2,84 | 4,23 | 2,78 | 430 000 | 900 | 740 |
| Tr400X5 | 208 | 398 | 542 | 4 | 3 350 000 | 7 200 000 | 0,31 | 2,15 | 3,2 | 2,1 | 580 000 | 750 | 530 |
| Tr400X5 | 232 | 400 | 600 | 4 | 4 050 000 | 8 150 000 | 0,32 | 2,12 | 3,15 | 2,07 | 385 000 | 800 | 510 |
| Tr400X5 | 271 | 400 | 600 | 4 | 4 650 000 | 9 500 000 | 0,39 | 1,71 | 2,54 | 1,67 | 770 000 | 700 | 330 |
| Tr400X5 | 284 | 406 | 654 | 5 | 5 300 000 | 9 800 000 | 0,37 | 1,8 | 2,69 | 1,76 | 780 000 | 750 | 400 |
| Tr420X5 | 130 | 414,6 | 525,4 | 3 | 1 830 000 | 4 150 000 | 0,18 | 3,71 | 5,52 | 3,63 | 275 000 | 900 | 1 030 |
| Tr420X5 | 183 | 418 | 582 | 4 | 3 050 000 | 6 200 000 | 0,24 | 2,79 | 4,15 | 2,73 | 365 000 | 800 | 680 |
| Tr420X5 | 228 | 418 | 582 | 4 | 3 900 000 | 8 500 000 | 0,33 | 2,06 | 3,06 | 2,01 | 670 000 | 700 | 485 |
| Tr420X5 | 240 | 426 | 624 | 5 | 4 250 000 | 8 500 000 | 0,31 | 2,15 | 3,2 | 2,1 | 670 000 | 750 | 490 |
| Tr420X5 | 278 | 426 | 624 | 5 | 5 100 000 | 10 400 000 | 0,39 | 1,72 | 2,56 | 1,68 | 790 000 | 670 | 305 |
| Tr420X5 | 302 | 426 | 694 | 5 | 5 700 000 | 10 800 000 | 0,38 | 1,78 | 2,65 | 1,74 | 820 000 | 700 | 375 |



Spherical roller bearings

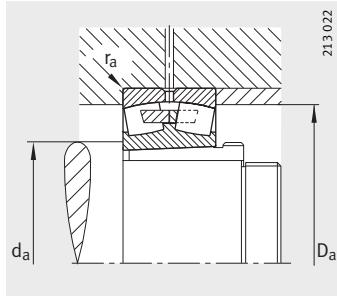
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | | |
|-------------------------|-------------------|-------------|-----------------------|-----------------|-----|-----|-----|--------|------------------|----------------|----------------|----|----|--|
| Bearing | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d _{1H} | d | D | B | r min. | D ₁ ≈ | d _s | n _s | a | b | |
| 23984-K-MB | AH3984G | 78 | 17,8 | 400 | 420 | 560 | 106 | 4 | 519,5 | 9,5 | 17,7 | 8 | 22 | |
| 23084-B-K-MB | AH3084G | 155 | 27,2 | 400 | 420 | 620 | 150 | 5 | 560,7 | 12,5 | 23,5 | 10 | 34 | |
| 24084-B-K30-MB | AH24084 | 214 | 29 | 400 | 420 | 620 | 200 | 5 | 550,2 | 12,5 | 23,5 | 22 | 30 | |
| 23184-K-MB | AH3184G | 339 | 42,3 | 400 | 420 | 700 | 224 | 6 | 605,4 | 12,5 | 23,5 | 10 | 40 | |
| 24184-B-K30 | AH24184 | 407 | 40,3 | 400 | 420 | 700 | 280 | 6 | 590,3 | 12,5 | 23,5 | 22 | 30 | |
| 23284-B-K-MB | AH3284G | 537 | 54 | 400 | 420 | 760 | 272 | 7,5 | 642,2 | 12,5 | 23,5 | 10 | 46 | |
| 23988-K-MB | AH3988 | 98,3 | 21,2 | 420 | 440 | 600 | 118 | 4 | 552,8 | 12,5 | 23,5 | 8 | 25 | |
| 23088-K-MB | AHX3088G | 177 | 30,1 | 420 | 440 | 650 | 157 | 6 | 586,8 | 12,5 | 23,5 | 11 | 35 | |
| 24088-B-K30-MB | AH24088 | 247 | 31,9 | 420 | 440 | 650 | 212 | 6 | 575,6 | 12,5 | 23,5 | 22 | 30 | |
| 23188-K-MB | AHX3188G | 378 | 45,3 | 420 | 440 | 720 | 226 | 6 | 626 | 12,5 | 23,5 | 11 | 42 | |
| 24188-B-K30 | AH24188 | 451 | 42,3 | 420 | 440 | 720 | 280 | 6 | 612,4 | 12,5 | 23,5 | 22 | 30 | |
| 23288-B-K-MB | AHX3288G | 586 | 58,8 | 420 | 440 | 790 | 280 | 7,5 | 669,3 | 12,5 | 23,5 | 11 | 48 | |
| 23992-B-K-MB | AH3992 | 103 | 22,5 | 440 | 460 | 620 | 118 | 4 | 573,3 | 12,5 | 23,5 | 8 | 25 | |
| 23092-B-K-MB | AHX3092G | 204 | 33,1 | 440 | 460 | 680 | 163 | 6 | 612,2 | 12,5 | 23,5 | 11 | 37 | |
| 23192-K-MB | AHX3192G | 420 | 50,8 | 440 | 460 | 760 | 240 | 7,5 | 661,4 | 12,5 | 23,5 | 11 | 43 | |
| 24192-B-K30-MB | AH24192 | 578 | 47,4 | 440 | 460 | 760 | 300 | 7,5 | 642,8 | 12,5 | 23,5 | 23 | 32 | |
| 23292-K-MB | AHX3292G | 699 | 66,2 | 440 | 460 | 830 | 296 | 7,5 | 701,6 | 12,5 | 23,5 | 11 | 50 | |
| 23996-B-K-MB | AH3996 | 121 | 25,7 | 460 | 480 | 650 | 128 | 5 | 598,8 | 12,5 | 23,5 | 9 | 28 | |
| 23096-K-MB | AHX3096G | 208 | 35,2 | 460 | 480 | 700 | 165 | 6 | 632,6 | 12,5 | 23,5 | 12 | 38 | |
| 24096-B-K30-MB | AH24096 | 289 | 36,6 | 460 | 480 | 700 | 218 | 6 | 625,4 | 12,5 | 23,5 | 23 | 32 | |
| 23196-K-MB | AHX3196G | 470 | 55,5 | 460 | 480 | 790 | 248 | 7,5 | 688,3 | 12,5 | 23,5 | 12 | 45 | |
| 24196-B-K30-MB | AH24196 | 700 | 53,1 | 460 | 480 | 790 | 308 | 7,5 | 669,9 | 12,5 | 23,5 | 25 | 35 | |
| 23296-K-MB | AHX3296G | 806 | 73,3 | 460 | 480 | 870 | 310 | 7,5 | 734,8 | 12,5 | 23,5 | 12 | 52 | |
| 239/500-K-MB | AH39/500 | 124 | 27,7 | 480 | 500 | 670 | 128 | 5 | 619,3 | 12,5 | 23,5 | 10 | 32 | |
| 230/500-B-K-MB | AHX30/500 | 219 | 42,5 | 480 | 500 | 720 | 167 | 6 | 653,5 | 12,5 | 23,5 | 12 | 40 | |
| 231/500-B-K-MB | AHX31/500 | 556 | 71,3 | 480 | 500 | 830 | 264 | 7,5 | 720,9 | 12,5 | 23,5 | 12 | 47 | |
| 241/500-B-K30-MB | AH241/500 | 717 | 60,5 | 480 | 500 | 830 | 325 | 7,5 | 701,8 | 12,5 | 23,5 | 25 | 37 | |
| 239/530-K-MB | AH39/530 | 146 | 43,4 | 500 | 530 | 710 | 136 | 5 | 656,4 | 12,5 | 23,5 | 10 | 37 | |
| 230/530-K-MB | AH30/530A | 291 | 61,8 | 500 | 530 | 780 | 185 | 6 | 703,7 | 12,5 | 23,5 | 12 | 45 | |
| 231/530-K-MB | AH31/530A | 643 | 93,4 | 500 | 530 | 870 | 272 | 7,5 | 756,3 | 12,5 | 23,5 | 12 | 53 | |
| 241/530-B-K30-MB | AH241/530 | 845 | 89 | 500 | 530 | 870 | 335 | 7,5 | 739,1 | 12,5 | 23,5 | 25 | 40 | |
| 239/560-B-K-MB | AH39/560 | 169 | 47 | 530 | 560 | 750 | 140 | 5 | 693,4 | 12,5 | 23,5 | 10 | 37 | |
| 230/560-B-K-MB | AH30/560A | 339 | 68,6 | 530 | 560 | 820 | 195 | 6 | 741,5 | 12,5 | 23,5 | 12 | 45 | |
| 231/560-K-MB | AH31/560A | 737 | 102 | 530 | 560 | 920 | 280 | 7,5 | 800,2 | 12,5 | 23,5 | 12 | 55 | |
| 241/560-B-K30-MB | AH241/560 | 974 | 101 | 530 | 560 | 920 | 355 | 7,5 | 785 | 12,5 | 23,5 | 28 | 45 | |



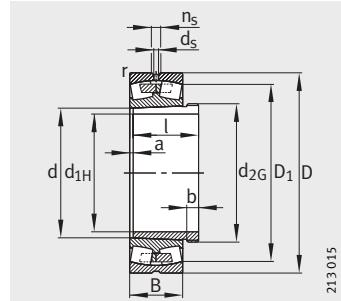
Mounting dimensions

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------------|-----|------------------------|------------------------|------------------------|---------------------|----------------------|---------------------|----------------|----------------|----------------|----------------------|-------------------------------------|-------------------------------------|
| Thread d _{2G} | l | d _a min. | d _a max. | r _a max. | C _r N | C _{0r} N | e | Y ₁ | Y ₂ | Y ₀ | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| Tr440X5 | 130 | 434,6 | 545,4 | 3 | 1 900 000 | 4 500 000 | 0,18 | 3,85 | 5,73 | 3,76 | 300 000 | 850 | 970 |
| Tr440X5 | 186 | 438 | 602 | 4 | 3 150 000 | 6 550 000 | 0,24 | 2,84 | 4,23 | 2,78 | 395 000 | 800 | 650 |
| Tr440X5 | 230 | 438 | 602 | 4 | 4 000 000 | 8 800 000 | 0,32 | 2,13 | 3,17 | 2,08 | 710 000 | 670 | 460 |
| Tr440X5 | 266 | 446 | 674 | 5 | 5 000 000 | 9 650 000 | 0,33 | 2,03 | 3,02 | 1,98 | 465 000 | 700 | 460 |
| Tr440X5 | 310 | 446 | 674 | 5 | 6 200 000 | 12 700 000 | 0,4 | 1,67 | 2,49 | 1,63 | 980 000 | 630 | 270 |
| Tr440X5 | 321 | 452 | 728 | 6 | 6 550 000 | 12 200 000 | 0,38 | 1,77 | 2,64 | 1,73 | 930 000 | 670 | 345 |
| Tr460X5 | 145 | 454,6 | 585,4 | 3 | 2 240 000 | 5 200 000 | 0,18 | 3,66 | 5,46 | 3,58 | 295 000 | 800 | 930 |
| Tr460X5 | 194 | 463 | 627 | 5 | 3 400 000 | 7 100 000 | 0,24 | 2,84 | 4,23 | 2,78 | 405 000 | 750 | 610 |
| Tr460X5 | 242 | 463 | 627 | 5 | 4 300 000 | 9 650 000 | 0,32 | 2,12 | 3,15 | 2,07 | 750 000 | 630 | 435 |
| Tr460X5 | 270 | 466 | 694 | 5 | 5 200 000 | 10 400 000 | 0,32 | 2,1 | 3,13 | 2,06 | 485 000 | 700 | 430 |
| Tr460X5 | 310 | 466 | 694 | 5 | 6 400 000 | 13 200 000 | 0,38 | 1,76 | 2,62 | 1,72 | 1 020 000 | 600 | 255 |
| Tr460X5 | 330 | 472 | 758 | 6 | 7 100 000 | 13 400 000 | 0,37 | 1,8 | 2,69 | 1,76 | 990 000 | 630 | 320 |
| Tr480X5 | 145 | 474,6 | 605,4 | 3 | 2 280 000 | 5 400 000 | 0,18 | 3,85 | 5,73 | 3,76 | 370 000 | 750 | 880 |
| Tr480X5 | 202 | 483 | 657 | 5 | 3 650 000 | 7 650 000 | 0,24 | 2,84 | 4,23 | 2,78 | 440 000 | 700 | 580 |
| Tr480X5 | 285 | 492 | 728 | 6 | 5 850 000 | 11 600 000 | 0,32 | 2,12 | 3,15 | 2,07 | 530 000 | 630 | 400 |
| Tr480X5 | 332 | 492 | 728 | 6 | 7 500 000 | 15 600 000 | 0,39 | 1,73 | 2,58 | 1,69 | 1 160 000 | 560 | 228 |
| Tr480X5 | 349 | 492 | 798 | 6 | 7 800 000 | 15 000 000 | 0,37 | 1,8 | 2,69 | 1,76 | 620 000 | 600 | 295 |
| Tr500X5 | 158 | 498 | 632 | 4 | 2 550 000 | 6 000 000 | 0,18 | 3,76 | 5,59 | 3,67 | 460 000 | 700 | 860 |
| Tr500X5 | 205 | 503 | 677 | 5 | 3 800 000 | 8 150 000 | 0,23 | 2,9 | 4,31 | 2,83 | 455 000 | 670 | 550 |
| Tr500X5 | 250 | 503 | 677 | 5 | 4 900 000 | 11 200 000 | 0,3 | 2,25 | 3,34 | 2,2 | 830 000 | 600 | 380 |
| Tr500X5 | 295 | 512 | 758 | 6 | 6 300 000 | 12 700 000 | 0,32 | 2,12 | 3,15 | 2,07 | 570 000 | 630 | 375 |
| Tr500X5 | 343 | 512 | 758 | 6 | 8 000 000 | 16 600 000 | 0,39 | 1,75 | 2,61 | 1,71 | 1 190 000 | 560 | 215 |
| Tr500X5 | 364 | 512 | 838 | 6 | 8 800 000 | 17 000 000 | 0,37 | 1,83 | 2,72 | 1,79 | 700 000 | 600 | 270 |
| Tr520X6 | 162 | 518 | 652 | 4 | 2 600 000 | 6 300 000 | 0,17 | 3,9 | 5,81 | 3,81 | 400 000 | 670 | 810 |
| Tr540X6 | 209 | 523 | 697 | 5 | 3 900 000 | 8 500 000 | 0,22 | 3,01 | 4,48 | 2,94 | 510 000 | 670 | 520 |
| Tr550X6 | 313 | 532 | 798 | 6 | 7 100 000 | 14 300 000 | 0,32 | 2,1 | 3,13 | 2,06 | 990 000 | 600 | 345 |
| Tr520X6 | 362 | 532 | 798 | 6 | 8 650 000 | 18 300 000 | 0,39 | 1,73 | 2,58 | 1,69 | 1 340 000 | 530 | 200 |
| Tr550X6 | 175 | 548 | 692 | 4 | 2 850 000 | 6 800 000 | 0,18 | 3,85 | 5,73 | 3,76 | 385 000 | 630 | 770 |
| Tr560X6 | 230 | 553 | 757 | 5 | 4 400 000 | 9 500 000 | 0,22 | 3,04 | 4,53 | 2,97 | 540 000 | 600 | 490 |
| Tr560X6 | 325 | 562 | 838 | 6 | 7 350 000 | 15 300 000 | 0,32 | 2,12 | 3,15 | 2,07 | 670 000 | 560 | 325 |
| Tr550X6 | 375 | 562 | 838 | 6 | 9 500 000 | 20 000 000 | 0,38 | 1,77 | 2,64 | 1,73 | 1 450 000 | 500 | 184 |
| Tr580X6 | 180 | 578 | 732 | 4 | 3 100 000 | 7 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 570 000 | 600 | 720 |
| Tr590X6 | 240 | 583 | 797 | 5 | 5 100 000 | 11 000 000 | 0,23 | 2,95 | 4,4 | 2,89 | 740 000 | 560 | 450 |
| Tr590X6 | 335 | 592 | 888 | 6 | 8 150 000 | 16 600 000 | 0,31 | 2,21 | 3,29 | 2,16 | 750 000 | 530 | 300 |
| Tr580X6 | 400 | 592 | 888 | 6 | 10 600 000 | 22 400 000 | 0,38 | 1,77 | 2,64 | 1,73 | 1 600 000 | 480 | 169 |



Spherical roller bearings

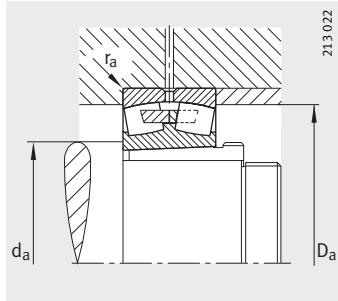
With extraction sleeve



With central rib

Dimension table (continued) · Dimensions in mm

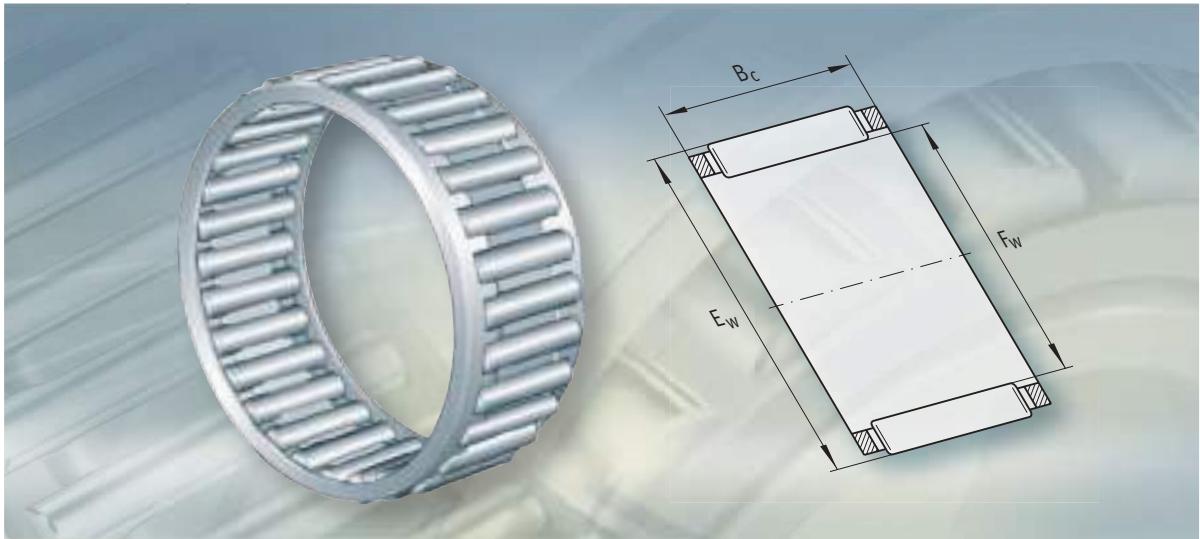
| Designation | | Mass m | | Dimensions | | | | | | | | | | |
|-------------------------|-------------------|-------------|-----------------------|------------|-----|-------|-----|-------------|------------|-------|-------|-----|-----|--|
| Bearing | Extraction sleeve | Bearing ≈kg | Extraction sleeve ≈kg | d_{1H} | d | D | B | r min. | D_1 ≈ | d_s | n_s | a | b | |
| 239/600-B-K-MB | AH39/600 | 210 | 55,6 | 570 | 600 | 800 | 150 | 5 | 740,5 | 12,5 | 23,5 | 10 | 38 | |
| 230/600-B-K-MB | AH30/600A | 388 | 75,6 | 570 | 600 | 870 | 200 | 6 | 791,9 | 12,5 | 23,5 | 14 | 45 | |
| 231/600-K-MB | AH31/600A | 901 | 118 | 570 | 600 | 980 | 300 | 7,5 | 852,6 | 12,5 | 23,5 | 14 | 55 | |
| 241/600-B-K30-MB | AH241/600 | 1 170 | 118 | 570 | 600 | 980 | 375 | 7,5 | 833 | 12,5 | 23,5 | 30 | 50 | |
| 239/630-B-K-MB | AH39/630 | 283 | 64,7 | 600 | 630 | 850 | 165 | 6 | 784,5 | 12,5 | 23,5 | 12 | 40 | |
| 230/630-B-K-MB | AH30/630A | 502 | 87,8 | 600 | 630 | 920 | 212 | 7,5 | 834,3 | 12,5 | 23,5 | 14 | 46 | |
| 240/630-B-K30-MB | AH240/630 | 649 | 95,1 | 600 | 630 | 920 | 290 | 7,5 | 817,9 | 12,5 | 23,5 | 30 | 45 | |
| 241/630-B-K30-MB | AH241/630 | 1 360 | 133 | 600 | 630 | 1 030 | 400 | 7,5 | 872,2 | 12,5 | 23,5 | 30 | 50 | |
| 239/670-B-K-MB | AH39/670 | 310 | 88 | 630 | 670 | 900 | 170 | 6 | 831,5 | 12,5 | 23,5 | 12 | 41 | |
| 230/670-B-K-MB | AH30/670A | 590 | 125 | 630 | 670 | 980 | 230 | 7,5 | 888,7 | 12,5 | 23,5 | 14 | 50 | |
| 241/670-B-K30-MB | AH241/670 | 1 540 | 184 | 630 | 670 | 1 090 | 412 | 7,5 | 929,4 | 12,5 | 23,5 | 30 | 55 | |
| 239/710-K-MB | AH39/710 | 336 | 102 | 670 | 710 | 950 | 180 | 6 | 877,5 | 12,5 | 23,5 | 12 | 43 | |
| 230/710-B-K-MB | AH30/710A | 650 | 136 | 670 | 710 | 1 030 | 236 | 7,5 | 938,8 | 12,5 | 23,5 | 16 | 50 | |
| 240/710-B-K30-MB | AH240/710 | 873 | 153 | 670 | 710 | 1 030 | 315 | 7,5 | 921,6 | 12,5 | 23,5 | 33 | 50 | |
| 241/710-B-K30-MB | AH241/710 | 1 820 | 209 | 670 | 710 | 1 150 | 438 | 9,5 | 982 | 12,5 | 23,5 | 26 | 45 | |
| 239/750-K-MB | AH39/750 | 394 | 110 | 710 | 750 | 1 000 | 185 | 6 | 923,2 | 12,5 | 23,5 | 12 | 44 | |
| 230/750-K-MB | AH30/750A | 792 | 156 | 710 | 750 | 1 090 | 250 | 7,5 | 990,9 | 12,5 | 23,5 | 16 | 50 | |
| 240/750-B-K30-MB | AH240/750 | 1 070 | 170 | 710 | 750 | 1 090 | 335 | 7,5 | 976,2 | 12,5 | 23,5 | 35 | 50 | |
| 239/800-B-K-MB | AH39/800 | 490 | 146 | 750 | 800 | 1 060 | 195 | 6 | 983,7 | 12,5 | 23,5 | 12 | 45 | |
| 230/800-K-MB | AH30/800A | 861 | 200 | 750 | 800 | 1 150 | 258 | 7,5 | 1 050,9 | 12,5 | 23,5 | 18 | 50 | |
| 239/850-K-MB | AH39/850 | 554 | 165 | 800 | 850 | 1 120 | 200 | 6 | 1 039,9 | 12,5 | 23,5 | 12 | 50 | |
| 240/850-B-K30-MB | AH240/850 | 1 420 | 252 | 800 | 850 | 1 220 | 365 | 7,5 | 1 092,9 | 12,5 | 23,5 | 40 | 53 | |
| 239/900-K-MB | AH39/900 | 641 | 180 | 850 | 900 | 1 180 | 206 | 6 | 1 098,8 | 12,5 | 23,5 | 12 | 51 | |



Mounting dimensions

| | | Mounting dimensions | | | Basic load ratings | | Calculation factors | | | | Fatigue limit load | Limiting speed | Reference speed |
|--------------------|-----|---------------------|---------------|---------------|--------------------|---------------|---------------------|-------|-------|-------|--------------------|----------------------------|----------------------------|
| Thread d_{2G} | l | d_a min. | D_a max. | r_a max. | C_r N | C_{0r} N | e | Y_1 | Y_2 | Y_0 | C_{ur} N | n_G min^{-1} | n_B min^{-1} |
| Tr625X6 | 192 | 618 | 782 | 4 | 3 450 000 | 8 650 000 | 0,17 | 3,95 | 5,88 | 3,86 | 630 000 | 560 | 670 |
| Tr630X6 | 245 | 623 | 847 | 5 | 5 700 000 | 12 500 000 | 0,22 | 3,07 | 4,57 | 3 | 890 000 | 530 | 405 |
| Tr630X6 | 355 | 632 | 948 | 6 | 9 000 000 | 19 300 000 | 0,31 | 2,2 | 3,27 | 2,15 | 810 000 | 500 | 270 |
| Tr625X6 | 425 | 632 | 948 | 6 | 11 600 000 | 26 000 000 | 0,38 | 1,79 | 2,67 | 1,75 | 1 780 000 | 450 | 149 |
| Tr655X6 | 210 | 653 | 827 | 5 | 4 050 000 | 9 800 000 | 0,18 | 3,8 | 5,66 | 3,72 | 710 000 | 530 | 650 |
| Tr670X6 | 258 | 658 | 892 | 6 | 6 300 000 | 13 700 000 | 0,22 | 3,01 | 4,48 | 2,94 | 890 000 | 500 | 385 |
| Tr655X6 | 335 | 658 | 892 | 6 | 8 000 000 | 19 000 000 | 0,31 | 2,21 | 3,29 | 2,16 | 1 350 000 | 480 | 265 |
| Tr655X6 | 450 | 662 | 998 | 6 | 12 900 000 | 29 000 000 | 0,38 | 1,78 | 2,65 | 1,74 | 1 960 000 | 450 | 138 |
| Tr695X6 | 216 | 693 | 877 | 5 | 4 300 000 | 10 600 000 | 0,17 | 3,95 | 5,88 | 3,86 | 750 000 | 500 | 600 |
| Tr710X7 | 280 | 698 | 952 | 6 | 7 200 000 | 16 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 100 000 | 480 | 350 |
| Tr710X7 | 467 | 702 | 1 058 | 6 | 14 000 000 | 31 500 000 | 0,37 | 1,83 | 2,72 | 1,79 | 2 120 000 | 430 | 127 |
| Tr740X7 | 228 | 733 | 927 | 5 | 4 800 000 | 12 000 000 | 0,18 | 3,85 | 5,73 | 3,76 | 720 000 | 480 | 570 |
| Tr750X7 | 286 | 738 | 1 002 | 6 | 7 650 000 | 17 000 000 | 0,22 | 3,07 | 4,57 | 3 | 1 140 000 | 480 | 330 |
| Tr740X7 | 365 | 738 | 1 002 | 6 | 9 500 000 | 22 800 000 | 0,3 | 2,26 | 3,37 | 2,21 | 1 550 000 | 430 | 226 |
| Tr740X7 | 483 | 750 | 1 110 | 8 | 15 600 000 | 35 500 000 | 0,38 | 1,79 | 2,67 | 1,75 | 2 340 000 | 400 | 116 |
| Tr780X7 | 234 | 773 | 977 | 5 | 5 200 000 | 12 900 000 | 0,17 | 3,95 | 5,88 | 3,86 | 790 000 | 480 | 540 |
| Tr800X7 | 300 | 778 | 1 062 | 6 | 8 500 000 | 19 000 000 | 0,22 | 3,01 | 4,48 | 2,94 | 1 010 000 | 450 | 305 |
| Tr800X7 | 385 | 778 | 1 062 | 6 | 10 800 000 | 26 000 000 | 0,3 | 2,26 | 3,37 | 2,21 | 1 730 000 | 400 | 206 |
| Tr830X7 | 245 | 823 | 1 037 | 5 | 5 850 000 | 15 000 000 | 0,17 | 4,05 | 6,04 | 3,96 | 1 010 000 | 450 | 500 |
| Tr850X7 | 308 | 828 | 1 122 | 6 | 9 300 000 | 21 200 000 | 0,22 | 3,07 | 4,57 | 3 | 1 430 000 | 430 | 280 |
| Tr880X7 | 258 | 873 | 1 097 | 5 | 6 300 000 | 16 300 000 | 0,16 | 4,11 | 6,12 | 4,02 | 960 000 | 430 | 465 |
| Tr900X7 | 418 | 878 | 1 192 | 6 | 12 900 000 | 32 000 000 | 0,29 | 2,33 | 3,47 | 2,28 | 2 060 000 | 480 | 173 |
| Tr930X8 | 265 | 923 | 1 157 | 5 | 6 550 000 | 17 300 000 | 0,16 | 4,28 | 6,37 | 4,19 | 1 010 000 | 400 | 440 |





Needle roller and cage assemblies

Needle roller and cage assemblies

| | Page |
|-------------------------------------|--|
| Product overview | Needle roller and cage assemblies 590 |
| Features | Needle rollers 591 Operating temperature 591 Cages 591 Other products 591 Suffixes 592 |
| Design and safety guidelines | Raceway design 592 Axial location 593 |
| Accuracy | Radial internal clearance 593 |
| Dimension tables | Needle roller and cage assemblies 594 |



Product overview Needle roller and cage assemblies

Single row



Double row



Other products

Needle roller and cage assemblies
for crank pin bearing arrangements

KZK



Needle roller and cage assemblies
for piston pin bearing arrangements

KBK



Needle roller and cage assemblies

| Features | Needle roller and cage assemblies are single or double row units comprising cages and needle rollers. The single row design is based on DIN 5 405-1. | | | | | | | | |
|--|--|--------------------------|--------------------------------------|-------|-------------------|--------|---------------------|--------------|-------------------|
| Very small cross-section height | Since the radial section height of needle roller and cage assemblies corresponds to the needle roller diameter, they permit bearing arrangements with a very small radial design envelope. They have high load carrying capacity, are suitable for high speeds and are particularly easy to fit. If the raceways are produced to high geometrical accuracy, bearing arrangements with high runout accuracy can be achieved. The radial internal clearance can be influenced by the needle roller sort as well as by the shaft and housing tolerances. Needle roller and cage assemblies require a hardened and ground raceway on the shaft and in the housing. | | | | | | | | |
| Double row | Double row needle roller and cage assemblies are only available in particular enveloping circle diameters F_W . These are indicated by the suffix ZW. | | | | | | | | |
| Needle rollers | Needle roller and cage assemblies are supplied with standard needle roller sorts according to the table. A needle roller and cage assembly contains needle rollers of one sort only. The sort is printed on the packaging and is colour coded according to the table. The sorts are indicated by the upper and lower deviation (in μm), the maximum diameter tolerance is $2 \mu\text{m}$, see table. Every two neighbouring sorts are matched as sort pairs. | | | | | | | | |
| Standard needle roller sorts | <table><thead><tr><th>Sort pair Colour code</th><th>Needle roller sorts μm</th></tr></thead><tbody><tr><td>Red</td><td>0 – 2 / – 1 – 3</td></tr><tr><td>Blue</td><td>– 2 – 4 / – 3 – 5</td></tr><tr><td>White (grey)</td><td>– 4 – 6 / – 5 – 7</td></tr></tbody></table> | Sort pair Colour code | Needle roller sorts μm | Red | 0 – 2 / – 1 – 3 | Blue | – 2 – 4 / – 3 – 5 | White (grey) | – 4 – 6 / – 5 – 7 |
| Sort pair Colour code | Needle roller sorts μm | | | | | | | | |
| Red | 0 – 2 / – 1 – 3 | | | | | | | | |
| Blue | – 2 – 4 / – 3 – 5 | | | | | | | | |
| White (grey) | – 4 – 6 / – 5 – 7 | | | | | | | | |
| Special needle roller sorts | The following sort pairs are available as special designs in accordance with the table. | | | | | | | | |
| Needle roller sorts | <table><thead><tr><th>Sort pair Colour code</th><th>Needle roller sorts μm</th></tr></thead><tbody><tr><td>Green</td><td>– 6 – 8 / – 7 – 9</td></tr><tr><td>Yellow</td><td>– 8 – 10 / – 9 – 11</td></tr></tbody></table> | Sort pair Colour code | Needle roller sorts μm | Green | – 6 – 8 / – 7 – 9 | Yellow | – 8 – 10 / – 9 – 11 | | |
| Sort pair Colour code | Needle roller sorts μm | | | | | | | | |
| Green | – 6 – 8 / – 7 – 9 | | | | | | | | |
| Yellow | – 8 – 10 / – 9 – 11 | | | | | | | | |
| Operating temperature | Needle roller and cage assemblies with plastic cage can be used at operating temperatures from -20°C to $+120^\circ\text{C}$. | | | | | | | | |
| Cages | Needle roller and cage assemblies are available with plastic cages and sheet steel cages. Plastic cages have the suffix TV and are only available in particular sizes. | | | | | | | | |
| Other products | Needle roller and cage assemblies are also available in designs for connecting rod bearing arrangements: <ul style="list-style-type: none">■ series KZK for crank pin bearing arrangements■ series KBK for piston pin bearing arrangements. These needle roller and cage assemblies are described in detail in Technical Product Information TPI 94. | | | | | | | | |



Needle roller and cage assemblies

Suffixes Suffixes for available designs: see table.

Available designs

| Prefix | Description |
|--------|--|
| TV | Cage made from glass fibre reinforced polyamide 66 ¹⁾ |
| ZW | Double row design ²⁾ |

¹⁾ Bearings with plastic cage: see dimension table.

²⁾ Available in particular sizes only.

Design and safety guidelines

Raceway design

Where needle roller and cage assemblies are to be used, the housing bore and the shaft raceway must be hardened and ground. The surface hardness of the raceways must be 670 HV + 170 HV and the hardening depth CHD or Rht must be sufficiently large.

Design of raceways: see table and section Design of bearing arrangements, from page 154.

Raceway design

| Shaft diameter Nominal dimension mm | Bore tolerance | Shaft tolerance | | | Roughness | Roundness | Parallelism | | | |
|--|----------------|---------------------|--------|-------|-----------|---------------------|---------------------------|--|--|--|
| | | Operating clearance | | | | | | | | |
| | | Small | Normal | Large | | | | | | |
| over incl. | 80 | G6 | j5 | h5 | g6 | $R_a 0,2 (R_z 1)$ | 25% of diameter tolerance | | | |
| | | H6 | h5 | g5 | f6 | | | | | |
| | 120 | G6 | h5 | g5 | f6 | $R_a 0,3 (R_z 1,6)$ | | | | |
| | 120 | G6 | h5 | g5 | f6 | $R_a 0,4 (R_z 2,5)$ | | | | |
| | | H6 | — | f5 | e6 | | | | | |

Raceway width

The raceway width must be at least equal to the cage width B_c (B_c is produced with a minus (-) tolerance); for B_c , see dimension tables. The axial location distance should therefore be tolerated to H12, Figure 1.

Caution!

The axial running surfaces for the needle roller and cage assemblies must be precision machined ($R_a 2$ recommended) and resistant to wear.

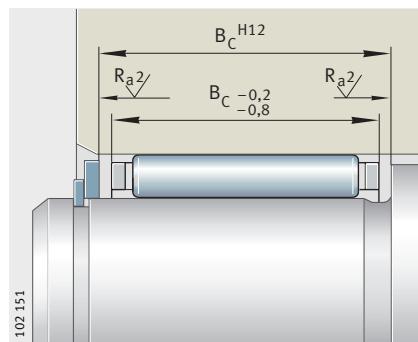


Figure 1
Raceway width and
axial running surfaces

Axial location

Caution!

Needle roller and cage assemblies must be axially located.

Needle roller and cage assemblies must be located by means of snap rings or an appropriate adjacent construction design, *Figure 1* and *Figure 2*.

If location is by means of a snap ring or retaining ring, a washer must be arranged in front of the ring. It must be ensured that there is sufficient interference between the retaining ring and washer.

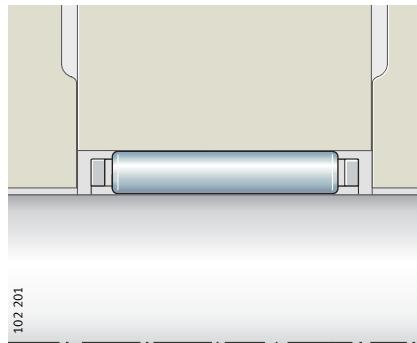


Figure 2

Axial location by adjacent construction

Accuracy

The width of the needle roller and cage assembly $B_c^{-0,2}$ corresponds to DIN 5 405-1.

B_c : see dimension tables.

Radial internal clearance

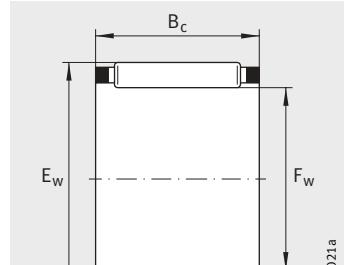
A radial internal clearance of C2 to CN is achieved with standard needle roller sorts if the shaft and housing tolerances are in accordance with the table Raceway design, page 592.

If the actual values are on the plus side, a radial internal clearance of 0 can be achieved.



Needle roller and cage assemblies

Single row



K

Dimension table · Dimensions in mm

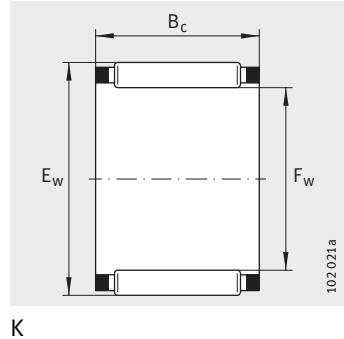
| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|---------------------|-----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---|--|---|
| | | F _w | E _w | B _c | dyn. C _r N | stat. C _{0r} N | | | |
| K3X5X7-TV | 0,3 | 3 | 5 | 7 | 1 540 | 1 290 | 152 | 50 000 | 78 000 |
| K3X5X9-TV | 0,4 | 3 | 5 | 9 | 1 710 | 1 480 | 188 | 50 000 | 80 000 |
| K3X6X7-TV | 0,4 | 3 | 6 | 7 | 1 430 | 970 | 109 | 47 000 | 75 000 |
| K4X7X7-TV | 0,5 | 4 | 7 | 7 | 1 740 | 1 270 | 145 | 42 500 | 59 000 |
| K4X7X10-TV | 0,7 | 4 | 7 | 10 | 2 330 | 1 840 | 236 | 42 500 | 59 000 |
| K5X8X8-TV | 0,7 | 5 | 8 | 8 | 2 350 | 1 920 | 237 | 39 000 | 48 000 |
| K5X8X10-TV | 0,9 | 5 | 8 | 10 | 3 000 | 2 650 | 350 | 39 000 | 47 000 |
| K6X9X8-TV | 0,8 | 6 | 9 | 8 | 2 600 | 2 280 | 285 | 36 500 | 41 000 |
| K6X9X10-TV | 1,1 | 6 | 9 | 10 | 3 350 | 3 150 | 420 | 36 500 | 40 000 |
| K6X10X13-TV | 1,9 | 6 | 10 | 13 | 3 800 | 3 100 | 395 | 35 500 | 40 000 |
| K7X9X7-TV | 0,6 | 7 | 9 | 7 | 1 730 | 1 770 | 215 | 35 500 | 40 000 |
| K7X10X8-TV | 0,9 | 7 | 10 | 8 | 2 850 | 2 650 | 330 | 34 500 | 36 000 |
| K7X10X10-TV | 1 | 7 | 10 | 10 | 3 650 | 3 600 | 485 | 34 500 | 35 000 |
| K8X11X8-TV | 1 | 8 | 11 | 8 | 3 100 | 3 000 | 375 | 32 500 | 32 000 |
| K8X11X10-TV | 1,2 | 8 | 11 | 10 | 3 950 | 4 100 | 560 | 32 500 | 31 000 |
| K8X11X13-TV | 1,7 | 8 | 11 | 13 | 5 100 | 5 800 | 790 | 32 500 | 30 500 |
| K8X12X10-TV | 2 | 8 | 12 | 10 | 5 000 | 4 700 | 560 | 31 500 | 29 000 |
| K9X12X10-TV | 1,5 | 9 | 12 | 10 | 4 500 | 5 000 | 680 | 31 000 | 27 500 |
| K9X12X13-TV | 2,1 | 9 | 12 | 13 | 5 900 | 7 100 | 970 | 31 000 | 27 000 |
| K10X13X10-TV | 1,6 | 10 | 13 | 10 | 4 750 | 5 500 | 750 | 29 500 | 24 900 |
| K10X13X13-TV | 2,3 | 10 | 13 | 13 | 6 200 | 7 800 | 1 060 | 29 500 | 24 400 |
| K10X13X16-TV | 2,9 | 10 | 13 | 16 | 7 100 | 9 300 | 1 310 | 29 500 | 24 600 |
| K10X14X10-TV | 2,5 | 10 | 14 | 10 | 5 800 | 6 000 | 720 | 29 000 | 23 500 |
| K10X14X13-TV | 4,6 | 10 | 14 | 13 | 7 500 | 8 400 | 1 020 | 29 000 | 23 000 |
| K10X16X12-TV | 5,5 | 10 | 16 | 12 | 8 100 | 7 200 | 1 000 | 27 500 | 21 800 |
| K12X15X10-TV | 2,9 | 12 | 15 | 10 | 4 900 | 6 100 | 830 | 27 000 | 21 500 |
| K12X15X13-TV | 2,3 | 12 | 15 | 13 | 6 400 | 8 500 | 1 170 | 27 000 | 21 100 |
| K12X16X13-TV | 5,5 | 12 | 16 | 13 | 8 000 | 9 400 | 1 150 | 26 500 | 19 900 |
| K12X17X13-TV | 4,9 | 12 | 17 | 13 | 9 600 | 10 400 | 1 330 | 26 500 | 18 800 |
| K12X18X12-TV | 6 | 12 | 18 | 12 | 10 000 | 9 900 | 1 400 | 26 000 | 18 100 |

| Dimension table (continued) · Dimensions in mm | | | | | | | | | |
|--|-----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---|--|---|
| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
| | | F _w | E _w | B _c | dyn. C _r N | stat. C _{0r} N | | | |
| K14X18X10 | 4 | 14 | 18 | 10 | 7 100 | 8 500 | 1 060 | 25 000 | 17 300 |
| K14X18X13 | 6,5 | 14 | 18 | 13 | 8 200 | 10 100 | 1 320 | 25 000 | 17 700 |
| K14X18X15-TV | 5 | 14 | 18 | 15 | 9 500 | 12 300 | 1 540 | 25 000 | 17 400 |
| K14X18X17 | 8 | 14 | 18 | 17 | 10 800 | 14 400 | 1 890 | 25 000 | 17 300 |
| K14X20X12 | 8,5 | 14 | 20 | 12 | 10 300 | 10 600 | 1 490 | 24 300 | 16 200 |
| K15X18X17-TV | 4,6 | 15 | 18 | 17 | 8 000 | 12 100 | 1 730 | 24 600 | 17 700 |
| K15X19X10 | 5 | 15 | 19 | 10 | 7 500 | 9 200 | 1 140 | 24 300 | 16 200 |
| K15X19X13 | 7 | 15 | 19 | 13 | 8 500 | 10 900 | 1 420 | 24 300 | 16 600 |
| K15X19X17 | 9,5 | 15 | 19 | 17 | 11 300 | 15 600 | 2 040 | 24 300 | 16 200 |
| K15X20X13 | 7 | 15 | 20 | 13 | 9 900 | 11 500 | 1 430 | 23 900 | 15 900 |
| K15X21X15 | 11 | 15 | 21 | 15 | 14 300 | 16 400 | 2 210 | 23 600 | 14 700 |
| K15X21X21 | 17 | 15 | 21 | 21 | 19 400 | 24 300 | 3 300 | 23 600 | 14 400 |
| K16X20X10 | 5,5 | 16 | 20 | 10 | 7 800 | 9 900 | 1 230 | 23 600 | 15 200 |
| K16X20X13 | 7,5 | 16 | 20 | 13 | 8 900 | 11 800 | 1 530 | 23 600 | 15 600 |
| K16X20X17 | 10 | 16 | 20 | 17 | 11 700 | 16 800 | 2 190 | 23 600 | 15 200 |
| K16X22X12 | 10 | 16 | 22 | 12 | 11 500 | 12 500 | 1 780 | 22 900 | 14 300 |
| K16X22X16 | 12 | 16 | 22 | 16 | 14 800 | 17 500 | 2 390 | 22 900 | 14 100 |
| K16X22X20 | 17 | 16 | 22 | 20 | 18 300 | 22 800 | 3 050 | 22 900 | 14 000 |
| K16X24X20 | 22 | 16 | 24 | 20 | 21 400 | 23 500 | 2 950 | 22 400 | 13 200 |
| K17X21X10 | 5,5 | 17 | 21 | 10 | 8 100 | 10 600 | 1 310 | 22 900 | 14 400 |
| K17X21X13 | 6,5 | 17 | 21 | 13 | 10 400 | 14 600 | 1 810 | 22 900 | 14 100 |
| K17X21X17 | 9,5 | 17 | 21 | 17 | 12 200 | 17 900 | 2 350 | 22 900 | 14 400 |
| K18X22X10 | 6 | 18 | 22 | 10 | 8 400 | 11 300 | 1 400 | 22 400 | 13 600 |
| K18X22X13 | 8 | 18 | 22 | 13 | 9 200 | 12 700 | 1 650 | 22 400 | 14 200 |
| K18X22X17 | 11 | 18 | 22 | 17 | 12 100 | 18 000 | 2 360 | 22 400 | 13 900 |
| K18X24X12 | 12 | 18 | 24 | 12 | 12 800 | 14 900 | 2 120 | 21 800 | 12 700 |
| K18X24X13 | 13 | 18 | 24 | 13 | 13 100 | 15 300 | 1 990 | 21 800 | 12 900 |
| K18X24X20 | 18 | 18 | 24 | 20 | 20 200 | 27 000 | 3 550 | 21 800 | 12 400 |
| K18X25X22 | 23 | 18 | 25 | 22 | 23 100 | 29 000 | 3 750 | 21 600 | 12 200 |
| K19X23X13 | 8 | 19 | 23 | 13 | 9 500 | 13 500 | 1 760 | 21 800 | 13 500 |
| K19X23X17 | 11 | 19 | 23 | 17 | 12 500 | 19 200 | 2 500 | 21 800 | 13 200 |

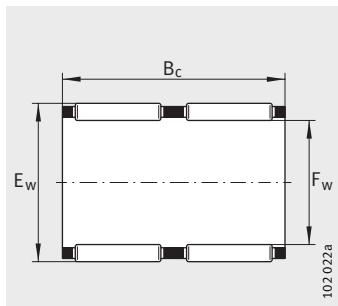


Needle roller and cage assemblies

Single row and double row



| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C_ur N | Limiting speed n_G min⁻¹ | Reference speed n_B min⁻¹ |
|--------------|-----------------|------------|-----|-----|--------------------|--------------------|------------------------------------|-----------------------------------|------------------------------------|
| | | F_w | E_w | B_c | dyn. C_r N | stat. C_0r N | | | |
| K20X24X10 | 6,5 | 20 | 24 | 10 | 8 900 | 12 600 | 1 570 | 21 300 | 12 400 |
| K20X24X13 | 9 | 20 | 24 | 13 | 9 800 | 14 300 | 1 860 | 21 300 | 12 800 |
| K20X24X17 | 12 | 20 | 24 | 17 | 12 900 | 20 400 | 2 650 | 21 300 | 12 500 |
| K20X26X12 | 11 | 20 | 26 | 12 | 13 400 | 16 200 | 2 310 | 20 900 | 11 700 |
| K20X26X13 | 12 | 20 | 26 | 13 | 14 400 | 17 900 | 2 330 | 20 900 | 11 600 |
| K20X26X17 | 16 | 20 | 26 | 17 | 19 200 | 26 000 | 3 300 | 20 900 | 11 200 |
| K20X26X20 | 19 | 20 | 26 | 20 | 21 100 | 29 000 | 3 850 | 20 900 | 11 400 |
| K20X28X16 | 20 | 20 | 28 | 16 | 19 800 | 22 400 | 3 000 | 20 400 | 11 100 |
| K20X28X20 | 27 | 20 | 28 | 20 | 23 900 | 28 500 | 3 600 | 20 400 | 11 100 |
| K20X28X25 | 32 | 20 | 28 | 25 | 30 500 | 39 000 | 5 300 | 20 400 | 10 800 |
| K20X30X30 | 49 | 20 | 30 | 30 | 35 500 | 41 500 | 5 500 | 19 600 | 10 800 |
| K21X25X13 | 9 | 21 | 25 | 13 | 10 100 | 15 100 | 1 970 | 20 900 | 12 300 |
| K22X26X10 | 7,5 | 22 | 26 | 10 | 9 100 | 13 400 | 1 670 | 20 400 | 11 500 |
| K22X26X13 | 9,5 | 22 | 26 | 13 | 10 400 | 15 900 | 2 080 | 20 400 | 11 800 |
| K22X26X17 | 12 | 22 | 26 | 17 | 13 700 | 22 700 | 3 000 | 20 400 | 11 500 |
| K22X28X17 | 18 | 22 | 28 | 17 | 19 400 | 27 000 | 3 450 | 19 600 | 10 500 |
| K22X29X16 | 16 | 22 | 29 | 16 | 20 000 | 25 500 | 3 350 | 19 200 | 10 300 |
| K22X30X15-TV | 18 | 22 | 30 | 15 | 20 100 | 23 400 | 3 050 | 18 800 | 10 200 |
| K22X32X24 | 43 | 22 | 32 | 24 | 34 000 | 40 000 | 4 900 | 18 100 | 9 700 |
| K23X35X16-TV | 29 | 23 | 35 | 16 | 24 500 | 23 900 | 2 950 | 16 900 | 9 500 |
| K24X28X10 | 8,5 | 24 | 28 | 10 | 9 600 | 14 800 | 1 840 | 18 800 | 10 600 |
| K24X28X13 | 10 | 24 | 28 | 13 | 11 000 | 17 600 | 2 290 | 18 800 | 10 800 |
| K24X28X17 | 13 | 24 | 28 | 17 | 14 500 | 25 000 | 3 300 | 18 800 | 10 600 |
| K24X30X17 | 19 | 24 | 30 | 17 | 19 500 | 27 500 | 3 500 | 18 100 | 10 000 |
| K24X30X31-ZW | 32 | 24 | 30 | 31 | 27 500 | 43 500 | 5 800 | 18 100 | 10 400 |



K..-ZW

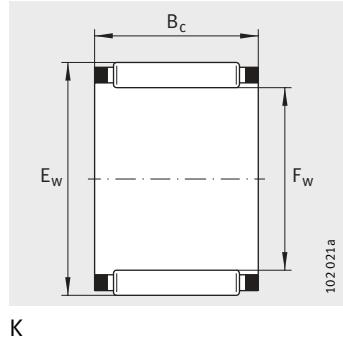
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|---------------------|-----------------|------------|-------|-------|--------------------|------------------------|--|---|--|
| | | F_w | E_w | B_c | dyn. C_r N | stat. C_{0r} N | | | |
| K25X29X10 | 8,5 | 25 | 29 | 10 | 9 900 | 15 400 | 1 930 | 18 100 | 10 200 |
| K25X29X13 | 11 | 25 | 29 | 13 | 11 300 | 18 400 | 2 400 | 18 100 | 10 400 |
| K25X29X17 | 14 | 25 | 29 | 17 | 14 900 | 26 000 | 3 450 | 18 100 | 10 200 |
| K25X30X17 | 16 | 25 | 30 | 17 | 18 700 | 30 000 | 3 850 | 17 800 | 9 600 |
| K25X30X20 | 18 | 25 | 30 | 20 | 21 700 | 36 500 | 4 850 | 17 800 | 9 500 |
| K25X30X26-ZW | 19 | 25 | 30 | 26 | 21 400 | 35 500 | 4 500 | 17 800 | 10 400 |
| K25X31X17 | 19 | 25 | 31 | 17 | 19 600 | 28 500 | 3 600 | 17 500 | 9 600 |
| K25X31X21 | 20 | 25 | 31 | 21 | 24 700 | 38 000 | 5 100 | 17 500 | 9 400 |
| K25X32X16 | 21 | 25 | 32 | 16 | 20 800 | 27 500 | 3 750 | 17 200 | 9 400 |
| K25X33X20 | 33 | 25 | 33 | 20 | 28 500 | 38 000 | 4 850 | 16 900 | 9 000 |
| K25X33X24 | 39 | 25 | 33 | 24 | 34 000 | 47 000 | 6 300 | 16 900 | 8 900 |
| K25X35X30 | 65 | 25 | 35 | 30 | 47 000 | 62 000 | 8 300 | 16 300 | 8 500 |
| K26X30X13 | 11 | 26 | 30 | 13 | 11 600 | 19 200 | 2 500 | 17 500 | 10 100 |
| K26X30X17 | 15 | 26 | 30 | 17 | 15 200 | 27 500 | 3 600 | 17 500 | 9 800 |
| K26X30X22-ZW | 12 | 26 | 30 | 22 | 15 700 | 28 500 | 3 550 | 17 500 | 10 400 |
| K28X33X13 | 13 | 28 | 33 | 13 | 15 300 | 24 200 | 3 100 | 16 100 | 9 800 |
| K28X33X17 | 17 | 28 | 33 | 17 | 19 700 | 33 500 | 4 250 | 16 100 | 8 700 |
| K28X34X17 | 24 | 28 | 34 | 17 | 21 800 | 33 500 | 4 300 | 15 800 | 8 600 |
| K28X35X16 | 24 | 28 | 35 | 16 | 21 500 | 29 500 | 3 950 | 15 600 | 8 700 |
| K28X35X18 | 27 | 28 | 35 | 18 | 24 000 | 34 000 | 4 700 | 15 600 | 8 600 |
| K28X40X25 | 70 | 28 | 40 | 25 | 45 500 | 55 000 | 6 600 | 14 400 | 7 700 |
| K30X34X13 | 14 | 30 | 34 | 13 | 12 300 | 21 700 | 2 850 | 15 300 | 8 900 |
| K30X35X13 | 14 | 30 | 35 | 13 | 15 600 | 25 500 | 3 250 | 15 100 | 8 400 |
| K30X35X17 | 19 | 30 | 35 | 17 | 19 600 | 34 000 | 4 300 | 15 100 | 8 300 |
| K30X35X27 | 30 | 30 | 35 | 27 | 30 500 | 59 000 | 8 500 | 15 100 | 8 100 |
| K30X37X16 | 27 | 30 | 37 | 16 | 23 100 | 33 500 | 4 450 | 14 600 | 8 000 |
| K30X37X18 | 30 | 30 | 37 | 18 | 26 000 | 38 500 | 5 300 | 14 600 | 8 000 |
| K30X40X18 | 48 | 30 | 40 | 18 | 32 000 | 40 000 | 5 000 | 14 000 | 7 600 |
| K30X40X30 | 73 | 30 | 40 | 30 | 49 000 | 69 000 | 9 200 | 14 000 | 7 500 |

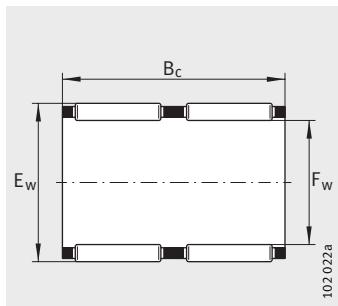


Needle roller and cage assemblies

Single row and double row



| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C_ur N | Limiting speed n_G min⁻¹ | Reference speed n_B min⁻¹ |
|-----------------|-----------------|------------|-----|-----|--------------------|--------------------|------------------------------------|-----------------------------------|------------------------------------|
| | | F_w | E_w | B_c | dyn. C_r N | stat. C_0r N | | | |
| K32X37X13 | 18 | 32 | 37 | 13 | 15 500 | 25 500 | 3 300 | 14 200 | 8 100 |
| K32X37X17 | 19 | 32 | 37 | 17 | 19 900 | 35 500 | 4 500 | 14 200 | 7 900 |
| K32X37X27 | 30 | 32 | 37 | 27 | 30 000 | 60 000 | 8 500 | 14 200 | 7 800 |
| K32X38X20 | 30 | 32 | 38 | 20 | 26 500 | 45 000 | 6 000 | 14 000 | 7 700 |
| K32X39X16 | 37 | 32 | 39 | 16 | 23 800 | 35 500 | 4 700 | 13 800 | 7 600 |
| K32X39X18 | 31 | 32 | 39 | 18 | 26 500 | 41 000 | 5 600 | 13 800 | 7 500 |
| K32X40X25 | 49 | 32 | 40 | 25 | 37 500 | 58 000 | 7 900 | 13 600 | 7 400 |
| K32X40X42-ZW-TV | 77 | 32 | 40 | 42 | 50 000 | 84 000 | 10 500 | 13 600 | 7 800 |
| K32X46X32 | 119 | 32 | 46 | 32 | 66 000 | 84 000 | 11 100 | 12 600 | 6 700 |
| K35X40X13 | 19 | 35 | 40 | 13 | 16 200 | 28 000 | 3 600 | 13 100 | 7 500 |
| K35X40X17 | 21 | 35 | 40 | 17 | 20 800 | 38 500 | 4 900 | 13 100 | 7 400 |
| K35X40X25 | 31 | 35 | 40 | 25 | 29 500 | 60 000 | 8 400 | 13 100 | 7 200 |
| K35X40X27-TV | 39 | 35 | 40 | 27 | 25 000 | 48 500 | 6 700 | 13 100 | 7 900 |
| K35X42X16 | 34 | 35 | 42 | 16 | 24 400 | 37 500 | 5 000 | 12 700 | 7 100 |
| K35X42X18 | 34 | 35 | 42 | 18 | 27 500 | 43 000 | 6 000 | 12 700 | 7 100 |
| K35X42X20 | 37 | 35 | 42 | 20 | 30 000 | 49 000 | 6 200 | 12 700 | 7 000 |
| K35X42X30 | 67 | 35 | 42 | 30 | 39 000 | 68 000 | 9 400 | 12 700 | 7 200 |
| K35X45X20 | 56 | 35 | 45 | 20 | 37 000 | 50 000 | 6 500 | 12 300 | 6 800 |
| K35X45X30 | 80 | 35 | 45 | 30 | 53 000 | 79 000 | 10 500 | 12 300 | 6 700 |
| K37X42X17 | 22 | 37 | 42 | 17 | 22 400 | 43 000 | 5 500 | 12 400 | 6 900 |
| K38X43X17 | 29 | 38 | 43 | 17 | 20 500 | 38 500 | 4 850 | 12 100 | 7 000 |
| K38X43X27 | 43 | 38 | 43 | 27 | 31 500 | 68 000 | 9 600 | 12 100 | 6 800 |
| K38X46X20 | 47 | 38 | 46 | 20 | 35 500 | 57 000 | 7 200 | 11 700 | 6 300 |
| K38X46X32 | 76 | 38 | 46 | 32 | 55 000 | 99 000 | 14 200 | 11 700 | 6 200 |
| K39X44X26-ZW | 45 | 39 | 44 | 26 | 27 500 | 56 000 | 7 100 | 11 800 | 7 000 |



K..-ZW

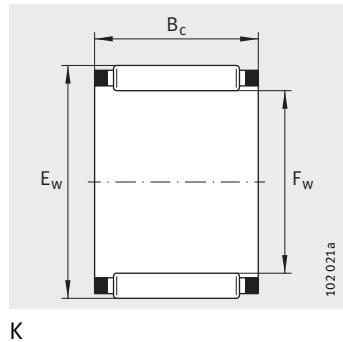
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|---------------------|-----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---|--|---|
| | | F _w | E _w | B _c | dyn. C _r N | stat. C _{0r} N | | | |
| K40X45X13 | 22 | 40 | 45 | 13 | 17 600 | 32 500 | 4 200 | 11 500 | 6 600 |
| K40X45X17 | 31 | 40 | 45 | 17 | 21 400 | 41 500 | 5 200 | 11 500 | 6 700 |
| K40X45X27 | 46 | 40 | 45 | 27 | 33 000 | 73 000 | 10 300 | 11 500 | 6 500 |
| K40X47X18 | 39 | 40 | 47 | 18 | 29 500 | 50 000 | 6 900 | 11 300 | 6 300 |
| K40X47X20 | 42 | 40 | 47 | 20 | 32 500 | 57 000 | 7 200 | 11 300 | 6 200 |
| K40X48X20 | 49 | 40 | 48 | 20 | 36 000 | 59 000 | 7 500 | 11 100 | 6 100 |
| K42X47X13 | 18 | 42 | 47 | 13 | 17 800 | 33 500 | 4 350 | 11 000 | 6 400 |
| K42X47X17 | 32 | 42 | 47 | 17 | 21 700 | 43 000 | 5 400 | 11 000 | 6 400 |
| K42X47X30-ZW | 54 | 42 | 47 | 30 | 33 500 | 76 000 | 10 000 | 11 000 | 6 400 |
| K42X50X20 | 53 | 42 | 50 | 20 | 35 000 | 57 000 | 7 300 | 10 700 | 6 000 |
| K43X48X17 | 30 | 43 | 48 | 17 | 21 600 | 43 000 | 5 400 | 10 800 | 6 300 |
| K43X48X27 | 50 | 43 | 48 | 27 | 33 500 | 75 000 | 10 700 | 10 800 | 6 200 |
| K45X50X17 | 34 | 45 | 50 | 17 | 22 500 | 46 000 | 5 800 | 10 300 | 6 100 |
| K45X50X27 | 51 | 45 | 50 | 27 | 34 500 | 80 000 | 11 400 | 10 300 | 5 900 |
| K45X52X18 | 42 | 45 | 52 | 18 | 31 500 | 57 000 | 7 900 | 10 100 | 5 700 |
| K45X53X20 | 55 | 45 | 53 | 20 | 39 000 | 67 000 | 8 700 | 10 000 | 5 500 |
| K45X53X21 | 60 | 45 | 53 | 21 | 38 500 | 67 000 | 8 600 | 10 000 | 5 600 |
| K45X53X28 | 81 | 45 | 53 | 28 | 52 000 | 98 000 | 13 700 | 10 000 | 5 400 |
| K45X59X18-TV | 72 | 45 | 59 | 18 | 44 000 | 54 000 | 6 900 | 9 400 | 5 400 |
| K45X59X32 | 148 | 45 | 59 | 32 | 73 000 | 103 000 | 13 800 | 9 400 | 5 300 |
| K47X52X17 | 35 | 47 | 52 | 17 | 23 300 | 49 000 | 6 100 | 9 900 | 5 800 |
| K47X52X27 | 51 | 47 | 52 | 27 | 35 000 | 83 000 | 11 800 | 9 900 | 5 700 |

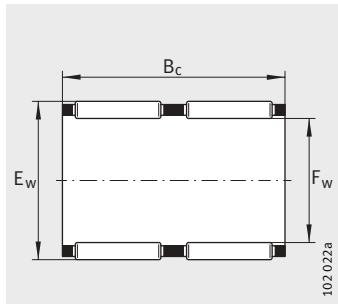


Needle roller and cage assemblies

Single row and double row



| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|--------------|-----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|---|--|---|
| | | F _w | E _w | B _c | dyn. C _r N | stat. C _{0r} N | | | |
| K50X55X13,5 | 30 | 50 | 55 | 13,5 | 18 200 | 36 500 | 4 600 | 9 300 | 5 700 |
| K50X55X17 | 35 | 50 | 55 | 17 | 22 100 | 47 000 | 7 300 | 9 300 | 5 700 |
| K50X55X20 | 43 | 50 | 55 | 20 | 26 500 | 60 000 | 7 800 | 9 300 | 5 500 |
| K50X55X30 | 65 | 50 | 55 | 30 | 39 000 | 97 000 | 13 900 | 9 300 | 5 400 |
| K50X57X18 | 47 | 50 | 57 | 18 | 33 500 | 63 000 | 8 800 | 9 200 | 5 200 |
| K50X58X20 | 75 | 50 | 58 | 20 | 35 500 | 62 000 | 8 800 | 9 100 | 5 400 |
| K50X58X25 | 90 | 50 | 58 | 25 | 44 000 | 81 000 | 10 800 | 9 100 | 5 300 |
| K52X57X12 | 24 | 52 | 57 | 12 | 18 000 | 36 500 | 4 600 | 9 000 | 5 400 |
| K55X60X20 | 40 | 55 | 60 | 20 | 28 500 | 66 000 | 8 600 | 8 500 | 5 100 |
| K55X60X27 | 60 | 55 | 60 | 27 | 38 000 | 97 000 | 13 600 | 8 500 | 4 950 |
| K55X60X30 | 71 | 55 | 60 | 30 | 41 000 | 108 000 | 15 400 | 8 500 | 4 950 |
| K55X62X18 | 52 | 55 | 62 | 18 | 35 500 | 70 000 | 9 800 | 8 400 | 4 750 |
| K55X63X20 | 67 | 55 | 63 | 20 | 40 000 | 74 000 | 9 500 | 8 300 | 4 800 |
| K55X63X25 | 80 | 55 | 63 | 25 | 51 000 | 101 000 | 13 700 | 8 300 | 4 700 |
| K55X63X32 | 102 | 55 | 63 | 32 | 62 000 | 130 000 | 18 600 | 8 300 | 4 650 |
| K58X65X18 | 52 | 58 | 65 | 18 | 35 000 | 70 000 | 9 800 | 8 000 | 4 650 |
| K58X65X36-ZW | 127 | 58 | 65 | 36 | 49 000 | 107 000 | 14 600 | 8 000 | 5 100 |
| K60X65X20 | 52 | 60 | 65 | 20 | 29 500 | 72 000 | 9 300 | 7 800 | 4 750 |
| K60X65X30 | 77 | 60 | 65 | 30 | 42 500 | 116 000 | 16 600 | 7 800 | 4 650 |
| K60X66X33-ZW | 104 | 60 | 66 | 33 | 46 000 | 112 000 | 15 100 | 7 800 | 4 800 |
| K60X66X40-ZW | 116 | 60 | 66 | 40 | 58 000 | 151 000 | 19 900 | 7 800 | 4 650 |
| K60X68X20 | 71 | 60 | 68 | 20 | 43 500 | 85 000 | 11 000 | 7 700 | 4 400 |
| K60X68X23 | 94 | 60 | 68 | 23 | 49 500 | 101 000 | 13 500 | 7 700 | 4 350 |
| K60X68X25 | 89 | 60 | 68 | 25 | 53 000 | 111 000 | 15 200 | 7 700 | 4 350 |
| K60X68X30-ZW | 129 | 60 | 68 | 30 | 44 500 | 88 000 | 11 300 | 7 700 | 4 950 |
| K60X75X42 | 240 | 60 | 75 | 42 | 118 000 | 199 000 | 27 000 | 7 300 | 4 050 |
| K62X70X40-ZW | 174 | 62 | 70 | 40 | 66 000 | 146 000 | 20 500 | 7 400 | 4 550 |
| K64X70X16 | 53 | 64 | 70 | 16 | 28 000 | 60 000 | 8 100 | 7 300 | 4 500 |



K..-ZW

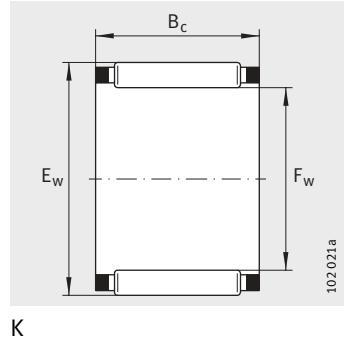
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C_ur N | Limiting speed n_G min⁻¹ | Reference speed n_B min⁻¹ |
|----------------------|-----------------|------------|-----|-----|--------------------|--------------------|------------------------------------|-----------------------------------|------------------------------------|
| | | F_w | E_w | B_c | dyn. C_r N | stat. C_0r N | | | |
| K65X70X20 | 56 | 65 | 70 | 20 | 30 500 | 77 000 | 10 000 | 7 300 | 4 450 |
| K65X70X30 | 83 | 65 | 70 | 30 | 44 000 | 124 000 | 17 800 | 7 300 | 4 350 |
| K65X73X23 | 108 | 65 | 73 | 23 | 46 000 | 94 000 | 12 200 | 7 100 | 4 300 |
| K65X73X30 | 141 | 65 | 73 | 30 | 57 000 | 123 000 | 17 100 | 7 100 | 4 300 |
| K68X74X20 | 71 | 68 | 74 | 20 | 35 500 | 84 000 | 11 000 | 6 900 | 4 200 |
| K68X74X30 | 100 | 68 | 74 | 30 | 46 500 | 118 000 | 16 900 | 6 900 | 4 300 |
| K68X74X35-ZW | 120 | 68 | 74 | 35 | 48 500 | 125 000 | 17 200 | 6 900 | 4 450 |
| K70X76X20 | 71 | 70 | 76 | 20 | 36 000 | 86 000 | 11 300 | 6 700 | 4 100 |
| K70X76X30 | 110 | 70 | 76 | 30 | 52 000 | 139 000 | 20 100 | 6 700 | 4 000 |
| K70X78X30 | 148 | 70 | 78 | 30 | 60 000 | 135 000 | 18 800 | 6 600 | 4 000 |
| K72X80X20 | 98 | 72 | 80 | 20 | 41 500 | 85 000 | 11 900 | 6 400 | 4 050 |
| K73X79X20 | 75 | 73 | 79 | 20 | 37 000 | 90 000 | 11 800 | 6 400 | 4 000 |
| K75X81X20 | 79 | 75 | 81 | 20 | 37 500 | 94 000 | 12 300 | 6 300 | 3 850 |
| K75X81X30 | 114 | 75 | 81 | 30 | 52 000 | 143 000 | 20 400 | 6 300 | 3 850 |
| K75X83X23 | 124 | 75 | 83 | 23 | 50 000 | 109 000 | 14 200 | 6 200 | 3 800 |
| K75X83X30 | 147 | 75 | 83 | 30 | 62 000 | 143 000 | 20 000 | 6 200 | 3 800 |
| K75X83X35-ZW | 182 | 75 | 83 | 35 | 63 000 | 147 000 | 19 900 | 6 200 | 3 950 |
| K75X83X40-ZW | 211 | 75 | 83 | 40 | 73 000 | 177 000 | 25 000 | 6 200 | 3 900 |
| K80X86X20 | 60 | 80 | 86 | 20 | 38 500 | 98 000 | 12 900 | 5 900 | 3 700 |
| K80X88X30 | 138 | 80 | 88 | 30 | 71 000 | 176 000 | 25 000 | 5 800 | 3 400 |
| K80X88X40-ZW | 227 | 80 | 88 | 40 | 76 000 | 192 000 | 27 000 | 5 800 | 3 700 |
| K80X88X46-ZW | 260 | 80 | 88 | 46 | 88 000 | 231 000 | 30 000 | 5 800 | 3 650 |
| K85X92X20 | 102 | 85 | 92 | 20 | 44 500 | 108 000 | 15 100 | 5 500 | 3 450 |
| K90X97X20 | 109 | 90 | 97 | 20 | 45 000 | 113 000 | 15 800 | 5 200 | 3 300 |
| K90X98X27 | 150 | 90 | 98 | 27 | 61 000 | 150 000 | 20 300 | 5 200 | 3 300 |
| K90X98X30 | 172 | 90 | 98 | 30 | 68 000 | 172 000 | 24 000 | 5 200 | 3 300 |
| K95X103X30 | 165 | 95 | 103 | 30 | 69 000 | 180 000 | 25 000 | 4 950 | 3 150 |
| K95X103X40-ZW | 266 | 95 | 103 | 40 | 83 000 | 228 000 | 32 500 | 4 950 | 3 200 |



Needle roller and cage assemblies

Single row

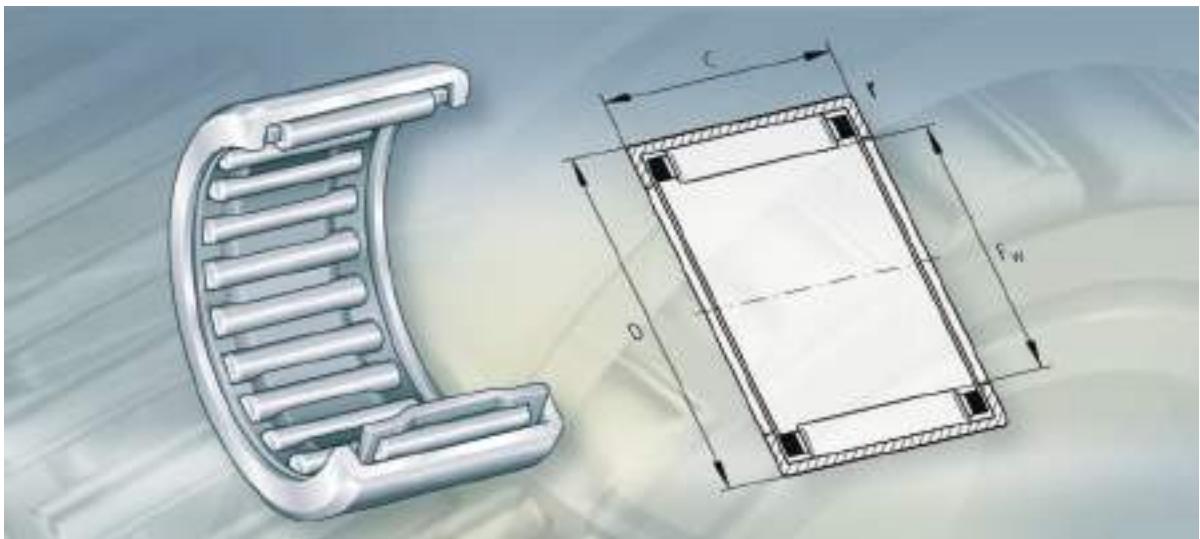


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Dimension table (continued) - Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | Basic load ratings | | Fatigue limit load C_ur N | Limiting speed n_G min⁻¹ | Reference speed n_B min⁻¹ |
|--------------------|-----------------|------------|-----|-----|--------------------|--------------------|------------------------------------|-----------------------------------|------------------------------------|
| | | F_w | E_w | B_c | dyn. C_r N | stat. C_0r N | | | |
| K100X107X21 | 120 | 100 | 107 | 21 | 48 000 | 127 000 | 17 600 | 4 750 | 3 100 |
| K100X108X27 | 185 | 100 | 108 | 27 | 57 000 | 143 000 | 18 900 | 4 700 | 3 200 |
| K100X108X30 | 180 | 100 | 108 | 30 | 71 000 | 188 000 | 26 000 | 4 700 | 3 050 |
| K105X112X21 | 129 | 105 | 112 | 21 | 47 500 | 127 000 | 17 400 | 4 500 | 3 000 |
| K110X117X24 | 172 | 110 | 117 | 24 | 56 000 | 158 000 | 19 800 | 4 300 | 2 850 |
| K110X118X30 | 217 | 110 | 118 | 30 | 78 000 | 219 000 | 29 500 | 4 300 | 2 750 |
| K115X123X27 | 200 | 115 | 123 | 27 | 63 000 | 170 000 | 21 600 | 4 100 | 2 850 |
| K120X127X24 | 165 | 120 | 127 | 24 | 59 000 | 174 000 | 21 400 | 3 950 | 2 650 |
| K125X133X35 | 275 | 125 | 133 | 35 | 86 000 | 260 000 | 34 500 | 3 800 | 2 600 |
| K130X137X24 | 170 | 130 | 137 | 24 | 61 000 | 186 000 | 22 300 | 3 650 | 2 500 |
| K135X143X35 | 300 | 135 | 143 | 35 | 91 000 | 290 000 | 37 500 | 3 550 | 2 390 |
| K145X153X26 | 262 | 145 | 153 | 26 | 74 000 | 225 000 | 27 000 | 3 300 | 2 280 |
| K150X160X46 | 570 | 150 | 160 | 46 | 147 000 | 470 000 | 60 000 | 3 150 | 2 100 |
| K155X163X26 | 265 | 155 | 163 | 26 | 75 000 | 236 000 | 28 000 | 3 100 | 2 180 |
| K160X170X46 | 550 | 160 | 170 | 46 | 152 000 | 510 000 | 63 000 | 2 950 | 1 970 |
| K165X173X26 | 320 | 165 | 173 | 26 | 81 000 | 265 000 | 30 500 | 2 900 | 2 030 |
| K175X183X32 | 400 | 175 | 183 | 32 | 99 000 | 350 000 | 41 500 | 2 750 | 1 930 |
| K185X195X37 | 607 | 185 | 195 | 37 | 128 000 | 425 000 | 48 500 | 2 600 | 1 840 |
| K195X205X37 | 620 | 195 | 205 | 37 | 133 000 | 450 000 | 51 000 | 2 450 | 1 760 |
| K210X220X42 | 740 | 210 | 220 | 42 | 154 000 | 560 000 | 63 000 | 2 280 | 1 590 |
| K220X230X42 | 790 | 220 | 230 | 42 | 158 000 | 590 000 | 66 000 | 2 180 | 1 510 |
| K240X250X42 | 850 | 240 | 250 | 42 | 164 000 | 630 000 | 69 000 | 2 000 | 1 390 |
| K265X280X50 | 1810 | 265 | 280 | 50 | 255 000 | 860 000 | 91 000 | 1 800 | 1 160 |





**Drawn cup needle roller bearings
with open ends**

**Drawn cup needle roller bearings
with closed end**

Drawn cup needle roller bearings

| | Page |
|---|--|
| Product overview | Drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end 606 |
| Features | Drawn cup needle roller bearings with open ends..... 607 Drawn cup needle roller bearings with closed end 607 Full complement drawn cup needle roller bearings with open ends 607 Operating temperature 608 Cages 608 Special designs 608 Suffixes 608 |
| Design and safety guidelines | Raceway for bearings without inner ring 609 Static load safety factor 609 Speeds 609 Radial location 609 Installation with fitting mandrel 610 |
| Accuracy | Enveloping circle 611 |
| Dimension tables | Drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with closed end 612 Sealed drawn cup needle roller bearings with open ends, sealed drawn cup needle roller bearings with closed end 616 Full complement drawn cup needle roller bearings with open ends 618 |



Product overview Drawn cup needle roller bearings

**Drawn cup
needle roller bearing
with open ends**
With cage or full complement



With cage
Lip seals



**Drawn cup
needle roller bearings
with closed end**
With cage



With cage
Lip seals



Drawn cup needle roller bearings

| | |
|--|--|
| Features | Drawn cup needle roller bearings with open ends and with closed end are complete units comprising thin-walled, drawn cup outer rings and needle roller and cage assemblies. Drawn cup needle roller bearings are also available in a full complement design. The majority of the bearings are of a single row design. Drawn cup needle roller bearings are available in open and sealed designs. Open designs correspond to DIN 618-1/ISO 3 245. In order to support axial forces, the bearings can also be combined with axial needle roller bearings AXW. |
| Particularly low cross-section height | Due to the thin-walled outer cup and the design without an inner ring, drawn cup needle roller bearings have extremely small radial dimensions. They have high load carrying capacity, are suitable for high speeds and are particularly easy to fit. If axial means of location such as shoulders, snap rings etc. are not used, the housing bore can be produced easily and particularly economically. Double row designs have a lubrication hole and the suffix ZW. Drawn cup needle roller bearings require a hardened and ground bearing raceway on the shaft. If the shaft cannot be used as a raceway, they can be combined with inner rings IR or LR. Suitable inner rings: see pages starting 690. |
| Drawn cup needle roller bearings with open ends | Drawn cup needle roller bearings HK are open on both sides. |
| Sealing/lubricant | Sealed drawn cup needle roller bearings with open ends correspond to DIN 618-2. They have lip seals on one or both sides and are therefore protected against contamination and spray water. They are greased using a lithium complex soap grease to GA08. |
| Drawn cup needle roller bearings with closed end | Drawn cup needle roller bearings BK are closed at one end. They are thus suitable for closing off the shaft ends of bearing arrangements. This gives protection against injury by rotating shafts and protects the bearing against contamination and moisture. Depending on the size, the base is either smooth or lock-beaded (stiffened). Due to the profiled base design, low axial guidance forces can be supported. |
| Sealing/lubricant | Sealed drawn cup roller bearings with closed end have lip seals and are therefore protected against contamination and spray water. They are greased using a lithium complex soap grease to GA08. |
| Full complement drawn cup needle roller bearings with open ends | Full complement drawn cup needle roller bearings with open ends comprise thin-walled drawn outer rings and needle rollers without any mechanical means of needle retention. The needle rollers are secured for transport and fitting by means of a special grease (DIN 51 825-K1/2K-30). However, this does not have adequate long term lubrication capacity. Relubrication is therefore recommended as appropriate after fitting. |
| For maximum load carrying capacity | Since full complement drawn cup needle roller bearings have the maximum number of needle rollers, they therefore offer extremely high load carrying capacity within a very small design envelope. However, their use at high speeds is restricted. |



Drawn cup needle roller bearings

| Operating temperature | Drawn cup needle roller bearings without seals can be used at operating temperatures from -25°C to $+140^{\circ}\text{C}$. | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|--|----------------|-------------|--------|-----|-----------------------------------|----------------|----|--------------------------|----------|------|--|----------------|----|--|----------|----|------------|----------|-----|-----------------------------|----------|
| Caution! | Sealed drawn cup needle roller bearings are suitable for operating temperatures from -20°C to $+100^{\circ}\text{C}$, restricted by the seal material. | | | | | | | | | | | | | | | | | | | | | |
| | Drawn cup needle roller bearings with plastic cages are suitable for operating temperatures from -25°C to $+120^{\circ}\text{C}$. | | | | | | | | | | | | | | | | | | | | | |
| Cages | With a few exceptions, drawn cup needle roller bearings have sheet steel cages. Plastic cages are indicated in the dimension tables by the suffix TV. | | | | | | | | | | | | | | | | | | | | | |
| Special designs | The following special designs are available by agreement (see also the table Suffixes): <ul style="list-style-type: none">■ unsealed bearings, greased using lithium complex soap grease to GA08■ bearings with lubrication holes – suffix AS1 – from size HK0609. Suffixes for available designs: see dimension tables. | | | | | | | | | | | | | | | | | | | | | |
| Special bearings | In addition to the catalogue designs, special designs are available by agreement: <ul style="list-style-type: none">■ in the enveloping circle range from 2 mm to 100 mm■ for special noise requirements, with special noise testing. | | | | | | | | | | | | | | | | | | | | | |
| Universal joint bearings | For universal joints, universal joint bearings of series BU and BBU are available by agreement. | | | | | | | | | | | | | | | | | | | | | |
| Suffixes | Suffixes for available designs: see table. | | | | | | | | | | | | | | | | | | | | | |
| Available designs | <table><thead><tr><th>Suffix</th><th>Description</th><th>Design</th></tr></thead><tbody><tr><td>AS1</td><td>With lubrication hole from HK0609</td><td>Special design</td></tr><tr><td>RS</td><td>Contact seal on one side</td><td>Standard</td></tr><tr><td>GA08</td><td>Unsealed, greased bearings for operating temperatures from -25°C to $+140^{\circ}\text{C}$</td><td>Special design</td></tr><tr><td>TV</td><td>Cage made from glass fibre reinforced polyamide 66</td><td>Standard</td></tr><tr><td>ZW</td><td>Double row</td><td>Standard</td></tr><tr><td>2RS</td><td>Contact seals on both sides</td><td>Standard</td></tr></tbody></table> | Suffix | Description | Design | AS1 | With lubrication hole from HK0609 | Special design | RS | Contact seal on one side | Standard | GA08 | Unsealed, greased bearings for operating temperatures from -25°C to $+140^{\circ}\text{C}$ | Special design | TV | Cage made from glass fibre reinforced polyamide 66 | Standard | ZW | Double row | Standard | 2RS | Contact seals on both sides | Standard |
| Suffix | Description | Design | | | | | | | | | | | | | | | | | | | | |
| AS1 | With lubrication hole from HK0609 | Special design | | | | | | | | | | | | | | | | | | | | |
| RS | Contact seal on one side | Standard | | | | | | | | | | | | | | | | | | | | |
| GA08 | Unsealed, greased bearings for operating temperatures from -25°C to $+140^{\circ}\text{C}$ | Special design | | | | | | | | | | | | | | | | | | | | |
| TV | Cage made from glass fibre reinforced polyamide 66 | Standard | | | | | | | | | | | | | | | | | | | | |
| ZW | Double row | Standard | | | | | | | | | | | | | | | | | | | | |
| 2RS | Contact seals on both sides | Standard | | | | | | | | | | | | | | | | | | | | |

Design and safety guidelines
Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness must be at least 670 HV, the hardening depth CHD or Rht must be sufficiently large.

Shaft and housing design: see the table and section Design of bearing arrangements, page 125.

Caution!

In order to utilise the load carrying capacity of the bearings to the full, rigid support must be provided for the thin-walled outer ring.

Note the recommended bore tolerance according to the table for the shaft raceway/housing bore.

Tolerances for shaft raceway/ housing bore

| Housing material | Shaft tolerance for bearings without inner ring | Bore tolerance |
|--------------------|---|----------------|
| Steel or cast iron | h6 | N6 |
| Light metal Al | | R6 |
| Mg | | S6 |

Surface for shaft raceway/ housing bore

| Surface quality | Shaft raceway for bearings without inner ring | Housing bore |
|-----------------|---|---------------------------------------|
| Roughness max. | R _a 0,2 (R _z 1) | R _a 0,8 (R _z 4) |
| Roundness | IT 3 | IT 5/2 |
| Parallelism | IT 3 | IT 5/2 |

Static load safety factor

$$S_0 = \frac{C_{0r}}{P_0}$$

S_0 –
Static load safety factor

C_{0r} N
Basic static load rating according to dimension tables

P_0 N
Equivalent static bearing load.

Caution!

In order to achieve sufficiently smooth running, a static load safety factor $S_0 \geq 3$ is necessary.

Speeds

Caution!

The speeds in the dimension tables are valid for oil lubrication. If grease lubrication is used, 60% of the stated value is permissible.

Radial location

Drawn cup needle roller bearings are pressed into the housing bore and require no further axial location.



Drawn cup needle roller bearings

Installation with fitting mandrel

The bearings should be installed using a special fitting mandrel, *Figure 1*. The shoulder of the fitting mandrel should rest on the bearing end face marked with the designation.

A round section seal ① should be used to retain the bearing. The length and oversize of the round section seal must be matched by the customer to the dimensions and mass of the bearing.

Before installation, the bearings should be lubricated with grease, if grease lubrication is to be used.

Caution!

Do not tilt drawn cup bearings during fitting.
Forces occurring during the fitting process are dependent on several variables. The fitting situation should be arranged so that the bearing rib on the end face is not deformed.

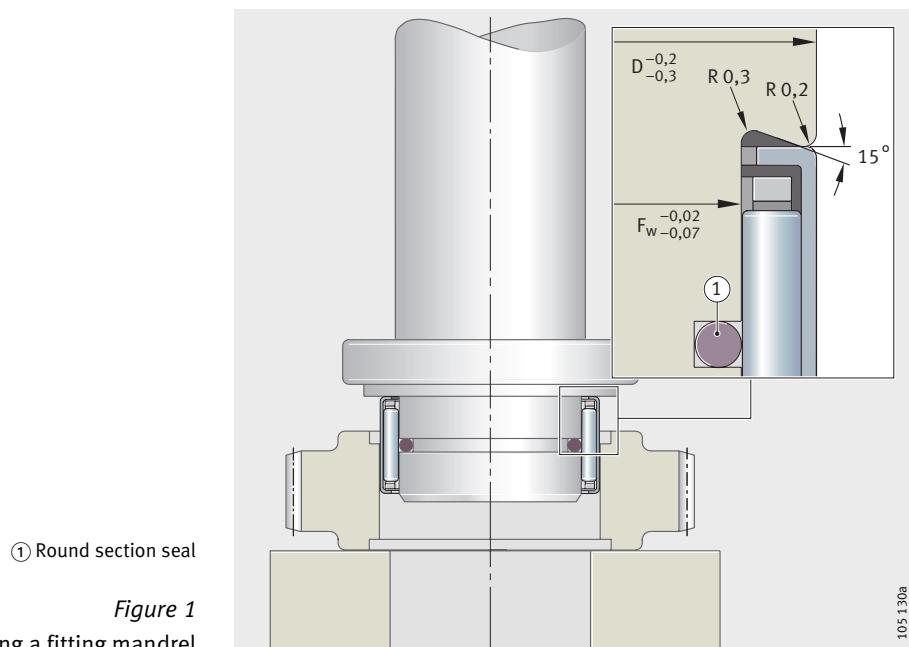


Figure 1
Installation using a fitting mandrel

Accuracy

The main bearing dimensions conform to DIN 618/ISO 3 245. The thin-walled outer rings adopt the dimensional and geometrical accuracy of the housing bore.

Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway.

Once fitted, the enveloping circle diameter F_w is approximately in tolerance zone F8 (assuming bore tolerances according to the table, page 609).

The enveloping circle is determined in accordance with the inspection dimensions in the table; see table Inspection dimensions for drawn cup needle roller bearings.

Caution!

Bearings intended for enveloping circle measurement should not be repeatedly pushed in and out of the gauge. Bearings which have been checked in the ring gauge should not be used again.

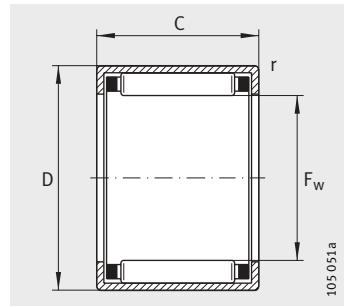
Inspection dimensions for drawn cup needle roller bearings

| F_w mm | D mm | Ring gauge bore Actual dimension mm | Enveloping circle diameter | |
|-------------|---------|---|-------------------------------------|-------------------------------------|
| | | | Upper deviation μm | Lower deviation μm |
| 3 | 6,5 | 6,484 | +24 | +6 |
| 4 | 8 | 7,984 | +28 | +10 |
| 5 | 9 | 8,984 | +28 | +10 |
| 6 | 10 | 9,984 | +28 | +10 |
| 7 | 11 | 10,980 | +31 | +13 |
| 8 | 12 | 11,980 | +31 | +13 |
| 9 | 13 | 12,980 | +31 | +13 |
| 10 | 14 | 13,980 | +31 | +13 |
| 12 | 16 | 15,980 | +34 | +16 |
| 12 | 18 | 17,980 | +34 | +16 |
| 13 | 19 | 18,976 | +34 | +16 |
| 14 | 20 | 19,976 | +34 | +16 |
| 15 | 21 | 20,976 | +34 | +16 |
| 16 | 22 | 21,976 | +34 | +16 |
| 17 | 23 | 22,976 | +34 | +16 |
| 18 | 24 | 23,976 | +34 | +16 |
| 20 | 26 | 25,976 | +41 | +20 |
| 22 | 28 | 27,976 | +41 | +20 |
| 25 | 32 | 31,972 | +41 | +20 |
| 28 | 35 | 34,972 | +41 | +20 |
| 30 | 37 | 36,972 | +41 | +20 |
| 32 | 39 | 38,972 | +50 | +25 |
| 35 | 42 | 41,972 | +50 | +25 |
| 40 | 47 | 46,972 | +50 | +25 |
| 45 | 52 | 51,967 | +50 | +25 |
| 50 | 58 | 57,967 | +50 | +25 |
| 55 | 63 | 62,967 | +60 | +30 |
| 60 | 68 | 67,967 | +60 | +30 |



Drawn cup needle roller bearings with open ends

Drawn cup needle roller bearings with closed end

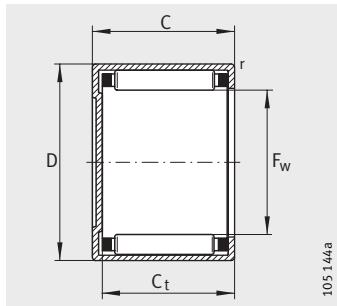


HK

Dimension table · Dimensions in mm

| Drawn cup needle roller bearings with open ends | | Drawn cup needle roller bearing with closed end | | Dimensions | | | | |
|---|--------------|---|--------------|----------------|-----|----|------------------------|-----------|
| Designation | Mass m ≈g | Designation | Mass m ≈g | F _w | D | C | C _t min. | r min. |
| + HK0306-TV | 1 | + BK0306 | 1 | 3 | 6,5 | 6 | 5,2 | 0,3 |
| + HK0408 | 2 | + BK0408 | 2,1 | 4 | 8 | 8 | 6,4 | 0,3 |
| + HK0509 | 2 | + BK0509 | 2,1 | 5 | 9 | 9 | 7,4 | 0,4 |
| + HK0606 | 1,5 | — | — | 6 | 10 | 6 | — | 0,4 |
| + HK0608 | 2,1 | — | — | 6 | 10 | 8 | — | 0,4 |
| HK0609 | 2,5 | BK0609 | 2,6 | 6 | 10 | 9 | 7,4 | 0,4 |
| HK0709 | 2,6 | BK0709 | 2,9 | 7 | 11 | 9 | 7,4 | 0,4 |
| HK0808 | 2,7 | BK0808 | 3 | 8 | 12 | 8 | 6,4 | 0,4 |
| HK0810 | 3 | BK0810 | 3,4 | 8 | 12 | 10 | 8,4 | 0,4 |
| HK0908 | 3 | — | — | 9 | 13 | 8 | — | 0,4 |
| HK0910 | 4 | BK0910 | 4,3 | 9 | 13 | 10 | 8,4 | 0,4 |
| HK0912 | 4,6 | BK0912 | 4,9 | 9 | 13 | 12 | 10,4 | 0,4 |
| HK1010 | 4,1 | BK1010 | 4,3 | 10 | 14 | 10 | 8,4 | 0,4 |
| HK1012 | 4,8 | BK1012 | 5 | 10 | 14 | 12 | 10,4 | 0,4 |
| HK1015 | 6 | BK1015 | 6,2 | 10 | 14 | 15 | 13,4 | 0,4 |
| HK1210 | 4,6 | BK1210 | 5,2 | 12 | 16 | 10 | 8,4 | 0,4 |
| HK1212 | 9 | BK1212 | 10 | 12 | 18 | 12 | 9,3 | 0,8 |
| HK1312 | 10 | BK1312 | 11 | 13 | 19 | 12 | 9,3 | 0,8 |
| HK1412 | 10,5 | BK1412 | 12 | 14 | 20 | 12 | 9,3 | 0,8 |
| HK1512 | 11 | BK1512 | 13 | 15 | 21 | 12 | 9,3 | 0,8 |
| HK1516 | 15 | BK1516 | 17 | 15 | 21 | 16 | 13,3 | 0,8 |
| HK1522-ZW | 20 | — | — | 15 | 21 | 22 | — | 0,8 |
| HK1612 | 12 | BK1612 | 14 | 16 | 22 | 12 | 9,3 | 0,8 |
| HK1616 | 16 | BK1616 | 18 | 16 | 22 | 16 | 13,3 | 0,8 |
| HK1622-ZW | 22 | BK1622-ZW | 24 | 16 | 22 | 22 | 19,3 | 0,8 |
| HK1712 | 12 | — | — | 17 | 23 | 12 | — | 0,8 |
| HK1812 | 13 | BK1812 | 15 | 18 | 24 | 12 | 9,3 | 0,8 |
| HK1816 | 18 | BK1816 | 20 | 18 | 24 | 16 | 13,3 | 0,8 |
| HK2010 | 12 | — | — | 20 | 26 | 10 | — | 0,8 |
| HK2012 | 14 | — | — | 20 | 26 | 12 | — | 0,8 |
| HK2016 | 19 | BK2016 | 22 | 20 | 26 | 16 | 13,3 | 0,8 |
| HK2020 | 24 | BK2020 | 27 | 20 | 26 | 20 | 17,3 | 0,8 |
| HK2030-ZW | 35 | — | — | 20 | 26 | 30 | — | 0,8 |

* Not available with lubrication hole.



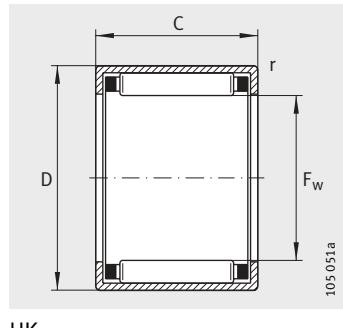
BK

| Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed | Suitable inner rings (to be ordered separately) | |
|-----------------------------|-------------------------------|----------------------|-------------------------------------|-------------------------------------|--|-------------------|
| dyn. C _r N | stat. C _{0r} N | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ | LR Designation | IR Designation |
| 1 230 | 840 | 113 | 46 000 | 49 500 | — | — |
| 1 780 | 1 310 | 114 | 41 000 | 38 500 | — | — |
| 2 400 | 1 990 | 239 | 38 000 | 32 000 | — | — |
| 1 610 | 1 220 | 167 | 35 000 | 28 500 | — | — |
| 2 030 | 1 650 | 184 | 35 000 | 28 500 | — | — |
| 2 850 | 2 600 | 310 | 35 000 | 27 000 | — | — |
| 3 100 | 2 950 | 355 | 31 000 | 24 000 | — | — |
| 2 750 | 2 600 | 290 | 28 000 | 21 800 | — | — |
| 3 800 | 3 950 | 500 | 28 000 | 21 200 | — | IR5X8X12 |
| 3 550 | 3 750 | 440 | 25 500 | 19 000 | — | — |
| 4 250 | 4 650 | 600 | 25 500 | 19 000 | — | — |
| 5 300 | 6 300 | 860 | 25 500 | 18 700 | — | IR6X9X12 |
| 4 400 | 5 100 | 650 | 23 300 | 17 400 | LR7X10X10,5 | IR7X10X10,5 |
| 5 500 | 6 800 | 930 | 23 300 | 17 100 | — | IR7X10X12 |
| 6 800 | 8 800 | 1 210 | 23 300 | 17 000 | — | IR7X10X16 |
| 4 950 | 6 200 | 800 | 20 000 | 14 800 | LR8X12X10,5 | IR8X12X10,5 |
| 6 500 | 7 300 | 860 | 18 700 | 13 800 | LR8X12X12,5 | IR8X12X12,5 |
| 6 800 | 7 900 | 940 | 17 500 | 12 900 | LR10X13X12,5 | IR10X13X12,5 |
| 7 100 | 8 500 | 1 010 | 16 500 | 12 100 | — | IR10X14X13 |
| 7 900 | 9 400 | 1 150 | 15 600 | 11 400 | LR12X15X12,5 | IR12X15X12,5 |
| 10 500 | 14 400 | 1 780 | 15 600 | 11 200 | LR12X15X16,5 | IR12X15X16,5 |
| 13 400 | 19 500 | 2 380 | 15 600 | 11 200 | LR12X15X22,5 | IR12X15X22,5 |
| 7 600 | 9 700 | 1 160 | 14 700 | 10 900 | — | IR12X16X13 |
| 10 900 | 15 300 | 1 900 | 14 700 | 10 600 | — | IR12X16X16 |
| 13 100 | 19 400 | 2 320 | 14 700 | 10 700 | — | IR12X16X22 |
| 7 900 | 10 300 | 1 230 | 14 000 | 10 300 | — | — |
| 8 100 | 10 900 | 1 300 | 13 300 | 9 800 | LR15X18X12,5 | — |
| 11 600 | 17 300 | 2 140 | 13 300 | 9 600 | LR15X18X16,5 | IR15X18X16,5 |
| 6 400 | 8 200 | 1 040 | 12 200 | 9 300 | — | — |
| 8 600 | 12 100 | 1 450 | 12 200 | 9 000 | — | IR15X20X13 |
| 12 700 | 20 100 | 2 500 | 12 200 | 8 700 | LR17X20X16,5 | IR17X20X16,5 |
| 15 700 | 26 000 | 3 500 | 12 200 | 8 600 | LR17X20X20,5 | IR17X20X20,5 |
| 21 800 | 40 000 | 5 000 | 12 200 | 8 600 | LR17X20X30,5 | IR17X20X30,5 |



Drawn cup needle roller bearings with open ends

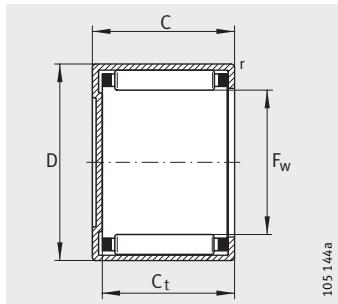
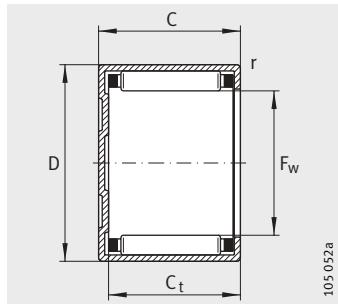
Drawn cup needle roller bearings with closed end



HK

Dimension table (continued) - Dimensions in mm

| Drawn cup needle roller bearings with open ends | | Drawn cup needle roller bearing with closed end | | Dimensions | | | | |
|---|-----------|---|-----------|------------|----|----|----------|--------|
| Designation | Mass m ≈g | Designation | Mass m ≈g | F_w | D | C | C_t min. | r min. |
| HK2210 | 13 | – | – | 22 | 28 | 10 | – | 0,8 |
| HK2212 | 15 | BK2212 | 18 | 22 | 28 | 12 | 9,3 | 0,8 |
| HK2216 | 21 | BK2216 | 24 | 22 | 28 | 16 | 13,3 | 0,8 |
| HK2220 | 26 | – | – | 22 | 28 | 20 | – | 0,8 |
| HK2512 | 20 | – | – | 25 | 32 | 12 | – | 0,8 |
| HK2516 | 27 | BK2516 | 32 | 25 | 32 | 16 | 13,3 | 0,8 |
| HK2520 | 33 | BK2520 | 38 | 25 | 32 | 20 | 17,3 | 0,8 |
| HK2526 | 44 | BK2526 | 48 | 25 | 32 | 26 | 23,3 | 0,8 |
| HK2538-ZW | 64 | BK2538-ZW | 68 | 25 | 32 | 38 | 35,3 | 0,8 |
| HK2816 | 29 | – | – | 28 | 35 | 16 | – | 0,8 |
| HK2820 | 36 | – | – | 28 | 35 | 20 | – | 0,8 |
| HK3012 | 23 | BK3012 | 28 | 30 | 37 | 12 | 9,3 | 0,8 |
| HK3016 | 31 | BK3016 | 38 | 30 | 37 | 16 | 13,3 | 0,8 |
| HK3020 | 39 | BK3020 | 47 | 30 | 37 | 20 | 17,3 | 0,8 |
| HK3022 | 42 | – | – | 30 | 37 | 22 | – | 0,8 |
| HK3026 | 51 | BK3026 | 58 | 30 | 37 | 26 | 23,3 | 0,8 |
| HK3038-ZW | 76 | BK3038-ZW | 84 | 30 | 37 | 38 | 35,3 | 0,8 |
| HK3220 | 40,6 | – | – | 32 | 39 | 20 | – | 0,8 |
| HK3224 | 49 | – | – | 32 | 39 | 24 | – | 0,8 |
| HK3512 | 27 | – | – | 35 | 42 | 12 | – | 0,8 |
| HK3516 | 36 | – | – | 35 | 42 | 16 | – | 0,8 |
| HK3520 | 44 | BK3520 | 53 | 35 | 42 | 20 | 17,3 | 0,8 |
| HK4012 | 30 | – | – | 40 | 47 | 12 | – | 0,8 |
| HK4016 | 39 | – | – | 40 | 47 | 16 | – | 0,8 |
| HK4020 | 54 | BK4020 | 62 | 40 | 47 | 20 | 17,3 | 0,8 |
| HK4512 | 33 | – | – | 45 | 52 | 12 | – | 0,8 |
| HK4516 | 46 | – | – | 45 | 52 | 16 | – | 0,8 |
| HK4520 | 56 | BK4520 | 72 | 45 | 52 | 20 | 17,3 | 0,8 |
| HK5020 | 70 | – | – | 50 | 58 | 20 | – | 0,8 |
| HK5025 | 90 | – | – | 50 | 58 | 25 | – | 0,8 |
| HK5520 | 74 | – | – | 55 | 63 | 20 | – | 0,8 |
| HK5528 | 105 | – | – | 55 | 63 | 28 | – | 0,8 |
| HK6012 | 49 | – | – | 60 | 68 | 12 | – | 0,8 |
| HK6020 | 81 | – | – | 60 | 68 | 20 | – | 0,8 |
| HK6032 | 136 | – | – | 60 | 68 | 32 | – | 0,8 |

BK with $F_w < 25 \text{ mm}$ BK with $F_w \geq 25 \text{ mm}$

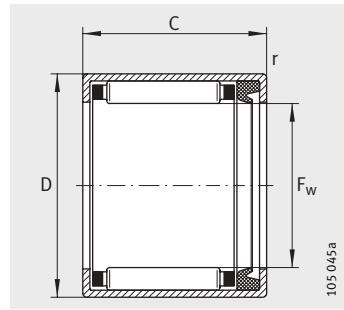
| Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed | Suitable inner rings (to be ordered separately) | |
|--------------------|------------------------|--------------------|----------------------------|----------------------------|--|---------------------|
| dyn. C_r N | stat. C_{or} N | C_{ur} N | n_G min^{-1} | n_B min^{-1} | LR Designation | IR Designation |
| 7 500 | 10 500 | 1 360 | 11 200 | 8 400 | — | — |
| 9 100 | 13 400 | 1 600 | 11 200 | 8 300 | — | IR17X22X13 |
| 13 400 | 22 100 | 2 800 | 11 200 | 8 000 | — | IR17X22X16 |
| 16 500 | 29 000 | 3 850 | 11 200 | 7 900 | — | IR17X22X23 |
| 11 000 | 15 200 | 1 990 | 9 800 | 7 300 | LR20X25X12,5 | — |
| 15 600 | 24 000 | 3 150 | 9 800 | 7 100 | LR20X25X16,5 | IR20X25X17 |
| 19 900 | 33 000 | 4 200 | 9 800 | 7 000 | LR20X25X20,5 | IR20X25X20,5 |
| 25 500 | 45 000 | 6 200 | 9 800 | 6 900 | LR20X25X26,5 | IR20X25X26,5 |
| 34 000 | 66 000 | 8 400 | 9 800 | 6 900 | LR20X25X38,5 | IR20X25X38,5 |
| 16 400 | 26 500 | 3 450 | 8 900 | 6 500 | — | IR22X28X17 |
| 20 900 | 36 000 | 4 650 | 8 900 | 6 400 | LR22X28X20,5 | IR22X28X20,5 |
| 12 100 | 18 200 | 2 390 | 8 400 | 6 300 | LR25X30X12,5 | — |
| 17 200 | 29 000 | 3 750 | 8 400 | 6 100 | LR25X30X16,5 | IR25X30X17 |
| 22 000 | 39 500 | 5 100 | 8 400 | 6 000 | LR25X30X20,5 | IR25X30X20,5 |
| 24 800 | 46 000 | 6 100 | 8 400 | 5 900 | — | — |
| 28 000 | 54 000 | 7 400 | 8 400 | 5 900 | LR25X30X26,5 | IR25X30X26,5 |
| 37 500 | 79 000 | 10 100 | 8 400 | 5 900 | LR25X30X38,5 | IR25X30X38,5 |
| 23 000 | 42 500 | 5 500 | 7 900 | 5 700 | LR28X32X20 | — |
| 27 500 | 54 000 | 7 300 | 7 900 | 5 600 | — | — |
| 13 100 | 21 300 | 2 800 | 7 300 | 5 500 | LR30X35X12,5 | — |
| 18 700 | 33 500 | 4 400 | 7 300 | 5 400 | LR30X35X16,5 | IR30X35X17 |
| 23 800 | 46 000 | 5 900 | 7 300 | 5 300 | LR30X35X20,5 | IR30X35X20,5 |
| 14 000 | 24 300 | 3 200 | 6 400 | 4 950 | LR35X40X12,5 | — |
| 20 000 | 38 500 | 5 000 | 6 400 | 4 800 | LR35X40X16,5 | IR35X40X17 |
| 25 500 | 52 000 | 6 800 | 6 400 | 4 750 | LR35X40X20,5 | IR35X40X20,5 |
| 14 900 | 27 500 | 3 600 | 5 800 | 4 500 | — | — |
| 21 300 | 43 000 | 5 700 | 5 800 | 4 400 | LR40X45X16,5 | IR40X45X17 |
| 27 000 | 59 000 | 7 600 | 5 800 | 4 300 | LR40X45X20,5 | IR40X45X20,5 |
| 31 000 | 63 000 | 8 200 | 5 200 | 3 950 | LR45X50X20,5 | — |
| 38 500 | 84 000 | 11 700 | 5 200 | 3 900 | LR45X50X25,5 | IR45X50X25,5 |
| 31 500 | 67 000 | 8 700 | 4 750 | 3 650 | LR50X55X20,5 | — |
| 44 000 | 103 000 | 14 700 | 4 750 | 3 600 | — | — |
| 17 400 | 32 000 | 4 250 | 4 400 | 3 650 | — | — |
| 33 500 | 75 000 | 9 800 | 4 400 | 3 400 | — | — |
| 53 000 | 135 000 | 19 700 | 4 400 | 3 300 | — | — |



Drawn cup needle roller bearings with open ends

Drawn cup needle roller bearings with closed end

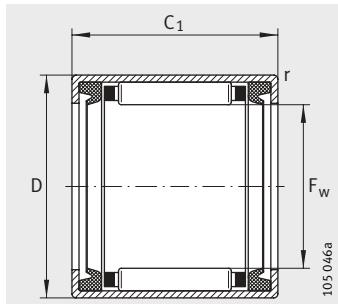
Sealed



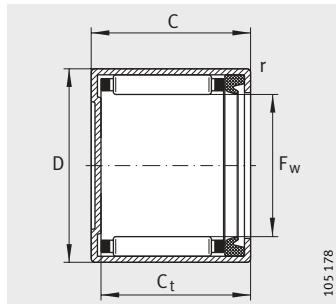
HK..-RS

Dimension table · Dimensions in mm

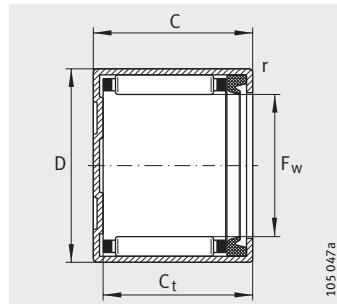
| Drawn cup needle roller bearings with open ends | | | | Drawn cup needle roller bearing with closed end | | Dimensions | | | |
|---|--------------|----------------------|--------------|---|--------------|----------------|----|------|----------------|
| Sealed on one side | | Sealed on both sides | | Sealed | | F _w | D | C | C ₁ |
| Designation | Mass m ≈g | Designation | Mass m ≈g | Designation | Mass m ≈g | | | -0,3 | -0,3 |
| – | – | HK0810-2RS | 3,2 | – | – | 8 | 12 | – | 10 |
| HK0810-RS | 3 | HK0812-2RS | 3,3 | – | – | 8 | 12 | 10 | 12 |
| HK0812-RS | 3,1 | – | – | – | – | 8 | 12 | 12 | – |
| – | – | HK1012-2RS | 4,3 | – | – | 10 | 14 | – | 12 |
| HK1012-RS | 4,2 | HK1014-2RS | 4,6 | BK1012-RS | 4,3 | 10 | 14 | 12 | 14 |
| – | – | HK1214-2RS | 8 | – | – | 12 | 16 | – | 14 |
| HK1214-RS | 10 | HK1216-2RS | 11 | – | – | 12 | 18 | 14 | 16 |
| HK1414-RS | 12 | HK1416-2RS | 13 | BK1414-RS | 13 | 14 | 20 | 14 | 16 |
| HK1514-RS | 12 | HK1516-2RS | 15 | – | – | 15 | 21 | 14 | 16 |
| HK1518-RS | 16 | HK1520-2RS | 18 | – | – | 15 | 21 | 18 | 20 |
| HK1614-RS | 13 | HK1616-2RS | 14 | BK1614-RS | 15 | 16 | 22 | 14 | 16 |
| – | – | HK1620-2RS | 18 | – | – | 16 | 22 | – | 20 |
| HK1814-RS | 14 | HK1816-2RS | 15 | – | – | 18 | 24 | 14 | 16 |
| – | – | HK2016-2RS | 18 | – | – | 20 | 26 | – | 16 |
| HK2018-RS | 21 | HK2020-2RS | 23 | BK2018-RS | 24 | 20 | 26 | 18 | 20 |
| HK2214-RS | 16 | HK2216-2RS | 18 | – | – | 22 | 28 | 14 | 16 |
| HK2218-RS | 24 | HK2220-2RS | 26 | – | – | 22 | 28 | 18 | 20 |
| – | – | HK2516-2RS | 27 | – | – | 25 | 32 | – | 16 |
| HK2518-RS | 29 | HK2520-2RS | 31 | BK2518-RS | 34 | 25 | 32 | 18 | 20 |
| – | – | HK2524-2RS | 40 | – | – | 25 | 32 | – | 24 |
| – | – | HK2530-2RS | 47 | – | – | 25 | 32 | – | 30 |
| HK2818-RS | 31 | HK2820-2RS | 34 | – | – | 28 | 35 | 18 | 20 |
| – | – | HK3016-2RS | 31 | – | – | 30 | 37 | – | 16 |
| HK3018-RS | 37 | HK3020-2RS | 36 | – | – | 30 | 37 | 18 | 20 |
| – | – | HK3024-2RS | 44 | – | – | 30 | 37 | – | 24 |
| – | – | HK3516-2RS | 32 | – | – | 35 | 42 | – | 16 |
| HK3518-RS | 39 | HK3520-2RS | 41 | – | – | 35 | 42 | 18 | 20 |
| – | – | HK4016-2RS | 37 | – | – | 40 | 47 | – | 16 |
| HK4018-RS | 45 | HK4020-2RS | 48 | – | – | 40 | 47 | 18 | 20 |
| HK4518-RS | 50 | HK4520-2RS | 54 | – | – | 45 | 52 | 18 | 20 |
| HK5022-RS | 76 | HK5024-2RS | 81 | – | – | 50 | 58 | 22 | 24 |



HK..-2RS



BK..-RS with Fw < 25 mm



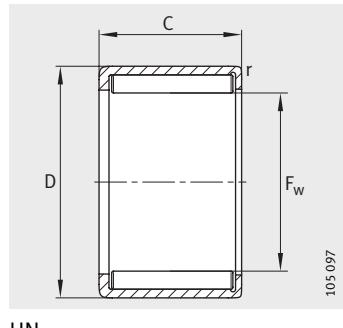
BK..-RS with Fw ≥ 25 mm

| | | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G grease min ⁻¹ | Suitable inner rings (to be ordered separately) | | | | |
|------------------------|-----------|-----------------------------|-------------------------------|--|--|---|-------------------|------------------------------------|--|--|
| C _t min. | r min. | dyn. C _r N | stat. C _{0r} N | | | For HK..-RS and HK..-2RS | | For BK..-RS, LR, IR Designation | | |
| | | | | | | LR Designation | IR Designation | | | |
| – | 0,4 | 2 180 | 1 930 | 265 | 28 000 | – | – | – | | |
| – | 0,4 | 2 750 | 2 600 | 290 | 28 000 | – | – | – | | |
| – | 0,4 | 3 800 | 3 950 | 500 | 28 000 | – | – | – | | |
| – | 0,4 | 3 200 | 3 350 | 380 | 23 300 | – | – | – | | |
| – | 0,4 | 4 400 | 5 100 | 650 | 23 300 | – | – | – | | |
| – | 0,4 | 4 950 | 6 200 | 800 | 20 000 | – | – | – | | |
| – | 0,8 | 6 500 | 7 300 | 860 | 18 700 | – | – | – | | |
| 11,3 | 0,8 | 7 100 | 8 500 | 1 010 | 16 500 | – | – | – | | |
| – | 0,8 | 7 800 | 9 800 | 1 190 | 15 600 | LR12X15X16,5 | IR12X15X16,5 | LR12X15X12,5 | | |
| – | 0,8 | 10 500 | 14 400 | 1 780 | 15 600 | – | – | – | | |
| 11,3 | 0,8 | 7 600 | 9 700 | 1 160 | 14 700 | – | IR12X16X20 | IR12X16X13 | | |
| – | 0,8 | 10 900 | 15 300 | 1 900 | 14 700 | – | – | – | | |
| – | 0,8 | 8 100 | 10 900 | 1 300 | 13 300 | LR15X18X16,5 | IR15X18X16,5 | – | | |
| – | 0,8 | 8 600 | 12 100 | 1 450 | 12 200 | LR17X20X16,5 | IR17X20X16,5 | – | | |
| 15,3 | 0,8 | 12 700 | 20 100 | 2 500 | 12 200 | LR17X20X20,5 | IR17X20X20,5 | LR17X20X16,5 | | |
| – | 0,8 | 9 100 | 13 400 | 1 600 | 11 200 | – | IR17X22X16 | – | | |
| – | 0,8 | 13 400 | 22 100 | 2 800 | 11 200 | – | IR17X22X23 | – | | |
| – | 0,8 | 11 000 | 15 200 | 1 990 | 9 800 | LR20X25X16,5 | IR20X25X17 | – | | |
| 15,3 | 0,8 | 15 600 | 24 000 | 3 150 | 9 800 | LR20X25×20,5 | IR20X25X20,5 | LR20X25X16,5 | | |
| – | 0,8 | 19 900 | 33 000 | 4 200 | 9 800 | – | – | – | | |
| – | 0,8 | 25 500 | 45 000 | 6 200 | 9 800 | – | IR20X25X30 | – | | |
| – | 0,8 | 16 400 | 26 500 | 3 450 | 8 900 | LR22X28X20,5 | IR22X28X20,5 | – | | |
| – | 0,8 | 12 100 | 18 200 | 2 390 | 8 400 | LR25X30X16,5 | IR25X30X17 | – | | |
| – | 0,8 | 17 200 | 29 000 | 3 750 | 8 400 | LR25X30X20,5 | IR25X30X20,5 | – | | |
| – | 0,8 | 22 000 | 39 500 | 5 100 | 8 400 | – | – | – | | |
| – | 0,8 | 13 100 | 21 300 | 2 800 | 7 300 | LR30X35X16,5 | IR30X35X17 | – | | |
| – | 0,8 | 18 700 | 33 500 | 4 400 | 7 300 | LR30X35X20,5 | IR30X35X20,5 | – | | |
| – | 0,8 | 14 000 | 24 300 | 3 200 | 6 400 | LR35X40X16,5 | IR35X40X17 | – | | |
| – | 0,8 | 20 000 | 38 500 | 5 000 | 6 400 | LR35X40X20,5 | IR35X40X20,5 | – | | |
| – | 0,8 | 21 300 | 43 000 | 5 700 | 5 800 | LR40X45X20,5 | IR40X45X20,5 | – | | |
| – | 0,8 | 31 000 | 63 000 | 8 200 | 5 200 | LR45X50X25,5 | IR45X50X25,5 | – | | |



Drawn cup needle roller bearings with open ends

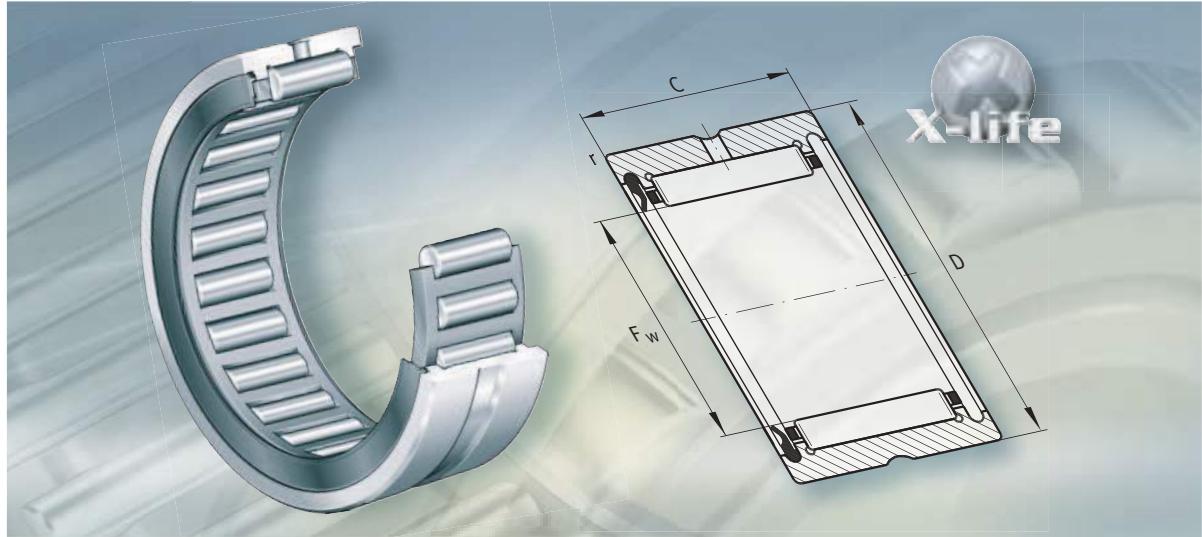
Full complement needle roller set



HN

Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G grease min ⁻¹ | Reference speed n _B min ⁻¹ |
|---------------|-----------------|----------------|----|----|-----------|-----------------------------|-------------------------------|---|---|---|
| | | F _w | D | C | r min. | dyn. C _r N | stat. C _{0r} N | | | |
| HN1010 | 4,6 | 10 | 14 | 10 | 0,4 | 7 200 | 11 100 | 1 540 | 10 000 | 13 300 |
| HN1210 | 5,3 | 12 | 16 | 10 | 0,4 | 8 000 | 13 400 | 1 850 | 8 600 | 11 300 |
| HN1212 | 10,5 | 12 | 18 | 12 | 0,8 | 10 200 | 15 200 | 1 950 | 8 000 | 10 800 |
| HN1412 | 12 | 14 | 20 | 12 | 0,8 | 11 000 | 17 500 | 2 260 | 7 100 | 9 500 |
| HN1516 | 14 | 15 | 21 | 16 | 0,8 | 15 400 | 27 500 | 3 600 | 6 700 | 8 700 |
| HN1612 | 13 | 16 | 22 | 12 | 0,8 | 12 000 | 20 300 | 2 600 | 6 300 | 8 400 |
| HN1816 | 20 | 18 | 24 | 16 | 0,8 | 17 000 | 32 500 | 4 250 | 5 700 | 7 500 |
| HN2016 | 22 | 20 | 26 | 16 | 0,8 | 18 100 | 36 500 | 4 750 | 5 200 | 6 800 |
| HN2020 | 29,5 | 20 | 26 | 20 | 0,8 | 22 400 | 48 000 | 6 600 | 5 200 | 6 700 |
| HN2520 | 39,6 | 25 | 32 | 20 | 0,8 | 28 000 | 59 000 | 7 900 | 4 200 | 5 500 |
| HN2820 | 44 | 28 | 35 | 20 | 0,8 | 30 000 | 67 000 | 9 000 | 3 800 | 4 950 |
| HN3520 | 54 | 35 | 42 | 20 | 0,8 | 33 500 | 83 000 | 11 100 | 3 100 | 4 100 |
| HN4020 | 60,5 | 40 | 47 | 20 | 0,8 | 36 000 | 95 000 | 12 700 | 2 750 | 3 650 |
| HN4520 | 66 | 45 | 52 | 20 | 0,8 | 38 500 | 108 000 | 14 500 | 2 470 | 3 300 |
| HN4525 | 85 | 45 | 52 | 25 | 0,8 | 47 000 | 139 000 | 19 500 | 2 470 | 3 250 |
| HN5020 | 85,3 | 50 | 58 | 20 | 0,8 | 44 500 | 119 000 | 16 200 | 2 220 | 3 000 |
| HN5025 | 107 | 50 | 58 | 25 | 0,8 | 54 000 | 152 000 | 21 700 | 2 220 | 2 950 |



Machined needle roller bearings

Needle roller bearings with ribs
Needle roller bearings without ribs
Aligning needle roller bearings
Combined needle roller bearings
Inner rings



Machined needle roller bearings

X-life 622

Needle roller bearings with ribs

In needle roller bearings with ribs, the outer ring and the needle roller and cage assembly form a self-retaining unit. These bearings with low radial height and high load capacity are highly suitable for designs with limited radial space. The bearings are available with and without inner rings and in sealed and open versions. Bearings without an inner ring are the best solution for bearing arrangements where the shaft can be hardened and ground. Needle roller bearings with inner ring are used if the shaft cannot be configured as a rolling bearing raceway.

X-life 656

Needle roller bearings without ribs

Needle roller bearings without ribs on the outer ring are not self-retaining. This means that the outer ring, needle roller and cage assembly and inner ring can be fitted independently of each other. This makes fitting of the bearings considerably easier. The bearings are available with and without inner rings and in single and double row versions. Bearings without an inner ring are used if the shaft can be hardened and ground.

X-life 668

Aligning needle roller bearings

Aligning needle roller bearings have a raceway ring with a spherical outside surface and a concave support ring. As a result, they can compensate for static misalignment of the bearing axis by up to 3°, but are not suitable for supporting swivel or wobble type motion. The bearings are available with and without inner ring. Bearings without an inner ring are used if the shaft can be hardened and ground.

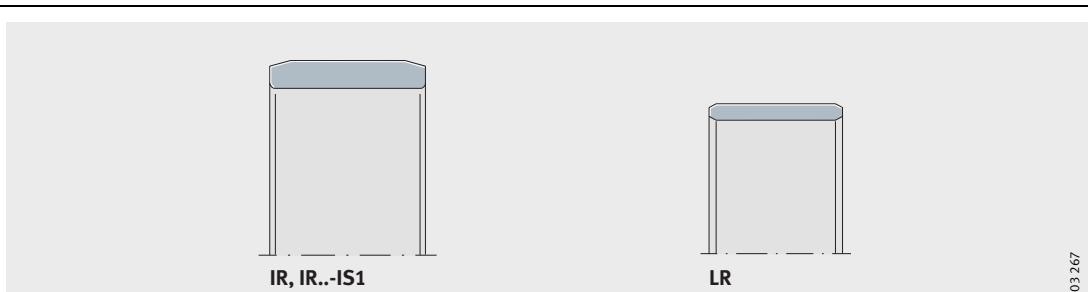
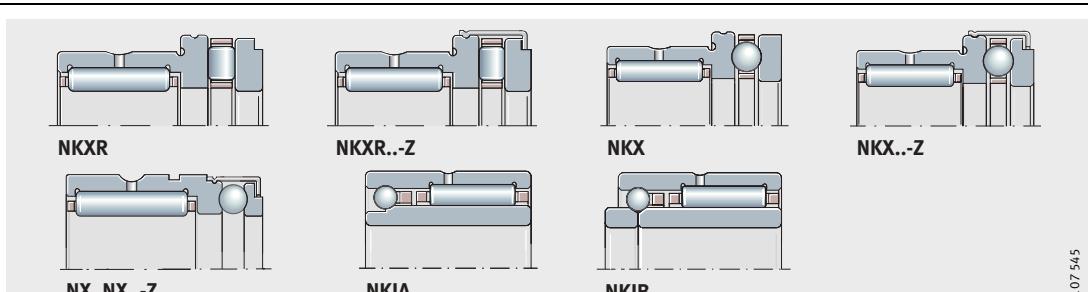
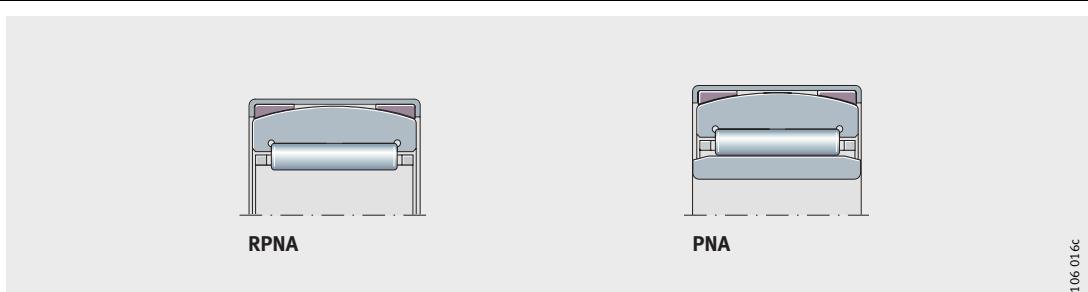
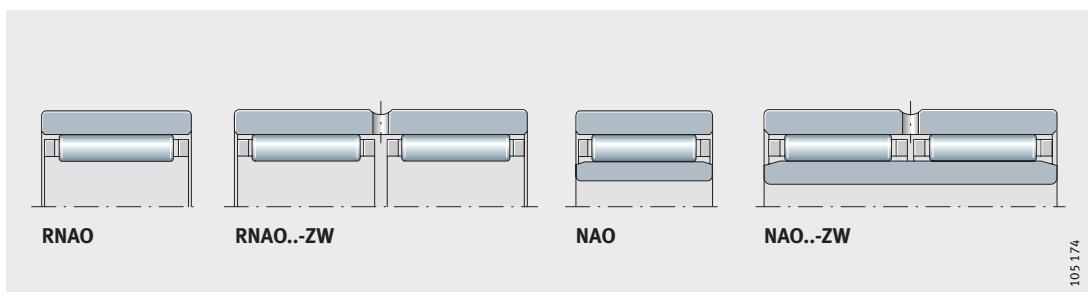
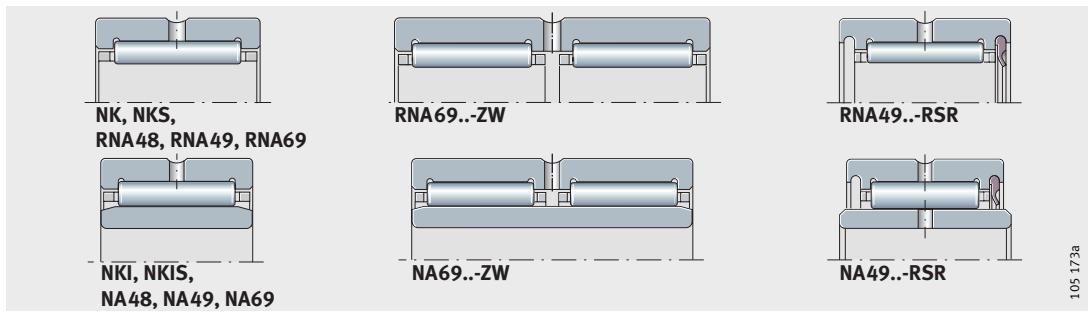
X-life 674

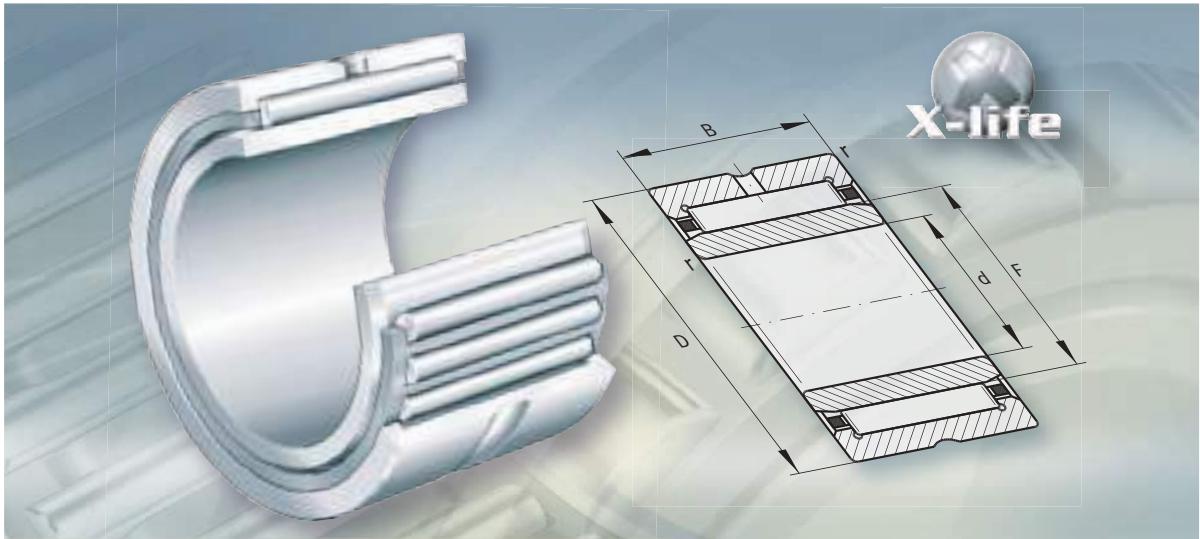
Combined needle roller bearings

Combined needle roller bearings are radial bearings with an axial component capable of supporting loads. Combined needle roller bearings are used as semi-locating or locating bearings. They do not permit any skewing between the shaft and housing. The bearings are available with and without inner ring. Bearings without an inner ring are used if the shaft can be hardened and ground.

Inner rings 690

Inner rings are used as raceways for rolling elements or seal lips where the shaft is unsuitable for this purpose. Where there is considerable axial displacement between the shaft and housing, wider inner rings can be used.





Needle roller bearings with ribs

Needle roller bearings with ribs

| | Page |
|-------------------------------------|--|
| Product overview | Needle roller bearings with ribs 624 |
| Features | X-life 625 Needle roller bearings without inner ring 625 Needle roller bearing with inner ring 625 Operating temperature 625 Cages 625 Suffixes 626 |
| Design and safety guidelines | Raceway for bearings without inner ring 626 Minimum radial load 626 Speeds 626 Sealing rings/wider inner rings 627 Radial location 627 Axial location 627 Fitting note 627 |
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| Dimension tables | Needle roller bearings without inner ring 630 Needle roller bearings with inner ring 642 Needle roller bearings without inner ring, sealed 654 Needle roller bearings with inner ring, sealed 655 |



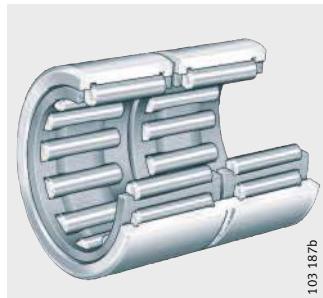
Product overview Needle roller bearings with ribs

Without inner ring
Single row and double row

NK, NKS, RNA48, RNA49,
RNA69



RNA69..-ZW



Lip seals

RNA49..-RSR



RNA49..-2RSR

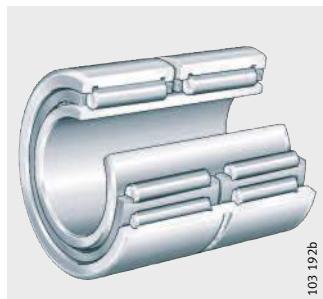


With inner ring
Single row and double row

NKI, NKIS, NA48, NA49,
NA69



NA69..-ZW



Lip seals

NA49..-RSR



NA49..-2RSR



Needle roller bearings with ribs

| | |
|--|---|
| Features | Needle roller bearings with ribs are single or double row units comprising machined outer rings with ribs, needle roller and cage assemblies and removable inner rings. The bearings are available in open and sealed designs. |
| X-life | Needle roller bearings with ribs are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life. |
| Needle roller bearings without inner ring | Bearings without inner ring have particularly compact radial dimensions. However, they require a shaft raceway that is hardened and ground. Bearings RNA69 are double row units with $F_w \geq 40$ mm. |
| Sealing/lubricant | Bearings RNA49..-RSR are sealed on one side and bearings RNA49..-2RSR on both sides by contact seals. They are greased using a lithium complex soap grease to GA08 and can be lubricated. For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring, with the exception of: NK with $F_w \leq 10$ mm. |
| Needle roller bearings with inner ring | Bearings with inner ring are used if the shaft cannot be configured as a rolling bearing raceway. Bearings NA69 are double row units with $d \geq 32$ mm. |
| Sealing/lubricant | Bearings NA49..-RSR are sealed on one side and bearings NA49..-2RSR on both sides by contact seals. They are greased using a lithium complex soap grease to GA08 and can be lubricated. For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring, with the exception of: NKI with $d \leq 7$ mm. |
| Displacement of the inner ring | The standard inner ring allows axial displacement within the values "s" stated in the dimension tables. Where larger displacements occur, the standard ring can be replaced by a wider inner ring IR. Inner rings: see page 690. |
| Operating temperature | Unsealed bearings can be used at operating temperatures from -20 °C to $+120$ °C. Caution! Sealed needle roller bearings are suitable for operating temperatures from -20 °C to $+100$ °C, restricted by the grease and seal material. |
| Cages | The cages are made from sheet steel or plastic. Plastic cages have the suffix TV. Caution! Before using bearings with plastic cages, check the compatibility of the lubricant used with the cage material (PA66-GF/H). |



Needle roller bearings with ribs

| <p>Suffixes</p> <p>Available designs</p> | <p>Suffixes for the available designs: see table.</p> <table border="1"> <thead> <tr> <th>Suffixes</th><th colspan="3">Description</th><th>Design</th></tr> </thead> <tbody> <tr> <td>C3</td><td colspan="3">Radial internal clearance larger than normal</td><td>Special design¹⁾</td></tr> <tr> <td>P5</td><td colspan="3">High dimensional and geometrical accuracy</td><td>Special design¹⁾</td></tr> <tr> <td>RSR</td><td colspan="3">Contact seal on one side</td><td>Standard</td></tr> <tr> <td>TV²⁾</td><td colspan="3">Cage made from glass fibre reinforced polyamide 66</td><td>Standard</td></tr> <tr> <td>ZW³⁾</td><td colspan="3">Double row</td><td>Standard</td></tr> <tr> <td>2RSR</td><td colspan="3">Contact seals on both sides</td><td>Standard</td></tr> </tbody> </table> | | | | | | Suffixes | Description | | | Design | C3 | Radial internal clearance larger than normal | | | Special design ¹⁾ | P5 | High dimensional and geometrical accuracy | | | Special design ¹⁾ | RSR | Contact seal on one side | | | Standard | TV ²⁾ | Cage made from glass fibre reinforced polyamide 66 | | | Standard | ZW ³⁾ | Double row | | | Standard | 2RSR | Contact seals on both sides | | | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--------|------------------------------|---|------------------------|---|-------------|--|--|--------|-------------------|--|---------------------|------|------------------------------|-------|---|-------|--|------------------------------|-----|--------------------------|----|----|----------|------------------|--|-----|-----|----------|------------------|------------|----|----|---|------|-----------------------------|----|----|----------|---------------------------------------|-----|-----|----|----|----|--|-----|-----|----|----|----|--|-----|-----|----|----|----|--|-----|-----|----|----|----|--|-----|-----|----|----|----|--|-----|-----|----|----|----|--|--|--|
| Suffixes | Description | | | Design | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C3 | Radial internal clearance larger than normal | | | Special design ¹⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P5 | High dimensional and geometrical accuracy | | | Special design ¹⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RSR | Contact seal on one side | | | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TV ²⁾ | Cage made from glass fibre reinforced polyamide 66 | | | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ZW ³⁾ | Double row | | | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2RSR | Contact seals on both sides | | | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <p>¹⁾ Available by agreement.</p> <p>²⁾ Bearings with plastic cage: see dimension tables.</p> <p>³⁾ Dependent on size.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Design and safety guidelines</p> <p>Raceway for bearings without inner ring</p> | <p>Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV, the hardening depth CHD or Rht must be sufficiently large.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Raceway design</p> | <table border="1"> <thead> <tr> <th colspan="2">Shaft diameter Nominal dimension mm</th> <th colspan="3">Shaft tolerance Operating clearance</th> <th>Roughness max.</th> <th>Round- ness max.</th> <th>Parallelism max.</th> </tr> <tr> <th>over</th> <th>incl.</th> <th>Small</th> <th>Normal</th> <th>Large</th> <td></td> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>-</td> <td>65</td> <td>k5</td> <td>h5</td> <td>g6</td> <td>R_a0,1 (R_z0,4)</td> <td rowspan="8">IT3</td> <td rowspan="8">IT3</td> </tr> <tr> <td>65</td> <td>80</td> <td>k5</td> <td>h5</td> <td>f6</td> <td>R_a0,15 (R_z0,63)</td> </tr> <tr> <td>80</td> <td>120</td> <td>k5</td> <td>g5</td> <td>f6</td> <td>R_a0,2 (R_z1)</td> </tr> <tr> <td>120</td> <td>160</td> <td>k5</td> <td>g5</td> <td>f6</td> <td></td> </tr> <tr> <td>160</td> <td>180</td> <td>k5</td> <td>g5</td> <td>e6</td> <td></td> </tr> <tr> <td>180</td> <td>200</td> <td>j5</td> <td>g5</td> <td>e6</td> <td></td> </tr> <tr> <td>200</td> <td>250</td> <td>j5</td> <td>f6</td> <td>e6</td> <td></td> </tr> <tr> <td>250</td> <td>315</td> <td>h5</td> <td>f6</td> <td>e6</td> <td></td> </tr> <tr> <td>315</td> <td>415</td> <td>g5</td> <td>f6</td> <td>d6</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | | | | | | Shaft diameter Nominal dimension mm | | Shaft tolerance Operating clearance | | | Roughness max. | Round- ness max. | Parallelism max. | over | incl. | Small | Normal | Large | | | | - | 65 | k5 | h5 | g6 | R _a 0,1 (R _z 0,4) | IT3 | IT3 | 65 | 80 | k5 | h5 | f6 | R _a 0,15 (R _z 0,63) | 80 | 120 | k5 | g5 | f6 | R _a 0,2 (R _z 1) | 120 | 160 | k5 | g5 | f6 | | 160 | 180 | k5 | g5 | e6 | | 180 | 200 | j5 | g5 | e6 | | 200 | 250 | j5 | f6 | e6 | | 250 | 315 | h5 | f6 | e6 | | 315 | 415 | g5 | f6 | d6 | | | |
| Shaft diameter Nominal dimension mm | | Shaft tolerance Operating clearance | | | Roughness max. | Round- ness max. | Parallelism max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| over | incl. | Small | Normal | Large | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - | 65 | k5 | h5 | g6 | R _a 0,1 (R _z 0,4) | IT3 | IT3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65 | 80 | k5 | h5 | f6 | R _a 0,15 (R _z 0,63) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | 120 | k5 | g5 | f6 | R _a 0,2 (R _z 1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 120 | 160 | k5 | g5 | f6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 160 | 180 | k5 | g5 | e6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 180 | 200 | j5 | g5 | e6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 200 | 250 | j5 | f6 | e6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 250 | 315 | h5 | f6 | e6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 315 | 415 | g5 | f6 | d6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Caution!</p> | <p>The values apply to housing tolerances up to K7. For tighter housing bores, the operating clearance should be checked by either calculation or measurement.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Minimum radial load</p> | <p>In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. In continuous operation, a minimum radial load of the order of $C_r/P < 50$ is necessary.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Speeds</p> <p>Caution!</p> | <p>The limiting speeds n_G for series RNA49..-RSR (2RSR) and NA49..-RSR (2RSR) are valid for grease lubrication.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Sealing rings/ wider inner rings

Sealing rings of series G, GR and SD are matched to the bearing dimensions and can be combined with wider inner rings IR. The outer surface of the inner rings can be used as the sliding surface for seal lips.

Sealing rings: see publication GSD, inner rings: see page 690.

Radial location

Needle roller bearings with inner ring are radially located by means of a close fit on the shaft and in the housing.

Axial location

In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking, *Figure 1* and *Figure 2*.

The abutting shoulders (shaft/housing) should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must be designed with rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r as given in the dimension tables.

The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

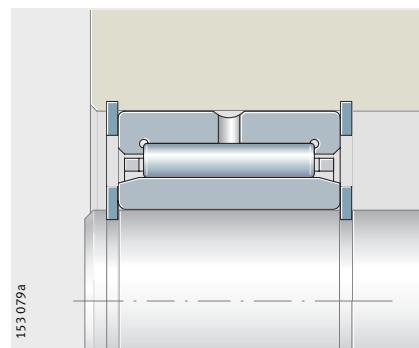


Figure 1

Axial location by snap rings

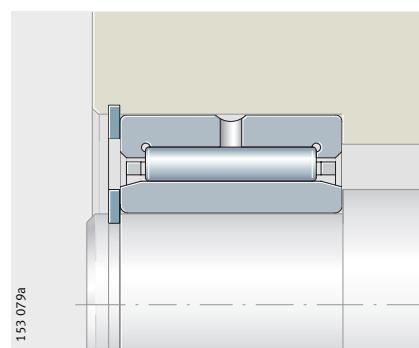


Figure 2

Axial location by snap rings
and abutting shoulders

Fitting instruction

Caution!

Combined needle roller bearings are not self-retaining.
Since the individual bearing parts are matched to each other,
the parts of bearings of identical size must not be interchanged
during fitting.



Needle roller bearings with ribs

Accuracy The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620.

Radial internal clearance Bearings with inner ring have a radial internal clearance of CN.

Radial internal clearance to DIN 620-4

| Bore d mm | incl. | Radial internal clearance | | | |
|-----------------|-------|---------------------------|----------|------|-----|
| | | CN μm | C3 μm | | |
| over | min. | max. | min. | max. | |
| – | 24 | 20 | 45 | 35 | 60 |
| 24 | 30 | 20 | 45 | 35 | 60 |
| 30 | 40 | 25 | 50 | 45 | 70 |
| 40 | 50 | 30 | 60 | 50 | 80 |
| 50 | 65 | 40 | 70 | 60 | 90 |
| 65 | 80 | 40 | 75 | 65 | 100 |
| 80 | 100 | 50 | 85 | 75 | 110 |
| 100 | 120 | 50 | 90 | 85 | 125 |
| 120 | 140 | 60 | 105 | 100 | 145 |
| 140 | 160 | 70 | 120 | 115 | 165 |
| 160 | 180 | 75 | 125 | 120 | 170 |
| 180 | 200 | 90 | 145 | 140 | 195 |
| 200 | 225 | 105 | 165 | 160 | 220 |
| 225 | 250 | 110 | 175 | 170 | 235 |
| 250 | 280 | 125 | 195 | 190 | 260 |
| 280 | 315 | 130 | 205 | 200 | 275 |
| 315 | 355 | 145 | 225 | 225 | 305 |
| 355 | 400 | 190 | 280 | 280 | 370 |
| 400 | 450 | 210 | 310 | 310 | 410 |
| 450 | 500 | 220 | 330 | 330 | 440 |

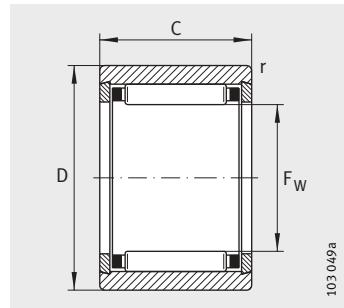
Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance. The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway. For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.



Needle roller bearings

Without inner ring

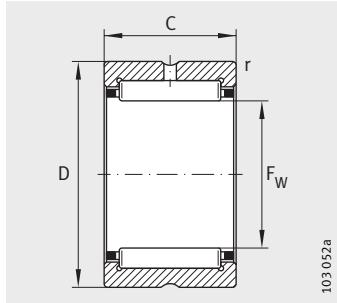


NK ($F_w \leq 10$ mm)

Dimension table · Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | |
|--------------------------|---------|-----------------|------------|------|----|-----------|-----|------|
| | | | F_w | D | C | r min. | | |
| NK5/10-TV ¹⁾ | - | - | XL | 3,1 | 5 | 10 | 10 | 0,15 |
| NK5/12-TV ¹⁾ | - | - | XL | 3,7 | 5 | 10 | 12 | 0,15 |
| NK6/10-TV ¹⁾ | - | - | XL | 4,7 | 6 | 12 | 10 | 0,15 |
| NK6/12-TV ¹⁾ | - | - | XL | 5,7 | 6 | 12 | 12 | 0,15 |
| NK7/10-TV ¹⁾ | - | - | XL | 6,9 | 7 | 14 | 10 | 0,3 |
| NK7/12-TV ¹⁾ | - | - | XL | 8,2 | 7 | 14 | 12 | 0,3 |
| NK8/12-TV ¹⁾ | - | - | XL | 8,7 | 8 | 15 | 12 | 0,3 |
| NK8/16-TV ¹⁾ | - | - | XL | 12 | 8 | 15 | 16 | 0,3 |
| NK9/12-TV ¹⁾ | - | - | XL | 10,3 | 9 | 16 | 12 | 0,3 |
| NK9/16-TV ¹⁾ | - | - | XL | 12,8 | 9 | 16 | 16 | 0,3 |
| NK10/12-TV ¹⁾ | - | - | XL | 10,1 | 10 | 17 | 12 | 0,3 |
| NK10/16-TV ¹⁾ | - | - | XL | 13,3 | 10 | 17 | 16 | 0,3 |
| NK12/12 | - | - | XL | 12,1 | 12 | 19 | 12 | 0,3 |
| NK12/16 | - | - | XL | 15,9 | 12 | 19 | 16 | 0,3 |
| NK14/16 | - | - | XL | 20,7 | 14 | 22 | 16 | 0,3 |
| NK14/20 | - | - | XL | 25,5 | 14 | 22 | 20 | 0,3 |
| - | RNA4900 | - | XL | 16,5 | 14 | 22 | 13 | 0,3 |
| NK15/16 | - | - | XL | 21,8 | 15 | 23 | 16 | 0,3 |
| NK15/20 | - | - | XL | 26,6 | 15 | 23 | 20 | 0,3 |
| NK16/16 | - | - | XL | 22,4 | 16 | 24 | 16 | 0,3 |
| NK16/20 | - | - | XL | 28,4 | 16 | 24 | 20 | 0,3 |
| - | RNA4901 | - | XL | 17,4 | 16 | 24 | 13 | 0,3 |
| - | RNA6901 | XL | 31 | 16 | 24 | 22 | 0,3 | |
| NK17/16 | - | - | XL | 23,7 | 17 | 25 | 16 | 0,3 |
| NK17/20 | - | - | XL | 29,8 | 17 | 25 | 20 | 0,3 |
| NK18/16 | - | - | XL | 24,9 | 18 | 26 | 16 | 0,3 |
| NK18/20 | - | - | XL | 31,4 | 18 | 26 | 20 | 0,3 |
| NK19/16 | - | - | XL | 26,1 | 19 | 27 | 16 | 0,3 |
| NK19/20 | - | - | XL | 32,2 | 19 | 27 | 20 | 0,3 |

¹⁾ With closing rings, without lubrication hole and groove.



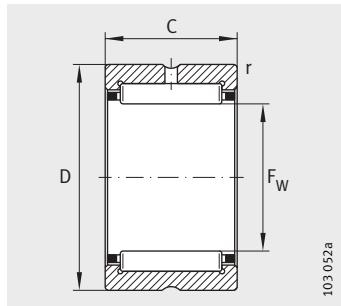
NK ($F_w \geq 12$ mm),
RNA49, RNA69

| Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|--------------------|------------------------|--------------------|----------------------------|----------------------------|
| dyn. C_r N | stat. C_{0r} N | C_{ur} N | n_G min^{-1} | n_B min^{-1} |
| 2 650 | 1 920 | 295 | 36 500 | 43 500 |
| 3 400 | 2 650 | 435 | 36 500 | 42 500 |
| 2 950 | 2 280 | 355 | 33 500 | 35 500 |
| 3 800 | 3 150 | 520 | 33 500 | 35 000 |
| 3 250 | 2 650 | 410 | 31 000 | 30 000 |
| 4 150 | 3 600 | 600 | 31 000 | 29 500 |
| 4 450 | 4 100 | 690 | 29 500 | 27 000 |
| 5 800 | 5 800 | 970 | 29 500 | 26 500 |
| 5 100 | 5 000 | 840 | 28 500 | 24 200 |
| 6 600 | 7 100 | 1 190 | 28 500 | 23 900 |
| 5 300 | 5 500 | 930 | 27 000 | 22 300 |
| 7 000 | 7 800 | 1 310 | 27 000 | 22 000 |
| 7 200 | 7 100 | 1 280 | 25 500 | 19 000 |
| 10 100 | 11 000 | 1 920 | 25 500 | 18 400 |
| 11 400 | 11 500 | 2 100 | 23 600 | 16 100 |
| 14 500 | 15 600 | 2 700 | 23 600 | 15 900 |
| 9 600 | 9 200 | 1 630 | 23 600 | 15 400 |
| 12 100 | 12 700 | 2 320 | 22 900 | 15 200 |
| 15 400 | 17 200 | 3 000 | 22 900 | 14 900 |
| 12 800 | 13 900 | 2 550 | 22 400 | 14 300 |
| 16 300 | 18 800 | 3 250 | 22 400 | 14 000 |
| 10 600 | 10 900 | 1 940 | 22 400 | 13 500 |
| 18 100 | 21 600 | 3 800 | 22 400 | 12 600 |
| 13 500 | 15 000 | 2 750 | 21 800 | 13 600 |
| 17 100 | 20 400 | 3 550 | 21 800 | 13 300 |
| 14 100 | 16 200 | 3 000 | 21 300 | 12 900 |
| 17 900 | 22 000 | 3 850 | 21 300 | 12 600 |
| 14 700 | 17 400 | 3 200 | 20 900 | 12 300 |
| 18 700 | 23 600 | 4 150 | 20 900 | 12 000 |



Needle roller bearings

Without inner ring



NK, NKS, RNA49, RNA69

Dimension table (continued) - Dimensions in mm

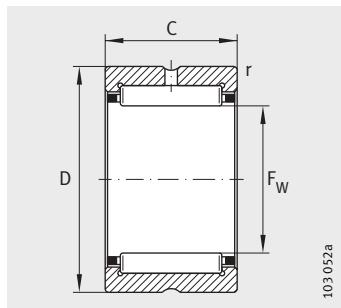
| Designation | | | | X-life | Mass m ≈g | Dimensions | | | |
|-------------------|-----------------|-----------------|--------------|--------|-----------------|----------------|----|----|-----------|
| | | | | | | F _w | D | C | r min. |
| NK20/16 | - | - | - | XL | 27 | 20 | 28 | 16 | 0,3 |
| NK20/20 | - | - | - | XL | 33,9 | 20 | 28 | 20 | 0,3 |
| - | RNA4902 | - | - | XL | 21,7 | 20 | 28 | 13 | 0,3 |
| - | - | RNA6902 | - | XL | 39,7 | 20 | 28 | 23 | 0,3 |
| - | - | - | NKS20 | XL | 48,7 | 20 | 32 | 20 | 0,6 |
| NK21/16 | - | - | - | XL | 28,1 | 21 | 29 | 16 | 0,3 |
| NK21/20 | - | - | - | XL | 35,2 | 21 | 29 | 20 | 0,3 |
| NK22/16 | - | - | - | XL | 30 | 22 | 30 | 16 | 0,3 |
| NK22/20 | - | - | - | XL | 37 | 22 | 30 | 20 | 0,3 |
| - | RNA4903 | - | - | XL | 22,2 | 22 | 30 | 13 | 0,3 |
| - | - | RNA6903 | - | XL | 42,4 | 22 | 30 | 23 | 0,3 |
| - | - | - | NKS22 | XL | 61,5 | 22 | 35 | 20 | 0,6 |
| NK24/16 | - | - | - | XL | 31,9 | 24 | 32 | 16 | 0,3 |
| NK24/20 | - | - | - | XL | 40 | 24 | 32 | 20 | 0,3 |
| - | - | - | NKS24 | XL | 65,5 | 24 | 37 | 20 | 0,6 |
| NK25/16 | - | - | - | XL | 32,6 | 25 | 33 | 16 | 0,3 |
| NK25/20 | - | - | - | XL | 42 | 25 | 33 | 20 | 0,3 |
| - | RNA4904 | - | - | XL | 52,3 | 25 | 37 | 17 | 0,3 |
| - | - | RNA6904 | - | XL | 100 | 25 | 37 | 30 | 0,3 |
| - | - | - | NKS25 | XL | 68,1 | 25 | 38 | 20 | 0,6 |
| NK26/16 | - | - | - | XL | 34 | 26 | 34 | 16 | 0,3 |
| NK26/20 | - | - | - | XL | 42 | 26 | 34 | 20 | 0,3 |
| NK28/20 | - | - | - | XL | 52,2 | 28 | 37 | 20 | 0,3 |
| NK28/30 | - | - | - | XL | 82 | 28 | 37 | 30 | 0,3 |
| - | RNA49/22 | - | - | XL | 50,2 | 28 | 39 | 17 | 0,3 |
| - | - | RNA69/22 | - | XL | 98 | 28 | 39 | 30 | 0,3 |
| - | - | - | NKS28 | XL | 83,6 | 28 | 42 | 20 | 0,6 |
| NK29/20-TV | - | - | - | XL | 50 | 29 | 38 | 20 | 0,3 |
| NK29/30 | - | - | - | XL | 84,3 | 29 | 38 | 30 | 0,3 |
| NK30/20-TV | - | - | - | XL | 61 | 30 | 40 | 20 | 0,3 |
| NK30/30-TV | - | - | - | XL | 92,4 | 30 | 40 | 30 | 0,3 |
| - | RNA4905 | - | - | XL | 61 | 30 | 42 | 17 | 0,3 |
| - | - | RNA6905 | - | XL | 112 | 30 | 42 | 30 | 0,3 |
| - | - | - | NKS30 | XL | 104 | 30 | 45 | 22 | 0,6 |

| Basic load ratings | | Fatigue limit load C_{ur} | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|--------------------|-------------------|--------------------------------|--|---|
| dyn. C_r | stat. C_{0r} | N | | |
| 14 600 | 17 500 | 3 200 | 20 400 | 11 900 |
| 18 600 | 23 800 | 4 150 | 20 400 | 11 600 |
| 12 000 | 13 600 | 2 430 | 20 400 | 10 800 |
| 19 500 | 25 500 | 4 450 | 20 400 | 10 600 |
| 26 000 | 25 000 | 4 400 | 18 800 | 10 700 |
| 15 200 | 18 700 | 3 450 | 19 600 | 11 400 |
| 19 300 | 25 500 | 4 450 | 19 600 | 11 100 |
| 15 800 | 19 900 | 3 650 | 18 800 | 10 900 |
| 20 000 | 27 000 | 4 700 | 18 800 | 10 700 |
| 12 400 | 14 600 | 2 600 | 18 800 | 9 900 |
| 21 100 | 29 000 | 5 100 | 18 800 | 9 500 |
| 27 500 | 28 000 | 4 900 | 17 200 | 9 700 |
| 16 900 | 22 300 | 4 100 | 17 500 | 10 100 |
| 21 400 | 30 500 | 5 300 | 17 500 | 9 800 |
| 29 500 | 31 000 | 5 400 | 16 100 | 9 100 |
| 16 800 | 22 400 | 4 150 | 16 900 | 9 800 |
| 21 300 | 30 500 | 5 300 | 16 900 | 9 600 |
| 23 700 | 25 500 | 4 600 | 15 800 | 8 900 |
| 40 500 | 51 000 | 9 100 | 15 800 | 8 500 |
| 31 000 | 33 500 | 5 800 | 15 600 | 8 700 |
| 17 300 | 23 600 | 4 350 | 16 300 | 9 500 |
| 22 000 | 32 000 | 5 600 | 16 300 | 9 300 |
| 24 800 | 34 000 | 5 900 | 15 100 | 8 600 |
| 37 000 | 57 000 | 10 500 | 15 100 | 8 400 |
| 26 000 | 29 500 | 5 300 | 14 600 | 8 000 |
| 42 000 | 55 000 | 9 900 | 14 600 | 7 800 |
| 32 500 | 36 500 | 6 400 | 14 000 | 7 900 |
| 27 500 | 39 000 | 6 800 | 14 600 | 8 500 |
| 37 000 | 57 000 | 10 600 | 14 600 | 8 100 |
| 28 000 | 41 000 | 7 200 | 14 600 | 8 200 |
| 42 000 | 69 000 | 12 700 | 14 000 | 7 500 |
| 26 500 | 31 500 | 5 700 | 13 600 | 7 400 |
| 44 000 | 59 000 | 10 600 | 13 600 | 7 200 |
| 36 500 | 40 000 | 6 900 | 13 100 | 7 600 |



Needle roller bearings

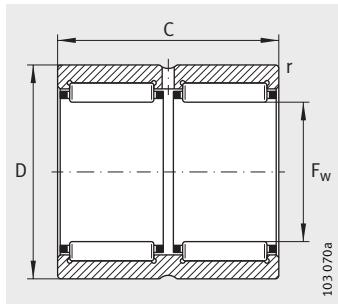
Without inner ring



NK, NKS, RNA49, RNA69

Dimension table (continued) - Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | | |
|-------------------|-----------------|--------------------|----------------|----|------|-----------|----|----|-----|
| | | | F _w | D | C | r min. | | | |
| NK32/20-TV | - | - | - | XL | 64 | 32 | 42 | 20 | 0,3 |
| NK32/30 | - | - | - | XL | 102 | 32 | 42 | 30 | 0,3 |
| - | RNA49/28 | - | - | XL | 73,2 | 32 | 45 | 17 | 0,3 |
| - | - | RNA69/28 | - | XL | 135 | 32 | 45 | 30 | 0,3 |
| - | - | - | NKS32 | XL | 110 | 32 | 47 | 22 | 0,6 |
| NK35/20-TV | - | - | - | XL | 69,4 | 35 | 45 | 20 | 0,3 |
| NK35/30-TV | - | - | - | XL | 106 | 35 | 45 | 30 | 0,3 |
| - | RNA4906 | - | - | XL | 69,4 | 35 | 47 | 17 | 0,3 |
| - | - | RNA6906 | - | XL | 126 | 35 | 47 | 30 | 0,3 |
| - | - | - | NKS35 | XL | 118 | 35 | 50 | 22 | 0,6 |
| NK37/20 | - | - | - | XL | 77 | 37 | 47 | 20 | 0,3 |
| NK37/30 | - | - | - | XL | 113 | 37 | 47 | 30 | 0,3 |
| - | - | - | NKS37 | XL | 123 | 37 | 52 | 22 | 0,6 |
| NK38/20 | - | - | - | XL | 79,4 | 38 | 48 | 20 | 0,3 |
| NK38/30 | - | - | - | XL | 116 | 38 | 48 | 30 | 0,3 |
| NK40/20-TV | - | - | - | XL | 78 | 40 | 50 | 20 | 0,3 |
| NK40/30 | - | - | - | XL | 125 | 40 | 50 | 30 | 0,3 |
| - | RNA49/32 | - | - | XL | 89,1 | 40 | 52 | 20 | 0,6 |
| - | - | RNA69/32-ZW | - | XL | 162 | 40 | 52 | 36 | 0,6 |
| - | - | - | NKS40 | XL | 129 | 40 | 55 | 22 | 0,6 |
| NK42/20 | - | - | - | XL | 85,8 | 42 | 52 | 20 | 0,3 |
| NK42/30 | - | - | - | XL | 130 | 42 | 52 | 30 | 0,3 |
| - | RNA4907 | - | - | XL | 107 | 42 | 55 | 20 | 0,6 |
| - | - | RNA6907-ZW | - | XL | 193 | 42 | 55 | 36 | 0,6 |
| NK43/20 | - | - | - | XL | 86 | 43 | 53 | 20 | 0,3 |
| NK43/30 | - | - | - | XL | 133 | 43 | 53 | 30 | 0,3 |
| - | - | - | NKS43 | XL | 139 | 43 | 58 | 22 | 0,6 |
| NK45/20-TV | - | - | - | XL | 85,3 | 45 | 55 | 20 | 0,3 |
| NK45/30-TV | - | - | - | XL | 132 | 45 | 55 | 30 | 0,3 |
| - | - | - | NKS45 | XL | 145 | 45 | 60 | 22 | 0,6 |
| NK47/20 | - | - | - | XL | 94,5 | 47 | 57 | 20 | 0,3 |
| NK47/30 | - | - | - | XL | 142 | 47 | 57 | 30 | 0,3 |
| - | RNA4908 | - | - | XL | 140 | 48 | 62 | 22 | 0,6 |
| - | - | RNA6908-ZW | - | XL | 256 | 48 | 62 | 40 | 0,6 |



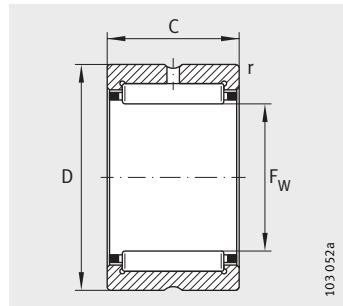
RNA69..ZW

| Basic load ratings | | Fatigue limit load C_{ur} | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|--------------------|-------------------|--------------------------------|--|---|
| dyn. C_r | stat. C_{0r} | N | | |
| 29 500 | 44 500 | 7 800 | 13 200 | 7 700 |
| 39 000 | 63 000 | 11 700 | 13 200 | 7 500 |
| 27 500 | 33 500 | 6 100 | 12 700 | 6 900 |
| 45 500 | 63 000 | 11 400 | 12 700 | 6 700 |
| 38 000 | 43 500 | 7 400 | 12 400 | 7 200 |
| 31 000 | 48 500 | 8 500 | 12 300 | 6 800 |
| 46 000 | 81 000 | 15 000 | 12 300 | 6 600 |
| 28 500 | 35 500 | 6 400 | 12 000 | 6 400 |
| 49 000 | 71 000 | 12 900 | 12 000 | 6 100 |
| 39 500 | 47 000 | 8 000 | 11 500 | 6 700 |
| 28 000 | 43 500 | 7 600 | 11 700 | 6 900 |
| 42 000 | 73 000 | 13 500 | 11 700 | 6 600 |
| 41 500 | 50 000 | 8 600 | 11 000 | 6 400 |
| 29 000 | 45 000 | 7 900 | 11 400 | 6 700 |
| 43 000 | 76 000 | 14 000 | 11 400 | 6 500 |
| 33 500 | 56 000 | 9 800 | 10 900 | 6 100 |
| 44 000 | 79 000 | 14 600 | 10 900 | 6 200 |
| 34 500 | 47 500 | 8 900 | 10 700 | 6 000 |
| 53 000 | 82 000 | 15 100 | 10 700 | 6 000 |
| 42 500 | 54 000 | 9 200 | 10 300 | 6 100 |
| 30 000 | 49 000 | 8 600 | 10 400 | 6 200 |
| 44 500 | 82 000 | 15 200 | 10 400 | 6 000 |
| 35 500 | 50 000 | 9 400 | 10 100 | 5 600 |
| 54 000 | 86 000 | 15 900 | 10 100 | 5 700 |
| 30 500 | 51 000 | 8 900 | 10 200 | 6 000 |
| 45 500 | 85 000 | 15 800 | 10 200 | 5 900 |
| 44 000 | 57 000 | 9 800 | 9 700 | 5 800 |
| 35 000 | 62 000 | 10 800 | 9 800 | 5 600 |
| 52 000 | 103 000 | 19 100 | 9 800 | 5 400 |
| 45 500 | 60 000 | 10 400 | 9 300 | 5 600 |
| 32 500 | 56 000 | 9 900 | 9 400 | 5 600 |
| 48 500 | 94 000 | 17 500 | 9 400 | 5 400 |
| 48 500 | 67 000 | 11 500 | 8 900 | 5 000 |
| 74 000 | 116 000 | 19 400 | 8 900 | 5 100 |



Needle roller bearings

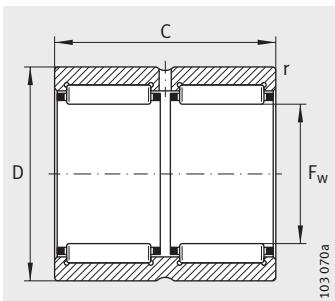
Without inner ring



NK, NKS, RNA49

Dimension table (continued) - Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | | |
|-------------------|----------------|-------------------|----------------|-----------|-----------|-----------|----|-----|-----|
| | | | F _w | D | C | r min. | | | |
| NK50/25-TV | - | - | - | XL | 146 | 50 | 62 | 25 | 0,6 |
| NK50/35-TV | - | - | - | XL | 207 | 50 | 62 | 35 | 0,6 |
| - | - | NKS50 | XL | 157 | 50 | 65 | 22 | 1 | |
| - | RNA4909 | - | - | XL | 182 | 52 | 68 | 22 | 0,6 |
| - | - | RNA6909-ZW | - | XL | 338 | 52 | 68 | 40 | 0,6 |
| NK55/25 | - | - | - | XL | 180 | 55 | 68 | 25 | 0,6 |
| NK55/35 | - | - | - | XL | 250 | 55 | 68 | 35 | 0,6 |
| - | - | NKS55 | XL | 221 | 55 | 72 | 22 | 1 | |
| - | RNA4910 | - | - | XL | 163 | 58 | 72 | 22 | 0,6 |
| - | - | RNA6910-ZW | - | XL | 310 | 58 | 72 | 40 | 0,6 |
| NK60/25-TV | - | - | - | XL | 170 | 60 | 72 | 25 | 0,6 |
| NK60/35 | - | - | - | XL | 258 | 60 | 72 | 35 | 0,6 |
| - | - | NKS60 | XL | 335 | 60 | 80 | 28 | 1,1 | |
| - | RNA4911 | - | - | XL | 255 | 63 | 80 | 25 | 1 |
| - | - | RNA6911-ZW | - | XL | 470 | 63 | 80 | 45 | 1 |
| NK65/25 | - | - | - | XL | 221 | 65 | 78 | 25 | 0,6 |
| NK65/35 | - | - | - | XL | 310 | 65 | 78 | 35 | 0,6 |
| - | - | NKS65 | XL | 356 | 65 | 85 | 28 | 1,1 | |
| NK68/25 | - | - | - | XL | 241 | 68 | 82 | 25 | 0,6 |
| NK68/35 | - | - | - | XL | 338 | 68 | 82 | 35 | 0,6 |
| - | RNA4912 | - | - | XL | 275 | 68 | 85 | 25 | 1 |
| - | - | RNA6912-ZW | - | XL | 488 | 68 | 85 | 45 | 1 |
| NK70/25 | - | - | - | XL | 260 | 70 | 85 | 25 | 0,6 |
| NK70/35 | - | - | - | XL | 370 | 70 | 85 | 35 | 0,6 |
| - | - | NKS70 | XL | 380 | 70 | 90 | 28 | 1,1 | |
| - | RNA4913 | - | - | XL | 312 | 72 | 90 | 25 | 1 |
| - | - | RNA6913-ZW | - | XL | 580 | 72 | 90 | 45 | 1 |
| NK73/25 | - | - | - | XL | 302 | 73 | 90 | 25 | 1 |
| NK73/35 | - | - | - | XL | 428 | 73 | 90 | 35 | 1 |
| NK75/25 | - | - | - | XL | 315 | 75 | 92 | 25 | 1 |
| NK75/35 | - | - | - | XL | 445 | 75 | 92 | 35 | 1 |
| - | - | NKS75 | XL | 402 | 75 | 95 | 28 | 1,1 | |



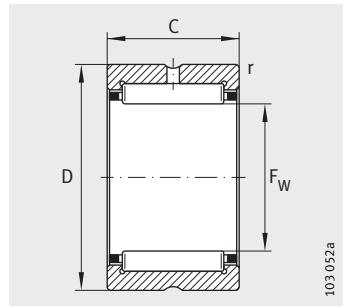
RNA69..ZW

| Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|-----------------------------|-------------------------------|----------------------|-------------------------------------|-------------------------------------|
| dyn. C _r N | stat. C _{0r} N | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 48 500 | 87 000 | 14 800 | 8 800 | 5 000 |
| 67 000 | 132 000 | 23 900 | 8 800 | 4 900 |
| 48 000 | 67 000 | 11 500 | 8 500 | 5 100 |
| 51 000 | 73 000 | 12 600 | 8 200 | 4 550 |
| 79 000 | 127 000 | 21 400 | 8 200 | 4 600 |
| 45 500 | 82 000 | 14 000 | 8 000 | 4 850 |
| 60 000 | 118 000 | 21 300 | 8 000 | 4 800 |
| 51 000 | 74 000 | 12 700 | 7 700 | 4 700 |
| 53 000 | 80 000 | 13 800 | 7 500 | 4 100 |
| 82 000 | 139 000 | 23 400 | 7 500 | 4 150 |
| 53 000 | 103 000 | 17 500 | 7 400 | 4 350 |
| 63 000 | 130 000 | 23 500 | 7 400 | 4 500 |
| 71 000 | 98 000 | 17 300 | 7 000 | 4 350 |
| 65 000 | 100 000 | 17 300 | 6 900 | 3 900 |
| 102 000 | 176 000 | 30 000 | 6 900 | 3 900 |
| 50 000 | 98 000 | 16 700 | 6 900 | 4 250 |
| 66 000 | 142 000 | 25 500 | 6 900 | 4 200 |
| 75 000 | 108 000 | 19 100 | 6 500 | 4 100 |
| 49 500 | 89 000 | 15 200 | 6 500 | 4 250 |
| 70 000 | 139 000 | 25 500 | 6 500 | 4 100 |
| 68 000 | 108 000 | 18 800 | 6 400 | 3 600 |
| 106 000 | 191 000 | 32 500 | 6 400 | 3 600 |
| 50 000 | 92 000 | 15 700 | 6 300 | 4 100 |
| 71 000 | 144 000 | 26 500 | 6 300 | 4 000 |
| 77 000 | 113 000 | 20 000 | 6 100 | 3 900 |
| 69 000 | 112 000 | 19 500 | 6 000 | 3 400 |
| 108 000 | 198 000 | 33 500 | 6 000 | 3 400 |
| 60 000 | 100 000 | 17 500 | 6 000 | 3 900 |
| 85 000 | 156 000 | 27 000 | 6 000 | 3 750 |
| 61 000 | 104 000 | 18 200 | 5 900 | 3 800 |
| 87 000 | 162 000 | 28 000 | 5 900 | 3 700 |
| 81 000 | 123 000 | 21 900 | 5 800 | 3 700 |



Needle roller bearings

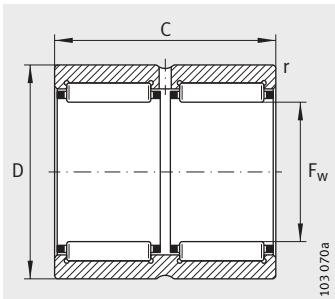
Without inner ring



NK, RNA49

Dimension table (continued) · Dimensions in mm

| Designation | | | X-life | Mass m ≈g | Dimensions | | | |
|-----------------|----------------|-------------------|-----------|-----------------|------------|-----|----|-----|
| F _w | D | C | | | r min. | | | |
| NK80/25 | — | — | XL | 301 | 80 | 95 | 25 | 1 |
| NK80/35 | — | — | XL | 425 | 80 | 95 | 35 | 1 |
| — | RNA4914 | — | XL | 460 | 80 | 100 | 30 | 1 |
| — | — | RNA6914-ZW | XL | 857 | 80 | 100 | 54 | 1 |
| NK85/25 | — | — | XL | 425 | 85 | 105 | 25 | 1 |
| NK85/35 | — | — | XL | 600 | 85 | 105 | 35 | 1 |
| — | RNA4915 | — | XL | 489 | 85 | 105 | 30 | 1 |
| — | — | RNA6915-ZW | XL | 935 | 85 | 105 | 54 | 1 |
| NK90/25 | — | — | XL | 450 | 90 | 110 | 25 | 1 |
| NK90/35 | — | — | XL | 630 | 90 | 110 | 35 | 1 |
| — | RNA4916 | — | XL | 516 | 90 | 110 | 30 | 1 |
| — | — | RNA6916-ZW | XL | 987 | 90 | 110 | 54 | 1 |
| NK95/26 | — | — | XL | 490 | 95 | 115 | 26 | 1 |
| NK95/36 | — | — | XL | 680 | 95 | 115 | 36 | 1 |
| NK100/26 | — | — | XL | 515 | 100 | 120 | 26 | 1 |
| NK100/36 | — | — | XL | 715 | 100 | 120 | 36 | 1 |
| — | RNA4917 | — | XL | 657 | 100 | 120 | 35 | 1,1 |
| — | — | RNA6917-ZW | XL | 1 200 | 100 | 120 | 63 | 1,1 |
| NK105/26 | — | — | XL | 540 | 105 | 125 | 26 | 1 |
| NK105/36 | — | — | XL | 713 | 105 | 125 | 36 | 1 |
| — | RNA4918 | — | XL | 745 | 105 | 125 | 35 | 1,1 |
| — | — | RNA6918-ZW | XL | 1 330 | 105 | 125 | 63 | 1,1 |
| NK110/30 | — | — | XL | 650 | 110 | 130 | 30 | 1,1 |
| NK110/40 | — | — | XL | 830 | 110 | 130 | 40 | 1,1 |
| — | RNA4919 | — | XL | 719 | 110 | 130 | 35 | 1,1 |
| — | — | RNA6919-ZW | XL | 1 460 | 110 | 130 | 63 | 1,1 |



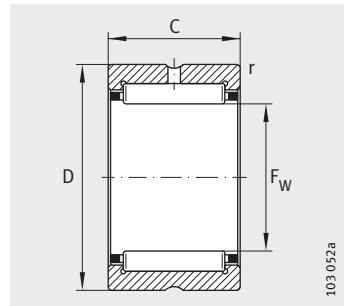
RNA69..ZW

| Basic load ratings | | Fatigue limit load C_{ur} | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|--------------------|-------------------|--------------------------------|--|---|
| dyn. C_r | stat. C_{or} | N | | |
| 63 000 | 119 000 | 19 600 | 5 600 | 3 600 |
| 89 000 | 184 000 | 32 500 | 5 600 | 3 450 |
| 95 000 | 156 000 | 27 500 | 5 400 | 3 200 |
| 145 000 | 265 000 | 47 500 | 5 400 | 3 250 |
| 78 000 | 123 000 | 21 700 | 5 200 | 3 350 |
| 111 000 | 193 000 | 34 500 | 5 200 | 3 250 |
| 97 000 | 162 000 | 28 500 | 5 200 | 3 050 |
| 147 000 | 275 000 | 49 500 | 5 200 | 3 050 |
| 81 000 | 132 000 | 23 300 | 4 900 | 3 200 |
| 116 000 | 208 000 | 37 000 | 4 900 | 3 100 |
| 101 000 | 174 000 | 30 500 | 4 900 | 2 850 |
| 153 000 | 300 000 | 53 000 | 4 900 | 2 850 |
| 83 000 | 137 000 | 24 000 | 4 650 | 3 150 |
| 121 000 | 223 000 | 39 500 | 4 650 | 2 950 |
| 86 000 | 146 000 | 25 000 | 4 450 | 3 000 |
| 125 000 | 237 000 | 41 500 | 4 450 | 2 850 |
| 125 000 | 237 000 | 41 500 | 4 450 | 2 650 |
| 188 000 | 400 000 | 71 000 | 4 450 | 2 700 |
| 89 000 | 155 000 | 26 500 | 4 250 | 2 900 |
| 129 000 | 250 000 | 43 500 | 4 250 | 2 750 |
| 129 000 | 250 000 | 43 500 | 4 250 | 2 500 |
| 195 000 | 425 000 | 74 000 | 4 250 | 2 700 |
| 111 000 | 210 000 | 35 500 | 4 100 | 2 700 |
| 143 000 | 290 000 | 50 000 | 4 100 | 2 650 |
| 131 000 | 260 000 | 44 500 | 4 100 | 2 410 |
| 197 000 | 440 000 | 76 000 | 4 100 | 2 450 |



Needle roller bearings

Without inner ring



RNA49, RNA48

Dimension table (continued) - Dimensions in mm

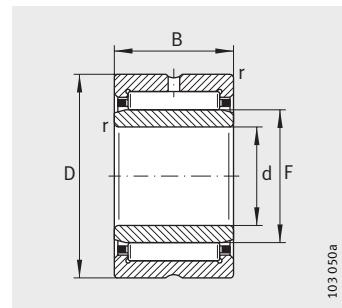
| Designation | X-life | Mass m ≈g | Dimensions | | | | |
|-------------|---------|-----------------|------------|-----|-----|-----------|-----|
| | | | F_w | D | C | r min. | |
| RNA4920 | - | XL | 1 150 | 115 | 140 | 40 | 1,1 |
| - | RNA4822 | XL | 670 | 120 | 140 | 30 | 1 |
| RNA4922 | - | XL | 1 240 | 125 | 150 | 40 | 1,1 |
| - | RNA4824 | XL | 730 | 130 | 150 | 30 | 1 |
| RNA4924 | - | XL | 1 860 | 135 | 165 | 45 | 1,1 |
| - | RNA4826 | XL | 990 | 145 | 165 | 35 | 1,1 |
| RNA4926 | - | XL | 2 210 | 150 | 180 | 50 | 1,5 |
| - | RNA4828 | XL | 1 050 | 155 | 175 | 35 | 1,1 |
| RNA4928 | - | XL | 2 350 | 160 | 190 | 50 | 1,5 |
| - | RNA4830 | XL | 1 600 | 165 | 190 | 40 | 1,1 |
| - | RNA4832 | XL | 1 700 | 175 | 200 | 40 | 1,1 |
| - | RNA4834 | XL | 2 540 | 185 | 215 | 45 | 1,1 |
| - | RNA4836 | XL | 2 680 | 195 | 225 | 45 | 1,1 |
| - | RNA4838 | XL | 3 210 | 210 | 240 | 50 | 1,5 |
| - | RNA4840 | XL | 3 350 | 220 | 250 | 50 | 1,5 |
| - | RNA4844 | XL | 3 620 | 240 | 270 | 50 | 1,5 |
| - | RNA4848 | XL | 5 400 | 265 | 300 | 60 | 2 |
| - | RNA4852 | XL | 5 800 | 285 | 320 | 60 | 2 |
| - | RNA4856 | XL | 9 300 | 305 | 350 | 69 | 2 |
| - | RNA4860 | XL | 12 700 | 330 | 380 | 80 | 2,1 |
| - | RNA4864 | XL | 13 400 | 350 | 400 | 80 | 2,1 |
| - | RNA4868 | XL | 14 000 | 370 | 420 | 80 | 2,1 |
| - | RNA4872 | XL | 14 800 | 390 | 440 | 80 | 2,1 |
| - | RNA4876 | XL | 26 000 | 415 | 480 | 100 | 2,1 |

| Basic load ratings | | Fatigue limit load C_{ur} | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|--------------------|-------------------|--------------------------------|--|---|
| dyn. C_r | stat. C_{0r} | N | | |
| 144 000 | 270 000 | 45 500 | 3 850 | 2 500 |
| 106 000 | 216 000 | 36 000 | 3 750 | 2 220 |
| 149 000 | 290 000 | 47 500 | 3 550 | 2 290 |
| 112 000 | 239 000 | 39 000 | 3 500 | 2 030 |
| 205 000 | 390 000 | 64 000 | 3 250 | 2 110 |
| 134 000 | 310 000 | 48 500 | 3 150 | 1 920 |
| 229 000 | 470 000 | 74 000 | 2 950 | 1 970 |
| 136 000 | 325 000 | 50 000 | 2 950 | 1 800 |
| 237 000 | 500 000 | 78 000 | 2 800 | 1 810 |
| 172 000 | 400 000 | 62 000 | 2 750 | 1 750 |
| 181 000 | 435 000 | 66 000 | 2 600 | 1 630 |
| 209 000 | 510 000 | 75 000 | 2 450 | 1 550 |
| 219 000 | 550 000 | 80 000 | 2 330 | 1 430 |
| 255 000 | 690 000 | 100 000 | 2 180 | 1 290 |
| 260 000 | 720 000 | 102 000 | 2 090 | 1 220 |
| 275 000 | 790 000 | 110 000 | 1 920 | 1 080 |
| 400 000 | 1 080 000 | 150 000 | 1 730 | 940 |
| 415 000 | 1 160 000 | 158 000 | 1 620 | 860 |
| 510 000 | 1 300 000 | 175 000 | 1 500 | 810 |
| 700 000 | 1 770 000 | 235 000 | 1 380 | 710 |
| 710 000 | 1 850 000 | 242 000 | 1 310 | 660 |
| 730 000 | 1 940 000 | 249 000 | 1 240 | 620 |
| 740 000 | 2 020 000 | 255 000 | 1 180 | 580 |
| 1 130 000 | 2 900 000 | 370 000 | 1 090 | 500 |

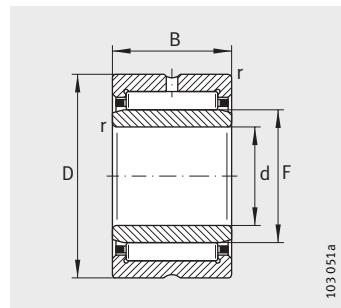


Needle roller bearings

With inner ring



NKI ($d \leq 7 \text{ mm}$)

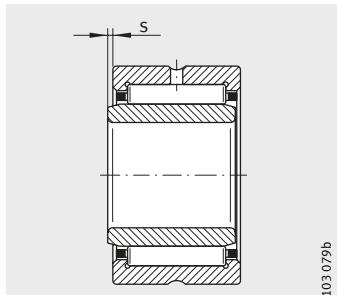


NKI ($d \geq 9 \text{ mm}$), NKIS, NA49,
NA69 ($d \leq 30 \text{ mm}$)

Dimension table · Dimensions in mm

| Designation | | | | X-life | Mass m ≈g | Dimensions | | |
|--------------------------|--------|--------|--------|--------|-----------------|------------|----|----|
| | | | | | | d | F | D |
| NKI5/12-TV ¹⁾ | - | - | - | XL | 11,5 | 5 | 8 | 15 |
| NKI5/16-TV ¹⁾ | - | - | - | XL | 15,3 | 5 | 8 | 15 |
| NKI6/12-TV ¹⁾ | - | - | - | XL | 13,5 | 6 | 9 | 16 |
| NKI6/16-TV ¹⁾ | - | - | - | XL | 17,4 | 6 | 9 | 16 |
| NKI7/12-TV ¹⁾ | - | - | - | XL | 13,7 | 7 | 10 | 17 |
| NKI7/16-TV ¹⁾ | - | - | - | XL | 18,2 | 7 | 10 | 17 |
| NKI9/12 | - | - | - | XL | 16,6 | 9 | 12 | 19 |
| NKI9/16 | - | - | - | XL | 21,9 | 9 | 12 | 19 |
| NKI10/16 | - | - | - | XL | 29,4 | 10 | 14 | 22 |
| NKI10/20 | - | - | - | XL | 37,1 | 10 | 14 | 22 |
| - | NA4900 | - | - | XL | 23 | 10 | 14 | 22 |
| NKI12/16 | - | - | - | XL | 33,3 | 12 | 16 | 24 |
| NKI12/20 | - | - | - | XL | 41,9 | 12 | 16 | 24 |
| - | NA4901 | - | - | XL | 26 | 12 | 16 | 24 |
| - | - | NA6901 | - | XL | 46 | 12 | 16 | 24 |
| NKI15/16 | - | - | - | XL | 38,8 | 15 | 19 | 27 |
| NKI15/20 | - | - | - | XL | 48,7 | 15 | 19 | 27 |
| - | NA4902 | - | - | XL | 34 | 15 | 20 | 28 |
| - | - | NA6902 | - | XL | 63,6 | 15 | 20 | 28 |
| - | - | - | NKIS15 | XL | 92 | 15 | 22 | 35 |
| NKI17/16 | - | - | - | XL | 42,4 | 17 | 21 | 29 |
| NKI17/20 | - | - | - | XL | 53,4 | 17 | 21 | 29 |
| - | NA4903 | - | - | XL | 37 | 17 | 22 | 30 |
| - | - | NA6903 | - | XL | 72 | 17 | 22 | 30 |
| - | - | - | NKIS17 | XL | 98 | 17 | 24 | 37 |

¹⁾ With closing rings, without lubrication hole and groove.



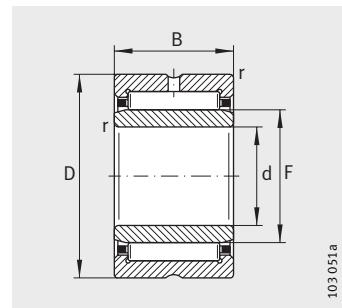
2) Axial displacement "s"

| B | r min. | s ²⁾ | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|----|-----------|-----------------|--------------------|------------------------|-------------------------------------|--|---|
| | | | dyn. C_r N | stat. C_{0r} N | | | |
| 12 | 0,3 | 1,5 | 4 450 | 4 100 | 690 | 31 500 | 29 500 |
| 16 | 0,3 | 2 | 5 800 | 5 800 | 970 | 31 500 | 29 500 |
| 12 | 0,3 | 1,5 | 5 100 | 5 000 | 840 | 30 000 | 26 500 |
| 16 | 0,3 | 2 | 6 600 | 7 100 | 1 190 | 30 000 | 26 000 |
| 12 | 0,3 | 1,5 | 5 300 | 5 500 | 930 | 29 000 | 24 100 |
| 16 | 0,3 | 2 | 7 000 | 7 800 | 1 310 | 29 000 | 23 800 |
| 12 | 0,3 | 1,5 | 7 200 | 7 100 | 1 280 | 26 500 | 22 200 |
| 16 | 0,3 | 2 | 10 100 | 11 000 | 1 920 | 26 500 | 19 500 |
| 16 | 0,3 | 0,5 | 11 400 | 11 500 | 2 100 | 25 000 | 17 300 |
| 20 | 0,3 | 0,5 | 14 500 | 15 600 | 2 700 | 25 000 | 17 000 |
| 13 | 0,3 | 0,5 | 9 600 | 9 200 | 1 630 | 25 000 | 17 300 |
| 16 | 0,3 | 0,5 | 12 800 | 13 900 | 2 550 | 23 600 | 15 200 |
| 20 | 0,3 | 0,5 | 16 300 | 18 800 | 3 250 | 23 600 | 14 900 |
| 13 | 0,3 | 0,5 | 10 600 | 10 900 | 1 940 | 23 600 | 14 900 |
| 22 | 0,3 | 1 | 18 100 | 21 600 | 3 800 | 23 600 | 13 900 |
| 16 | 0,3 | 0,5 | 14 700 | 17 400 | 3 200 | 21 800 | 12 800 |
| 20 | 0,3 | 0,5 | 18 700 | 23 600 | 4 150 | 21 800 | 12 600 |
| 13 | 0,3 | 0,5 | 12 000 | 13 600 | 2 430 | 21 600 | 12 000 |
| 23 | 0,3 | 1 | 19 500 | 25 500 | 4 450 | 21 600 | 11 700 |
| 20 | 0,6 | 0,5 | 27 500 | 28 000 | 4 900 | 19 600 | 10 300 |
| 16 | 0,3 | 0,5 | 15 200 | 18 700 | 3 450 | 20 900 | 11 800 |
| 20 | 0,3 | 0,5 | 19 300 | 25 500 | 4 450 | 20 900 | 11 600 |
| 13 | 0,3 | 0,5 | 12 400 | 14 600 | 2 600 | 20 600 | 10 900 |
| 23 | 0,3 | 1 | 21 100 | 29 000 | 5 100 | 20 600 | 10 500 |
| 20 | 0,6 | 0,5 | 29 500 | 31 000 | 5 400 | 18 100 | 9 500 |

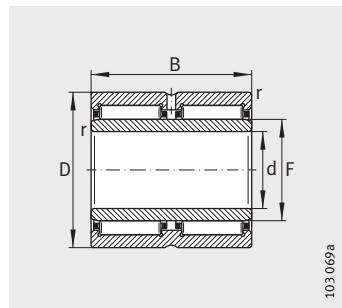


Needle roller bearings

With inner ring



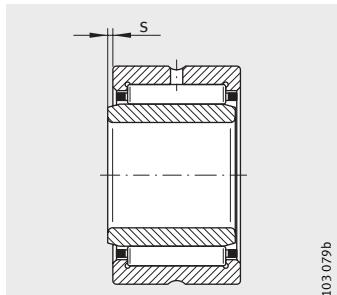
NKI, NKIS, NA49,
NA69 ($d \leq 30$ mm)



NA69..-ZW

Dimension table (continued) · Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | |
|--------------------|----------------|-------------------|---------------|----|------|-----------|----|----|
| | | | d | F | D | | | |
| NKI20/16 | — | — | — | XL | 49 | 20 | 24 | 32 |
| NKI20/20 | — | — | — | XL | 61 | 20 | 24 | 32 |
| — | NA4904 | — | — | XL | 75,2 | 20 | 25 | 37 |
| — | — | NA6904 | — | XL | 141 | 20 | 25 | 37 |
| — | — | — | NKIS20 | XL | 129 | 20 | 28 | 42 |
| NKI22/16 | — | — | — | XL | 52 | 22 | 26 | 34 |
| NKI22/20 | — | — | — | XL | 65,4 | 22 | 26 | 34 |
| — | NA49/22 | — | — | XL | 80 | 22 | 28 | 39 |
| — | — | NA69/22 | — | XL | 150 | 22 | 28 | 39 |
| NKI25/20-TV | — | — | — | XL | 75,8 | 25 | 29 | 38 |
| NKI25/30 | — | — | — | XL | 124 | 25 | 29 | 38 |
| — | NA4905 | — | — | XL | 88 | 25 | 30 | 42 |
| — | — | NA6905 | — | XL | 161 | 25 | 30 | 42 |
| — | — | — | NKIS25 | XL | 162 | 25 | 32 | 47 |
| NKI28/20-TV | — | — | — | XL | 92,4 | 28 | 32 | 42 |
| NKI28/30 | — | — | — | XL | 146 | 28 | 32 | 42 |
| — | NA49/28 | — | — | XL | 97,7 | 28 | 32 | 45 |
| — | — | NA69/28 | — | XL | 182 | 28 | 32 | 45 |
| NKI30/20-TV | — | — | — | XL | 108 | 30 | 35 | 45 |
| NKI30/30-TV | — | — | — | XL | 165 | 30 | 35 | 45 |
| — | NA4906 | — | — | XL | 101 | 30 | 35 | 47 |
| — | — | NA6906 | — | XL | 192 | 30 | 35 | 47 |
| — | — | — | NKIS30 | XL | 184 | 30 | 37 | 52 |
| NKI32/20 | — | — | — | XL | 118 | 32 | 37 | 47 |
| NKI32/30 | — | — | — | XL | 180 | 32 | 37 | 47 |
| — | NA49/32 | — | — | XL | 158 | 32 | 40 | 52 |
| — | — | NA69/32-ZW | — | XL | 288 | 32 | 40 | 52 |
| NKI35/20-TV | — | — | — | XL | 122 | 35 | 40 | 50 |
| NKI35/30 | — | — | — | XL | 193 | 35 | 40 | 50 |
| — | NA4907 | — | — | XL | 170 | 35 | 42 | 55 |
| — | — | NA6907-ZW | — | XL | 310 | 35 | 42 | 55 |
| — | — | — | NKIS35 | XL | 220 | 35 | 43 | 58 |



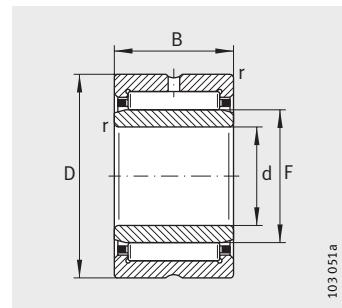
¹⁾ Axial displacement "s"

| B | r min. | s ¹⁾ | Basic load ratings | | Fatigue limit load C _{ur} | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|----|-----------|-----------------|-----------------------------|-------------------------------|---------------------------------------|---|--|
| | | | dyn. C _r N | stat. C _{0r} N | | | |
| 16 | 0,3 | 0,5 | 16 900 | 22 300 | 4 100 | 18 800 | 10 400 |
| 20 | 0,3 | 0,5 | 21 400 | 30 500 | 5 300 | 18 800 | 10 200 |
| 17 | 0,3 | 0,8 | 23 700 | 25 500 | 4 600 | 17 200 | 9 600 |
| 30 | 0,3 | 1 | 40 500 | 51 000 | 9 100 | 17 200 | 9 200 |
| 20 | 0,6 | 0,5 | 32 500 | 36 500 | 6 400 | 15 800 | 8 300 |
| 16 | 0,3 | 0,5 | 17 300 | 23 600 | 4 350 | 17 500 | 9 800 |
| 20 | 0,3 | 0,5 | 22 000 | 32 000 | 5 600 | 17 500 | 9 500 |
| 17 | 0,3 | 0,8 | 26 000 | 29 500 | 5 300 | 16 100 | 8 700 |
| 30 | 0,3 | 0,5 | 42 000 | 55 000 | 9 900 | 16 100 | 8 500 |
| 20 | 0,3 | 1 | 27 500 | 39 000 | 6 800 | 15 600 | 8 300 |
| 30 | 0,3 | 1,5 | 37 000 | 57 000 | 10 600 | 15 600 | 8 400 |
| 17 | 0,3 | 0,8 | 26 500 | 31 500 | 5 700 | 14 600 | 7 900 |
| 30 | 0,3 | 1 | 44 000 | 59 000 | 10 600 | 14 600 | 7 700 |
| 22 | 0,6 | 1 | 38 000 | 43 500 | 7 400 | 13 600 | 7 400 |
| 20 | 0,3 | 1 | 29 500 | 44 500 | 7 800 | 14 000 | 7 500 |
| 30 | 0,3 | 1,5 | 39 000 | 63 000 | 11 700 | 14 000 | 7 600 |
| 17 | 0,3 | 0,8 | 27 500 | 33 500 | 6 100 | 13 400 | 7 200 |
| 30 | 0,3 | 1 | 45 500 | 63 000 | 11 400 | 13 400 | 7 000 |
| 20 | 0,3 | 0,5 | 31 000 | 48 500 | 8 500 | 13 100 | 7 000 |
| 30 | 0,3 | 1 | 46 000 | 81 000 | 15 000 | 13 100 | 6 700 |
| 17 | 0,3 | 0,8 | 28 500 | 35 500 | 6 400 | 12 700 | 6 800 |
| 30 | 0,3 | 1 | 49 000 | 71 000 | 12 900 | 12 700 | 6 400 |
| 22 | 0,6 | 1 | 41 500 | 50 000 | 8 600 | 12 000 | 6 600 |
| 20 | 0,3 | 0,5 | 28 000 | 43 500 | 7 600 | 12 400 | 7 000 |
| 30 | 0,3 | 1 | 42 000 | 73 000 | 13 500 | 12 400 | 6 800 |
| 20 | 0,6 | 0,8 | 34 500 | 47 500 | 8 900 | 11 700 | 6 500 |
| 36 | 0,6 | 0,5 | 53 000 | 82 000 | 15 100 | 11 700 | 6 500 |
| 20 | 0,3 | 0,5 | 33 500 | 56 000 | 9 800 | 11 500 | 6 200 |
| 30 | 0,3 | 1 | 44 000 | 79 000 | 14 600 | 11 500 | 6 300 |
| 20 | 0,6 | 0,8 | 35 500 | 50 000 | 9 400 | 10 900 | 6 000 |
| 36 | 0,6 | 0,5 | 54 000 | 86 000 | 15 900 | 10 900 | 6 100 |
| 22 | 0,6 | 0,5 | 44 000 | 57 000 | 9 800 | 10 500 | 5 900 |

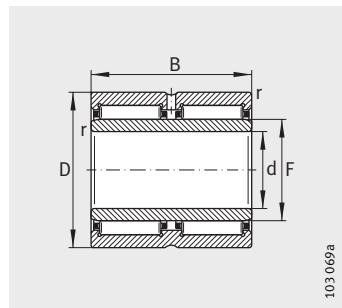


Needle roller bearings

With inner ring



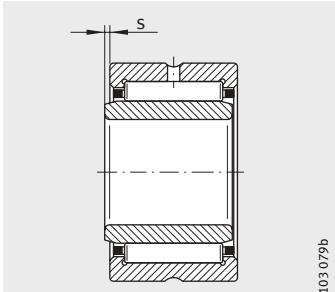
NKI, NKIS, NA49



NA69..-ZW

Dimension table (continued) - Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | |
|--------------------|---------------|------------------|---------------|-----------|-----|-----------|----|----|
| | | | d | F | D | | | |
| NKI38/20 | - | - | - | XL | 136 | 38 | 43 | 53 |
| NKI38/30 | - | - | - | XL | 207 | 38 | 43 | 53 |
| NKI40/20-TV | - | - | - | XL | 136 | 40 | 45 | 55 |
| NKI40/30-TV | - | - | - | XL | 216 | 40 | 45 | 55 |
| - | NA4908 | - | - | XL | 230 | 40 | 48 | 62 |
| - | - | NA6908-ZW | - | XL | 430 | 40 | 48 | 62 |
| - | - | - | NKIS40 | XL | 281 | 40 | 50 | 65 |
| NKI42/20 | - | - | - | XL | 148 | 42 | 47 | 57 |
| NKI42/30 | - | - | - | XL | 222 | 42 | 47 | 57 |
| NKI45/25-TV | - | - | - | XL | 217 | 45 | 50 | 62 |
| NKI45/35-TV | - | - | - | XL | 308 | 45 | 50 | 62 |
| - | NA4909 | - | - | XL | 271 | 45 | 52 | 68 |
| - | - | NA6909-ZW | - | XL | 495 | 45 | 52 | 68 |
| - | - | - | NKIS45 | XL | 336 | 45 | 55 | 72 |
| NKI50/25 | - | - | - | XL | 270 | 50 | 55 | 68 |
| NKI50/35 | - | - | - | XL | 379 | 50 | 55 | 68 |
| - | NA4910 | - | - | XL | 274 | 50 | 58 | 72 |
| - | - | NA6910-ZW | - | XL | 515 | 50 | 58 | 72 |
| - | - | - | NKIS50 | XL | 518 | 50 | 60 | 80 |
| NKI55/25-TV | - | - | - | XL | 255 | 55 | 60 | 72 |
| NKI55/35 | - | - | - | XL | 379 | 55 | 60 | 72 |
| - | NA4911 | - | - | XL | 393 | 55 | 63 | 80 |
| - | - | NA6911-ZW | - | XL | 780 | 55 | 63 | 80 |
| - | - | - | NKIS55 | XL | 558 | 55 | 65 | 85 |
| NKI60/25 | - | - | - | XL | 394 | 60 | 68 | 82 |
| NKI60/35 | - | - | - | XL | 553 | 60 | 68 | 82 |
| - | NA4912 | - | - | XL | 426 | 60 | 68 | 85 |
| - | - | NA6912-ZW | - | XL | 808 | 60 | 68 | 85 |
| - | - | - | NKIS60 | XL | 560 | 60 | 70 | 90 |



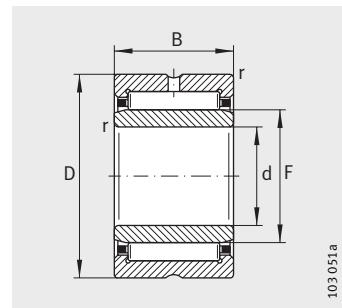
¹⁾ Axial displacement "s"

| B | r min. | s ¹⁾ | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|----|-----------|-----------------|--------------------|------------------------|-------------------------------------|--|---|
| | | | dyn. C_r N | stat. C_{0r} N | | | |
| 20 | 0,3 | 0,5 | 30 500 | 51 000 | 8 900 | 10 800 | 6 200 |
| 30 | 0,3 | 1 | 45 500 | 85 000 | 15 800 | 10 800 | 6 000 |
| 20 | 0,3 | 0,5 | 35 000 | 62 000 | 10 800 | 10 300 | 5 600 |
| 30 | 0,3 | 1 | 52 000 | 103 000 | 19 100 | 10 300 | 5 500 |
| 22 | 0,6 | 1 | 48 500 | 67 000 | 11 500 | 9 600 | 5 300 |
| 40 | 0,6 | 0,5 | 74 000 | 116 000 | 19 400 | 9 600 | 5 400 |
| 22 | 1 | 0,5 | 48 000 | 67 000 | 11 500 | 9 300 | 5 200 |
| 20 | 0,3 | 0,5 | 32 500 | 56 000 | 9 900 | 9 900 | 5 700 |
| 30 | 0,3 | 1 | 48 500 | 94 000 | 17 500 | 9 900 | 5 500 |
| 25 | 0,6 | 1,5 | 48 500 | 87 000 | 14 800 | 9 200 | 5 100 |
| 35 | 0,6 | 2 | 67 000 | 132 000 | 23 900 | 9 200 | 4 950 |
| 22 | 0,6 | 1 | 51 000 | 73 000 | 12 600 | 8 700 | 4 750 |
| 40 | 0,6 | 0,5 | 79 000 | 127 000 | 21 400 | 8 700 | 4 850 |
| 22 | 1 | 0,5 | 51 000 | 74 000 | 12 700 | 8 400 | 4 750 |
| 25 | 0,6 | 1,5 | 45 500 | 82 000 | 14 000 | 8 300 | 4 900 |
| 35 | 0,6 | 2 | 60 000 | 118 000 | 21 300 | 8 300 | 4 850 |
| 22 | 0,6 | 1 | 53 000 | 80 000 | 13 800 | 8 000 | 4 350 |
| 40 | 0,6 | 0,5 | 82 000 | 139 000 | 23 400 | 8 000 | 4 400 |
| 28 | 1,1 | 2 | 71 000 | 98 000 | 17 300 | 7 500 | 4 450 |
| 25 | 0,6 | 1,5 | 47 500 | 90 000 | 15 400 | 7 700 | 4 600 |
| 35 | 0,6 | 2 | 63 000 | 130 000 | 23 500 | 7 700 | 4 550 |
| 25 | 1 | 1,5 | 65 000 | 100 000 | 17 300 | 7 300 | 4 100 |
| 45 | 1 | 1,5 | 102 000 | 176 000 | 30 000 | 7 300 | 4 100 |
| 28 | 1,1 | 2 | 75 000 | 108 000 | 22 200 | 7 000 | 4 150 |
| 25 | 0,6 | 1 | 49 500 | 89 000 | 15 200 | 6 900 | 4 300 |
| 35 | 0,6 | 1 | 70 000 | 139 000 | 25 500 | 6 900 | 4 150 |
| 25 | 1 | 1,5 | 68 000 | 108 000 | 18 800 | 6 800 | 3 750 |
| 45 | 1 | 1,5 | 106 000 | 191 000 | 32 500 | 6 800 | 3 750 |
| 28 | 1,1 | 2 | 77 000 | 113 000 | 23 400 | 6 500 | 3 950 |

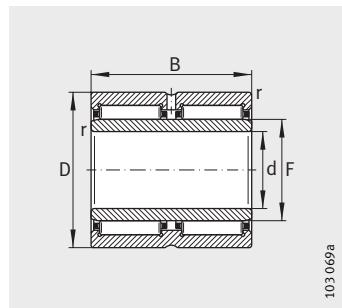


Needle roller bearings

With inner ring



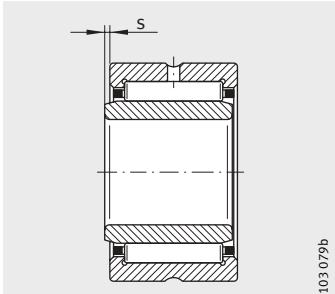
NKI, NKIS, NA49



NA69..-ZW

Dimension table (continued) · Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | |
|-----------------|---------------|------------------|---------------|-----------|-------|-----------|-----|-----|
| | | | d | F | D | | | |
| NKI65/25 | — | — | — | XL | 467 | 65 | 73 | 90 |
| NKI65/35 | — | — | — | XL | 659 | 65 | 73 | 90 |
| — | NA4913 | — | — | XL | 456 | 65 | 72 | 90 |
| — | — | NA6913-ZW | — | XL | 833 | 65 | 72 | 90 |
| — | — | — | NKIS65 | XL | 641 | 65 | 75 | 95 |
| NKI70/25 | — | — | — | XL | 521 | 70 | 80 | 95 |
| NKI70/35 | — | — | — | XL | 737 | 70 | 80 | 95 |
| — | NA4914 | — | — | XL | 728 | 70 | 80 | 100 |
| — | — | NA6914-ZW | — | XL | 1 340 | 70 | 80 | 100 |
| NKI75/25 | — | — | — | XL | 641 | 75 | 85 | 105 |
| NKI75/35 | — | — | — | XL | 908 | 75 | 85 | 105 |
| — | NA4915 | — | — | XL | 775 | 75 | 85 | 105 |
| — | — | NA6915-ZW | — | XL | 1 450 | 75 | 85 | 105 |
| NKI80/25 | — | — | — | XL | 677 | 80 | 90 | 110 |
| NKI80/35 | — | — | — | XL | 959 | 80 | 90 | 110 |
| — | NA4916 | — | — | XL | 878 | 80 | 90 | 110 |
| — | — | NA6916-ZW | — | XL | 1 522 | 80 | 90 | 110 |
| NKI85/26 | — | — | — | XL | 743 | 85 | 95 | 115 |
| NKI85/36 | — | — | — | XL | 1 040 | 85 | 95 | 115 |
| — | NA4917 | — | — | XL | 1 250 | 85 | 100 | 120 |
| — | — | NA6917-ZW | — | XL | 2 200 | 85 | 100 | 120 |
| NKI90/26 | — | — | — | XL | 778 | 90 | 100 | 120 |
| NKI90/36 | — | — | — | XL | 1 090 | 90 | 100 | 120 |
| — | NA4918 | — | — | XL | 1 312 | 90 | 105 | 125 |
| — | — | NA6918-ZW | — | XL | 2 310 | 90 | 105 | 125 |
| NKI95/26 | — | — | — | XL | 816 | 95 | 105 | 125 |
| NKI95/36 | — | — | — | XL | 1 145 | 95 | 105 | 125 |
| — | NA4919 | — | — | XL | 1 371 | 95 | 110 | 130 |
| — | — | NA6919-ZW | — | XL | 2 500 | 95 | 110 | 130 |



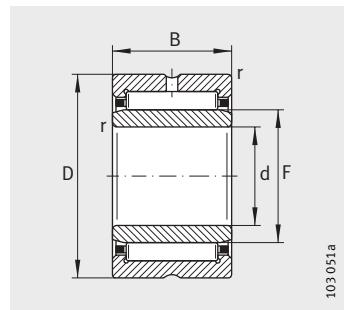
¹⁾ Axial displacement "s"

| | | | Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|----|-----------|-----------------|-----------------------------|-------------------------------|----------------------|-------------------------------------|-------------------------------------|
| B | r min. | s ¹⁾ | dyn. C _r N | stat. C _{0r} N | C _{ur} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 25 | 1 | 1 | 60 000 | 100 000 | 17 500 | 6 300 | 3 950 |
| 35 | 1 | 1 | 85 000 | 156 000 | 27 000 | 6 300 | 3 800 |
| 25 | 1 | 1,5 | 69 000 | 112 000 | 19 500 | 6 300 | 3 500 |
| 45 | 1 | 1,5 | 108 000 | 198 000 | 33 500 | 6 300 | 3 550 |
| 28 | 1,1 | 2 | 81 000 | 123 000 | 25 500 | 6 100 | 3 700 |
| 25 | 1 | 0,8 | 63 000 | 119 000 | 19 600 | 5 900 | 3 600 |
| 35 | 1 | 0,8 | 89 000 | 184 000 | 32 500 | 5 900 | 3 500 |
| 30 | 1 | 1,5 | 95 000 | 156 000 | 27 500 | 5 800 | 3 350 |
| 54 | 1 | 1 | 145 000 | 265 000 | 47 500 | 5 800 | 3 400 |
| 25 | 1 | 1 | 78 000 | 123 000 | 23 500 | 5 400 | 3 400 |
| 35 | 1 | 1 | 111 000 | 193 000 | 40 000 | 5 400 | 3 250 |
| 30 | 1 | 1,5 | 97 000 | 162 000 | 28 500 | 5 400 | 3 150 |
| 54 | 1 | 1 | 147 000 | 275 000 | 49 500 | 5 400 | 3 200 |
| 25 | 1 | 1 | 81 000 | 132 000 | 27 500 | 5 200 | 3 250 |
| 35 | 1 | 1 | 116 000 | 208 000 | 43 000 | 5 200 | 3 100 |
| 30 | 1 | 1,5 | 101 000 | 174 000 | 30 500 | 5 200 | 2 950 |
| 54 | 1 | 1 | 153 000 | 300 000 | 53 000 | 5 200 | 3 000 |
| 26 | 1 | 1,5 | 83 000 | 137 000 | 28 000 | 4 900 | 3 150 |
| 36 | 1 | 1,5 | 121 000 | 223 000 | 46 000 | 4 900 | 3 000 |
| 35 | 1,1 | 1 | 125 000 | 237 000 | 41 500 | 4 800 | 2 800 |
| 63 | 1,1 | 1 | 188 000 | 400 000 | 71 000 | 4 800 | 2 850 |
| 26 | 1 | 1,5 | 86 000 | 146 000 | 29 500 | 4 650 | 3 050 |
| 36 | 1 | 1,5 | 125 000 | 237 000 | 48 000 | 4 650 | 2 850 |
| 35 | 1,1 | 1 | 129 000 | 250 000 | 43 500 | 4 550 | 2 650 |
| 63 | 1,1 | 1 | 195 000 | 425 000 | 74 000 | 4 550 | 2 700 |
| 26 | 1 | 1,5 | 89 000 | 155 000 | 31 000 | 4 450 | 2 900 |
| 36 | 1 | 1,5 | 129 000 | 250 000 | 50 000 | 4 450 | 2 750 |
| 35 | 1,1 | 1 | 131 000 | 260 000 | 44 500 | 4 350 | 2 550 |
| 63 | 1,1 | 1 | 197 000 | 440 000 | 76 000 | 4 350 | 2 600 |



Needle roller bearings

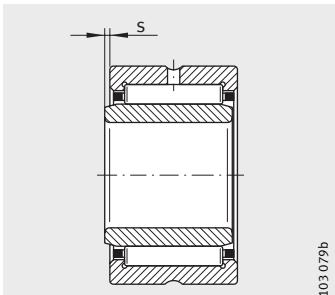
With inner ring



NKI, NA49, NA48

Dimension table (continued) · Dimensions in mm

| Designation | | X-life | Mass m ≈g | Dimensions | | | |
|------------------|---------------|---------------|-----------------|------------|------------|-----|-----|
| | | | | d | F | D | |
| NKI100/30 | - | - | XL | 990 | 100 | 110 | 130 |
| NKI100/40 | - | - | XL | 1 330 | 100 | 110 | 130 |
| - | NA4920 | - | XL | 1 900 | 100 | 115 | 140 |
| - | NA4922 | - | XL | 2 070 | 110 | 125 | 150 |
| - | - | NA4822 | XL | 1 080 | 110 | 120 | 140 |
| - | NA4924 | - | XL | 2 860 | 120 | 135 | 165 |
| - | - | NA4824 | XL | 1 170 | 120 | 130 | 150 |
| - | NA4926 | - | XL | 3 900 | 130 | 150 | 180 |
| - | - | NA4826 | XL | 1 810 | 130 | 145 | 165 |
| - | NA4928 | - | XL | 4 150 | 140 | 160 | 190 |
| - | - | NA4828 | XL | 1 920 | 140 | 155 | 175 |
| - | - | NA4830 | XL | 2 720 | 150 | 165 | 190 |
| - | - | NA4832 | XL | 2 890 | 160 | 175 | 200 |
| - | - | NA4834 | XL | 3 960 | 170 | 185 | 215 |
| - | - | NA4836 | XL | 4 200 | 180 | 195 | 225 |
| - | - | NA4838 | XL | 5 610 | 190 | 210 | 240 |



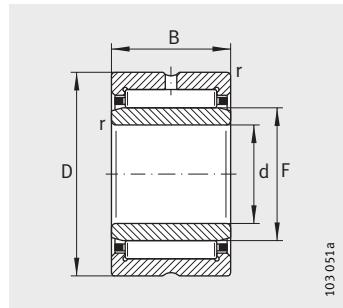
¹⁾ Axial displacement "s"

| B | r min. | s ¹⁾ | Basic load ratings | | Fatigue limit load C _{ur} N | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|----|-----------|-----------------|-----------------------------|-------------------------------|--|---|--|
| | | | dyn. C _r N | stat. C _{0r} N | | | |
| 30 | 1,1 | 1,5 | 111 000 | 210 000 | 41 500 | 4 250 | 2 700 |
| 40 | 1,1 | 2 | 143 000 | 290 000 | 58 000 | 4 250 | 2 650 |
| 40 | 1,1 | 2 | 144 000 | 270 000 | 45 500 | 4 100 | 2 600 |
| 40 | 1,1 | 2 | 149 000 | 290 000 | 47 500 | 3 750 | 2 400 |
| 30 | 1 | 0,8 | 106 000 | 216 000 | 36 000 | 3 900 | 2 300 |
| 45 | 1,1 | 2 | 205 000 | 390 000 | 64 000 | 3 450 | 2 200 |
| 30 | 1 | 0,8 | 112 000 | 239 000 | 39 000 | 3 650 | 2 090 |
| 50 | 1,5 | 1,5 | 229 000 | 470 000 | 74 000 | 3 150 | 2 080 |
| 35 | 1,1 | 1 | 134 000 | 310 000 | 48 500 | 3 300 | 2 000 |
| 50 | 1,5 | 1,5 | 237 000 | 500 000 | 78 000 | 2 950 | 1 920 |
| 35 | 1,1 | 1 | 136 000 | 325 000 | 50 000 | 3 100 | 1 870 |
| 40 | 1,1 | 1,5 | 172 000 | 400 000 | 62 000 | 2 900 | 1 810 |
| 40 | 1,1 | 1,5 | 181 000 | 435 000 | 66 000 | 2 700 | 1 680 |
| 45 | 1,1 | 1,5 | 209 000 | 510 000 | 75 000 | 2 550 | 1 610 |
| 45 | 1,1 | 1,5 | 219 000 | 550 000 | 80 000 | 2 420 | 1 490 |
| 50 | 1,5 | 1,5 | 255 000 | 690 000 | 100 000 | 2 280 | 1 350 |



Needle roller bearings

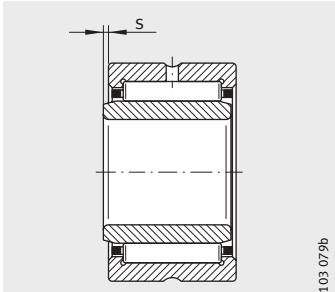
With inner ring



NA48

Dimension table (continued) · Dimensions in mm

| Designation | X-life | Mass m ≈g | Dimensions | | | | | |
|---------------|-----------|-----------------|------------|-----|-----|-----|-----------|-----------------|
| | | | d | F | D | B | r min. | s ¹⁾ |
| NA4840 | XL | 5 840 | 200 | 220 | 250 | 50 | 1,5 | 1,5 |
| NA4844 | XL | 6 380 | 220 | 240 | 270 | 50 | 1,5 | 1,5 |
| NA4848 | XL | 10 000 | 240 | 265 | 300 | 60 | 2 | 2 |
| NA4852 | XL | 10 600 | 260 | 285 | 320 | 60 | 2 | 2 |
| NA4856 | XL | 15 300 | 280 | 305 | 350 | 69 | 2 | 2,5 |
| NA4860 | XL | 21 800 | 300 | 330 | 380 | 80 | 2,1 | 2 |
| NA4864 | XL | 23 000 | 320 | 350 | 400 | 80 | 2,1 | 2 |
| NA4868 | XL | 24 200 | 340 | 370 | 420 | 80 | 2,1 | 2 |
| NA4872 | XL | 25 600 | 360 | 390 | 440 | 80 | 2,1 | 2 |
| NA4876 | XL | 42 600 | 380 | 415 | 480 | 100 | 2,1 | 2 |



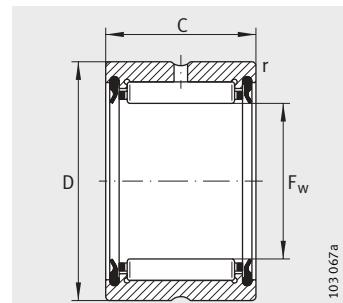
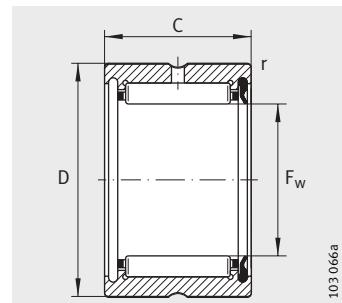
¹⁾ Axial displacement "s"

| Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min^{-1} | Reference speed n_B min^{-1} |
|--------------------|------------------------|-------------------------------------|--|---|
| dyn. C_r N | stat. C_{0r} N | | | |
| 260 000 | 720 000 | 102 000 | 2 180 | 1 270 |
| 275 000 | 790 000 | 110 000 | 2 000 | 1 130 |
| 400 000 | 1 080 000 | 150 000 | 1 810 | 990 |
| 415 000 | 1 160 000 | 158 000 | 1 690 | 890 |
| 510 000 | 1 300 000 | 175 000 | 1 560 | 840 |
| 700 000 | 1 770 000 | 235 000 | 1 440 | 730 |
| 710 000 | 1 850 000 | 242 000 | 1 360 | 680 |
| 730 000 | 1 940 000 | 249 000 | 1 290 | 640 |
| 740 000 | 2 020 000 | 255 000 | 1 230 | 600 |
| 1 130 000 | 2 900 000 | 370 000 | 1 140 | 520 |



Needle roller bearings

Without inner ring,
sealed



RNA49..-RSR

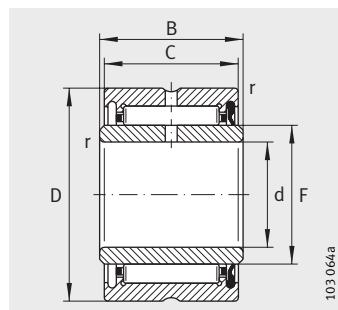
RNA49..-2RSR

Dimension table · Dimensions in mm

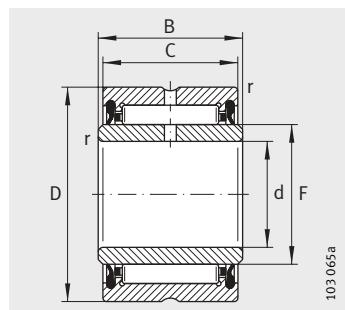
| Designation | | Mass m ≈g | Dimensions | | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G grease min ⁻¹ | |
|-------------|--------------|-----------------|------------|----|----|-----------|--------------------|------------------------|--|--|--------|
| | | | F_w | D | C | r min. | dyn. C_r N | stat. C_{or} N | | | |
| RNA4900-RSR | RNA4900-2RSR | XL | 16 | 14 | 22 | 13 | 0,3 | 7700 | 6 900 | 1 360 | 13 000 |
| RNA4901-RSR | RNA4901-2RSR | XL | 18 | 16 | 24 | 13 | 0,3 | 8 600 | 8 300 | 1 630 | 12 000 |
| RNA4902-RSR | RNA4902-2RSR | XL | 21,5 | 20 | 28 | 13 | 0,3 | 9 700 | 10 300 | 2 040 | 10 000 |
| RNA4903-RSR | RNA4903-2RSR | XL | 23 | 22 | 30 | 13 | 0,3 | 10 000 | 11 000 | 2 180 | 9 000 |
| RNA4904-RSR | RNA4904-2RSR | XL | 56 | 25 | 37 | 17 | 0,3 | 19 500 | 19 900 | 3 750 | 7 500 |
| RNA4905-RSR | RNA4905-2RSR | XL | 60 | 30 | 42 | 17 | 0,3 | 21 800 | 24 200 | 4 550 | 6 500 |
| RNA4906-RSR | RNA4906-2RSR | XL | 69 | 35 | 47 | 17 | 0,3 | 23 900 | 28 500 | 5 400 | 5 500 |
| RNA4907-RSR | RNA4907-2RSR | XL | 107 | 42 | 55 | 20 | 0,6 | 29 500 | 39 500 | 7 200 | 4 800 |
| RNA4908-RSR | RNA4908-2RSR | XL | 154 | 48 | 62 | 22 | 0,6 | 41 000 | 53 000 | 8 800 | 4 200 |
| RNA4909-RSR | RNA4909-2RSR | XL | 157 | 52 | 68 | 22 | 0,6 | 43 000 | 59 000 | 9 700 | 3 900 |
| RNA4910-RSR | RNA4910-2RSR | XL | 160 | 58 | 72 | 22 | 0,6 | 45 000 | 64 000 | 10 600 | 3 500 |

Needle roller bearings

With inner ring,
sealed



NA49..-RSR



NA49..-2RSR

Dimension table · Dimensions in mm

| Designation | | Mass $m \approx g$ | Dimensions | | | | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G grease min^{-1} | |
|-------------|-------------|-----------------------|------------|----|----|----|----|-----------|--------------------|------------------------|--|--|--------|
| | | | d | F | D | C | B | r min. | dyn. C_r N | stat. C_{0r} N | | | |
| NA4900-RSR | NA4900-2RSR | XL | 24,5 | 10 | 14 | 22 | 13 | 14 | 0,3 | 7 700 | 6 900 | 1 360 | 13 000 |
| NA4901-RSR | NA4901-2RSR | XL | 27,5 | 12 | 16 | 24 | 13 | 14 | 0,3 | 8 600 | 8 300 | 1 630 | 12 000 |
| NA4902-RSR | NA4902-2RSR | XL | 37 | 15 | 20 | 28 | 13 | 14 | 0,3 | 9 700 | 10 300 | 2 040 | 10 000 |
| NA4903-RSR | NA4903-2RSR | XL | 40 | 17 | 22 | 30 | 13 | 14 | 0,3 | 10 000 | 11 000 | 2 180 | 9 000 |
| NA4904-RSR | NA4904-2RSR | XL | 80 | 20 | 25 | 37 | 17 | 18 | 0,3 | 19 500 | 19 900 | 3 750 | 7 500 |
| NA4905-RSR | NA4905-2RSR | XL | 89,5 | 25 | 30 | 42 | 17 | 18 | 0,3 | 21 800 | 24 200 | 4 550 | 6 500 |
| NA4906-RSR | NA4906-2RSR | XL | 104 | 30 | 35 | 47 | 17 | 18 | 0,3 | 23 900 | 28 500 | 5 400 | 5 500 |
| NA4907-RSR | NA4907-2RSR | XL | 175 | 35 | 42 | 55 | 20 | 21 | 0,6 | 29 500 | 39 500 | 7 200 | 4 800 |
| NA4908-RSR | NA4908-2RSR | XL | 252 | 40 | 48 | 62 | 22 | 23 | 0,6 | 41 000 | 53 000 | 8 800 | 4 200 |
| NA4909-RSR | NA4909-2RSR | XL | 290 | 45 | 52 | 68 | 22 | 23 | 0,6 | 43 000 | 59 000 | 9 700 | 3 900 |
| NA4910-RSR | NA4910-2RSR | XL | 295 | 50 | 58 | 72 | 22 | 23 | 0,6 | 45 000 | 64 000 | 10 600 | 3 500 |





Needle roller bearings without ribs

Needle roller bearings without ribs

| | Page |
|-------------------------------------|---|
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| Features | X-life 659 Needle roller bearings without inner ring 659 Needle roller bearings with inner ring 659 Operating temperature 660 Cages 660 Suffixes 660 |
| Design and safety guidelines | Raceway for bearings without inner ring 660 Minimum radial load 660 Sealing rings/wider inner rings 660 Axial guidance of needle roller and cage assemblies 661 Radial location 661 Axial location 661 Fitting note 661 |
| Accuracy | Radial internal clearance 661 Enveloping circle 661 |
| Dimension tables | Needle roller bearings without ribs, without inner ring 662 Needle roller bearings without ribs, with inner ring 666 |



Product overview Needle roller bearings without ribs

Without inner ring

Single row



Double row



With inner ring

Single row



Double row



Needle roller bearings without ribs

| | |
|--|--|
| Features | Needle roller bearings without ribs are single or double row units comprising machined outer rings without ribs, needle roller and cage assemblies and removable inner rings. The bearings are not self-retaining. This means that the outer ring, needle roller and cage assembly and inner ring can be fitted independently of each other. |
| X-life | Needle roller bearings without ribs are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life. |
| Sealing/lubricant | Needle roller bearings without ribs are not sealed and not greased. Double row bearings can be lubricated via a lubrication groove and lubrication hole in the outer ring. These bearings have the suffix ZW-ASR1. |
| Needle roller bearings without inner ring | Bearings RNAO have particularly compact radial dimensions. However, they require a shaft raceway that is hardened and ground. The needle roller and cage assembly can be fitted either together with the outer ring or with the shaft. It can also be subsequently slid between the outer ring and shaft. The double row design is indicated by the suffix ZW, the lubrication hole and lubrication groove are indicated by the suffix ASR1. |
| Needle roller bearings with inner ring | Bearings NAO are used if the shaft cannot be configured as a rolling bearing raceway. The needle roller and cage assembly can be fitted either together with the outer ring or with the inner ring. It can also be subsequently slid between the outer ring and inner ring. Bearings with a lubrication hole in the inner ring have the suffix IS1. The double row design is indicated by the suffix ZW, the lubrication hole and lubrication groove in the outer ring are indicated by the suffix ASR1. |
| Displacement of the inner ring | The standard inner ring allows axial displacement within the values "s" stated in the dimension tables. Where larger displacements occur, the standard ring can be replaced by a wider inner ring IR. Inner rings: see page 690. |



Needle roller bearings without ribs

Operating temperature Bearings with plastic cage can be used at operating temperatures from -20°C to $+120^{\circ}\text{C}$.

Cages The cages are made from sheet steel or plastic. Plastic cages have the suffix TV.

Suffixes Suffixes for the available designs: see table.

Available designs

| Suffix | Description |
|--------------------|---|
| ASR ¹⁾ | Lubrication hole and lubrication groove in outer ring |
| IS ¹⁾ | Lubrication hole in inner ring |
| TV ¹⁾²⁾ | Cage made from glass fibre reinforced polyamide 66 |
| ZW ²⁾ | Double row |

¹⁾ Bearings with plastic cage: see dimension tables.

²⁾ Dependent on size.

Design and safety guidelines
Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be $670 \text{ HV} + 170 \text{ HV}$ and the hardening depth CHD or Rht must be sufficiently large.

Raceway design

| Shaft-diameter Nominal dimension mm | | Shaft tolerance Operating clearance | | | Roughness max. | Roundness max. | Parallelism max. |
|--|-------|--|--------|-------|---------------------|-------------------|---------------------|
| over | incl. | Small | Normal | Large | | | |
| – | 65 | k5 | h5 | g6 | $R_a0,1 (R_z0,4)$ | IT3 | IT3 |
| 65 | 80 | k5 | h5 | f6 | | | |
| 80 | 120 | k5 | g5 | f6 | $R_a0,15 (R_z0,63)$ | | |

Caution!

The values apply to housing tolerances up to K7. For tighter housing bores, the operating clearance should be checked by either calculation or measurement.

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. In continuous operation, a minimum radial load of the order of $C_r/P < 50$ is necessary.

**Sealing rings/
wider inner rings**

Sealing rings of series G, GR and SD are matched to the bearing dimensions and can be combined with wider inner rings IR. The outer surface of the inner rings can be used as the sliding surface for seal lips.

Sealing rings: see publication GSD, inner rings: see page 690.

Caution!

Sealing rings must not be used as running surfaces for the cage.

Axial guidance of needle roller and cage assemblies

Caution!

In bearings without ribs, the needle roller and cage assemblies must be axially guided on lateral, burr-free running surfaces, see dimension tables.

The axial running surfaces for the cage must be precision machined (R_a2) and resistant to wear. Note the mounting dimensions in the dimension tables.

Radial location

Needle roller bearings with inner ring are radially located by means of a close fit on the shaft and in the housing.

Axial location

In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking.

The abutting shoulders (shaft/housing) should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must have rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r in the dimension tables.

The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

Fitting note

Caution!

Needle roller bearings without ribs are not self-retaining. Since the individual parts are matched to each other, parts of bearings of equal size must not be interchanged during fitting.

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620.

Radial internal clearance

Radial internal clearance to DIN 620-4

| Bore d mm | | Radial internal clearance | |
|-----------------|-------|---------------------------|------|
| over | incl. | CN μm | max. |
| – | 24 | 20 | 45 |
| 24 | 30 | 20 | 45 |
| 30 | 40 | 25 | 50 |
| 40 | 50 | 30 | 60 |
| 50 | 65 | 40 | 70 |
| 65 | 80 | 40 | 75 |
| 80 | 100 | 50 | 85 |
| 100 | 120 | 50 | 90 |

Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.

The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway.

For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.

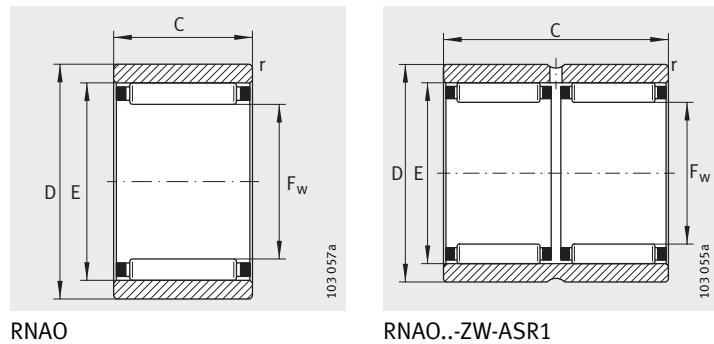
Caution!

If the enveloping circle diameter must be in tolerance zone F6, the parts as delivered (outer ring/needle roller and cage assembly matched pair) must not be interchanged with other matched pairs.



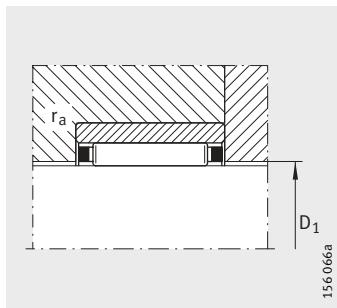
Needle roller bearings without ribs

Without inner ring

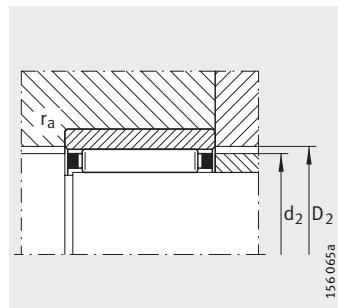


Dimension table · Dimensions in mm

| Designation | X-life | Mass $\approx g$ | Dimensions | | | | | Mounting dimensions | |
|----------------------|--------|---------------------|------------|----|----|----|-----------|---------------------|-------|
| | | | F_w | D | C | E | r min. | D_1 | d_2 |
| RNA05X10X8-TV | XL | 3 | 5 | 10 | 8 | 8 | 0,15 | 5,3 | 7,7 |
| RNA06X13X8-TV | XL | 6 | 6 | 13 | 8 | 9 | 0,3 | 6,3 | 8,7 |
| RNA07X14X8-TV | XL | 6 | 7 | 14 | 8 | 10 | 0,3 | 7,3 | 9,7 |
| RNA08X15X10-TV | XL | 8 | 8 | 15 | 10 | 11 | 0,3 | 8,3 | 10,7 |
| RNA010X17X10-TV | XL | 10 | 10 | 17 | 10 | 13 | 0,3 | 10,3 | 12,7 |
| RNA012X22X12-TV | XL | 19 | 12 | 22 | 12 | 18 | 0,3 | 12,3 | 17,6 |
| RNA015X23X13 | XL | 20 | 15 | 23 | 13 | 19 | 0,3 | 15,4 | 18,6 |
| RNA016X24X13 | XL | 21 | 16 | 28 | 12 | 20 | 0,3 | 16,4 | 19,6 |
| RNA016X28X12 | XL | 32 | 16 | 28 | 12 | 22 | 0,3 | 16,4 | 21,6 |
| RNA017X25X13 | XL | 22 | 17 | 25 | 13 | 21 | 0,3 | 17,4 | 20,6 |
| RNA018X30X24-ZW-ASR1 | XL | 69 | 18 | 30 | 24 | 24 | 0,3 | 18,4 | 23,6 |
| RNA020X28X13 | XL | 25 | 20 | 28 | 13 | 24 | 0,3 | 20,4 | 23,6 |
| RNA020X28X26-ZW-ASR1 | XL | 50 | 20 | 28 | 26 | 24 | 0,3 | 20,4 | 23,6 |
| RNA020X32X12 | XL | 38 | 20 | 32 | 12 | 26 | 0,3 | 20,4 | 25,6 |
| RNA022X30X13 | XL | 27 | 22 | 30 | 13 | 26 | 0,3 | 22,4 | 25,6 |
| RNA022X35X16 | XL | 59 | 22 | 35 | 16 | 29 | 0,3 | 22,4 | 28,4 |
| RNA025X35X17 | XL | 53 | 25 | 35 | 17 | 29 | 0,3 | 25,6 | 28,4 |
| RNA025X35X26-ZW-ASR1 | XL | 76 | 25 | 35 | 26 | 29 | 0,3 | 25,6 | 28,4 |
| RNA025X37X16 | XL | 60 | 25 | 37 | 16 | 32 | 0,3 | 25,6 | 31,4 |
| RNA030X40X17 | XL | 60 | 30 | 40 | 17 | 35 | 0,3 | 30,6 | 34,4 |
| RNA030X42X16 | XL | 59 | 30 | 42 | 16 | 37 | 0,3 | 30,6 | 36,4 |
| RNA030X42X32-ZW-ASR1 | XL | 137 | 30 | 42 | 32 | 37 | 0,3 | 30,6 | 36,4 |
| RNA035X45X13 | XL | 53 | 35 | 45 | 13 | 40 | 0,3 | 35,6 | 39,4 |
| RNA035X45X17 | XL | 69 | 35 | 45 | 17 | 40 | 0,3 | 35,6 | 39,4 |
| RNA035X45X26-ZW-ASR1 | XL | 91 | 35 | 45 | 26 | 40 | 0,3 | 35,6 | 39,4 |
| RNA035X47X16 | XL | 78 | 35 | 47 | 16 | 42 | 0,3 | 35,6 | 41,4 |
| RNA035X47X18 | XL | 89 | 35 | 47 | 16 | 42 | 0,3 | 35,6 | 41,4 |
| RNA035X47X32-ZW-ASR1 | XL | 156 | 35 | 47 | 32 | 42 | 0,3 | 35,6 | 41,4 |



Axial guidance of needle roller
and cage assembly in housing



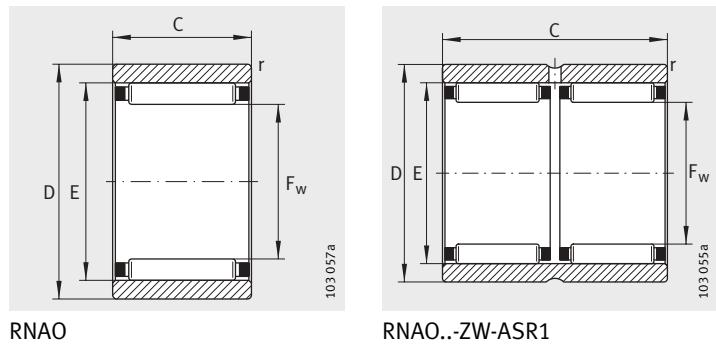
Axial guidance of needle roller
and cage assembly on shaft

| | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|-------|---------------|--------------------|------------------------|-------------------------------------|--|---|
| D_2 | r_a max. | dyn. C_r N | stat. C_{0r} N | | | |
| 8,3 | 0,1 | 2 650 | 1 920 | 295 | 37 000 | 60 000 |
| 9,3 | 0,3 | 2 950 | 2 280 | 355 | 32 000 | 55 000 |
| 10,3 | 0,3 | 3 250 | 2 650 | 410 | 31 000 | 48 000 |
| 11,3 | 0,3 | 4 450 | 4 100 | 690 | 29 000 | 41 000 |
| 13,3 | 0,3 | 5 300 | 5 500 | 930 | 27 000 | 33 000 |
| 18,3 | 0,3 | 11 300 | 9 900 | 1 740 | 24 000 | 23 000 |
| 19,3 | 0,3 | 9 700 | 10 900 | 1 760 | 22 900 | 15 000 |
| 20,3 | 0,3 | 10 100 | 11 800 | 1 890 | 22 400 | 14 200 |
| 22,3 | 0,3 | 13 000 | 12 500 | 2 210 | 21 300 | 12 600 |
| 21,3 | 0,3 | 11 700 | 14 600 | 2 240 | 21 800 | 13 000 |
| 24,5 | 0,3 | 24 800 | 30 000 | 5 300 | 20 400 | 17 300 |
| 24,3 | 0,3 | 11 100 | 14 300 | 2 310 | 20 400 | 11 900 |
| 24,3 | 0,3 | 19 000 | 28 500 | 4 600 | 20 000 | 16 000 |
| 26,5 | 0,3 | 15 100 | 16 200 | 2 850 | 18 800 | 10 500 |
| 26,3 | 0,3 | 11 800 | 15 900 | 2 550 | 18 800 | 10 900 |
| 29,5 | 0,3 | 22 600 | 25 500 | 4 200 | 17 200 | 9 400 |
| 29,5 | 0,3 | 16 800 | 26 000 | 4 250 | 16 300 | 9 300 |
| 29,5 | 0,3 | 21 900 | 37 000 | 5 900 | 16 000 | 13 000 |
| 32,5 | 0,3 | 23 800 | 28 000 | 4 650 | 15 800 | 8 700 |
| 35,5 | 0,3 | 22 100 | 34 000 | 5 300 | 14 000 | 7 800 |
| 37,5 | 0,3 | 26 000 | 33 500 | 5 500 | 13 600 | 7 600 |
| 37,5 | 0,3 | 45 000 | 67 000 | 11 100 | 14 000 | 10 000 |
| 40,5 | 0,3 | 18 300 | 28 000 | 4 550 | 12 300 | 7 100 |
| 40,5 | 0,3 | 23 500 | 38 500 | 6 100 | 12 300 | 7 000 |
| 40,5 | 0,3 | 31 500 | 56 000 | 8 900 | 12 000 | 9 000 |
| 42,5 | 0,3 | 27 500 | 37 500 | 6 200 | 12 000 | 6 800 |
| 42,5 | 0,3 | 31 000 | 43 000 | 7 400 | 12 000 | 6 700 |
| 42,5 | 0,3 | 47 500 | 75 000 | 12 400 | 12 000 | 9 000 |



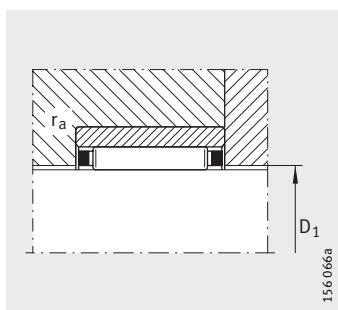
Needle roller bearings without ribs

Without inner ring

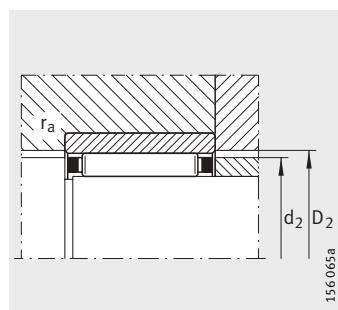


Dimension table (continued) - Dimensions in mm

| Designation | X-life | Mass $\approx g$ | Dimensions | | | | | Mounting dimensions | |
|----------------------|--------|---------------------|------------|-----|----|-----|-----------|---------------------|-------|
| | | | F_w | D | C | E | r min. | D_1 | d_2 |
| RNAO40X50X17 | XL | 74 | 40 | 50 | 17 | 45 | 0,3 | 40,6 | 44,4 |
| RNAO40X50X34-ZW-ASR1 | XL | 152 | 40 | 50 | 34 | 45 | 0,3 | 40,6 | 44,4 |
| RNAO40X55X20 | XL | 145 | 40 | 55 | 20 | 47 | 0,3 | 40,6 | 46,2 |
| RNAO40X55X40-ZW-ASR1 | XL | 275 | 40 | 55 | 40 | 48 | 0,3 | 40,6 | 47,2 |
| RNAO45X55X17 | XL | 83 | 45 | 55 | 17 | 50 | 0,3 | 45,6 | 49,2 |
| RNAO45X62X40-ZW-ASR1 | XL | 377 | 45 | 62 | 40 | 53 | 0,3 | 45,6 | 52,2 |
| RNAO50X62X20 | XL | 140 | 50 | 62 | 20 | 55 | 0,3 | 50,6 | 54,2 |
| RNAO50X65X20 | XL | 168 | 50 | 65 | 20 | 58 | 0,3 | 50,6 | 57,2 |
| RNAO50X65X40-ZW-ASR1 | XL | 355 | 50 | 65 | 40 | 58 | 0,6 | 50,6 | 57,2 |
| RNAO55X68X20 | XL | 166 | 55 | 68 | 20 | 60 | 0,6 | 55,8 | 59,4 |
| RNAO60X78X20 | XL | 255 | 60 | 78 | 20 | 68 | 1 | 60,8 | 67,2 |
| RNAO60X78X40-ZW-ASR1 | XL | 435 | 60 | 78 | 40 | 68 | 1 | 60,8 | 67,2 |
| RNAO65X85X30 | XL | 464 | 65 | 85 | 30 | 73 | 1 | 66 | 72,2 |
| RNAO70X90X30 | XL | 499 | 70 | 90 | 30 | 78 | 1 | 71 | 77,2 |
| RNAO80X100X30 | XL | 580 | 80 | 100 | 30 | 88 | 1 | 81 | 87,2 |
| RNAO90X105X26 | XL | 373 | 90 | 105 | 26 | 98 | 1 | 91 | 97,2 |
| RNAO90X110X30 | XL | 610 | 90 | 110 | 30 | 98 | 1 | 91 | 97,2 |
| RNAO100X120X30 | XL | 694 | 100 | 120 | 30 | 108 | 1 | 101 | 107,2 |



Axial guidance of needle roller
and cage assembly in housing



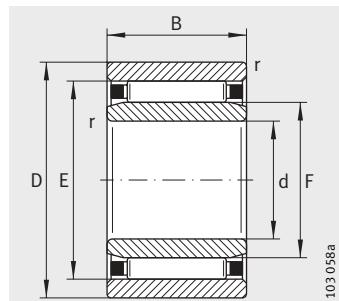
Axial guidance of needle roller
and cage assembly on shaft

| | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|-------|---------------|--------------------|------------------------|-------------------------------------|--|---|
| D_2 | r_a max. | dyn. C_r N | stat. C_{0r} N | | | |
| 45,5 | 0,3 | 24 200 | 41 500 | 6 400 | 10 900 | 6 400 |
| 45,5 | 0,3 | 41 500 | 83 000 | 12 900 | 11 000 | 7 000 |
| 47,5 | 0,3 | 37 000 | 57 000 | 8 900 | 10 300 | 5 800 |
| 47,5 | 0,3 | 70 000 | 118 000 | 18 700 | 10 000 | 7 500 |
| 50,5 | 0,3 | 25 500 | 46 000 | 7 100 | 9 800 | 5 800 |
| 53,5 | 0,3 | 76 000 | 135 000 | 21 500 | 9 000 | 7 000 |
| 55,8 | 0,3 | 30 000 | 60 000 | 9 600 | 8 800 | 5 300 |
| 58,5 | 0,3 | 40 500 | 62 000 | 10 800 | 8 500 | 5 100 |
| 58,5 | 0,6 | 69 000 | 124 000 | 21 700 | 8 500 | 6 500 |
| 60,8 | 0,6 | 32 000 | 66 000 | 10 700 | 8 000 | 4 850 |
| 68,8 | 1 | 49 500 | 85 000 | 13 600 | 7 100 | 4 150 |
| 68,8 | 1 | 85 000 | 171 000 | 27 500 | 7 000 | 5 500 |
| 73,8 | 1 | 64 000 | 123 000 | 21 100 | 6 500 | 4 000 |
| 78,8 | 1 | 68 000 | 135 000 | 23 200 | 6 100 | 3 750 |
| 89 | 1 | 80 000 | 176 000 | 31 000 | 5 400 | 3 250 |
| 99 | 1 | 69 000 | 150 000 | 25 000 | 5 000 | 3 200 |
| 99 | 1 | 76 000 | 172 000 | 29 500 | 4 900 | 3 100 |
| 109 | 1 | 80 000 | 188 000 | 32 000 | 4 500 | 3 700 |

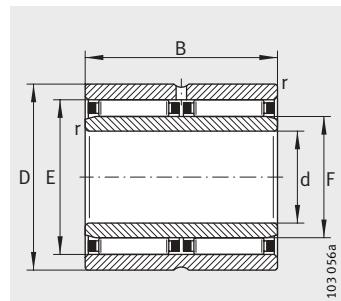


Needle roller bearings without ribs

With inner ring



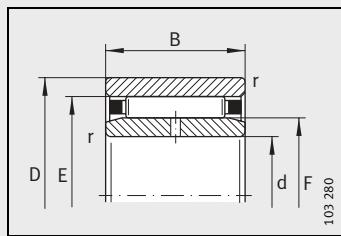
NAO



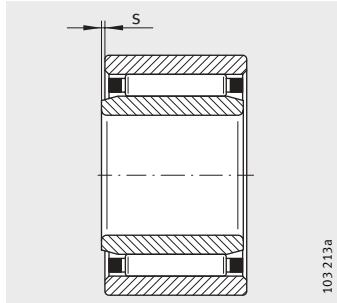
NAO..-ZW-ASR1

Dimension table · Dimensions in mm

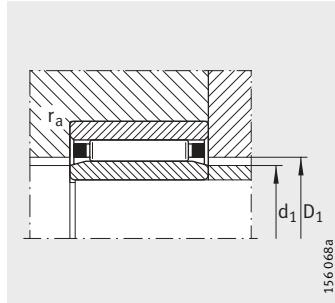
| Designation | X-life | Mass m ≈g | Dimensions | | | | | | |
|---------------------|--------|-----------------|------------|-----|----|-----|-----|-----------|-----------------|
| | | | d | D | B | F | E | r min. | s ¹⁾ |
| NA06X17X10-TV-IS1 | XL | 14 | 6 | 17 | 10 | 10 | 13 | 0,3 | 0,5 |
| NA09X22X12-TV | XL | 23,5 | 9 | 22 | 12 | 12 | 18 | 0,3 | 0,5 |
| NA012X24X13 | XL | 30 | 12 | 24 | 13 | 16 | 20 | 0,3 | 0,5 |
| NA012X28X12-IS1 | XL | 40 | 12 | 28 | 12 | 16 | 22 | 0,3 | 0,5 |
| NA015X28X13 | XL | 29 | 15 | 28 | 13 | 20 | 24 | 0,3 | 0,5 |
| NA015X32X12-IS1 | XL | 50 | 15 | 32 | 12 | 20 | 26 | 0,3 | 0,5 |
| NA017X30X13 | XL | 42 | 17 | 30 | 13 | 22 | 26 | 0,3 | 0,5 |
| NA017X35X16 | XL | 78 | 17 | 35 | 16 | 22 | 29 | 0,3 | 0,5 |
| NA020X35X17 | XL | 76 | 20 | 35 | 17 | 25 | 29 | 0,3 | 0,5 |
| NA020X37X16 | XL | 82 | 20 | 37 | 16 | 25 | 32 | 0,3 | 0,5 |
| NA025X40X17 | XL | 88 | 25 | 40 | 17 | 30 | 35 | 0,3 | 0,8 |
| NA025X42X16-IS1 | XL | 86 | 25 | 42 | 16 | 30 | 37 | 0,3 | 0,8 |
| NA025X42X32-ZW-ASR1 | XL | 190 | 25 | 43 | 32 | 30 | 37 | 0,3 | 0,8 |
| NA030X45X17 | XL | 102 | 30 | 45 | 17 | 35 | 40 | 0,3 | 0,8 |
| NA030X45X26-ZW-ASR1 | XL | 157 | 30 | 45 | 26 | 35 | 40 | 0,3 | 0,8 |
| NA030X47X16 | XL | 109 | 30 | 47 | 16 | 35 | 42 | 0,3 | 0,8 |
| NA030X47X18 | XL | 119 | 30 | 47 | 18 | 35 | 42 | 0,3 | 0,8 |
| NA035X50X17 | XL | 113 | 35 | 50 | 17 | 40 | 45 | 0,3 | 0,8 |
| NA035X55X20 | XL | 190 | 35 | 55 | 20 | 40 | 47 | 0,3 | 0,8 |
| NA040X55X17 | XL | 127 | 40 | 55 | 17 | 45 | 50 | 0,3 | 0,8 |
| NA050X68X20-IS1 | XL | 230 | 50 | 68 | 20 | 55 | 60 | 0,6 | 1 |
| NA070X100X30 | XL | 850 | 70 | 100 | 30 | 80 | 88 | 1 | 1 |
| NA080X110X30 | XL | 920 | 80 | 110 | 30 | 90 | 98 | 1 | 1 |
| NA090X120X30 | XL | 1 044 | 90 | 120 | 30 | 100 | 108 | 1 | 1 |



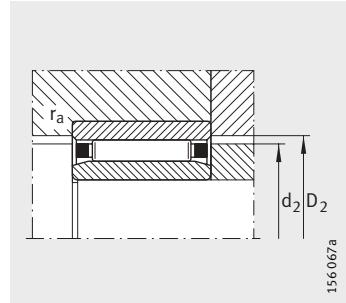
NAO..-IS1



1) Axial displacement "s"



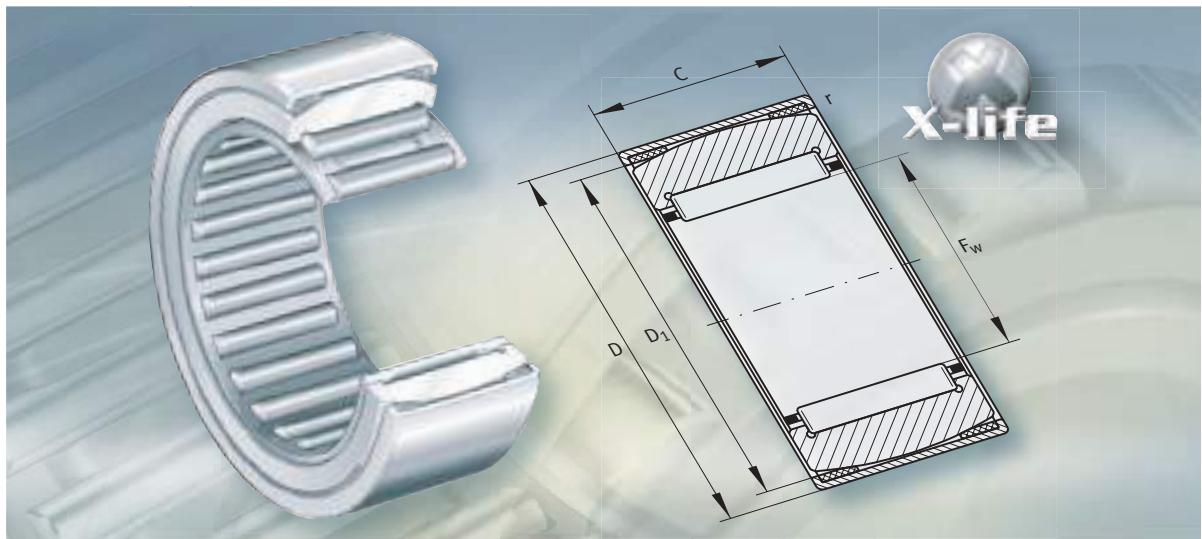
Axial guidance of needle roller
and cage assembly in housing



Axial guidance of needle roller
and cage assembly on shaft

| Mounting dimensions | | | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|---------------------|-------|-------|-------|---------------|--------------------|------------------------|-------------------------------------|--|---|
| d_1 | D_1 | d_2 | D_2 | r_a max. | dyn. C_r N | stat. C_{or} N | | | |
| 9,7 | 10,3 | 12,7 | 13,3 | 0,3 | 5 300 | 5 500 | 930 | 29 000 | 28 000 |
| 11,7 | 12,3 | 17,6 | 18,3 | 0,3 | 11 300 | 9 900 | 1 740 | 25 000 | 21 000 |
| 15,7 | 16,4 | 19,6 | 20,3 | 0,3 | 10 100 | 11 800 | 1 890 | 24 000 | 18 000 |
| 15,7 | 16,4 | 21,6 | 22,3 | 0,3 | 13 000 | 12 500 | 2 210 | 22 000 | 17 000 |
| 19,7 | 20,4 | 23,6 | 24,3 | 0,3 | 11 100 | 14 300 | 2 310 | 22 000 | 14 000 |
| 19,7 | 20,4 | 25,6 | 26,5 | 0,3 | 15 100 | 16 200 | 2 850 | 21 000 | 13 000 |
| 21,5 | 22,4 | 25,6 | 26,3 | 0,3 | 11 800 | 15 900 | 2 550 | 21 000 | 13 000 |
| 21,5 | 22,4 | 28,4 | 29,5 | 0,3 | 22 600 | 25 500 | 4 200 | 19 000 | 12 000 |
| 24,5 | 25,6 | 28,4 | 29,5 | 0,3 | 16 800 | 26 000 | 4 250 | 18 000 | 12 000 |
| 24,5 | 25,6 | 31,4 | 32,5 | 0,3 | 23 800 | 28 000 | 4 650 | 17 000 | 11 000 |
| 29,5 | 30,6 | 34,4 | 35,5 | 0,3 | 22 100 | 34 000 | 5 300 | 15 000 | 9 500 |
| 29,5 | 30,6 | 36,4 | 37,5 | 0,3 | 26 000 | 33 500 | 5 500 | 15 000 | 9 000 |
| 29,5 | 30,6 | 36,4 | 37,5 | 0,3 | 45 000 | 67 000 | 11 100 | 15 000 | 9 000 |
| 34,5 | 35,6 | 39,4 | 40,5 | 0,3 | 23 500 | 38 500 | 6 100 | 13 000 | 8 500 |
| 34,5 | 35,6 | 39,4 | 40,5 | 0,3 | 31 500 | 56 000 | 8 900 | 13 000 | 8 500 |
| 34,5 | 35,6 | 41,4 | 42,5 | 0,3 | 27 500 | 37 500 | 6 200 | 13 000 | 8 000 |
| 34,5 | 35,6 | 41,4 | 42,5 | 0,3 | 31 000 | 43 000 | 7 400 | 13 000 | 8 000 |
| 39,5 | 40,6 | 44,4 | 45,5 | 0,3 | 24 200 | 41 500 | 6 400 | 12 000 | 7 500 |
| 39,5 | 40,6 | 46,2 | 47,5 | 0,3 | 37 000 | 57 000 | 8 900 | 11 000 | 7 500 |
| 44,5 | 45,6 | 49,2 | 50,5 | 0,3 | 25 500 | 46 000 | 7 100 | 10 000 | 7 000 |
| 54,5 | 55,8 | 59,2 | 60,8 | 0,6 | 32 000 | 66 000 | 10 700 | 8 500 | 6 000 |
| 79,3 | 81 | 87,2 | 89 | 1 | 80 000 | 176 000 | 31 000 | 6 000 | 3 900 |
| 89,3 | 91 | 97,2 | 99 | 1 | 76 000 | 172 000 | 29 500 | 5 000 | 3 800 |
| 99,3 | 101 | 107,2 | 109 | 1 | 80 000 | 188 000 | 32 000 | 4 700 | 3 500 |





Aligning needle roller bearings

Aligning needle roller bearings

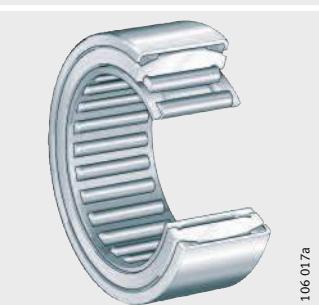
| | Page |
|-------------------------------------|---|
| Product overview | Aligning needle roller bearings 670 |
| Features | X-life 671 Needle roller bearings with/without inner ring 671 Operating temperature 671 Cages 671 |
| Design and safety guidelines | Compensation of misalignments 671 Raceway for bearings without inner ring 671 Minimum radial load 672 Speeds 672 Radial and axial location 672 Installation with fitting mandrel 672 |
| Accuracy | Radial internal clearance 672 Enveloping circle 672 |
| Dimension tables | Aligning needle roller bearings without inner ring 673 Aligning needle roller bearings with inner ring 673 |



Product overview Aligning needle roller bearings

Without inner ring

RPNA



106 017a

With inner ring

PNA



106 018a

Aligning needle roller bearings

| | |
|--|---|
| Features | Aligning needle roller bearings are units comprising drawn outer cups, plastic support rings with a concave inner profile, outer rings with a spherical outside surface, needle roller and cage assemblies and removable inner rings. The bearings can compensate static misalignments and can thus tolerate misalignment of the shaft relative to the housing; see Compensation of misalignments. Aligning needle roller bearings are firmly seated in the housing bore. The bore can therefore be produced easily and economically. |
| X-life | Aligning needle roller bearings are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life. |
| Sealing/lubricant | Aligning needle roller bearings are unsealed and are not supplied greased. They can be lubricated with grease or oil. |
| Needle roller bearings with/ without inner ring | Bearings RPNA do not have an inner ring and are therefore particularly compact. However, they require a raceway that is hardened and ground. Bearings PNA have an inner ring. They are used if the shaft cannot be configured as a rolling bearing raceway. |
| Displacement of the inner ring | The standard inner ring allows axial displacement within the values "s" stated in the dimension tables. Where larger displacements occur, the standard ring can be replaced by a wider inner ring IR. Inner rings: see page 690. |
| Operating temperature | Caution! Aligning needle roller bearings are suitable for operating temperatures from -20°C to $+100^{\circ}\text{C}$; this is limited by the plastic support rings. |
| Cages | The bearings have sheet steel cages. |
| Design and safety guidelines | |
| Compensation of misalignments | Due to the spherical outer ring and the concave support ring, aligning needle roller bearings can compensate static shaft misalignments of up to 3° . |
| Caution! | The bearings must not be used to support swivel or tumbling motion. During adjustment motion between the outer cup and the ring, a breakaway torque occurs. |
| | In order that adjustment motion can take place, the tolerances for the housing bore according to the table must be observed. |
| Raceway for bearings without inner ring | Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be $670\text{ HV} + 170\text{ HV}$ and the hardening depth CHD or Rht must be sufficiently large. |



Aligning needle roller bearings

**Tolerances for shaft raceway/
housing bore**

| Housing material | Shaft tolerance for bearings without inner ring | Bore tolerance |
|--------------------|--|----------------|
| Steel or cast iron | h6 | N6 |
| Light metal | | R6 |

**Surface for shaft raceway/
housing bore**

| Surface quality | Shaft raceway for bearings without inner ring | Housing bore |
|------------------|--|---------------------------------------|
| Roughness max. | R _a 0,1 (R _z 0,4) | R _a 0,8 (R _z 4) |
| Roundness max. | IT3 | IT 5/2 |
| Parallelism max. | IT3 | IT 5/2 |

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. For continuous operation, therefore, a ratio $C_r/P < 50$ is necessary.

Speeds

Caution!

The speeds n_G in the dimension tables are valid for oil lubrication. With grease lubrication, the permissible value is taken as 60% of the value given in the table.

Radial and axial location

Caution!

Aligning needle roller bearings are firmly seated in the housing bore. No further axial location is required.

Aligning needle roller bearings are not self-retaining. Since the individual bearing parts are matched to each other, the parts of bearings of identical size must not be interchanged during fitting.

Installation with fitting mandrel

Due to the drawn outer cup, the bearings must be fitted using a special pressing mandrel: see the section Drawn cup needle roller bearings, page 610. The marked side of the bearing should be in contact with the flange of the mandrel. A toroidal ring on the mandrel holds the bearing securely on the mandrel.

Accuracy

The dimensional and geometrical tolerances are in accordance with PN to DIN 620, apart from the outside diameter and width of the outer cup. The width has a tolerance of $\pm 0,5$ mm.

Radial internal clearance

Radial internal clearance to DIN 620-4

Bearings with inner ring have a radial internal clearance of CN.

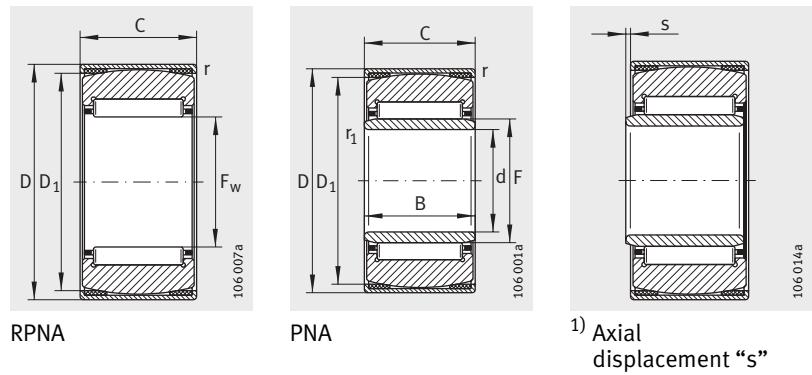
| Bore d mm | | Radial internal clearance CN μm | |
|-----------------|-------|--|------|
| over | incl. | min. | max. |
| – | 24 | 20 | 45 |
| 24 | 30 | 20 | 45 |
| 30 | 40 | 25 | 50 |
| 40 | 50 | 30 | 60 |

Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_W is used instead of the radial internal clearance. The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway. For bearings before fitting, the enveloping circle F_W is in the tolerance zone F6.

Aligning needle roller bearings

With or
without inner ring



¹⁾ Axial
displacement "s"

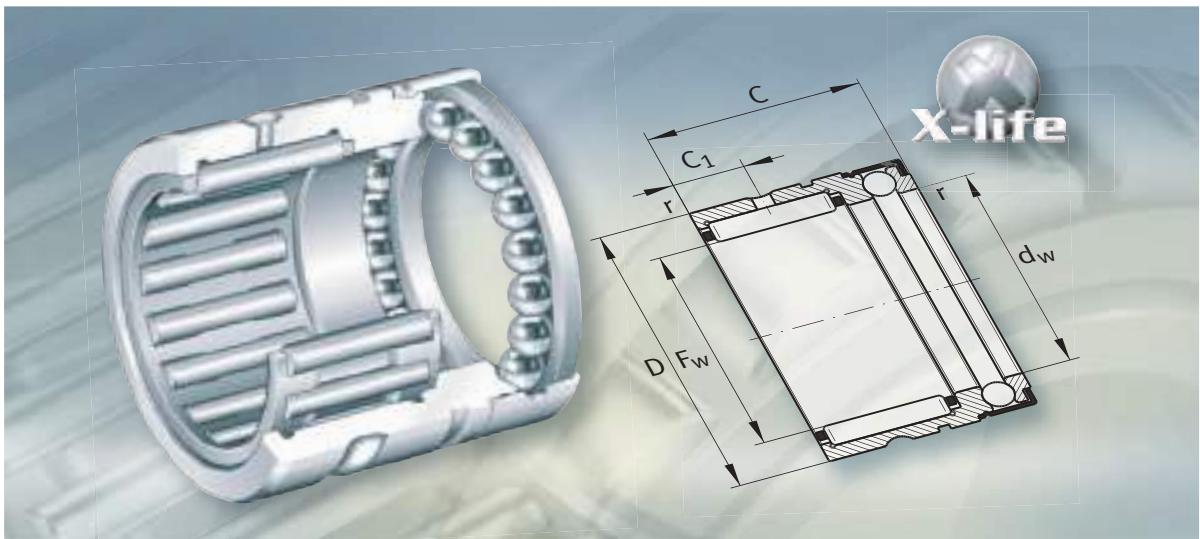
Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ |
|------------------|-----------------|------------|-----------|-----------|-------|-----------|--------------------|------------------------|--------|--|---|
| | | F_w | D | C ±0,5 | D_1 | r min. | dyn. C_r N | stat. C_{0r} N | | | |
| RPNA15/28 | XL | 32 | 15 | 28 | 12 | 24,5 | 0,8 | 7 800 | 7 900 | 1 430 | 24 000 |
| RPNA18/32 | XL | 52 | 18 | 32 | 16 | 27 | 0,8 | 14 100 | 16 200 | 3 000 | 22 000 |
| RPNA20/35 | XL | 62 | 20 | 35 | 16 | 30,5 | 0,8 | 14 600 | 17 500 | 3 200 | 21 000 |
| RPNA25/42 | XL | 109 | 25 | 42 | 20 | 36,5 | 0,8 | 21 300 | 30 500 | 5 300 | 18 000 |
| RPNA28/44 | XL | 112 | 28 | 44 | 20 | 38,5 | 0,8 | 24 800 | 34 000 | 5 900 | 16 000 |
| RPNA30/47 | XL | 125 | 30 | 47 | 20 | 42 | 0,8 | 25 500 | 36 000 | 6 300 | 15 000 |
| RPNA35/52 | XL | 131 | 35 | 52 | 20 | 47,5 | 0,8 | 27 500 | 41 500 | 7 300 | 13 000 |
| RPNA40/55 | XL | 141 | 40 | 55 | 20 | 50,5 | 0,8 | 29 500 | 47 000 | 8 300 | 11 000 |
| RPNA45/62 | XL | 176 | 45 | 62 | 20 | 58 | 0,8 | 31 000 | 53 000 | 9 300 | 10 000 |

Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | | | | | Basic load ratings | | Fatigue limit load C_{ur} N | Limiting speed n_G min ⁻¹ | |
|-----------------|-----------------|------------|-----------|----|-----------|----|-------|------|-------|-----------------|--------------------|------------------------|--|---|--------|
| | | d | F | D | C ±0,5 | B | D_1 | r | r_1 | s ¹⁾ | dyn. C_r N | stat. C_{0r} N | | | |
| PNA12/28 | XL | 37 | 12 | 15 | 28 | 12 | 12 | 24,5 | 0,8 | 0,3 | 0,5 | 7 800 | 7 900 | 1 430 | 24 000 |
| PNA15/32 | XL | 62 | 15 | 18 | 32 | 16 | 16 | 27 | 0,8 | 0,3 | 0,5 | 14 100 | 16 200 | 3 000 | 22 000 |
| PNA17/35 | XL | 73 | 17 | 20 | 35 | 16 | 16 | 30,5 | 0,8 | 0,3 | 0,5 | 14 600 | 17 500 | 3 200 | 21 000 |
| PNA20/42 | XL | 136 | 20 | 25 | 42 | 20 | 20 | 36,5 | 0,8 | 0,3 | 0,5 | 21 300 | 30 500 | 5 300 | 18 000 |
| PNA22/44 | XL | 145 | 22 | 28 | 44 | 20 | 20 | 38,5 | 0,8 | 0,3 | 0,5 | 24 800 | 34 000 | 5 900 | 16 000 |
| PNA25/47 | XL | 157 | 25 | 30 | 47 | 20 | 20 | 42 | 0,8 | 0,3 | 0,5 | 25 500 | 36 000 | 6 300 | 15 000 |
| PNA30/52 | XL | 181 | 30 | 35 | 52 | 20 | 20 | 47,5 | 0,8 | 0,3 | 0,5 | 27 500 | 41 500 | 7 300 | 13 000 |
| PNA35/55 | XL | 177 | 35 | 40 | 55 | 20 | 20 | 50,5 | 0,8 | 0,3 | 0,5 | 29 500 | 47 000 | 8 300 | 11 000 |
| PNA40/62 | XL | 227 | 40 | 45 | 62 | 20 | 20 | 58 | 0,8 | 0,3 | 0,5 | 31 000 | 53 000 | 9 300 | 10 000 |





Combined needle roller bearings

Combined needle roller bearings

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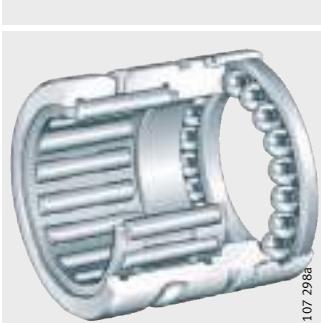


Product overview Combined needle roller bearings

Needle roller/ axial deep groove ball bearings

Without inner ring
With or without end cap

NX, NX..-Z



NKX., NKX..-Z



Needle roller/ axial cylindrical roller bearings

Without inner ring
With or without end cap

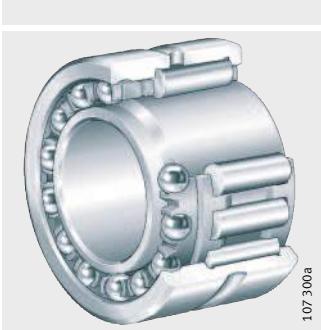
NKXR, NKXR..-Z



Needle roller/ angular contact ball bearings

With inner ring

NKIA



NKIB



Combined needle roller bearings

Features

Combined needle roller bearings are units comprising radial needle roller bearings with a rolling bearing component capable of supporting axial loads.

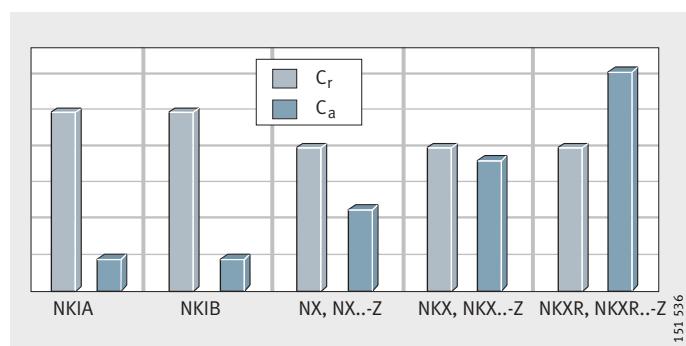
Radial and axial load carrying capacity

The bearings can support high radial forces as well as axial forces in one direction, while NKIB bearings can support axial forces from both directions, and are used as locating or semi-locating bearings, *Figure 1*.

X-life

Combined needle roller bearings are X-life bearings. In these bearings, the raceways have optimised roughness and geometrical accuracy. This gives higher load carrying capacity and longer life.

Figure 1
Dynamic load carrying capacity C_r and C_a



Needle roller/axial deep groove ball bearings

These bearings do not have an inner ring. Bearings without inner ring have particularly compact radial dimensions. However, they require a shaft raceway that is hardened and ground. Bearings NX and NX..-Z have a full complement axial ball bearing component and end caps. Bearings NKX (NAXK to DIN 5 429-1) and NKX..-Z (NAXK..-Z to DIN 5 429-1) have an axial bearing component comprising a ball and cage assembly with a sheet steel or plastic cage. Series NKX..-Z also has an end cap on the axial bearing component.

Sealing/lubricant

For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring.

Series NX and NKX are lubricated with oil. The end cap in series NX has lubrication holes.

Series NX..-Z and NKX..-Z are lubricated with grease. The axial bearing component is greased using a lithium complex soap grease to GA08. The end caps do not have lubrication holes.



Combined needle roller bearings

Needle roller/ axial cylindrical roller bearings

These bearings do not have an inner ring. Bearings without inner ring have particularly compact radial dimensions. However, they require a shaft raceway that is hardened and ground. Bearings NKXR (NAXR to DIN 5 429-1) and NKXR..Z (NAXR..Z to DIN 5 429-1) have an axial bearing component comprising a roller and cage assembly with a plastic cage; NKXR..Z also has an end cap on the axial bearing component.

Sealing/lubricant

For lubrication, the bearings have a lubrication groove and lubrication hole in the outer ring. Series NKXR is lubricated with oil. Series NKXR..Z is lubricated with grease. The axial bearing component is greased using a lithium complex soap grease to GA08. The end cap does not have lubrication holes.

Needle roller/ angular contact ball bearings

Combined bearings NKIA and NKIB have an inner ring. Series NKIA corresponds to DIN 5 429-2. It can support axial loads from one direction. Bearings NKIB have one narrow inner ring and one wide inner ring. The axial bearing component has a plastic ball cage. At the point where the inner rings join, there is a shoulder on both sides for guidance of the ball and cage assembly. As a result, these bearings are also suitable for supporting axial forces alternating in direction. The bearings guide the shaft with an axial clearance of 0,08 mm to 0,25 mm.

Sealing/lubricant

Bearings NKIA and NKIB can be lubricated with grease or oil. For lubrication, the outer ring has a lubrication groove and a lubrication hole.

Operating temperature

The bearings can be used at operating temperatures from -20 °C to +120 °C.

Cages

Bearings with plastic cage are indicated by the suffix TV in the dimension tables.

Suffixes

Suffixes for the available designs: see table.

Available designs

| Suffix | Description |
|------------------|--|
| TV ¹⁾ | Cage made from glass fibre reinforced polyamide 66 |
| Z | Bearing with end cap, axial bearing component greased with lithium complex soap grease to GA08 |

¹⁾ Bearings with plastic cage: see dimension tables.

Design and safety guidelines

Raceway for bearings without inner ring

Where bearings without an inner ring are to be used, the rolling element raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV and the hardening depth CHD or Rht must be sufficiently large.

Tolerances for shaft raceway/ housing bore

| Series | Shaft tolerance | | Bore tolerance |
|---------------|---------------------------------|------------------------------|--|
| | for bearings without inner ring | for bearings with inner ring | |
| NKIA, NKIB | – | k6 | M6 |
| NX, NKX, NKXR | k6 | k6 | K6, M6 for rigid bearing arrangements |

Caution!

For bearings NKIA, NKIB, the shaft tolerance must not be greater than k6 and the bore tolerance must not be less than M6.

Surface for shaft raceway/ housing bore

| Surface quality | Shaft raceway | | Housing bore |
|------------------|---|------------------------------|--------------|
| | for bearings without inner ring | for bearings with inner ring | |
| Roughness max. | R _a 0,1 (R _z 0,4) | – | – |
| Roundness max. | IT3 | IT 4/2 | IT 5/2 |
| Parallelism max. | IT3 | IT 4 | IT 4 |

If the shaft cannot be configured as a raceway, inner rings of series IR or LR can be used. The inner rings must be ordered separately. Inner rings: see page 690.

Support of axial forces

The axial bearing component must be preloaded to 1% of the axial basic static load rating C_{0a}. The basic load ratings C_{0a} are stated in the dimension tables.

Needle roller/ axial deep groove ball bearings, needle roller/ axial cylindrical roller bearings

In order to support axial forces, the bearing must be abutted by means of snap rings on the outer ring or a housing shoulder. If there is little distance between the shaft centres, the snap rings should be shortened. Snap rings WR and SW are available from trade outlets.

If the bearings are to support axial forces from alternating directions, two bearings must be fitted opposed to each other. The unloaded bearing must be axially preloaded, for example by means of springs. This allows compensation of thermal expansion.

In order to avoid double fits on NKX and NKXR, the axial bearing component should be free in the housing (outside diameter D₁ or D₂ +0,5 mm min.).



Combined needle roller bearings

Needle roller/ angular contact ball bearings

Bearings NKIA can support axial forces in one direction, bearings NKIB can support axial forces in both directions.

If bearings NKIA are to support axial forces from alternating directions, two bearings must be fitted opposed to each other, *Figure 2*.

In the case of NKIB, the wide and narrow inner ring must be axially clamped against each other. The narrow inner ring has a larger bore diameter. This results in an interference fit if a shaft tolerance of k6 is used.

Axial static load safety factor

Caution!

The axial load must not exceed 25% of the radial load.

The axial static load safety factor S_0 must be $> 1,5$.

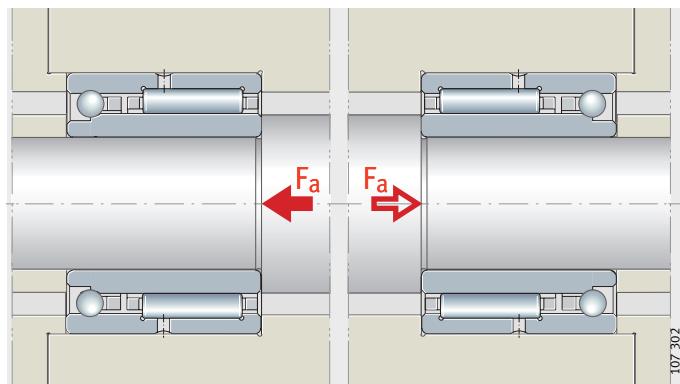


Figure 2

NKIA, two bearings fitted opposed to each other

Minimum radial load

In order to ensure operation without slippage, the bearings must be subjected to a minimum radial load $F_{r\min}$. This applies in particular to high speed bearings since, if the radial load is insufficient or not present, damaging sliding motion may occur between the rolling elements and raceways. In continuous operation, a minimum radial load of the order of $C_r/P < 50$ is necessary.

Speeds

Caution!

The speeds n_G in the dimension tables are valid for oil lubrication.

With grease lubrication, the permissible value is taken as 60% of the value given in the table. For NKXR, NKXR...Z, NKIA, NKIB, the reference speed n_B is given in the dimension tables. In order to calculate the thermally safe speed n_{per} , bearings NKXR(Z) must be regarded as axial bearings and NKIA, NKIB as radial bearings.

Radial location Combined needle roller bearings with inner ring are radially located by means of a close fit on the shaft and in the housing.

Axial location In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking.
The abutting shoulders (shaft, housing) should be sufficiently high and perpendicular to the bearing axis.
The transition from the bearing seating to the abutting shoulder must be designed with rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r as given in the dimension tables.
The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.
Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

Fitting note

Caution!

Combined needle roller bearings are not self-retaining.
Since the individual bearing parts are matched to each other,
the parts of bearings of identical size must not be interchanged
during fitting.

Lubrication

Before operation, the radial component should be greased using a grease of equivalent quality to that used in the axial component.
In order to determine the relubrication interval, values must be calculated separately for the axial and radial component and the lower value should be used.

Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620. This excludes bearings NKIB, the bore d_1 of the narrow inner ring and the width ($-0,3$ mm) over both inner rings as well as bearings NKX and NKXR for the diameters D_1 , D_2 .

Radial internal clearance

Bearings with inner ring have a radial internal clearance of CN.

Radial internal clearance to DIN 620-4

| Bore d mm | | Radial internal clearance CN μm | |
|-------------------|-------|--|------|
| over | incl. | min. | max. |
| – | 24 | 20 | 45 |
| 24 | 30 | 20 | 45 |
| 30 | 40 | 25 | 50 |
| 40 | 50 | 30 | 60 |
| 50 | 65 | 40 | 70 |
| 65 | 80 | 40 | 75 |
| 80 | 100 | 50 | 85 |

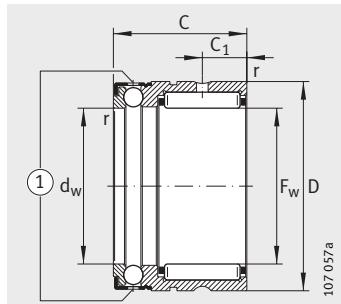
Enveloping circle

In the case of bearings without inner ring, the enveloping circle dimension F_w is used instead of the radial internal clearance.
The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway. For bearings before fitting, the enveloping circle F_w is in the tolerance zone F6.



Needle roller/ axial deep groove ball bearings

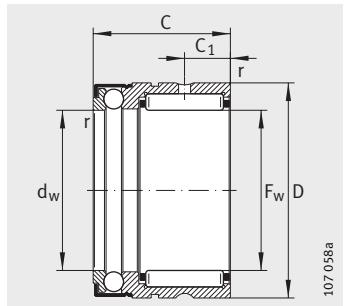
Without inner ring



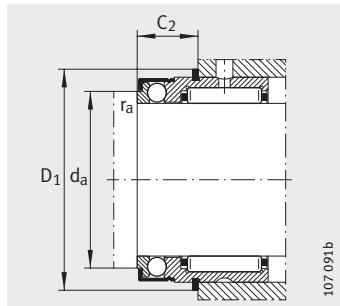
NX
① Oil lubrication holes

Dimension table · Dimensions in mm

| Designation | | | | Dimensions | | | | | | Mounting dimensions | | | |
|---------------------|------------------------|-----------|-----------|----------------|----|----|----------------|----------------|-----|---------------------|----------------|----------------|----------------|
| For oil lubrication | For grease lubrication | X-life | Mass m ≈g | F _w | D | C | C ₁ | d _w | r | C ₂ | D ₁ | d _a | r _a |
| NX7-TV | NX7-Z-TV | XL | 14 | 7 | 14 | 18 | 4,7 | 7 | 0,3 | 10 | 16,5 | 9,6 | 0,3 |
| NX10 | NX10-Z | XL | 25 | 10 | 19 | 18 | 4,7 | 10 | 0,3 | 10 | 21,9 | 14,6 | 0,3 |
| NX12 | NX12-Z | XL | 28 | 12 | 21 | 18 | 4,7 | 12 | 0,3 | 10 | 23,7 | 16,6 | 0,3 |
| NX15 | NX15-Z | XL | 48 | 15 | 24 | 28 | 8 | 15 | 0,3 | 12,2 | 26,5 | 19 | 0,3 |
| NX17 | NX17-Z | XL | 53 | 17 | 26 | 28 | 8 | 17 | 0,3 | 12,2 | 28,5 | 21 | 0,3 |
| NX20 | NX20-Z | XL | 68 | 20 | 30 | 28 | 8 | 20 | 0,3 | 12,2 | 33,6 | 25 | 0,3 |
| NX25 | NX25-Z | XL | 115 | 25 | 37 | 30 | 8 | 25 | 0,3 | 14,2 | 40,4 | 31,6 | 0,3 |
| NX30 | NX30-Z | XL | 130 | 30 | 42 | 30 | 10 | 30 | 0,3 | 14,2 | 45,1 | 36,5 | 0,3 |
| NX35 | NX35-Z | XL | 160 | 35 | 47 | 30 | 10 | 35 | 0,3 | 14,2 | 50,1 | 40,5 | 0,3 |



NX..-Z



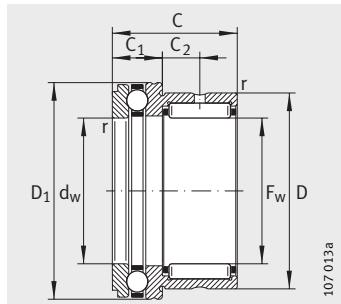
Mounting dimensions
Snap ring in outer ring

| Basic load ratings | | | | Fatigue limit load | | Limiting speed n_G min ⁻¹ | Recommended inner rings Designation | Suitable snap rings |
|--------------------|------------------------|--------------------|------------------------|--------------------|---------------|--|--|---------------------|
| radial | | axial | | C_{ur} N | C_{ua} N | | | |
| dyn. C_r N | stat. C_{0r} N | dyn. C_a N | stat. C_{0a} N | | | | | |
| 3 250 | 2 650 | 3 150 | 4 300 | 410 | 190 | 15 000 | – | WR14, SW14 |
| 6 000 | 3 700 | 4 600 | 7 200 | 720 | 320 | 11 000 | IR6X10X10-IS1 | WR19, SW19 |
| 5 400 | 4 300 | 4 850 | 8 200 | 830 | 365 | 9 500 | IR8X12X10-IS1 | WR21, SW21 |
| 12 100 | 12 700 | 5 600 | 10 400 | 2 320 | 460 | 8 000 | IR12X15X16 | WR24, SW24 |
| 13 500 | 15 000 | 5 800 | 11 500 | 2 750 | 510 | 7 500 | IR14X17X17 | WR26, SW26 |
| 14 600 | 17 500 | 7 000 | 14 700 | 3 200 | 650 | 6 500 | IR17X20X16 | WR30, SW30 |
| 16 800 | 22 400 | 11 100 | 24 300 | 4 150 | 1 080 | 4 900 | IR20X25X16-IS1 | WR37, SW37 |
| 25 500 | 36 000 | 11 700 | 28 000 | 6 300 | 1 230 | 4 300 | IR25X30X20 | WR42, SW42 |
| 27 500 | 41 500 | 12 400 | 32 500 | 7 300 | 1 440 | 3 700 | IR30X35X20 | WR47, SW47 |



Needle roller/ axial deep groove ball bearings

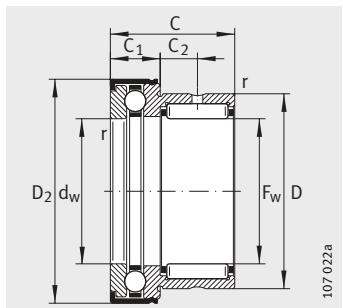
Without inner ring
With or without end cap



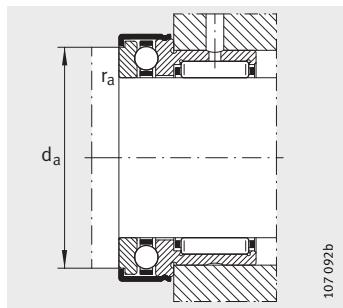
NKX

Dimension table · Dimensions in mm

| Without end cap Designation | X-life | Designation to DIN 5 429 | Mass m | With end cap Designation | X-life | Designation to DIN 5 429 | Mass m | Dimensions | | | | | |
|-----------------------------------|-----------|-----------------------------|-----------|-----------------------------|-----------|-----------------------------|-----------|------------|----|----------------|----------------|----|----------------|
| | | | | | | | | F_w | D | D ₁ | D ₂ | C | C ₁ |
| NKX10-TV | XL | NAXK10TN | 34 | NKX10-Z-TV | XL | NAXK10ZTN | 36 | 10 | 19 | 24,1 | 25,2 | 23 | 9 |
| NKX12 | XL | NAXK12 | 38 | NKX12-Z | XL | NAXK12Z | 40 | 12 | 21 | 26,1 | 27,2 | 23 | 9 |
| NKX15 | XL | NAXK15 | 44 | NKX15-Z | XL | NAXK15Z | 47 | 15 | 24 | 28,1 | 29,2 | 23 | 9 |
| NKX17 | XL | NAXK17 | 53 | NKX17-Z | XL | NAXK17Z | 55 | 17 | 26 | 30,1 | 31,2 | 25 | 9 |
| NKX20 | XL | NAXK20 | 83 | NKX20-Z | XL | NAXK20Z | 90 | 20 | 30 | 35,1 | 36,2 | 30 | 10 |
| NKX25 | XL | NAXK25 | 125 | NKX25-Z | XL | NAXK25Z | 132 | 25 | 37 | 42,1 | 43,2 | 30 | 11 |
| NKX30 | XL | NAXK30 | 141 | NKX30-Z | XL | NAXK30Z | 148 | 30 | 42 | 47,1 | 48,2 | 30 | 11 |
| NKX35 | XL | NAXK35 | 163 | NKX35-Z | XL | NAXK35Z | 168 | 35 | 47 | 52,1 | 53,2 | 30 | 12 |
| NKX40 | XL | NAXK40 | 200 | NKX40-Z | XL | NAXK40Z | 208 | 40 | 52 | 60,1 | 61,2 | 32 | 13 |
| NKX45 | XL | NAXK45 | 252 | NKX45-Z | XL | NAXK45Z | 265 | 45 | 58 | 65,2 | 66,5 | 32 | 14 |
| NKX50 | XL | NAXK50 | 280 | NKX50-Z | XL | NAXK50Z | 300 | 50 | 62 | 70,2 | 71,5 | 35 | 14 |
| NKX60 | XL | NAXK60 | 360 | NKX60-Z | XL | NAXK60Z | 380 | 60 | 72 | 85,2 | 86,5 | 40 | 17 |
| NKX70 | XL | NAXK70 | 500 | NKX70-Z | XL | NAXK70Z | 520 | 70 | 85 | 95,2 | 96,5 | 40 | 18 |



NKX..-Z



Mounting dimensions

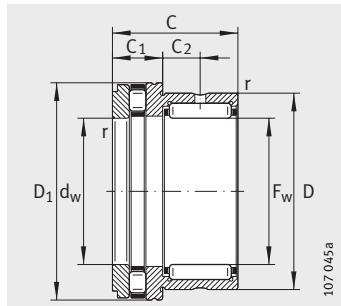
| | | | Mounting dimensions | | Basic load ratings | | | | Fatigue limit load | | Limiting speed n_G min ⁻¹ | Recommended inner rings Designation | | |
|-------|-------|-----|---------------------|-------|--------------------|------------------------|--------------------|------------------------|--------------------|----------|--|--|--|--|
| C_2 | d_w | r | d_a | r_a | radial | | axial | | C_{ur} | C_{ua} | | | | |
| | | | | | dyn. C_r N | stat. C_{0r} N | dyn. C_a N | stat. C_{0a} N | | | | | | |
| 6,5 | 10 | 0,3 | 19,7 | 0,3 | 7 000 | 7 800 | 10 000 | 14 000 | 1 310 | 670 | 12 400 | IR7X10X16 | | |
| 6,5 | 12 | 0,3 | 21,7 | 0,3 | 10 100 | 11 000 | 10 300 | 15 400 | 1 920 | 740 | 10 900 | IR9X12X16 | | |
| 6,5 | 15 | 0,3 | 23,7 | 0,3 | 12 100 | 12 700 | 10 500 | 16 800 | 2 320 | 810 | 9 200 | IR12X15X16 | | |
| 8 | 17 | 0,3 | 25,7 | 0,3 | 13 500 | 15 000 | 10 800 | 18 200 | 2 750 | 870 | 8 400 | IR14X17X17 | | |
| 10,5 | 20 | 0,3 | 30,7 | 0,3 | 18 600 | 23 800 | 14 300 | 24 700 | 4 150 | 1 190 | 7 200 | IR17X20X20 | | |
| 9,5 | 25 | 0,6 | 37,7 | 0,6 | 21 300 | 30 500 | 19 600 | 37 500 | 5 300 | 1 790 | 5 800 | IR20X25X20 | | |
| 9,5 | 30 | 0,6 | 42,7 | 0,6 | 25 500 | 36 000 | 20 400 | 42 000 | 6 300 | 2 030 | 5 000 | IR25X30X20 | | |
| 9 | 35 | 0,6 | 47,7 | 0,6 | 27 500 | 41 500 | 21 200 | 47 000 | 7 300 | 2 270 | 4 400 | IR30X35X20 | | |
| 10 | 40 | 0,6 | 55,7 | 0,6 | 29 500 | 47 000 | 27 000 | 63 000 | 8 300 | 3 000 | 3 900 | IR35X40X20 | | |
| 9 | 45 | 0,6 | 60,5 | 0,6 | 31 000 | 53 000 | 28 000 | 69 000 | 9 300 | 3 350 | 3 500 | IR40X45X20 | | |
| 10 | 50 | 0,6 | 65,5 | 0,6 | 43 000 | 74 000 | 29 000 | 75 000 | 12 700 | 3 650 | 3 200 | IR45X50X25 | | |
| 12 | 60 | 1 | 80,5 | 1 | 47 500 | 90 000 | 41 500 | 113 000 | 15 400 | 5 400 | 2 750 | IR50X60X25 | | |
| 11 | 70 | 1 | 90,5 | 1 | 50 000 | 92 000 | 43 000 | 127 000 | 15 700 | 6 100 | 2 320 | IR60X70X25 | | |



Needle roller/ axial cylindrical roller bearings

Without inner ring

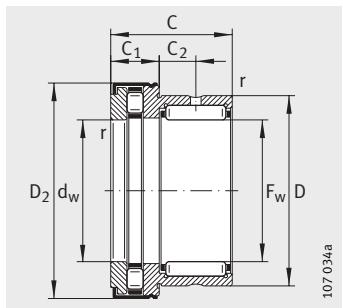
With or without end cap



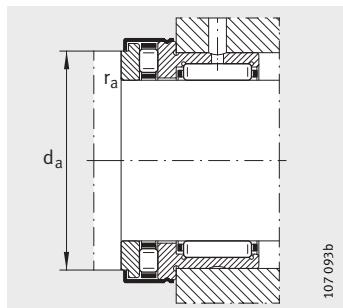
NKXR

Dimension table · Dimensions in mm

| Without end cap Designation | X-life | Designation to DIN 5429 | Mass m | With end cap Designation | X-life | Designation to DIN 5429 | Mass m | Dimensions | | | | |
|-----------------------------------|--------|----------------------------|-----------|-----------------------------|--------|----------------------------|-----------|----------------|----|----------------|----------------|----|
| | | | | | | | | F _w | D | D ₁ | D ₂ | C |
| NKXR15 | XL | NAXR15 | 42 | NKXR15-Z | XL | NAXR15Z | 45 | 15 | 24 | 28,1 | 29,2 | 23 |
| NKXR17 | XL | NAXR17 | 50 | NKXR17-Z | XL | NAXR17Z | 53 | 17 | 26 | 30,1 | 31,2 | 25 |
| NKXR20 | XL | NAXR20 | 80 | NKXR20-Z | XL | NAXR20Z | 84 | 20 | 30 | 35,1 | 36,2 | 30 |
| NKXR25 | XL | NAXR25 | 120 | NKXR25-Z | XL | NAXR25Z | 125 | 25 | 37 | 42,1 | 43,2 | 30 |
| NKXR30 | XL | NAXR30 | 135 | NKXR30-Z | XL | NAXR30Z | 141 | 30 | 42 | 47,1 | 48,2 | 30 |
| NKXR35 | XL | NAXR35 | 157 | NKXR35-Z | XL | NAXR35Z | 165 | 35 | 47 | 52,1 | 53,2 | 30 |
| NKXR40 | XL | NAXR40 | 204 | NKXR40-Z | XL | NAXR40Z | 214 | 40 | 52 | 60,1 | 61,2 | 32 |
| NKXR45 | XL | NAXR45 | 244 | NKXR45-Z | XL | NAXR45Z | 260 | 45 | 58 | 65,2 | 66,5 | 32 |
| NKXR50 | XL | NAXR50 | 268 | NKXR50-Z | XL | NAXR50Z | 288 | 50 | 62 | 70,2 | 71,5 | 35 |



NKXR..-Z

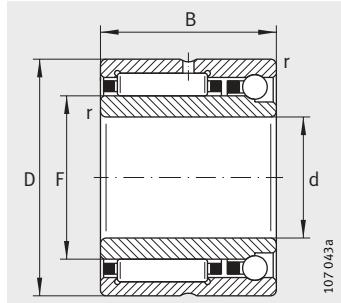


Mounting dimensions

| | | | | Mounting dimensions | | Basic load ratings | | | | Fatigue limit load | | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ | Recommended inner rings Designation | | | |
|-------|-------|-------|------|---------------------|-------|--------------------|------------------------|--------------------|------------------------|--------------------|---------------|--|---|-------------------------------------|--|--|--|
| C_1 | C_2 | d_w | r | d_a | r_a | radial | | axial | | C_{ur} N | C_{ua} N | | | | | | |
| | | | | | | dyn. C_r N | stat. C_{0r} N | dyn. C_a N | stat. C_{0a} N | | | | | | | | |
| -0,2 | | E8 | min. | | max. | | | | | | | | | | | | |
| 9 | 6,5 | 15 | 0,3 | 23,7 | 0,3 | 12 100 | 12 700 | 14 400 | 28 500 | 2 320 | 4 000 | 9 200 | 6 500 | IR12X15X16 | | | |
| 9 | 8 | 17 | 0,3 | 25,7 | 0,3 | 13 500 | 15 000 | 15 900 | 33 500 | 2 750 | 4 650 | 8 400 | 5 500 | IR14X17X17 | | | |
| 10 | 10,5 | 20 | 0,3 | 30,7 | 0,3 | 18 600 | 23 800 | 24 900 | 53 000 | 4 150 | 7 300 | 7 200 | 4 200 | IR17X20X20 | | | |
| 11 | 9,5 | 25 | 0,6 | 37,7 | 0,6 | 21 300 | 30 500 | 33 500 | 76 000 | 5 300 | 7 100 | 5 800 | 3 400 | IR20X25X20 | | | |
| 11 | 9,5 | 30 | 0,6 | 42,7 | 0,6 | 25 500 | 36 000 | 35 500 | 86 000 | 6 300 | 8 000 | 5 000 | 2 900 | IR25X30X20 | | | |
| 12 | 9 | 35 | 0,6 | 47,7 | 0,6 | 27 500 | 41 500 | 39 000 | 101 000 | 7 300 | 9 500 | 4 400 | 2 500 | IR30X35X20 | | | |
| 13 | 10 | 40 | 0,6 | 55,7 | 0,6 | 29 500 | 47 000 | 56 000 | 148 000 | 8 300 | 14 500 | 3 900 | 2 000 | IR35X40X20 | | | |
| 14 | 9 | 45 | 0,6 | 60,6 | 0,6 | 31 000 | 53 000 | 59 000 | 163 000 | 9 300 | 16 000 | 3 500 | 1 900 | IR40X45X20 | | | |
| 14 | 10 | 50 | 0,6 | 65,5 | 0,6 | 43 000 | 74 000 | 61 000 | 177 000 | 12 700 | 17 400 | 3 200 | 1 700 | IR45X50X25 | | | |



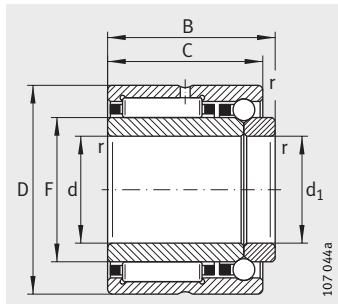
Needle roller/ angular contact ball bearings



NKIA
Single direction

Dimension table · Dimensions in mm

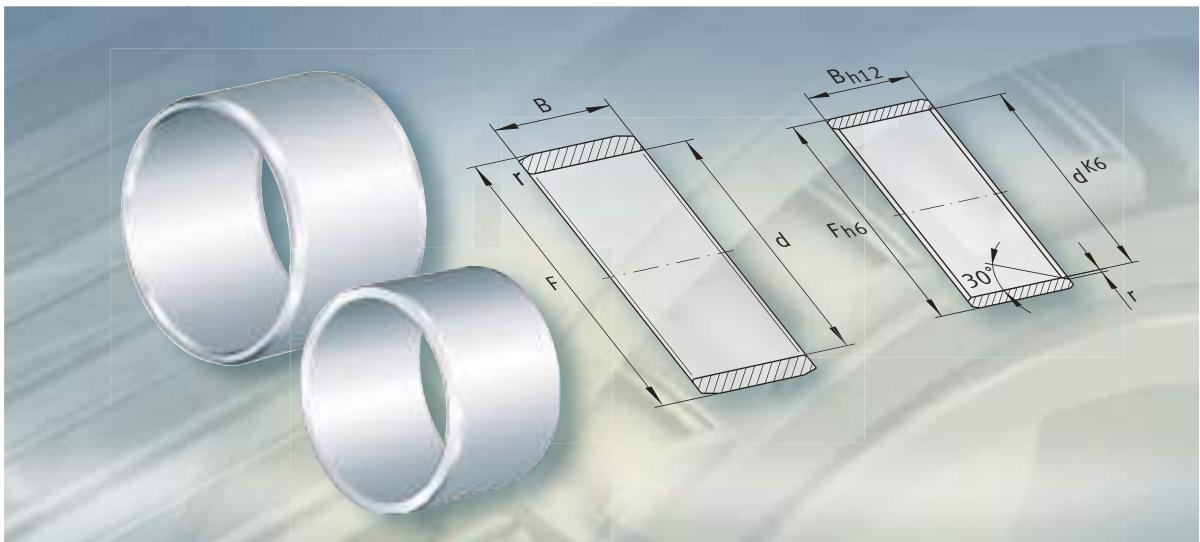
| Designation | X-life | Mass m ≈g | Dimensions | | | | | | Basic load ratings | | |
|-------------|--------|-----------------|------------|----|-----|------|----|-----------|-----------------------------|-------------------------------|--|
| | | | d | F | D | B | C | r min. | radial | | |
| | | | | | | | | | dyn. C _r N | stat. C _{0r} N | |
| NKIA5901 | XL | 40 | 12 | 16 | 24 | 16 | — | 0,3 | 10 600 | 10 900 | |
| NKIB5901 | XL | 43 | 12 | 16 | 24 | 17,5 | 16 | 0,3 | 10 600 | 10 900 | |
| NKIA5902 | XL | 50 | 15 | 20 | 28 | 18 | — | 0,3 | 12 000 | 13 600 | |
| NKIB5902 | XL | 52 | 15 | 20 | 28 | 20 | 18 | 0,3 | 12 000 | 13 600 | |
| NKIA5903 | XL | 56 | 17 | 22 | 30 | 18 | — | 0,3 | 12 400 | 14 600 | |
| NKIB5903 | XL | 58 | 17 | 22 | 30 | 20 | 18 | 0,3 | 12 400 | 14 600 | |
| NKIA5904 | XL | 103 | 20 | 25 | 37 | 23 | — | 0,3 | 23 700 | 25 500 | |
| NKIB5904 | XL | 107 | 20 | 25 | 37 | 25 | 23 | 0,3 | 23 700 | 25 500 | |
| NKIA59/22 | XL | 118 | 22 | 28 | 39 | 23 | — | 0,3 | 26 000 | 29 500 | |
| NKIB59/22 | XL | 122 | 22 | 28 | 39 | 25 | 23 | 0,3 | 26 000 | 29 500 | |
| NKIA5905 | XL | 130 | 25 | 30 | 42 | 23 | — | 0,3 | 26 500 | 31 500 | |
| NKIB5905 | XL | 134 | 25 | 30 | 42 | 25 | 23 | 0,3 | 26 500 | 31 500 | |
| NKIA5906 | XL | 147 | 30 | 35 | 47 | 23 | — | 0,3 | 28 500 | 35 500 | |
| NKIB5906 | XL | 151 | 30 | 35 | 47 | 25 | 23 | 0,3 | 28 500 | 35 500 | |
| NKIA5907 | XL | 243 | 35 | 42 | 55 | 27 | — | 0,6 | 35 500 | 50 000 | |
| NKIB5907 | XL | 247 | 35 | 42 | 55 | 30 | 27 | 0,6 | 35 500 | 50 000 | |
| NKIA5908 | XL | 315 | 40 | 48 | 62 | 30 | — | 0,6 | 48 500 | 67 000 | |
| NKIB5908 | XL | 320 | 40 | 48 | 62 | 34 | 30 | 0,6 | 48 500 | 67 000 | |
| NKIA5909 | XL | 375 | 45 | 52 | 68 | 30 | — | 0,6 | 51 000 | 73 000 | |
| NKIB5909 | XL | 380 | 45 | 52 | 68 | 34 | 30 | 0,6 | 51 000 | 73 000 | |
| NKIA5910 | XL | 380 | 50 | 58 | 72 | 30 | — | 0,6 | 53 000 | 80 000 | |
| NKIB5910 | XL | 385 | 50 | 58 | 72 | 34 | 30 | 0,6 | 53 000 | 80 000 | |
| NKIA5911 | XL | 550 | 55 | 63 | 80 | 34 | — | 1 | 65 000 | 100 000 | |
| NKIB5911 | XL | 555 | 55 | 63 | 80 | 38 | 34 | 1 | 65 000 | 100 000 | |
| NKIA5912 | XL | 590 | 60 | 68 | 85 | 34 | — | 1 | 68 000 | 108 000 | |
| NKIB5912 | XL | 595 | 60 | 68 | 85 | 38 | 34 | 1 | 68 000 | 108 000 | |
| NKIA5913 | XL | 635 | 65 | 72 | 90 | 34 | — | 1 | 69 000 | 112 000 | |
| NKIB5913 | XL | 640 | 65 | 72 | 90 | 38 | 34 | 1 | 69 000 | 112 000 | |
| NKIA5914 | XL | 980 | 70 | 80 | 100 | 40 | — | 1 | 95 000 | 156 000 | |
| NKIB5914 | XL | 985 | 70 | 80 | 100 | 45 | 40 | 1 | 95 000 | 156 000 | |



NKIB
Double direction

| | | Fatigue limit load | | Limiting speed n_G min $^{-1}$ | Reference speed n_B min $^{-1}$ |
|--------------------|------------------------|--------------------|---------------|--|---|
| axial | | C_{ur} N | C_{ua} N | | |
| dyn. C_a N | stat. C_{0a} N | | | | |
| 2 700 | 3 450 | 1 940 | 152 | 23 600 | 21 000 |
| 2 700 | 3 450 | 1 940 | 152 | 23 600 | 21 000 |
| 2 900 | 4 200 | 2 430 | 186 | 21 600 | 17 000 |
| 2 900 | 4 200 | 2 430 | 186 | 21 600 | 17 000 |
| 3 150 | 4 900 | 2 600 | 216 | 20 600 | 15 000 |
| 3 150 | 4 900 | 2 600 | 216 | 20 600 | 15 000 |
| 4 900 | 7 400 | 4 600 | 330 | 17 200 | 14 000 |
| 4 900 | 7 400 | 4 600 | 330 | 17 200 | 14 000 |
| 5 300 | 8 600 | 5 300 | 380 | 16 100 | 12 000 |
| 5 300 | 8 600 | 5 300 | 380 | 16 100 | 12 000 |
| 5 400 | 9 300 | 5 700 | 410 | 14 600 | 12 000 |
| 5 400 | 9 300 | 5 700 | 410 | 14 600 | 12 000 |
| 5 900 | 11 200 | 6 400 | 495 | 12 700 | 10 000 |
| 5 900 | 11 200 | 6 400 | 495 | 12 700 | 10 000 |
| 7 400 | 14 900 | 9 400 | 660 | 10 900 | 9 000 |
| 7 400 | 14 900 | 9 400 | 660 | 10 900 | 9 000 |
| 9 200 | 19 400 | 11 500 | 860 | 9 600 | 7 500 |
| 9 200 | 19 400 | 11 500 | 860 | 9 600 | 7 500 |
| 9 600 | 21 400 | 12 600 | 950 | 8 700 | 7 000 |
| 9 600 | 21 400 | 12 600 | 950 | 8 700 | 7 000 |
| 10 100 | 24 300 | 13 800 | 1 080 | 8 000 | 6 500 |
| 10 100 | 24 300 | 13 800 | 1 080 | 8 000 | 6 500 |
| 12 100 | 29 500 | 17 300 | 1 300 | 7 300 | 6 000 |
| 12 100 | 29 500 | 17 300 | 1 300 | 7 300 | 6 000 |
| 12 400 | 32 000 | 18 800 | 1 510 | 6 800 | 5 500 |
| 12 400 | 32 000 | 18 800 | 1 510 | 6 800 | 5 500 |
| 12 800 | 34 000 | 19 500 | 1 410 | 6 300 | 5 500 |
| 12 800 | 34 000 | 19 500 | 1 410 | 6 300 | 5 500 |
| 16 800 | 44 500 | 27 500 | 1 970 | 5 800 | 4 900 |
| 16 800 | 44 500 | 27 500 | 1 970 | 5 800 | 4 900 |





Inner rings

Inner rings

| | Page |
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Product overview Inner rings

Precision machined

IR



103 205a

With lubrication hole

IR..-IS1



103 271

Ground

LR



103 206a

Inner rings

Features

Inner rings are made from hardened rolling bearing steel and have precision machined or ground raceways.

They are used where:

- the shaft cannot be used as a raceway for needle roller and cage assemblies, drawn cup needle roller bearings with open ends or with closed end and needle roller bearings
- needle roller bearings must be combined with wider inner rings in order to allow larger axial displacements of the shaft in relation to the housing
- optimum running surfaces are required for seal lips.

Inner rings, precision machined

Inner rings IR have a precision machined raceway. Chamfers on the end faces allow easy insertion into the bearing and prevent damage to the seal lips of the bearing. Inner rings are available with and without a lubrication hole. Rings with a lubrication hole in the inner ring have the suffix IS1.

Inner rings, ground

Inner rings LR have a ground raceway. The end faces are turned and the edges are broken.

These rings have larger tolerances than the rings IR. They are thus suitable for applications that allow larger width tolerances and less demanding requirements for axial runout.

Machining allowance on raceway

Inner rings are available as a special design with a machining allowance z on the raceway (suffix VGS). The size of the allowance is dependent on the raceway diameter.

Machining allowance

| Raceway diameter F mm | | Machining allowance z mm | Preground raceway diameter F _{VGS} |
|-----------------------------|-------|-----------------------------------|---|
| over | incl. | | |
| – | 50 | 0,1 | $F_{VGS} = F + z$ (tolerance h7) |
| 50 | 80 | 0,15 | |
| 80 | 180 | 0,2 | |
| 180 | 250 | 0,25 | |
| 250 | 315 | 0,3 | |
| 315 | 400 | 0,35 | |
| 400 | 500 | 0,4 | |

Suffixes

Suffixes for the available designs: see table.

Available designs

| Suffix | Description | Design |
|--------|---|------------------------------|
| C3, C4 | Radial internal clearance larger than normal | Special design ¹⁾ |
| C2 | Radial internal clearance smaller than normal | Special design ¹⁾ |
| EGS | Surface ground free from spiral marks for rotary shaft seals to DIN 3 760 and DIN 3 761 | Special design ¹⁾ |
| IS1 | With one lubrication hole | Special design ¹⁾ |
| VGS | With machining allowance z on raceway ²⁾ | Special design ¹⁾ |

¹⁾ Available by agreement.

²⁾ See table Machining allowance on raceway.



Inner rings

Design and safety guidelines

Axial location

In order to prevent lateral creep of the bearing rings, they must be located by means of physical locking.

The abutting shoulders on the shaft should be sufficiently high and perpendicular to the bearing axis.

The transition from the bearing seating to the abutting shoulder must be designed with rounding to DIN 5 418 or an undercut to DIN 509. Note the minimum chamfer dimensions r as given in the dimension tables.

The overlap between the snap rings and the end faces of the bearing rings must be sufficiently large.

Maximum inner ring chamfer dimensions to DIN 620-6 must be taken into consideration.

Accuracy

Standard tolerances to DIN 620

Radial internal clearance

The dimensional and geometrical tolerances of inner rings IR correspond to tolerance class PN to DIN 620.

When combined with INA needle roller bearings, inner rings have an internal clearance of CN.

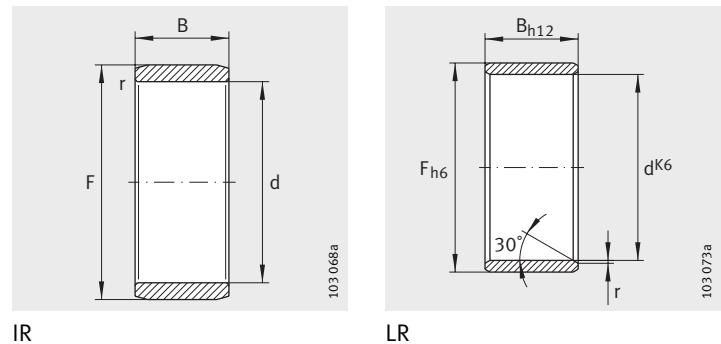
When combined with INA drawn cup needle roller bearings with open ends or closed end, inner rings have a radial internal clearance of C2 or C3 depending on the raceway diameter.

Radial internal clearance to DIN 620-4

| Bore d mm | | Radial internal clearance | | | | | | | |
|-----------------|-------|---------------------------|------|----------|------|----------|------|----------|------|
| | | C2 μm | | CN μm | | C3 μm | | C4 μm | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. | max. |
| – | 24 | 0 | 25 | 20 | 45 | 35 | 60 | 50 | 75 |
| 24 | 30 | 0 | 25 | 20 | 45 | 35 | 60 | 50 | 75 |
| 30 | 40 | 5 | 30 | 25 | 50 | 45 | 70 | 60 | 85 |
| 40 | 50 | 5 | 35 | 30 | 60 | 50 | 80 | 70 | 100 |
| 50 | 65 | 10 | 40 | 40 | 70 | 60 | 90 | 80 | 110 |
| 65 | 80 | 10 | 45 | 40 | 75 | 65 | 100 | 90 | 125 |
| 80 | 100 | 15 | 50 | 50 | 85 | 75 | 110 | 105 | 140 |
| 100 | 120 | 15 | 55 | 50 | 90 | 85 | 125 | 125 | 165 |
| 120 | 140 | 15 | 60 | 60 | 105 | 100 | 145 | 145 | 190 |
| 140 | 160 | 20 | 70 | 70 | 120 | 115 | 165 | 165 | 215 |
| 160 | 180 | 25 | 75 | 75 | 125 | 120 | 170 | 170 | 220 |
| 180 | 200 | 35 | 90 | 90 | 145 | 140 | 195 | 195 | 250 |
| 200 | 225 | 45 | 105 | 105 | 165 | 160 | 220 | 220 | 280 |
| 225 | 250 | 45 | 110 | 110 | 175 | 170 | 235 | 235 | 300 |
| 250 | 280 | 55 | 125 | 125 | 195 | 190 | 260 | 260 | 330 |
| 280 | 315 | 55 | 130 | 130 | 205 | 200 | 275 | 275 | 350 |
| 315 | 355 | 65 | 145 | 145 | 225 | 225 | 305 | 305 | 385 |
| 355 | 400 | 100 | 190 | 190 | 280 | 280 | 370 | 370 | 460 |
| 400 | 450 | 110 | 210 | 210 | 310 | 310 | 410 | 410 | 510 |

Inner rings

Without lubrication hole



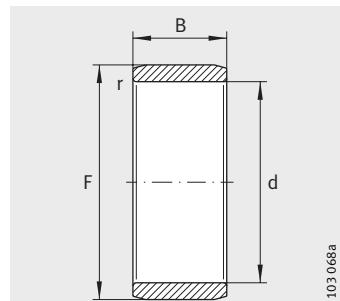
| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F μm | | |
|--------------|-----------------|------------|----|------|-----|------------------------------|-------|--|
| | | d | F | B | r | min. | | |
| | | | | | | upper | lower | |
| IR5X8X12 | 2,8 | 5 | 8 | 12 | 0,3 | -7 | -23 | |
| IR5X8X16 | 3,7 | 5 | 8 | 16 | 0,3 | -7 | -23 | |
| IR6X9X12 | 3 | 6 | 9 | 12 | 0,3 | -7 | -23 | |
| IR6X9X16 | 4,3 | 6 | 9 | 16 | 0,3 | -7 | -23 | |
| IR7X10X10,5 | 3,1 | 7 | 10 | 10,5 | 0,3 | -7 | -23 | |
| LR7X10X10,5 | 3,1 | 7 | 10 | 10,5 | 0,3 | - | - | |
| IR7X10X12 | 3,6 | 7 | 10 | 12 | 0,3 | -7 | -23 | |
| IR7X10X16 | 4,9 | 7 | 10 | 16 | 0,3 | -7 | -23 | |
| IR8X12X10,5 | 5 | 8 | 12 | 10,5 | 0,3 | -4 | -18 | |
| LR8X12X10,5 | 5 | 8 | 12 | 10,5 | 0,3 | - | - | |
| IR8X12X12,5 | 5,9 | 8 | 12 | 12,5 | 0,3 | -4 | -18 | |
| LR8X12X12,5 | 5 | 8 | 12 | 12,5 | 0,3 | - | - | |
| IR9X12X12 | 4,4 | 9 | 12 | 12 | 0,3 | -4 | -18 | |
| IR9X12X16 | 6 | 9 | 12 | 16 | 0,3 | -4 | -18 | |
| IR10X13X12,5 | 5,2 | 10 | 13 | 12,5 | 0,3 | -4 | -18 | |
| LR10X13X12,5 | 5,2 | 10 | 13 | 12,5 | 0,3 | - | - | |
| IR10X14X13 | 7,4 | 10 | 14 | 13 | 0,3 | -4 | -18 | |
| IR10X14X16 | 9,2 | 10 | 14 | 16 | 0,3 | -4 | -18 | |
| IR10X14X20 | 11,5 | 10 | 14 | 20 | 0,3 | -4 | -18 | |
| IR12X15X12 | 5,7 | 12 | 15 | 12 | 0,3 | -4 | -18 | |
| IR12X15X12,5 | 6,1 | 12 | 15 | 12,5 | 0,3 | -4 | -18 | |
| LR12X15X12,5 | 6,1 | 12 | 15 | 12,5 | 0,3 | - | - | |
| IR12X15X16 | 7,6 | 12 | 15 | 16 | 0,3 | -4 | -18 | |
| IR12X15X16,5 | 8,1 | 12 | 15 | 16,5 | 0,3 | -4 | -18 | |
| LR12X15X16,5 | 8,1 | 12 | 15 | 16,5 | 0,3 | - | - | |
| IR12X15X22,5 | 10,9 | 12 | 15 | 22,5 | 0,3 | -4 | -18 | |
| LR12X15X22,5 | 10,9 | 12 | 15 | 22,5 | 0,3 | - | - | |
| IR12X16X13 | 8,5 | 12 | 16 | 13 | 0,3 | -4 | -18 | |
| IR12X16X16 | 10,7 | 12 | 16 | 16 | 0,3 | -4 | -18 | |
| IR12X16X20 | 13,5 | 12 | 16 | 20 | 0,3 | -4 | -18 | |
| IR12X16X22 | 14,9 | 12 | 16 | 22 | 0,3 | -4 | -18 | |
| IR14X17X17 | 9,5 | 14 | 17 | 17 | 0,3 | -4 | -18 | |

| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F μm | | |
|--------------|-----------------|------------|----|------|-----|------------------------------|-------|--|
| | | d | F | B | r | min. | | |
| | | | | | | upper | lower | |
| LR15X18X12,5 | 7,2 | 15 | 18 | 12,5 | 0,3 | - | - | |
| IR15X18X16 | 9,4 | 15 | 18 | 16 | 0,3 | -4 | -18 | |
| IR15X18X16,5 | 9,8 | 15 | 18 | 16,5 | 0,3 | -4 | -18 | |
| LR15X18X16,5 | 9,8 | 15 | 18 | 16,5 | 0,3 | - | - | |
| IR15X19X16 | 12,9 | 15 | 19 | 16 | 0,3 | 0 | -12 | |
| IR15X19X20 | 16,3 | 15 | 19 | 20 | 0,3 | 0 | -12 | |
| IR15X20X13 | 13,5 | 15 | 20 | 13 | 0,3 | 0 | -12 | |
| IR15X20X23 | 24,4 | 15 | 20 | 23 | 0,3 | 0 | -12 | |
| IR17X20X16 | 10,6 | 17 | 20 | 16 | 0,3 | 0 | -12 | |
| IR17X20X16,5 | 11,1 | 17 | 20 | 16,5 | 0,3 | 0 | -12 | |
| LR17X20X16,5 | 11,1 | 17 | 20 | 16,5 | 0,3 | - | - | |
| IR17X20X20 | 13,5 | 17 | 20 | 20 | 0,3 | 0 | -12 | |
| IR17X20X20,5 | 13,8 | 17 | 20 | 20,5 | 0,3 | 0 | -12 | |
| LR17X20X20,5 | 13,8 | 17 | 20 | 20,5 | 0,3 | - | - | |
| IR17X20X30,5 | 20,6 | 17 | 20 | 30,5 | 0,3 | 0 | -12 | |
| LR17X20X30,5 | 20,6 | 17 | 20 | 30,5 | 0,3 | - | - | |
| IR17X21X16 | 15 | 17 | 21 | 16 | 0,3 | 0 | -12 | |
| IR17X21X20 | 18 | 17 | 21 | 20 | 0,3 | 0 | -12 | |
| IR17X22X13 | 14,9 | 17 | 22 | 13 | 0,3 | 0 | -12 | |
| IR17X22X16 | 18,4 | 17 | 22 | 16 | 0,3 | 0 | -12 | |
| IR17X22X23 | 27,1 | 17 | 22 | 23 | 0,3 | 0 | -12 | |
| IR17X24X20 | 33,8 | 17 | 24 | 20 | 0,6 | 0 | -12 | |

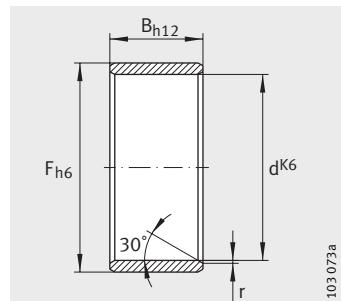


Inner rings

Without lubrication hole



IR



LR

Dimension table (continued) · Dimensions in mm

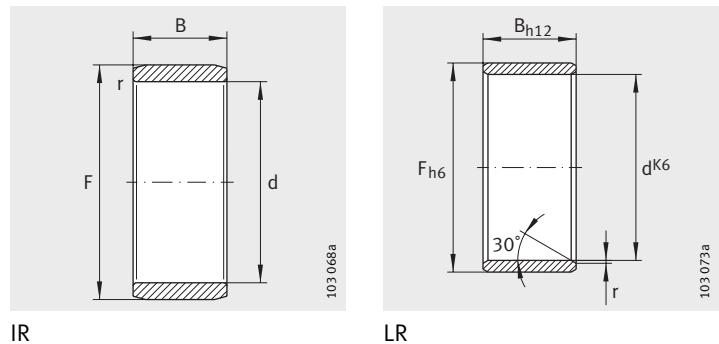
| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F μm | |
|---------------------|-----------------|------------|----|------|-----|---------------------------------|-------|
| | | d | F | B | r | min. | upper |
| IR20X24X16 | 15 | 20 | 24 | 16 | 0,3 | 0 | -12 |
| IR20X24X20 | 21,3 | 20 | 24 | 20 | 0,3 | 0 | -12 |
| LR20X25X12,5 | 16,3 | 20 | 25 | 12,5 | 0,3 | - | - |
| LR20X25X16,5 | 21,7 | 20 | 25 | 16,5 | 0,3 | - | - |
| IR20X25X17 | 25 | 20 | 25 | 17 | 0,3 | 0 | -12 |
| IR20X25X20 | 27,5 | 20 | 25 | 20 | 0,3 | 0 | -12 |
| IR20X25X20,5 | 27,4 | 20 | 25 | 20,5 | 0,3 | 0 | -12 |
| LR20X25X20,5 | 27,4 | 20 | 25 | 20,5 | 0,3 | - | - |
| IR20X25X26,5 | 38 | 20 | 25 | 26,5 | 0,3 | 0 | -12 |
| LR20X25X26,5 | 38 | 20 | 25 | 26,5 | 0,3 | - | - |
| IR20X25X30 | 40,4 | 20 | 25 | 30 | 0,3 | 0 | -12 |
| IR20X25X38,5 | 52,5 | 20 | 25 | 38,5 | 0,3 | 0 | -12 |
| LR20X25X38,5 | 52,5 | 20 | 25 | 38,5 | 0,3 | - | - |
| IR20X28X20 | 45,2 | 20 | 28 | 20 | 0,6 | 0 | -12 |
| IR22X26X16 | 18,2 | 22 | 26 | 16 | 0,3 | 0 | -12 |
| IR22X26X20 | 23 | 22 | 26 | 20 | 0,3 | 0 | -12 |
| IR22X28X17 | 29,5 | 22 | 28 | 17 | 0,3 | 0 | -12 |
| IR22X28X20 | 35 | 22 | 28 | 20 | 0,3 | 0 | -12 |
| IR22X28X20,5 | 36 | 22 | 28 | 20,5 | 0,3 | 0 | -12 |
| LR22X28X20,5 | 36 | 22 | 28 | 20,5 | 0,3 | - | - |
| IR22X28X30 | 54,4 | 22 | 28 | 30 | 0,3 | 0 | -12 |

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F μm | |
|---------------------|-----------------|------------|----|------|-----|---------------------------------|-------|
| | | d | F | B | r | min. | upper |
| IR25X29X20 | 25,9 | 25 | 29 | 20 | 0,3 | 0 | -12 |
| IR25X29X30 | 39,3 | 25 | 29 | 30 | 0,3 | 0 | -12 |
| LR25X30X12,5 | 20 | 25 | 30 | 12,5 | 0,3 | - | - |
| LR25X30X16,5 | 26,7 | 25 | 30 | 16,5 | 0,3 | - | - |
| IR25X30X20 | 27,4 | 25 | 30 | 17 | 0,3 | 0 | -12 |
| IR25X30X20 | 32,8 | 25 | 30 | 20 | 0,3 | 0 | -12 |
| IR25X30X20,5 | 33,4 | 25 | 30 | 20,5 | 0,3 | 0 | -12 |
| LR25X30X20,5 | 33,4 | 25 | 30 | 20,5 | 0,3 | - | - |
| IR25X30X26,5 | 46 | 25 | 30 | 26,5 | 0,3 | 0 | -12 |
| LR25X30X26,5 | 46 | 25 | 30 | 26,5 | 0,3 | - | - |
| IR25X30X30 | 53 | 25 | 30 | 30 | 0,3 | 0 | -12 |
| IR25X30X32 | 56 | 25 | 30 | 32 | 0,3 | 0 | -12 |
| IR25X30X38,5 | 64,5 | 25 | 30 | 38,5 | 0,3 | 0 | -12 |
| LR25X30X38,5 | 64,5 | 25 | 30 | 38,5 | 0,3 | - | - |
| IR25X32X22 | 52,5 | 25 | 32 | 22 | 0,6 | +5 | -4 |
| IR28X32X17 | 24,5 | 28 | 32 | 17 | 0,3 | +5 | -4 |
| IR28X32X20 | 28,5 | 28 | 32 | 20 | 0,3 | +5 | -4 |
| IR28X32X30 | 43,5 | 28 | 32 | 30 | 0,3 | +5 | -4 |
| LR30x35X12,5 | 23,3 | 30 | 35 | 12,5 | 0,3 | - | - |
| IR30X35X13 | 25 | 30 | 35 | 13 | 0,3 | +5 | -4 |
| IR30X35X16 | 34 | 30 | 35 | 16 | 0,3 | +5 | -4 |
| LR30X35X16,5 | 31,4 | 30 | 35 | 16,5 | 0,3 | - | - |
| IR30X35X17 | 36 | 30 | 35 | 17 | 0,3 | +5 | -4 |
| IR30X35X20 | 39 | 30 | 35 | 20 | 0,3 | +5 | -4 |
| IR30X35X20,5 | 39,7 | 30 | 35 | 20,5 | 0,3 | +5 | -4 |
| LR30X35X20,5 | 39,7 | 30 | 35 | 20,5 | 0,3 | - | - |
| IR30X35X26 | 50,4 | 30 | 35 | 26 | 0,3 | +5 | -4 |
| IR30X35X30 | 58,5 | 30 | 35 | 30 | 0,3 | +5 | -4 |
| IR30X37X18 | 50 | 30 | 37 | 18 | 0,6 | +5 | -4 |
| IR30X37X22 | 61,6 | 30 | 37 | 22 | 0,6 | +5 | -4 |
| IR32X37X20 | 42 | 32 | 37 | 20 | 0,3 | 0 | -9 |
| IR32X37X30 | 62 | 32 | 37 | 30 | 0,3 | 0 | -9 |
| IR32X40X20 | 68 | 32 | 40 | 20 | 0,6 | 0 | -9 |
| IR32X40X36 | 124 | 32 | 40 | 36 | 0,6 | 0 | -9 |
| IR33X37X13 | 21,9 | 33 | 37 | 13 | 0,3 | 0 | -9 |

Inner rings

Without lubrication hole



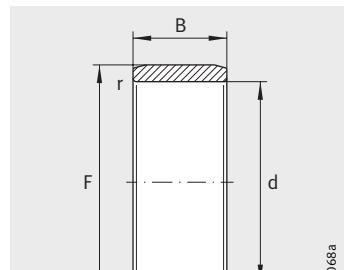
| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F μm | | |
|--------------|-----------------|------------|----|------|-----|------------------------------|-------|-------|
| | | d | F | B | r | min. | upper | lower |
| LR35X40X12,5 | 27,2 | 35 | 40 | 12,5 | 0,3 | - | - | |
| LR35X40X16,5 | 37,4 | 35 | 40 | 16,5 | 0,3 | - | - | |
| IR35X40X17 | 37,8 | 35 | 40 | 17 | 0,3 | 0 | -9 | |
| IR35X40X20 | 44,2 | 35 | 40 | 20 | 0,3 | 0 | -9 | |
| IR35X40X20,5 | 46,1 | 35 | 40 | 20,5 | 0,3 | 0 | -9 | |
| LR35X40X20,5 | 46,1 | 35 | 40 | 20,5 | 0,3 | - | - | |
| IR35X40X30 | 67,1 | 35 | 40 | 30 | 0,3 | 0 | -9 | |
| IR35X42X36 | 117 | 35 | 42 | 36 | 0,6 | 0 | -9 | |
| IR35X43X22 | 82 | 35 | 43 | 22 | 0,6 | 0 | -9 | |
| IR38X43X20 | 48,1 | 38 | 43 | 20 | 0,3 | 0 | -9 | |
| IR38X43X30 | 73,6 | 38 | 43 | 30 | 0,3 | 0 | -9 | |
| LR40X45X16,5 | 41,4 | 40 | 45 | 16,5 | 0,3 | - | - | |
| IR40X45X17 | 42,5 | 40 | 45 | 17 | 0,3 | 0 | -9 | |
| IR40X45X20 | 50,8 | 40 | 45 | 20 | 0,3 | 0 | -9 | |
| IR40X45X20,5 | 51,8 | 40 | 45 | 20,5 | 0,3 | 0 | -9 | |
| LR40X45X20,5 | 51,8 | 40 | 45 | 20,5 | 0,3 | - | - | |
| IR40X45X30 | 84 | 40 | 45 | 30 | 0,3 | 0 | -9 | |
| IR40X48X22 | 91,6 | 40 | 48 | 22 | 0,6 | 0 | -9 | |
| IR40X48X40 | 170 | 40 | 48 | 40 | 0,6 | 0 | -9 | |
| IR40X50X22 | 118 | 40 | 50 | 22 | 1 | 0 | -9 | |
| IR42X47X20 | 52,8 | 42 | 47 | 20 | 0,3 | -5 | -19 | |
| IR42X47X30 | 81 | 42 | 47 | 30 | 0,3 | -5 | -19 | |
| LR45X50X20,5 | 58,8 | 45 | 50 | 20,5 | 0,3 | - | - | |
| IR45X50X25 | 70,8 | 45 | 50 | 25 | 0,6 | -5 | -19 | |
| IR45X50X25,5 | 75,1 | 45 | 50 | 25,5 | 0,3 | -5 | -19 | |
| LR45X50X25,5 | 75,1 | 45 | 50 | 25,5 | 0,3 | - | - | |
| IR45X50X35 | 101 | 45 | 50 | 35 | 0,6 | -5 | -19 | |
| IR45X52X22 | 89 | 45 | 52 | 22 | 0,6 | 0 | -11 | |
| IR45X52X40 | 164 | 45 | 52 | 40 | 0,6 | 0 | -11 | |
| IR45X55X22 | 129 | 45 | 55 | 22 | 1 | 0 | -11 | |
| LR50X55X20,5 | 64,1 | 50 | 55 | 20,5 | 0,6 | - | - | |
| IR50X55X25 | 78 | 50 | 55 | 25 | 0,6 | 0 | -11 | |
| IR50X55X35 | 112 | 50 | 55 | 35 | 0,6 | 0 | -11 | |

| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F μm | | |
|-------------|-----------------|------------|-----|----|-----|------------------------------|-------|-------|
| | | d | F | B | r | min. | upper | lower |
| IR50X58X22 | 115 | 50 | 58 | 22 | 0,6 | - | 0 | -11 |
| IR50X58X40 | 208 | 50 | 58 | 40 | 0,6 | - | 0 | -11 |
| IR50X60X25 | 162 | 50 | 60 | 25 | 1 | - | 0 | -11 |
| IR50X60X28 | 181 | 50 | 60 | 28 | 1,1 | - | 0 | -11 |
| IR55X60X25 | 85,5 | 55 | 60 | 25 | 0,6 | -10 | - | -21 |
| IR55X60X35 | 121 | 55 | 60 | 35 | 0,6 | -10 | - | -21 |
| IR55X63X25 | 141 | 55 | 63 | 25 | 1 | -10 | - | -21 |
| IR55X63X45 | 256 | 55 | 63 | 45 | 1 | -10 | - | -21 |
| IR55X65X28 | 198 | 55 | 65 | 28 | 1,1 | -10 | - | -21 |
| IR60X68X25 | 152 | 60 | 68 | 25 | 1 | -10 | - | -21 |
| IR60X68X35 | 213 | 60 | 68 | 35 | 0,6 | -10 | - | -21 |
| IR60X68X45 | 276 | 60 | 68 | 45 | 1 | -10 | - | -21 |
| IR60X70X25 | 195 | 60 | 70 | 25 | 1 | -10 | - | -21 |
| IR60X70X28 | 215 | 60 | 70 | 28 | 1,1 | -10 | - | -21 |
| IR65X72X25 | 141 | 65 | 72 | 25 | 1 | -10 | - | -21 |
| IR65X72X45 | 259 | 65 | 72 | 45 | 1 | -10 | - | -21 |
| IR65X73X25 | 164 | 65 | 73 | 25 | 1 | -10 | - | -21 |
| IR65X73X35 | 231 | 65 | 73 | 35 | 1 | -10 | - | -21 |
| IR65X75X28 | 229 | 65 | 75 | 28 | 1,1 | -10 | - | -21 |
| IR70X80x25 | 221 | 70 | 80 | 25 | 1 | -10 | - | -26 |
| IR70X80X30 | 267 | 70 | 80 | 30 | 1 | -10 | - | -26 |
| IR70X80X35 | 312 | 70 | 80 | 35 | 1 | -10 | - | -26 |
| IR70X80X54 | 488 | 70 | 80 | 54 | 1 | -10 | - | -26 |
| IR75X85X25 | 238 | 75 | 85 | 25 | 1 | -4 | - | -17 |
| IR75X85X30 | 287 | 75 | 85 | 30 | 1 | -4 | - | -17 |
| IR75X85X35 | 336 | 75 | 85 | 35 | 1 | -4 | - | -17 |
| IR75X85X54 | 520 | 75 | 85 | 54 | 1 | -4 | - | -17 |
| IR80X90X25 | 253 | 80 | 90 | 25 | 1 | -4 | - | -17 |
| IR80X90X30 | 304 | 80 | 90 | 30 | 1 | -4 | - | -17 |
| IR80X90X35 | 355 | 80 | 90 | 35 | 1 | -4 | - | -17 |
| IR80X90X54 | 556 | 80 | 90 | 54 | 1 | -4 | - | -17 |
| IR85X95X26 | 277 | 85 | 95 | 26 | 1 | -14 | - | -27 |
| IR85X95X36 | 388 | 85 | 95 | 36 | 1 | -14 | - | -27 |
| IR85X100X35 | 582 | 85 | 100 | 35 | 1,1 | -14 | - | -27 |
| IR85X100X63 | 1054 | 85 | 100 | 63 | 1,1 | -14 | - | -27 |



Inner rings

Without lubrication hole



103 068a

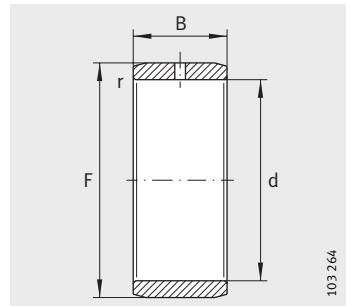
IR

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F | |
|---------------|-----------------|------------|-----|-----|-----------|------------------------|-------|
| | | d | F | B | r min. | μm | upper |
| IR90X100X26 | 294 | 90 | 100 | 26 | 1 | -14 | -27 |
| IR90X100X30 | 340 | 90 | 100 | 30 | 1 | -14 | -27 |
| IR90X100X36 | 406 | 90 | 100 | 36 | 1 | -14 | -27 |
| IR90X105X35 | 610 | 90 | 105 | 35 | 1,1 | -14 | -27 |
| IR90X105X63 | 1 110 | 90 | 105 | 63 | 1,1 | -14 | -27 |
| IR95X105X26 | 313 | 95 | 105 | 26 | 1 | -14 | -27 |
| IR95X105X36 | 431 | 95 | 105 | 36 | 1 | -14 | -27 |
| IR95X110X35 | 657 | 95 | 110 | 35 | 1,1 | -14 | -27 |
| IR95X110X63 | 1 170 | 95 | 110 | 63 | 1,1 | -14 | -27 |
| IR100X110X30 | 350 | 100 | 110 | 30 | 1,1 | -14 | -27 |
| IR100X110X40 | 505 | 100 | 110 | 40 | 1,1 | -14 | -27 |
| IR100X115X40 | 797 | 100 | 115 | 40 | 1,1 | -14 | -27 |
| IR110X120X30 | 409 | 110 | 120 | 30 | 1 | -14 | -32 |
| IR110X125X40 | 840 | 110 | 125 | 40 | 1,1 | -7 | -22 |
| IR120X130X30 | 442 | 120 | 130 | 30 | 1 | -7 | -22 |
| IR120X135X45 | 1 044 | 120 | 135 | 45 | 1,1 | -7 | -22 |
| IR130X145X35 | 855 | 130 | 145 | 35 | 1,1 | -17 | -37 |
| IR130X150X50 | 1 690 | 130 | 150 | 50 | 1,5 | -17 | -37 |
| IR140X155X35 | 917 | 140 | 155 | 35 | 1,1 | -17 | -37 |
| IR140X160X50 | 1 800 | 140 | 160 | 50 | 1,5 | -17 | -37 |
| IR150X165X40 | 1 122 | 150 | 165 | 40 | 1,1 | -27 | -52 |
| IR160X175X40 | 1 200 | 160 | 175 | 40 | 1,1 | -27 | -52 |
| IR170X185X45 | 1 441 | 170 | 185 | 45 | 1,1 | -25 | -46 |
| IR180X195X45 | 1 510 | 180 | 195 | 45 | 1,1 | -25 | -46 |
| IR190X210X50 | 2 410 | 190 | 210 | 50 | 1,5 | -40 | -66 |
| IR200X220X50 | 2 518 | 200 | 220 | 50 | 1,5 | -40 | -66 |
| IR220X240X50 | 2 753 | 220 | 240 | 50 | 1,5 | -55 | -86 |
| IR240X265X60 | 4 600 | 240 | 265 | 60 | 2 | -55 | -86 |
| IR260X285X60 | 4 980 | 260 | 285 | 60 | 2 | -69 | -107 |
| IR280X305X69 | 6 100 | 280 | 305 | 69 | 2 | -69 | -107 |
| IR300X330X80 | 9 200 | 300 | 330 | 80 | 2,1 | -69 | -107 |
| IR320X350X80 | 9 800 | 320 | 350 | 80 | 2,1 | -83 | -127 |
| IR340X370X80 | 10 200 | 340 | 370 | 80 | 2,1 | -83 | -127 |
| IR360X390X80 | 10 900 | 360 | 390 | 80 | 2,1 | -128 | -182 |
| IR380X415X100 | 16 700 | 380 | 415 | 100 | 2,1 | -122 | -172 |

Inner rings

With lubrication hole

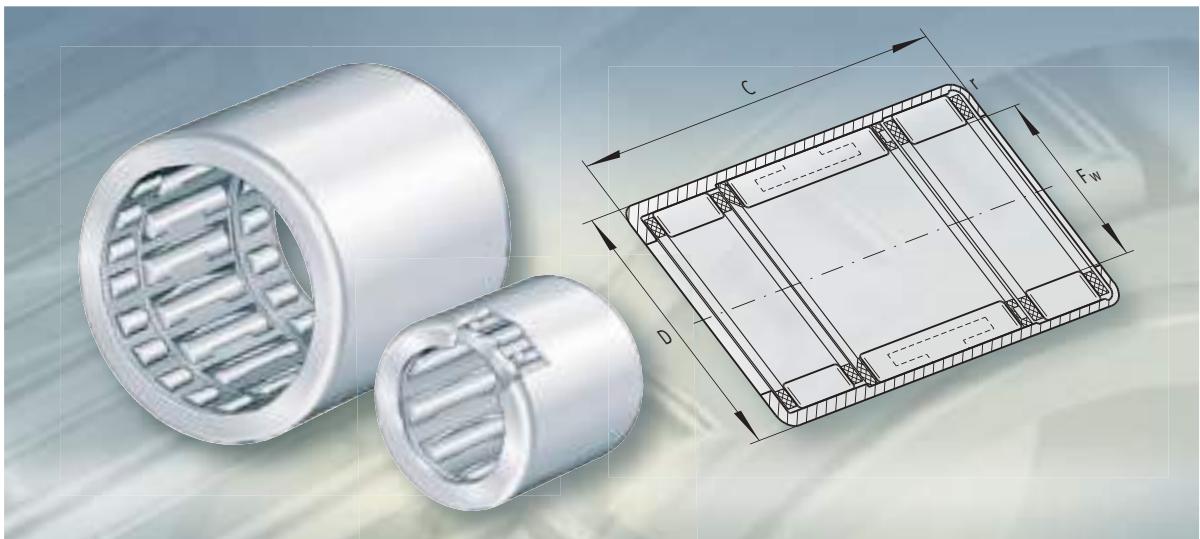


IR..-IS1

Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | Tolerance of raceway F | |
|-----------------------|-----------------|------------|----|----|-----------|------------------------|-------|
| | | d | F | B | r min. | μm | |
| | | | | | | upper | lower |
| IR6X10X10-IS1 | 3,7 | 6 | 10 | 10 | 0,3 | -7 | -23 |
| IR8X12X10-IS1 | 4,8 | 8 | 12 | 10 | 0,3 | -4 | -18 |
| IR10X14X12-IS1 | 7,3 | 10 | 14 | 12 | 0,3 | -4 | -18 |
| IR12X16X12-IS1 | 7,9 | 12 | 16 | 12 | 0,3 | -4 | -18 |
| IR15X20X12-IS1 | 12,2 | 15 | 20 | 12 | 0,3 | 0 | -12 |
| IR20X25X16-IS1 | 24 | 20 | 25 | 16 | 0,3 | 0 | -12 |
| IR25X30X16-IS1 | 25,7 | 25 | 30 | 16 | 0,3 | 0 | -12 |
| IR30X38X20-IS1 | 77 | 30 | 38 | 20 | 0,6 | +5 | -4 |
| IR35X42X20-IS1 | 63,9 | 35 | 42 | 20 | 0,6 | 0 | -9 |
| IR40X50X20-IS1 | 106 | 40 | 50 | 20 | 1 | 0 | -9 |
| IR45X55X20-IS1 | 117 | 45 | 55 | 20 | 1 | 0 | -11 |
| IR50X55X20-IS1 | 62,5 | 50 | 55 | 20 | 0,6 | 0 | -11 |
| IR50X60X20-IS1 | 128 | 50 | 60 | 20 | 1 | 0 | -11 |





Drawn cup roller clutches

Drawn cup roller clutches

| | Page |
|-------------------------------------|--|
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| Design and safety guidelines | Retention for transport 704 Limiting load 704 Indexing frequency and indexing accuracy 704 Transmissible torque 704 Frictional energy 705 Speeds 705 Housing design 706 Shaft design 707 Axial location 708 Sealing of the bearing position 708 Lubrication 708 Fitting using pressing-in mandrel 708 |
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Product overview Drawn cup roller clutches

Without bearing arrangement

With and without knurling
With steel springs

HF



HF..-R



125 166a

125 171b

With and without knurling
With plastic springs

HF..-KF



HF..-KFR



125 238

125 173b

With bearing arrangement

With and without knurling
With steel springs

HFL



HFL..-R



125 169a

125 170a

With and without knurling
With plastic springs

HFL..-KF



HFL..-KFR



125 172a

125 239

Drawn cup roller clutches

Features

Drawn cup roller clutches are one-way clutches comprising thin-walled, drawn outer rings with ramps on the inside diameter, plastic cages, pressure springs and needle rollers. They can transmit torques in one direction and are radially compact. The roller clutches are available with and without bearing arrangements.

Drawn cup roller clutches give very precise indexing, since the individual spring loading of the needle rollers ensures continuous contact between the shaft, needle rollers and ramps. They allow high indexing frequencies due to their low mass and the resulting low moment of inertia of the clamping elements. They also have a low overrunning frictional torque.

Drawn cup roller clutches can be used in various applications such as indexing clutches, back-stopping clutches and overrunning clutches. In these cases, the drawn cup roller clutch performs an overrunning or locking function.

Sealing/lubricant

Drawn cup roller clutches are greased using a lithium soap grease to GA26. For applications with oil lubrication, roller clutches are available without greasing. These roller clutches are coated with a preservative.

In many cases, the initial greasing is sufficient to last the operating life of the roller clutches.

Drawn cup roller clutches without bearing arrangement

Caution!

In the case of drawn cup roller clutches without a bearing arrangement, concentricity to the shaft axis must be secured by additional rolling bearings or drawn cup roller clutches with a bearing arrangement must be used.

Without knurling/with knurling

Drawn cup roller clutches HF have steel pressure springs, roller clutches HF..KF have plastic pressure springs.

Roller clutches with a knurled outside surface have the suffix R and are suitable for use with plastic housings.

Drawn cup roller clutches with bearing arrangement

Drawn cup roller clutches HFL are roller clutches with a bearing arrangement. Due to the integrated rolling or plain bearings, they can support torques as well as additional radial forces.

Without knurling/with knurling

Drawn cup roller clutches HFL have steel pressure springs, roller clutches HFL..KF have plastic pressure springs.

Roller clutches with a knurled outside surface have the suffix R and are suitable for use with plastic housings.

Operating temperature

Caution!

Due to the grease used, drawn cup roller clutches are suitable for operating temperatures from -10°C to $+70^{\circ}\text{C}$.

Suffixes

Suffixes for available designs: see table.

Available designs

| Suffixes | Description | Design |
|----------|---|------------------------------|
| - | Steel springs | Standard |
| KF | Plastic springs | Standard |
| R | Knurled outside surface | Standard |
| RR | Drawn cup roller clutch with Corrotect [®] coating | Special design ¹⁾ |

¹⁾ Available by agreement.



Drawn cup roller clutches

Design and safety guidelines

Caution!

Drawn cup roller clutches should not be used if a malfunction could lead to personal injury.

New applications, especially those involving extreme conditions, should first be verified by tests.

Correct functioning can only be guaranteed if there is only a small concentricity defect between the support bearing and the shaft.

Retention for transport

Drawn cup roller clutches are normally packed individually in the case of small quantities.

Where larger quantities are involved, drawn cup roller clutches are placed in a specific orientation in blister packaging and delivered in this form. The blister packaging serves to retain the parts in position during transport.

Limiting load

Caution!

In the case of drawn cup roller clutches with plain bearings, the product calculated from the actual speed n and radial load F_r must not exceed the value stated for the limiting load $(F_r \cdot n)_{\max}$. The operating limits are determined by the limiting speeds stated in the dimension tables and the permissible radial load.

Indexing frequency and indexing accuracy

In order not to overload the roller clutch, the inertia of the entire system must be taken into consideration. The high indexing accuracy is due to the individual spring loading of the needle rollers, which ensures continuous contact between the shaft, needle rollers and clamping surface.

The indexing accuracy is influenced by the indexing frequency, lubrication, fitting tolerances, adjacent construction, elastic deformation of the adjacent parts and the drive method, either through the shaft or the housing. Optimum accuracy is achieved if the drive is via the shaft.

Transmissible torque

Transmission of torque requires a rigid housing. The transmissible torque is therefore dependent on the shaft and housing material, the shaft hardness, the wall thickness of the housing and the shaft and housing tolerances.

Caution!

When calculating the torque, the maximum drive torque and the moment of inertia of the masses during acceleration must be taken into consideration.

Frictional energy

The frictional torque curve is shown in *Figure 1*.

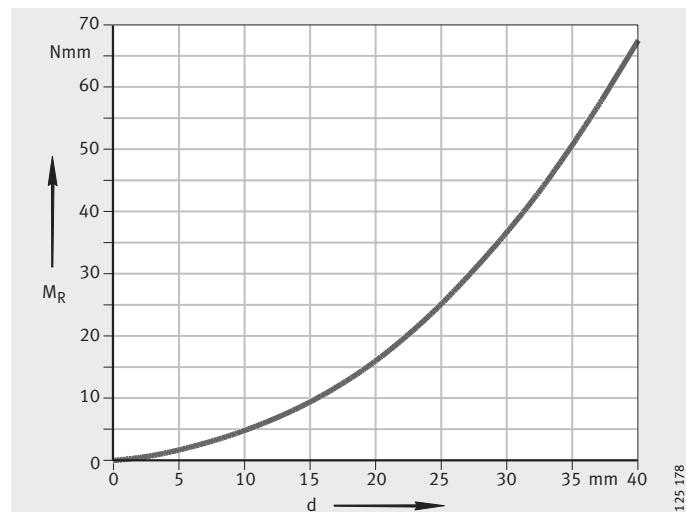
The frictional energy during idling is dependent on whether the shaft or the outer ring is rotating, *Figure 2*.

If the outer ring rotates, the frictional energy increases at first as the speed increases but then decreases gradually due to centrifugal force until it approaches zero.

At this speed, there is no longer any frictional contact between the needle rollers and the shaft. Due to the increasing centrifugal force, the needle rollers lift from the shaft.

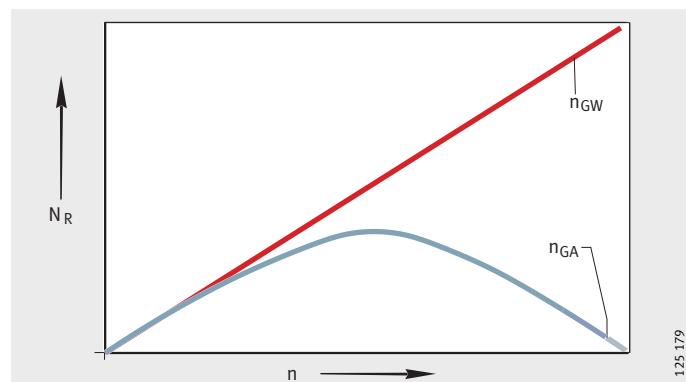
M_R = frictional torque during idling
 d = shaft diameter

Figure 1
 Frictional torque during idling,
 as a function of shaft diameter



n = speed
 N_R = frictional energy during idling
 n_{GA} = limiting speed with
 rotating outer ring
 n_{GW} = limiting speed with
 rotating shaft

Figure 2
 Frictional energy during idling,
 as a function of speed



Speeds **Caution!**

The limiting speeds n_{GW} and n_{GA} in the dimension tables are valid for oil and grease lubrication.

The limiting speed n_{GW} is valid for a rotating shaft.

The limiting speed n_{GA} is valid for a rotating outer ring.



Drawn cup roller clutches

Housing design

The accuracy of the locating bore essentially determines the geometrical accuracy of the drawn cup and thus the functioning of the clutch.

Housing bore

The housing bore should have a chamfer of 15° . The bore tolerances should be in accordance with the table and have a surface quality of $R_a 0,8$.

The cylindricity tolerance of the housing bore in metal housings should be within the tolerance grade IT 5/2.

Bore tolerances

| Series | Springs | Bore Housing material | | |
|-----------------------------|---------|--------------------------|-----------------------|---------------------------------------|
| | | Steel Cast iron | Light metal | Max. bore in plastic ²⁾ |
| HF, HFL | Steel | N6 (N7) ¹⁾ | R6 (R7) ¹⁾ | — |
| HF..-KF, HFL..-KF | Plastic | N7 | R7 | — |
| HF..-R, HFL..-R | Steel | — | — | D _{-0,05} |
| HF..-KFR, HFL..-KFR | Plastic | — | — | D _{-0,05} |
| HFL0606-KFR, HFL0806-KFR | Plastic | — | — | D _{-0,05} |

¹⁾ The values in brackets can be used if the actual torque is up to 50% of the permissible torque $M_{d\text{ per}}$ (see dimension tables).

²⁾ Guide values dependent on the plastic used.
Outside diameter D: see dimension tables.

Minimum wall thickness – metal and plastic housings

Caution!

For metal housings, the minimum wall thickness is determined according to Figure 3. Calculation examples: see page 707.

The comparative stress σ_v must not exceed the yield stress of the housing material.

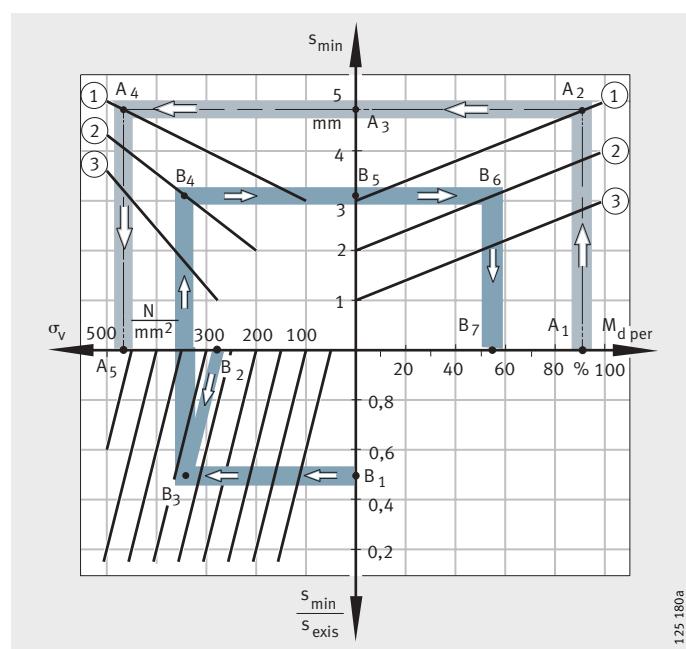
For plastic housings, drawn cup roller clutches with a partially or fully knurled outside surface should be used.

- ① HF2520 to HF3520,
HFL2530 to HFL3530
- ② HF1216 to HF2016,
HFL1226 to HFL2026
- ③ Up to HF1012, up to HFL1220

$M_{d\text{ per}}$ = permissible torque
 σ_v = comparative stress

s_{\min} = minimum wall thickness
 $s_{\min}/s_{\text{exist}}$ = ratio of wall thicknesses

Figure 3
Minimum wall thicknesses
of metal housings,
as a function of torque



125 180a

Calculation example

Calculation example A

Lines A₁ to A₄, *Figure 3:*

Given:

- Drawn cup roller clutch HF3020
- Permissible torque M_{d per} = 90 Nm
- Torque M_d = 81 Nm
(= 90% of permissible torque M_{d per})
- Metal housing.

Required:

- Minimum wall thickness s_{min} and comparative stress σ_v.

Result:

- s_{min} = 4,8 mm and σ_v = 460 N/mm².

Calculation example B

Lines B₁ to B₇, *Figure 3:*

Given:

- Drawn cup roller clutch HF1416
- Permissible torque M_{d per} = 17,3 Nm
- Ratio of wall thicknesses s_{min}/s_{exist} = 0,5
- Permissible housing stress R_{p0,2} = 280 N/mm²
- Metal housing.

Required:

- Minimum wall thickness s_{min} and transmissible torque M_d.

Result:

- s_{min} = 3,1 mm and M_d = 9,6 Nm.

Shaft design

The raceway on the shaft must be hardened and ground. The surface hardness of the raceway must be 670 HV + 170 HV, the hardening depth CHD or Rht must be sufficiently large (CHD ≥ 0,3 mm).

The end face of the shaft must be chamfered to approx. 1 mm and 15°.

Shaft design: see table Shaft tolerances.

Shaft tolerances

| Series | Springs | Shaft | | | |
|--------------------------|---------|-----------------------|---------------------------------------|---------------------------|---------------------------|
| | | Tolerances | Roughness max. | Roundness max. | Parallelism max. |
| HF, HFL | Steel | h5 (h6) ¹⁾ | R _a 0,4 (R _Z 2) | 25% of diameter tolerance | 25% of diameter tolerance |
| HF..-KF, HFL..-KF | Plastic | h8 | | | |
| HF..-R, HFL..-R | Steel | h5 (h6) ¹⁾ | | | |
| HF..-KFR, HFL..-KFR | Plastic | h8 | | | |
| HFL0606-KFR, HFL0806-KFR | Plastic | h9 | | | |

¹⁾ The values in brackets can be used if the actual torque is up to 50% of the permissible torque M_{d per} (see dimension tables).



Drawn cup roller clutches

Axial location Drawn cup roller clutches are pressed into the housing bore and require no further axial location (if the recommendations in the table Bore tolerances, page 706 are observed).

Sealing of the bearing position If there is a risk of contamination, sealing rings of series G or SD should be fitted. The sealing rings are matched to the dimensions of the roller clutches and can be combined with wider inner rings IR.

Lubrication In order to ensure optimum function, different lubricants may be required. The suitability of the lubricant must be verified by tests. For general applications (mixed operation involving locking and overrunning), the INA initial greasing has proved effective. For applications in which one operating condition (overrunning or locking) is heavily predominant, a special greasing should be used. In this case, please contact us.

It is not possible to calculate the grease operating life or lubrication interval for drawn cup roller clutches.

Caution! If drawn cup roller clutches are to be relubricated, only oil lubrication should be used or lubrication should be changed to oil.

For temperatures $< -10^{\circ}\text{C}$ and speeds $> 0,7 n_G$, a lubricant recommendation should be requested.

For temperatures over $+70^{\circ}\text{C}$, oil lubrication should be used. The oil level should such that, when the roller clutch is stationary and the axis is horizontal, it is immersed approx. $\frac{1}{3}$ in the oil bath. Suitable oils are CL and CLP to DIN 51 517 or HL and HLP to DIN 51 524. Viscosity classes: see table.

| Viscosity classes | Operating temperature | Viscosity class |
|-------------------|-----------------------|-----------------|
| | +15 °C to +30 °C | ISO VG 10 |
| | +15 °C to +90 °C | ISO VG 32 |
| | +60 °C to +120 °C | ISO VG 100 |

Installation using a fitting mandrel

Caution! Drawn cup roller clutches should only be fitted in the locating bore using a special fitting mandrel, see Drawn cup needle roller bearings, page 610. Note the clamping direction of the roller clutch. The clamping direction is indicated by an arrow on the end face.

Guidelines for fitting Drawn cup roller clutches should be protected against dust, contaminants and moisture. Contaminants can impair the function and operating life of roller clutches.

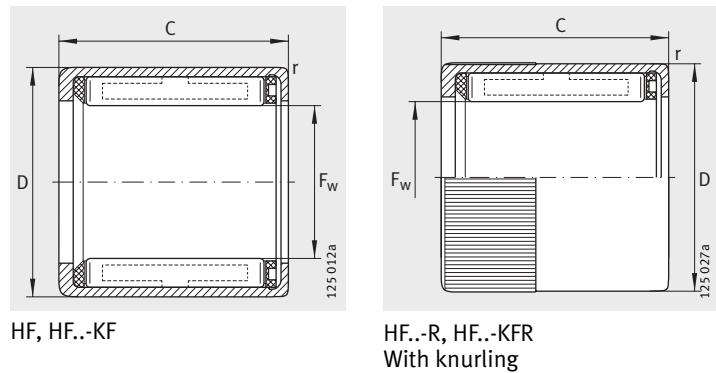
Caution! Pressing-in forces must never be directed through the rolling elements. Roller clutches should not be tilted during fitting.

Accuracy The thin-walled outer rings adopt the dimensional and geometrical accuracy of the housing bore.

Enveloping circle In roller clutches with a rolling bearing arrangement, the enveloping circle diameter F_w of the fitted bearings (in a heavy-section ring gauge) is approximately in tolerance zone F8 (for values according to table, Bore tolerances, page 706 and Shaft tolerances, page 707). The enveloping circle is the inner inscribed circle of the support bearing needle rollers in clearance-free contact with the outer raceway.

Drawn cup roller clutches

Without
bearing arrangement
With or without knurling



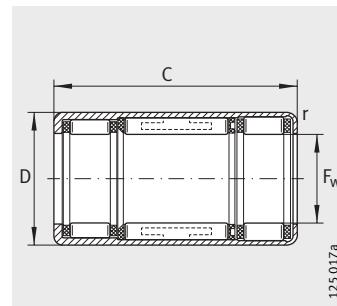
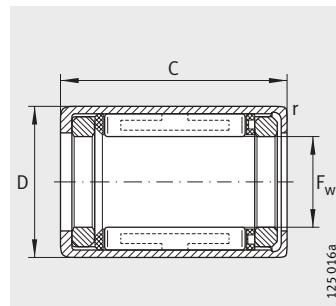
Dimension table · Dimensions in mm

| Spring design | | Mass m ≈g | Dimensions | | | | Permissible torque M_d per Nm | Limiting speeds | | Drawn cup needle roller bearings for radial bearing arrangement Designation |
|-------------------|-----------------|-----------------|------------|-----|------|------|--|-------------------|-------------------|---|
| Plastic springs | Steel springs | | F_w | D | C | r | | n_{GW} min⁻¹ | n_{GA} min⁻¹ | |
| Designation | Designation | | | | -0,3 | min. | | | | |
| HF0306-KF | – | 1 | 3 | 6,5 | 6 | 0,3 | 0,18 | 45 000 | 8 000 | HK0306-TV |
| HF0306-KFR | – | 1 | 3 | 6,5 | 6 | 0,3 | 0,06 | 45 000 | 8 000 | HK0306-TV |
| HF0406-KF | – | 1 | 4 | 8 | 6 | 0,3 | 0,34 | 34 000 | 8 000 | HK0408 |
| HF0406-KFR | – | 1 | 4 | 8 | 6 | 0,3 | 0,1 | 34 000 | 8 000 | HK0408 |
| HF0612-KF | HF0612 | 3 | 6 | 10 | 12 | 0,3 | 1,76 | 23 000 | 13 000 | HK0608 |
| HF0612-KFR | HF0612-R | 3 | 6 | 10 | 12 | 0,3 | 0,6 | 23 000 | 13 000 | HK0608 |
| HF0812-KF | HF0812 | 3,5 | 8 | 12 | 12 | 0,3 | 3,15 | 17 000 | 12 000 | HK0808 |
| HF0812-KFR | HF0812-R | 3,5 | 8 | 12 | 12 | 0,3 | 1 | 17 000 | 12 000 | HK0808 |
| HF1012-KF | HF1012 | 4 | 10 | 14 | 12 | 0,3 | 5,3 | 14 000 | 11 000 | HK1010 |
| – | HF1216 | 11 | 12 | 18 | 16 | 0,3 | 12,2 | 11 000 | 8 000 | HK1212 |
| – | HF1416 | 13 | 14 | 20 | 16 | 0,3 | 17,3 | 9 500 | 8 000 | HK1412 |
| – | HF1616 | 14 | 16 | 22 | 16 | 0,3 | 20,5 | 8 500 | 7 500 | HK1612 |
| – | HF1816 | 16 | 18 | 24 | 16 | 0,3 | 24,1 | 7 500 | 7 500 | HK1812 |
| – | HF2016 | 17 | 20 | 26 | 16 | 0,3 | 28,5 | 7 000 | 6 500 | HK2010 |
| – | HF2520 | 30 | 25 | 32 | 20 | 0,3 | 66 | 5 500 | 5 500 | HK2512 |
| – | HF3020 | 36 | 30 | 37 | 20 | 0,3 | 90 | 4 500 | 4 500 | HK3012 |
| – | HF3520 | 40 | 35 | 42 | 20 | 0,3 | 121 | 3 900 | 3 900 | HK3512 |



Drawn cup roller clutches

With bearing arrangement
With or without knurling



HFL, HFL..-KF, with plain bearing arr. (HFL0308-KF, HFL0408-KF, HFL0615-KF, HFL0615)

HFL, HFL..-KF, with rolling bearing arr. ($F_w \geq 8$ mm and $C \geq 22$ mm) and HFL0822-KFR, HFL0822-R

Dimension table (continued) · Dimensions in mm

| Spring design | | Mass m | Dimensions | | | | Permissible torque Md per Nm |
|--------------------|------------------|-------------|------------|-----|------|-----------|---------------------------------------|
| Plastic springs | Steel springs | | F_w | D | C | r min. | |
| Designation | Designation | $\approx g$ | | | -0,3 | | |
| HFL0308-KF | – | 1,4 | 3 | 6,5 | 8 | 0,3 | 0,18 |
| HFL0308-KFR | – | 1,4 | 3 | 6,5 | 8 | 0,3 | 0,06 |
| HFL0408-KF | – | 1,6 | 4 | 8 | 8 | 0,3 | 0,34 |
| HFL0408-KFR | – | 1,6 | 4 | 8 | 8 | 0,3 | 0,1 |
| HFL0606-KFR | – | 1 | 6 | 10 | 6 | 0,3 | 0,5 |
| HFL0615-KF | HFL0615 | 4 | 6 | 10 | 15 | 0,3 | 1,76 |
| HFL0615-KFR | HFL0615-R | 4 | 6 | 10 | 15 | 0,3 | 0,6 |
| HFL0806-KFR | – | 2 | 8 | 12 | 6 | 0,3 | 0,7 |
| HFL0822-KF | HFL0822 | 7 | 8 | 12 | 22 | 0,3 | 3,15 |
| HFL0822-KFR | HFL0822-R | 7 | 8 | 12 | 22 | 0,3 | 1 |
| – | HFL1022 | 8 | 10 | 14 | 22 | 0,3 | 5,3 |
| – | HFL1226 | 18 | 12 | 18 | 26 | 0,3 | 12,2 |
| – | HFL1426 | 20 | 14 | 20 | 26 | 0,3 | 17,3 |
| – | HFL1626 | 22 | 16 | 22 | 26 | 0,3 | 20,5 |
| – | HFL1826 | 25 | 18 | 24 | 26 | 0,3 | 24,1 |
| – | HFL2026 | 27 | 20 | 26 | 26 | 0,3 | 28,5 |
| – | HFL2530 | 44 | 25 | 32 | 30 | 0,3 | 66 |
| – | HFL3030 | 51 | 30 | 37 | 30 | 0,3 | 90 |
| – | HFL3530 | 58 | 35 | 42 | 30 | 0,3 | 121 |

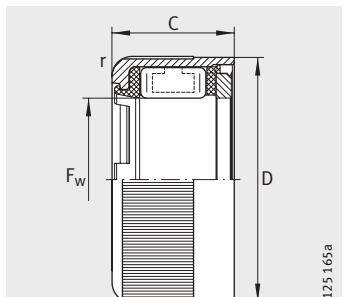
1) Caution!

Drawn cup roller clutches with plain bearings: During operation, the product of the actual speed n and the radial load F_r must not exceed the stated operating limit $(F_r \cdot n)_{max}$.

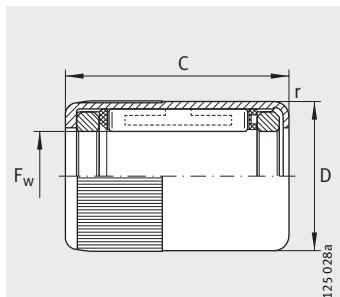
The operating limits are determined by the limiting speeds stated and the permissible radial load.

2) Drawn cup roller clutches with rolling bearings.

3) No arrow on end face.



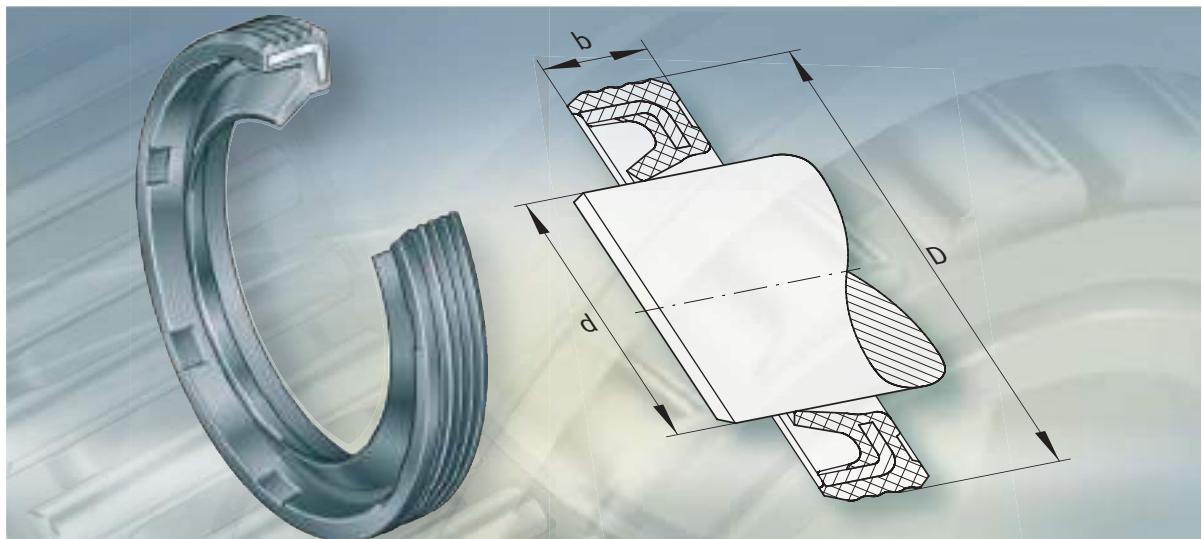
HFL0606-KFR³⁾, HFL0806-KFR³⁾



HFL0308-KFR, HFL0408-KFR,
HFL0615-R, HFL0615-KFR

| Limiting speeds | | Permissible radial load ¹⁾ $F_{r\max}$ | Limiting load ($F_r \cdot n$) _{max} ¹⁾ | Basic load ratings ²⁾ | | Fatigue limit load C_{ur} |
|-------------------------------|-------------------------------|--|---|----------------------------------|------------------------|--------------------------------|
| n_{GW} min ⁻¹ | n_{GA} min ⁻¹ | | | dyn. C_r N | stat. C_{0r} N | |
| 45 000 | 8 000 | 60 | 16 000 | — | — | — |
| 45 000 | 8 000 | 60 | 16 000 | — | — | — |
| 34 000 | 8 000 | 80 | 16 000 | — | — | — |
| 34 000 | 8 000 | 80 | 16 000 | — | — | — |
| 23 000 | 13 000 | 40 | 4 200 | — | — | — |
| 23 000 | 13 000 | 110 | 18 000 | — | — | — |
| 23 000 | 13 000 | 110 | 18 000 | — | — | — |
| 17 000 | 12 000 | 54 | 4 200 | — | — | — |
| 17 000 | 12 000 | — | — | 3 650 | 3 950 | 550 |
| 17 000 | 12 000 | — | — | 3 650 | 3 950 | 550 |
| 14 000 | 11 000 | — | — | 3 950 | 4 500 | 630 |
| 11 000 | 8 000 | — | — | 6 300 | 6 700 | 920 |
| 9 500 | 8 000 | — | — | 6 800 | 7 800 | 1 080 |
| 8 500 | 7 500 | — | — | 7 400 | 9 000 | 1 250 |
| 7 500 | 7 500 | — | — | 8 000 | 10 200 | 1 420 |
| 7 000 | 6 500 | — | — | 8 500 | 11 400 | 1 590 |
| 5 500 | 5 500 | — | — | 10 600 | 14 000 | 1 900 |
| 4 500 | 4 500 | — | — | 11 600 | 16 900 | 2 290 |
| 3 900 | 3 900 | — | — | 12 200 | 18 800 | 2 550 |





Sealing rings

Sealing rings

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| Design and safety guidelines | Resistance/leakage 716 Sealing lip orientation 716 Shaft and housing design 716 |
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Product overview Sealing rings

Single lip



With external steel reinforcement



Double lip



Sealing rings

Features

Sealing rings are designed as contact seals. They protect the bearing position against contamination, spray water and the excessive loss of grease.

Sealing rings are matched to the low radial dimensions of drawn cup needle roller bearings and needle roller bearings. They are very easy to fit, since they are simply pressed into the housing bore.

Sealing rings allow circumferential speeds at the seal lip of up to 10 m/s, depending on the surface quality of the shaft.

Sealing rings, single lip

Sealing rings G and GR are single lip seals made from synthetic NBR elastomer (coloured green).

The design GR is suitable for shaft diameters up to 7 mm and has an external steel reinforcement for stiffening purposes.

Sealing rings G are suitable for shaft diameters over 8 mm and have a rubber-encased steel reinforcement with a rubber wave profile for stiffening purposes. This provides good sealing on the outside diameter. At the same time, it also reduces the forces required for fitting.

Sealing rings, double lip

Sealing rings SD have a contact lip and a non-contact dust shield lip facing the shaft (on the marked side). They comprise two plastic components.

The seal carrier is made from reinforced polyamide (coloured black), while the seal lip area is made from thermoplastic PU elastomer (coloured green).

Sealing rings SD can also be used as wipers on shafts with axial motion. Stroke speeds up to 3 m/s are possible, dependent on the condition of the shaft.

Operating temperature

The permissible operating temperature is dependent on the interaction between the medium and the temperature and its effect on the sealing ring material. The suitability of the sealing rings should be checked by tests as extremes of operation are approached.

Caution!

Sealing rings G and GR are suitable for operating temperatures from –30 °C to +110 °C, depending on the medium acting on the sealing ring.

Sealing rings SD are suitable for operating temperatures from –30 °C to +110 °C, depending on the medium acting on the sealing ring.

Suffixes

Suffixes for available designs: see table.

Available designs

| Suffixes | Description | Design |
|----------|---|------------------------------|
| FPM | Sealing rings G and GR for temperatures from –20 °C to +160 °C or circumferential speeds up to 16 m/s | Special design ¹⁾ |

¹⁾ Available by agreement.

Further information

Further information on sealing rings and the basic principles of sealing ring technology is given in publication GSD.



Sealing rings

Design and safety guidelines

Resistance/leakage

Sealing rings are resistant to undoped lubricants with a mineral oil base. For other media, please check the resistance of the sealing rings.

Low leakage rates are possible (grease or fluid film). The sealing effect is aided by a grease collar.

Sealing lip orientation

A sealing lip facing outwards protects the bearing against ingress of contaminants, *Figure 1, ①*. A sealing lip facing inwards prevents egress of lubricant from the bearing, *Figure 1, ②*.

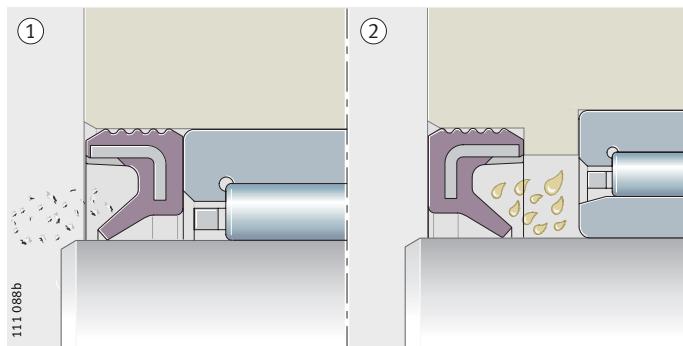


Figure 1

- ① Sealing lip facing outwards
- ② Sealing lip facing inwards

Shaft and housing design

The sliding surface for the sealing lips must be free from cracks and damage such as impact points, scratches, cracks, rust, raised areas.

Tolerances and surface quality

| Sealing ring | Shaft movement | Bore tolerance | Shaft | | |
|--------------|----------------|----------------|-----------|--------------------------|------------------------|
| | | | Tolerance | Roughness | Hardness |
| G, GR, SD | Rotation only | G7 to R7 | g7 to k7 | 0,2 \leq Ra \leq 0,8 | 55 HRC or 600 HV |
| SD | Axial motion | | | Ra 0,3 | |

In order to protect the sealing lips during fitting, the shaft ends and the housing bore should be chamfered in accordance with DIN 3 761, see table and *Figure 2*.

Chamfer dimensions

| Chamfer | D \leq 30 mm | D > 30 mm | d \leq 30 mm | d > 30 mm |
|---------|----------------|-----------|----------------|-----------|
| v min. | 0,3 | 1% of D | – | – |
| w min. | – | – | 0,3 | 0,5 |

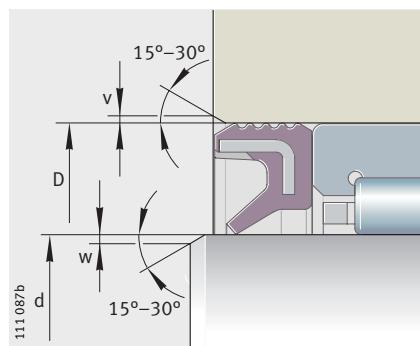
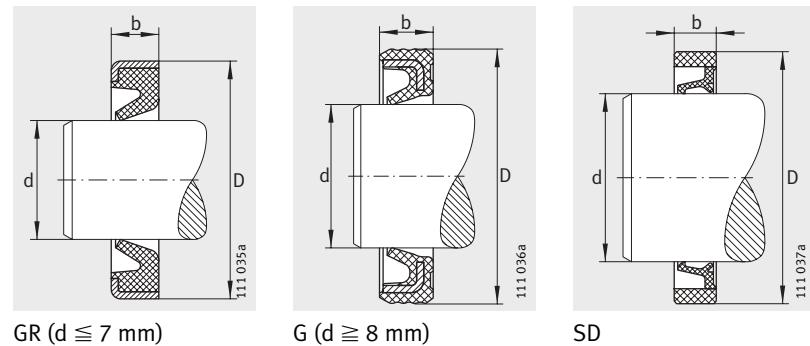


Figure 2
Chamfers on housing bore and shaft end

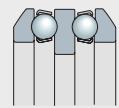
Sealing rings



| Dimension table · Dimensions in mm | | | | | | |
|------------------------------------|--------|-----------------------|--------|------------|----|---|
| Single lip NBR elastomer | | Double lip Plastic | | Dimensions | | |
| Designation | Mass m | Designation | Mass m | d | D | b |
| GR4X8X2 | 0,2 | — | — | 4 | 8 | 2 |
| GR5X9X2 | 0,2 | — | — | 5 | 9 | 2 |
| GR5X10X2 | 0,2 | — | — | 5 | 10 | 2 |
| GR6X10X2 | 0,2 | — | — | 6 | 10 | 2 |
| GR6X12X2 | 0,4 | — | — | 6 | 12 | 2 |
| GR7X11X2 | 0,3 | — | — | 7 | 11 | 2 |
| GR7X14X2 | 0,5 | — | — | 7 | 14 | 2 |
| G8X12X3 | 0,4 | — | — | 8 | 12 | 3 |
| G8X15X3 | 0,7 | SD8X15X3 | 0,3 | 8 | 15 | 3 |
| G9X13X3 | 0,5 | — | — | 9 | 13 | 3 |
| G9X16X3 | 0,7 | — | — | 9 | 16 | 3 |
| G10X14X3 | 0,5 | — | — | 10 | 14 | 3 |
| G10X17X3 | 0,9 | SD10X17X3 | 0,4 | 10 | 17 | 3 |
| G12X16X3 | 0,6 | — | — | 12 | 16 | 3 |
| G12X18X3 | 0,9 | SD12X18X3 | 0,4 | 12 | 18 | 3 |
| G12X19X3 | 1 | SD12X19X3 | 0,5 | 12 | 19 | 3 |
| G13X19X3 | 0,9 | — | — | 13 | 19 | 3 |
| G14X20X3 | 1 | SD14X20X3 | 0,5 | 14 | 20 | 3 |
| G14X21X3 | 1,1 | — | — | 14 | 21 | 3 |
| G14X22X3 | 1,3 | SD14X22X3 | 0,7 | 14 | 22 | 3 |
| G15X21X3 | 1 | SD15X21X3 | 0,5 | 15 | 21 | 3 |
| G15X23X3 | 1,3 | SD15X23X3 | 0,7 | 15 | 23 | 3 |
| G16X22X3 | 1,3 | SD16X22X3 | 0,6 | 16 | 22 | 3 |
| G16X24X3 | 1,3 | SD16X24X3 | 0,7 | 16 | 24 | 3 |
| G16X25X3 | 1,6 | — | — | 16 | 25 | 3 |
| G17X23X3 | 1,3 | SD17X23X3 | 0,6 | 17 | 23 | 3 |
| G17X25X3 | 1,5 | SD17X25X3 | 0,8 | 17 | 25 | 3 |
| G18X24X3 | 1,2 | SD18X24X3 | 0,6 | 18 | 24 | 3 |
| G18X26X4 | 1,8 | SD18X26X4 | 1,1 | 18 | 26 | 4 |
| G19X27X4 | 2 | SD19X27X4 | 1,1 | 19 | 27 | 4 |
| G20X26X4 | 1,8 | SD20X26X4 | 0,8 | 20 | 26 | 4 |
| G20X28X4 | 2,1 | SD20X28X4 | 1,1 | 20 | 28 | 4 |
| G21X29X4 | 2,2 | — | — | 21 | 29 | 4 |

| Dimension table (continued) · Dimensions in mm | | | | | | |
|--|-------------|-----------------------|------------|--------------|--------------|--------------|
| Single lip NBR elastomer | | Double lip Plastic | | Dimensions | | |
| Designation | Mass m | Designation | Mass m | d | D | b |
| ≈g | ≈g | ≈g | ≈g | +0,4 -0,2 | +0,4 -0,2 | +0,4 -0,2 |
| G22X28X4 | 1,8 | SD22X28X4 | 0,9 | 22 | 28 | 4 |
| G22X30X4 | 2,2 | SD22X30X4 | 1,3 | 22 | 30 | 4 |
| G24X32X4 | 2,5 | — | — | 24 | 32 | 4 |
| G25X32X4 | 2,3 | SD25X32X4 | 1,3 | 25 | 32 | 4 |
| G25X33X4 | 2,5 | SD25X33X4 | 1,3 | 25 | 33 | 4 |
| G25X35X4 | 2,6 | SD25X35X4 | 1,9 | 25 | 35 | 4 |
| G26X34X4 | 2,6 | SD26X34X4 | 1,4 | 26 | 34 | 4 |
| G28X35X4 | 2,4 | SD28X35X4 | 1,3 | 28 | 35 | 4 |
| G28X37X4 | 3,1 | — | — | 28 | 37 | 4 |
| G29X38X4 | 3,2 | — | — | 29 | 38 | 4 |
| G30X37X4 | 2,7 | SD30X37X4 | 1,3 | 30 | 37 | 4 |
| G30X40X4 | 3,6 | SD30X40X4 | 2,1 | 30 | 40 | 4 |
| G32X42X4 | 3,7 | SD32X42X4 | 2,4 | 32 | 42 | 4 |
| G32X45X4 | 5,1 | — | — | 32 | 45 | 4 |
| G35X42X4 | 3 | SD35X42X4 | 1,5 | 35 | 42 | 4 |
| G35X45X4 | 4,1 | SD35X45X4 | 2,5 | 35 | 45 | 4 |
| G37X47X4 | 4 | SD37X47X4 | 2,7 | 37 | 47 | 4 |
| G38X48X4 | 4,4 | SD38X48X4 | 2,8 | 38 | 48 | 4 |
| G40X47X4 | 3,3 | SD40X47X4 | 1,7 | 40 | 47 | 4 |
| G40X50X4 | 4,6 | SD40X50X4 | 2,9 | 40 | 50 | 4 |
| G40X52X5 | 4,8 | SD40X52X5 | 4,5 | 40 | 52 | 5 |
| G42X52X4 | 4,7 | SD42X52X4 | 3 | 42 | 52 | 4 |
| G43X53X4 | 4,8 | — | — | 43 | 53 | 4 |
| G45X52X4 | 3,8 | SD45X52X4 | 1,9 | 45 | 52 | 4 |
| G45X55X4 | 5,2 | SD45X55X4 | 3,2 | 45 | 55 | 4 |
| G50X58X4 | 4,5 | SD50X58X4 | 2,4 | 50 | 58 | 4 |
| G50X62X5 | 10,4 | SD50X62X5 | 5,5 | 50 | 62 | 5 |
| G55X63X5 | 7,1 | — | — | 55 | 63 | 5 |
| G70X78X5 | 9 | — | — | 70 | 78 | 5 |

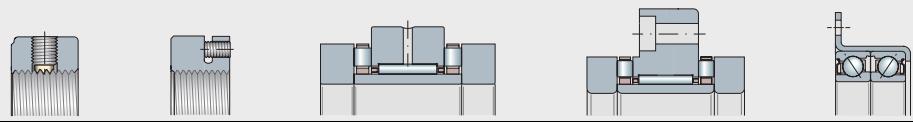




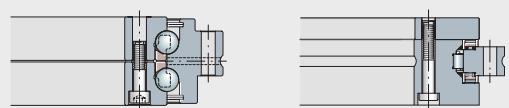
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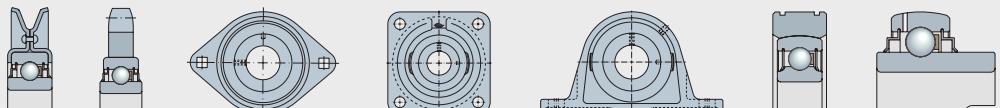
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191563



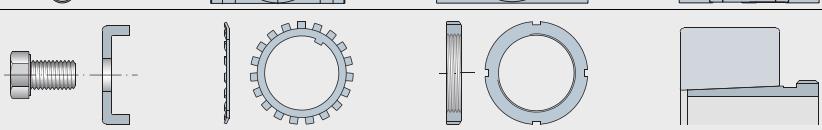
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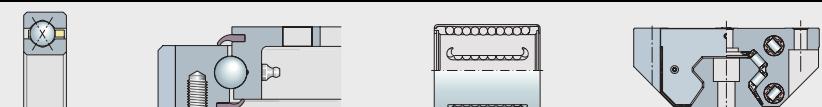
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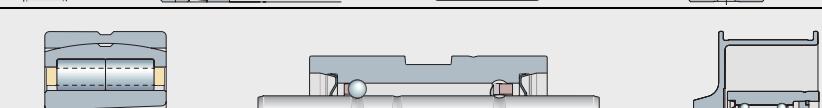
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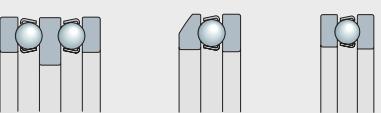
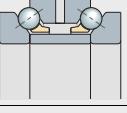
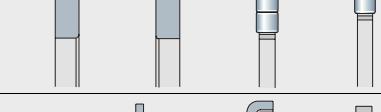
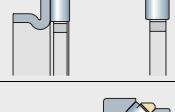
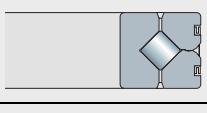
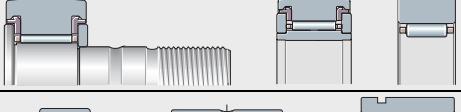
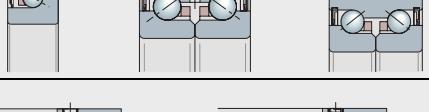
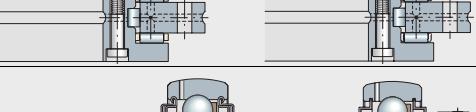
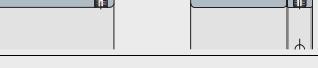
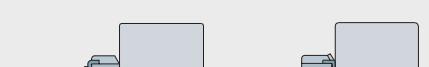
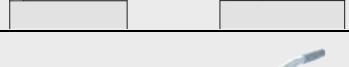
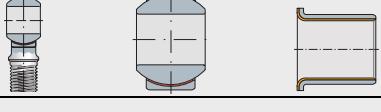
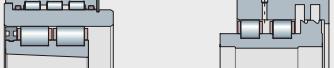
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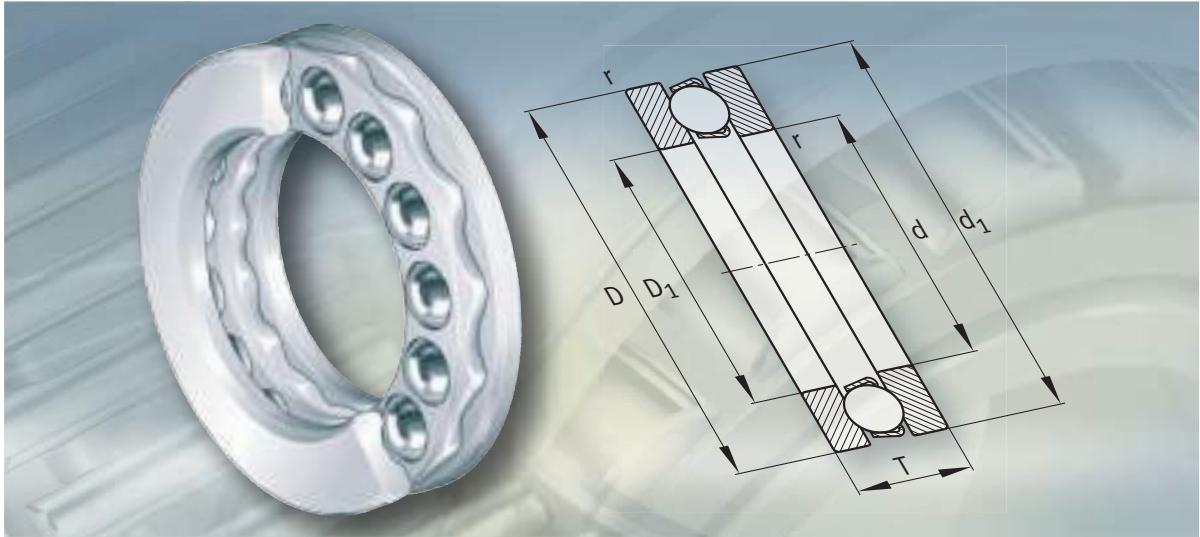
191583



191585

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|  | Axial needle roller and cage assemblies 191 579 |
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FAG



Axial deep groove ball bearings



Axial deep groove ball bearings

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| Equivalent dynamic bearing load..... | 724 |
| Equivalent static bearing load | 724 |
| Minimum axial load..... | 724 |
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Product overview Axial deep groove ball bearings

Single direction

With flat housing locating washer

511, 512
513, 514



190 271b

With spherical housing locating washer

Without and with seating washer

532
533



108 245a

532 + U2
533 + U3



108 246a

Double direction

With flat housing locating washers

522
523



108 243a

With spherical housing locating washers

Without and with seating washers

542
543



108 247a

542 + U2
543 + U3



108 246a



Axial deep groove ball bearings

| Features | Axial deep groove ball bearings comprise shaft locating washers, housing locating washers and ball and cage assemblies. The bearings are not self-retaining; the ball and cage assembly and bearing washers can therefore be fitted separately. In addition to the series with flat washers, series are also available with spherical housing locating washers for the compensation of static angular misalignment. These designs are normally used in conjunction with seating washers. Axial deep groove ball bearings are available in single and double direction designs. Both designs can support high axial forces but cannot be subjected to radial loads. |
|-----------------------------|--|
| Single direction bearings | Single direction axial deep groove ball bearings can support axial forces in one direction. Bearings of series 511, 512, 513 and 514 have a flat housing locating washer. They do not permit angular misalignment or skewing between the shaft and housing. |
| Angular adjustment facility | Bearings of series 532 and 533 have a spherical housing locating washer. With an appropriate housing design and in conjunction with seating washers U2 and U3, they allow angular adjustment and can therefore compensate static misalignments between the shaft and housing. |
| Double direction bearings | Double direction axial deep groove ball bearings can support axial forces in both directions. Bearings of series 522 and 523 have two flat housing locating washers and do not allow angular adjustment. |
| Angular adjustment facility | Bearings of series 542 and 543 have spherical housing locating washers. With an appropriate housing design and in conjunction with seating washers U2 and U3, they allow angular adjustment and can therefore compensate static misalignments between the shaft and housing. |
| Operating temperature | Axial deep groove ball bearings can be used at operating temperatures from -30°C to $+150^{\circ}\text{C}$, restricted by the lubricant. |
| Cages | Bearings with sheet steel cages do not have a cage suffix. Solid brass window cages are indicated by the suffix MP, see table Suffixes, page 724. The cage design as a function of the bore code is shown in the table Cage/bore code. |

| Cage/bore code | Series | Sheet steel cage | Solid brass cage |
|----------------|-----------|------------------|------------------|
| | Bore code | | |
| 511 | up to 28 | from 30 | |
| 512 | up to 28 | from 30 | |
| 513 | up to 20 | from 22 | |
| 514 | up to 11 | from 12 | |
| 522 | up to 28 | from 30 | |
| 523 | up to 20 | from 22 | |
| 532 | up to 28 | from 30 | |
| 533 | up to 20 | from 22 | |
| 542 | all | — | |
| 543 | up to 20 | 22 | |

Axial deep groove ball bearings

Suffixes Suffixes for available designs: see table.

Available designs

| Suffix | Description | Design |
|--------|---------------------------------------|------------------------------|
| MP | Solid brass window cage, ball-guided | Standard |
| P5 | Higher accuracy to tolerance class P5 | Special design ¹⁾ |
| P6 | Higher accuracy to tolerance class P6 | Special design ¹⁾ |

¹⁾ Available by agreement.

Design and safety guidelines
Equivalent dynamic bearing load Axial deep groove ball bearings can support axial forces only.
The following applies:

$$P = F_a$$

P N
Equivalent dynamic bearing load
F_a N
Axial dynamic bearing load.

Equivalent static bearing load Axial deep groove ball bearings can support axial forces only.
The following applies:

$$P_0 = F_{0a}$$

P₀ N
Equivalent static bearing load
F_{0a} N
Axial static bearing load.

Minimum axial load At higher speeds, detrimental sliding movements can occur between the rolling elements and the raceways due to centrifugal forces and gyroscopic moments. In order to avoid this, the bearings must be subjected to a minimum load F_{a min}. This can be achieved by means of preloading – for example using springs.

The minimum load factor A is given in the dimension tables.
For n_{max}, the maximum operating speed must be used.

$$F_{a\min} = A \cdot \left(\frac{n_{\max}}{1000} \right)^2$$

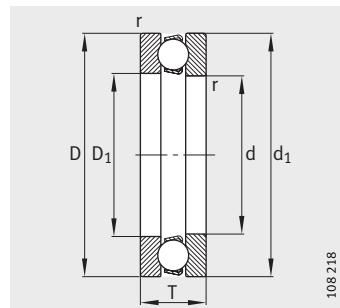
F_{a min} N
Minimum axial load
A –
Minimum load factor according to dimension tables
n_{max} min⁻¹
Maximum operating speed.



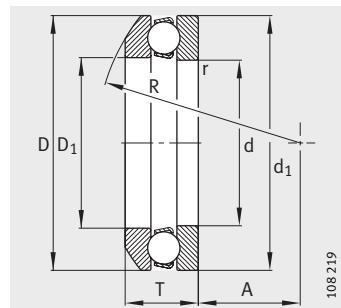
| | |
|---------------------------------|---|
| Speeds | ISO 15 312 does not give thermal reference speeds for these bearings. |
| Caution! | The dimension tables only state limiting speeds n_G . These values are for oil lubrication and must not be exceeded. |
| Design of adjacent parts | <p>The shoulders on the adjacent construction (shaft/housing) must be sufficiently high that the shaft and housing locating washers are supported over at least half their height.</p> <p>The abutting shoulders should be rigid, flat and perpendicular to the axis of rotation.</p> <p>The maximum values for the radii r_a and the diameters of the abutment surfaces d_a, D_a are indicated in the dimension tables.</p> |
| Locating bore tolerance | The tolerance of the locating bore is dependent on the running accuracy to be achieved. For normal running accuracy, the tolerance should be in the tolerance zone E8, for high running accuracy it should be in the tolerance zone H6. |
| Shaft tolerances | For single direction bearings, the shaft tolerance should be j6, for double direction bearings the shaft tolerance should be k6. |
| Accuracy | <p>The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620-3.</p> <p>The main dimensions for single direction bearings and seating washers conform to ISO 104/DIN 711, for double direction bearings they conform to DIN 715.</p> |

Axial deep groove ball bearings

Single direction



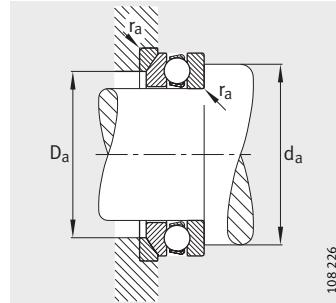
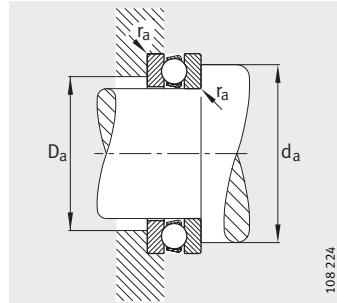
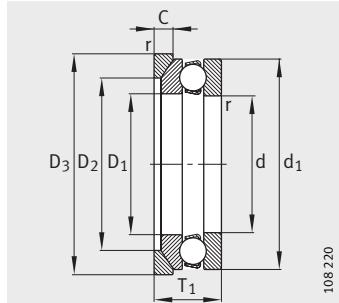
511, 512, 513, 514



532, 533
Spherical housing locating
washer

Dimension table · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|----|------|----------------|----------------|--------|----|------|----------------|--|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r min. | R | A | D ₂ | |
| 51100 | - | 0,018 | - | 10 | 24 | 9 | 11 | 24 | 0,3 | - | - | - | |
| 51200 | - | 0,029 | - | 10 | 26 | 11 | 12 | 26 | 0,6 | - | - | - | |
| 53200 | - | 0,028 | - | 10 | 26 | 11,6 | 12 | 26 | 0,6 | 22 | 8,5 | - | |
| 53200 | U200 | 0,028 | 0,01 | 10 | 26 | 11,6 | 12 | 26 | 0,6 | 22 | 8,5 | 18 | |
| 51101 | - | 0,021 | - | 12 | 26 | 9 | 13 | 26 | 0,3 | - | - | - | |
| 51201 | - | 0,032 | - | 12 | 28 | 11 | 14 | 28 | 0,6 | - | - | - | |
| 53201 | - | 0,03 | - | 12 | 28 | 11,4 | 14 | 28 | 0,6 | 25 | 11,5 | - | |
| 53201 | U201 | 0,03 | 0,012 | 12 | 28 | 11,4 | 14 | 28 | 0,6 | 25 | 11,5 | 20 | |
| 51102 | - | 0,024 | - | 15 | 28 | 9 | 16 | 28 | 0,3 | - | - | - | |
| 51202 | - | 0,043 | - | 15 | 32 | 12 | 17 | 32 | 0,6 | - | - | - | |
| 53202 | - | 0,046 | - | 15 | 32 | 13,3 | 17 | 32 | 0,6 | 28 | 12 | - | |
| 53202 | U202 | 0,046 | 0,014 | 15 | 32 | 13,3 | 17 | 32 | 0,6 | 28 | 12 | 24 | |
| 51103 | - | 0,024 | - | 17 | 30 | 9 | 18 | 30 | 0,3 | - | - | - | |
| 51203 | - | 0,05 | - | 17 | 35 | 12 | 19 | 35 | 0,6 | - | - | - | |
| 53203 | - | 0,052 | - | 17 | 35 | 13,2 | 19 | 35 | 0,6 | 32 | 16 | - | |
| 53203 | U203 | 0,052 | 0,015 | 17 | 35 | 13,2 | 19 | 35 | 0,6 | 32 | 16 | 26 | |
| 51104 | - | 0,037 | - | 20 | 35 | 10 | 21 | 35 | 0,3 | - | - | - | |
| 51204 | - | 0,082 | - | 20 | 40 | 14 | 22 | 40 | 0,6 | - | - | - | |
| 53204 | - | 0,081 | - | 20 | 40 | 14,7 | 22 | 40 | 0,6 | 36 | 18 | - | |
| 53204 | U204 | 0,081 | 0,021 | 20 | 40 | 14,7 | 22 | 40 | 0,6 | 36 | 18 | 30 | |
| 51105 | - | 0,055 | - | 25 | 42 | 11 | 26 | 42 | 0,6 | - | - | - | |
| 51205 | - | 0,114 | - | 25 | 47 | 15 | 27 | 47 | 0,6 | - | - | - | |
| 53205 | - | 0,121 | - | 25 | 47 | 16,7 | 27 | 47 | 0,6 | 40 | 19 | - | |
| 53205 | U205 | 0,121 | 0,032 | 25 | 47 | 16,7 | 27 | 47 | 0,6 | 40 | 19 | 36 | |
| 51305 | - | 0,154 | - | 25 | 52 | 18 | 27 | 52 | 1 | - | - | - | |
| 53305 | - | 0,203 | - | 25 | 52 | 19,8 | 27 | 52 | 1 | 45 | 21 | - | |
| 53305 | U305 | 0,203 | 0,044 | 25 | 52 | 19,8 | 27 | 52 | 1 | 45 | 21 | 38 | |
| 51405 | - | 0,295 | - | 25 | 60 | 24 | 27 | 60 | 1 | - | - | - | |



532, 533
Spherical housing locating
washer, seating washer U2, U3

Mounting dimensions

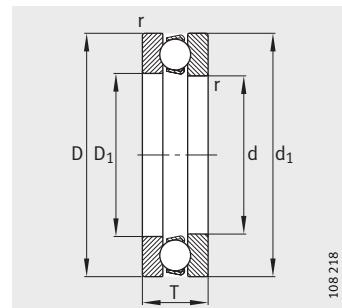
Mounting dimensions

108 220 108 224 108 226

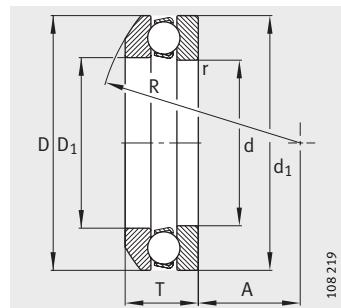
| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|-----|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| - | - | - | 18 | 16 | 0,3 | 10 000 | 14 000 | 620 | 0,001 | 13 000 |
| - | - | - | 20 | 16 | 0,6 | 12 700 | 17 000 | 760 | 0,002 | 11 000 |
| - | - | - | 20 | 18 | 0,6 | 12 700 | 17 000 | 760 | 0,002 | 11 000 |
| 28 | 3,5 | 13 | 20 | 18 | 0,6 | 12 700 | 17 000 | 760 | 0,002 | 11 000 |
| - | - | - | 20 | 18 | 0,3 | 10 400 | 15 300 | 690 | 0,001 | 13 000 |
| - | - | - | 22 | 18 | 0,6 | 13 200 | 19 000 | 840 | 0,002 | 10 000 |
| - | - | - | 22 | 20 | 0,6 | 13 200 | 19 000 | 840 | 0,002 | 10 000 |
| 30 | 3,5 | 13 | 22 | 20 | 0,6 | 13 200 | 19 000 | 840 | 0,002 | 10 000 |
| - | - | - | 23 | 20 | 0,3 | 10 600 | 16 600 | 750 | 0,002 | 12 000 |
| - | - | - | 25 | 22 | 0,6 | 16 600 | 25 000 | 1 100 | 0,004 | 9 000 |
| - | - | - | 25 | 24 | 0,6 | 16 600 | 25 000 | 1 100 | 0,004 | 9 000 |
| 35 | 4 | 15 | 25 | 24 | 0,6 | 16 600 | 25 000 | 1 100 | 0,004 | 9 000 |
| - | - | - | 25 | 22 | 0,3 | 11 400 | 19 600 | 870 | 0,002 | 11 000 |
| - | - | - | 28 | 24 | 0,6 | 17 300 | 27 500 | 1 210 | 0,004 | 8 500 |
| - | - | - | 28 | 26 | 0,6 | 17 300 | 27 500 | 1 210 | 0,004 | 8 500 |
| 38 | 4 | 15 | 28 | 26 | 0,6 | 17 300 | 27 500 | 1 210 | 0,004 | 8 500 |
| - | - | - | 29 | 26 | 0,3 | 15 000 | 26 500 | 1 180 | 0,004 | 9 500 |
| - | - | - | 32 | 28 | 0,6 | 22 400 | 37 500 | 1 660 | 0,01 | 7 500 |
| - | - | - | 32 | 30 | 0,6 | 22 400 | 37 500 | 1 660 | 0,01 | 7 500 |
| 42 | 5 | 17 | 32 | 30 | 0,6 | 22 400 | 37 500 | 1 660 | 0,01 | 7 500 |
| - | - | - | 35 | 32 | 0,6 | 18 000 | 35 500 | 1 570 | 0,006 | 9 000 |
| - | - | - | 38 | 34 | 0,6 | 28 000 | 50 000 | 2 220 | 0,01 | 6 700 |
| - | - | - | 38 | 36 | 0,6 | 28 000 | 50 000 | 2 220 | 0,013 | 6 700 |
| 50 | 5,5 | 19 | 38 | 36 | 0,6 | 28 000 | 50 000 | 2 220 | 0,013 | 6 700 |
| - | - | - | 41 | 36 | 1 | 34 500 | 55 000 | 2 450 | 0,019 | 5 300 |
| - | - | - | 41 | 38 | 1 | 34 500 | 55 000 | 2 450 | 0,019 | 5 300 |
| 55 | 6 | 22 | 41 | 38 | 1 | 34 500 | 55 000 | 2 450 | 0,019 | 5 300 |
| - | - | - | 46 | 39 | 1 | 45 500 | 67 000 | 2 950 | 0,032 | 4 500 |

Axial deep groove ball bearings

Single direction



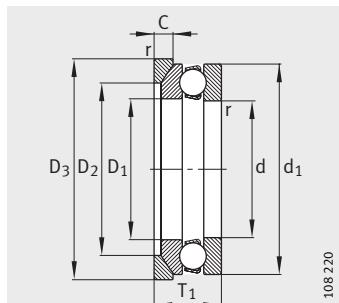
511, 512, 513, 514



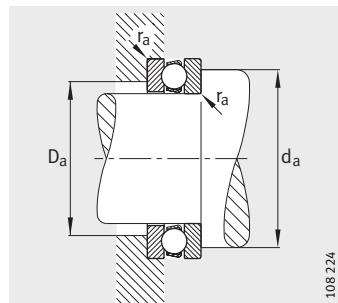
532, 533
Spherical housing locating
washer

Dimension table (continued) · Dimensions in mm

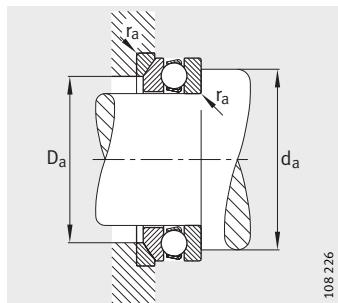
| Designation | | Mass m | | Dimensions | | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|-----|------|----------------|----------------|-----|----|------|----------------|--|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r | R | A | D ₂ | |
| 51106 | - | 0,063 | - | 30 | 47 | 11 | 32 | 47 | 0,6 | - | - | - | |
| 51206 | - | 0,136 | - | 30 | 52 | 16 | 32 | 52 | 0,6 | - | - | - | |
| 53206 | - | 0,147 | - | 30 | 52 | 17,8 | 32 | 52 | 0,6 | 45 | 22 | - | |
| 53206 | U206 | 0,147 | 0,038 | 30 | 52 | 17,8 | 32 | 52 | 0,6 | 45 | 22 | 42 | |
| 51306 | - | 0,244 | - | 30 | 60 | 21 | 32 | 60 | 1 | - | - | - | |
| 53306 | - | 0,303 | - | 30 | 60 | 22,6 | 32 | 60 | 1 | 50 | 22 | - | |
| 53306 | U306 | 0,303 | 0,056 | 30 | 60 | 22,6 | 32 | 60 | 1 | 50 | 22 | 45 | |
| 51406 | - | 0,49 | - | 30 | 70 | 28 | 32 | 70 | 1 | - | - | - | |
| 51107 | - | 0,08 | - | 35 | 52 | 12 | 37 | 52 | 0,6 | - | - | - | |
| 51207 | - | 0,198 | - | 35 | 62 | 18 | 37 | 62 | 1 | - | - | - | |
| 53207 | - | 0,265 | - | 35 | 62 | 19,9 | 37 | 62 | 1 | 50 | 24 | - | |
| 53207 | U207 | 0,265 | 0,057 | 35 | 62 | 19,9 | 37 | 62 | 1 | 50 | 24 | 48 | |
| 51307 | - | 0,351 | - | 35 | 68 | 24 | 37 | 68 | 1 | - | - | - | |
| 53307 | - | 0,437 | - | 35 | 68 | 25,6 | 37 | 68 | 1 | 56 | 24 | - | |
| 53307 | U307 | 0,437 | 0,083 | 35 | 68 | 25,6 | 37 | 68 | 1 | 56 | 24 | 52 | |
| 51407 | - | 0,709 | - | 35 | 80 | 32 | 37 | 80 | 1,1 | - | - | - | |
| 51108 | - | 0,114 | - | 40 | 60 | 13 | 42 | 60 | 0,6 | - | - | - | |
| 51208 | - | 0,257 | - | 40 | 68 | 19 | 42 | 68 | 1 | - | - | - | |
| 53208 | - | 0,259 | - | 40 | 68 | 20,3 | 42 | 68 | 1 | 56 | 28,5 | - | |
| 53208 | U208 | 0,259 | 0,071 | 40 | 68 | 20,3 | 42 | 68 | 1 | 56 | 28,5 | 55 | |
| 51308 | - | 0,536 | - | 40 | 78 | 26 | 42 | 78 | 1 | - | - | - | |
| 53308 | - | 0,561 | - | 40 | 78 | 28,5 | 42 | 78 | 1 | 64 | 28 | - | |
| 53308 | U308 | 0,561 | 0,12 | 40 | 78 | 28,5 | 42 | 78 | 1 | 64 | 28 | 60 | |
| 51408 | - | 1,03 | - | 40 | 90 | 36 | 42 | 90 | 1,1 | - | - | - | |
| 51109 | - | 0,087 | - | 45 | 65 | 14 | 47 | 65 | 0,6 | - | - | - | |
| 51209 | - | 0,279 | - | 45 | 73 | 20 | 47 | 73 | 1 | - | - | - | |
| 53209 | - | 0,278 | - | 45 | 73 | 21,3 | 47 | 73 | 1 | 56 | 26 | - | |
| 53209 | U209 | 0,278 | 0,088 | 45 | 73 | 21,3 | 47 | 73 | 1 | 56 | 26 | 60 | |
| 51309 | - | 0,612 | - | 45 | 85 | 28 | 47 | 85 | 1 | - | - | - | |
| 53309 | - | 0,783 | - | 45 | 85 | 30,1 | 47 | 85 | 1 | 64 | 25 | - | |
| 53309 | U309 | 0,783 | 0,173 | 45 | 85 | 30,1 | 47 | 85 | 1 | 64 | 25 | 65 | |
| 51409 | - | 1,36 | - | 45 | 100 | 39 | 47 | 100 | 1,1 | - | - | - | |



532, 533
Spherical housing locating
washer, seating washer U2, U3



Mounting dimensions

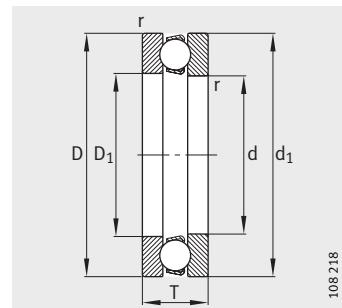


Mounting dimensions

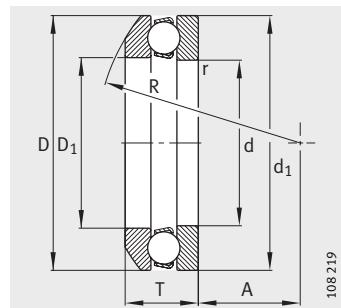
| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|-----|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| — | — | — | 40 | 37 | 0,6 | 19 000 | 40 000 | 1 770 | 0,009 | 8 000 |
| — | — | — | 43 | 39 | 0,6 | 25 000 | 46 500 | 2 040 | 0,01 | 6 300 |
| — | — | — | 43 | 42 | 0,6 | 25 000 | 46 500 | 2 040 | 0,01 | 6 300 |
| 55 | 5,5 | 20 | 43 | 42 | 0,6 | 25 000 | 46 500 | 2 040 | 0,01 | 6 300 |
| — | — | — | 48 | 42 | 1 | 38 000 | 65 500 | 2 850 | 0,028 | 5 000 |
| — | — | — | 48 | 45 | 1 | 38 000 | 65 500 | 2 850 | 0,028 | 5 000 |
| 62 | 7 | 25 | 48 | 45 | 1 | 38 000 | 65 500 | 2 850 | 0,028 | 5 000 |
| — | — | — | 54 | 46 | 1 | 69 500 | 112 000 | 5 000 | 0,075 | 3 800 |
| — | — | — | 45 | 42 | 0,6 | 20 000 | 46 500 | 2 060 | 0,011 | 7 500 |
| — | — | — | 51 | 46 | 1 | 35 500 | 67 000 | 3 000 | 0,028 | 5 300 |
| — | — | — | 51 | 48 | 1 | 35 500 | 67 000 | 3 000 | 0,028 | 5 300 |
| 65 | 7 | 22 | 51 | 48 | 1 | 35 500 | 67 000 | 3 000 | 0,028 | 5 300 |
| — | — | — | 55 | 48 | 1 | 50 000 | 88 000 | 3 900 | 0,05 | 4 500 |
| — | — | — | 55 | 52 | 1 | 50 000 | 88 000 | 3 900 | 0,05 | 4 500 |
| 72 | 7,5 | 28 | 55 | 52 | 1 | 50 000 | 88 000 | 3 900 | 0,05 | 4 500 |
| — | — | — | 62 | 53 | 1 | 76 500 | 127 000 | 5 600 | 0,11 | 3 600 |
| — | — | — | 52 | 48 | 0,6 | 27 000 | 63 000 | 2 750 | 0,02 | 6 300 |
| — | — | — | 57 | 51 | 1 | 46 500 | 98 000 | 4 300 | 0,05 | 4 800 |
| — | — | — | 57 | 55 | 1 | 46 500 | 98 000 | 4 300 | 0,05 | 4 800 |
| 72 | 7 | 23 | 57 | 55 | 1 | 46 500 | 98 000 | 4 300 | 0,05 | 4 800 |
| — | — | — | 63 | 55 | 1 | 61 000 | 112 000 | 5 000 | 0,08 | 4 000 |
| — | — | — | 63 | 60 | 1 | 61 000 | 112 000 | 5 000 | 0,08 | 4 000 |
| 82 | 8,5 | 31 | 63 | 60 | 1 | 61 000 | 112 000 | 5 000 | 0,08 | 4 000 |
| — | — | — | 70 | 60 | 1 | 96 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | 57 | 53 | 0,6 | 28 000 | 69 500 | 3 050 | 0,024 | 6 000 |
| — | — | — | 62 | 56 | 1 | 39 000 | 80 000 | 3 550 | 0,043 | 4 800 |
| — | — | — | 62 | 60 | 1 | 39 000 | 80 000 | 3 550 | 0,043 | 4 800 |
| 78 | 7,5 | 24 | 62 | 60 | 1 | 39 000 | 80 000 | 3 550 | 0,043 | 4 800 |
| — | — | — | 69 | 61 | 1 | 75 000 | 140 000 | 6 300 | 0,12 | 3 600 |
| — | — | — | 69 | 65 | 1 | 75 000 | 140 000 | 6 300 | 0,12 | 3 600 |
| 90 | 10 | 33 | 69 | 65 | 1 | 75 000 | 140 000 | 6 300 | 0,12 | 3 600 |
| — | — | — | 78 | 67 | 1 | 122 000 | 220 000 | 9 800 | 0,3 | 3 000 |

Axial deep groove ball bearings

Single direction



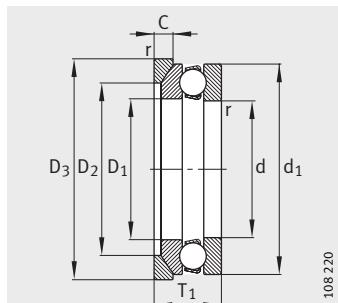
511, 512, 513, 514



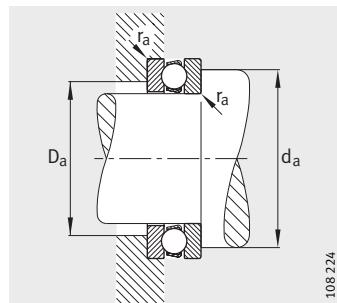
532, 533
Spherical housing locating
washer

Dimension table (continued) · Dimensions in mm

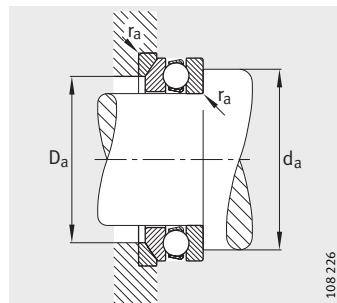
| Designation | | Mass m | | Dimensions | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|-----|------|----------------|----------------|-----|----|------|----------------|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r | R | A | D ₂ |
| 51110 | - | 0,151 | - | 50 | 70 | 14 | 52 | 70 | 0,6 | - | - | - |
| 51210 | - | 0,346 | - | 50 | 78 | 22 | 52 | 78 | 1 | - | - | - |
| 53210 | - | 0,341 | - | 50 | 78 | 23,5 | 52 | 78 | 1 | 64 | 32,5 | - |
| 53210 | U210 | 0,341 | 0,098 | 50 | 78 | 23,5 | 52 | 78 | 1 | 64 | 32,5 | 62 |
| 51310 | - | 0,932 | - | 50 | 95 | 31 | 52 | 95 | 1,1 | - | - | - |
| 53310 | - | 0,97 | - | 50 | 95 | 34,3 | 52 | 95 | 1,1 | 72 | 28 | - |
| 53310 | U310 | 0,97 | 0,225 | 50 | 95 | 34,3 | 52 | 95 | 1,1 | 72 | 28 | 72 |
| 51410 | - | 1,81 | - | 50 | 110 | 43 | 52 | 110 | 1,5 | - | - | - |
| 51111 | - | 0,208 | - | 55 | 78 | 16 | 57 | 78 | 0,6 | - | - | - |
| 51211 | - | 0,382 | - | 55 | 90 | 25 | 57 | 90 | 1 | - | - | - |
| 53211 | - | 0,609 | - | 55 | 90 | 27,3 | 57 | 90 | 1 | 72 | 35 | - |
| 53211 | U211 | 0,609 | 0,152 | 55 | 90 | 27,3 | 57 | 90 | 1 | 72 | 35 | 72 |
| 51311 | - | 1,3 | - | 55 | 105 | 35 | 57 | 105 | 1,1 | - | - | - |
| 53311 | - | 1,38 | - | 55 | 105 | 39,3 | 57 | 105 | 1,1 | 80 | 30 | - |
| 53311 | U311 | 1,38 | 0,277 | 55 | 105 | 39,3 | 57 | 105 | 1,1 | 80 | 30 | 80 |
| 51411 | - | 2,83 | - | 55 | 120 | 48 | 57 | 120 | 1,5 | - | - | - |
| 51112 | - | 0,278 | - | 60 | 85 | 17 | 62 | 85 | 1 | - | - | - |
| 51212 | - | 0,649 | - | 60 | 95 | 26 | 62 | 95 | 1 | - | - | - |
| 53212 | - | 0,655 | - | 60 | 95 | 28 | 62 | 95 | 1 | 72 | 32,5 | - |
| 53212 | U212 | 0,655 | 0,165 | 60 | 95 | 28 | 62 | 95 | 1 | 72 | 32,5 | 78 |
| 51312 | - | 1,36 | - | 60 | 110 | 35 | 62 | 110 | 1,1 | - | - | - |
| 53312 | - | 1,41 | - | 60 | 110 | 38,3 | 62 | 110 | 1,1 | 90 | 41 | - |
| 53312 | U312 | 1,41 | 0,31 | 60 | 110 | 38,3 | 62 | 110 | 1,1 | 90 | 41 | 85 |
| 51412-MP | - | 3,51 | - | 60 | 130 | 51 | 62 | 130 | 1,5 | - | - | - |
| 51113 | - | 0,3 | - | 65 | 90 | 18 | 67 | 90 | 1 | - | - | - |
| 51213 | - | 0,684 | - | 65 | 100 | 27 | 67 | 100 | 1 | - | - | - |
| 53213 | - | 0,855 | - | 65 | 100 | 28,7 | 67 | 100 | 1 | 80 | 40 | - |
| 53213 | U213 | 0,855 | 0,184 | 65 | 100 | 28,7 | 67 | 100 | 1 | 80 | 40 | 82 |
| 51313 | - | 1,39 | - | 65 | 115 | 36 | 67 | 115 | 1,1 | - | - | - |
| 53313 | - | 1,78 | - | 65 | 115 | 39,4 | 67 | 115 | 1,1 | 90 | 38,5 | - |
| 53313 | U313 | 1,78 | 0,338 | 65 | 115 | 39,4 | 67 | 115 | 1,1 | 90 | 38,5 | 90 |
| 51413-MP | - | 4,47 | - | 65 | 140 | 56 | 68 | 140 | 2 | - | - | - |



532, 533
Spherical housing locating
washer, seating washer U2, U3



Mounting dimensions

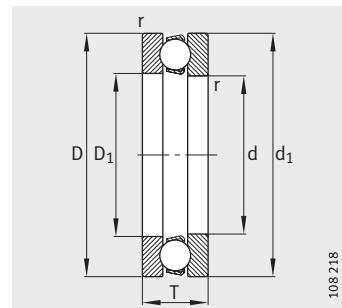


Mounting dimensions

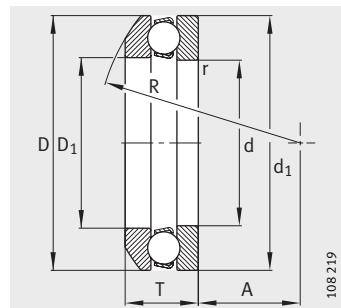
| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|------|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| — | — | — | 62 | 58 | 0,6 | 29 000 | 75 000 | 3 300 | 0,03 | 5 600 |
| — | — | — | 67 | 61 | 1 | 50 000 | 106 000 | 4 700 | 0,07 | 4 300 |
| — | — | — | 67 | 62 | 1 | 50 000 | 106 000 | 4 700 | 0,07 | 4 300 |
| 82 | 7,5 | 26 | 67 | 62 | 1 | 50 000 | 106 000 | 4 700 | 0,07 | 4 300 |
| — | — | — | 77 | 68 | 1 | 86 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | 77 | 72 | 1 | 86 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| 100 | 11 | 37 | 77 | 72 | 1 | 86 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | 86 | 74 | 1,5 | 137 000 | 255 000 | 11 400 | 0,4 | 2 800 |
| — | — | — | 69 | 64 | 0,6 | 30 500 | 75 000 | 3 300 | 0,036 | 5 300 |
| — | — | — | 76 | 69 | 1 | 61 000 | 134 000 | 6 100 | 0,11 | 3 800 |
| — | — | — | 76 | 72 | 1 | 61 000 | 134 000 | 6 100 | 0,11 | 3 800 |
| 95 | 9 | 30 | 76 | 72 | 1 | 61 000 | 134 000 | 6 100 | 0,11 | 3 800 |
| — | — | — | 85 | 75 | 1 | 102 000 | 208 000 | 9 000 | 0,26 | 3 200 |
| — | — | — | 85 | 80 | 1 | 102 000 | 208 000 | 9 000 | 0,26 | 3 200 |
| 110 | 11,5 | 42 | 85 | 80 | 1 | 102 000 | 208 000 | 9 000 | 0,26 | 3 200 |
| — | — | — | 94 | 81 | 1,5 | 180 000 | 360 000 | 19 000 | 0,67 | 2 600 |
| — | — | — | 75 | 70 | 1 | 41 500 | 112 000 | 5 000 | 0,063 | 4 800 |
| — | — | — | 81 | 74 | 1 | 62 000 | 140 000 | 6 200 | 0,12 | 3 800 |
| — | — | — | 81 | 78 | 1 | 62 000 | 140 000 | 6 200 | 0,12 | 3 800 |
| 100 | 9 | 31 | 81 | 78 | 1 | 62 000 | 140 000 | 6 200 | 0,12 | 3 800 |
| — | — | — | 90 | 80 | 1 | 100 000 | 208 000 | 9 000 | 0,28 | 3 200 |
| — | — | — | 90 | 85 | 1 | 100 000 | 208 000 | 9 000 | 0,28 | 3 200 |
| 115 | 11,5 | 42 | 90 | 85 | 1 | 100 000 | 208 000 | 9 000 | 0,28 | 3 200 |
| — | — | — | 102 | 88 | 1,5 | 200 000 | 400 000 | 21 300 | 1 | 2 200 |
| — | — | — | 80 | 75 | 1 | 38 000 | 100 000 | 4 400 | 0,063 | 4 500 |
| — | — | — | 86 | 79 | 1 | 64 000 | 150 000 | 6 600 | 0,14 | 3 600 |
| — | — | — | 86 | 82 | 1 | 64 000 | 150 000 | 6 600 | 0,14 | 3 600 |
| 105 | 9 | 32 | 86 | 82 | 1 | 64 000 | 150 000 | 6 600 | 0,14 | 3 600 |
| — | — | — | 95 | 85 | 1 | 106 000 | 220 000 | 9 700 | 0,32 | 3 000 |
| — | — | — | 95 | 90 | 1 | 106 000 | 220 000 | 9 700 | 0,32 | 3 000 |
| 120 | 12,5 | 43 | 95 | 90 | 1 | 106 000 | 220 000 | 9 700 | 0,32 | 3 000 |
| — | — | — | 110 | 95 | 2 | 216 000 | 450 000 | 23 500 | 1,1 | 2 000 |

Axial deep groove ball bearings

Single direction



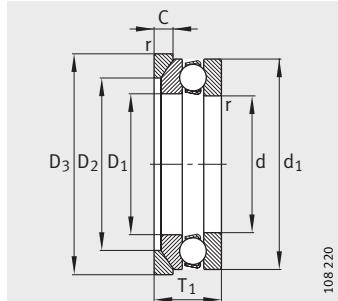
511, 512, 513, 514



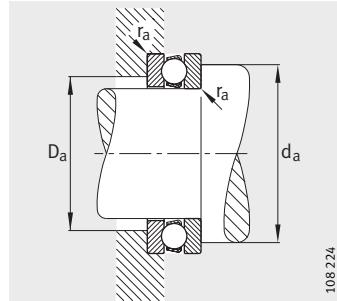
532, 533
Spherical housing locating washer

Dimension table (continued) · Dimensions in mm

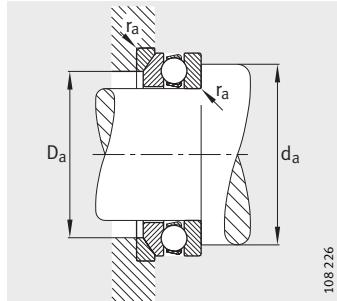
| Designation | | Mass m | | Dimensions | | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|-----|------|----------------|----------------|--------|-----|----|----------------|--|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r min. | R | A | D ₂ | |
| 51114 | - | 0,352 | - | 70 | 95 | 18 | 72 | 95 | 1 | - | - | - | |
| 51214 | - | 0,727 | - | 70 | 105 | 27 | 72 | 105 | 1 | - | - | - | |
| 53214 | - | 0,903 | - | 70 | 105 | 28,8 | 72 | 105 | 1 | 80 | 38 | - | |
| 53214 | U214 | 0,903 | 0,187 | 70 | 105 | 28,8 | 72 | 105 | 1 | 80 | 38 | 88 | |
| 51314 | - | 1,9 | - | 70 | 125 | 40 | 72 | 125 | 1,1 | - | - | - | |
| 53314 | - | 2,09 | - | 70 | 125 | 44,2 | 72 | 125 | 1,1 | 100 | 43 | - | |
| 53314 | U314 | 2,09 | 0,408 | 70 | 125 | 44,2 | 72 | 125 | 1,1 | 100 | 43 | 98 | |
| 51414-MP | - | 5,49 | - | 70 | 150 | 60 | 73 | 150 | 2 | - | - | - | |
| 51115 | - | 0,365 | - | 75 | 100 | 19 | 77 | 100 | 1 | - | - | - | |
| 51215 | - | 0,819 | - | 75 | 110 | 27 | 77 | 110 | 1 | - | - | - | |
| 53215 | - | 1,01 | - | 75 | 110 | 28,3 | 77 | 110 | 1 | 90 | 49 | - | |
| 53215 | U215 | 1,01 | 0,21 | 75 | 110 | 28,3 | 77 | 110 | 1 | 90 | 49 | 92 | |
| 51315 | - | 2,59 | - | 75 | 135 | 44 | 77 | 135 | 1,5 | - | - | - | |
| 53315 | - | 3,19 | - | 75 | 135 | 48,1 | 77 | 135 | 1,5 | 100 | 37 | - | |
| 53315 | U315 | 3,19 | 0,544 | 75 | 135 | 48,1 | 77 | 135 | 1,5 | 100 | 37 | 105 | |
| 51415-MP | - | 6,82 | - | 75 | 160 | 65 | 78 | 160 | 2 | - | - | - | |
| 51116 | - | 0,384 | - | 80 | 105 | 19 | 82 | 105 | 1 | - | - | - | |
| 51216 | - | 0,908 | - | 80 | 115 | 28 | 82 | 115 | 1 | - | - | - | |
| 53216 | - | 0,903 | - | 80 | 115 | 29,5 | 82 | 115 | 1 | 90 | 46 | - | |
| 53216 | U216 | 0,903 | 0,218 | 80 | 115 | 29,5 | 82 | 115 | 1 | 90 | 46 | 98 | |
| 51316 | - | 2,69 | - | 80 | 140 | 44 | 82 | 140 | 1,5 | - | - | - | |
| 53316 | - | 2,75 | - | 80 | 140 | 47,6 | 82 | 140 | 1,5 | 112 | 50 | - | |
| 53316 | U316 | 2,75 | 0,57 | 80 | 140 | 47,6 | 82 | 140 | 1,5 | 112 | 50 | 110 | |
| 51416-MP | - | 7,95 | - | 80 | 170 | 68 | 83 | 170 | 2,1 | - | - | - | |
| 51117 | - | 0,404 | - | 85 | 110 | 19 | 87 | 110 | 1 | - | - | - | |
| 51217 | - | 1,21 | - | 85 | 125 | 31 | 88 | 125 | 1 | - | - | - | |
| 53217 | - | 1,22 | - | 85 | 125 | 33,1 | 88 | 125 | 1 | 100 | 52 | - | |
| 53217 | U217 | 1,22 | 0,29 | 85 | 125 | 33,1 | 88 | 125 | 1 | 100 | 52 | 105 | |
| 51317 | - | 3,48 | - | 85 | 150 | 49 | 88 | 150 | 1,5 | - | - | - | |
| 53317 | - | 3,51 | - | 85 | 150 | 53,1 | 88 | 150 | 1,5 | 112 | 43 | - | |
| 53317 | U317 | 3,51 | 0,803 | 85 | 150 | 53,1 | 88 | 150 | 1,5 | 112 | 43 | 115 | |
| 51417-MP | - | 9,3 | - | 85 | 180 | 72 | 88 | 177 | 2,1 | - | - | - | |



532, 533
Spherical housing locating
washer, seating washer U2, U3



Mounting dimensions

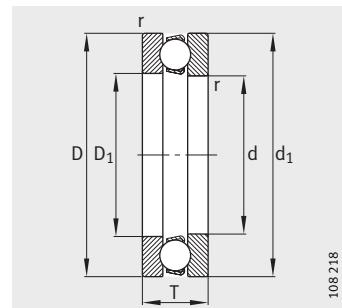


Mounting dimensions

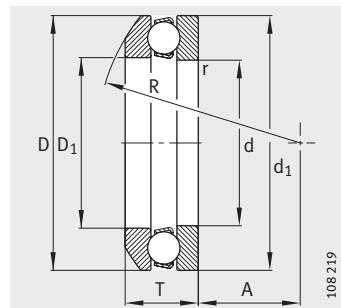
| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|------|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| — | — | — | 85 | 80 | 1 | 40 000 | 110 000 | 4 850 | 0,075 | 4 300 |
| — | — | — | 91 | 84 | 1 | 65 500 | 160 000 | 7 000 | 0,16 | 3 600 |
| — | — | — | 91 | 88 | 1 | 65 500 | 160 000 | 7 000 | 0,16 | 3 600 |
| 110 | 9 | 32 | 91 | 88 | 1 | 65 500 | 160 000 | 7 000 | 0,16 | 3 600 |
| — | — | — | 103 | 92 | 1 | 134 000 | 290 000 | 12 900 | 0,5 | 2 800 |
| — | — | — | 103 | 98 | 1 | 134 000 | 290 000 | 12 900 | 0,5 | 2 800 |
| 130 | 13 | 48 | 103 | 98 | 1 | 134 000 | 290 000 | 12 900 | 0,5 | 2 800 |
| — | — | — | 118 | 102 | 2 | 236 000 | 500 000 | 25 500 | 1,4 | 1 900 |
| — | — | — | 90 | 85 | 1 | 44 000 | 122 000 | 5 500 | 0,095 | 4 000 |
| — | — | — | 96 | 89 | 1 | 67 000 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | 96 | 92 | 1 | 67 000 | 170 000 | 7 500 | 0,18 | 3 400 |
| 115 | 9,5 | 32 | 96 | 92 | 1 | 67 000 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | 111 | 99 | 1,5 | 163 000 | 360 000 | 15 400 | 0,75 | 2 400 |
| — | — | — | 111 | 105 | 1,5 | 163 000 | 360 000 | 15 400 | 0,75 | 2 400 |
| 140 | 15 | 52 | 111 | 105 | 1,5 | 163 000 | 360 000 | 15 400 | 0,75 | 2 400 |
| — | — | — | 126 | 109 | 2 | 250 000 | 560 000 | 27 000 | 1,8 | 1 800 |
| — | — | — | 95 | 90 | 1 | 45 000 | 129 000 | 5 700 | 0,1 | 4 000 |
| — | — | — | 101 | 94 | 1 | 75 000 | 190 000 | 8 500 | 0,22 | 3 400 |
| — | — | — | 101 | 98 | 1 | 75 000 | 190 000 | 8 500 | 0,22 | 3 400 |
| 120 | 10 | 33 | 101 | 98 | 1 | 75 000 | 190 000 | 8 500 | 0,22 | 3 400 |
| — | — | — | 116 | 104 | 1,5 | 160 000 | 360 000 | 15 100 | 0,8 | 2 400 |
| — | — | — | 116 | 110 | 1,5 | 160 000 | 360 000 | 15 100 | 0,8 | 2 400 |
| 145 | 15 | 52 | 116 | 110 | 1,5 | 160 000 | 360 000 | 15 100 | 0,8 | 2 400 |
| — | — | — | 134 | 116 | 2,1 | 270 000 | 620 000 | 29 000 | 2,2 | 1 700 |
| — | — | — | 100 | 95 | 1 | 45 500 | 134 000 | 6 000 | 0,11 | 3 800 |
| — | — | — | 109 | 101 | 1 | 98 000 | 250 000 | 10 900 | 0,38 | 3 000 |
| — | — | — | 109 | 105 | 1 | 98 000 | 250 000 | 10 900 | 0,38 | 3 000 |
| 130 | 11 | 37 | 109 | 105 | 1 | 98 000 | 250 000 | 10 900 | 0,38 | 3 000 |
| — | — | — | 124 | 111 | 1,5 | 186 000 | 415 000 | 16 700 | 1,1 | 2 200 |
| — | — | — | 124 | 115 | 1,5 | 186 000 | 415 000 | 16 700 | 1,1 | 2 200 |
| 155 | 17,5 | 58 | 124 | 115 | 1,5 | 186 000 | 415 000 | 16 700 | 1,1 | 2 200 |
| — | — | — | 142 | 123 | 2,1 | 290 000 | 680 000 | 32 000 | 2,8 | 1 700 |

Axial deep groove ball bearings

Single direction



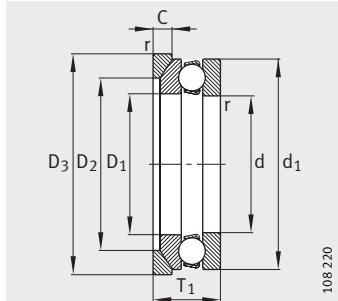
511, 512, 513, 514



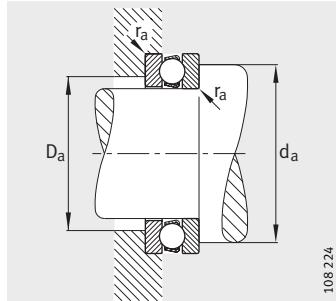
532, 533
Spherical housing locating
washer

Dimension table (continued) · Dimensions in mm

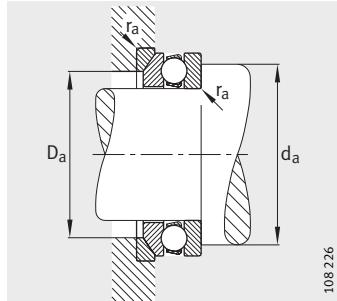
| Designation | | Mass m | | Dimensions | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|-----|------|----------------|----------------|--------|-----|----|----------------|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r min. | R | A | D ₂ |
| 51118 | - | 0,617 | - | 90 | 120 | 22 | 92 | 120 | 1 | - | - | - |
| 51218 | - | 1,66 | - | 90 | 135 | 35 | 93 | 135 | 1,1 | - | - | - |
| 53218 | - | 1,7 | - | 90 | 135 | 38,5 | 93 | 135 | 1,1 | 100 | 45 | - |
| 53218 | U218 | 1,7 | 0,425 | 90 | 135 | 38,5 | 93 | 135 | 1,1 | 100 | 45 | 110 |
| 51318 | - | 3,75 | - | 90 | 155 | 50 | 93 | 155 | 1,5 | - | - | - |
| 53318 | - | 3,81 | - | 90 | 155 | 54,6 | 93 | 155 | 1,5 | 112 | 40 | - |
| 53318 | U318 | 3,81 | 0,83 | 90 | 155 | 54,6 | 93 | 155 | 1,5 | 112 | 40 | 120 |
| 51418-MP | - | 11,1 | - | 90 | 190 | 77 | 93 | 187 | 2,1 | - | - | - |
| 51120 | - | 1,26 | - | 100 | 135 | 25 | 102 | 135 | 1 | - | - | - |
| 51220 | - | 2,21 | - | 100 | 150 | 38 | 103 | 150 | 1,1 | - | - | - |
| 53220 | - | 2,23 | - | 100 | 150 | 40,9 | 103 | 150 | 1,1 | 112 | 52 | - |
| 53220 | U220 | 2,23 | 0,507 | 100 | 150 | 40,9 | 103 | 150 | 1,1 | 112 | 52 | 125 |
| 51320 | - | 4,94 | - | 100 | 170 | 55 | 103 | 170 | 1,5 | - | - | - |
| 53320 | - | 4,99 | - | 100 | 170 | 59,2 | 103 | 170 | 1,5 | 125 | 46 | - |
| 53320 | U320 | 4,99 | 0,95 | 100 | 170 | 59,2 | 103 | 170 | 1,5 | 125 | 46 | 135 |
| 51420-MP | - | 14,8 | - | 100 | 210 | 85 | 103 | 205 | 3 | - | - | - |
| 51122 | - | 1,45 | - | 110 | 145 | 25 | 112 | 145 | 1 | - | - | - |
| 51222 | - | 2,28 | - | 110 | 160 | 38 | 113 | 160 | 1,1 | - | - | - |
| 53222 | - | 2,24 | - | 110 | 160 | 40,2 | 113 | 160 | 1,1 | 125 | 65 | - |
| 53222 | U222 | 2,24 | 0,56 | 110 | 160 | 40,2 | 113 | 160 | 1,1 | 125 | 65 | 135 |
| 51322-MP | - | 7,85 | - | 110 | 190 | 63 | 113 | 187 | 2 | - | - | - |
| 53322-MP | - | 7,85 | - | 110 | 190 | 67,2 | 113 | 187 | 2 | 140 | 51 | - |
| 53322-MP | U322 | 7,85 | 1,28 | 110 | 190 | 67,2 | 113 | 187 | 2 | 140 | 51 | 150 |
| 51422-MP | - | 19,9 | - | 110 | 230 | 95 | 113 | 225 | 3 | - | - | - |
| 51124 | - | 1,54 | - | 120 | 155 | 25 | 122 | 155 | 1 | - | - | - |
| 51224 | - | 2,66 | - | 120 | 170 | 39 | 123 | 170 | 1,1 | - | - | - |
| 53224 | - | 2,58 | - | 120 | 170 | 40,8 | 123 | 170 | 1,1 | 125 | 61 | - |
| 53224 | U224 | 2,58 | 0,65 | 120 | 170 | 40,8 | 123 | 170 | 1,1 | 125 | 61 | 145 |
| 51324-MP | - | 9,3 | - | 120 | 210 | 70 | 123 | 205 | 2,1 | - | - | - |
| 53324-MP | - | 9,18 | - | 120 | 210 | 74,1 | 123 | 205 | 2,1 | 160 | 63 | - |
| 53324-MP | U324 | 9,18 | 2,02 | 120 | 210 | 74,1 | 123 | 205 | 2,1 | 160 | 63 | 165 |
| 51424-MP | - | 25,1 | - | 120 | 250 | 102 | 123 | 245 | 4 | - | - | - |



532, 533
Spherical housing locating
washer, seating washer U2, U3



Mounting dimensions

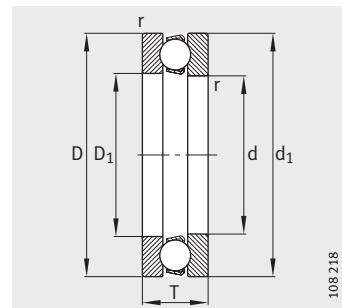


Mounting dimensions

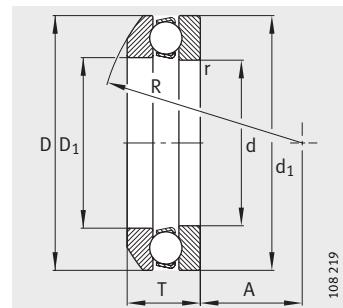
| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|------|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| — | — | — | 108 | 102 | 1 | 45 500 | 140 000 | 6 100 | 0,13 | 3 800 |
| — | — | — | 117 | 108 | 1 | 118 000 | 300 000 | 12 300 | 0,53 | 2 800 |
| — | — | — | 117 | 110 | 1 | 118 000 | 300 000 | 12 300 | 0,53 | 2 800 |
| 140 | 13,5 | 42 | 117 | 110 | 1 | 118 000 | 300 000 | 12 300 | 0,53 | 2 800 |
| — | — | — | 129 | 116 | 1,5 | 193 000 | 455 000 | 17 700 | 1,2 | 2 000 |
| — | — | — | 129 | 120 | 1,5 | 193 000 | 455 000 | 17 700 | 1,2 | 2 000 |
| 160 | 18 | 59 | 129 | 120 | 1,5 | 193 000 | 455 000 | 17 700 | 1,2 | 2 000 |
| — | — | — | 150 | 130 | 2,1 | 305 000 | 750 000 | 34 000 | 3,4 | 1 600 |
| — | — | — | 121 | 114 | 1 | 85 000 | 270 000 | 13 000 | 0,36 | 3 200 |
| — | — | — | 130 | 120 | 1 | 122 000 | 320 000 | 14 400 | 0,67 | 2 600 |
| — | — | — | 130 | 125 | 1 | 122 000 | 320 000 | 14 400 | 0,67 | 2 600 |
| 155 | 14 | 45 | 130 | 125 | 1 | 122 000 | 320 000 | 14 400 | 0,67 | 2 600 |
| — | — | — | 142 | 128 | 1,5 | 240 000 | 585 000 | 21 900 | 1,9 | 1 900 |
| — | — | — | 142 | 135 | 1,5 | 240 000 | 585 000 | 21 900 | 1,9 | 1 900 |
| 175 | 18 | 64 | 142 | 135 | 1,5 | 240 000 | 585 000 | 21 900 | 1,9 | 1 900 |
| — | — | — | 166 | 144 | 2,5 | 365 000 | 965 000 | 41 000 | 5,3 | 1 500 |
| — | — | — | 131 | 124 | 1 | 86 500 | 290 000 | 13 400 | 0,43 | 3 200 |
| — | — | — | 140 | 130 | 1 | 134 000 | 365 000 | 16 000 | 0,85 | 2 400 |
| — | — | — | 140 | 135 | 1 | 134 000 | 365 000 | 16 000 | 0,85 | 2 400 |
| 165 | 14 | 45 | 140 | 135 | 1 | 134 000 | 365 000 | 16 000 | 0,85 | 2 400 |
| — | — | — | 158 | 142 | 2 | 280 000 | 750 000 | 27 000 | 3 | 1 700 |
| — | — | — | 158 | 150 | 2 | 280 000 | 750 000 | 27 000 | 3 | 1 700 |
| 195 | 20,5 | 72 | 158 | 150 | 2 | 280 000 | 750 000 | 27 000 | 3 | 1 700 |
| — | — | — | 182 | 158 | 2,5 | 415 000 | 1 140 000 | 46 500 | 7,5 | 1 300 |
| — | — | — | 141 | 134 | 1 | 90 000 | 310 000 | 13 900 | 0,48 | 3 000 |
| — | — | — | 150 | 140 | 1 | 134 000 | 390 000 | 14 200 | 0,95 | 2 200 |
| — | — | — | 150 | 145 | 1 | 134 000 | 390 000 | 14 200 | 0,95 | 2 200 |
| 175 | 15 | 46 | 150 | 145 | 1 | 134 000 | 390 000 | 14 200 | 0,95 | 2 200 |
| — | — | — | 174 | 156 | 2,1 | 325 000 | 915 000 | 31 500 | 4,5 | 1 600 |
| — | — | — | 174 | 165 | 2,1 | 325 000 | 915 000 | 31 500 | 4,5 | 1 600 |
| 220 | 22 | 80 | 174 | 165 | 2,1 | 325 000 | 915 000 | 31 500 | 4,5 | 1 600 |
| — | — | — | 198 | 172 | 3 | 425 000 | 1 220 000 | 47 500 | 9 | 1 200 |

Axial deep groove ball bearings

Single direction



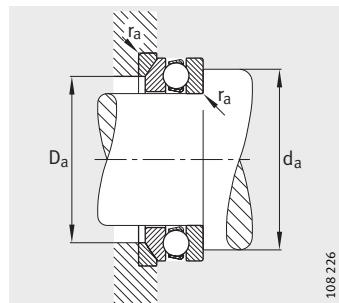
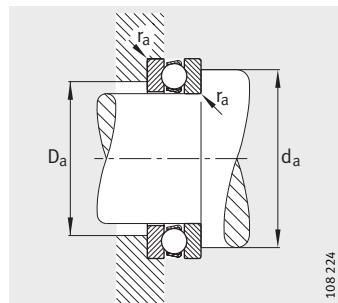
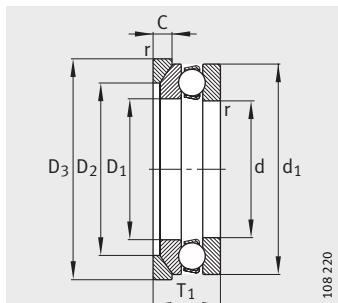
511, 512, 513



532, 533
Spherical housing locating
washer

Dimension table (continued) · Dimensions in mm

| Designation | | Mass m | | Dimensions | | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|-----|------|----------------|----------------|--------|-----|------|----------------|--|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r min. | R | A | D ₂ | |
| 51126 | - | 2,28 | - | 130 | 170 | 30 | 132 | 170 | 1 | - | - | - | |
| 51226 | - | 3,96 | - | 130 | 190 | 45 | 133 | 187 | 1,5 | - | - | - | |
| 53226 | - | 3,9 | - | 130 | 190 | 47,9 | 133 | 187 | 1,5 | 140 | 67 | - | |
| 53226 | U226 | 3,9 | 0,9 | 130 | 190 | 47,9 | 133 | 187 | 1,5 | 140 | 67 | 160 | |
| 51326-MP | - | 13 | - | 130 | 225 | 75 | 134 | 220 | 2,1 | - | - | - | |
| 51128 | - | 2,51 | - | 140 | 180 | 31 | 142 | 178 | 1 | - | - | - | |
| 51228 | - | 4,3 | - | 140 | 200 | 46 | 143 | 197 | 1,5 | - | - | - | |
| 53228 | - | 4,25 | - | 140 | 200 | 48,6 | 143 | 197 | 1,5 | 160 | 87 | - | |
| 53228 | U228 | 4,25 | 1,22 | 140 | 200 | 48,6 | 143 | 197 | 1,5 | 160 | 87 | 170 | |
| 51328-MP | - | 15,6 | - | 140 | 240 | 80 | 144 | 235 | 2,1 | - | - | - | |
| 51130-MP | - | 2,17 | - | 150 | 190 | 31 | 152 | 188 | 1 | - | - | - | |
| 51230-MP | - | 6,08 | - | 150 | 215 | 50 | 153 | 212 | 1,5 | - | - | - | |
| 53230-MP | - | 5,95 | - | 150 | 215 | 53,3 | 153 | 212 | 1,5 | 160 | 79 | - | |
| 53230-MP | U230 | 5,95 | 1,69 | 150 | 215 | 53,3 | 153 | 212 | 1,5 | 160 | 79 | 180 | |
| 51330-MP | - | 16,2 | - | 150 | 250 | 80 | 154 | 245 | 2,1 | - | - | - | |
| 53330-MP | - | 12,8 | - | 150 | 250 | 83,7 | 154 | 245 | 2,1 | 200 | 89,5 | - | |
| 53330-MP | U330 | 12,8 | 3,1 | 150 | 250 | 83,7 | 154 | 245 | 2,1 | 200 | 89,5 | 200 | |
| 51132-MP | - | 2,29 | - | 160 | 200 | 31 | 162 | 198 | 1 | - | - | - | |
| 51232-MP | - | 6,53 | - | 160 | 225 | 51 | 163 | 222 | 1,5 | - | - | - | |
| 53232-MP | - | 6,45 | - | 160 | 225 | 54,7 | 163 | 222 | 1,5 | 160 | 74 | - | |
| 53232-MP | U232 | 6,45 | 1,81 | 160 | 225 | 54,7 | 163 | 222 | 1,5 | 160 | 74 | 190 | |
| 51332-MP | - | 21,2 | - | 160 | 270 | 87 | 164 | 265 | 3 | - | - | - | |
| 51134-MP | - | 3,08 | - | 170 | 215 | 34 | 172 | 213 | 1,1 | - | - | - | |
| 51234-MP | - | 8,12 | - | 170 | 240 | 55 | 173 | 237 | 1,5 | - | - | - | |
| 53234-MP | - | 7,91 | - | 170 | 240 | 58,7 | 173 | 237 | 1,5 | 180 | 91 | - | |
| 53234-MP | U234 | 7,91 | 2,14 | 170 | 240 | 58,7 | 173 | 237 | 1,5 | 180 | 91 | 200 | |
| 51334-MP | - | 22,2 | - | 170 | 280 | 87 | 174 | 275 | 3 | - | - | - | |



532, 533
Spherical housing locating
washer, seating washer U2, U3

Mounting dimensions

Mounting dimensions

108 220

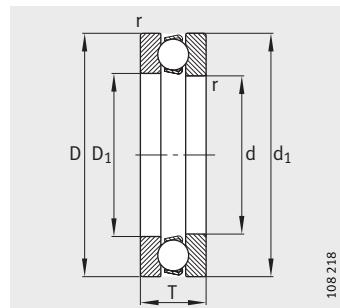
108 224

108 226

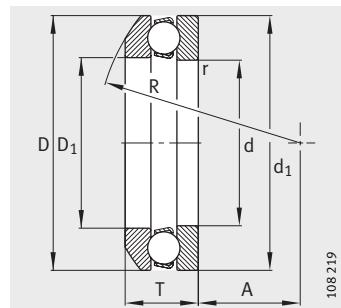
| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|------|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| — | — | — | 154 | 146 | 1 | 112 000 | 390 000 | 17 200 | 0,75 | 2 800 |
| — | — | — | 166 | 154 | 1,5 | 183 000 | 540 000 | 18 900 | 1,7 | 1 900 |
| — | — | — | 166 | 160 | 1,5 | 183 000 | 540 000 | 18 900 | 1,7 | 1 900 |
| 195 | 17 | 53 | 166 | 160 | 1,5 | 183 000 | 540 000 | 18 900 | 1,7 | 1 900 |
| — | — | — | 187 | 168 | 2,1 | 360 000 | 1 060 000 | 35 000 | 6 | 1 500 |
| — | — | — | 164 | 156 | 1 | 112 000 | 400 000 | 16 900 | 0,85 | 2 600 |
| — | — | — | 176 | 164 | 1,5 | 190 000 | 570 000 | 19 200 | 1,9 | 1 900 |
| — | — | — | 176 | 170 | 1,5 | 190 000 | 570 000 | 19 200 | 1,9 | 1 900 |
| 210 | 17 | 55 | 176 | 170 | 1,5 | 190 000 | 570 000 | 19 200 | 1,9 | 1 900 |
| — | — | — | 200 | 180 | 2,1 | 405 000 | 1 250 000 | 40 000 | 8 | 1 400 |
| — | — | — | 174 | 166 | 1 | 110 000 | 400 000 | 16 700 | 0,9 | 2 400 |
| — | — | — | 189 | 176 | 1,5 | 236 000 | 735 000 | 24 200 | 2,8 | 1 800 |
| — | — | — | 189 | 180 | 1,5 | 236 000 | 735 000 | 24 200 | 2,8 | 1 800 |
| 225 | 20,5 | 60 | 189 | 180 | 1,5 | 236 000 | 735 000 | 24 200 | 2,8 | 1 800 |
| — | — | — | 210 | 190 | 2,1 | 415 000 | 1 340 000 | 41 500 | 9,5 | 1 400 |
| — | — | — | 210 | 200 | 2,1 | 415 000 | 1 340 000 | 41 500 | 9,5 | 1 400 |
| 260 | 26 | 92 | 210 | 200 | 2,1 | 415 000 | 1 340 000 | 41 500 | 9,5 | 1 400 |
| — | — | — | 184 | 176 | 1 | 112 000 | 430 000 | 17 200 | 1 | 2 200 |
| — | — | — | 199 | 186 | 1,5 | 240 000 | 765 000 | 24 700 | 3,2 | 1 700 |
| — | — | — | 199 | 190 | 1,5 | 240 000 | 765 000 | 24 700 | 3,2 | 1 700 |
| 235 | 21 | 61 | 199 | 190 | 1,5 | 240 000 | 765 000 | 24 700 | 3,2 | 1 700 |
| — | — | — | 226 | 204 | 2,5 | 465 000 | 1 560 000 | 47 000 | 13 | 1 200 |
| — | — | — | 197 | 188 | 1 | 132 000 | 500 000 | 19 400 | 1,4 | 2 000 |
| — | — | — | 212 | 198 | 1,5 | 285 000 | 930 000 | 28 500 | 4,5 | 1 600 |
| — | — | — | 212 | 200 | 1,5 | 285 000 | 930 000 | 28 500 | 4,5 | 1 600 |
| 250 | 21,5 | 65 | 212 | 200 | 1,5 | 285 000 | 930 000 | 28 500 | 4,5 | 1 600 |
| — | — | — | 236 | 214 | 2,5 | 465 000 | 1 560 000 | 46 000 | 13 | 1 200 |

Axial deep groove ball bearings

Single direction



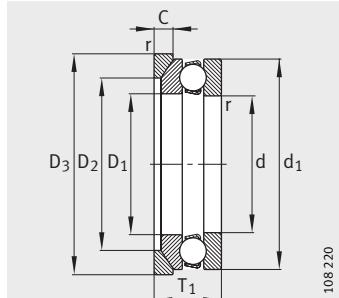
511, 512, 513



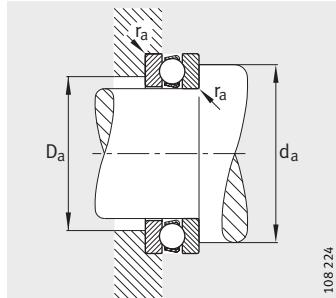
532
Spherical housing locating
washer

Dimension table (continued) · Dimensions in mm

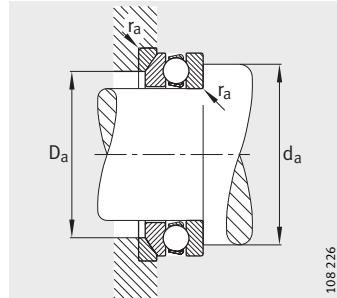
| Designation | | Mass m | | Dimensions | | | | | | | | |
|-------------|----------------|-------------|--------------------|------------|-----|------|----------------|----------------|--------|-----|-----|----------------|
| Bearing | Seating washer | Bearing ≈kg | Seating washer ≈kg | d | D | T | D ₁ | d ₁ | r min. | R | A | D ₂ |
| 51136-MP | - | 3,06 | - | 180 | 225 | 34 | 183 | 222 | 1,1 | - | - | - |
| 51236-MP | - | 8,56 | - | 180 | 250 | 56 | 183 | 245 | 1,5 | - | - | - |
| 53236-MP | - | 8,19 | - | 180 | 250 | 58,2 | 183 | 245 | 1,5 | 200 | 112 | - |
| 53236-MP | U236 | 8,19 | 1,25 | 180 | 250 | 58,2 | 183 | 245 | 1,5 | 200 | 112 | 210 |
| 51336-MP | - | 24,8 | - | 180 | 300 | 95 | 184 | 295 | 3 | - | - | - |
| 51138-MP | - | 3,94 | - | 190 | 240 | 37 | 193 | 237 | 1,1 | - | - | - |
| 51238-MP | - | 11,6 | - | 190 | 270 | 62 | 194 | 265 | 2 | - | - | - |
| 53238-MP | - | 11,5 | - | 190 | 270 | 65,7 | 195 | 265 | 2 | 200 | 98 | - |
| 53238-MP | U238 | 11,5 | 2,65 | 190 | 270 | 65,7 | 195 | 265 | 2 | 200 | 98 | 230 |
| 51338-MP | - | 31,9 | - | 190 | 320 | 105 | 195 | 315 | 4 | - | - | - |
| 51140-MP | - | 4,12 | - | 200 | 250 | 37 | 203 | 247 | 1,1 | - | - | - |
| 51240-MP | - | 12 | - | 200 | 280 | 62 | 204 | 275 | 2 | - | - | - |
| 51340-MP | - | 40,9 | - | 200 | 340 | 110 | 205 | 335 | 4 | - | - | - |
| 51144-MP | - | 4,54 | - | 220 | 270 | 37 | 223 | 267 | 1,1 | - | - | - |
| 51244-MP | - | 13,1 | - | 220 | 300 | 63 | 224 | 295 | 2 | - | - | - |
| 51148-MP | - | 7,41 | - | 240 | 300 | 45 | 243 | 297 | 1,5 | - | - | - |
| 51248-MP | - | 22,9 | - | 240 | 340 | 78 | 244 | 335 | 2,1 | - | - | - |
| 51152-MP | - | 7,89 | - | 260 | 320 | 45 | 263 | 317 | 1,5 | - | - | - |
| 51252-MP | - | 24,8 | - | 260 | 360 | 79 | 264 | 355 | 2,1 | - | - | - |
| 51156-MP | - | 12 | - | 280 | 350 | 53 | 283 | 347 | 1,5 | - | - | - |
| 51256-MP | - | 23,7 | - | 280 | 380 | 80 | 284 | 375 | 2,1 | - | - | - |
| 51160-MP | - | 17,1 | - | 300 | 380 | 62 | 304 | 376 | 2 | - | - | - |
| 51260-MP | - | 41,8 | - | 300 | 420 | 95 | 304 | 415 | 3 | - | - | - |
| 51164-MP | - | 18,5 | - | 320 | 400 | 63 | 324 | 396 | 2 | - | - | - |
| 51264-MP | - | 44,6 | - | 320 | 440 | 95 | 325 | 435 | 3 | - | - | - |



532
Spherical housing locating
washer, seating washer U2



Mounting dimensions

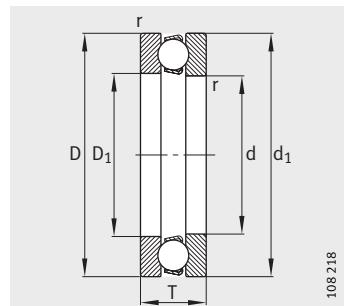


Mounting dimensions

| D ₃ | C | T ₁ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed n _G min ⁻¹ |
|----------------|------|----------------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|--|--------------------------|---|
| | | | d _a min. | d _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | | | |
| - | - | - | 207 | 198 | 1 | 134 000 | 530 000 | 20 100 | 1,5 | 2 000 |
| - | - | - | 222 | 208 | 1,5 | 305 000 | 1 040 000 | 31 500 | 5,3 | 1 600 |
| - | - | - | 222 | 210 | 1,5 | 305 000 | 1 040 000 | 31 500 | 5,3 | 1 600 |
| 260 | 21,5 | 66 | 222 | 210 | 1,5 | 305 000 | 1 040 000 | 31 500 | 5,3 | 1 600 |
| - | - | - | 252 | 228 | 2,5 | 520 000 | 1 830 000 | 52 000 | 18 | 1 100 |
| - | - | - | 220 | 210 | 1 | 170 000 | 655 000 | 23 200 | 2,4 | 1 800 |
| - | - | - | 238 | 222 | 2 | 335 000 | 1 160 000 | 34 500 | 7 | 1 500 |
| - | - | - | 238 | 230 | 2 | 335 000 | 1 160 000 | 34 500 | 7 | 1 500 |
| 280 | 23 | 73 | 238 | 230 | 2 | 335 000 | 1 160 000 | 34 500 | 7 | 1 500 |
| - | - | - | 268 | 242 | 3 | 600 000 | 2 200 000 | 61 000 | 26 | 1 000 |
| - | - | - | 230 | 220 | 1 | 170 000 | 655 000 | 22 700 | 2,4 | 1 800 |
| - | - | - | 248 | 232 | 2 | 340 000 | 1 220 000 | 35 000 | 8 | 1 400 |
| - | - | - | 284 | 256 | 3 | 620 000 | 2 400 000 | 65 000 | 30 | 950 |
| - | - | - | 250 | 240 | 1 | 176 000 | 735 000 | 24 500 | 3 | 1 700 |
| - | - | - | 268 | 252 | 2 | 355 000 | 1 340 000 | 36 500 | 9,5 | 1 300 |
| - | - | - | 276 | 264 | 1,5 | 232 000 | 965 000 | 31 000 | 5 | 1 600 |
| - | - | - | 300 | 280 | 2,1 | 465 000 | 1 860 000 | 48 000 | 18 | 1 100 |
| - | - | - | 296 | 284 | 1,5 | 236 000 | 1 020 000 | 31 500 | 5,6 | 1 500 |
| - | - | - | 320 | 300 | 2,1 | 490 000 | 2 040 000 | 52 000 | 22 | 1 000 |
| - | - | - | 322 | 308 | 1,5 | 315 000 | 1 340 000 | 40 500 | 10 | 1 300 |
| - | - | - | 340 | 320 | 2,1 | 490 000 | 2 160 000 | 53 000 | 24 | 950 |
| - | - | - | 348 | 332 | 2 | 365 000 | 1 600 000 | 46 000 | 14 | 1 200 |
| - | - | - | 372 | 348 | 2,5 | 585 000 | 2 700 000 | 63 000 | 38 | 850 |
| - | - | - | 368 | 352 | 2 | 375 000 | 1 700 000 | 47 500 | 16 | 1 100 |
| - | - | - | 392 | 368 | 2,5 | 600 000 | 2 800 000 | 64 000 | 43 | 850 |

Axial deep groove ball bearings

Single direction

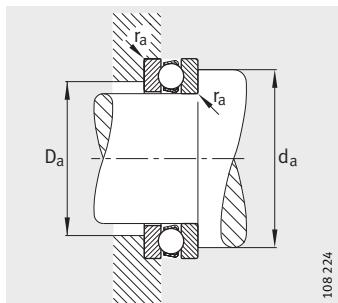


511, 512

108718

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | |
|-------------------|------------------|------------|-----|-----|----------------|----------------|-----------|
| | | d | D | T | D ₁ | d ₁ | r min. |
| 51168-MP | 19,9 | 340 | 420 | 64 | 344 | 416 | 2 |
| 51268-MP | 47,6 | 340 | 460 | 96 | 345 | 455 | 3 |
| 51172-MP | 21,5 | 360 | 440 | 65 | 364 | 436 | 2 |
| 51272-MP | 70,4 | 360 | 500 | 110 | 365 | 495 | 4 |
| 51176-MP | 22,4 | 380 | 460 | 65 | 384 | 456 | 2 |
| 51180-MP | 23,5 | 400 | 480 | 65 | 404 | 476 | 2 |
| 51184-MP | 24,4 | 420 | 500 | 65 | 424 | 495 | 2 |
| 51192-MP | 37,2 | 460 | 560 | 80 | 464 | 555 | 2,1 |
| 511/500-MP | 44,9 | 500 | 600 | 80 | 505 | 595 | 2,1 |
| 511/530-MP | 55,9 | 530 | 640 | 85 | 535 | 635 | 3 |
| 511/560-MP | 58,8 | 560 | 670 | 85 | 565 | 665 | 3 |

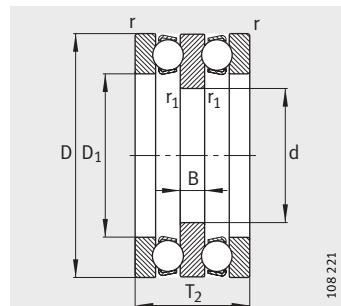


Mounting dimensions

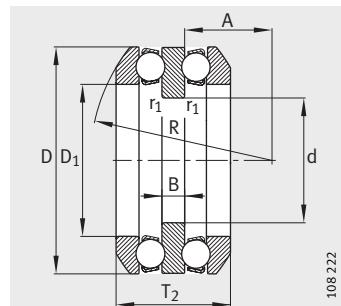
| Mounting dimensions | | | Basic load ratings | | Fatigue limit load | Minimum load factor | Limiting speed |
|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|----------------------|---------------------|-------------------------------------|
| d _a min. | D _a max. | r _a max. | dyn. C _a N | stat. C _{0a} N | C _{ua} N | A | n _G min ⁻¹ |
| 388 | 372 | 2 | 380 000 | 1 800 000 | 49 000 | 18 | 1 000 |
| 412 | 388 | 2,5 | 620 000 | 3 050 000 | 67 000 | 50 | 800 |
| 408 | 392 | 2 | 405 000 | 2 000 000 | 45 000 | 22 | 1 000 |
| 444 | 416 | 3 | 720 000 | 3 650 000 | 79 000 | 70 | 700 |
| 428 | 412 | 2 | 430 000 | 2 240 000 | 48 500 | 24 | 950 |
| 448 | 432 | 2 | 440 000 | 2 320 000 | 49 500 | 28 | 900 |
| 468 | 452 | 2 | 440 000 | 2 450 000 | 51 000 | 30 | 900 |
| 520 | 500 | 2,1 | 530 000 | 3 100 000 | 61 000 | 50 | 800 |
| 560 | 540 | 2,1 | 550 000 | 3 350 000 | 63 000 | 56 | 750 |
| 596 | 574 | 2,5 | 620 000 | 3 900 000 | 73 000 | 80 | 670 |
| 626 | 604 | 2,5 | 630 000 | 4 150 000 | 74 000 | 85 | 670 |

Axial deep groove ball bearings

Double direction



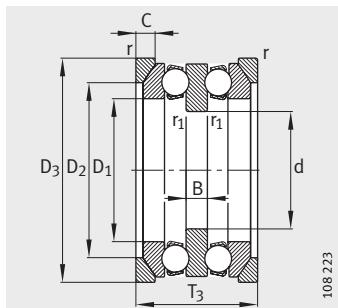
522, 523



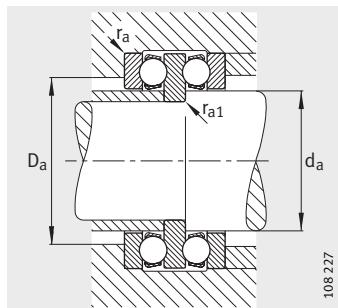
542, 543
Spherical housing locating
washers

Dimension table · Dimensions in mm

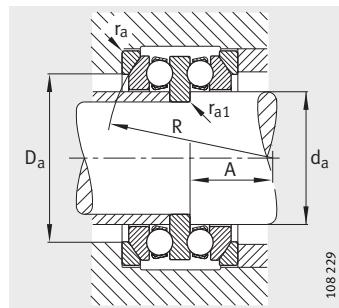
| Designation | | Mass m | | Dimensions | | | | | | | |
|-------------|----------------|---------|--------------------|------------|----|----------------|----------------|----|--------|---------------------|----|
| Bearing | Seating washer | Bearing | Seating washer ≈kg | d | D | T ₂ | D ₁ | B | r min. | r ₁ min. | R |
| 52202 | – | 0,076 | – | 10 | 32 | 22 | 17 | 5 | 0,6 | 0,3 | – |
| 52204 | – | 0,145 | – | 15 | 40 | 26 | 22 | 6 | 0,6 | 0,3 | – |
| 52205 | – | 0,215 | – | 20 | 47 | 28 | 27 | 7 | 0,6 | 0,3 | – |
| 54205 | – | 0,221 | – | 20 | 47 | 31,4 | 27 | 7 | 0,6 | 0,3 | 40 |
| 54205 | U205 | 0,221 | 0,032 | 20 | 47 | 31,4 | 27 | 7 | 0,6 | 0,3 | 40 |
| 52305 | – | 0,291 | – | 20 | 52 | 34 | 27 | 8 | 1 | 0,3 | – |
| 54305 | – | 0,303 | – | 20 | 52 | 37,6 | 27 | 8 | 1 | 0,3 | 45 |
| 54305 | U305 | 0,303 | 0,044 | 20 | 52 | 37,6 | 27 | 8 | 1 | 0,3 | 45 |
| 52206 | – | 0,236 | – | 25 | 52 | 29 | 32 | 7 | 0,6 | 0,3 | – |
| 54206 | – | 0,269 | – | 25 | 52 | 32,6 | 32 | 7 | 0,6 | 0,3 | 45 |
| 54206 | U206 | 0,269 | 0,038 | 25 | 52 | 32,6 | 32 | 7 | 0,6 | 0,3 | 45 |
| 52306 | – | 0,435 | – | 25 | 60 | 38 | 32 | 9 | 1 | 0,3 | – |
| 54306 | – | 0,553 | – | 25 | 60 | 41,2 | 32 | 9 | 1 | 0,3 | 50 |
| 54306 | U306 | 0,553 | 0,056 | 25 | 60 | 41,2 | 32 | 9 | 1 | 0,3 | 50 |
| 52207 | – | 0,371 | – | 30 | 62 | 34 | 37 | 8 | 1 | 0,3 | – |
| 54207 | – | 0,749 | – | 30 | 62 | 37,8 | 37 | 8 | 1 | 0,3 | 50 |
| 54207 | U207 | 0,749 | 0,057 | 30 | 62 | 37,8 | 37 | 8 | 1 | 0,3 | 50 |
| 52307 | – | 0,63 | – | 30 | 68 | 44 | 37 | 10 | 1 | 0,3 | – |
| 54307 | – | 0,802 | – | 30 | 68 | 47,2 | 37 | 10 | 1 | 0,3 | 56 |
| 54307 | U307 | 0,802 | 0,083 | 30 | 68 | 47,2 | 37 | 10 | 1 | 0,3 | 56 |
| 52208 | – | 0,509 | – | 30 | 68 | 36 | 42 | 9 | 1 | 0,6 | – |
| 54208 | – | 0,513 | – | 30 | 68 | 38,6 | 42 | 9 | 1 | 0,6 | 56 |
| 54208 | U208 | 0,513 | 0,071 | 30 | 68 | 38,6 | 42 | 9 | 1 | 0,6 | 56 |
| 52308 | – | 1,02 | – | 30 | 78 | 49 | 42 | 12 | 1 | 0,6 | – |
| 52209 | – | 0,539 | – | 35 | 73 | 37 | 47 | 9 | 1 | 0,6 | – |
| 54209 | – | 0,537 | – | 35 | 73 | 39,6 | 47 | 9 | 1 | 0,6 | 56 |
| 54209 | U209 | 0,537 | 0,088 | 35 | 73 | 39,6 | 47 | 9 | 1 | 0,6 | 56 |
| 52309 | – | 1,15 | – | 35 | 85 | 52 | 47 | 12 | 1 | 0,6 | – |
| 54309 | – | 2,15 | – | 35 | 85 | 56,2 | 47 | 12 | 1 | 0,6 | 64 |
| 54309 | U309 | 2,15 | 0,173 | 35 | 85 | 56,2 | 47 | 12 | 1 | 0,6 | 64 |



542, 543
Spherical housing locating
washers, seating washers U2, U3



Mounting dimensions

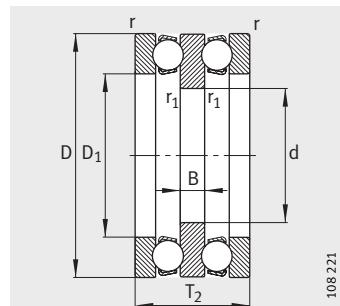


Mounting dimensions

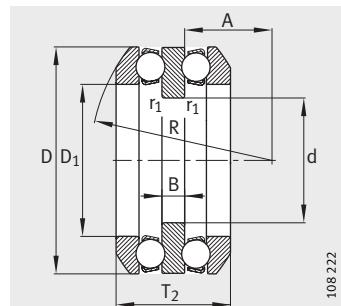
| A | D ₂ | D ₃ | C | T ₃ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed min ⁻¹ | |
|------|----------------|----------------|-----|----------------|------------------------|----------------|------------------------|-------------------------|-----------------------------|--|--------------------------|-------------------------------------|-------|
| | | | | | d _a max. | D _a | r _a max. | r _{a1} max. | dyn. C _a N | stat. C _{0a} N | | | |
| - | - | - | - | - | 15 | 22 | 0,6 | 0,3 | 16 600 | 25 000 | 1 100 | 0,003 | 9 000 |
| - | - | - | - | - | 20 | 28 | 0,6 | 0,3 | 22 400 | 37 500 | 1 660 | 0,01 | 7 500 |
| - | - | - | - | - | 25 | 34 | 0,6 | 0,3 | 28 000 | 50 000 | 2 220 | 0,013 | 6 700 |
| 16,5 | - | - | - | - | 25 | 36 | 0,6 | 0,3 | 28 000 | 50 000 | 2 220 | 0,013 | 6 700 |
| 16,5 | 36 | 50 | 5,5 | 36 | 25 | 36 | 0,6 | 0,3 | 28 000 | 50 000 | 2 220 | 0,013 | 6 700 |
| - | - | - | - | - | 25 | 36 | 1 | 0,3 | 34 500 | 55 000 | 2 450 | 0,019 | 5 300 |
| 18 | - | - | - | - | 25 | 38 | 1 | 0,3 | 34 500 | 55 000 | 2 450 | 0,019 | 5 300 |
| 18 | 38 | 55 | 6 | 42 | 25 | 38 | 1 | 0,3 | 34 500 | 55 000 | 2 450 | 0,019 | 5 300 |
| - | - | - | - | - | 30 | 39 | 0,6 | 0,3 | 25 000 | 46 500 | 2 040 | 0,01 | 6 300 |
| 20 | - | - | - | - | 30 | 42 | 0,6 | 0,3 | 25 000 | 46 500 | 2 040 | 0,01 | 6 300 |
| 20 | 42 | 55 | 5,5 | 37 | 30 | 42 | 0,6 | 0,3 | 25 000 | 46 500 | 2 040 | 0,01 | 6 300 |
| - | - | - | - | - | 30 | 42 | 1 | 0,3 | 38 000 | 65 500 | 2 850 | 0,028 | 5 000 |
| 19,5 | - | - | - | - | 30 | 45 | 1 | 0,3 | 38 000 | 65 500 | 2 850 | 0,028 | 5 000 |
| 19,5 | 45 | 62 | 7 | 46 | 30 | 45 | 1 | 0,3 | 38 000 | 65 500 | 2 850 | 0,028 | 5 000 |
| - | - | - | - | - | 35 | 46 | 1 | 0,3 | 35 500 | 67 000 | 3 000 | 0,028 | 5 300 |
| 21 | - | - | - | - | 35 | 48 | 1 | 0,3 | 35 500 | 67 000 | 3 000 | 0,028 | 5 300 |
| 21 | 48 | 65 | 7 | 42 | 35 | 48 | 1 | 0,3 | 35 500 | 67 000 | 3 000 | 0,028 | 5 300 |
| - | - | - | - | - | 35 | 48 | 1 | 0,3 | 50 000 | 88 000 | 3 900 | 0,05 | 4 500 |
| 21 | - | - | - | - | 35 | 52 | 1 | 0,3 | 50 000 | 88 000 | 3 900 | 0,05 | 4 500 |
| 21 | 52 | 72 | 7,5 | 52 | 35 | 52 | 1 | 0,3 | 50 000 | 88 000 | 3 900 | 0,05 | 4 500 |
| - | - | - | - | - | 40 | 51 | 1 | 0,6 | 46 500 | 98 000 | 4 300 | 0,05 | 4 800 |
| 25 | - | - | - | - | 40 | 55 | 1 | 0,6 | 46 500 | 98 000 | 4 300 | 0,05 | 4 800 |
| 25 | 55 | 72 | 7 | 44 | 40 | 55 | 1 | 0,6 | 46 500 | 98 000 | 4 300 | 0,05 | 4 800 |
| - | - | - | - | - | 40 | 55 | 1 | 0,6 | 61 000 | 112 000 | 5 000 | 0,08 | 4 000 |
| - | - | - | - | - | 45 | 56 | 1 | 0,6 | 39 000 | 80 000 | 3 550 | 0,043 | 4 800 |
| 23 | - | - | - | - | 45 | 60 | 1 | 0,6 | 39 000 | 80 000 | 3 550 | 0,043 | 4 800 |
| 23 | 60 | 78 | 7,5 | 45 | 45 | 60 | 1 | 0,6 | 39 000 | 80 000 | 3 550 | 0,043 | 4 800 |
| - | - | - | - | - | 45 | 61 | 1 | 0,6 | 75 000 | 140 000 | 6 300 | 0,12 | 3 600 |
| 21 | - | - | - | - | 45 | 65 | 1 | 0,6 | 75 000 | 140 000 | 6 300 | 0,12 | 3 600 |
| 21 | 65 | 90 | 10 | 62 | 45 | 65 | 1 | 0,6 | 75 000 | 140 000 | 6 300 | 0,12 | 3 600 |

Axial deep groove ball bearings

Double direction



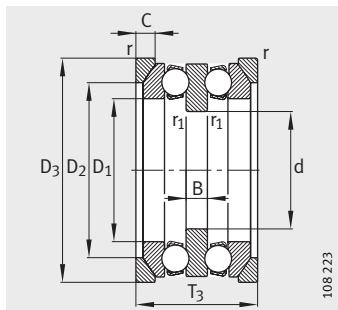
522, 523



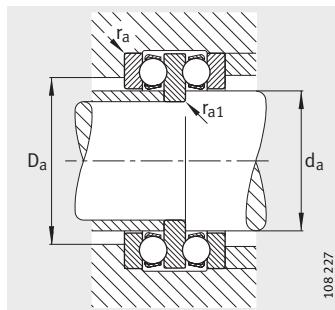
542, 543
Spherical housing locating
washers

Dimension table (continued) · Dimensions in mm

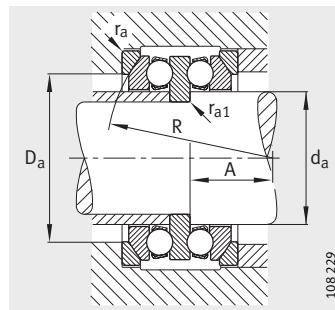
| Designation | | Mass m | | Dimensions | | | | | | | |
|-------------|----------------|---------|--------------------|------------|-----|----------------|----------------|----|--------|---------------------|-----|
| Bearing | Seating washer | Bearing | Seating washer ≈kg | d | D | T ₂ | D ₁ | B | r min. | r ₁ min. | R |
| 52210 | – | 0,635 | – | 40 | 78 | 39 | 52 | 9 | 1 | 0,6 | – |
| 54210 | – | 0,625 | – | 40 | 78 | 42 | 52 | 9 | 1 | 0,6 | 64 |
| 54210 | U210 | 0,625 | 0,098 | 40 | 78 | 42 | 52 | 9 | 1 | 0,6 | 64 |
| 52310 | – | 1,76 | – | 40 | 95 | 58 | 52 | 14 | 1,1 | 0,6 | – |
| 54310 | – | 1,84 | – | 40 | 95 | 64,6 | 52 | 14 | 1,1 | 0,6 | 72 |
| 54310 | U310 | 1,84 | 0,225 | 40 | 95 | 64,6 | 52 | 14 | 1,1 | 0,6 | 72 |
| 52211 | – | 0,571 | – | 45 | 90 | 45 | 57 | 10 | 1 | 0,6 | – |
| 54211 | – | 1,02 | – | 45 | 90 | 49,6 | 57 | 10 | 1 | 0,6 | 72 |
| 54211 | U211 | 1,02 | 0,152 | 45 | 90 | 49,6 | 57 | 10 | 1 | 0,6 | 72 |
| 52311 | – | 2,37 | – | 45 | 105 | 64 | 57 | 15 | 1,1 | 0,6 | – |
| 54311 | – | 2,53 | – | 45 | 105 | 72,6 | 57 | 15 | 1,1 | 0,6 | 80 |
| 54311 | U311 | 2,53 | 0,277 | 45 | 105 | 72,6 | 57 | 15 | 1,1 | 0,6 | 80 |
| 52212 | – | 1,12 | – | 50 | 95 | 46 | 62 | 10 | 1 | 0,6 | – |
| 54212 | – | 1,17 | – | 50 | 95 | 50 | 62 | 10 | 1 | 0,6 | 72 |
| 54212 | U212 | 1,17 | 0,165 | 50 | 95 | 50 | 62 | 10 | 1 | 0,6 | 72 |
| 52312 | – | 2,49 | – | 50 | 110 | 64 | 62 | 15 | 1,1 | 0,6 | – |
| 54312 | – | 2,59 | – | 50 | 110 | 70,6 | 62 | 15 | 1,1 | 0,6 | 90 |
| 54312 | U312 | 2,59 | 0,31 | 50 | 110 | 70,6 | 62 | 15 | 1,1 | 0,6 | 90 |
| 52213 | – | 1,19 | – | 55 | 100 | 47 | 67 | 10 | 1 | 0,6 | – |
| 52313 | – | 2,5 | – | 55 | 115 | 65 | 67 | 15 | 1,1 | 0,6 | – |
| 52214 | – | 1,3 | – | 55 | 105 | 47 | 72 | 10 | 1 | 1 | – |
| 52314 | – | 3,55 | – | 55 | 125 | 72 | 72 | 16 | 1,1 | 1 | – |
| 54314 | – | 3,77 | – | 55 | 125 | 80,4 | 72 | 16 | 1,1 | 1 | 100 |
| 54314 | U314 | 3,77 | 0,408 | 55 | 125 | 80,4 | 72 | 16 | 1,1 | 1 | 100 |
| 52215 | – | 1,48 | – | 60 | 110 | 47 | 77 | 10 | 1 | 1 | – |
| 54215 | – | 1,87 | – | 60 | 110 | 49,6 | 77 | 10 | 1 | 1 | 90 |
| 54215 | U215 | 1,87 | 0,21 | 60 | 110 | 49,6 | 77 | 10 | 1 | 1 | 90 |
| 52315 | – | 4,72 | – | 60 | 135 | 79 | 77 | 18 | 1,5 | 1 | – |
| 54315 | – | 5,92 | – | 60 | 135 | 87,2 | 77 | 18 | 1,5 | 1 | 100 |
| 54315 | U315 | 5,92 | 0,544 | 60 | 135 | 87,2 | 77 | 18 | 1,5 | 1 | 100 |
| 52216 | – | 1,55 | – | 65 | 115 | 48 | 82 | 10 | 1 | 1 | – |
| 54216 | – | 1,6 | – | 65 | 115 | 51 | 82 | 10 | 1 | 1 | 90 |
| 54216 | U216 | 1,6 | 0,218 | 65 | 115 | 51 | 82 | 10 | 1 | 1 | 90 |
| 52316 | – | 4,82 | – | 65 | 140 | 79 | 82 | 18 | 1,5 | 1 | – |
| 54316 | – | 4,93 | – | 65 | 140 | 86,2 | 82 | 18 | 1,5 | 1 | 112 |
| 54316 | U316 | 4,93 | 0,57 | 65 | 140 | 86,2 | 82 | 18 | 1,5 | 1 | 112 |



542, 543
Spherical housing locating
washers, seating washers U2, U3



Mounting dimensions

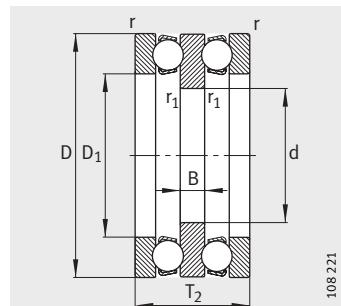


Mounting dimensions

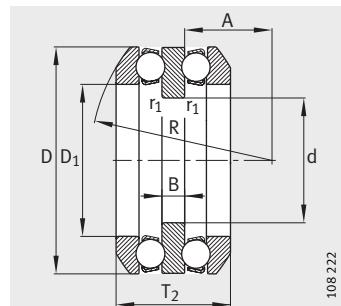
| A | D ₂ | D ₃ | C | T ₃ | Mounting dimensions | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed min ⁻¹ | |
|------|----------------|----------------|------|----------------|------------------------|----------------|------------------------|-------------------------|-----------------------------|--|--------------------------|-------------------------------------|-------|
| | | | | | d _a max. | D _a | r _a max. | r _{a1} max. | dyn. C _a N | stat. C _{0a} N | | | |
| — | — | — | — | — | 50 | 61 | 1 | 0,6 | 50 000 | 106 000 | 4 700 | 0,07 | 4 300 |
| 30,5 | — | — | — | — | 50 | 62 | 1 | 0,6 | 50 000 | 106 000 | 4 700 | 0,07 | 4 300 |
| 30,5 | 62 | 82 | 7,5 | 47 | 50 | 62 | 1 | 0,6 | 50 000 | 106 000 | 4 700 | 0,07 | 4 300 |
| — | — | — | — | — | 50 | 68 | 1 | 0,6 | 86 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| 23 | — | — | — | — | 50 | 72 | 1 | 0,6 | 86 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| 23 | 72 | 100 | 11 | 70 | 50 | 72 | 1 | 0,6 | 86 500 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | — | — | 55 | 69 | 1 | 0,6 | 61 000 | 134 000 | 6 100 | 0,11 | 3 800 |
| 32,5 | — | — | — | — | 55 | 72 | 1 | 0,6 | 61 000 | 134 000 | 6 100 | 0,11 | 3 800 |
| 32,5 | 72 | 95 | 9 | 55 | 55 | 72 | 1 | 0,6 | 61 000 | 134 000 | 6 100 | 0,11 | 3 800 |
| — | — | — | — | — | 55 | 75 | 1 | 0,6 | 102 000 | 208 000 | 9 000 | 0,26 | 3 200 |
| 25,5 | — | — | — | — | 55 | 80 | 1 | 0,6 | 102 000 | 208 000 | 9 000 | 0,26 | 3 200 |
| 25,5 | 80 | 110 | 11,5 | 78 | 55 | 80 | 1 | 0,6 | 102 000 | 208 000 | 9 000 | 0,26 | 3 200 |
| — | — | — | — | — | 60 | 74 | 1 | 0,6 | 62 000 | 140 000 | 6 200 | 0,12 | 3 800 |
| 30,5 | — | — | — | — | 60 | 78 | 1 | 0,6 | 62 000 | 140 000 | 6 200 | 0,12 | 3 800 |
| 30,5 | 78 | 100 | 9 | 56 | 60 | 78 | 1 | 0,6 | 62 000 | 140 000 | 6 200 | 0,12 | 3 800 |
| — | — | — | — | — | 60 | 80 | 1 | 0,6 | 100 000 | 208 000 | 9 000 | 0,28 | 3 200 |
| 36,5 | — | — | — | — | 60 | 85 | 1 | 0,6 | 100 000 | 208 000 | 9 000 | 0,28 | 3 200 |
| 36,5 | 85 | 115 | 11,5 | 78 | 60 | 85 | 1 | 0,6 | 100 000 | 208 000 | 9 000 | 0,28 | 3 200 |
| — | — | — | — | — | 65 | 79 | 1 | 0,6 | 64 000 | 150 000 | 6 600 | 0,14 | 3 600 |
| — | — | — | — | — | 65 | 85 | 1 | 0,6 | 106 000 | 220 000 | 9 700 | 0,32 | 3 000 |
| — | — | — | — | — | 70 | 84 | 1 | 1 | 65 500 | 160 000 | 7 000 | 0,16 | 3 600 |
| — | — | — | — | — | 70 | 92 | 1 | 1 | 134 000 | 290 000 | 12 900 | 0,5 | 2 800 |
| 39 | — | — | — | — | 70 | 98 | 1 | 1 | 134 000 | 290 000 | 12 900 | 0,5 | 2 800 |
| 39 | 98 | 130 | 13 | 88 | 70 | 98 | 1 | 1 | 134 000 | 290 000 | 12 900 | 0,5 | 2 800 |
| — | — | — | — | — | 75 | 89 | 1 | 1 | 67 000 | 170 000 | 7 500 | 0,18 | 3 400 |
| 47,5 | — | — | — | — | 75 | 92 | 1 | 1 | 67 000 | 170 000 | 7 500 | 0,18 | 3 400 |
| 47,5 | 92 | 115 | 9,5 | 57 | 75 | 92 | 1 | 1 | 67 000 | 170 000 | 7 500 | 0,18 | 3 400 |
| — | — | — | — | — | 75 | 99 | 1,5 | 1 | 163 000 | 360 000 | 15 400 | 0,75 | 2 400 |
| 32,5 | — | — | — | — | 75 | 105 | 1,5 | 1 | 163 000 | 360 000 | 15 400 | 0,75 | 2 400 |
| 32,5 | 105 | 140 | 15 | 95 | 75 | 105 | 1,5 | 1 | 163 000 | 360 000 | 15 400 | 0,75 | 2 400 |
| — | — | — | — | — | 80 | 94 | 1 | 1 | 75 000 | 190 000 | 8 500 | 0,22 | 3 400 |
| 45 | — | — | — | — | 80 | 98 | 1 | 1 | 75 000 | 190 000 | 8 500 | 0,22 | 3 400 |
| 45 | 98 | 120 | 10 | 58 | 80 | 98 | 1 | 1 | 75 000 | 190 000 | 8 500 | 0,22 | 3 400 |
| — | — | — | — | — | 80 | 104 | 1,5 | 1 | 160 000 | 360 000 | 15 100 | 0,8 | 2 400 |
| 45,5 | — | — | — | — | 80 | 110 | 1,5 | 1 | 160 000 | 360 000 | 15 100 | 0,8 | 2 400 |
| 45,5 | 110 | 145 | 15 | 95 | 80 | 110 | 1,5 | 1 | 160 000 | 360 000 | 15 100 | 0,8 | 2 400 |

Axial deep groove ball bearings

Double direction



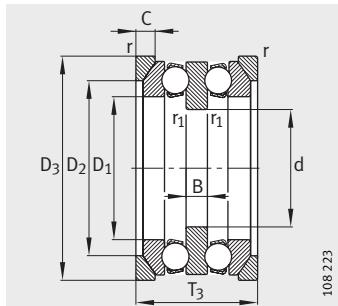
522, 523



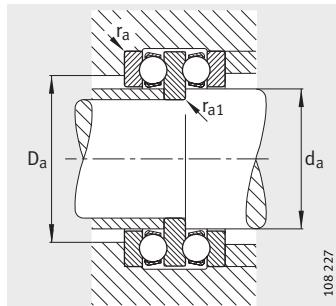
542, 543
Spherical housing locating
washers

Dimension table (continued) · Dimensions in mm

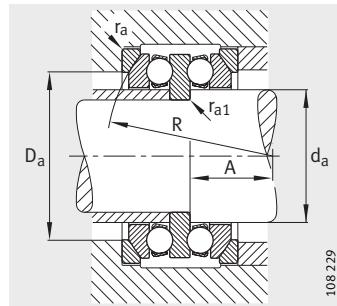
| Designation | | Mass m | | Dimensions | | | | | | | |
|-------------|----------------|---------|--------------------|------------|-----|----------------|----------------|----|--------|---------------------|-----|
| Bearing | Seating washer | Bearing | Seating washer ≈kg | d | D | T ₂ | D ₁ | B | r min. | r ₁ min. | R |
| 52217 | – | 2,23 | – | 70 | 125 | 55 | 88 | 12 | 1 | 1 | – |
| 54217 | – | 2,25 | – | 70 | 125 | 59,2 | 88 | 12 | 1 | 1 | 100 |
| 54217 | U217 | 2,25 | 0,29 | 70 | 125 | 59,2 | 88 | 12 | 1 | 1 | 100 |
| 52317 | – | 6,21 | – | 70 | 150 | 87 | 88 | 19 | 1,5 | 1 | – |
| 54317 | – | 6,27 | – | 70 | 150 | 95,2 | 88 | 19 | 1,5 | 1 | 112 |
| 54317 | U317 | 6,27 | 0,803 | 70 | 150 | 95,2 | 88 | 19 | 1,5 | 1 | 112 |
| 52218 | – | 3,05 | – | 75 | 135 | 62 | 93 | 14 | 1,1 | 1 | – |
| 54218 | – | 3,11 | – | 75 | 135 | 69 | 93 | 14 | 1,1 | 1 | 100 |
| 54218 | U218 | 3,11 | 0,425 | 75 | 135 | 69 | 93 | 14 | 1,1 | 1 | 100 |
| 52318 | – | 6,62 | – | 75 | 155 | 88 | 93 | 19 | 1,5 | 1 | – |
| 54318 | – | 6,74 | – | 75 | 155 | 97,2 | 93 | 19 | 1,5 | 1 | 112 |
| 54318 | U318 | 6,74 | 0,83 | 75 | 155 | 97,2 | 93 | 19 | 1,5 | 1 | 112 |
| 52220 | – | 3,83 | – | 85 | 150 | 67 | 103 | 15 | 1,1 | 1 | – |
| 54220 | – | 3,87 | – | 85 | 150 | 72,8 | 103 | 15 | 1,1 | 1 | 112 |
| 54220 | U220 | 3,87 | 0,507 | 85 | 150 | 72,8 | 103 | 15 | 1,1 | 1 | 112 |
| 52320 | – | 8,71 | – | 85 | 170 | 97 | 103 | 21 | 1,5 | 1 | – |
| 54320 | – | 8,81 | – | 85 | 170 | 105,4 | 103 | 21 | 1,5 | 1 | 125 |
| 54320 | U320 | 8,81 | 0,95 | 85 | 170 | 105,4 | 103 | 21 | 1,5 | 1 | 125 |
| 52222 | – | 4,06 | – | 95 | 160 | 67 | 113 | 15 | 1,1 | 1 | – |
| 52322-MP | – | 14 | – | 95 | 190 | 110 | 113 | 24 | 2 | 1 | – |
| 54322-MP | – | 14 | – | 95 | 190 | 118,4 | 113 | 24 | 2 | 1 | 140 |
| 54322-MP | U322 | 14 | 1,28 | 95 | 190 | 118,4 | 113 | 24 | 2 | 1 | 140 |
| 52224 | – | 4,82 | – | 100 | 170 | 68 | 123 | 15 | 1,1 | 1,1 | – |
| 52324-MP | – | 16,8 | – | 100 | 210 | 123 | 123 | 27 | 2,1 | 1,1 | – |
| 52226 | – | 7,26 | – | 110 | 190 | 80 | 133 | 18 | 1,5 | 1,1 | – |
| 52326-MP | – | 22 | – | 110 | 225 | 130 | 134 | 30 | 2,1 | 1,1 | – |
| 52228 | – | 7,78 | – | 120 | 200 | 81 | 143 | 18 | 1,5 | 1,1 | – |
| 52328-MP | – | 28,3 | – | 120 | 240 | 140 | 144 | 31 | 2,1 | 1,1 | – |
| 52230-MP | – | 10,7 | – | 130 | 215 | 89 | 153 | 20 | 1,5 | 1,1 | – |
| 52330-MP | – | 29,4 | – | 130 | 250 | 140 | 154 | 31 | 2,1 | 1,1 | – |
| 52232-MP | – | 12,2 | – | 140 | 225 | 90 | 163 | 20 | 1,5 | 1,1 | – |
| 52234-MP | – | 14 | – | 150 | 240 | 97 | 173 | 21 | 1,5 | 1,1 | – |



542, 543
Spherical housing locating
washers, seating washers U2, U3



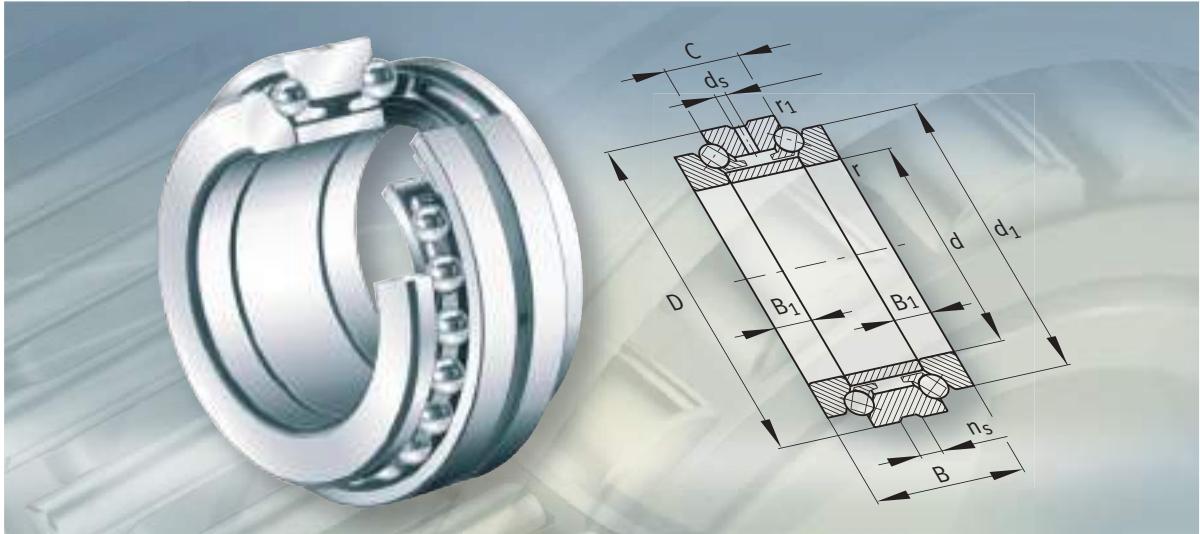
Mounting dimensions



Mounting dimensions

| A | D ₂ | D ₃ | C | T ₃ | Mounting dimensions | | | | Basic load ratings | | Fatigue limit load C _{ua} N | Minimum load factor A | Limiting speed min ⁻¹ |
|------|----------------|----------------|------|----------------|------------------------|------------------------|------------------------|-------------------------|-----------------------------|-------------------------------|--|--------------------------|-------------------------------------|
| | | | | | d _a max. | D _a max. | r _a max. | r _{a1} max. | dyn. C _a N | stat. C _{0a} N | | | |
| - | - | - | - | - | 85 | 101 | 1 | 1 | 98 000 | 250 000 | 10 900 | 0,38 | 3 000 |
| 49,5 | - | - | - | - | 85 | 105 | 1 | 1 | 98 000 | 250 000 | 10 900 | 0,38 | 3 000 |
| 49,5 | 105 | 130 | 11 | 67 | 85 | 105 | 1 | 1 | 98 000 | 250 000 | 10 900 | 0,38 | 3 000 |
| - | - | - | - | - | 85 | 111 | 1,5 | 1 | 186 000 | 415 000 | 16 700 | 1,1 | 2 200 |
| 39 | - | - | - | - | 85 | 115 | 1,5 | 1 | 186 000 | 415 000 | 16 700 | 1,1 | 2 200 |
| 39 | 115 | 155 | 17,5 | 105 | 85 | 115 | 1,5 | 1 | 186 000 | 415 000 | 16 700 | 1,1 | 2 200 |
| - | - | - | - | - | 90 | 108 | 1 | 1 | 118 000 | 300 000 | 12 300 | 0,53 | 2 800 |
| 42 | - | - | - | - | 90 | 110 | 1 | 1 | 118 000 | 300 000 | 12 300 | 0,53 | 2 800 |
| 42 | 110 | 140 | 13,5 | 76 | 90 | 110 | 1 | 1 | 118 000 | 300 000 | 12 300 | 0,53 | 2 800 |
| - | - | - | - | - | 90 | 116 | 1,5 | 1 | 193 000 | 455 000 | 17 700 | 1,2 | 2 000 |
| 36,5 | - | - | - | - | 90 | 120 | 1,5 | 1 | 193 000 | 455 000 | 17 700 | 1,2 | 2 000 |
| 36,5 | 120 | 160 | 18 | 106 | 90 | 120 | 1,5 | 1 | 193 000 | 455 000 | 17 700 | 1,2 | 2 000 |
| - | - | - | - | - | 100 | 120 | 1 | 1 | 122 000 | 320 000 | 14 400 | 0,67 | 2 600 |
| 49 | - | - | - | - | 100 | 125 | 1 | 1 | 122 000 | 320 000 | 14 400 | 0,67 | 2 600 |
| 49 | 125 | 155 | 14 | 81 | 100 | 125 | 1 | 1 | 122 000 | 320 000 | 14 400 | 0,67 | 2 600 |
| - | - | - | - | - | 100 | 128 | 1,5 | 1 | 240 000 | 585 000 | 21 900 | 1,9 | 1 900 |
| 42 | - | - | - | - | 100 | 135 | 1,5 | 1 | 240 000 | 585 000 | 21 900 | 1,9 | 1 900 |
| 42 | 135 | 175 | 18 | 115 | 100 | 135 | 1,5 | 1 | 240 000 | 585 000 | 21 900 | 1,9 | 1 900 |
| - | - | - | - | - | 110 | 130 | 1 | 1 | 134 000 | 365 000 | 16 000 | 0,85 | 2 400 |
| - | - | - | - | - | 110 | 142 | 2 | 1 | 280 000 | 750 000 | 27 000 | 3 | 1 700 |
| 47 | - | - | - | - | 110 | 150 | 2 | 1 | 280 000 | 750 000 | 27 000 | 3 | 1 700 |
| 47 | 150 | 195 | 20,5 | 128 | 110 | 150 | 2 | 1 | 280 000 | 750 000 | 27 000 | 3 | 1 700 |
| - | - | - | - | - | 120 | 140 | 1 | 1 | 134 000 | 390 000 | 14 200 | 0,95 | 2 200 |
| - | - | - | - | - | 120 | 156 | 2,1 | 1 | 325 000 | 915 000 | 31 500 | 4,5 | 1 600 |
| - | - | - | - | - | 130 | 154 | 1,5 | 1 | 183 000 | 540 000 | 18 900 | 1,7 | 1 900 |
| - | - | - | - | - | 130 | 168 | 2,1 | 1 | 360 000 | 1 060 000 | 35 000 | 6 | 1 500 |
| - | - | - | - | - | 140 | 164 | 1,5 | 1 | 190 000 | 570 000 | 19 200 | 1,9 | 1 900 |
| - | - | - | - | - | 140 | 180 | 2,1 | 1 | 405 000 | 1 250 000 | 40 000 | 8 | 1 400 |
| - | - | - | - | - | 150 | 176 | 1,5 | 1 | 236 000 | 735 000 | 24 200 | 2,8 | 1 800 |
| - | - | - | - | - | 150 | 190 | 2,1 | 1 | 415 000 | 1 340 000 | 41 500 | 9,5 | 1 400 |
| - | - | - | - | - | 160 | 186 | 1,5 | 1 | 240 000 | 765 000 | 24 700 | 3,2 | 1 700 |
| - | - | - | - | - | 170 | 198 | 1,5 | 1 | 285 000 | 930 000 | 28 500 | 4,5 | 1 600 |

FAG



Axial angular contact ball bearings



Axial angular contact ball bearings

| | Page |
|-------------------------------------|--|
| Product overview | Axial angular contact ball bearings..... |
| Features | Operating temperature 751 Cages 751 Suffixes 751 |
| Design and safety guidelines | Equivalent dynamic bearing load 752 Equivalent static bearing load 752 Static load safety factor 752 Speeds 752 Preload 752 Mounting dimensions 752 |
| Accuracy | 753 |
| Dimension tables | Axial angular contact ball bearings, double direction..... 754 |

Product overview Axial angular contact ball bearings

Double direction

2344, 2347



Axial angular contact ball bearings



| | |
|--|---|
| Features | Double direction axial angular contact ball bearings are precision bearings without self-retention and with restricted tolerances to class SP. They comprise solid shaft locating washers, a spacer ring, a housing locating washer and ball and cage assemblies with solid brass cages. The bearing parts are matched to each other and can be fitted separately, but must not be interchanged with parts from bearings of the same size. |
| High axial load carrying capacity | The contact angle is 60°. As a result, these highly rigid axial angular contact ball bearings can support high axial forces in both directions. The double direction precision bearings are therefore particularly suitable for precision spindle bearing arrangements in machine tools. In this case, the axial angular contact ball bearing is combined with a double row cylindrical roller bearing with a tapered bore, which supports the radial forces. |
| Two designs | Axial angular contact ball bearings are available in two designs. Series 2344 can be fitted on the small diameter of the shaft taper and series 2347 on the large diameter. These series have the same nominal outside diameter as cylindrical roller bearings NN30..-AS-K. However, the outside diameter tolerance is designed to give a loose fit when the seats of the axial angular contact ball bearing and the cylindrical roller bearing are machined together. Guide values for the machining tolerances of the bearing seats are given in the publication Super Precision Bearings AC 41 130. |
| Sealing/lubrication | The bearings are not sealed and not greased. They can be lubricated using oil or grease. Higher speeds can be achieved with oil lubrication. In order to allow oil to flow between the two rows of balls, the housing locating washer has a lubrication groove and lubrication holes. At high speeds, over lubrication of the radial bearing can be prevented if the installation space is separated between the axial angular contact ball bearing and the cylindrical roller bearing. |
| Operating temperature | Axial angular contact ball bearings can be used at operating temperatures from -30 °C to +150 °C, restricted by the lubricant. |
| Cages | Each row of rolling elements has a ball-guided solid brass cage. The cage is indicated by the suffix M and, together with the lubrication, has a considerable influence on the speed suitability of the bearing. |
| Suffixes | Suffixes for available designs: see table. |

Available designs

| Suffix | Description | Design |
|--------|-------------------------------|------------------------------|
| M | Solid brass cage, ball-guided | Standard |
| SP | Restricted tolerance class SP | Standard |
| UP | Restricted tolerance class UP | Special design ¹⁾ |

¹⁾ Available by agreement.

Axial angular contact ball bearings

| Design and safety guidelines | Axial angular contact ball bearings, installed adjacent to a cylindrical roller bearing, support axial forces only: |
|---------------------------------|--|
| Equivalent dynamic bearing load | $P = F_a$ $P \quad N$ Equivalent dynamic bearing load $F_a \quad N$ Axial dynamic bearing load. |
| Equivalent static bearing load | Axial angular contact ball bearings, installed adjacent to a cylindrical roller bearing, support axial forces only: $P_0 = F_{0a}$ $P_0 \quad N$ Equivalent static bearing load $F_{0a} \quad N$ Axial static bearing load. |
| Static load safety factor | In order to achieve sufficiently smooth running of the bearings, a static load safety factor $S_0 \geq 2,5$ is required: $S_0 = \frac{C_{0a}}{P_0}$ $S_0 \quad -$ Static load safety factor $C_{0a} \quad N$ Basic static load rating according to dimension tables $P_0 \quad N$ Equivalent static bearing load. |
| Speeds | Double direction axial angular contact ball bearings are suitable for high speeds. Under certain circumstances, the high values may not be achieved if the cylindrical roller bearing arranged adjacent to the axial angular contact ball bearing is preloaded. |
| Caution! | The limiting speeds n_G given in the dimension tables are valid for lubrication with grease or for minimal quantity lubrication with oil and must not be exceeded. |
| Preload | The preload is determined by the spacer ring arranged between the two shaft locating washers. |
| Mounting dimensions | The maximum values for the radii r_a and the diameters of the abutment surfaces d_a , D_a are indicated in the dimension tables. |



Accuracy

The dimensional and geometrical tolerances correspond to the Schaeffler Group tolerance class SP.

Tolerances for shaft locating washer

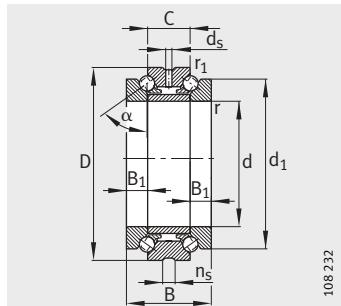
| Bore | | Bore deviation | | V_{dp} μm | S_i μm | Width deviation | |
|---------|----------------------|----------------|------|----------------|-------------|---------------------|------|
| d mm | Δ_{dmp} μm | min. | max. | | | Δ_{Hs} μm | min. |
| 18 | 30 | -8 | 0 | 6 | 3 | -150 | +50 |
| 30 | 50 | -10 | 0 | 8 | 3 | -200 | +75 |
| 50 | 80 | -12 | 0 | 9 | 4 | -250 | +100 |
| 80 | 120 | -15 | 0 | 11 | 4 | -300 | +125 |
| 120 | 180 | -18 | 0 | 14 | 5 | -350 | +150 |
| 180 | 250 | -22 | 0 | 17 | 5 | -400 | +175 |
| 250 | 315 | -25 | 0 | 19 | 7 | -450 | +200 |
| 315 | 400 | -30 | 0 | 22 | 7 | -600 | +250 |
| 400 | 500 | -35 | 0 | 26 | 9 | -750 | +300 |

Tolerances for housing locating washer

| Outside diameter | | Deviation of outside diameter | | V_{Dp} μm | Wall thickness variation | |
|------------------|----------------------|-------------------------------|------|----------------|--|--|
| D mm | Δ_{Dmp} μm | min. | max. | | S_e μm | |
| 50 | 80 | -43 | -24 | 6 | The wall thickness variation S_e for the housing locating washer is identical to S_i for the shaft locating washer | |
| 80 | 120 | -50 | -28 | 8 | | |
| 120 | 180 | -58 | -33 | 9 | | |
| 180 | 250 | -66 | -37 | 10 | | |
| 250 | 315 | -73 | -41 | 12 | | |
| 315 | 400 | -82 | -46 | 13 | | |
| 400 | 500 | -90 | -50 | 15 | | |
| 500 | 630 | -99 | -55 | 16 | | |

Axial angular contact ball bearings

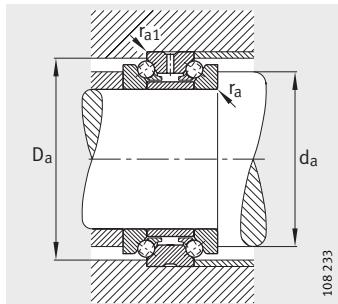
Double direction



2344, 2347
Contact angle $\alpha = 60^\circ$

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | |
|-------------|------------------|------------|-----|----|----|----------------|----------------|-----------|------------------------|
| | | d | D | B | C | d ₁ | B ₁ | r min. | r ₁ min. |
| 234406-M-SP | 0,297 | 30 | 55 | 32 | 16 | 47 | 8 | 1 | 0,15 |
| 234706-M-SP | 0,232 | 32 | 55 | 32 | 16 | 47 | 8 | 1 | 0,15 |
| 234407-M-SP | 0,318 | 35 | 62 | 34 | 17 | 53 | 8,5 | 1 | 0,15 |
| 234707-M-SP | 0,302 | 37 | 62 | 34 | 17 | 53 | 8,5 | 1 | 0,15 |
| 234408-M-SP | 0,39 | 40 | 68 | 36 | 18 | 58,5 | 9 | 1 | 0,15 |
| 234708-M-SP | 0,371 | 42 | 68 | 36 | 18 | 58,5 | 9 | 1 | 0,15 |
| 234409-M-SP | 0,486 | 45 | 75 | 38 | 19 | 65 | 9,5 | 1 | 0,15 |
| 234709-M-SP | 0,472 | 47 | 75 | 38 | 19 | 65 | 9,5 | 1 | 0,15 |
| 234410-M-SP | 0,485 | 50 | 80 | 38 | 19 | 70 | 9,5 | 1 | 0,15 |
| 234710-M-SP | 0,408 | 52 | 80 | 38 | 19 | 70 | 9,5 | 1 | 0,15 |
| 234411-M-SP | 0,944 | 55 | 90 | 44 | 22 | 78 | 11 | 1,1 | 0,3 |
| 234711-M-SP | 0,884 | 57 | 90 | 44 | 22 | 78 | 11 | 1,1 | 0,3 |
| 234412-M-SP | 0,884 | 60 | 95 | 44 | 22 | 83 | 11 | 1,1 | 0,3 |
| 234712-M-SP | 0,852 | 62 | 95 | 44 | 22 | 83 | 11 | 1,1 | 0,3 |
| 234413-M-SP | 0,898 | 65 | 100 | 44 | 22 | 88 | 11 | 1,1 | 0,3 |
| 234713-M-SP | 0,862 | 67 | 100 | 44 | 22 | 88 | 11 | 1,1 | 0,3 |
| 234414-M-SP | 1,22 | 70 | 110 | 48 | 24 | 97 | 12 | 1,1 | 0,3 |
| 234714-M-SP | 1,16 | 73 | 110 | 48 | 24 | 97 | 12 | 1,1 | 0,3 |
| 234415-M-SP | 1,22 | 75 | 115 | 48 | 24 | 102 | 12 | 1,1 | 0,3 |
| 234715-M-SP | 1,22 | 78 | 115 | 48 | 24 | 102 | 12 | 1,1 | 0,3 |
| 234416-M-SP | 1,79 | 80 | 125 | 54 | 27 | 110 | 13,5 | 1,1 | 0,3 |
| 234716-M-SP | 1,69 | 83 | 125 | 54 | 27 | 110 | 13,5 | 1,1 | 0,3 |
| 234417-M-SP | 1,85 | 85 | 130 | 54 | 27 | 115 | 13,5 | 1,1 | 0,3 |
| 234717-M-SP | 1,77 | 88 | 130 | 54 | 27 | 115 | 13,5 | 1,1 | 0,3 |
| 234418-M-SP | 2,45 | 90 | 140 | 60 | 30 | 123 | 15 | 1,5 | 0,3 |
| 234718-M-SP | 2,35 | 93 | 140 | 60 | 30 | 123 | 15 | 1,5 | 0,3 |
| 234419-M-SP | 2,55 | 95 | 145 | 60 | 30 | 128 | 15 | 1,5 | 0,3 |
| 234719-M-SP | 2,45 | 98 | 145 | 60 | 30 | 128 | 15 | 1,5 | 0,3 |
| 234420-M-SP | 2,66 | 100 | 150 | 60 | 30 | 133 | 15 | 1,5 | 0,3 |
| 234720-M-SP | 2,54 | 103 | 150 | 60 | 30 | 133 | 15 | 1,5 | 0,3 |
| 234421-M-SP | 3,41 | 105 | 160 | 66 | 33 | 142 | 16,5 | 2 | 0,6 |
| 234721-M-SP | 3,24 | 109 | 160 | 66 | 33 | 142 | 16,5 | 2 | 0,6 |



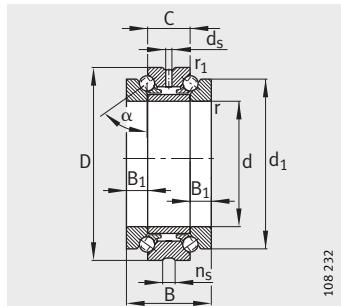
Mounting dimensions



| | | Mounting dimensions | | | | Basic load ratings | | Fatigue limit load C_uu N | Limiting speeds | |
|-----|-----|---------------------|------------|-------------|--------------|--------------------|--------------------|---------------------------------|---------------------|------------------|
| d_s | n_s | d_a h12 | D_a H12 | r_a max. | r_a1 max. | dyn. C_a N | stat. C_0a N | | n_G grease min⁻¹ | n_G oil min⁻¹ |
| 3,2 | 4,8 | 40,5 | 50,5 | 1 | 0,15 | 15 300 | 36 000 | 3 250 | 11 000 | 16 000 |
| 3,2 | 4,8 | 40,5 | 50,5 | 1 | 0,15 | 15 300 | 36 000 | 3 250 | 11 000 | 16 000 |
| 3,2 | 4,8 | 46,5 | 57 | 1 | 0,15 | 18 900 | 47 000 | 4 250 | 9 500 | 14 000 |
| 3,2 | 4,8 | 46,5 | 57 | 1 | 0,15 | 18 900 | 47 000 | 4 250 | 9 500 | 14 000 |
| 3,2 | 4,8 | 51,5 | 63,5 | 1 | 0,15 | 22 900 | 59 000 | 5 300 | 8 500 | 12 000 |
| 3,2 | 4,8 | 51,5 | 63,5 | 1 | 0,15 | 22 900 | 59 000 | 5 300 | 8 500 | 12 000 |
| 3,2 | 4,8 | 57,5 | 70 | 1 | 0,15 | 25 000 | 67 000 | 6 000 | 7 500 | 10 000 |
| 3,2 | 4,8 | 57,5 | 70 | 1 | 0,15 | 25 000 | 67 000 | 6 000 | 7 500 | 10 000 |
| 3,2 | 4,8 | 62,5 | 75 | 1 | 0,15 | 26 000 | 72 000 | 6 500 | 7 000 | 9 500 |
| 3,2 | 4,8 | 62,5 | 75 | 1 | 0,15 | 26 000 | 72 000 | 6 500 | 7 000 | 9 500 |
| 3,2 | 6,5 | 69 | 84,5 | 1 | 0,3 | 36 500 | 99 000 | 8 900 | 6 300 | 8 500 |
| 3,2 | 6,5 | 69 | 84,5 | 1 | 0,3 | 36 500 | 99 000 | 8 900 | 6 300 | 8 500 |
| 3,2 | 6,5 | 74 | 89,5 | 1 | 0,3 | 36 000 | 98 000 | 8 900 | 6 000 | 8 000 |
| 3,2 | 6,5 | 74 | 89,5 | 1 | 0,3 | 36 000 | 98 000 | 8 900 | 6 000 | 8 000 |
| 3,2 | 6,5 | 79 | 94,5 | 1 | 0,3 | 38 500 | 111 000 | 10 000 | 5 600 | 7 500 |
| 3,2 | 6,5 | 79 | 94,5 | 1 | 0,3 | 38 500 | 111 000 | 10 000 | 5 600 | 7 500 |
| 3,2 | 6,5 | 86,5 | 103,5 | 1 | 0,3 | 46 000 | 134 000 | 12 100 | 5 300 | 7 000 |
| 3,2 | 6,5 | 86,5 | 103,5 | 1 | 0,3 | 46 000 | 134 000 | 12 100 | 5 300 | 7 000 |
| 3,2 | 6,5 | 91,5 | 108,5 | 1 | 0,3 | 47 500 | 144 000 | 12 900 | 5 000 | 6 700 |
| 3,2 | 6,5 | 91,5 | 108,5 | 1 | 0,3 | 47 500 | 144 000 | 12 900 | 5 000 | 6 700 |
| 3,2 | 6,5 | 98,5 | 117 | 1 | 0,3 | 56 000 | 175 000 | 15 500 | 4 500 | 6 000 |
| 3,2 | 6,5 | 98,5 | 117 | 1 | 0,3 | 56 000 | 175 000 | 15 500 | 4 500 | 6 000 |
| 4,8 | 9,5 | 103,5 | 122 | 1 | 0,3 | 57 000 | 181 000 | 15 600 | 4 500 | 6 000 |
| 4,8 | 9,5 | 103,5 | 122 | 1 | 0,3 | 57 000 | 181 000 | 15 600 | 4 500 | 6 000 |
| 4,8 | 9,5 | 110,5 | 130,5 | 1,5 | 0,3 | 66 000 | 213 000 | 17 700 | 4 000 | 5 300 |
| 4,8 | 9,5 | 110,5 | 130,5 | 1,5 | 0,3 | 66 000 | 213 000 | 17 700 | 4 000 | 5 300 |
| 4,8 | 9,5 | 115,5 | 135,5 | 1,5 | 0,3 | 66 000 | 219 000 | 17 900 | 4 000 | 5 300 |
| 4,8 | 9,5 | 115,5 | 135,5 | 1,5 | 0,3 | 66 000 | 219 000 | 17 900 | 4 000 | 5 300 |
| 4,8 | 9,5 | 120,5 | 140,5 | 1,5 | 0,3 | 67 000 | 226 000 | 18 100 | 3 800 | 5 000 |
| 4,8 | 9,5 | 120,5 | 140,5 | 1,5 | 0,3 | 67 000 | 226 000 | 18 100 | 3 800 | 5 000 |
| 4,8 | 9,5 | 128 | 150 | 2 | 0,6 | 74 000 | 250 000 | 19 500 | 3 600 | 4 800 |
| 4,8 | 9,5 | 128 | 150 | 2 | 0,6 | 74 000 | 250 000 | 19 500 | 3 600 | 4 800 |

Axial angular contact ball bearings

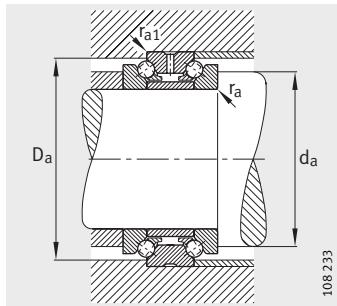
Double direction



2344, 2347
Contact angle $\alpha = 60^\circ$

Dimension table (continued) - Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | |
|-------------|------------------|------------|-----|-----|----|----------------|----------------|-----------|------------------------|
| | | d | D | B | C | d ₁ | B ₁ | r min. | r ₁ min. |
| 234422-M-SP | 4,75 | 110 | 170 | 72 | 36 | 150 | 18 | 2 | 0,6 |
| 234722-M-SP | 4,51 | 114 | 170 | 72 | 36 | 150 | 18 | 2 | 0,6 |
| 234424-M-SP | 4,72 | 120 | 180 | 72 | 36 | 160 | 18 | 2 | 0,6 |
| 234724-M-SP | 4,46 | 124 | 180 | 72 | 36 | 160 | 18 | 2 | 0,6 |
| 234426-M-SP | 6,86 | 130 | 200 | 84 | 42 | 177 | 21 | 2 | 0,6 |
| 234726-M-SP | 6,52 | 135 | 200 | 84 | 42 | 177 | 21 | 2 | 0,6 |
| 234428-M-SP | 8,78 | 140 | 210 | 84 | 42 | 187 | 21 | 2,1 | 0,6 |
| 234728-M-SP | 8,07 | 145 | 210 | 84 | 42 | 187 | 21 | 2,1 | 0,6 |
| 234430-M-SP | 9,21 | 150 | 225 | 90 | 45 | 200 | 22,5 | 2,1 | 0,6 |
| 234730-M-SP | 8,79 | 155 | 225 | 90 | 45 | 200 | 22,5 | 2,1 | 0,6 |
| 234432-M-SP | 11,1 | 160 | 240 | 96 | 48 | 212 | 24 | 2,1 | 0,6 |
| 234732-M-SP | 10,7 | 165 | 240 | 96 | 48 | 212 | 24 | 2,1 | 0,6 |
| 234434-M-SP | 15,3 | 170 | 260 | 108 | 54 | 230 | 27 | 2,1 | 0,6 |
| 234734-M-SP | 14,6 | 176 | 260 | 108 | 54 | 230 | 27 | 2,1 | 0,6 |
| 234436-M-SP | 20,5 | 180 | 280 | 120 | 60 | 248 | 30 | 2,1 | 0,6 |
| 234736-M-SP | 19,6 | 187 | 280 | 120 | 60 | 248 | 30 | 2,1 | 0,6 |
| 234438-M-SP | 24,1 | 190 | 290 | 120 | 60 | 258 | 30 | 2,1 | 0,6 |
| 234738-M-SP | 21,2 | 197 | 290 | 120 | 60 | 258 | 30 | 2,1 | 0,6 |
| 234440-M-SP | 30,9 | 200 | 310 | 132 | 66 | 274 | 33 | 2,1 | 0,6 |
| 234740-M-SP | 28,6 | 207 | 310 | 132 | 66 | 274 | 33 | 2,1 | 0,6 |
| 234444-M-SP | 36,9 | 220 | 340 | 144 | 72 | 304 | 36 | 3 | 1,1 |
| 234744-M-SP | 35,3 | 228 | 340 | 144 | 72 | 304 | 36 | 3 | 1,1 |
| 234448-M-SP | 38,9 | 240 | 360 | 144 | 72 | 322 | 36 | 3 | 1,1 |
| 234748-M-SP | 37,2 | 248 | 360 | 144 | 72 | 322 | 36 | 3 | 1,1 |
| 234452-M-SP | 56,5 | 260 | 400 | 164 | 82 | 354 | 41 | 4 | 1,5 |
| 234752-M-SP | 54,1 | 269 | 400 | 164 | 82 | 354 | 41 | 4 | 1,5 |
| 234456-M-SP | 57,1 | 280 | 420 | 164 | 82 | 374 | 41 | 4 | 1,5 |
| 234756-M-SP | 54,5 | 289 | 420 | 164 | 82 | 374 | 41 | 4 | 1,5 |
| 234460-M-SP | 90,7 | 300 | 460 | 190 | 95 | 406 | 47,5 | 4 | 1,5 |
| 234760-M-SP | 86,5 | 310 | 460 | 190 | 95 | 406 | 47,5 | 4 | 1,5 |
| 234464-M-SP | 90,3 | 320 | 480 | 190 | 95 | 426 | 47,5 | 4 | 1,5 |
| 234764-M-SP | 86,5 | 330 | 480 | 190 | 95 | 426 | 47,5 | 4 | 1,5 |

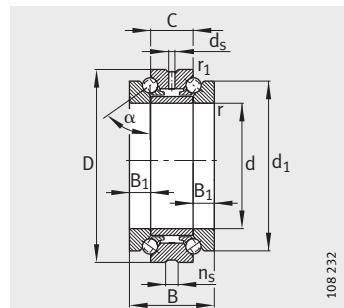


Mounting dimensions

| | | Mounting dimensions | | | | Basic load ratings | | Fatigue limit load C_{ua} N | Limiting speeds | |
|-------|-------|---------------------|--------------|---------------|------------------|--------------------|------------------------|-------------------------------------|-----------------------------------|--------------------------------|
| d_s | n_s | d_a h12 | D_a H12 | r_a max. | r_{a1} max. | dyn. C_a N | stat. C_{0a} N | | n_G grease min^{-1} | n_G oil min^{-1} |
| 4,8 | 9,5 | 134,5 | 160 | 2 | 0,6 | 98 000 | 325 000 | 24 400 | 3 400 | 4 500 |
| 4,8 | 9,5 | 134,5 | 160 | 2 | 0,6 | 98 000 | 325 000 | 24 400 | 3 400 | 4 500 |
| 4,8 | 9,5 | 144,5 | 170 | 2 | 0,6 | 101 000 | 345 000 | 25 000 | 3 200 | 4 300 |
| 4,8 | 9,5 | 144,5 | 170 | 2 | 0,6 | 101 000 | 345 000 | 25 000 | 3 200 | 4 300 |
| 6,3 | 12,2 | 159 | 188 | 2 | 0,6 | 128 000 | 440 000 | 30 500 | 2 800 | 3 800 |
| 6,3 | 12,2 | 159 | 188 | 2 | 0,6 | 128 000 | 440 000 | 30 500 | 2 800 | 3 800 |
| 6,3 | 12,2 | 169 | 198 | 2,1 | 0,6 | 132 000 | 470 000 | 31 500 | 2 600 | 3 600 |
| 6,3 | 12,2 | 169 | 198 | 2,1 | 0,6 | 132 000 | 470 000 | 31 500 | 2 600 | 3 600 |
| 8 | 15 | 181 | 211,5 | 2,1 | 0,6 | 142 000 | 520 000 | 34 000 | 2 600 | 3 600 |
| 8 | 15 | 181 | 211,5 | 2,1 | 0,6 | 142 000 | 520 000 | 34 000 | 2 600 | 3 600 |
| 8 | 15 | 192,5 | 226 | 2,1 | 0,6 | 168 000 | 600 000 | 38 000 | 2 400 | 3 400 |
| 8 | 15 | 192,5 | 226 | 2,1 | 0,6 | 168 000 | 600 000 | 38 000 | 2 400 | 3 400 |
| 8 | 15 | 206,5 | 245 | 2,1 | 0,6 | 207 000 | 740 000 | 45 500 | 2 200 | 3 200 |
| 8 | 15 | 206,5 | 245 | 2,1 | 0,6 | 207 000 | 740 000 | 45 500 | 2 200 | 3 200 |
| 8 | 15 | 221 | 263 | 2,1 | 0,6 | 235 000 | 840 000 | 49 500 | 2 000 | 3 000 |
| 8 | 15 | 221 | 263 | 2,1 | 0,6 | 235 000 | 840 000 | 49 500 | 2 000 | 3 000 |
| 8 | 15 | 231 | 273 | 2,1 | 0,6 | 244 000 | 900 000 | 52 000 | 1 900 | 2 800 |
| 8 | 15 | 231 | 273 | 2,1 | 0,6 | 244 000 | 900 000 | 52 000 | 1 900 | 2 800 |
| 8 | 15 | 245 | 291,5 | 2,1 | 0,6 | 285 000 | 1 060 000 | 59 000 | 1 800 | 2 600 |
| 8 | 15 | 245 | 291,5 | 2,1 | 0,6 | 285 000 | 1 060 000 | 59 000 | 1 800 | 2 600 |
| 9,5 | 17,7 | 269 | 318 | 2,5 | 1 | 340 000 | 1 330 000 | 71 000 | 1 600 | 2 200 |
| 9,5 | 17,7 | 269 | 318 | 2,5 | 1 | 340 000 | 1 330 000 | 71 000 | 1 600 | 2 200 |
| 9,5 | 17,7 | 289 | 338 | 2,5 | 1 | 350 000 | 1 420 000 | 73 000 | 1 500 | 2 000 |
| 9,5 | 17,7 | 289 | 338 | 2,5 | 1 | 350 000 | 1 420 000 | 73 000 | 1 500 | 2 000 |
| 9,5 | 17,7 | 317,5 | 374,5 | 3 | 1,5 | 400 000 | 1 680 000 | 83 000 | 1 400 | 1 900 |
| 9,5 | 17,7 | 317,5 | 374,5 | 3 | 1,5 | 400 000 | 1 680 000 | 83 000 | 1 400 | 1 900 |
| 9,5 | 17,7 | 337,5 | 394,5 | 3 | 1,5 | 415 000 | 1 790 000 | 86 000 | 1 300 | 1 800 |
| 9,5 | 17,7 | 337,5 | 394,5 | 3 | 1,5 | 415 000 | 1 790 000 | 86 000 | 1 300 | 1 800 |
| 9,5 | 17,7 | 366 | 428,5 | 3 | 1,5 | 480 000 | 2 170 000 | 99 000 | 1 200 | 1 700 |
| 9,5 | 17,7 | 366 | 428,5 | 3 | 1,5 | 480 000 | 2 170 000 | 99 000 | 1 200 | 1 700 |
| 9,5 | 17,7 | 386 | 448,5 | 3 | 1,5 | 495 000 | 2 310 000 | 103 000 | 1 200 | 1 700 |
| 9,5 | 17,7 | 386 | 448,5 | 3 | 1,5 | 495 000 | 2 310 000 | 103 000 | 1 200 | 1 700 |

Axial angular contact ball bearings

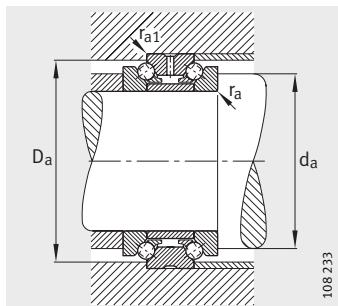
Double direction



2344, 2347
Contact angle $\alpha = 60^\circ$

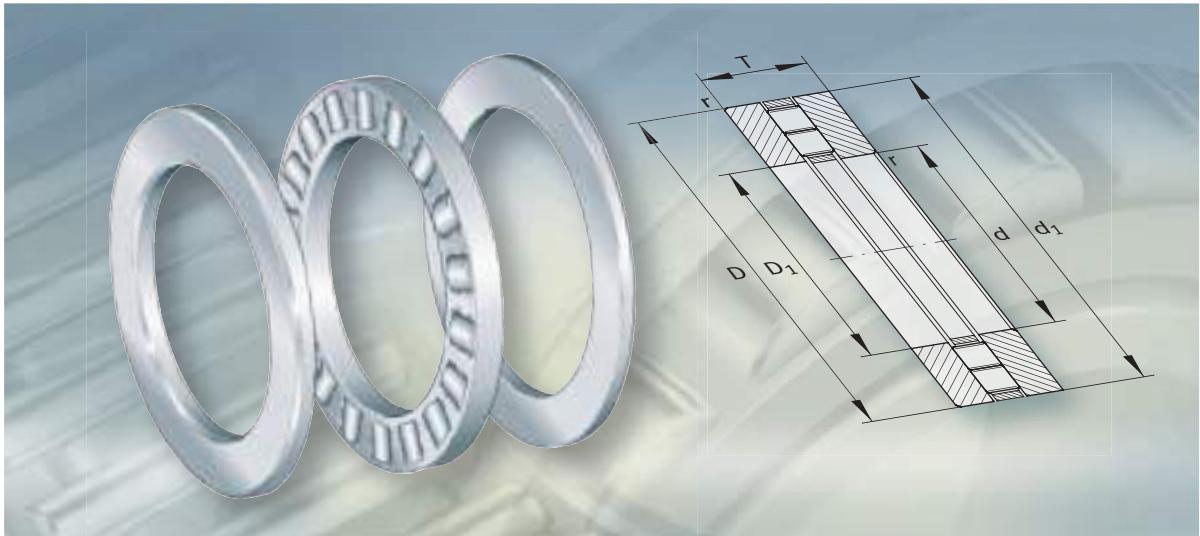
Dimension table (continued) - Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | |
|--------------------|------------------|------------|-----|-----|-----|----------------|----------------|-----------|------------------------|
| | | d | D | B | C | d ₁ | B ₁ | r min. | r ₁ min. |
| 234468-M-SP | 122 | 340 | 520 | 212 | 106 | 459 | 53 | 4 | 1,5 |
| 234768-M-SP | 117 | 350 | 520 | 212 | 106 | 459 | 53 | 4 | 1,5 |
| 234472-M-SP | 128 | 360 | 540 | 212 | 106 | 479 | 53 | 4 | 1,5 |
| 234772-M-SP | 123 | 370 | 540 | 212 | 106 | 479 | 53 | 4 | 1,5 |
| 234476-M-SP | 133 | 380 | 560 | 212 | 106 | 499 | 53 | 4 | 1,5 |
| 234776-M-SP | 128 | 390 | 560 | 212 | 106 | 499 | 53 | 4 | 1,5 |
| 234480-M-SP | 198 | 400 | 600 | 236 | 118 | 532 | 59 | 5 | 2 |
| 234780-M-SP | 187 | 410 | 600 | 236 | 118 | 532 | 59 | 5 | 2 |



Mounting dimensions

| | | Mounting dimensions | | | | Basic load ratings | | Fatigue limit load C_{ua} N | Limiting speeds | |
|-------|-------|---------------------|--------------|---------------|------------------|--------------------|------------------------|-------------------------------------|-----------------------------------|--------------------------------|
| d_s | n_s | d_a h12 | D_a H12 | r_a max. | r_{a1} max. | dyn. C_a N | stat. C_{0a} N | | n_G grease min^{-1} | n_G oil min^{-1} |
| 9,5 | 17,7 | 413 | 485,5 | 3 | 1,5 | 580 000 | 2 850 000 | 124 000 | 1 100 | 1 600 |
| 9,5 | 17,7 | 413 | 485,5 | 3 | 1,5 | 580 000 | 2 850 000 | 124 000 | 1 100 | 1 600 |
| 9,5 | 17,7 | 433 | 505,5 | 3 | 1,5 | 590 000 | 2 950 000 | 125 000 | 1 000 | 1 500 |
| 9,5 | 17,7 | 433 | 505,5 | 3 | 1,5 | 590 000 | 2 950 000 | 125 000 | 1 000 | 1 500 |
| 9,5 | 17,7 | 453 | 525,5 | 3 | 1,5 | 610 000 | 3 150 000 | 130 000 | 1 000 | 1 500 |
| 9,5 | 17,7 | 453 | 525,5 | 3 | 1,5 | 610 000 | 3 150 000 | 130 000 | 1 000 | 1 500 |
| 9,5 | 17,7 | 480 | 561,5 | 4 | 2 | 680 000 | 3 650 000 | 147 000 | 900 | 1 300 |
| 9,5 | 17,7 | 480 | 561,5 | 4 | 2 | 680 000 | 3 650 000 | 147 000 | 900 | 1 300 |



**Axial cylindrical roller bearings
Axial cylindrical roller
and cage assemblies
Axial bearing washers**



Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

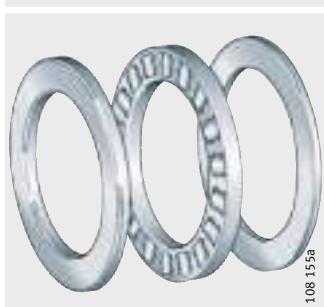
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Product overview Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

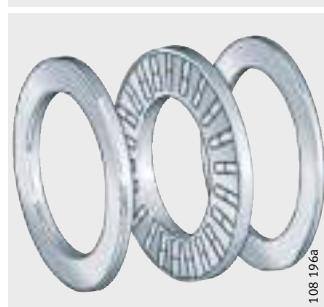
Axial cylindrical roller bearings

Single row and double row

811, 812



893, 894



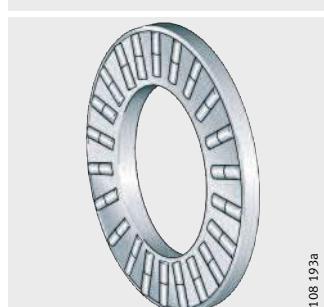
Axial cylindrical roller and cage assemblies

Single row and double row

K811, K812



K893, K894



Housing locating washers Shaft locating washers

GS811, GS812
GS893, GS894



WS811, WS812
WS893, WS894



Bearing washers

LS



Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

| Features | | | | | | | | | | | | | |
|---|--|------------------------------|-------------|--------|-----------------|------------|----------|------------------|--|----------|----|---|------------------------------|
| Axial cylindrical roller bearings | <p>Axial cylindrical roller bearings comprise axial cylindrical roller and cage assemblies K, housing locating washers GS and shaft locating washers WS.</p> <p>Bearings 811, 812 are single row bearings and correspond to DIN 722/ISO 104, bearings 893, 894 are double row bearings and correspond to DIN 616/ISO 104.</p> <p>The cages are made from plastic or brass. Plastic cages have the suffix TV, brass cages have the suffix M. The bearings have very low axial section height, high load capacity, high rigidity and can support axial forces in one direction.</p> | | | | | | | | | | | | |
| Axial cylindrical roller and cage assemblies | <p>The cage assemblies comprise axial cages and one or two rows of cylindrical rollers. The diameter series 1, 2, 3, 4 correspond to DIN 616/ISO 104.</p> <p>The cages are made from plastic or brass. The cage assemblies have very low axial section height, high load capacity and high rigidity. They can support axial forces in one direction and act as a non-locating bearing in a radial direction. Axial cage assemblies are combined with shaft or housing locating washers or are integrated directly in the adjacent construction. If they are used without axial bearing washers, the raceway must be produced as a rolling bearing raceway.</p> | | | | | | | | | | | | |
| Housing locating washers | <p>Housing locating washers are produced by machining, the outside surface is ground and the running surface is precision machined. The diameter series 1, 2, 3, 4 correspond to DIN 616/ISO 104. They are centred on their outer edge and are combined with axial cage assemblies if the adjacent surface cannot be used as a raceway.</p> | | | | | | | | | | | | |
| Shaft locating washers | <p>Shaft locating washers are produced by machining, the bore is ground and the running surface is precision machined. The diameter series 1, 2, 3, 4 correspond to DIN 616/ISO 104. They are centred on their inner edge and are combined with axial cage assemblies if the adjacent surface cannot be used as a raceway.</p> | | | | | | | | | | | | |
| Bearing washers | <p>Bearing washers can be used as housing and shaft locating washers. The bore and outside surface are turned, the running surface is ground. Bearing washers can be used with axial cylindrical roller and cage assemblies K811 and axial needle roller bearings AXK.</p> | | | | | | | | | | | | |
| Operating temperature | <p>Axial cylindrical roller bearings and axial cylindrical roller and cage assemblies can be used at operating temperatures from -30°C to $+150^{\circ}\text{C}$.</p> | | | | | | | | | | | | |
| Caution! | Bearings with plastic cages (suffix TV) are suitable up to $+120^{\circ}\text{C}$. | | | | | | | | | | | | |
| Suffixes | Suffixes for available designs: see table. | | | | | | | | | | | | |
| Available designs | <table border="1"> <thead> <tr> <th>Suffix</th><th>Description</th><th>Design</th></tr> </thead> <tbody> <tr> <td>M¹⁾</td><td>Brass cage</td><td>Standard</td></tr> <tr> <td>TV¹⁾</td><td>Plastic cage made from glass fibre reinforced polyamide 66</td><td>Standard</td></tr> <tr> <td>P5</td><td>High dimensional and geometrical accuracy</td><td>Special design²⁾</td></tr> </tbody> </table> | Suffix | Description | Design | M ¹⁾ | Brass cage | Standard | TV ¹⁾ | Plastic cage made from glass fibre reinforced polyamide 66 | Standard | P5 | High dimensional and geometrical accuracy | Special design ²⁾ |
| Suffix | Description | Design | | | | | | | | | | | |
| M ¹⁾ | Brass cage | Standard | | | | | | | | | | | |
| TV ¹⁾ | Plastic cage made from glass fibre reinforced polyamide 66 | Standard | | | | | | | | | | | |
| P5 | High dimensional and geometrical accuracy | Special design ²⁾ | | | | | | | | | | | |



¹⁾ Depending on series and size.

²⁾ By agreement for axial bearing washers GS, WS.

Axial cylindrical roller bearings, roller and cage assemblies, bearing washers

Design and safety guidelines

Design of adjacent parts

Axial bearing washers must always be fully supported on their entire abutment surface. The abutting shoulders should be rigid, flat and perpendicular to the axis of rotation.

Radial cage running surfaces should be precision machined and resistant to wear ($R_z 4$ ($R_a 0,8$)).

Caution!

If axial cylindrical roller and cage assemblies run directly on the adjacent construction, the running surfaces must be produced as rolling bearing raceways. The surface hardness of the raceway must be $670 \text{ HV} +170 \text{ HV}$ and the hardening depth CHD or Rht must be sufficiently large.

Tolerances for shaft and housing bore

The tolerances for the housing bore and shaft must be applied in accordance with the table.

Housing bore and shaft tolerances

| Bearing component | | Shaft tolerance | Bore tolerance |
|-------------------------------|----------------------------|-----------------|------------------|
| K811, K812, K893, K894 | Guided on shaft | h8 | – |
| GS811, GS812, GS893, GS894 | – | – | H9 |
| WS811, WS812, WS893, WS894 | – | h8 | – |
| LS | As housing locating washer | Clear of shaft | H9 |
| | As shaft locating washer | h8 | Clear of housing |

Limiting speed

The limiting speeds n_G given in the dimension tables are for oil lubrication.

Caution!

With grease lubrication, the permissible value is 25% of the value given in the table.

Minimum axial load

A minimum axial load $F_{a\ min}$ according to the formula must be applied.

$$F_{a\ min} = 0,0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$$

$F_{a\ min}$ N
Minimum axial load

k_a – Factor for determining the minimum load: see table

C_{0a} N
Basic static load rating

n min^{-1}
Speed.

Factor k_a for determining the minimum load

| Series | k_a |
|--------|-------|
| K811 | 1,4 |
| K812 | 0,9 |
| K893 | 0,7 |
| K894 | 0,5 |

Orientation of washers

Caution!

Axial washers should be fitted with the raceway facing towards the rolling elements.



Accuracy

The dimensional and geometrical tolerances of axial bearing washers GS and WS are in accordance with tolerance class PN to DIN 620.

The bore, external and height tolerances of the bearing components are shown in the table and *Figure 1*.

Tolerances for bearing components

| Series | Tolerance | | | | | |
|-------------------------------------|-----------|------------|------------------|------------|--------|-------------------|
| | Bore | | Outside diameter | | Height | |
| K811, K812, K893, K894 | D_{c1} | $E11^{1)}$ | D_c | $a13^{1)}$ | D_w | to DIN 5 402-1 |
| GS811, GS812, GS893, GS894 | D_1 | — | D | to DIN 620 | B | $h11$ |
| WS811, WS812, WS893, WS894 | d | to DIN 620 | d_1 | — | B | $h11$ |
| LS | d | $E12^{1)}$ | D | $a12^{1)}$ | B | $h11$ |

¹⁾ Deviation from mean diameter.

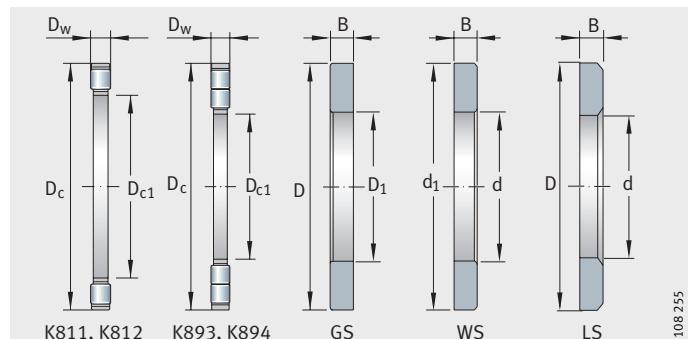
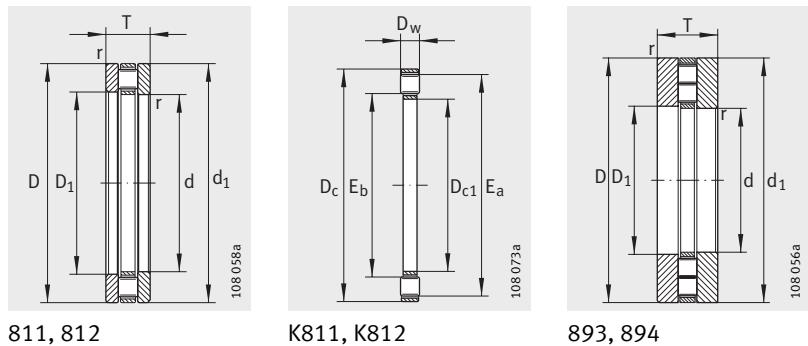


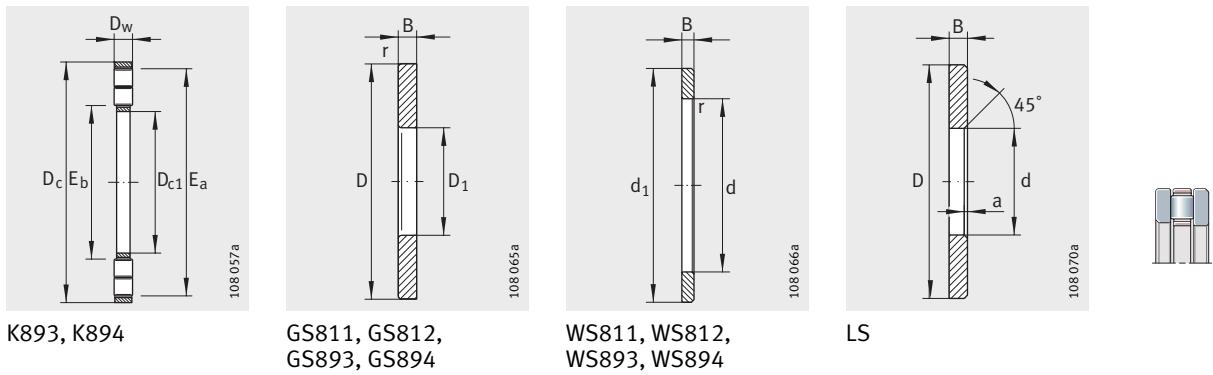
Figure 1
Axial bearing washers

Axial cylindrical roller bearings



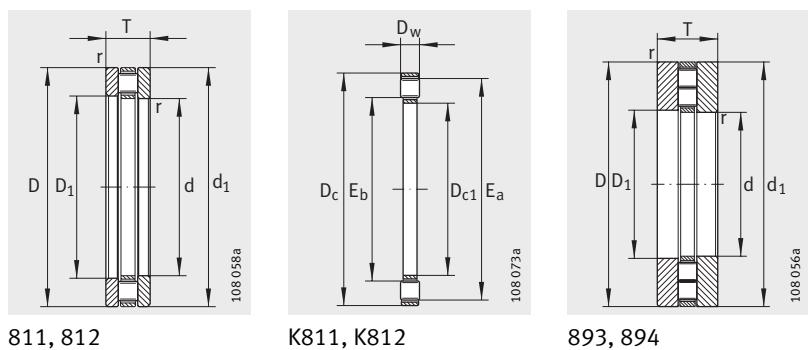
Dimension table · Dimensions in mm

| Axial cylindrical roller bearings | | | | | Axial cylindrical roller bearing and cage assembly | | Axial bearing washers | | | |
|-----------------------------------|----------|----------|----------|--------|--|--------|-------------------------|-----------------------|----------------|--------|
| Complete bearings | | | | Mass m | Desig-nation | Mass m | Housing locating washer | Shaft locating washer | Bearing washer | Mass m |
| Designation | | | | ≈kg | | ≈kg | Desig-nation | Desig-nation | Desig-nation | ≈kg |
| 81102-TV | - | - | - | 0,024 | K81102-TV | 0,006 | GS81102 | WS81102 | LS1528 | 0,008 |
| 81103-TV | - | - | - | 0,027 | K81103-TV | 0,009 | GS81103 | WS81103 | LS1730 | 0,009 |
| 81104-TV | - | - | - | 0,037 | K81104-TV | 0,013 | GS81104 | WS81104 | LS2035 | 0,012 |
| 81105-TV | - | - | - | 0,053 | K81105-TV | 0,015 | GS81105 | WS81105 | LS2542 | 0,019 |
| 81106-TV | - | - | - | 0,057 | K81106-TV | 0,017 | GS81106 | WS81106 | LS3047 | 0,02 |
| | 81206-TV | - | - | 0,123 | K81206-TV | 0,033 | GS81206 | WS81206 | - | 0,045 |
| | | 89306-TV | - | 0,24 | K89306-TV | 0,04 | GS89306 | WS89306 | - | 0,095 |
| 81107-TV | - | - | - | 0,073 | K81107-TV | 0,019 | GS81107 | WS81107 | LS3552 | 0,027 |
| | 81207-TV | - | - | 0,195 | K81207-TV | 0,043 | GS81207 | WS81207 | - | 0,076 |
| | | 89307-TV | - | 0,34 | K89307-TV | 0,053 | GS89307 | WS89307 | - | 0,134 |
| 81108-TV | - | - | - | 0,105 | K81108-TV | 0,031 | GS81108 | WS81108 | LS4060 | 0,037 |
| | 81208-TV | - | - | 0,249 | K81208-TV | 0,081 | GS81208 | WS81208 | - | 0,084 |
| | | 89308-TV | - | 0,484 | K89308-TV | 0,098 | GS89308 | WS89308 | - | 0,193 |
| 81109-TV | - | - | - | 0,13 | K81109-TV | 0,035 | GS81109 | WS81109 | LS4565 | 0,047 |
| | 81209-TV | - | - | 0,287 | K81209-TV | 0,085 | GS81209 | WS81209 | - | 0,101 |
| | | 89309-TV | - | 0,615 | K89309-TV | 0,121 | GS89309 | WS89309 | - | 0,247 |
| 81110-TV | - | - | - | 0,14 | K81110-TV | 0,038 | GS81110 | WS81110 | LS5070 | 0,051 |
| | 81210-TV | - | - | 0,356 | K81210-TV | 0,098 | GS81210 | WS81210 | - | 0,129 |
| | | 89310-TV | - | 0,887 | K89310-TV | 0,175 | GS89310 | WS89310 | - | 0,356 |
| 81111-TV | - | - | - | 0,218 | K81111-TV | 0,045 | GS81111 | WS81111 | LS5578 | 0,082 |
| | 81211-TV | - | - | 0,568 | K81211-TV | 0,166 | GS81211 | WS81211 | - | 0,201 |
| | | 89311-TV | - | 1,18 | K89311-TV | 0,195 | GS89311 | WS89311 | - | 0,485 |
| 81112-TV | - | - | - | 0,266 | K81112-TV | 0,082 | GS81112 | WS81112 | LS6085 | 0,092 |
| | 81212-TV | - | - | 0,642 | K81212-TV | 0,176 | GS81212 | WS81212 | - | 0,233 |
| | | 89312-TV | - | 1,26 | K89312-TV | 0,21 | GS89312 | WS89312 | - | 0,517 |
| | | | 89412-TV | 2,818 | K89412-TV | 0,538 | GS89412 | WS89412 | - | 1,115 |



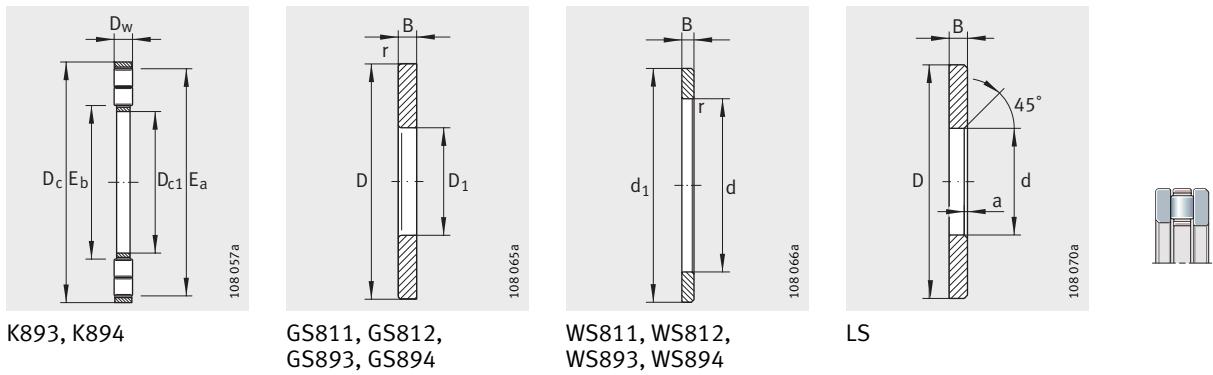
| Dimensions | | | | | | | | | Raceway dimensions | | Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|------------|-------|-------|-------|-----|-------|------|------|-------|--------------------|------------|--------------------|----------|--------------------|-------------------|-----------------|
| D_{c1} | D_1 | D_c | d_1 | T | D_w | B | a | E_b | E_a | dyn. C_a | stat. C_{0a} | C_{ua} | n_G | n_B | |
| d | | D | | | | | min. | | | N | N | N | min ⁻¹ | min ⁻¹ | |
| 15 | 16 | 28 | 28 | 9 | 3,5 | 2,75 | 0,3 | 16 | 27 | 14 400 | 28 500 | 4 000 | 13 400 | 6 300 | |
| 17 | 18 | 30 | 30 | 9 | 3,5 | 2,75 | 0,3 | 18 | 29 | 15 900 | 33 500 | 4 650 | 12 300 | 5 400 | |
| 20 | 21 | 35 | 35 | 10 | 4,5 | 2,75 | 0,3 | 21 | 34 | 24 900 | 53 000 | 7 300 | 10 500 | 4 300 | |
| 25 | 26 | 42 | 42 | 11 | 5 | 3 | 0,6 | 26 | 41 | 33 500 | 76 000 | 7 100 | 8 600 | 3 500 | |
| 30 | 32 | 47 | 47 | 11 | 5 | 3 | 0,6 | 31 | 46 | 35 500 | 86 000 | 8 000 | 7 500 | 3 050 | |
| 30 | 32 | 52 | 52 | 16 | 7,5 | 4,25 | 0,6 | 31 | 50 | 64 000 | 141 000 | 14 100 | 7 000 | 2 650 | |
| 30 | 32 | 60 | 60 | 18 | 5,5 | 6,25 | 1 | 33 | 59 | 69 000 | 197 000 | 18 900 | 6 400 | 2 600 | |
| 35 | 37 | 52 | 52 | 12 | 5 | 3,5 | 0,6 | 36 | 51 | 39 000 | 101 000 | 9 500 | 6 600 | 2 600 | |
| 35 | 37 | 62 | 62 | 18 | 7,5 | 5,25 | 1 | 39 | 58 | 80 000 | 199 000 | 20 000 | 5 900 | 2 320 | |
| 35 | 37 | 68 | 68 | 20 | 6 | 7 | 1 | 38 | 67 | 80 000 | 237 000 | 23 200 | 5 600 | 2 390 | |
| 40 | 42 | 60 | 60 | 13 | 6 | 3,5 | 0,6 | 42 | 58 | 56 000 | 148 000 | 14 500 | 5 800 | 2 190 | |
| 40 | 42 | 68 | 68 | 19 | 9 | 5 | 1 | 43 | 66 | 107 000 | 265 000 | 23 300 | 5 300 | 1 860 | |
| 40 | 42 | 78 | 78 | 22 | 7 | 7,5 | 1 | 44 | 77 | 122 000 | 385 000 | 39 000 | 4 900 | 1 780 | |
| 45 | 47 | 65 | 65 | 14 | 6 | 4 | 0,6 | 47 | 63 | 59 000 | 163 000 | 16 000 | 5 200 | 1 970 | |
| 45 | 47 | 73 | 73 | 20 | 9 | 5,5 | 1 | 48 | 70 | 105 000 | 265 000 | 23 300 | 4 900 | 1 820 | |
| 45 | 47 | 85 | 85 | 24 | 7,5 | 8,25 | 1 | 49 | 83 | 139 000 | 445 000 | 44 500 | 4 450 | 1 620 | |
| 50 | 52 | 70 | 70 | 14 | 6 | 4 | 0,6 | 52 | 68 | 61 000 | 177 000 | 17 400 | 4 800 | 1 810 | |
| 50 | 52 | 78 | 78 | 22 | 9 | 6,5 | 1 | 53 | 75 | 117 000 | 315 000 | 27 500 | 4 500 | 1 550 | |
| 50 | 52 | 95 | 95 | 27 | 8 | 9,5 | 1,1 | 56 | 92 | 167 000 | 560 000 | 58 000 | 3 950 | 1 460 | |
| 55 | 57 | 78 | 78 | 16 | 6 | 5 | 0,6 | 57 | 77 | 90 000 | 300 000 | 31 000 | 4 350 | 1 330 | |
| 55 | 57 | 90 | 90 | 25 | 11 | 7 | 1 | 59 | 85 | 154 000 | 405 000 | 38 500 | 3 950 | 1 510 | |
| 55 | 57 | 105 | 105 | 30 | 9 | 10,5 | 1,1 | 61 | 103 | 184 000 | 600 000 | 52 000 | 3 600 | 1 490 | |
| 60 | 62 | 85 | 85 | 17 | 7,5 | 4,75 | 1 | 62 | 82 | 103 000 | 315 000 | 32 000 | 3 950 | 1 360 | |
| 60 | 62 | 95 | 95 | 26 | 11 | 7,5 | 1 | 64 | 91 | 172 000 | 480 000 | 45 500 | 3 700 | 1 300 | |
| 60 | 62 | 110 | 110 | 30 | 9 | 10,5 | 1,1 | 66 | 108 | 196 000 | 670 000 | 58 000 | 3 400 | 1 350 | |
| 60 | 62 | 130 | 130 | 42 | 14 | 14 | 1,5 | 65 | 126 | 390 000 | 1 220 000 | 121 000 | 3 050 | 1 080 | |

Axial cylindrical roller bearings



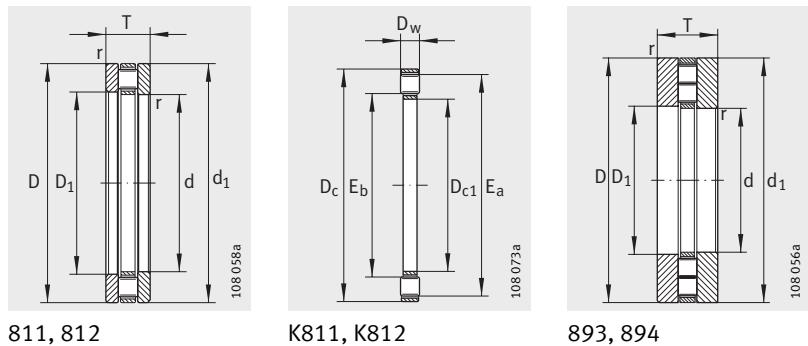
Dimension table (continued) · Dimensions in mm

| Axial cylindrical roller bearings | | | | Axial cylindrical roller bearing and cage assembly | | Axial bearing washers | | | | |
|-----------------------------------|----------|----------|----------|--|-------------|-----------------------|-------------------------|-----------------------|----------------|--------|
| Complete bearings | | | | Mass m | Designation | Mass m | Housing locating washer | Shaft locating washer | Bearing washer | Mass m |
| Designation | | | | ≈kg | | ≈kg | Designation | Designation | Designation | ≈kg |
| 81113-TV | - | - | - | 0,31 | K81113-TV | 0,09 | GS81113 | WS81113 | LS6590 | 0,11 |
| - | 81213-TV | - | - | 0,721 | K81213-TV | 0,185 | GS81213 | WS81213 | - | 0,268 |
| - | - | 89313-TV | - | 1,33 | K89313-TV | 0,21 | GS89313 | WS89313 | - | 0,535 |
| - | - | - | 89413-TV | 3,52 | K89413-TV | 0,72 | GS89413 | WS89413 | - | 1,4 |
| 81114-TV | - | - | - | 0,332 | K81114-TV | 0,092 | GS81114 | WS81114 | LS7095 | 0,12 |
| - | 81214-TV | - | - | 0,768 | K81214-TV | 0,212 | GS81214 | WS81214 | - | 0,278 |
| - | - | 89314-TV | - | 1,82 | K89314-TV | 0,29 | GS89314 | WS89314 | - | 0,8 |
| - | - | - | 89414-TV | 4,18 | K89414-TV | 0,76 | GS89414 | WS89414 | - | 1,73 |
| 81115-TV | - | - | - | 0,393 | K81115-TV | 0,096 | GS81115 | WS81115 | LS75100 | 0,136 |
| - | 81215-TV | - | - | 0,8 | K81215-TV | 0,195 | GS81215 | WS81215 | - | 0,293 |
| - | - | 89315-TV | - | 2,23 | K89315-TV | 0,375 | GS89315 | WS89315 | - | 0,97 |
| - | - | - | 89415-M | 5,96 | K89415-M | 1,78 | GS89415 | WS89415 | - | 2,09 |
| 81116-TV | - | - | - | 0,4 | K81116-TV | 0,095 | GS81116 | WS81116 | LS80105 | 0,144 |
| - | 81216-TV | - | - | 0,9 | K81216-TV | 0,234 | GS81216 | WS81216 | - | 0,333 |
| - | - | 89316-TV | - | 2,37 | K89316-TV | 0,42 | GS89316 | WS89316 | - | 1,02 |
| - | - | - | 89416-M | 7,04 | K89416-M | 2,04 | GS89416 | WS89416 | - | 2,5 |
| 81117-TV | - | - | - | 0,42 | K81117-TV | 0,118 | GS81117 | WS81117 | LS85110 | 0,151 |
| - | 81217-TV | - | - | 1,26 | K81217-TV | 0,28 | GS81217 | WS81217 | - | 0,49 |
| - | - | 89317-M | - | 3,39 | K89317-M | 0,93 | GS89317 | WS89317 | - | 1,23 |
| - | - | - | 89417-M | 8,65 | K89417-M | 2,71 | GS89417 | WS89417 | - | 2,97 |
| 81118-TV | - | - | - | 0,62 | K81118-TV | 0,15 | GS81118 | WS81118 | LS90120 | 0,225 |
| - | 81218-TV | - | - | 1,77 | K81218-TV | 0,54 | GS81218 | WS81218 | - | 0,614 |
| - | - | 89318-M | - | 3,63 | K89318-M | 0,97 | GS89318 | WS89318 | - | 1,33 |
| - | - | - | 89418-M | 9,94 | K89418-M | 3,04 | GS89418 | WS89418 | - | 3,45 |
| 81120-TV | - | - | - | 0,95 | K81120-TV | 0,25 | GS81120 | WS81120 | LS100135 | 0,35 |
| - | 81220-TV | - | - | 2,2 | K81220-TV | 0,6 | GS81220 | WS81220 | - | 0,8 |
| - | - | 89320-M | - | 4,56 | K89320-M | 1,18 | GS89320 | WS89320 | - | 1,69 |
| - | - | - | 89420-M | 13,4 | K89420-M | 3,92 | GS89420 | WS89420 | - | 4,75 |



| Dimensions | D _{c1} d | D ₁ | D _c D | d ₁ | T | D _w | B | a r | Raceway dimensions | | Basic load ratings | | Fatigue limit load C _{ua} | n _G | Limiting speed min ⁻¹ | Reference speed n _B |
|------------|----------------------|----------------|---------------------|----------------|-----|----------------|-----|--------|--------------------|----------------|------------------------|--------------------------|--|----------------|--|--------------------------------------|
| | | | | | | | | | E _b | E _a | dyn. C _a | stat. C _{0a} | | | | |
| 65 | 67 | 90 | 90 | 18 | 7,5 | 5,25 | 1 | 67 | 87 | 107 000 | 340 000 | 34 000 | 3 700 | 1 260 | | |
| 65 | 67 | 100 | 100 | 27 | 11 | 8 | 1 | 69 | 96 | 177 000 | 500 000 | 48 000 | 3 500 | 1 240 | | |
| 65 | 67 | 115 | 115 | 30 | 9 | 10,5 | 1,1 | 71 | 113 | 194 000 | 670 000 | 58 000 | 3 200 | 1 330 | | |
| 65 | 68 | 140 | 140 | 45 | 15 | 15 | 2 | 70 | 135 | 445 000 | 1 410 000 | 139 000 | 2 800 | 1 000 | | |
| 70 | 72 | 95 | 95 | 18 | 7,5 | 5,25 | 1 | 72 | 92 | 111 000 | 365 000 | 36 500 | 3 500 | 1 170 | | |
| 70 | 72 | 105 | 105 | 27 | 11 | 8 | 1 | 74 | 102 | 187 000 | 550 000 | 53 000 | 3 300 | 1 130 | | |
| 70 | 72 | 125 | 125 | 34 | 10 | 12 | 1,1 | 76 | 123 | 239 000 | 830 000 | 74 000 | 2 950 | 1 200 | | |
| 70 | 73 | 150 | 150 | 48 | 16 | 16 | 2 | 76 | 147 | 475 000 | 1 500 000 | 148 000 | 2 600 | 1 000 | | |
| 75 | 77 | 100 | 100 | 19 | 7,5 | 5,75 | 1 | 78 | 97 | 107 000 | 350 000 | 35 500 | 3 300 | 1 190 | | |
| 75 | 77 | 110 | 110 | 27 | 11 | 8 | 1 | 79 | 106 | 172 000 | 500 000 | 48 000 | 3 100 | 1 210 | | |
| 75 | 77 | 135 | 135 | 36 | 11 | 12,5 | 1,5 | 81 | 132 | 285 000 | 1 010 000 | 92 000 | 2 750 | 1 080 | | |
| 75 | 78 | 160 | 160 | 51 | 17 | 17 | 2 | 82 | 156 | 500 000 | 1 580 000 | 150 000 | 2 450 | 1 000 | | |
| 80 | 82 | 105 | 105 | 19 | 7,5 | 5,75 | 1 | 83 | 102 | 106 000 | 350 000 | 35 500 | 3 100 | 1 170 | | |
| 80 | 82 | 115 | 115 | 28 | 11 | 8,5 | 1 | 84 | 112 | 201 000 | 630 000 | 60 000 | 2 950 | 990 | | |
| 80 | 82 | 140 | 140 | 36 | 11 | 12,5 | 1,5 | 86 | 137 | 305 000 | 1 110 000 | 99 000 | 2 600 | 990 | | |
| 80 | 83 | 170 | 170 | 54 | 18 | 18 | 2,1 | 88 | 165 | 560 000 | 1 770 000 | 169 000 | 2 300 | 950 | | |
| 85 | 87 | 110 | 110 | 19 | 7,5 | 5,75 | 1 | 87 | 108 | 112 000 | 385 000 | 39 000 | 2 950 | 1 070 | | |
| 85 | 88 | 125 | 125 | 31 | 12 | 9,5 | 1 | 90 | 119 | 217 000 | 660 000 | 64 000 | 2 750 | 1 060 | | |
| 85 | 88 | 150 | 150 | 39 | 12 | 13,5 | 1,5 | 93 | 146 | 325 000 | 1 140 000 | 104 000 | 2 450 | 1 030 | | |
| 85 | 88 | 180 | 180 | 58 | 19 | 19,5 | 2,1 | 93 | 175 | 620 000 | 1 980 000 | 188 000 | 2 170 | 900 | | |
| 90 | 92 | 120 | 120 | 22 | 9 | 6,5 | 1 | 93 | 117 | 141 000 | 465 000 | 40 000 | 2 750 | 1 070 | | |
| 90 | 93 | 135 | 135 | 35 | 14 | 10,5 | 1,1 | 95 | 129 | 290 000 | 890 000 | 88 000 | 2 550 | 910 | | |
| 90 | 93 | 155 | 155 | 39 | 12 | 13,5 | 1,5 | 98 | 151 | 335 000 | 1 200 000 | 108 000 | 2 350 | 980 | | |
| 90 | 93 | 190 | 190 | 60 | 20 | 20 | 2,1 | 99 | 185 | 680 000 | 2 200 000 | 207 000 | 2 060 | 850 | | |
| 100 | 102 | 135 | 135 | 25 | 11 | 7 | 1 | 104 | 131 | 199 000 | 650 000 | 59 000 | 2 450 | 920 | | |
| 100 | 103 | 150 | 150 | 38 | 15 | 11,5 | 1,1 | 107 | 142 | 340 000 | 1 080 000 | 104 000 | 2 300 | 840 | | |
| 100 | 103 | 170 | 170 | 42 | 13 | 14,5 | 1,5 | 109 | 166 | 380 000 | 1 400 000 | 122 000 | 2 130 | 910 | | |
| 100 | 103 | 210 | 210 | 67 | 22 | 22,5 | 3 | 111 | 205 | 850 000 | 2 850 000 | 265 000 | 1 860 | 720 | | |

Axial cylindrical roller bearings



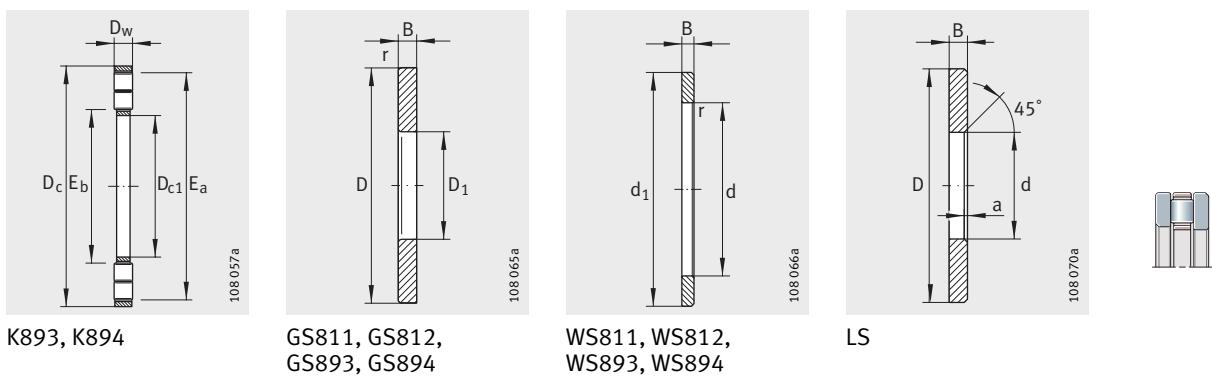
811, 812

K811, K812

893, 894

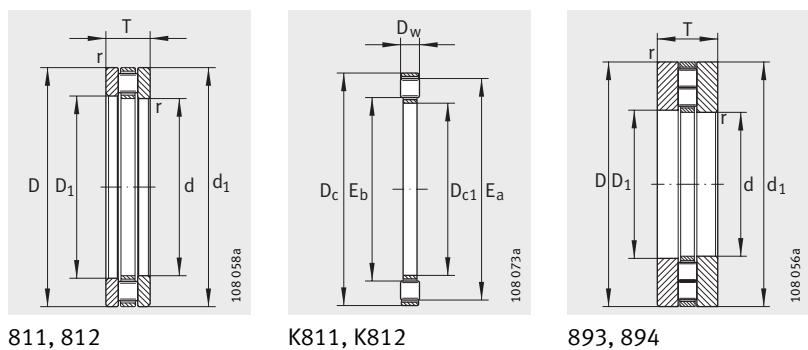
Dimension table (continued) · Dimensions in mm

| Axial cylindrical roller bearings | | | | Axial cylindrical roller bearing and cage assembly | | Axial bearing washers | | | | |
|-----------------------------------|----------|---------|---------|--|-------------|-----------------------|-------------------------|-----------------------|----------------|--------|
| Complete bearings | | | | Mass m | Designation | Mass m | Housing locating washer | Shaft locating washer | Bearing washer | Mass m |
| Designation | | | | ≈kg | | ≈kg | Designation | Designation | Designation | ≈kg |
| 81122-TV | - | - | - | 1,04 | K81122-TV | 0,27 | GS81122 | WS81122 | LS110145 | 0,385 |
| - | 81222-TV | - | - | 2,29 | K81222-TV | 0,53 | GS81222 | WS81222 | - | 0,88 |
| - | - | 89322-M | - | 6,7 | K89322-M | 1,83 | GS89322 | WS89322 | - | 2,44 |
| - | - | - | 89422-M | 17,4 | K89422-M | 5,11 | GS89422 | WS89422 | - | 6,15 |
| 81124-TV | - | - | - | 1,12 | K81124-TV | 0,29 | GS81124 | WS81124 | LS120155 | 0,415 |
| - | 81224-TV | - | - | 2,54 | K81224-TV | 0,58 | GS81224 | WS81224 | - | 0,98 |
| - | - | 89324-M | - | 9,44 | K89324-M | 2,64 | GS89324 | WS89324 | - | 3,4 |
| - | - | - | 89424-M | 21,9 | K89424-M | 6,37 | GS89424 | WS89424 | - | 7,7 |
| 81126-TV | - | - | - | 1,67 | K81126-TV | 0,38 | GS81126 | WS81126 | LS130170 | 0,643 |
| - | 81226-TV | - | - | 3,98 | K81226-TV | 0,92 | GS81226 | WS81226 | - | 1,53 |
| - | - | 89326-M | - | 11,2 | K89326-M | 2,09 | GS89326 | WS89326 | - | 4,045 |
| - | - | - | 89426-M | 27,1 | K89426-M | 7,96 | GS89426 | WS89426 | - | 9,5 |
| 81128-TV | - | - | - | 1,9 | K81128-TV | 0,4 | GS81128 | WS81128 | LS140180 | 0,749 |
| - | 81228-M | - | - | 5,07 | K81228-M | 1,8 | GS81228 | WS81228 | - | 1,635 |
| - | - | 89328-M | - | 13,2 | K89328-M | 2,57 | GS89328 | WS89328 | - | 4,8 |
| - | - | - | 89428-M | 29,8 | K89428-M | 8,53 | GS89428 | WS89428 | - | 10,6 |
| 81130-TV | - | - | - | 2,2 | K81130-TV | 0,43 | GS81130 | WS81130 | LS150190 | 0,796 |
| - | 81230-M | - | - | 7,17 | K81230-M | 2,81 | GS81230 | WS81230 | - | 2,18 |
| - | - | 89330-M | - | 13,9 | K89330-M | 3,75 | GS89330 | WS89330 | - | 5,06 |
| - | - | - | 89430-M | 35,4 | K89430-M | 10,4 | GS89430 | WS89430 | - | 12,5 |
| 81132-TV | - | - | - | 2,12 | K81132-TV | 0,44 | GS81132 | WS81132 | LS160200 | 0,842 |
| - | 81232-M | - | - | 7,6 | K81232-M | 3,01 | GS81232 | WS81232 | - | 2,3 |
| - | - | - | 89432-M | 42 | K89432-M | 12,4 | GS89432 | WS89432 | - | 14,8 |
| 81134-TV | - | - | - | 2,41 | K81134-TV | 0,66 | GS81134 | WS81134 | - | 1,1 |
| - | 81234-M | - | - | 9,3 | K81234-M | 3,5 | GS81234 | WS81234 | - | 2,9 |
| - | - | - | 89434-M | 51,9 | K89434-M | 14,9 | GS89434 | WS89434 | - | 18,5 |



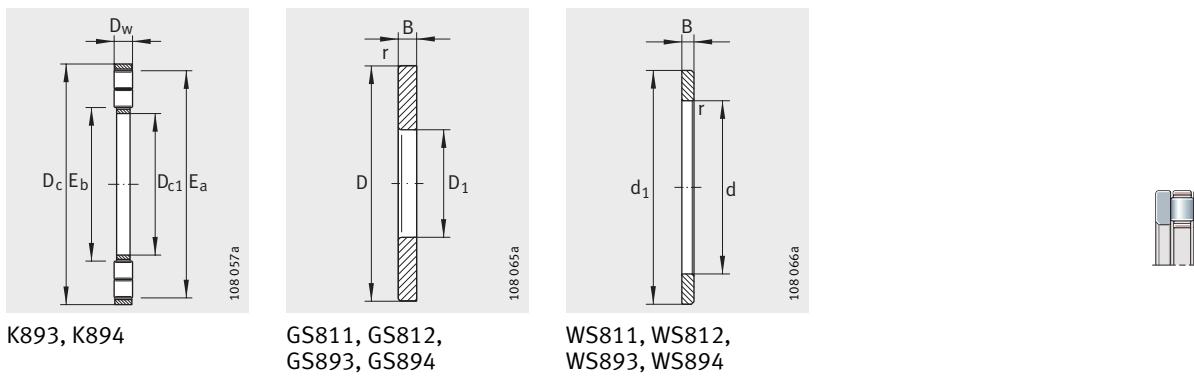
| Dimensions | | | | | | | | Raceway dimensions | | Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|------------|-------|-------|-------|-----|-------|------|-------|--------------------|-------|--------------------|----------------|--------------------|-------------------|-------------------|
| D_{c1} | D_1 | D_c | d_1 | T | D_w | B | a_r | E_b | E_a | dyn. C_a | stat. C_{0a} | C_{ua} | n_G | n_B |
| | | | | | | | min. | | | N | N | N | min ⁻¹ | min ⁻¹ |
| 110 | 112 | 145 | 145 | 25 | 11 | 7 | 1 | 114 | 141 | 207 000 | 700 000 | 62 000 | 2 260 | 850 |
| 110 | 113 | 160 | 160 | 38 | 15 | 11,5 | 1,1 | 117 | 152 | 325 000 | 1 030 000 | 98 000 | 2 130 | 860 |
| 110 | 113 | 190 | 190 | 48 | 15 | 16,5 | 2 | 120 | 185 | 500 000 | 1 870 000 | 166 000 | 1 920 | 790 |
| 110 | 113 | 230 | 230 | 73 | 24 | 24,5 | 3 | 121 | 223 | 1 000 000 | 3 400 000 | 315 000 | 1 690 | 640 |
| 120 | 122 | 155 | 155 | 25 | 11 | 7 | 1 | 124 | 151 | 214 000 | 760 000 | 65 000 | 2 090 | 780 |
| 120 | 123 | 170 | 170 | 39 | 15 | 12 | 1,1 | 127 | 162 | 340 000 | 1 120 000 | 104 000 | 1 990 | 790 |
| 120 | 123 | 210 | 210 | 54 | 17 | 18,5 | 2,1 | 132 | 205 | 640 000 | 2 420 000 | 210 000 | 1 750 | 690 |
| 120 | 123 | 250 | 250 | 78 | 26 | 26 | 4 | 133 | 243 | 1 160 000 | 4 000 000 | 365 000 | 1 560 | 580 |
| 130 | 132 | 170 | 170 | 30 | 12 | 9 | 1 | 135 | 165 | 250 000 | 900 000 | 79 000 | 1 920 | 760 |
| 130 | 133 | 190 | 187 | 45 | 19 | 13 | 1,5 | 137 | 181 | 480 000 | 1 520 000 | 143 000 | 1 800 | 710 |
| 130 | 134 | 225 | 225 | 58 | 18 | 20 | 2,1 | 141 | 219 | 710 000 | 2 700 000 | 237 000 | 1 620 | 650 |
| 130 | 134 | 270 | 270 | 85 | 28 | 28,5 | 4 | 145 | 263 | 1 330 000 | 4 600 000 | 405 000 | 1 440 | 530 |
| 140 | 142 | 180 | 178 | 31 | 12 | 9,5 | 1 | 145 | 175 | 260 000 | 960 000 | 83 000 | 1 800 | 710 |
| 140 | 143 | 200 | 197 | 46 | 19 | 13,5 | 1,5 | 151 | 195 | 455 000 | 1 450 000 | 133 000 | 1 690 | 730 |
| 140 | 144 | 240 | 240 | 60 | 19 | 20,5 | 2,1 | 152 | 234 | 820 000 | 3 200 000 | 275 000 | 1 520 | 570 |
| 140 | 144 | 280 | 280 | 85 | 28 | 28,5 | 4 | 155 | 273 | 1 380 000 | 4 950 000 | 430 000 | 1 370 | 490 |
| 150 | 152 | 190 | 188 | 31 | 12 | 9,5 | 1 | 155 | 185 | 270 000 | 1 020 000 | 86 000 | 1 690 | 660 |
| 150 | 153 | 215 | 212 | 50 | 21 | 14,5 | 1,5 | 162 | 210 | 590 000 | 1 940 000 | 175 000 | 1 580 | 650 |
| 150 | 154 | 250 | 250 | 60 | 19 | 20,5 | 2,1 | 162 | 244 | 840 000 | 3 350 000 | 285 000 | 1 440 | 510 |
| 150 | 154 | 300 | 300 | 90 | 30 | 30 | 4 | 167 | 293 | 1 570 000 | 5 700 000 | 495 000 | 1 280 | 445 |
| 160 | 162 | 200 | 198 | 31 | 12 | 9,5 | 1 | 165 | 195 | 260 000 | 990 000 | 82 000 | 1 600 | 670 |
| 160 | 163 | 225 | 222 | 51 | 21 | 15 | 1,5 | 171 | 219 | 600 000 | 2 030 000 | 181 000 | 1 500 | 610 |
| 160 | 164 | 320 | 320 | 95 | 32 | 31,5 | 5 | 179 | 313 | 1 780 000 | 6 500 000 | 560 000 | 1 200 | 410 |
| 170 | 172 | 215 | 213 | 34 | 14 | 10 | 1,1 | 176 | 209 | 360 000 | 1 380 000 | 116 000 | 1 500 | 570 |
| 170 | 173 | 240 | 237 | 55 | 22 | 16,5 | 1,5 | 184 | 233 | 680 000 | 2 340 000 | 207 000 | 1 400 | 600 |
| 170 | 174 | 340 | 340 | 103 | 34 | 34,5 | 5 | 191 | 333 | 1 990 000 | 7 400 000 | 640 000 | 1 130 | 375 |

Axial cylindrical roller bearings



Dimension table (continued) · Dimensions in mm

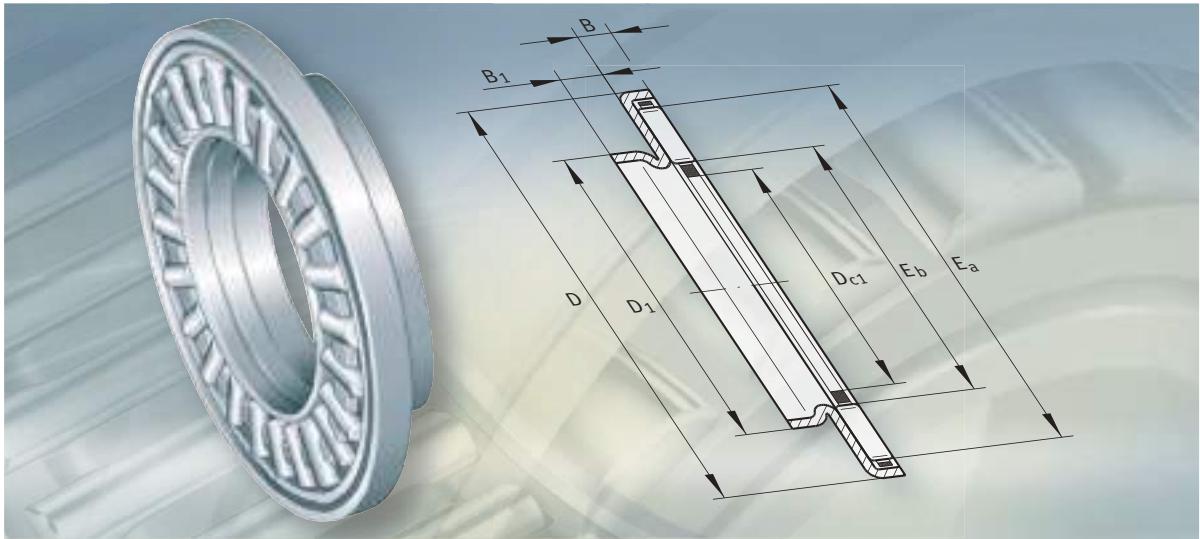
| Axial cylindrical roller bearings | | | Axial cylindrical roller bearing and cage assembly | | Axial bearing washers | | |
|-----------------------------------|---------|---------|--|--------|-------------------------|-----------------------|--------|
| Complete bearings | | Mass m | Designation | Mass m | Housing locating washer | Shaft locating washer | Mass m |
| Designation | | ≈kg | | ≈kg | Designation | Designation | ≈kg |
| 81136-M | - | - | K81136-M | 1,46 | GS81136 | WS81136 | 1,12 |
| - | 81236-M | - | K81236-M | 3,67 | GS81236 | WS81236 | 3,13 |
| - | - | 89436-M | K89436-M | 17,6 | GS89436 | WS89436 | 21,3 |
| 81138-M | - | - | K81138-M | 1,84 | GS81138 | WS81138 | 1,45 |
| - | 81238-M | - | K81238-M | 5,17 | GS81238 | WS81238 | 3,835 |
| - | - | 89438-M | K89438-M | 20,9 | GS89438 | WS89438 | 25,6 |
| 81140-M | - | - | K81140-M | 1,93 | GS81140 | WS81140 | 1,51 |
| - | 81240-M | - | K81240-M | 5,4 | GS81240 | WS81240 | 4,41 |
| - | - | 89440-M | K89440-M | 24 | GS89440 | WS89440 | 29,3 |
| 81144-M | - | - | K81144-M | 2,04 | GS81144 | WS81144 | 1,59 |
| - | 81244-M | - | K81244-M | 5,8 | GS81244 | WS81244 | 4,75 |
| - | - | 89444-M | K89444-M | 25,7 | GS89444 | WS89444 | 32,2 |
| 81148-M | - | - | K81148-M | 3,32 | GS81148 | WS81148 | 2,57 |
| - | 81248-M | - | K81248-M | 9,94 | GS81248 | WS81248 | 8,15 |
| - | - | 89448-M | K89448-M | 27,3 | GS89448 | WS89448 | 34,3 |
| 81152-M | - | - | K81152-M | 3,55 | GS81152 | WS81152 | 2,765 |
| - | 81252-M | - | K81252-M | 10,8 | GS81252 | WS81252 | 8,9 |
| - | - | 89452-M | K89452-M | 36,8 | GS89452 | WS89452 | 44,25 |
| 81156-M | - | - | K81156-M | 5,31 | GS81156 | WS81156 | 3,65 |
| - | 81256-M | - | K81256-M | 11,5 | GS81256 | WS81256 | 9,75 |
| - | - | 89456-M | K89456-M | 47,5 | GS89456 | WS89456 | 55,6 |
| 81160-M | - | - | K81160-M | 7,6 | GS81160 | WS81160 | 5,92 |
| - | 81260-M | - | K81260-M | 17,8 | GS81260 | WS81260 | 15,2 |
| - | - | 89460-M | K89460-M | 49,8 | GS89460 | WS89460 | 60,15 |
| 81164-M | - | - | K81164-M | 8,04 | GS81164 | WS81164 | 6,35 |
| - | - | 89464-M | K89464-M | 80,3 | GS89464 | WS89464 | 61,5 |



K893, K894

GS811, GS812,
GS893, GS894WS811, WS812,
WS893, WS894

| Dimensions | Raceway dimensions | | | | | | | | Basic load ratings | | Fatigue limit load C_{ua} | Limiting speed n_G | Reference speed n_B | |
|------------|--------------------|-------|------------|-------|----|-------|-----|----------------|--------------------|-----------|--------------------------------|-------------------------|--------------------------|-----|
| | D_{c1} d | D_1 | D_c D | d_1 | T | D_w | B | a r min. | E_b | E_a | dyn. C_a | stat. C_{0a} | | |
| 180 | 183 | 225 | 222 | 34 | 14 | 10 | 1,1 | 186 | 220 | 340 000 | 1 300 000 | 107 000 | 1 420 | 590 |
| 180 | 183 | 250 | 247 | 56 | 22 | 17 | 1,5 | 194 | 243 | 690 000 | 2 440 000 | 213 000 | 1 340 | 580 |
| 180 | 184 | 360 | 360 | 109 | 36 | 36,5 | 5 | 200 | 351 | 2 210 000 | 8 200 000 | 690 000 | 1 070 | 360 |
| 190 | 193 | 240 | 237 | 37 | 15 | 11 | 1,1 | 198 | 234 | 385 000 | 1 500 000 | 123 000 | 1 340 | 570 |
| 190 | 194 | 270 | 267 | 62 | 26 | 18 | 2 | 205 | 263 | 880 000 | 3 000 000 | 270 000 | 1 250 | 530 |
| 190 | 195 | 380 | 380 | 115 | 38 | 38,5 | 5 | 212 | 371 | 2 450 000 | 9 200 000 | 770 000 | 1 100 | 330 |
| 200 | 203 | 250 | 247 | 37 | 15 | 11 | 1,1 | 208 | 244 | 390 000 | 1 550 000 | 125 000 | 1 280 | 530 |
| 200 | 204 | 280 | 277 | 62 | 26 | 18 | 2 | 215 | 273 | 900 000 | 3 150 000 | 280 000 | 1 200 | 485 |
| 200 | 205 | 400 | 400 | 122 | 40 | 41 | 5 | 224 | 391 | 2 700 000 | 10 200 000 | 840 000 | 960 | 315 |
| 220 | 223 | 270 | 267 | 37 | 15 | 11 | 1,1 | 228 | 264 | 420 000 | 1 730 000 | 137 000 | 1 180 | 470 |
| 220 | 224 | 300 | 297 | 63 | 26 | 18,5 | 2 | 236 | 294 | 940 000 | 3 450 000 | 295 000 | 1 110 | 435 |
| 220 | 225 | 420 | 420 | 122 | 40 | 41 | 6 | 244 | 411 | 2 900 000 | 11 500 000 | 940 000 | 900 | 270 |
| 240 | 243 | 300 | 297 | 45 | 18 | 13,5 | 1,5 | 253 | 294 | 600 000 | 2 500 000 | 199 000 | 1 070 | 440 |
| 240 | 244 | 340 | 335 | 78 | 32 | 23 | 2,1 | 263 | 333 | 1 370 000 | 5 000 000 | 425 000 | 990 | 395 |
| 240 | 245 | 440 | 440 | 122 | 40 | 41 | 6 | 264 | 431 | 3 000 000 | 12 200 000 | 980 000 | 850 | 250 |
| 260 | 263 | 320 | 317 | 45 | 18 | 13,5 | 1,5 | 272 | 314 | 620 000 | 2 650 000 | 205 000 | 990 | 390 |
| 260 | 264 | 360 | 355 | 79 | 32 | 23,5 | 2,1 | 281 | 351 | 1 440 000 | 5 400 000 | 455 000 | 930 | 355 |
| 260 | 265 | 480 | 480 | 132 | 44 | 44 | 6 | 286 | 468 | 3 600 000 | 14 700 000 | 1 160 000 | 780 | 224 |
| 280 | 283 | 350 | 347 | 53 | 22 | 15,5 | 1,5 | 294 | 344 | 860 000 | 3 650 000 | 285 000 | 910 | 345 |
| 280 | 284 | 380 | 375 | 80 | 32 | 24 | 2,1 | 301 | 371 | 1 460 000 | 5 600 000 | 465 000 | 870 | 335 |
| 280 | 285 | 520 | 520 | 145 | 48 | 48,5 | 6 | 309 | 508 | 4 200 000 | 17 600 000 | 1 360 000 | 720 | 199 |
| 300 | 304 | 380 | 376 | 62 | 25 | 18,5 | 2 | 316 | 372 | 1 060 000 | 4 500 000 | 355 000 | 850 | 330 |
| 300 | 304 | 420 | 415 | 95 | 38 | 28,5 | 3 | 329 | 412 | 1 930 000 | 7 300 000 | 600 000 | 800 | 305 |
| 300 | 305 | 540 | 540 | 145 | 48 | 48,5 | 6 | 329 | 528 | 4 350 000 | 18 500 000 | 1 420 000 | 690 | 188 |
| 320 | 324 | 400 | 396 | 63 | 25 | 19 | 2 | 336 | 392 | 1 100 000 | 4 750 000 | 370 000 | 800 | 290 |
| 320 | 325 | 580 | 575 | 155 | 68 | 43,5 | 7,5 | 343 | 566 | 5 500 000 | 19 900 000 | 1 430 000 | 640 | 185 |



**Axial needle roller and cage assemblies
Axial bearing washers
Axial needle roller bearings**

Axial needle roller and cage assemblies, washers, axial needle roller bearings



| | Page |
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| Design and safety guidelines | Running surfaces 778 Tolerances for shaft and housing bore 778 Speeds 778 Minimum axial load 778 Orientation of washers 778 |
| Accuracy | Tolerances of bearing components 779 |
| Dimension tables | Axial needle roller and cage assemblies, axial bearing washers 780 Axial needle roller bearings, with centring spigot 782 |

Product overview Axial needle roller and cage assemblies, washers, axial needle roller bearings

Axial needle roller and cage assemblies

AXK



Axial bearing washers

AS



Axial needle roller bearings
With centring spigot

AXW



Other products

AX



Axial needle roller and cage assemblies, washers, axial needle roller bearings

Features

Axial needle roller and cage assemblies

Axial needle roller and cage assemblies AXK correspond to DIN 5 405-2. They comprise plastic or metal axial cages with integral needle rollers and have a very low axial section height.

The cage assemblies can support high axial forces in one direction. Radial loads must be supported by separate means.

Axial needle roller and cage assemblies require hardened and ground running surfaces as a raceway.



Axial bearing washers

Axial bearing washers AS are punched, through hardened, polished and suitable for use as shaft or housing locating washers. They correspond to DIN 5 405-3 and are suitable for use with axial needle roller and cage assemblies AXK.

These washers are suitable for use where the adjacent machine part is unhardened but is sufficiently rigid and geometrically accurate.

Axial needle roller bearings

Axial needle roller bearings AXW are units comprising axial needle roller and cage assemblies AXK and axial bearing washers with centring spigot. They can be combined with drawn cup needle roller bearings with open ends or with closed end, and with needle roller bearings.

The running surface for the needle roller and cage assembly must be hardened and ground.

Operating temperature

Needle roller and cage assemblies and needle roller bearings with plastic cage are suitable for operating temperatures from -20°C to $+120^{\circ}\text{C}$.

Cages

Cage assemblies with a plastic cage have the suffix TV.

Suffixes

Suffixes for available designs: see table.

Available designs

| Suffixes | Description | Design |
|------------------|--|------------------------------|
| TV ¹⁾ | Plastic cage made from glass fibre reinforced polyamide 66 | Standard |
| RR | Corrosion-resistant design, with Corrotect® plating | Special design ²⁾ |

¹⁾ Axial needle roller and cage assemblies with plastic cage: see dimension table.

²⁾ Available by agreement.

Other products

Axial needle roller bearings are available in a special range with two raceways in various sizes; see Technical Publication API 18.

Axial needle roller and cage assemblies, washers, axial needle roller bearings

| <h2>Design and safety guidelines</h2> <h3>Running surfaces</h3> <h3>Tolerances for shaft and housing bore</h3> <h3>Housing bore and shaft tolerances</h3> <h3>Speeds</h3> <p>Caution! The limiting speeds n_G given in the dimension tables for AXK and AXW are for oil lubrication. With grease lubrication, the permissible value is 25% of the value given in the table. Higher speeds may be possible by agreement.</p> <h3>Minimum axial load</h3> <p>A minimum axial load $F_{a\ min}$ according to the formula must be applied.</p> $F_{a\ min} = 0,0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$ <p style="text-align: center;">$F_{a\ min}$ N Minimum axial load k_a – Factor for determining the minimum load; $k_a = 3$ C_{0a} N Basic static load rating, axial n min^{-1} Speed.</p> <h3>Orientation of washers</h3> <p>Axial bearing washers AS are suitable as raceways on both sides.</p> | <p>Axial bearing washers AS must always be fully supported on their entire abutment surface.</p> <p>The abutment shoulders should be rigid, flat and perpendicular to the axis of rotation.</p> <p>Radial cage running surfaces should be precision machined and resistant to wear, $R_a 0,8$ ($R_z 4$).</p> <p>Raceways for axial needle roller and cage assemblies should be precision machined and resistant to wear:</p> <ul style="list-style-type: none"> ■ raceway hardness 58 HRC to 64 HRC ■ hardening depth $Rht \geq 140 \cdot D_W / R_{p0,2}$ <ul style="list-style-type: none"> – Rht, hardening depth in mm – D_W, rolling element diameter in mm – $R_{p0,2}$, proof stress in N/mm² ■ roughness $R_a 0,2$ ($R_z 1$) ■ raceway dimensions E_a and E_b according to the dimension table must be observed ■ runout tolerances to ISO tolerance grade IT 5, for special requirements to IT 4, in relation to the inside diameter of the cage assemblies (D_{c1}) must be observed. <p>If axial needle roller bearings AXW are combined with drawn cup needle roller bearings or machined needle roller bearings, the same tolerances must be selected for the housing bore on the centring spigot as for the radial bearings.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Bearing component</th> <th style="text-align: left;">Shaft tolerance</th> <th style="text-align: left;">Bore tolerance</th> </tr> </thead> <tbody> <tr> <td>AXK</td> <td>Guided on shaft</td> <td>$h8$</td> <td>–</td> </tr> <tr> <td rowspan="2">AS</td> <td>As housing locating washer</td> <td>Clear of shaft</td> <td>$H9$</td> </tr> <tr> <td>As shaft locating washer</td> <td>$h8$</td> <td>Clear of housing</td> </tr> </tbody> </table> <h3>Speeds</h3> <p>Caution! The limiting speeds n_G given in the dimension tables for AXK and AXW are for oil lubrication. With grease lubrication, the permissible value is 25% of the value given in the table. Higher speeds may be possible by agreement.</p> <h3>Minimum axial load</h3> <p>A minimum axial load $F_{a\ min}$ according to the formula must be applied.</p> $F_{a\ min} = 0,0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$ <p style="text-align: center;">$F_{a\ min}$ N Minimum axial load k_a – Factor for determining the minimum load; $k_a = 3$ C_{0a} N Basic static load rating, axial n min^{-1} Speed.</p> <h3>Orientation of washers</h3> <p>Axial bearing washers AS are suitable as raceways on both sides.</p> | Bearing component | Shaft tolerance | Bore tolerance | AXK | Guided on shaft | $h8$ | – | AS | As housing locating washer | Clear of shaft | $H9$ | As shaft locating washer | $h8$ | Clear of housing |
|---|--|-------------------|------------------|----------------|-----|-----------------|------|---|----|----------------------------|----------------|------|--------------------------|------|------------------|
| Bearing component | Shaft tolerance | Bore tolerance | | | | | | | | | | | | | |
| AXK | Guided on shaft | $h8$ | – | | | | | | | | | | | | |
| AS | As housing locating washer | Clear of shaft | $H9$ | | | | | | | | | | | | |
| | As shaft locating washer | $h8$ | Clear of housing | | | | | | | | | | | | |

Accuracy Tolerances for bearing components

Tolerances for bearing components: see table and *Figure 1*.

The diameter sort tolerance of the needle rollers in the axial needle roller and cage assembly AXK is $2 \mu\text{m}$.

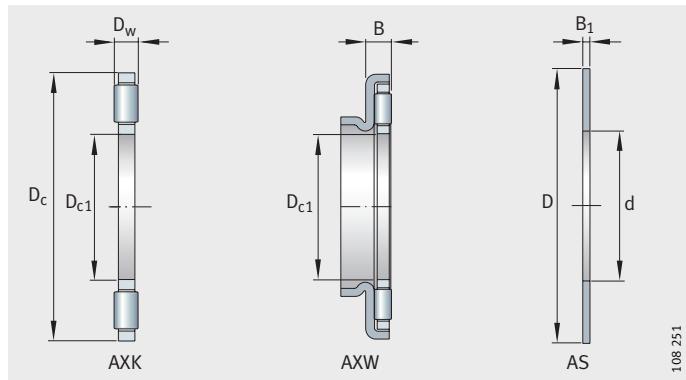
Axial bearing washers AS match themselves to the accuracy of the contact surface. They are flat under a minimum concentric load of 200 N.



Tolerances

| Series | Bore | | Outside diameter | | Height | |
|--------|----------|-----------|------------------|-----------|--------|-----------------------|
| | | Tolerance | | Tolerance | | Tolerance |
| AXK | D_{c1} | E12 | D_c | c13 | D_W | -0,01 mm |
| AXW | D_{c1} | E12 | - | - | B | -0,2 mm |
| AS | d | E13 | D | e13 | B_1 | $\pm 0,05 \text{ mm}$ |

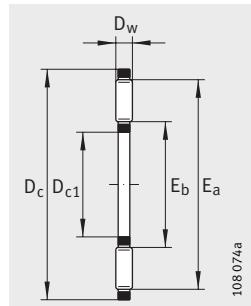
Figure 1
Bearing components



108 251

Axial needle roller and cage assemblies

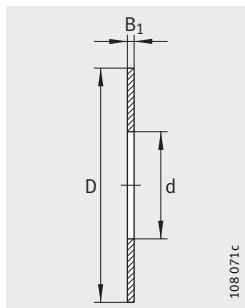
Axial bearing washers



AXK

Dimension table · Dimensions in mm

| Axial needle roller and cage assemblies | | Axial bearing washers | | Dimensions | | | |
|--|--------------------------|-----------------------|--------------------------|------------|---------|-------|-------|
| Designation | Mass m $\approx g$ | Designation | Mass m $\approx g$ | D_{c1}/d | D_c/D | D_w | B_1 |
| AXK0414-TV | 0,7 | AS0414 | 1 | 4 | 14 | 2 | 1 |
| AXK0515-TV | 0,8 | AS0515 | 1 | 5 | 15 | 2 | 1 |
| AXK0619-TV | 1 | AS0619 | 2 | 6 | 19 | 2 | 1 |
| AXK0821-TV | 2 | AS0821 | 2 | 8 | 21 | 2 | 1 |
| AXK1024 | 3 | AS1024 | 3 | 10 | 24 | 2 | 1 |
| AXK1226 | 3 | AS1226 | 3 | 12 | 26 | 2 | 1 |
| AXK1528 | 4 | AS1528 | 3 | 15 | 28 | 2 | 1 |
| AXK1730 | 4 | AS1730 | 4 | 17 | 30 | 2 | 1 |
| AXK2035 | 5 | AS2035 | 5 | 20 | 35 | 2 | 1 |
| AXK2542 | 7 | AS2542 | 7 | 25 | 42 | 2 | 1 |
| AXK3047 | 8 | AS3047 | 8 | 30 | 47 | 2 | 1 |
| AXK3552 | 10 | AS3552 | 9 | 35 | 52 | 2 | 1 |
| AXK4060 | 16 | AS4060 | 12 | 40 | 60 | 3 | 1 |
| AXK4565 | 18 | AS4565 | 13 | 45 | 65 | 3 | 1 |
| AXK5070 | 20 | AS5070 | 14 | 50 | 70 | 3 | 1 |
| AXK5578 | 28 | AS5578 | 18 | 55 | 78 | 3 | 1 |
| AXK6085 | 33 | AS6085 | 22 | 60 | 85 | 3 | 1 |
| AXK6590 | 35 | AS6590 | 24 | 65 | 90 | 3 | 1 |
| AXK7095 | 60 | AS7095 | 25 | 70 | 95 | 4 | 1 |
| AXK75100 | 61 | AS75100 | 27 | 75 | 100 | 4 | 1 |
| AXK80105 | 63 | AS80105 | 28 | 80 | 105 | 4 | 1 |
| AXK85110 | 67 | AS85110 | 29 | 85 | 110 | 4 | 1 |
| AXK90120 | 86 | AS90120 | 39 | 90 | 120 | 4 | 1 |
| AXK100135 | 104 | AS100135 | 50 | 100 | 135 | 4 | 1 |
| AXK110145 | 122 | AS110145 | 55 | 110 | 145 | 4 | 1 |
| AXK120155 | 131 | AS120155 | 59 | 120 | 155 | 4 | 1 |
| AXK130170 | 205 | AS130170 | 65 | 130 | 170 | 5 | 1 |
| AXK140180 | 219 | AS140180 | 79 | 140 | 180 | 5 | 1 |
| AXK150190 | 232 | AS150190 | 84 | 150 | 190 | 5 | 1 |
| AXK160200 | 246 | AS160200 | 89 | 160 | 200 | 5 | 1 |



108 071c

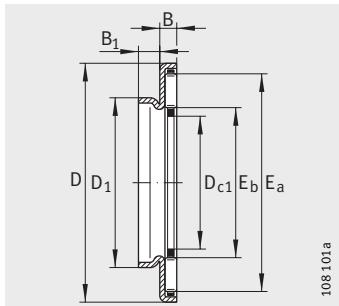
AS



| Raceway dimensions | | Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|--------------------|-------|--------------------|------------------------|--------------------|----------------------------|----------------------------|
| E_b | E_a | dyn. C_a N | stat. C_{0a} N | C_{ua} N | n_G min ⁻¹ | n_B min ⁻¹ |
| 5 | 13 | 4 400 | 8 000 | 940 | 21 400 | 14 900 |
| 6 | 14 | 4 750 | 9 200 | 1 070 | 20 500 | 13 000 |
| 7 | 18 | 6 800 | 15 500 | 1 580 | 18 800 | 10 800 |
| 9 | 20 | 7 800 | 19 400 | 1 970 | 17 700 | 8 800 |
| 12 | 23 | 9 200 | 25 500 | 2 500 | 16 900 | 7 400 |
| 14 | 25 | 9 900 | 29 000 | 2 850 | 15 200 | 6 500 |
| 17 | 27 | 11 300 | 36 000 | 3 600 | 13 400 | 5 100 |
| 19 | 29 | 11 900 | 39 500 | 3 950 | 12 300 | 4 600 |
| 22 | 34 | 13 100 | 46 500 | 4 750 | 10 500 | 4 350 |
| 29 | 41 | 14 700 | 58 000 | 5 900 | 8 600 | 3 850 |
| 34 | 46 | 16 300 | 70 000 | 7 100 | 7 500 | 3 200 |
| 39 | 51 | 17 800 | 81 000 | 8 300 | 6 600 | 2 800 |
| 45 | 58 | 28 000 | 114 000 | 11 800 | 5 800 | 2 440 |
| 50 | 63 | 30 000 | 128 000 | 13 300 | 5 200 | 2 170 |
| 55 | 68 | 32 000 | 143 000 | 14 800 | 4 800 | 1 950 |
| 60 | 76 | 38 000 | 186 000 | 20 300 | 4 350 | 1 780 |
| 65 | 83 | 44 500 | 234 000 | 26 500 | 3 950 | 1 590 |
| 70 | 88 | 46 500 | 255 000 | 28 500 | 3 700 | 1 470 |
| 74 | 93 | 54 000 | 255 000 | 26 500 | 3 500 | 1 430 |
| 79 | 98 | 55 000 | 265 000 | 28 000 | 3 300 | 1 350 |
| 84 | 103 | 56 000 | 280 000 | 29 500 | 3 100 | 1 280 |
| 89 | 108 | 58 000 | 290 000 | 30 500 | 2 950 | 1 220 |
| 94 | 118 | 73 000 | 405 000 | 44 500 | 2 750 | 1 120 |
| 105 | 133 | 91 000 | 560 000 | 58 000 | 2 450 | 980 |
| 115 | 143 | 97 000 | 620 000 | 63 000 | 2 260 | 890 |
| 125 | 153 | 102 000 | 680 000 | 68 000 | 2 090 | 810 |
| 136 | 167 | 133 000 | 840 000 | 75 000 | 1 920 | 760 |
| 146 | 177 | 138 000 | 900 000 | 79 000 | 1 800 | 710 |
| 156 | 187 | 143 000 | 960 000 | 82 000 | 1 690 | 660 |
| 166 | 197 | 148 000 | 1 020 000 | 86 000 | 1 600 | 620 |

Axial needle roller bearings

With centring spigot



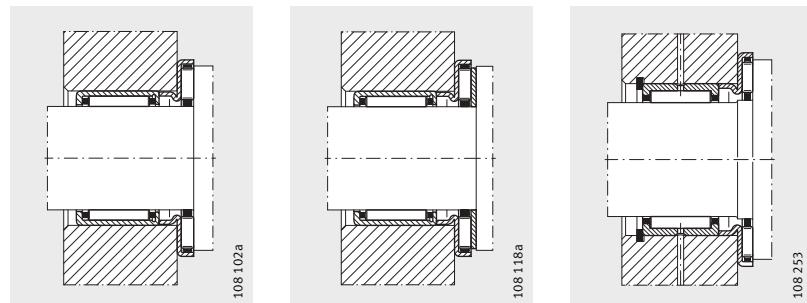
AXW

Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | Raceway dimensions | | Basic load ratings | | Fatigue limit load C _{ua} | Limiting speed n _G min ⁻¹ | Reference speed n _B min ⁻¹ |
|--------------|-----------------|-----------------|----------------|----|-----|----------------|--------------------|----------------|-----------------------------|-------------------------------|--|--|---|
| | | D _{c1} | D ₁ | D | B | B ₁ | E _b | E _a | dyn. C _a N | stat. C _{0a} N | | | |
| AXW10 | 8,3 | 10 | 14 | 27 | 3,2 | 3 | 12 | 23 | 9 200 | 25 500 | 2 500 | 15 600 | 8 300 |
| AXW12 | 9,1 | 12 | 16 | 29 | 3,2 | 3 | 14 | 25 | 9 900 | 29 000 | 2 850 | 14 000 | 7 300 |
| AXW15 | 10 | 15 | 21 | 31 | 3,2 | 3,5 | 17 | 27 | 11 300 | 36 000 | 3 600 | 12 500 | 5 800 |
| AXW17 | 11 | 17 | 23 | 33 | 3,2 | 3,5 | 19 | 29 | 11 900 | 39 500 | 3 950 | 11 500 | 5 300 |
| AXW20 | 14 | 20 | 26 | 38 | 3,2 | 3,5 | 22 | 34 | 13 100 | 46 500 | 4 750 | 9 900 | 4 900 |
| AXW25 | 20 | 25 | 32 | 45 | 3,2 | 4 | 29 | 41 | 14 700 | 58 000 | 5 900 | 8 200 | 4 250 |
| AXW30 | 22 | 30 | 37 | 50 | 3,2 | 4 | 34 | 46 | 16 300 | 70 000 | 7 100 | 7 200 | 3 600 |
| AXW35 | 27 | 35 | 42 | 55 | 3,2 | 4 | 39 | 51 | 17 800 | 81 000 | 8 300 | 6 400 | 3 100 |
| AXW40 | 39 | 40 | 47 | 63 | 4,2 | 4 | 45 | 58 | 28 000 | 114 000 | 11 800 | 5 600 | 2 700 |
| AXW45 | 43 | 45 | 52 | 68 | 4,2 | 4 | 50 | 63 | 30 000 | 128 000 | 13 300 | 5 100 | 2 400 |
| AXW50 | 49 | 50 | 58 | 73 | 4,2 | 4,5 | 55 | 68 | 32 000 | 143 000 | 14 800 | 4 700 | 2 160 |

¹⁾ Dimensions for axial bearing washers AS, for drawn cup needle roller bearings with open ends, drawn cup needle roller bearings with open end and needle roller bearings: see corresponding product section.

**Combination with
radial needle
roller bearings**



AXW with HK

AXW with AS
and HK

AXW with NK, NKS,
RNA49, RNA69

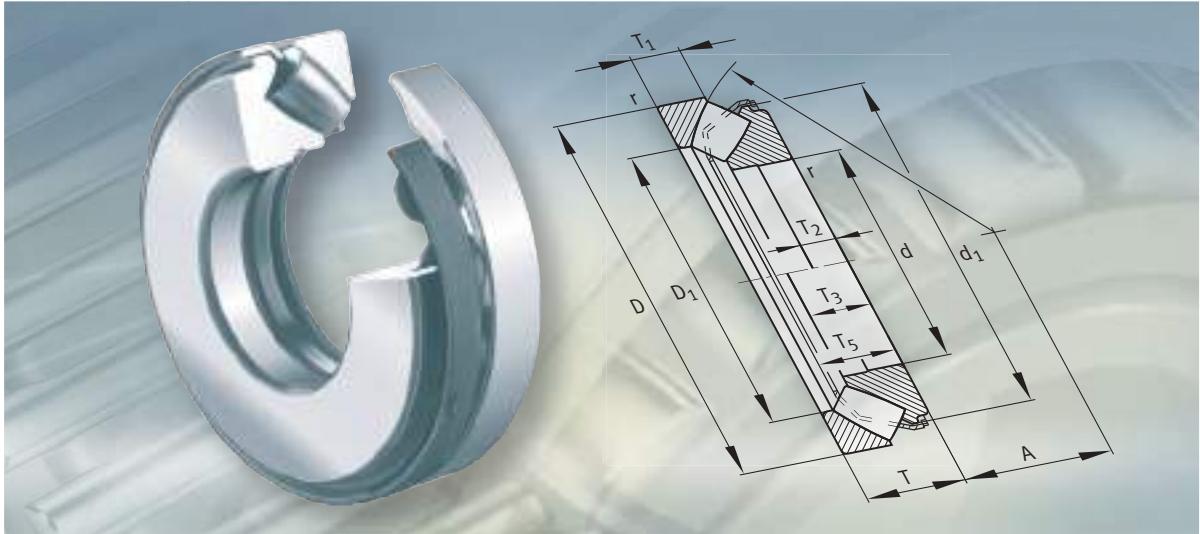


**Combination with drawn cup needle roller bearings with open ends,
drawn cup needle roller bearings with closed end and with needle roller bearings**

Designation

| AS | HK | HK..-RS | BK | NK, NKS, RNA49, RNA69 Needle roller bearings ¹⁾ | NKI, NKIS, NA49, NA69 Needle roller bearings ¹⁾ |
|--------|--|--|---|---|---|
| | Drawn cup needle roller bearing with open ends ¹⁾ | Drawn cup needle roller bearing with open ends ¹⁾ | Drawn cup needle roller bearing with closed end ¹⁾ | NK, NKS, RNA49, RNA69 Needle roller bearings ¹⁾ | NKI, NKIS, NA49, NA69 Needle roller bearings ¹⁾ |
| AS1024 | HK1010, HK1012 | – | BK1010, BK1012 | NK7/10TV | – |
| – | HK1015 | – | BK1015 | NK7/12TV | – |
| AS1226 | HK1210 | – | BK1210 | NK9/12TV | NKI6/12TV |
| – | – | – | – | NK9/16TV | NKI6/16TV |
| AS1528 | HK1512, HK1516 | HK1514-RS | BK1512, BK1516 | – | – |
| – | HK1522-ZW | – | – | – | – |
| AS1730 | HK1712 | – | – | NK15/16, NK15/20 | – |
| AS2035 | HK2012, HK2016 | HK2018-RS | BK2016 | NK18/16, NK18/20 | – |
| – | HK2020 | – | BK2020 | – | – |
| – | HK2030-ZW | – | – | – | – |
| AS2542 | HK2512, HK2516 | HK2518-RS | – | NK24/16, NK24/20 | NKI20/16 |
| – | HK2520, HK2526 | – | BK2520, BK2526 | NKS20 | NKI20/20 |
| – | HK2538-ZW | – | BK2538-ZW | – | – |
| AS3047 | HK3012, HK3016 | HK3018-RS | BK3012, BK3016 | NK28/20, NK28/30 | NA4904 |
| – | HK3020, HK3026 | – | BK3020, BK3026 | NKS 24 | NA6904 |
| – | HK3038-ZW | – | BK3038-ZW | RNA4904, RNA6904 | – |
| AS3552 | HK3512, HK3516 | HK3518-RS | – | NK32/20, NK32/30 | NKI20, NA4905 |
| – | HK3520 | – | BK3520 | NKS28 | NA6905 |
| – | – | – | – | RNA4905, RNA6905 | NKI28/20 NKI28/30 |
| AS4060 | HK4012, HK4016 | HK4018-RS | – | NK37/20, NK37/30 | NKI25, NA4906 |
| – | HK4020 | – | BK4020 | NKS32 | NA6906 |
| – | – | – | – | RNA4906, RNA6906 | NKI32/20 |
| – | – | – | – | – | NKI32/30 |
| AS4565 | HK4516, HK4520 | HK4518-RS | BK4520 | NK42/20, NK42/30 | NKI30 |
| – | – | – | – | NKS37 | NA49/32 |
| – | – | – | – | RNA49/32, RNA69/32 | NA69/32 |
| AS5070 | HK5020, HK5025 | HK5022-RS | – | NKS43 | NKI35 |

FAG



Axial spherical roller bearings

Axial spherical roller bearings

| | Page |
|-------------------------------------|---|
| Product overview | Axial spherical roller bearings 786 |
| Features | Compensation of angular misalignments..... 787 Operating temperature 787 Cages 787 Suffixes 787 |
| Design and safety guidelines | Equivalent dynamic bearing load..... 788 Equivalent static bearing load 788 Static load safety factor 788 Minimum axial load 789 Speeds 789 Design of adjacent parts 789 |
| Accuracy | 789 |
| Dimension tables | Axial spherical roller bearings 790 |



Product overview Axial spherical roller bearings

Increased capacity design

292..-E, 293..-E, 294..-E



108 24/da

Axial spherical roller bearings

| Features | Axial spherical roller bearings are single row, self-aligning roller bearings. They comprise solid shaft and housing locating washers and asymmetrical barrel rollers with cages. The cage holds the roller and cage assembly and the shaft locating washer together. The bearings can be dismantled. As a result, the bearing components can be fitted separately. | | | | | | | | | | | | |
|--|---|------------------|-----------------------------------|------------------|---------------------------|---------|------------------|---------|----------|---------|---------|----------|---------|
| Axial and radial load capacity | Axial spherical roller bearings can support very high axial loads and allow relatively high speeds. Since the raceways are inclined relative to the bearing axis, the bearings can also support radial loads. Radial loading: see page 788. | | | | | | | | | | | | |
| Sealing/lubrication | Axial spherical roller bearings are not sealed and not greased. They must be lubricated using oil. | | | | | | | | | | | | |
| Compensation of angular misalignments | Axial spherical roller bearings can be swivelled about their central position by a few degrees, see table Permissible skewing. As a result, they permit skewing between the housing and shaft locating washer and can thus compensate misalignments, shaft deflections and housing deformations. The adjustment angles in the table are permissible under the following conditions: <ul style="list-style-type: none"> ■ $P \text{ or } P_0 \leq 0,05 \cdot C_{0a}$ ■ constant angular deviation (static angular misalignment) ■ rotating shaft locating washer. The lower values are valid for large bearings. | | | | | | | | | | | | |
| Permissible skewing | <table border="1"> <thead> <tr> <th>Series</th><th>Permissible skewing¹⁾</th></tr> </thead> <tbody> <tr> <td>292..-E</td><td>1° to 1,5°</td></tr> <tr> <td>293..-E</td><td>1,5° to 2,5°</td></tr> <tr> <td>294..-E</td><td>2° to 3°</td></tr> </tbody> </table> | Series | Permissible skewing ¹⁾ | 292..-E | 1° to 1,5° | 293..-E | 1,5° to 2,5° | 294..-E | 2° to 3° | | | | |
| Series | Permissible skewing ¹⁾ | | | | | | | | | | | | |
| 292..-E | 1° to 1,5° | | | | | | | | | | | | |
| 293..-E | 1,5° to 2,5° | | | | | | | | | | | | |
| 294..-E | 2° to 3° | | | | | | | | | | | | |
| | <p>¹⁾ If the housing locating washer rotates or the shaft locating washer undergoes tumbling motion, the angular adjustment facility is smaller.</p> | | | | | | | | | | | | |
| Operating temperature | Axial spherical roller bearings can be used at operating temperatures from -30°C to $+150^{\circ}\text{C}$, restricted by the lubricant. | | | | | | | | | | | | |
| Cages | The standard cages for axial spherical roller bearings are shown in the table Cage/bore code. Bearings with solid brass cages have the suffix MB. The other bearings have sheet steel cages and do not have a cage suffix. | | | | | | | | | | | | |
| Cage/bore code | <table border="1"> <thead> <tr> <th>Series</th><th>Sheet steel cage Bore code</th><th>Solid brass cage</th></tr> </thead> <tbody> <tr> <td>292..-E</td><td>–</td><td>all</td></tr> <tr> <td>293..-E</td><td>up to 64</td><td>from 68</td></tr> <tr> <td>294..-E</td><td>up to 68</td><td>from 72</td></tr> </tbody> </table> | Series | Sheet steel cage Bore code | Solid brass cage | 292..-E | – | all | 293..-E | up to 64 | from 68 | 294..-E | up to 68 | from 72 |
| Series | Sheet steel cage Bore code | Solid brass cage | | | | | | | | | | | |
| 292..-E | – | all | | | | | | | | | | | |
| 293..-E | up to 64 | from 68 | | | | | | | | | | | |
| 294..-E | up to 68 | from 72 | | | | | | | | | | | |
| Suffixes | Suffixes for available designs: see table. | | | | | | | | | | | | |
| Available designs | <table border="1"> <thead> <tr> <th>Suffix</th><th>Description</th></tr> </thead> <tbody> <tr> <td>E</td><td>Increased capacity design</td></tr> <tr> <td>MB</td><td>Solid brass cage</td></tr> </tbody> </table> | Suffix | Description | E | Increased capacity design | MB | Solid brass cage | | | | | | |
| Suffix | Description | | | | | | | | | | | | |
| E | Increased capacity design | | | | | | | | | | | | |
| MB | Solid brass cage | | | | | | | | | | | | |



Axial spherical roller bearings

| Design and safety guidelines | | | | | | | | | |
|--|--|---------------------------------|------------|--------------|---|--------------|---|--------------|--|
| Equivalent dynamic bearing load | For bearings under dynamic loading, the following applies: $P = F_a + 1,2 \cdot F_r$ | | | | | | | | |
| | P N Equivalent dynamic bearing load for combined load F_a N Axial dynamic bearing load F_r N Radial dynamic bearing load. | | | | | | | | |
| Radial load | | | | | | | | | |
| Caution! | The radial bearing load must not exceed 55% of the axial load: $F_r \leq 0,55 \cdot F_a$. | | | | | | | | |
| Equivalent static bearing load | For bearings under static loading, the following applies: $P_0 = F_{0a} + 2,7 \cdot F_{0r}$ | | | | | | | | |
| | P_0 N Equivalent static bearing load for combined load F_{0a} N Axial static bearing load F_{0r} N Radial static bearing load. | | | | | | | | |
| Radial load | | | | | | | | | |
| Caution! | The radial bearing load must not exceed 55% of the axial load: $F_{0r} \leq 0,55 \cdot F_{0a}$. | | | | | | | | |
| Static load safety factor | For the static load safety factor S_0 , the following values must be observed: | | | | | | | | |
| Static load safety factor | <table border="1"> <thead> <tr> <th>Static load safety factor S_0</th><th>Conditions</th></tr> </thead> <tbody> <tr> <td>$S_0 \geq 8$</td><td>Axial support by the abutting shoulders in accordance with the bearing tables (d_a and D_a)</td></tr> <tr> <td>$S_0 \geq 6$</td><td>Full axial support of the housing and shaft locating washers by the entire mating surface, dimensions D_1 and d_1 (see dimension table)</td></tr> <tr> <td>$S_0 \geq 4$</td><td>Full axial support, dimensions D_1 and d_1 (see dimension table) together with good radial support of the housing locating washer (housing tolerance K7)</td></tr> </tbody> </table> | Static load safety factor S_0 | Conditions | $S_0 \geq 8$ | Axial support by the abutting shoulders in accordance with the bearing tables (d_a and D_a) | $S_0 \geq 6$ | Full axial support of the housing and shaft locating washers by the entire mating surface, dimensions D_1 and d_1 (see dimension table) | $S_0 \geq 4$ | Full axial support, dimensions D_1 and d_1 (see dimension table) together with good radial support of the housing locating washer (housing tolerance K7) |
| Static load safety factor S_0 | Conditions | | | | | | | | |
| $S_0 \geq 8$ | Axial support by the abutting shoulders in accordance with the bearing tables (d_a and D_a) | | | | | | | | |
| $S_0 \geq 6$ | Full axial support of the housing and shaft locating washers by the entire mating surface, dimensions D_1 and d_1 (see dimension table) | | | | | | | | |
| $S_0 \geq 4$ | Full axial support, dimensions D_1 and d_1 (see dimension table) together with good radial support of the housing locating washer (housing tolerance K7) | | | | | | | | |

Minimum axial load

At higher speeds, harmful sliding movement can occur between the rolling elements and raceways due to centrifugal forces and gyroscopic moments. To avoid this, the bearings must be subjected to a minimum load $F_{a\min}$ according to the formula. The minimum load can be applied by preloading.

$$F_{a\min} = \frac{C_{0a}}{1400} + A \left(\frac{D \cdot T \cdot n}{10^6} \right)^2$$

$F_{a\min}$ N
 Minimum axial load
 C_{0a} N
 Basic static load rating, see dimension table
 A –
 Factor dependent on the series, see table
 D mm
 Outside diameter of housing locating washer
 T mm
 Total height
 n min⁻¹
 Maximum speed.



Factor dependent on series

| Series | Factor A |
|---------|----------|
| 292..-E | 2,7 |
| 293..-E | 3,1 |
| 294..-E | 2,1 |

Speeds

Caution!

The limiting speeds n_G given in the dimension tables must not be exceeded. The values are for oil lubrication.

The reference speeds n_B were calculated according to ISO 15 312.

Design of adjacent parts

The abutting shoulders should be rigid, flat and perpendicular to the axis of rotation.

A recess of diameter $D_b\min$ according to the dimension table must be provided above the housing locating washer in the housing bore. Otherwise, the rollers will foul the housing when the shaft swivels.

Tolerances for shaft and housing

The runout tolerances of the abutting shoulders should be to IT5 or better. The tolerances for the shaft and locating bore must be applied in accordance with the table.

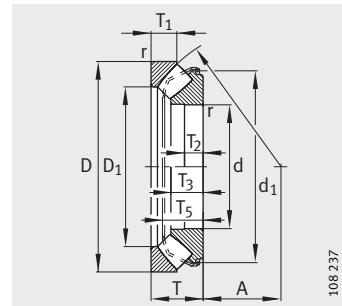
Shaft/housing tolerances

| Adjacent part | Load type | Operating conditions | Tolerance |
|---------------|---------------|---|-----------|
| Shaft | Combined load | Point load for shaft locating washer | j6 |
| | | Circumferential load for shaft locating washer, shaft diameter up to 200 mm | j6 (k6) |
| | | Circumferential load for shaft locating washer, shaft diameter from 200 mm | k6 (m6) |
| Housing | Axial load | Normal load | E8 |
| | | High load | G7 |
| | Combined load | Point load for housing locating washer | H7 |
| | | Circumf. load for housing locating washer | K7 |

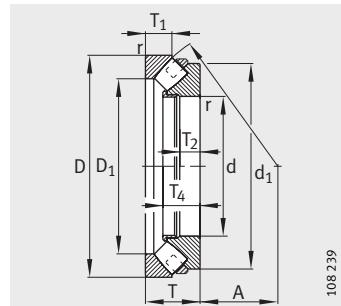
Accuracy

The main dimensions of the bearings conform to ISO 104 and DIN 728. The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620-3.

Axial spherical roller bearings



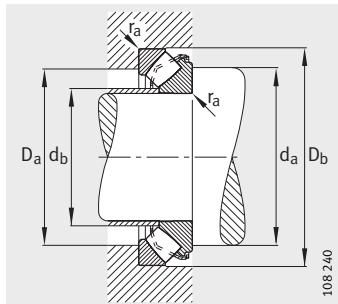
293..-E, 294..-E



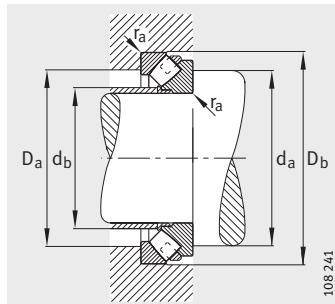
292..-E-MB

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | |
|-------------|------------------|------------|-----|-----|----------------|----------------|-----|----------------|----------------|----------------|----------------|----------------|-----|--|
| | | d | D | T | D ₁ | d ₁ | r | T ₁ | T ₂ | T ₃ | T ₄ | T ₅ | A | |
| 29412-E | 2,23 | 60 | 130 | 42 | 88 | 115 | 1,5 | 20 | 15 | 27 | - | 36 | 38 | |
| 29413-E | 3,03 | 65 | 140 | 45 | 94 | 125 | 2 | 21 | 16 | 29,5 | - | 38 | 42 | |
| 29414-E | 3,71 | 70 | 150 | 48 | 102 | 135 | 2 | 23 | 17 | 31 | - | 40 | 44 | |
| 29415-E | 4,4 | 75 | 160 | 51 | 108 | 140 | 2 | 24 | 18 | 33,5 | - | 43 | 47 | |
| 29416-E | 5,28 | 80 | 170 | 54 | 116 | 150 | 2,1 | 26 | 19 | 35 | - | 45 | 50 | |
| 29317-E | 2,54 | 85 | 150 | 39 | 111 | 135 | 1,5 | 19 | 14 | 24,5 | - | 33 | 50 | |
| 29417-E | 5,89 | 85 | 180 | 58 | 123 | 160 | 2,1 | 28 | 21 | 37 | - | 48 | 54 | |
| 29318-E | 2,65 | 90 | 155 | 39 | 115 | 140 | 1,5 | 19 | 14 | 24,5 | - | 33 | 52 | |
| 29418-E | 7,38 | 90 | 190 | 60 | 130 | 170 | 2,1 | 29 | 22 | 39 | - | 50 | 56 | |
| 29320-E | 3,38 | 100 | 170 | 42 | 129 | 155 | 1,5 | 20,8 | 15 | 26 | - | 36 | 58 | |
| 29420-E | 10 | 100 | 210 | 67 | 142 | 185 | 3 | 32 | 24 | 43 | - | 55 | 62 | |
| 29322-E | 5,04 | 110 | 190 | 48 | 142 | 175 | 2 | 23 | 17 | 30,3 | - | 41 | 64 | |
| 29422-E | 13,1 | 110 | 230 | 73 | 158 | 205 | 3 | 35 | 26 | 47 | - | 60 | 69 | |
| 29324-E | 6,9 | 120 | 210 | 54 | 158 | 190 | 2,1 | 26 | 19 | 34 | - | 46 | 70 | |
| 29424-E | 16,3 | 120 | 250 | 78 | 172 | 220 | 4 | 37 | 28 | 50,5 | - | 64 | 74 | |
| 29326-E | 8,49 | 130 | 225 | 58 | 169 | 205 | 2,1 | 28 | 21 | 36,5 | - | 49 | 76 | |
| 29426-E | 19 | 130 | 270 | 85 | 187 | 240 | 4 | 41 | 31 | 54 | - | 69 | 81 | |
| 29328-E | 9,87 | 140 | 240 | 60 | 181 | 220 | 2,1 | 29 | 22 | 38,5 | - | 51 | 82 | |
| 29428-E | 21,9 | 140 | 280 | 85 | 194 | 250 | 4 | 41 | 31 | 54 | - | 69 | 86 | |
| 29330-E | 10,5 | 150 | 250 | 60 | 192 | 230 | 2,1 | 29 | 22 | 38 | - | 51 | 87 | |
| 29430-E | 26,9 | 150 | 300 | 90 | 211 | 270 | 4 | 44 | 32 | 58 | - | 74 | 92 | |
| 29332-E | 13,6 | 160 | 270 | 67 | 206 | 245 | 3 | 32 | 24 | 42 | - | 56 | 92 | |
| 29432-E | 31,6 | 160 | 320 | 95 | 224 | 285 | 5 | 45 | 34 | 60,5 | - | 78 | 99 | |
| 29334-E | 14,2 | 170 | 280 | 67 | 215 | 255 | 3 | 32 | 24 | 42 | - | 57 | 96 | |
| 29434-E | 39,2 | 170 | 340 | 103 | 239 | 305 | 5 | 50 | 37 | 65,5 | - | 84 | 104 | |
| 29336-E | 18,4 | 180 | 300 | 73 | 230 | 275 | 4 | 35 | 26 | 46 | - | 61 | 103 | |
| 29436-E | 46,2 | 180 | 360 | 109 | 253 | 320 | 5 | 52 | 39 | 69,5 | - | 89 | 110 | |
| 29338-E | 22,8 | 190 | 320 | 78 | 243 | 295 | 4 | 38 | 28 | 49 | - | 66 | 110 | |
| 29438-E | 54,9 | 190 | 380 | 115 | 268 | 340 | 5 | 55 | 41 | 73 | - | 94 | 117 | |
| 29240-E-MB | 8,15 | 200 | 280 | 48 | 236 | 265 | 2 | 24 | 17 | 29 | 45 | - | 108 | |
| 29340-E | 28 | 200 | 340 | 85 | 258 | 310 | 4 | 41 | 31 | 53,5 | - | 71 | 116 | |
| 29440-E | 64,7 | 200 | 400 | 122 | 282 | 360 | 5 | 59 | 44 | 77 | - | 99 | 122 | |
| 29244-E-MB | 9,18 | 220 | 300 | 48 | 254 | 285 | 2 | 24 | 17 | 30 | 35 | - | 117 | |
| 29344-E | 29,9 | 220 | 360 | 85 | 279 | 330 | 4 | 41 | 31 | 53 | - | 71 | 125 | |
| 29444-E | 67,4 | 220 | 420 | 122 | 303 | 375 | 6 | 58 | 44 | 76,5 | - | 99 | 132 | |



Mounting dimensions
293..-E, 294..-E

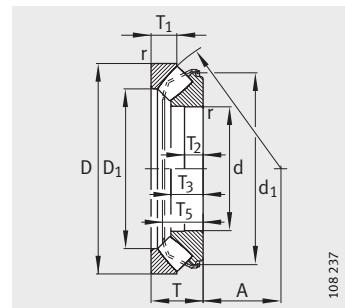


Mounting dimensions
292..-E-MB

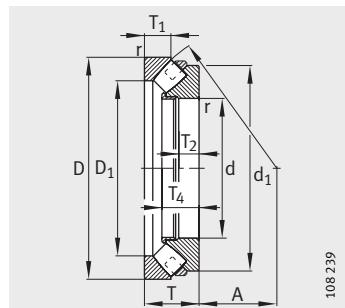


| Mounting dimensions | | | | | Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | D _b | d _b | r _a | dyn. C _a N | stat. C _{0a} N | C _{ua} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 90 | 107 | 133 | 70 | 1,5 | 335 000 | 900 000 | 65 000 | 3 600 | 2 750 |
| 100 | 115 | 143 | 73 | 2 | 380 000 | 1 020 000 | 77 000 | 3 400 | 2 650 |
| 105 | 124 | 153 | 80 | 2 | 430 000 | 1 200 000 | 87 000 | 3 000 | 2 480 |
| 115 | 132 | 163 | 86 | 2 | 490 000 | 1 370 000 | 100 000 | 2 800 | 2 280 |
| 120 | 141 | 173 | 91 | 2,1 | 550 000 | 1 560 000 | 110 000 | 2 800 | 2 170 |
| 115 | 129 | 153 | 93 | 1,5 | 345 000 | 1 060 000 | 72 000 | 3 400 | 2 210 |
| 130 | 150 | 183 | 97 | 2,1 | 600 000 | 1 730 000 | 122 000 | 2 600 | 2 090 |
| 118 | 135 | 158 | 99 | 1,5 | 355 000 | 1 100 000 | 74 000 | 3 400 | 2 130 |
| 135 | 158 | 193 | 103 | 2,1 | 670 000 | 1 930 000 | 134 000 | 2 400 | 2 010 |
| 132 | 148 | 173 | 109 | 1,5 | 405 000 | 1 340 000 | 91 000 | 3 000 | 1 930 |
| 150 | 175 | 214 | 112 | 2,5 | 830 000 | 2 450 000 | 167 000 | 2 200 | 1 800 |
| 145 | 165 | 193 | 119 | 2 | 530 000 | 1 700 000 | 112 000 | 2 600 | 1 850 |
| 165 | 192 | 234 | 125 | 2,5 | 950 000 | 2 800 000 | 189 000 | 2 000 | 1 710 |
| 160 | 182 | 213 | 132 | 2,1 | 640 000 | 2 080 000 | 135 000 | 2 400 | 1 680 |
| 180 | 210 | 254 | 135 | 3 | 1 120 000 | 3 350 000 | 224 000 | 1 800 | 1 550 |
| 170 | 195 | 228 | 141 | 2,1 | 720 000 | 2 360 000 | 154 000 | 2 200 | 1 600 |
| 195 | 227 | 275 | 151 | 3 | 1 250 000 | 3 900 000 | 255 000 | 1 700 | 1 440 |
| 185 | 208 | 244 | 152 | 2,1 | 800 000 | 2 700 000 | 175 000 | 2 000 | 1 510 |
| 205 | 237 | 285 | 158 | 3 | 1 290 000 | 4 050 000 | 265 000 | 1 700 | 1 370 |
| 195 | 220 | 254 | 163 | 2,1 | 815 000 | 2 850 000 | 179 000 | 2 000 | 1 420 |
| 220 | 253 | 306 | 171 | 3 | 1 460 000 | 4 800 000 | 305 000 | 1 500 | 1 250 |
| 210 | 236 | 274 | 174 | 2,5 | 965 000 | 3 350 000 | 210 000 | 2 000 | 1 330 |
| 230 | 271 | 326 | 181 | 4 | 1 660 000 | 5 300 000 | 335 000 | 1 400 | 1 180 |
| 220 | 247 | 284 | 184 | 2,5 | 1 000 000 | 3 450 000 | 217 000 | 1 800 | 1 270 |
| 245 | 288 | 346 | 191 | 4 | 1 860 000 | 6 000 000 | 385 000 | 1 300 | 1 110 |
| 235 | 263 | 304 | 193 | 2,5 | 1 180 000 | 4 150 000 | 255 000 | 1 500 | 1 180 |
| 260 | 305 | 366 | 202 | 4 | 2 080 000 | 6 800 000 | 430 000 | 1 300 | 1 020 |
| 250 | 281 | 325 | 206 | 3 | 1 320 000 | 4 650 000 | 285 000 | 1 500 | 1 140 |
| 275 | 322 | 386 | 214 | 4 | 2 320 000 | 7 500 000 | 470 000 | 1 200 | 970 |
| 235 | 258 | 284 | 211 | 2 | 655 000 | 2 650 000 | 152 000 | 2 000 | 1 260 |
| 265 | 298 | 348 | 215 | 3 | 1 530 000 | 5 300 000 | 325 000 | 1 400 | 1 060 |
| 290 | 338 | 406 | 225 | 4 | 2 550 000 | 8 500 000 | 510 000 | 1 100 | 920 |
| 260 | 277 | 304 | 229 | 2 | 720 000 | 3 150 000 | 173 000 | 2 000 | 1 130 |
| 285 | 316 | 368 | 235 | 3 | 1 560 000 | 5 600 000 | 335 000 | 1 400 | 980 |
| 310 | 360 | 428 | 243 | 5 | 2 600 000 | 8 500 000 | 520 000 | 1 100 | 860 |

Axial spherical roller bearings



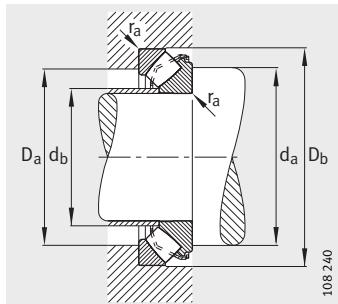
293..-E, 294..-E



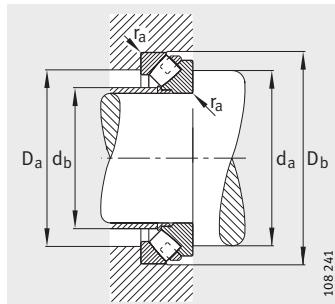
292..-E-MB, 293..-E-MB,
294..-E-MB

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | |
|-------------|------------------|------------|-----|-----|----------------|----------------|-----|----------------|----------------|----------------|----------------|----------------|-----|--|
| | | d | D | T | D ₁ | d ₁ | r | T ₁ | T ₂ | T ₃ | T ₄ | T ₅ | A | |
| 29248-E-MB | 16,1 | 240 | 340 | 60 | 282 | 320 | 2,1 | 30 | 22 | 38 | 44 | — | 130 | |
| 29348-E | 32,5 | 240 | 380 | 85 | 299 | 350 | 4 | 41 | 31 | 53 | — | 71 | 135 | |
| 29448-E | 73,5 | 240 | 440 | 122 | 321 | 400 | 6 | 59 | 44 | 78 | — | 99 | 142 | |
| 29252-E-MB | 17 | 260 | 360 | 60 | 302 | 340 | 2,1 | 30 | 22 | 38 | 44 | — | 139 | |
| 29352-E | 45,2 | 260 | 420 | 95 | 327 | 385 | 5 | 45 | 34 | 61 | — | 79 | 148 | |
| 29452-E | 93,6 | 260 | 480 | 132 | 353 | 435 | 6 | 64 | 48 | 83 | — | 107 | 154 | |
| 29256-E-MB | 19,2 | 280 | 380 | 60 | 322 | 360 | 2,1 | 30 | 22 | 38 | 44 | — | 150 | |
| 29356-E | 48,8 | 280 | 440 | 95 | 346 | 405 | 5 | 46 | 34 | 61 | — | 79 | 158 | |
| 29456-E | 121 | 280 | 520 | 145 | 380 | 470 | 6 | 68 | 52 | 92 | — | 118 | 166 | |
| 29260-E-MB | 28,6 | 300 | 420 | 73 | 353 | 395 | 3 | 38 | 26 | 44 | 51 | — | 162 | |
| 29360-E | 66,4 | 300 | 480 | 109 | 378 | 440 | 5 | 50 | 39 | 69 | — | 90 | 168 | |
| 29460-E | 129 | 300 | 540 | 145 | 398 | 490 | 6 | 70 | 52 | 93 | — | 118 | 175 | |
| 29264-E-MB | 30,3 | 320 | 440 | 73 | 372 | 415 | 3 | 38 | 26 | 44,5 | 51 | — | 172 | |
| 29364-E | 71 | 320 | 500 | 109 | 396 | 465 | 5 | 53 | 39 | 68 | — | 90 | 180 | |
| 29464-E | 158 | 320 | 580 | 155 | 432 | 525 | 7,5 | 75 | 56 | 97 | — | 126 | 191 | |
| 29268-E-MB | 32 | 340 | 460 | 73 | 391 | 435 | 3 | 37 | 26 | 45 | 52 | — | 183 | |
| 29368-E-MB | 98,9 | 340 | 540 | 122 | 426 | 500 | 5 | 59 | 44 | 75 | 85 | — | 192 | |
| 29468-E | 200 | 340 | 620 | 170 | 458 | 560 | 7,5 | 82 | 61 | 106 | — | 138 | 201 | |
| 29272-E-MB | 46,5 | 360 | 500 | 85 | 423 | 475 | 4 | 44 | 31 | 51 | 59 | — | 194 | |
| 29372-E-MB | 103 | 360 | 560 | 122 | 446 | 520 | 5 | 59 | 44 | 75 | 86 | — | 202 | |
| 29472-E-MB | 219 | 360 | 640 | 170 | 475 | 580 | 7,5 | 82 | 61 | 108 | 121 | — | 210 | |
| 29276-E-MB | 48,4 | 380 | 520 | 85 | 440 | 490 | 4 | 42 | 31 | 53 | 81 | — | 202 | |
| 29376-E-MB | 132 | 380 | 600 | 132 | 474 | 555 | 6 | 63 | 48 | 83 | 94 | — | 216 | |
| 29476-E-MB | 248 | 380 | 670 | 175 | 500 | 610 | 7,5 | 85 | 63 | 111 | 124 | — | 230 | |
| 29280-E-MB | 51,2 | 400 | 540 | 85 | 460 | 510 | 4 | 42 | 31 | 53,5 | 62 | — | 212 | |
| 29380-E-MB | 137 | 400 | 620 | 132 | 493 | 575 | 6 | 64 | 48 | 83 | 94 | — | 225 | |
| 29480-E-MB | 294 | 400 | 710 | 185 | 530 | 645 | 7,5 | 89 | 67 | 117 | 131 | — | 236 | |
| 29284-E-MB | 73,4 | 420 | 580 | 95 | 489 | 550 | 5 | 46 | 34 | 60,5 | 70 | — | 225 | |
| 29384-E-MB | 157 | 420 | 650 | 140 | 520 | 600 | 6 | 68 | 50 | 85 | 97 | — | 235 | |
| 29484-E-MB | 305 | 420 | 730 | 185 | 550 | 665 | 7,5 | 89 | 67 | 117 | 132 | — | 244 | |
| 29288-E-MB | 74 | 440 | 600 | 95 | 506 | 570 | 5 | 49 | 34 | 61 | 70 | — | 235 | |
| 29388-E-MB | 176 | 440 | 680 | 145 | 548 | 630 | 6 | 70 | 52 | 87 | 100 | — | 245 | |
| 29488-E-MB | 393 | 440 | 780 | 206 | 585 | 710 | 9,5 | 100 | 74 | 128 | 144 | — | 260 | |
| 29292-E-MB | 76,3 | 460 | 620 | 95 | 528 | 590 | 5 | 46 | 34 | 61 | 70 | — | 245 | |
| 29392-E-MB | 203 | 460 | 710 | 150 | 567 | 660 | 6 | 72 | 54 | 94,5 | 108 | — | 257 | |
| 29492-E-MB | 407 | 460 | 800 | 206 | 605 | 730 | 9,5 | 100 | 74 | 128 | 144 | — | 272 | |



Mounting dimensions
293..-E, 294..-E

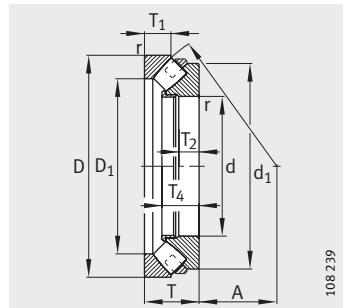


Mounting dimensions
292..-E-MB, 293..-E-MB,
294..-E-MB



| Mounting dimensions | | | | | Basic load ratings | | Fatigue limit load | Limiting speed | Reference speed |
|---------------------|----------------|----------------|----------------|----------------|-----------------------------|-------------------------------|----------------------|-------------------------------------|-------------------------------------|
| d _a | D _a | D _b | d _b | r _a | dyn. C _a N | stat. C _{0a} N | C _{ua} N | n _G min ⁻¹ | n _B min ⁻¹ |
| 285 | 311 | 344 | 251 | 2,1 | 1 040 000 | 4 500 000 | 249 000 | 1 700 | 1 040 |
| 300 | 337 | 390 | 256 | 3 | 1 630 000 | 6 100 000 | 355 000 | 1 400 | 890 |
| 330 | 381 | 448 | 265 | 5 | 2 700 000 | 9 500 000 | 570 000 | 1 100 | 790 |
| 305 | 331 | 365 | 272 | 2,1 | 1 060 000 | 4 750 000 | 260 000 | 1 700 | 960 |
| 330 | 372 | 430 | 277 | 4 | 2 040 000 | 7 650 000 | 445 000 | 1 200 | 810 |
| 360 | 419 | 488 | 291 | 5 | 3 100 000 | 11 000 000 | 650 000 | 1 000 | 730 |
| 325 | 351 | 385 | 291 | 2,1 | 1 120 000 | 5 100 000 | 270 000 | 1 500 | 890 |
| 350 | 394 | 450 | 298 | 4 | 2 120 000 | 8 300 000 | 470 000 | 1 200 | 750 |
| 390 | 446 | 530 | 310 | 5 | 3 650 000 | 12 900 000 | 750 000 | 900 | 670 |
| 355 | 386 | 426 | 317 | 2,5 | 1 430 000 | 6 550 000 | 345 000 | 1 400 | 830 |
| 380 | 429 | 490 | 320 | 4 | 2 550 000 | 9 650 000 | 540 000 | 1 100 | 700 |
| 410 | 471 | 550 | 326 | 5 | 3 900 000 | 14 000 000 | 810 000 | 900 | 620 |
| 375 | 406 | 450 | 336 | 2,5 | 1 500 000 | 6 950 000 | 360 000 | 1 300 | 770 |
| 400 | 449 | 510 | 340 | 4 | 2 650 000 | 10 600 000 | 580 000 | 1 100 | 660 |
| 435 | 507 | 590 | 354 | 6 | 4 300 000 | 15 600 000 | 890 000 | 800 | 590 |
| 395 | 427 | 470 | 353 | 2,5 | 1 560 000 | 7 350 000 | 385 000 | 1 300 | 730 |
| 430 | 484 | 550 | 364 | 4 | 3 250 000 | 12 900 000 | 750 000 | 950 | 600 |
| 465 | 541 | 630 | 373 | 6 | 5 200 000 | 19 000 000 | 1 070 000 | 750 | 530 |
| 420 | 461 | 510 | 380 | 3 | 1 900 000 | 8 800 000 | 455 000 | 1 200 | 700 |
| 450 | 504 | 572 | 384 | 4 | 3 350 000 | 13 400 000 | 720 000 | 900 | 570 |
| 485 | 560 | 650 | 391 | 6 | 5 400 000 | 20 400 000 | 1 130 000 | 750 | 495 |
| 440 | 480 | 530 | 395 | 3 | 2 080 000 | 9 650 000 | 495 000 | 1 100 | 650 |
| 480 | 538 | 612 | 404 | 5 | 3 900 000 | 16 000 000 | 860 000 | 850 | 530 |
| 510 | 587 | 682 | 415 | 6 | 5 850 000 | 22 400 000 | 1 220 000 | 700 | 465 |
| 460 | 500 | 550 | 415 | 3 | 2 120 000 | 10 200 000 | 510 000 | 1 100 | 610 |
| 500 | 557 | 634 | 424 | 5 | 4 000 000 | 16 600 000 | 880 000 | 850 | 510 |
| 540 | 622 | 722 | 441 | 6 | 6 400 000 | 25 000 000 | 1 330 000 | 670 | 440 |
| 490 | 534 | 590 | 437 | 4 | 2 650 000 | 12 500 000 | 620 000 | 1 000 | 580 |
| 525 | 585 | 664 | 447 | 5 | 4 300 000 | 18 000 000 | 940 000 | 800 | 475 |
| 560 | 643 | 742 | 455 | 6 | 6 700 000 | 26 000 000 | 1 390 000 | 630 | 420 |
| 510 | 554 | 610 | 458 | 4 | 2 650 000 | 13 400 000 | 660 000 | 1 000 | 550 |
| 548 | 614 | 695 | 470 | 5 | 4 550 000 | 19 000 000 | 990 000 | 750 | 460 |
| 595 | 684 | 794 | 486 | 8 | 7 650 000 | 30 000 000 | 1 570 000 | 600 | 395 |
| 530 | 575 | 632 | 477 | 4 | 2 700 000 | 13 400 000 | 660 000 | 950 | 530 |
| 575 | 638 | 726 | 487 | 5 | 5 000 000 | 21 200 000 | 1 120 000 | 700 | 440 |
| 615 | 704 | 815 | 502 | 8 | 7 800 000 | 31 000 000 | 1 620 000 | 600 | 380 |

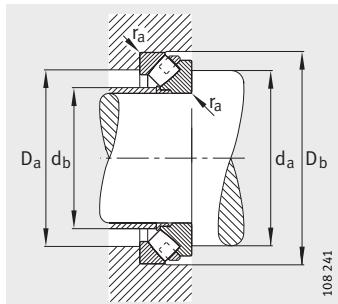
Axial spherical roller bearings



292..-E-MB, 293..-E-MB,
294..-E-MB

Dimension table (continued) · Dimensions in mm

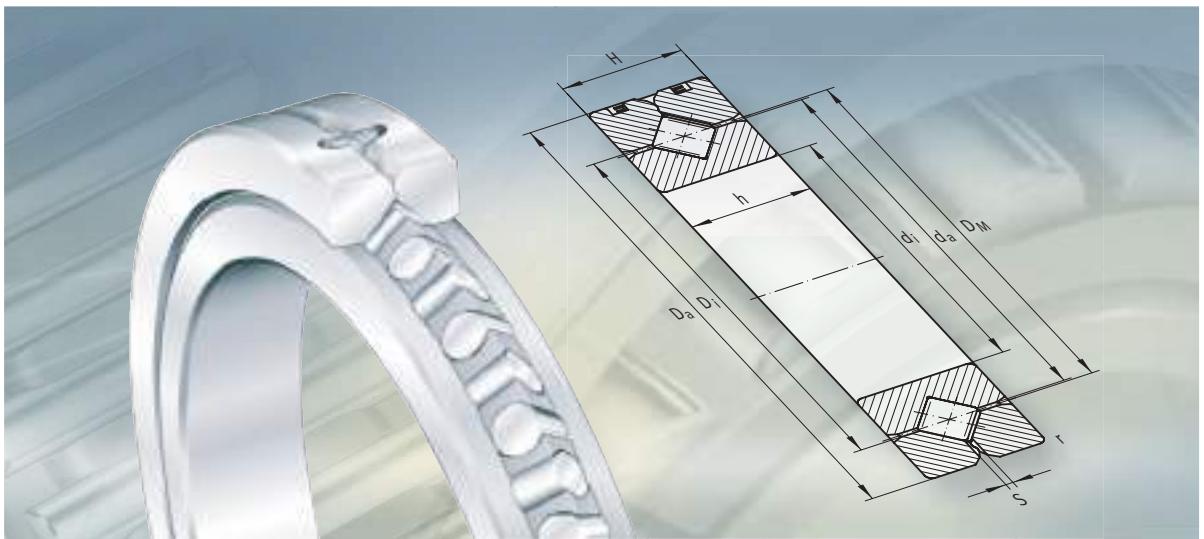
| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | |
|---------------------|------------------|------------|------|-----|----------------|----------------|-----------|----------------|----------------|----------------|----------------|-----|
| | | d | D | T | D ₁ | d ₁ | r min. | T ₁ | T ₂ | T ₃ | T ₄ | A |
| 29296-E-MB | 90,9 | 480 | 650 | 103 | 556 | 620 | 5 | 55 | 37 | 62 | 71 | 259 |
| 29396-E-MB | 208 | 480 | 730 | 150 | 587 | 675 | 6 | 72 | 54 | 94 | 107 | 270 |
| 29496-E-MB | 511 | 480 | 850 | 224 | 630 | 770 | 9,5 | 108 | 81 | 142 | 159 | 280 |
| 292/500-E-MB | 93,5 | 500 | 670 | 103 | 574 | 640 | 5 | 55 | 37 | 63 | 72 | 268 |
| 293/500-E-MB | 216 | 500 | 750 | 150 | 610 | 700 | 6 | 74 | 54 | 92 | 105 | 280 |
| 294/500-E-MB | 525 | 500 | 870 | 224 | 654 | 790 | 9,5 | 107 | 81 | 142 | 160 | 290 |
| 292/530-E-MB | 110 | 530 | 710 | 109 | 612 | 675 | 5 | 57 | 39 | 64 | 74 | 288 |
| 293/530-E-MB | 266 | 530 | 800 | 160 | 646 | 745 | 7,5 | 76 | 58 | 101,5 | 116 | 295 |
| 294/530-E-MB | 621 | 530 | 920 | 236 | 690 | 840 | 9,5 | 114 | 85 | 150,5 | 169 | 309 |
| 292/560-E-MB | 131 | 560 | 750 | 115 | 642 | 715 | 5 | 60 | 41 | 71 | 111 | 302 |
| 294/560-E-MB | 733 | 560 | 980 | 250 | 729 | 890 | 12 | 120 | 90 | 163 | 182 | 328 |
| 292/600-E-MB | 154 | 600 | 800 | 122 | 688 | 760 | 5 | 65 | 44 | 71,5 | 82 | 321 |
| 294/600-E-MB | 839 | 600 | 1030 | 258 | 782 | 940 | 12 | 127 | 93 | 162 | 182 | 347 |
| 292/630-E-MB | 195 | 630 | 850 | 132 | 724 | 805 | 6 | 67 | 48 | 82 | 94 | 338 |
| 294/630-E-MB | 1030 | 630 | 1090 | 280 | 820 | 995 | 12 | 136 | 101 | 176,5 | 198 | 365 |
| 292/670-E-MB | 228 | 670 | 900 | 140 | 773 | 855 | 6 | 74 | 50 | 81 | 93 | 364 |
| 294/710-E-MB | 1420 | 710 | 1220 | 308 | 916 | 1115 | 15 | 150 | 111 | 198 | 221 | 415 |
| 292/750-E-MB | 299 | 750 | 1000 | 150 | 861 | 955 | 6 | 81 | 54 | 88 | 100 | 406 |
| 293/750-E-MB | 716 | 750 | 1120 | 224 | 909 | 1045 | 9,5 | 108 | 81 | 140 | 159 | 415 |
| 292/800-E-MB | 341 | 800 | 1060 | 155 | 915 | 1010 | 7,5 | 81 | 56 | 96 | 110 | 426 |
| 293/800-E-MB | 801 | 800 | 1180 | 230 | 961 | 1100 | 9,5 | 112 | 83 | 145,5 | 165 | 440 |
| 293/850-E-MB | 933 | 850 | 1250 | 243 | 1021 | 1165 | 12 | 118 | 87 | 152 | 173 | 468 |



Mounting dimensions



| Mounting dimensions | | | | | Basic load ratings | | Fatigue limit load C_{ua} N | Limiting speed n_G min ⁻¹ | Reference speed n_B min ⁻¹ |
|---------------------|---------------|---------------|---------------|---------------|--------------------|------------------------|-------------------------------------|--|---|
| d_a min. | D_a max. | D_b min. | d_b max. | r_a max. | dyn. C_a N | stat. C_{0a} N | | | |
| 555 | 603 | 662 | 508 | 4 | 2 800 000 | 14 600 000 | 700 000 | 900 | 510 |
| 593 | 660 | 746 | 507 | 5 | 5 200 000 | 22 400 000 | 1 160 000 | 700 | 410 |
| 645 | 744 | 865 | 521 | 8 | 9 300 000 | 36 500 000 | 1 920 000 | 530 | 350 |
| 575 | 622 | 682 | 527 | 4 | 2 900 000 | 15 300 000 | 740 000 | 900 | 490 |
| 615 | 683 | 768 | 532 | 5 | 5 100 000 | 22 800 000 | 1 160 000 | 700 | 400 |
| 670 | 765 | 886 | 542 | 8 | 9 300 000 | 37 500 000 | 1 930 000 | 530 | 340 |
| 611 | 661 | 722 | 560 | 4 | 3 100 000 | 16 300 000 | 770 000 | 850 | 465 |
| 650 | 724 | 818 | 561 | 6 | 6 000 000 | 26 500 000 | 1 350 000 | 630 | 375 |
| 700 | 810 | 937 | 573 | 8 | 10 200 000 | 41 500 000 | 2 160 000 | 500 | 320 |
| 645 | 697 | 762 | 586 | 4 | 3 650 000 | 19 300 000 | 910 000 | 800 | 435 |
| 750 | 860 | 997 | 606 | 10 | 11 800 000 | 49 000 000 | 2 480 000 | 480 | 290 |
| 690 | 744 | 814 | 633 | 4 | 3 800 000 | 20 400 000 | 960 000 | 750 | 410 |
| 800 | 900 | 1 055 | 653 | 10 | 12 200 000 | 52 000 000 | 2 600 000 | 450 | 275 |
| 730 | 789 | 864 | 657 | 5 | 4 800 000 | 25 500 000 | 1 180 000 | 670 | 375 |
| 840 | 960 | 1 115 | 681 | 10 | 14 000 000 | 58 500 000 | 2 850 000 | 430 | 260 |
| 775 | 836 | 915 | 710 | 5 | 4 900 000 | 26 000 000 | 1 190 000 | 630 | 365 |
| 925 | 1 073 | 1 250 | 768 | 12 | 17 300 000 | 75 000 000 | 3 600 000 | 400 | 224 |
| 863 | 930 | 1 017 | 798 | 5 | 5 600 000 | 32 000 000 | 1 410 000 | 600 | 325 |
| 915 | 1 015 | 1 142 | 795 | 8 | 10 800 000 | 51 000 000 | 2 420 000 | 450 | 255 |
| 918 | 987 | 1 078 | 837 | 6 | 6 550 000 | 37 500 000 | 1 640 000 | 530 | 295 |
| 970 | 1 070 | 1 202 | 842 | 8 | 11 800 000 | 57 000 000 | 2 700 000 | 450 | 232 |
| 1 028 | 1 137 | 1 273 | 896 | 10 | 12 900 000 | 64 000 000 | 2 900 000 | 430 | 215 |



Crossed roller bearings

Crossed roller bearings

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| Product overview | Crossed roller bearings..... 798 |
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| Design and safety guidelines | Static load carrying capacity..... 800 Checking the static load carrying capacity 800 Application factors 804 Safety factors 804 Dynamic load carrying capacity 804 Determining the basic rating life 805 Load carrying capacity of fixing screws 807 Checking the static load carrying capacity of the screws 808 Checking the dynamic load carrying capacity of the screws 808 Shaft and housing tolerances for normal applications 809 Shaft and housing tolerances for precision applications..... 809 Location using clamping rings 810 Fixing screws..... 812 Securing of screws 812 Fitting of crossed roller bearings..... 814 Checking the function 815 |
| Accuracy | 815 |
| Dimension tables | Crossed roller bearings..... 816 |



Product overview Crossed roller bearings

Dimension series 18

sX



Crossed roller bearings

Features

Crossed roller bearings SX are bearings for high precision applications, whose dimensions conform to ISO dimension series 18 to DIN 616. They comprise outer rings, inner rings, rolling elements and plastic spacers. The outer ring is split and is held together by three retaining rings.

Rollers in X arrangement

Due to the X arrangement of the cylindrical rollers, these bearings can support axial forces from both directions as well as radial forces, tilting moment loads and any combination of loads by means of a single bearing position. As a result, designs involving two bearing positions can be reduced to a single bearing position, *Figure 1*, *Figure 2*.

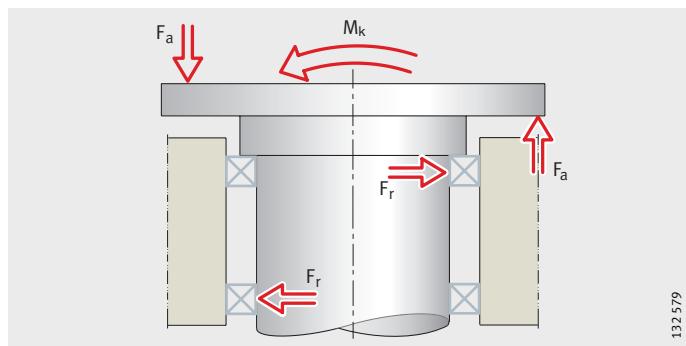
Crossed roller bearings are very rigid, have high running accuracy and are supplied with normal clearance, low clearance or preload. Preloaded bearings have the suffix VSP.

The bearing outer rings are easily fixed to the adjacent construction using clamping rings.



Figure 1

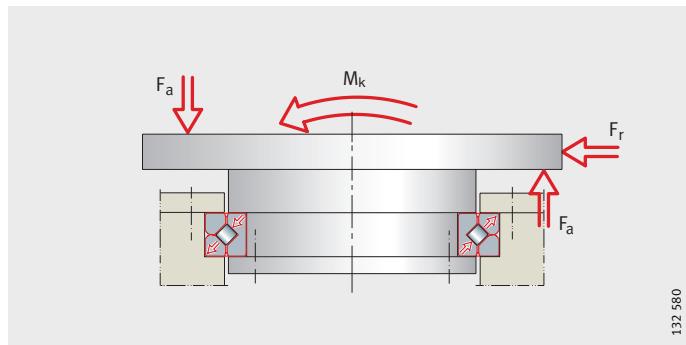
Bearing arrangement with two bearing positions



132 579

Figure 2

Bearing arrangement with one crossed roller bearing SX



132 580

The circumferential speed depends on the variant of the bearing (normal clearance or preloaded) and on the lubrication (grease or oil), see table Circumferential speed.

Circumferential speed

| Normal clearance | Preload | Circumferential speed |
|--------------------|--------------------|--|
| Oil lubrication | – | up to 8 m/s ($n \cdot D_M = 152\,800$) |
| Grease lubrication | – | up to 4 m/s ($n \cdot D_M = 76\,400$) |
| – | Oil lubrication | up to 4 m/s ($n \cdot D_M = 76\,400$) |
| – | Grease lubrication | up to 2 m/s ($n \cdot D_M = 38\,200$) |

Crossed roller bearings

Corrosion-resistant Crossed roller bearings are also available in a corrosion-resistant version with the INA special plating Corrotect®. These bearings have the suffix RR.

Sealing/lubricant The bearings are not sealed. If sealing of the bearing position is necessary, this can be freely designed as part of the adjacent construction.
Crossed roller bearings are supplied preserved with oil. Bearings should be lubricated before being put into operation.
For grease lubrication, a high quality lithium soap grease DIN 51825-KP2N-20 is suitable, for example Arcanol LOAD220.
For oil lubrication, suitable oils are type CLP to DIN 51517 or HLP to DIN 51524 of viscosity class ISO VG 10 to 100.

Operating temperature Crossed roller bearings are suitable for operating temperatures from -30 °C to +80 °C.

Suffixes Suffixes for available designs: see table.

Available designs

| Suffixes | Description | Design |
|----------|---|------------------------------|
| RR | Corrosion-resistant design, with Corrotect® plating | Special design ¹⁾ |
| RLO | Low clearance | Standard |
| VSP | Preloaded | Standard |

¹⁾ Available by agreement.

Design and safety guidelines

Static load carrying capacity

Crossed roller bearings that undergo rotary motion only infrequently, undergo slow swivel motion, rotate only slowly or are subjected to load while stationary are dimensioned on the basis of their static load carrying capacity.

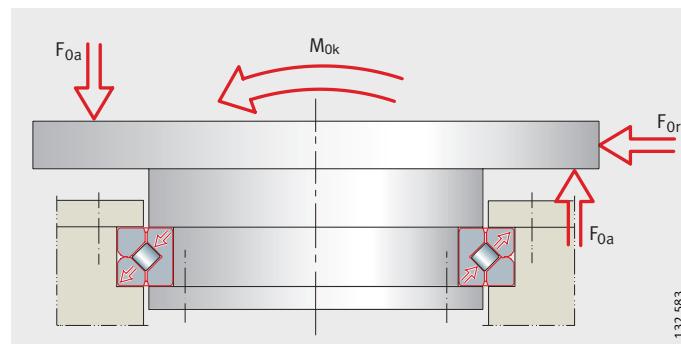
The size of a statically loaded crossed roller bearing can therefore be checked in approximate terms using the basic static load ratings C_0 and the static limiting load diagrams.

Checking the static load carrying capacity

Caution!

It can be checked in approximate terms if the load arrangement is in accordance with *Figure 3* and all the requirements relating to clamping rings, location, fitting and lubrication are fulfilled.

Where load arrangements are more complex or the conditions are not fulfilled, please contact us.



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Determining the equivalent static bearing load without radial load

In order to check the static load carrying capacity, the following equivalent static operating values must be determined:

- the equivalent static bearing load F_{0q}
- the equivalent static tilting moment load M_{0q} .

Checking is possible for applications with or without radial load.

If only axial and tilting moment loads are present, the following apply:

$$F_{0q} \triangleq F_{0a} \cdot f_A \cdot f_S$$

$$M_{0q} \triangleq M_{0k} \cdot f_A \cdot f_S$$

F_{0q} kN
Equivalent axial bearing load (static)

F_{0a} kN
Static axial bearing load

f_A –
Application factor, see table, page 804

f_S –
Factor for additional safety, see page 804

M_{0q} kNm
Equivalent tilting moment load (static)

M_{0k} kNm
Static tilting moment load.



Using the values for F_{0q} and M_{0q} , determine the load point in the static limiting load diagram Raceway, see dimension tables.

In addition to the raceway, the dimensioning of the fixing screws must also be checked.

The static limiting load diagrams for the raceway and the fixing screws are indicated in the dimension tables.

Caution! The load point must be below the raceway curve.

Crossed roller bearings

Determining the equivalent static bearing load with radial load

Caution!

Radial loads can only be taken into consideration if the radial load F_{0r} is smaller than the basic static radial load rating C_{0r} according to the dimension table.

The equivalent static bearing load with radial load is determined as follows:

- Calculate the load eccentricity parameter ϵ using the formula.
- Determine the static radial load factor f_{0r} . To do this:
 - determine the ratio F_{0r}/F_{0a} in *Figure 4* or *Figure 5*
 - from the ratio F_{0r}/F_{0a} and ϵ , determine the static radial load factor f_{0r} from *Figure 4* or *Figure 5*.
- Determine the application factor f_A according to the table, page 804, and the safety factor f_S if required.
- Calculate the equivalent axial bearing load F_{0q} and the equivalent tilting moment load M_{0q} according to the formulae.
- Using the values for F_{0q} and M_{0q} , determine the load point in the static limiting load diagram Raceway (see dimension tables).

Caution!

The load point must be below the raceway curve.

$$\epsilon = \frac{2000 \cdot M_{0k}}{F_{0a} \cdot D_M}$$

$$F_{0q} = F_{0a} \cdot f_A \cdot f_S \cdot f_{0r}$$

$$M_{0q} = M_{0k} \cdot f_A \cdot f_S \cdot f_{0r}$$

ϵ – Load eccentricity parameter

M_{0k} kNm

Static tilting moment load

F_{0a} kN

Static bearing load (axial)

D_M mm

Rolling element pitch circle diameter, see dimension table

F_{0q} kN

Equivalent bearing load (static)

f_A – Application factor, see table, page 804

f_S – Factor for additional safety, see page 804

f_{0r} –

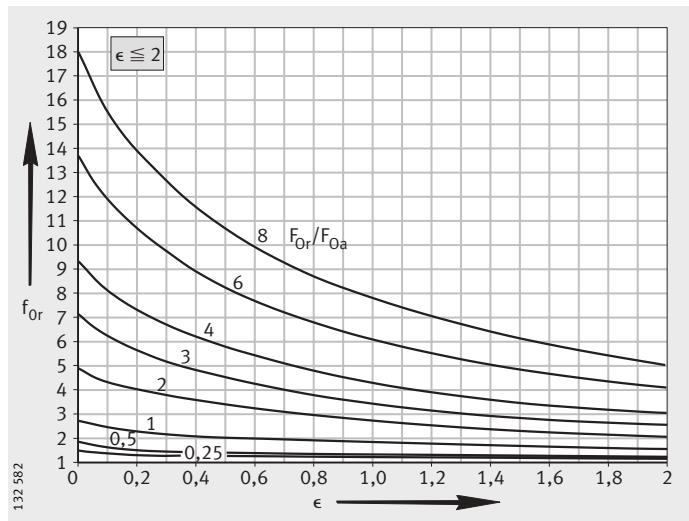
Static radial load factor, see *Figure 4* and *Figure 5*, page 803

M_{0q} kNm

Equivalent tilting moment load (static).

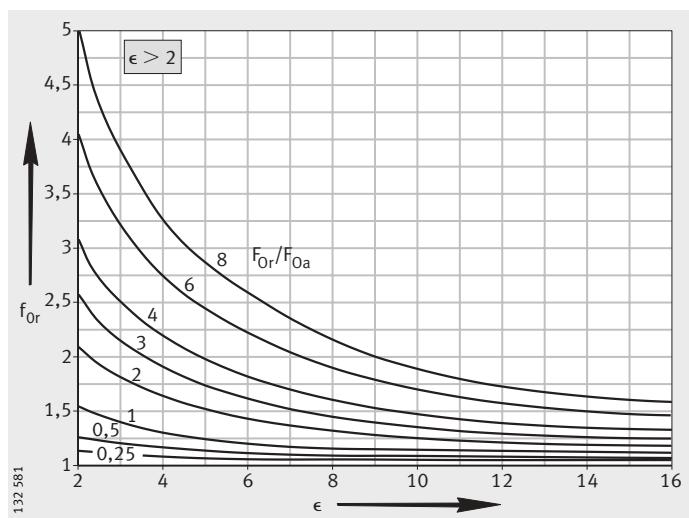
f_{0r} = static radial load factor
 ϵ = load eccentricity parameter; $\epsilon \leq 2$

Figure 4
Static radial load factor



f_{0r} = static radial load factor
 ϵ = load eccentricity parameter; $\epsilon > 2$

Figure 5
Static radial load factor



Crossed roller bearings

Application factors The application factors f_A in the table are empirical values. They take account of the most important requirements, e.g. the type and severity of operation, rigidity, running accuracy. If the precise requirements of an application are known, the values may be altered accordingly.

Caution! Application factors < 1 must not be used.

A large proportion of applications can be statically calculated using a factor of 1 – such as bearings for gearboxes and rotary tables.

In addition to static calculation, the life should also always be checked, see Dynamic load carrying capacity.

Application factors f_A

| Application | Operating/ requirement criteria | Application factor f_A |
|---------------------|------------------------------------|-----------------------------|
| Robots | Rigidity | 1,25 |
| Antennae | Accuracy | 1,5 |
| Machine tools | Accuracy | 1,5 |
| Measuring equipment | Smooth running | 2 |
| Medical equipment | Smooth running | 1,5 |

Safety factors

The factor for additional safety is $f_S = 1$.

It is not normally necessary to factor in any additional safety in calculation.

Caution! In special cases, such as approval specifications, internal specifications, requirements stipulated by inspection bodies etc., the appropriate safety factor should be used.

Dynamic load carrying capacity

Dynamically loaded crossed roller bearings – i.e. bearings undergoing predominantly rotary motion – are dimensioned in accordance with their dynamic load carrying capacity.

The size of a dynamically loaded bearing can therefore be checked in approximate terms using the basic dynamic load ratings C and the basic rating life L or L_h .

Determining the basic rating life

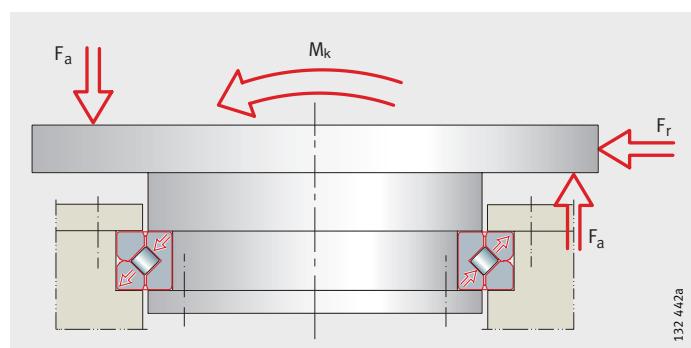
The life formulae for L and L_h are only valid:

- with a load arrangement in accordance with *Figure 6*
- if all the requirements are fulfilled in relation to location (the bearing rings must be rigid or firmly connected to the adjacent construction), fitting, lubrication and sealing
- if the load and speed can be regarded as constant during operation. If the load and speed are not constant, equivalent operating values can be determined that will result in the same fatigue conditions as the actual loads (see Equivalent operating values)
- if the load ratio is $F_r/F_a \leq 8$.

Caution!

If more complex load arrangements are present, if the ratio is $F_r/F_a > 8$ or if the conditions differ from those stated, please contact us.

Figure 6
Load arrangement



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Determining the basic rating life for bearings subjected to combined loads

For bearings subjected to combined loads – bearings with axial, radial and tilting moment loads – the life L and L_h is calculated as follows:

- Calculate the load eccentricity parameter ϵ according to the formula, page 806.
 - Determine the ratio of the dynamic radial bearing load F_r to the dynamic axial bearing load F_a (F_r/F_a).
 - Based on the values for ϵ and the ratio F_r/F_a , determine the dynamic load factor k_F , *Figure 7*, page 807.
 - Calculate the equivalent dynamic bearing load $P_{\text{axial}} = k_F \cdot F_a$ according to the formula, page 806.
 - Enter the equivalent dynamic bearing load P_{axial} and the basic dynamic axial load rating C_a in the life formulae L and L_h and calculate the life, page 806.
- If swivel operation is present, enter the operating speed n calculated according to the formula in the life formula L_h , page 806.

Crossed roller bearings

Determining the basic rating life for bearings subjected to radial loads only

For slewing rings subjected to radial loads only, the following values are entered in the life formulae for L and L_h :

- instead of the equivalent dynamic axial bearing load P_{axial} , the equivalent dynamic radial bearing load P_{radial} (i.e. F_r)
 - $P_{\text{radial}} = F_r$
- the basic dynamic radial load rating C_r .

$$\epsilon = \frac{2000 \cdot M_k}{F_a \cdot D_M}$$

$$P_{\text{axial}} = k_F \cdot F_a$$

$$L = \left(\frac{C_a}{P_{\text{axial}}} \right)^p \text{ or } L = \left(\frac{C_r}{P_{\text{radial}}} \right)^p$$

$$L_h = \frac{16666}{n} \cdot \left(\frac{C_a}{P_{\text{axial}}} \right)^p \text{ or } L_h = \frac{16666}{n} \cdot \left(\frac{C_r}{P_{\text{radial}}} \right)^p$$

$$n = n_{\text{osc}} \cdot \frac{\gamma}{90^\circ}$$

ϵ – Load eccentricity parameter

M_k kNm

Dynamic tilting moment load

F_a kN

Dynamic bearing load (axial)

D_M mm

Rolling element pitch circle diameter, see dimension table

P_{axial} kN

Equivalent dynamic axial bearing load.

For bearings subjected to radial load only, enter P_{radial}

k_F – Dynamic load factor, see *Figure 7*

L 10^6 revolutions

Basic rating life in millions of revolutions

C_a, C_r kN

Basic dynamic axial or radial load rating according to dimension table.

For bearings subjected to radial load only, enter C_r

p – Life exponent for crossed roller bearings: $p = 10/3$

L_h h

Basic rating life in operating hours

n min^{-1}

Operating speed

n_{osc} min^{-1}

Frequency of to and fro movement

γ °

Half of swivel angle

P_{radial} kN

Equivalent dynamic radial bearing load

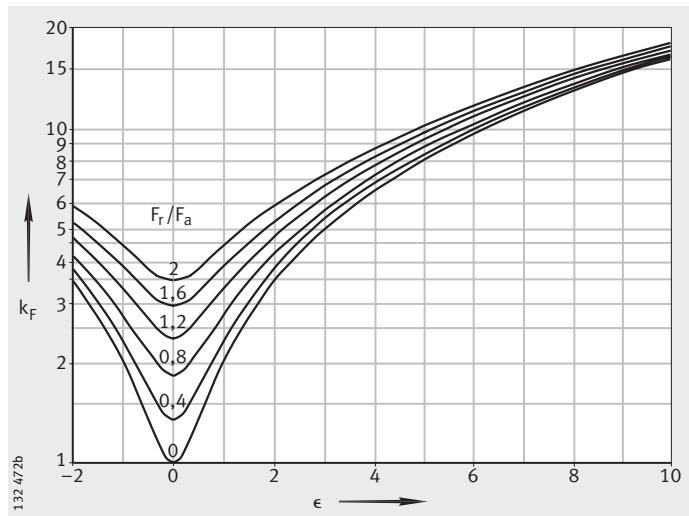
F_r kN

Dynamic bearing load (radial).

k_F = dynamic load factor
 ϵ = load eccentricity parameter

Figure 7

Dynamic load factor



Load carrying capacity of fixing screws

In addition to the raceway, the load carrying capacity of the fixing screws must also be checked. This is based on the information in the section Static load carrying capacity, page 800.

The load carrying capacity of the fixing screws can be checked if the following conditions are fulfilled:

- the criteria in the section Static load carrying capacity are fulfilled
- the screws are tightened as specified using a torque wrench
 - screw tightening factor $\alpha_A = 1,6$.
 - tightening torques according to table, page 812 and page 813.
- the permissible contact pressure is not exceeded
- screws of the recommended size, quantity and grade are used.

Indicator of load carrying capacity

The load carrying capacity of the screws is described by:

- the curves in the limiting load diagrams for fixing screws in the dimension tables
- the maximum permissible radial load $F_{r\text{per}}$ (friction locking).

The screw curves are shown in the static limiting load diagrams Fixing screws. The curves are based on screws of grade 10.9, tightened to 90% of their proof stress including the torsion content.

If screws of grade 8.8 or 12.9 are used, the equivalent static loads F_{0q} and M_{0q} (see Static load carrying capacity, page 801), must be converted using the following factors:

- grade 8.8 ($F_{0q} \times 1,65$, $M_{0q} \times 1,65$)
- grade 12.9 ($F_{0q} \times 0,8$, $M_{0q} \times 0,8$)

Crossed roller bearings

Checking the static load carrying capacity of the screws

The static load carrying capacity of the screw is limited by its proof stress.

Static load carrying capacity for applications with and without radial load

Determine the equivalent static bearing loads F_{0q} and M_{0q} . Using the values for F_{0q} and M_{0q} , determine the load point in the static limiting load diagram Fixing screws according to the dimension table. The load point must be below the appropriate screw curve.

Influence of radial load on the static load carrying capacity of the screws

If radial loads occur in uncentred bearing rings, the screw connections must prevent displacement of the bearing rings on the adjacent construction.

In order to check this:

- multiply the radial bearing load by an application factor f_A according to the table, page 804
- compare the values determined with the maximum permissible radial load $F_{r\text{per}}$.

Caution!

The maximum permissible radial load $F_{r\text{per}}$ of the fixing screws is dependent on their friction locking and not on the radial load carrying capacity of the bearing.

If the radial load on the bearing is higher than the friction locking of the fixing screws or very high radial loads are present ($F_r/F_a > 4$), please contact us.

Checking the dynamic load carrying capacity of the screws

The dynamic load carrying capacity of the screws corresponds to the fatigue strength of the screw.

Dynamic load carrying capacity

Based on the dynamic loads present, the equivalent loads F_{0q} and M_{0q} are determined.

Instead of the application factor f_A , the operating load must always be increased by the following factor:

- grade 8.8 (factor 1,8)
- grade 10.9 (factor 1,6)
- grade 12.9 (factor 1,5).

Check the load carrying capacity in the static limiting load diagram Fixing screws, see dimension tables.

Caution!

The load point must be below the appropriate screw curve.

Shaft and housing tolerances for normal applications

For normal applications, sufficient tolerances are K7 for the housing and h7 for the shaft, see tables Fitting tolerances.

Shaft and housing tolerances for precision applications

In precision applications, the bearing seat in the housing should be designed to tolerance K6 and the bearing seat on the shaft to h6, see tables Fitting tolerances.

Fitting tolerances for the shaft

| Nominal dimension range | | Nominal deviations | | | |
|-------------------------|-----|--------------------|----------|----------|----------|
| > | ≤ | h6 | | h7 | |
| mm | mm | upper µm | lower µm | upper µm | lower µm |
| 65 | 80 | 0 | -19 | 0 | -30 |
| 80 | 100 | 0 | -22 | 0 | -35 |
| 100 | 120 | 0 | -22 | 0 | -35 |
| 120 | 140 | 0 | -25 | 0 | -40 |
| 140 | 160 | 0 | -25 | 0 | -40 |
| 160 | 180 | 0 | -25 | 0 | -40 |
| 180 | 200 | 0 | -29 | 0 | -46 |
| 200 | 225 | 0 | -29 | 0 | -46 |
| 225 | 250 | 0 | -29 | 0 | -46 |
| 250 | 280 | 0 | -32 | 0 | -52 |
| 280 | 315 | 0 | -32 | 0 | -52 |
| 315 | 355 | 0 | -36 | 0 | -57 |
| 355 | 400 | 0 | -36 | 0 | -57 |
| 400 | 450 | 0 | -40 | 0 | -63 |
| 450 | 500 | 0 | -40 | 0 | -63 |



Fitting tolerances for the housing bore

| Nominal dimension range | | Nominal deviations | | | |
|-------------------------|-----|--------------------|----------|----------|----------|
| > | ≤ | K6 | | K7 | |
| mm | mm | upper µm | lower µm | upper µm | lower µm |
| 80 | 100 | +4 | -18 | +10 | -25 |
| 100 | 120 | +4 | -18 | +10 | -25 |
| 120 | 140 | +4 | -21 | +12 | -28 |
| 140 | 160 | +4 | -21 | +12 | -28 |
| 160 | 180 | +4 | -21 | +12 | -28 |
| 180 | 200 | +5 | -24 | +13 | -33 |
| 200 | 225 | +5 | -24 | +13 | -33 |
| 225 | 250 | +5 | -24 | +13 | -33 |
| 250 | 280 | +5 | -27 | +16 | -36 |
| 280 | 315 | +5 | -27 | +16 | -36 |
| 315 | 355 | +7 | -29 | +17 | -40 |
| 355 | 400 | +7 | -29 | +17 | -40 |
| 400 | 450 | +8 | -32 | +18 | -45 |
| 450 | 500 | +8 | -32 | +18 | -45 |
| 500 | 560 | 0 | -44 | 0 | -70 |
| 560 | 630 | 0 | -44 | 0 | -70 |

Crossed roller bearings

Location using clamping rings

For location of crossed roller bearings SX, clamping rings have proved effective, *Figure 8*, page 811.

Caution!

Bearing rings must always be rigidly and uniformly supported over their entire circumference and width.

The thickness of the clamping rings and mounting flanges must not be less than the minimum thickness, table Mounting dimensions, *Figure 8*.

Counterbores to DIN 74, type J, for screws to DIN 6912 are permissible. For deeper counterbores, the thickness of the clamping ring s must be increased by the additional counterbore depth.

For mounting dimensions, see table and *Figure 8*, for minimum strength of the clamping rings, see section Minimum strength.

Bearing seat depth

In order that the clamping rings retain the bearing securely, the bearing seat depth t must be in accordance with the table, table Mounting dimensions and *Figure 8*.

Caution!

The depth of the bearing seat influences the bearing clearance and the rotational resistance.

Preloaded bearings (suffix VSP) have a considerably higher rotational resistance.

If particular requirements for rotational resistance apply, the depth t must be produced to match the relevant height of the bearing ring. It has proved useful to tolerance the depth t to deviations that are the same as or further restricted compared to the dimension h in the dimension tables. For safety, internal tests should in any case be carried out.

Minimum strength of clamping rings

For screws of grade 10.9, the minimum strength under the screw heads or nuts must be 500 N/mm^2 . Washers are not necessary for these screws.

For fixing screws of grade 12.9, the minimum strength must not be less than 850 N/mm^2 or quenched and tempered washers must be used under the screw heads or nuts.

Mounting dimensions

| Designation | Mounting dimensions | | | | | | | | | | |
|-------------------|---------------------|-------|------------------------|-------------|----------|----------|----------|----------|---------------|---------------|--|
| | d_i h7 (h6) | D_a | t | s min. | d_{Ra} | d_{Ri} | D_{Ri} | D_{Ra} | L_i max. | L_a min. | |
| SX011814 | 70 | 90 | $10^{-0,005}_{-0,015}$ | 8 | 78 | 42 | 82 | 118 | 60 | 100 | |
| SX011818 | 90 | 115 | $13^{-0,005}_{-0,020}$ | 10 | 100 | 61 | 104 | 144 | 80 | 125 | |
| SX011820 | 100 | 125 | $13^{-0,005}_{-0,020}$ | 10 | 110 | 71 | 114 | 154 | 90 | 135 | |
| SX011824 | 120 | 150 | $16^{-0,005}_{-0,025}$ | 12 | 132 | 84 | 138 | 186 | 108 | 162 | |
| SX011828 | 140 | 175 | $18^{-0,005}_{-0,030}$ | 14 | 154 | 94 | 160 | 221 | 124 | 191 | |
| SX011832 | 160 | 200 | $20^{-0,02}_{-0,05}$ | 15 | 177 | 111 | 183 | 249 | 144 | 216 | |
| SX011836 | 180 | 225 | $22^{-0,02}_{-0,05}$ | 17 | 199 | 121 | 205 | 284 | 160 | 245 | |
| SX011840 | 200 | 250 | $24^{-0,02}_{-0,06}$ | 18 | 221 | 139 | 229 | 311 | 180 | 270 | |
| SX011848 | 240 | 300 | $28^{-0,02}_{-0,06}$ | 21 | 226 | 166 | 274 | 374 | 216 | 324 | |
| SX011860 | 300 | 380 | $38^{-0,04}_{-0,10}$ | 29 | 335 | 201 | 345 | 479 | 268 | 412 | |
| SX011868 | 340 | 420 | $38^{-0,04}_{-0,10}$ | 29 | 375 | 241 | 385 | 519 | 308 | 452 | |
| SX011880 | 400 | 500 | $46^{-0,04}_{-0,10}$ | 35 | 445 | 275 | 455 | 625 | 360 | 540 | |
| SX0118/500 | 500 | 620 | $56^{-0,04}_{-0,10}$ | 42 | 554 | 350 | 566 | 700 | 452 | 668 | |



① Slots, threaded extraction holes or similar for dismantling purposes

Figure 8
Clamping rings, bearing seat depth,
mounting dimensions

Crossed roller bearings

Fixing screws For location of the bearing or clamping rings, screws of grade 10.9 are suitable, see table Fixing screws.

Caution! Any deviations from the recommended size, grade and quantity of screws will considerably reduce the load carrying capacity and operating life of the bearings.

For screws of grade 12.9, observe the minimum strength of the clamping rings or use quenched and tempered washers.

| Fixing screws | Crossed roller bearing | Fixing screws Grade 10.9 | | Tightening torque M_A Nm |
|---------------|------------------------|--------------------------|----------|----------------------------------|
| | | Size | Quantity | |
| SX011814 | M5 | 18 | 7 | |
| SX011818 | M5 | 24 | 7 | |
| SX011820 | M5 | 24 | 7 | |
| SX011824 | M6 | 24 | 11,7 | |
| SX011828 | M8 | 24 | 27,8 | |
| SX011832 | M8 | 24 | 27,8 | |
| SX011836 | M10 | 24 | 55,6 | |
| SX011840 | M10 | 24 | 55,6 | |
| SX011848 | M12 | 24 | 98,4 | |
| SX011860 | M16 | 24 | 247 | |
| SX011868 | M16 | 24 | 247 | |
| SX011880 | M20 | 24 | 481 | |
| SX0118/500 | M24 | 24 | 831 | |

Securing of screws Normally, the screws are adequately secured by the correct preload. If regular shock loads or vibrations occur, however, additional securing of the screws may be necessary.

Caution! Not every method of securing screws is suitable for crossed roller bearings.

Never use spring washers or split washers.

General information on securing of screws is given in DIN 25 201, and securing by means of adhesive in particular is described in DIN 25 203, issued 1992.

If these are to be used, please consult the relevant companies.

**Tightening torques M_A
for torque-controlled tightening
of set screws**

| Fixing screw | Clamping cross-section A_s mm ² | Core cross-section A_{d3} mm ² | Tightening torque $M_A^{1)}$ in Nm for grade | | |
|--------------|--|---|--|------|------|
| | | | 8.8 | 10.9 | 12.9 |
| M4 | 8,78 | 7,75 | 2,25 | 3,31 | 3,87 |
| M5 | 14,2 | 12,7 | 4,61 | 6,77 | 7,92 |
| M6 | 20,1 | 17,9 | 7,8 | 11,5 | 13,4 |
| M8 | 36,6 | 32,8 | 19,1 | 28 | 32,8 |
| M10 | 58 | 52,3 | 38 | 55,8 | 65,3 |
| M12 | 84,3 | 76,2 | 66,5 | 97,7 | 114 |
| M14 | 115 | 105 | 107 | 156 | 183 |
| M16 | 157 | 144 | 168 | 246 | 288 |
| M18 | 192 | 175 | 229 | 336 | 394 |
| M20 | 245 | 225 | 327 | 481 | 562 |
| M22 | 303 | 282 | 450 | 661 | 773 |
| M24 | 353 | 324 | 565 | 830 | 972 |



¹⁾ M_A to VDI Guideline 2 230 (July 1986) for $\mu_K = 0,08$ and $\mu_G = 0,12$.

**Assembly preload forces F_M
for torque-controlled tightening
of set screws**

| Fixing screw | Clamping cross-section A_s mm ² | Core cross-section A_{d3} mm ² | Assembly preload force $F_M^{1)}$ in kN for grade | | |
|--------------|--|---|---|------|------|
| | | | 8.8 | 10.9 | 12.9 |
| M4 | 8,78 | 7,75 | 4,05 | 5,95 | 6,96 |
| M5 | 14,2 | 12,7 | 6,63 | 9,74 | 11,4 |
| M6 | 20,1 | 17,9 | 9,36 | 13,7 | 16,1 |
| M8 | 36,6 | 32,8 | 17,2 | 25,2 | 29,5 |
| M10 | 58 | 52,3 | 27,3 | 40,2 | 47 |
| M12 | 84,3 | 76,2 | 39,9 | 58,5 | 68,5 |
| M14 | 115 | 105 | 54,7 | 80,4 | 94,1 |
| M16 | 157 | 144 | 75,3 | 111 | 129 |
| M18 | 192 | 175 | 91,6 | 134 | 157 |
| M20 | 245 | 225 | 118 | 173 | 202 |
| M22 | 303 | 282 | 147 | 216 | 253 |
| M24 | 353 | 324 | 169 | 249 | 291 |

¹⁾ F_M according to VDI Guideline 2 230 (July 1986) for $\mu_G = 0,12$.

Crossed roller bearings

Fitting of crossed roller bearings

The bores and edges of the adjacent components must be free from burrs. The support surfaces for the bearing rings must be clean.

Lightly oil or grease the bearing seat and locating surfaces on the adjacent construction.

Lightly oil the thread of the fixing screws in order to prevent varying friction factors (do not oil or grease screws that will be secured by means of adhesive).

Caution!

Ensure that all adjacent components and lubrication ducts are free from cleaning agents, solvents and washing emulsions.

The bearing seating surfaces can rust or the raceway system can become contaminated.

Assembly forces must only be applied to the bearing ring to be fitted; they must never be directed through the rolling elements or seals. Direct blows on the bearing rings must be avoided.

Bearing rings should be located consecutively and without external load.

The outer ring is split and is held together by three retaining rings ①, *Figure 9*. Never apply tensile loads to the retaining rings.

Locating the outer bearing ring

Fitting of the ring, see *Figure 9*:

- Insert or press the bearing ② into the external adjacent construction ③ with the outer ring first
- Position the external clamping ring ④
- Insert the fixing screws ⑤ in the clamping ring and tighten in steps up to the specified tightening torque M_A
 - tighten the screws in a crosswise sequence in order to prevent unacceptable fluctuations in the screw tensioning forces
 - tightening torques M_A for fixing screws: see tables, page 813.

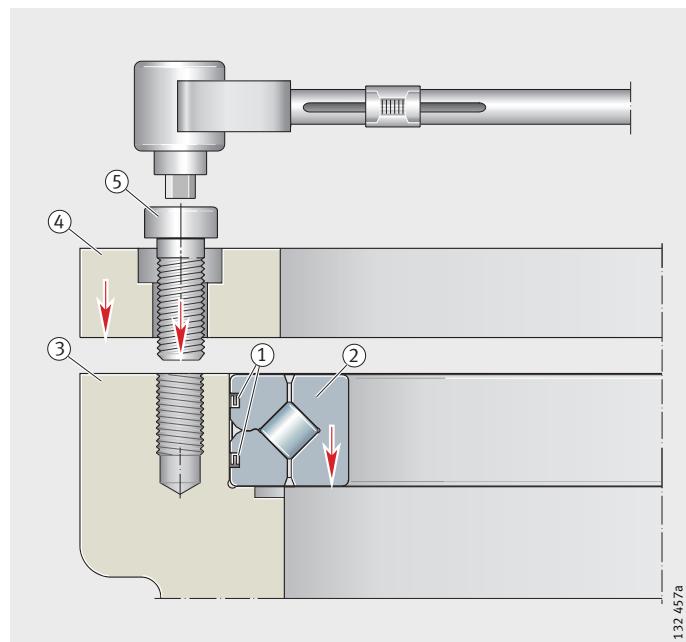


Figure 9

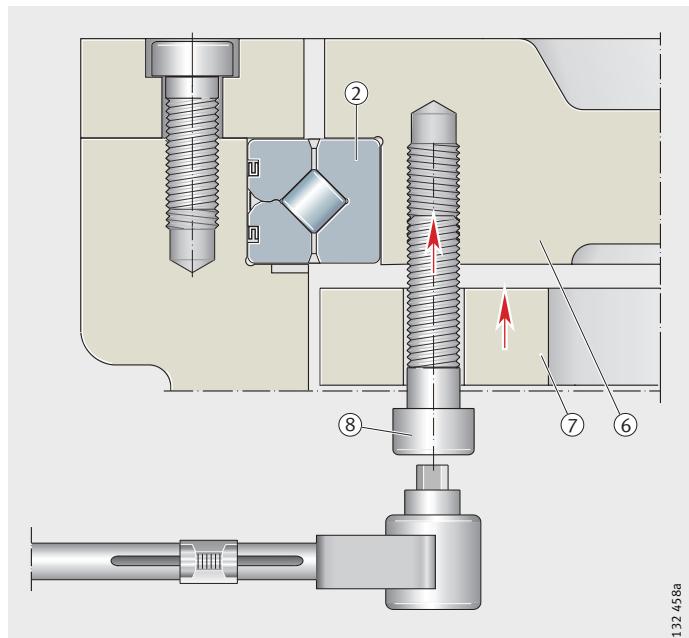
Locating the outer bearing ring

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Locating the inner bearing ring

Fitting of the ring, see *Figure 10*:

- Insert the bearing ② into the internal adjacent construction ⑥
- Position the internal clamping ring ⑦
- Insert the fixing screws ⑧ in the clamping ring and tighten in steps up to the specified tightening torque M_A
 - tighten the screws in a crosswise sequence in order to prevent unacceptable fluctuations in the screw tensioning forces.



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Figure 10
Locating the inner bearing ring

Checking operation

Caution!

Once assembly is complete, the operation of the fitted crossed roller bearing must be checked.

If the bearing runs irregularly or roughly, or the temperature in the bearing shows an unusual increase, dismantle and check the bearing and reassemble the bearing in accordance with the fitting guidelines described.

Accuracy

The dimensional and geometrical tolerances are based on DIN 620-2 and DIN 620-3 and are within the range P6 to P5.

The main dimensions conform to DIN 616, dimension series 18.

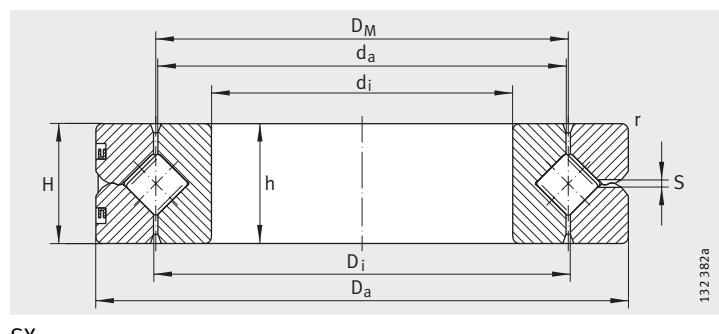
Crossed roller bearings

| Designation | No. ¹⁾ | Mass m ≈kg | Dimensions | | | | | | | | | Running accuracy | |
|-----------------|-------------------|------------------|----------------|--|-----------------------|-----------------|----------------------|----------------|----------------|-----|-------------------------|---------------------|-------|
| | | | D _M | d _i | D _a | H ²⁾ | h ²⁾ | d _a | D _i | r | S ³⁾ min. | | |
| SX011814 | (1) | 0,3 | 80 | 70^{+0,004}_{-0,015} | 90 _{-0,022} | 10±0,10 | 10 _{-0,01} | 79,5 | 80,5 | 0,6 | 1,2 | 0,010 | 0,010 |
| SX011818 | (2) | 0,4 | 102 | 90^{+0,004}_{-0,018} | 115 _{-0,022} | 13±0,12 | 13 _{-0,01} | 101,5 | 102,5 | 1 | 1,2 | 0,010 | 0,010 |
| SX011820 | (3) | 0,5 | 112 | 100^{+0,004}_{-0,018} | 125 _{-0,025} | 13±0,12 | 13 _{-0,01} | 111,5 | 112,5 | 1 | 1,2 | 0,010 | 0,010 |
| SX011824 | (4) | 0,8 | 135 | 120^{+0,004}_{-0,018} | 150 _{-0,025} | 16±0,12 | 16 _{-0,01} | 134,4 | 135,5 | 1 | 1,5 | 0,010 | 0,010 |
| SX011828 | (5) | 1,1 | 157 | 140^{+0,004}_{-0,021} | 175 _{-0,025} | 18±0,12 | 18 _{-0,01} | 156,3 | 157,7 | 1,1 | 1,5 | 0,015 | 0,010 |
| SX011832 | (6) | 1,7 | 180 | 160^{+0,004}_{-0,021} | 200 _{-0,029} | 20±0,12 | 20 _{-0,025} | 179,2 | 180,8 | 1,1 | 1,5 | 0,015 | 0,010 |

1) Curve in the static limiting load load diagram for the raceway and fixing screws.
 2) H: section height of bearing,
 h: height of individual ring.
 3) Lubrication hole: 3 holes spaced evenly about the circumference.
 4) Basic load ratings, radial: for radial loads only.

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Static limiting load diagram for fixing screws – compressive load

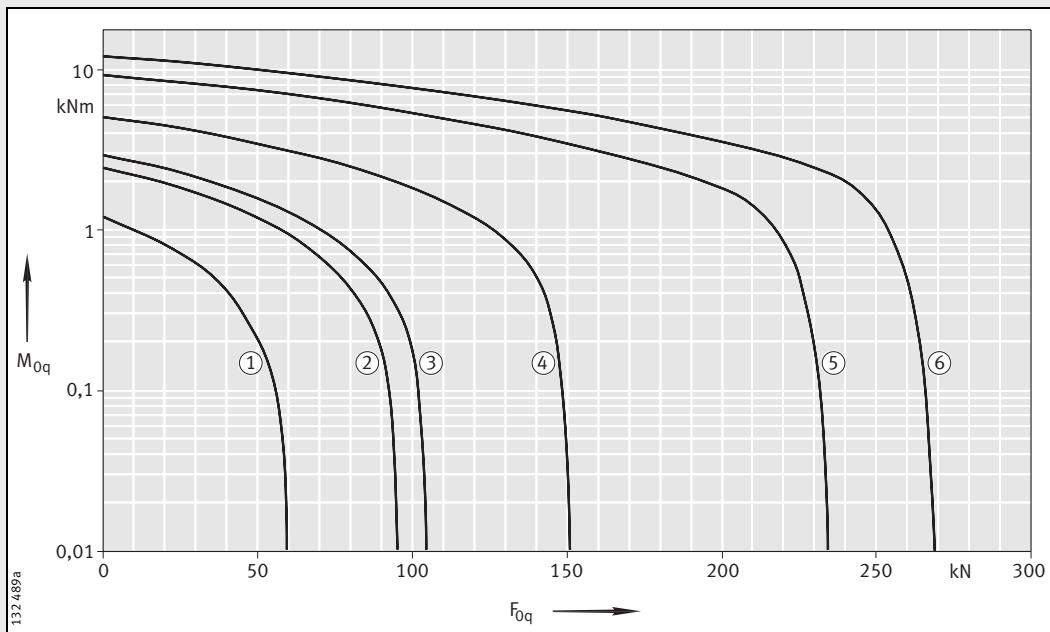


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| Normal clearance | | | | Low clearance RLO | | Preload VSP | Basic load ratings | | | | Limiting speeds | | | | Dimensions identical to ISO dimension series 18 | |
|------------------|-------|-------------------------|------|-------------------|----------|-------------|--------------------|------|------------------------|--------------------------|------------------------|--------------------------|--------------------------------------|---|---|---|
| Radial clearance | | Axial tilting clearance | | Radial clearance | Pre-load | | axial | | radial ⁽⁴⁾ | | With normal clearance | | With preload | | | |
| min. | max. | min. | max. | max. | max. | | min. | max. | dyn. C _a kN | stat. C _{0a} kN | dyn. C _r kN | stat. C _{0r} kN | n _G oil min ⁻¹ | n _G grease min ⁻¹ | n _G oil min ⁻¹ | n _G grease min ⁻¹ |
| 0,003 | 0,015 | 0,006 | 0,03 | 0,003 | 0,006 | 0,003 | 0,015 | 18 | 60 | 12 | 30 | 1 910 | 955 | 955 | 475 | 618 14 |
| 0,003 | 0,015 | 0,006 | 0,03 | 0,003 | 0,006 | 0,003 | 0,015 | 26 | 96 | 17 | 47 | 1 500 | 750 | 750 | 375 | 618 18 |
| 0,005 | 0,020 | 0,010 | 0,04 | 0,004 | 0,008 | 0,005 | 0,020 | 28 | 106 | 18 | 52 | 1 360 | 680 | 680 | 340 | 818 20 |
| 0,005 | 0,020 | 0,010 | 0,04 | 0,004 | 0,008 | 0,005 | 0,020 | 41 | 153 | 26 | 75 | 1 130 | 565 | 565 | 280 | 618 24 |
| 0,005 | 0,020 | 0,010 | 0,04 | 0,004 | 0,008 | 0,005 | 0,020 | 64 | 237 | 41 | 116 | 975 | 485 | 485 | 240 | 618 28 |
| 0,005 | 0,020 | 0,010 | 0,04 | 0,004 | 0,008 | 0,005 | 0,020 | 69 | 272 | 44 | 133 | 850 | 425 | 425 | 210 | 618 32 |



Static limiting load diagram for raceway – compressive load

Crossed roller bearings

Dimension table (continued) · Dimensions in mm

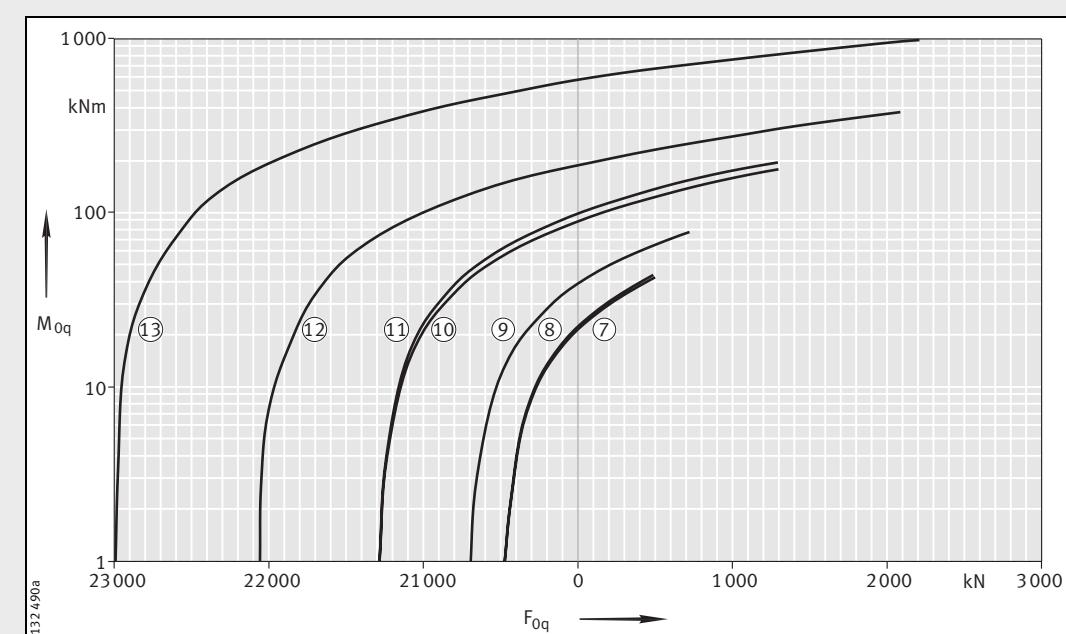
| Designation | No. ¹⁾ | Mass m ≈kg | Dimensions | | | | | | | | | Running accuracy | |
|-------------------|-------------------|------------------|----------------|--|-----------------------|-----------------|-----------------------|----------------|----------------|-----------|-----------------|---------------------|-------|
| | | | D _M | d _i K6 | D _a h6 | H ²⁾ | H ²⁾ E8 | d _a | D _i | r min. | S ³⁾ | | |
| SX011836 | (7) | 2,3 | 202 | 180^{+0,004}_{-0,021} | 225 _{-0,029} | 22±0,13 | 22 _{-0,025} | 201,2 | 202,8 | 1,1 | 2 | 0,015 | 0,010 |
| SX011840 | (8) | 3,1 | 225 | 200^{+0,004}_{-0,024} | 250 _{-0,029} | 24±0,13 | 24 _{-0,025} | 224,2 | 225,8 | 1,5 | 2 | 0,015 | 0,010 |
| SX011848 | (9) | 5,3 | 270 | 240^{+0,005}_{-0,024} | 300 _{-0,032} | 28±0,13 | 28 _{-0,025} | 269,2 | 270,8 | 2 | 2 | 0,020 | 0,010 |
| SX011860 | (10) | 12 | 340 | 300^{+0,005}_{-0,027} | 380 _{-0,036} | 38±0,14 | 38 _{-0,05} | 339,2 | 340,8 | 2,1 | 2,5 | 0,020 | 0,010 |
| SX011868 | (11) | 13,5 | 380 | 340^{+0,007}_{-0,029} | 420 _{-0,040} | 38±0,14 | 38 _{-0,05} | 379,2 | 380,8 | 2,1 | 2,5 | 0,025 | 0,010 |
| SX011880 | (12) | 24 | 450 | 400^{+0,007}_{-0,029} | 500 _{-0,040} | 46±0,15 | 46 _{-0,05} | 449 | 451 | 2,1 | 2,5 | 0,030 | 0,010 |
| SX0118/500 | (13) | 44 | 560 | 500^{+0,008}_{-0,032} | 620 _{-0,044} | 56±0,16 | 56 _{-0,05} | 558,8 | 561,2 | 3 | 2,5 | 0,040 | 0,010 |

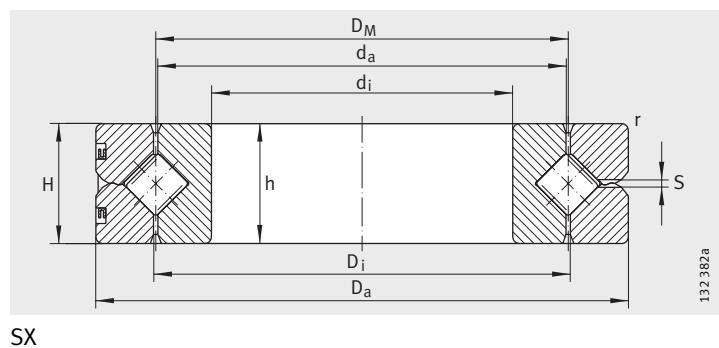
¹⁾ Curve in the static limiting load load diagram for the raceway and fixing screws.

²⁾ H: section height of bearing,
h: height of individual ring.

³⁾ Lubrication hole: 3 holes spaced evenly about the circumference.

⁴⁾ Basic load ratings, radial: for radial loads only.



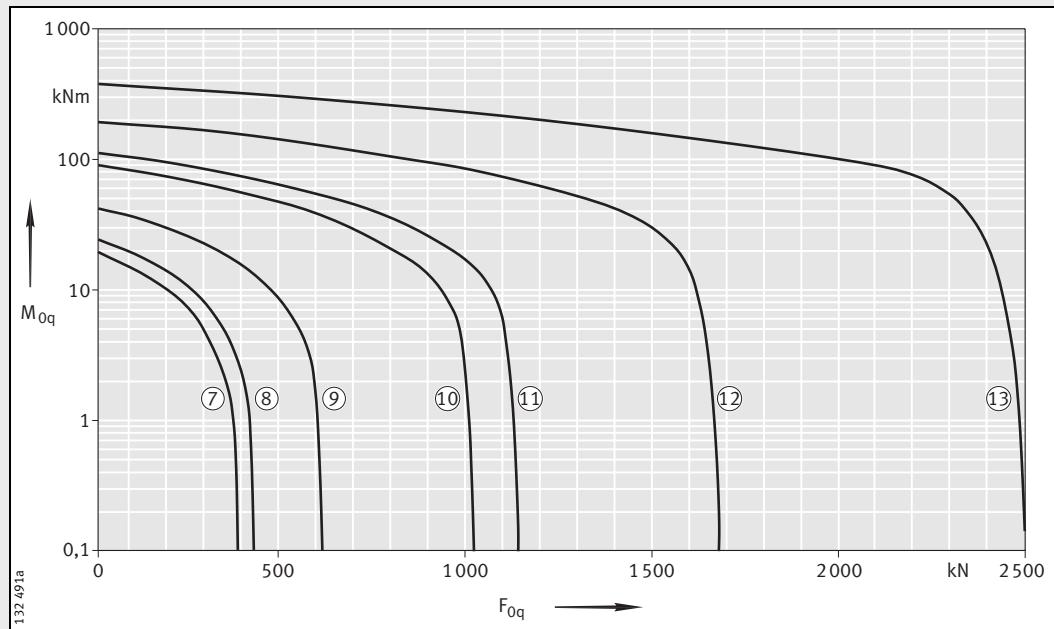


132382a

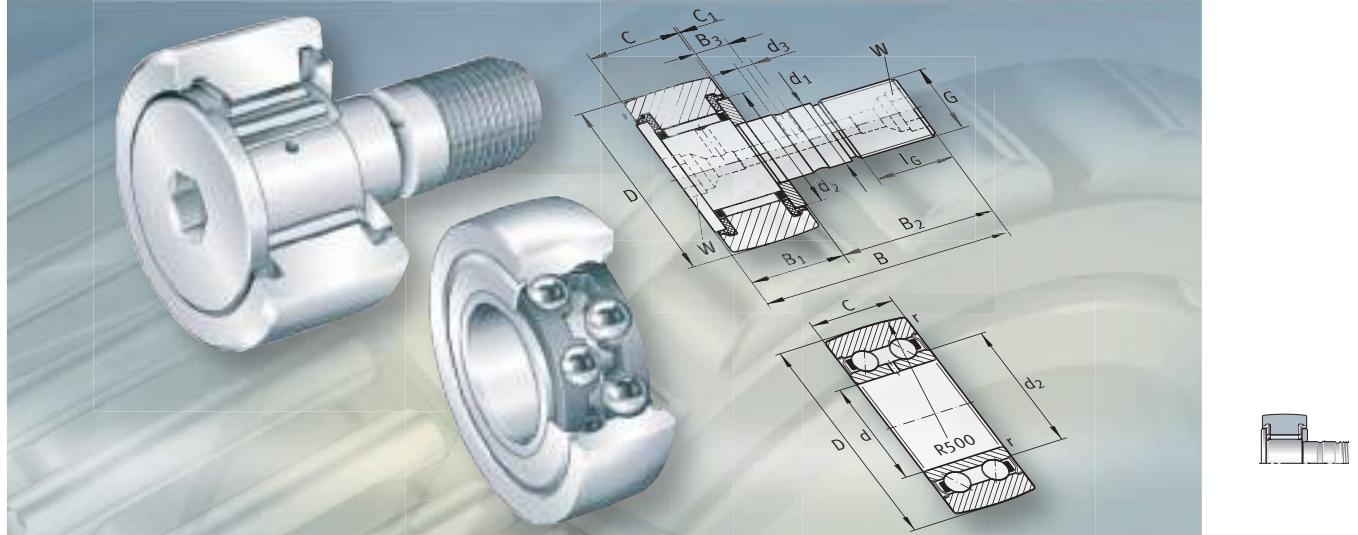
SX



| Normal clearance | | | | Low clearance RLO | | Preload VSP | Basic load ratings | | | | Limiting speeds | | | | Dimensions identical to ISO dimension series 18 | |
|------------------|-------|-------------------------|------|-------------------|---------------|-------------|------------------------------|--------------------------------|------------------------------|--------------------------------|--|---|--|---|---|---------|
| Radial clearance | | Axial tilting clearance | | Radial clearance | Pre-clearance | | axial | | radial ⁴⁾ | | With normal clearance | | With preload | | | |
| min. | max. | min. | max. | max. | max. | | dyn. C _a kN | stat. C _{0a} kN | dyn. C _r kN | stat. C _{0r} kN | n _G oil min ⁻¹ | n _G grease min ⁻¹ | n _G oil min ⁻¹ | n _G grease min ⁻¹ | | |
| 0,005 | 0,025 | 0,010 | 0,05 | 0,005 | 0,010 | | 0,005 | 0,025 | 98 | 381 | 63 | 187 | 755 | 375 | 618 36 | |
| 0,005 | 0,025 | 0,010 | 0,05 | 0,005 | 0,010 | | 0,005 | 0,025 | 106 | 425 | 68 | 208 | 680 | 340 | 618 40 | |
| 0,010 | 0,030 | 0,020 | 0,06 | 0,005 | 0,010 | | 0,005 | 0,025 | 149 | 612 | 95 | 300 | 565 | 280 | 618 48 | |
| 0,010 | 0,040 | 0,020 | 0,08 | 0,005 | 0,010 | | 0,005 | 0,025 | 245 | 1 027 | 156 | 504 | 450 | 225 | 618 60 | |
| 0,010 | 0,040 | 0,020 | 0,08 | 0,005 | 0,010 | | 0,005 | 0,025 | 265 | 1 148 | 167 | 563 | 400 | 200 | 618 68 | |
| 0,010 | 0,050 | 0,020 | 0,10 | 0,005 | 0,010 | | 0,005 | 0,025 | 385 | 1 699 | 244 | 833 | 340 | 170 | 618 80 | |
| 0,015 | 0,060 | 0,030 | 0,12 | 0,006 | 0,012 | | 0,005 | 0,030 | 560 | 2 538 | 355 | 1 244 | 275 | 135 | 65 | 618/500 |



Static limiting load diagram for raceway – compressive load



Track rollers

Yoke type track rollers
Stud type track rollers
Ball bearing track rollers

Track rollers

Yoke type track rollers 824

Yoke type track rollers are ready-to-fit needle and cylindrical roller bearings with a particularly thick-walled outer ring and are used in cam gears, bed ways, conveying equipment, linear guidance systems etc. In addition to high radial loads, they can also support axial loads which are due, for example, to slight misalignment defects, skewed running or brief contact running impacts.

Yoke type track rollers are available with and without axial guidance of the outer ring and in both sealed and open versions.

The outside surface of the outer rings is crowned and corresponds in the majority of designs to the optimised INA profile. In these bearings, the Hertzian pressure, edge load under tilting and wear of the mating track are reduced and the operating life of the mating track is increased.

Yoke type track rollers are mounted on a shaft or stud and are supplied with or without an inner ring.

Stud type track rollers 824

Stud type track rollers correspond in their design to yoke type track rollers with axial guidance but, in place of the inner ring, they have a heavy-section roller stud. The stud has a fixing thread and, in most cases, a hexagonal socket on both ends. It is also available with a shrink-fitted eccentric collar. Due to the eccentric collar, the outside surface of the outer ring can be adjusted to match the mating track on the adjacent construction.

Stud type track rollers are available with labyrinth, gap or contact seals.

The outside surface of the outer rings is crowned and corresponds in the majority of designs to the optimised INA profile.

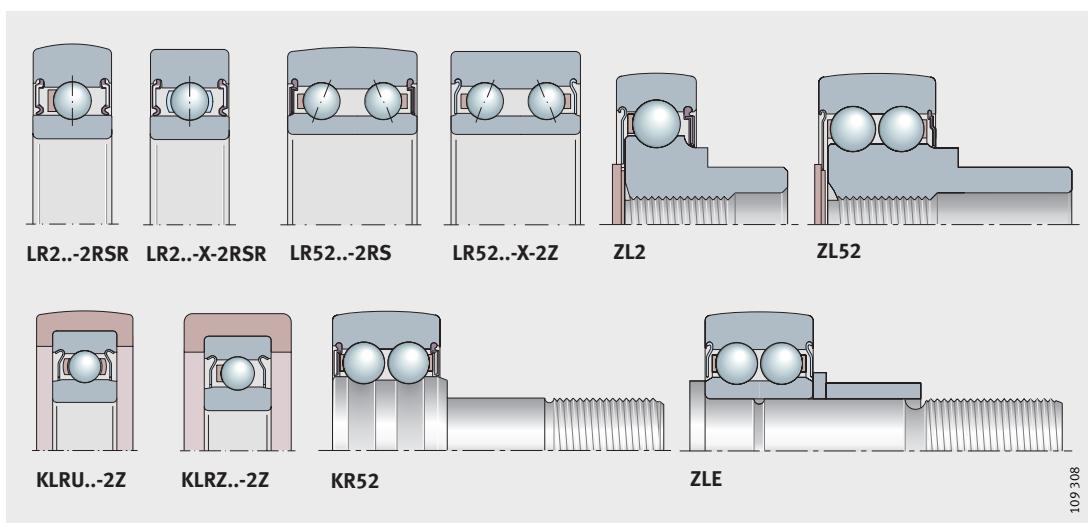
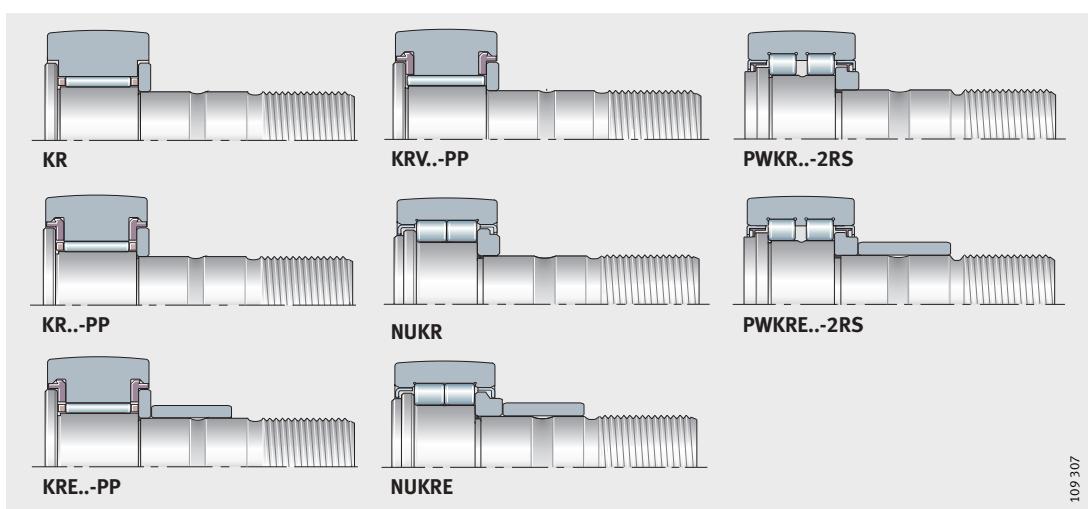
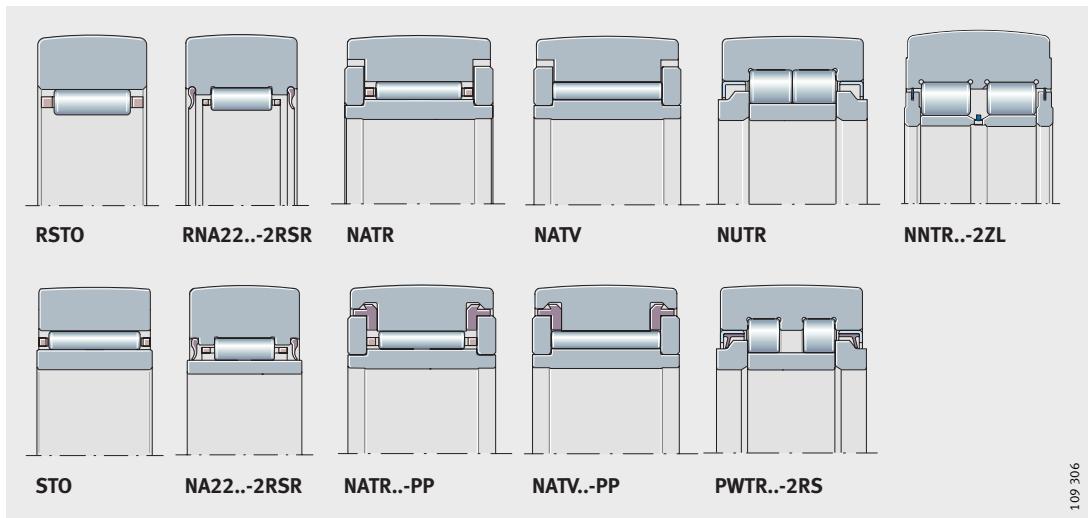
Ball bearing track rollers 874

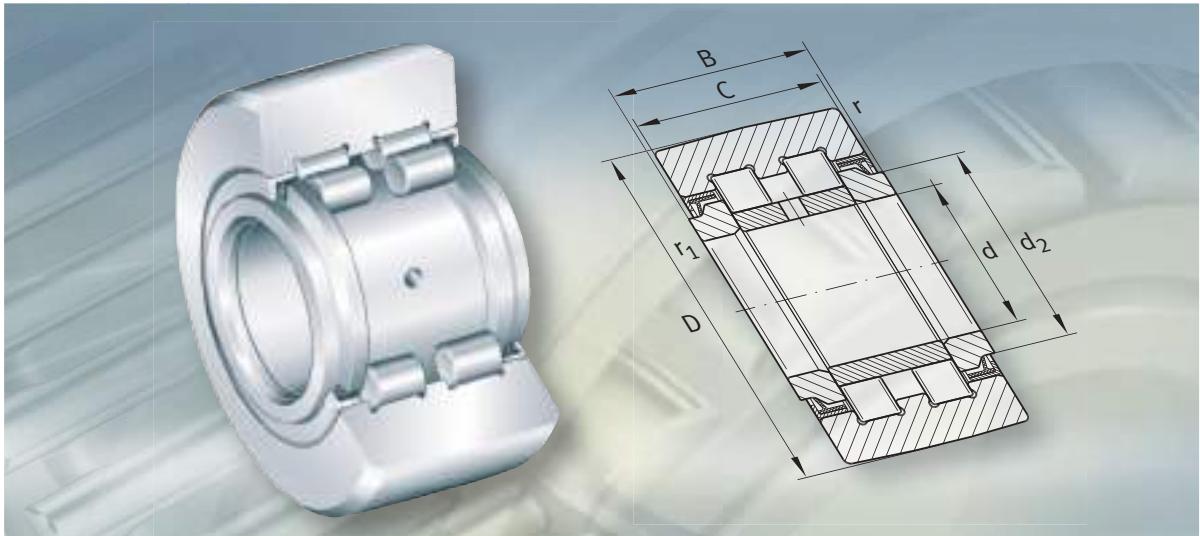
These track rollers correspond in their design to deep groove or angular contact ball bearings but have thick-walled outer rings with a crowned outside surface. They can support high radial forces as well as axial forces in both directions. The bearings are sealed.

Ball bearing track rollers are available with and without a stud and with a plastic tyre.

Track rollers without a stud are mounted on a shaft or stud.

Track rollers with a plastic tyre are used if the bearings are required to run with particularly low noise.

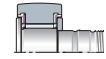




Yoke type track rollers Stud type track rollers

Yoke type track rollers Stud type track rollers

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Product overview Yoke type track rollers

Without axial guidance

Without inner ring

RSTO



109 299

Lip seals

RNA22..-2RSR



109 196a

With inner ring

STO



109 17/b

Lip seals

NA22..-2RSR

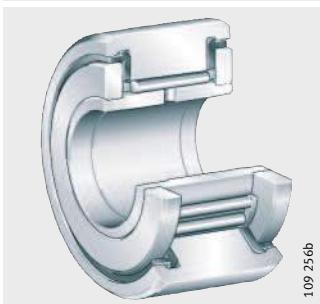


109 17/a

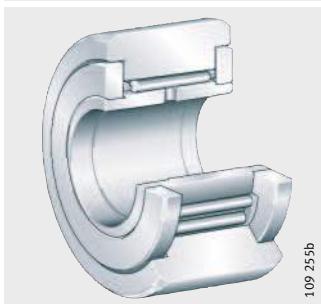
With axial guidance
With cage

Plastic axial plain washers/
gap seals

NATR..-PP



NATR



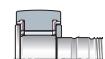
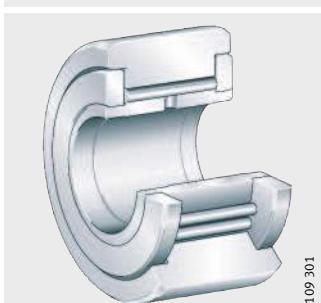
Full complement
needle roller set

Plastic axial plain washers/
gap seals

NATV..-PP



NATV



Full complement
cylindrical roller set

Labyrinth seals

NUTR



Full complement
cylindrical roller set,
with central rib

Protected lip seals/
sealing shields with lamellar ring

PWTR..-2RS



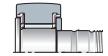
NNTR..-2ZL



Yoke type track rollers

| | |
|---|--|
| Features | <p>Yoke type track rollers are single or double row units mounted on shafts or studs. They comprise thick-walled outer rings with a profiled outside surface and needle roller and cage assemblies or full complement needle roller or cylindrical roller sets.</p> <p>Yoke type track rollers can support high radial loads as well as axial loads arising from slight misalignment and skewed running; they are suitable for cam gears, bed ways, conveying equipment etc.</p> <p>The bearings are available with and without an inner ring and in both sealed and open versions.</p> |
| Outside surface profile of the outer ring | <p>Yoke type track rollers with a crowned outside surface are predominantly used since they are often inclined in relation to the mating track and edge stresses must be avoided.</p> <p>The radius of curvature of the outside surface is $R = 500$ mm.</p> <p>In series NNTR..-2ZL, the radius is indicated in the dimension table.</p> <p>In series NATR..-PP, NATV..-PP, NUTR and PWTR..-2RS, the outside surface has the optimised INA profile.</p> <p>In yoke type track rollers with this curvature profile, <i>Figure 1</i> to <i>Figure 6</i>, page 834 and page 835:</p> <ul style="list-style-type: none">■ the Hertzian pressure is lower■ edge loading under tilting is lower■ wear of the mating track is reduced■ the operating life of the mating track is extended. |
| Yoke type track rollers without inner ring | <p>Yoke type track rollers RSTO and RNA22..-2RSR do not have an inner ring. They are particularly compact but require a hardened and ground raceway on the shaft or stud.</p> <p>Series RSTO is not self-retaining. The outer ring, needle roller and cage assembly and inner ring can therefore be fitted independently.</p> |
| With cage/axial guidance of outer ring | <p>Yoke type track rollers RSTO and RNA22..-2RSR have a cage. These designs do not have axial guidance of the outer ring. Axial guidance of the outer ring and needle roller and cage assembly must be provided in the adjacent component; see Adjacent construction for yoke type track rollers, page 846.</p> |
| Sealing/lubricant | <p>Yoke type track rollers RSTO are not sealed, series RNA22..-2RSR has lip seals on both sides.</p> <p>They are greased using a lithium complex soap grease to GA08.</p> |
| Yoke type track rollers with inner ring | <p>These yoke type track rollers are used if the shaft or stud does not have a hardened and ground raceway.</p> <p>Series STO is not self-retaining. This means that the outer ring, needle roller and cage assembly and inner ring can be fitted independently of each other.</p> |
| With cage/with full complement needle roller set/with full complement cylindrical roller set | <p>Yoke type track rollers STO, NA22..-2RSR, NATR and NATR..-PP have a cage. Series NATV and NATV..-PP have a full complement needle roller set, yoke type track rollers NUTR, PWTR..-2RS and NNTR..-2ZL have a full complement cylindrical roller set.</p> <p>Bearings without a cage have the largest possible number of rolling elements and therefore have particularly high load carrying capacity. Due to the kinematic conditions, however, the speeds achievable with these bearings are somewhat lower than those achievable with the cage-guided yoke type track rollers.</p> |

| Axial guidance of outer ring | Series STO and NA22..-2RSR do not have axial guidance of the outer ring. This must be provided in the adjacent construction; see Adjacent construction for yoke type track rollers, page 846. In NATR and NATV, axial guidance is provided by contact washers and plain washers. In NUTR, the outer ring is guided by the rolling elements, in PWTR..-2RS and NNTR..-2ZL this function is performed by the central rib and the rolling elements. | | | | | | | | | | | | | | |
|---------------------------------------|---|--------|-------------|----|--|----|--|----|--------------|-----|--|------|---|-----|--|
| With anti-corrosion protection | Series PWTR..-2RS-RR is protected against corrosion by the INA special plating Corrotect®, see page 859. | | | | | | | | | | | | | | |
| Sealing/lubricant | Yoke type track rollers STO are not sealed. Series NA22..-2RSR has lip seals, PWTR..-2RS has protected lip seals on both sides. NATR..-PP and NATV..-PP have three-stage seals with plastic axial plain washers. NATR, NATV have gap seals, NUTR has labyrinth seals and NNTR..-2ZL has sealing shields with lamellar rings. In the three-stage concept, there is a gap seal between the plastic axial plain washer and the outer ring and a labyrinth seal between the formed seal lip and the undercut in the outer ring. The disc spring shape of the axial plain washers gives a preloaded contact seal as the third stage. It also provides axial sliding contact between the outer ring and contact washers, thus reducing wear and grease consumption. They are greased using a lithium complex soap grease to GA08 and can be lubricated via the inner ring. | | | | | | | | | | | | | | |
| Operating temperature | Yoke type track rollers have an operating temperature range from -30 °C to +140 °C. In sealed bearings (suffixes 2RS and 2RSR) and bearings with a plastic cage (suffix TV), the temperature range is restricted to between -30 °C and +120 °C. Note the information on the operating temperature range in Technical Principles, Lubrication. | | | | | | | | | | | | | | |
| Caution! | Yoke type track rollers NATR..-PP and NATV..-PP are suitable for operating temperatures from -30 °C to +100 °C, restricted by the grease and seal material. | | | | | | | | | | | | | | |
| Suffixes | Suffixes for the available designs: see table. | | | | | | | | | | | | | | |
| Available designs | <table border="1"> <thead> <tr> <th>Suffix</th><th>Description</th></tr> </thead> <tbody> <tr> <td>PP</td><td>Plastic axial plain washer with formed seal lip on both sides of the yoke type track roller, giving a three-stage seal</td></tr> <tr> <td>RR</td><td>Corrosion-resistant design with INA special plating Corrotect®</td></tr> <tr> <td>TV</td><td>Plastic cage</td></tr> <tr> <td>2RS</td><td>Protected lip seal on both sides of the yoke type track roller</td></tr> <tr> <td>2RSR</td><td>Radial contact lip seal on both sides of the yoke type track roller</td></tr> <tr> <td>2ZL</td><td>Sealing shield with lamellar rings on both sides of the track roller</td></tr> </tbody> </table> | Suffix | Description | PP | Plastic axial plain washer with formed seal lip on both sides of the yoke type track roller, giving a three-stage seal | RR | Corrosion-resistant design with INA special plating Corrotect® | TV | Plastic cage | 2RS | Protected lip seal on both sides of the yoke type track roller | 2RSR | Radial contact lip seal on both sides of the yoke type track roller | 2ZL | Sealing shield with lamellar rings on both sides of the track roller |
| Suffix | Description | | | | | | | | | | | | | | |
| PP | Plastic axial plain washer with formed seal lip on both sides of the yoke type track roller, giving a three-stage seal | | | | | | | | | | | | | | |
| RR | Corrosion-resistant design with INA special plating Corrotect® | | | | | | | | | | | | | | |
| TV | Plastic cage | | | | | | | | | | | | | | |
| 2RS | Protected lip seal on both sides of the yoke type track roller | | | | | | | | | | | | | | |
| 2RSR | Radial contact lip seal on both sides of the yoke type track roller | | | | | | | | | | | | | | |
| 2ZL | Sealing shield with lamellar rings on both sides of the track roller | | | | | | | | | | | | | | |



Product overview Stud type track rollers

Without eccentric collar

With cage

Plastic axial plain washers/
gap seals

KR..-PP

KR



110 188b

Full complement
needle roller set

Plastic axial plain washers

KRV..-PP



110 190a

Full complement
cylindrical roller set

Labyrinth seals

NUKR

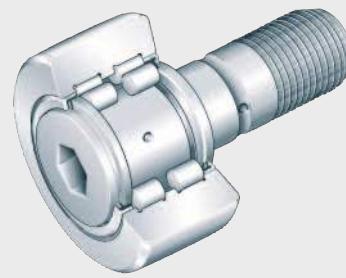


110 112a

Full complement
cylindrical roller set,
with central rib

Protected lip seals

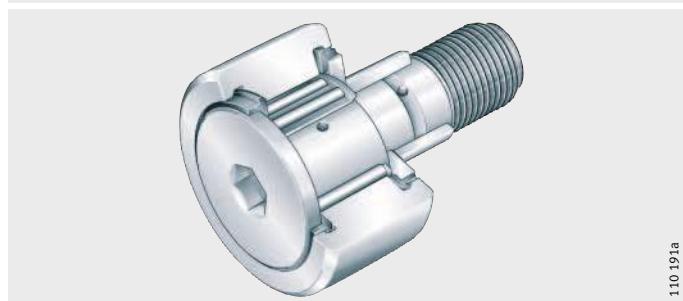
PWKR..-2RS



110 111a

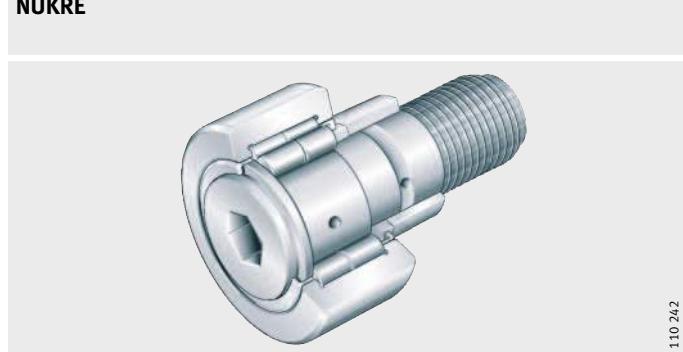
With eccentric collar
With cage
Plastic axial plain washers

KRE..-PP



Full complement
cylindrical roller set
Labyrinth seals

NUKRE



Full complement
cylindrical roller set,
with central rib
Protected lip seals

PWKRE..-2RS



Stud type track rollers

| | |
|---|---|
| Features | <p>Stud type track rollers comprise thick-walled outer rings with a profiled outside surface, heavy-section roller studs with a fixing thread, contact washers and needle roller and cage assemblies or single or double row full complement needle roller or cylindrical roller sets.</p> <p>They can support high radial loads as well as axial loads arising from slight misalignment and skewed running; they are suitable for cam gears, bed ways, conveying equipment etc.</p> <p>The bearings are available in several designs as well as with or without an eccentric collar.</p> |
| Outside surface profile of the outer ring | <p>Stud type track rollers with a crowned outside surface are predominantly used since they are often inclined in relation to the mating track and edge stresses must be avoided.</p> <p>In series KR, the radius of curvature is $R = 500$ mm.</p> <p>In series KR..-PP, KRE..-PP, KRV..-PP, NUKR, NUKRE, PWKR..-2RS and PWKRE..-2RS, the outside surface has the optimised INA profile.</p> <p>In stud type track rollers with this curvature profile, <i>Figure 1</i> to <i>Figure 6</i>, page 834 and page 835:</p> <ul style="list-style-type: none">■ the Hertzian pressure is lower■ edge loading under tilting is lower■ wear of the mating track is reduced■ the operating life of the mating track is extended. |
| Stud type track rollers without eccentric collar | <p>Stud type track rollers without an eccentric collar do not have a defined adjustment facility in relation to the mating track on the adjacent construction.</p> <p>Stud type track rollers KR and KR..-PP have a cage, the design KRV..-PP has a full complement needle roller set. Series NUKR and PWKR..-2RS have a full complement cylindrical roller set.</p> <p>Stud type track rollers without a cage have the largest possible number of rolling elements and therefore have particularly high load carrying capacity. Due to the kinematic conditions, however, the speeds achievable with these bearings are somewhat lower than those achievable with the cage-guided stud type track rollers.</p> |
| Axial guidance of outer ring | <p>In series KR, KR..-PP and KRV..-PP, axial guidance is provided by the contact flange and contact washers.</p> <p>The outer rings of series NUKR and PWKR..-2RS are guided by the rolling elements and central rib.</p> |
| With anti-corrosion protection | <p>Series PWKR..-2RS-RR is protected against corrosion by the INA special plating Corrotect®, see page 859.</p> |
| Sealing/lubricant | <p>The stud type track rollers are sealed on both sides. Series KR has gap seals, KR..-PP has a three-stage seal with plastic axial plain washers having formed seal lips on both sides of the bearing, NUKR has labyrinth seals and PWKR..-2RS has protected lip seals.</p> <p>Description of the three-stage PP seal: see page 829.</p> <p>They are greased using a lithium complex soap grease to GA08 and can be lubricated via the roller stud.</p> |

Stud type track rollers with eccentric collar

Designs with an eccentric collar can be adjusted by means of a hexagonal socket on the flange/thread side of the roller stud. The outer ring outside surface can thus be adjusted against the mating track; this allows less accurate manufacturing tolerances on the adjacent construction. Furthermore, this gives improved load distribution when using several stud type track rollers and also allows preloaded linear systems to be easily realised.

The highest point of the eccentric collar is indicated by the position of the INA logo and the eccentricity e is stated in the dimension tables.

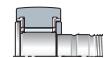
With cage/ with full complement cylindrical roller set

Stud type track rollers KRE..-PP have a cage. Series NUKRE and PWKRE..-2RS have a full complement cylindrical roller set.

Stud type track rollers without a cage have the largest possible number of rolling elements and therefore have particularly high load carrying capacity. Due to the kinematic conditions, however, the speeds achievable with these bearings are somewhat lower than those achievable with the cage-guided stud type track rollers.

Axial guidance of outer ring

In series KRE..-PP, axial guidance is provided by the contact rib and contact washers. The outer rings of series NUKRE and PWKRE..-2RS are axially guided by the rolling elements and central rib.



Sealing/lubricant

The stud type track rollers are sealed on both sides. Series KRE..-PP has a three-stage seal with plastic axial plain washers having formed lips on both sides of the bearing, NUKRE has labyrinth seals and PWKRE..-2RS has protected lip seals.

Description of the three-stage PP seal: see page 829.

They are greased using a lithium complex soap grease to GA08 and can be lubricated via the roller stud.

Caution!

The eccentric collar covers the radial lubrication hole in the shank. Relubrication must therefore be carried out via the end faces.

Operating temperature

Stud type track rollers have an operating temperature range from -30°C to $+140^{\circ}\text{C}$. In sealed bearings (suffix 2RS), the temperature range is restricted to between -30°C and $+120^{\circ}\text{C}$.

Note the information on the operating temperature range in Technical Principles, Lubrication.

Caution!

Stud type track rollers KR..-PP, KRV..-PP and KRE..-PP are suitable for operating temperatures from -30°C to $+100^{\circ}\text{C}$, restricted by the lubricant and seal material.

Suffixes

Suffixes for the available designs: see table.

Available designs

| Suffix | Description |
|--------|--|
| PP | Plastic axial plain washer with formed seal lip on both sides of the stud type track roller, giving a three-stage seal |
| RR | Corrosion-resistant design with INA special plating Corrotect® |
| SK | Hexagonal socket only on the flange-side end face. No relubrication facility |
| 2RS | Protected lip seal on both sides of the stud type track roller |

Yoke type track rollers Stud type track rollers

Advantages of the optimised INA profile

- Lower maximum Hertzian pressure under tilting, *Figure 1* and *Figure 2*.
- Higher basic rating life of the outer ring and mating track, *Figure 3*.
- Reduced wear between the outer ring outside surface and mating track, *Figure 4* and *Figure 5*.
- Increased rigidity of outer ring contact, *Figure 6*.

Hertzian pressure curve

Comparison: Cylindrical profile/profile $R = 500$ mm; optimised INA profile ($C_{rw}/P_r = 5$), *Figure 1*.

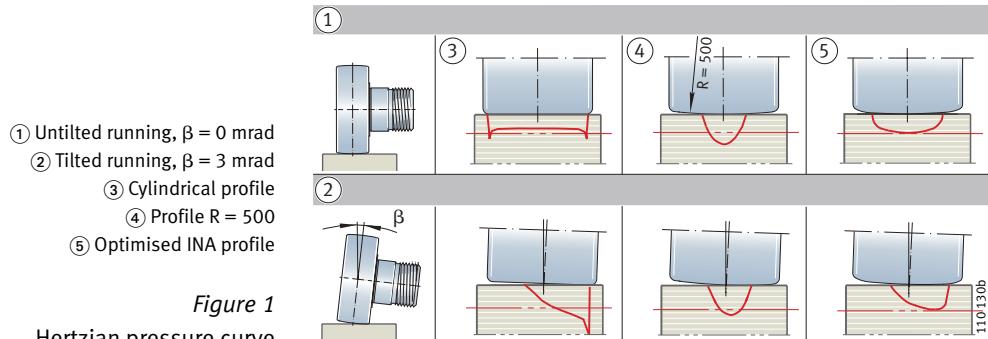


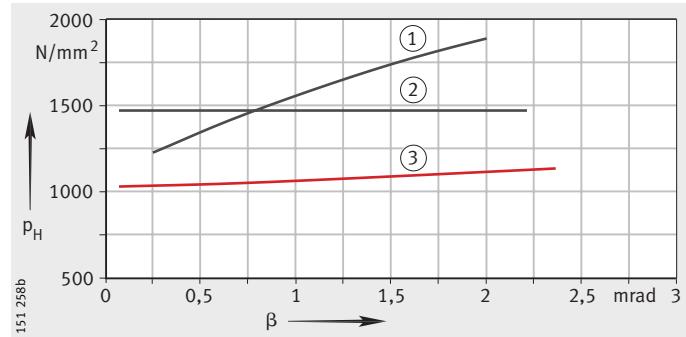
Figure 1
Hertzian pressure curve

Max. Hertzian pressure

Stud type track roller NUKR80, radial load $F_r = 13\,800$ N ($C_{rw}/P_r = 5$), *Figure 2*.

① Cylindrical profile
② Profile $R = 500$
③ Optimised INA profile
 $p_H = \text{max. Hertzian pressure}$
 $\beta = \text{tilt angle}$

Figure 2
Max. Hertzian pressure

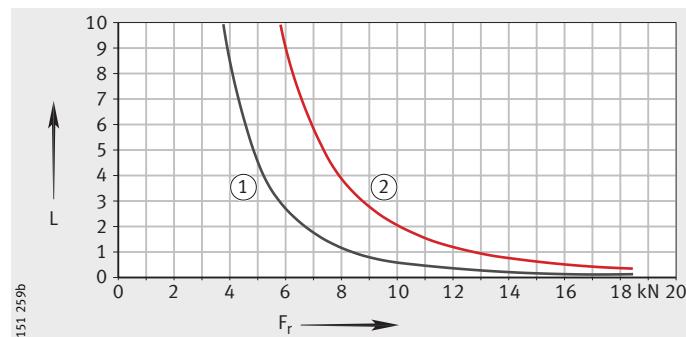


Basic rating life of mating track

Yoke type track roller NUTR15, mating track made from 42CrMo4V, hardness 350 HV, *Figure 3*.

① Crowned outer ring, $R = 500$
② Optimised INA profile
 $L = \text{basic rating life}$
[millions of overrolling motions]
 $F_r = \text{load}$

Figure 3
Basic rating life of the mating track

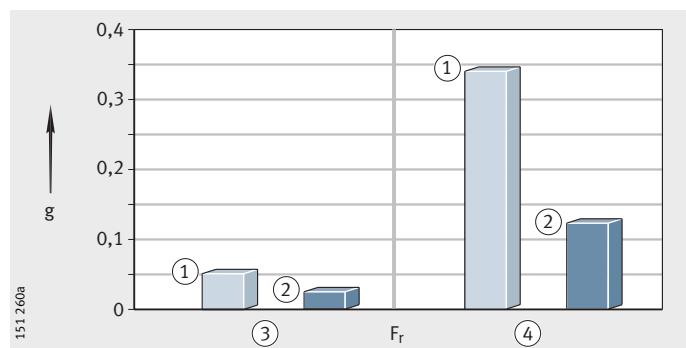


Wear of mating track

Mating track made from GGG–50.
Mean value from several test runs after 360 000 overrolling motions,
Figure 4.

- ① Outer ring with $R = 500$
 - ② Optimised INA profile
 - ③ Low load F_r
 - ④ High load F_r
- $g = \text{wear}$

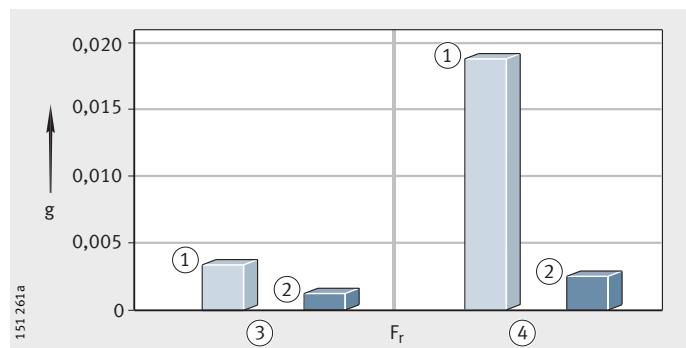
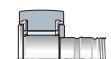
Figure 4
Wear of mating track



- ① Outer ring with $R = 500$
 - ② Optimised INA profile
 - ③ Low load F_r
 - ④ High load F_r
- $g = \text{wear}$

Figure 5
Wear of mating track

Mating track made from 58CrV4.
Mean value from several test runs after 8 000 000 overrolling motions,
Figure 5.

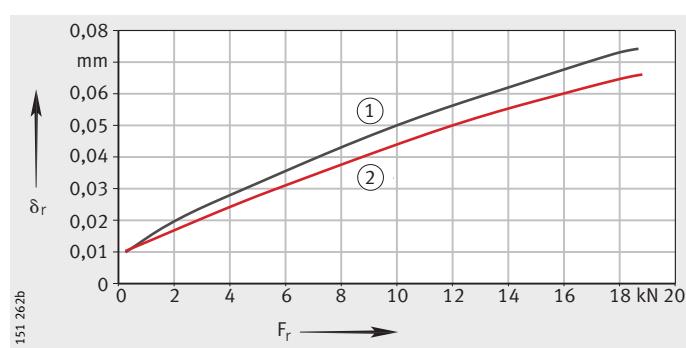


Rigidity in outer ring contact

Yoke type track roller NUTR15, radial deflection of outer ring and rolling element set, *Figure 6.*

- ① Crowned outer ring, $R = 500$
 - ② Optimised INA profile
- $\delta_r = \text{radial deflection}$
 $F_r = \text{load}$

Figure 6
Rigidity in outer ring contact



Yoke type track rollers Stud type track rollers

Design and safety guidelines Installation as yoke or stud type track roller

The thick-walled outer rings of yoke and stud type track rollers can support high radial loads. If these track rollers are used on a flat mating track, the outer rings undergo elastic deformation, *Figure 7*.

Compared to rolling bearings supported in a housing bore, track rollers have the following characteristics:

- modified load distribution in the bearing.
This is taken into consideration by the effective load ratings C_{rw} and C_{orw} used in life calculation.
- bending stresses in the outer ring. These are taken into consideration by the permissible radial loads $F_{r,per}$ and $F_{or,per}$. The bending stresses must not exceed the permissible strength values of the material.

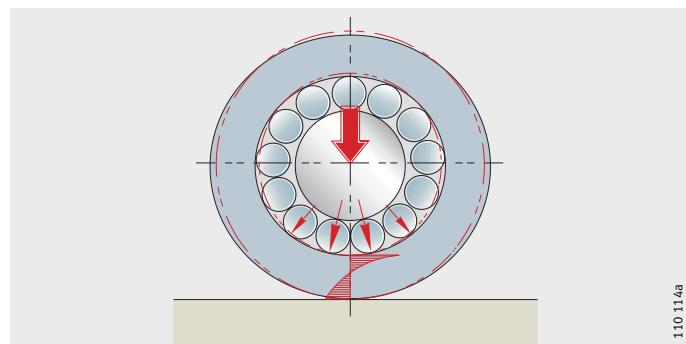


Figure 7
Deformation of the outer ring when used against a flat mating track

Permissible dynamic radial load

Caution!

For bearings under dynamic – rotating – load, the effective dynamic load rating C_{rw} is used. C_{rw} is used to calculate the basic rating life.

The permissible dynamic radial load $F_{r,per}$ must not be exceeded. If a value for $F_{r,per}$ is not given, the basic dynamic load rating C_{rw} is used as a substitute. The radial load acting on the bearing must not exceed this value.

If the basic static load rating C_{orw} is lower than the basic dynamic load rating C_{rw} , then C_{orw} applies.

Permissible static radial load

Caution!

For bearings under static load – stationary or with only infrequent rotary motion – the effective static load rating C_{orw} applies. C_{orw} is used to calculate the static load safety factor S_0 .

The permissible static radial load $F_{or,per}$ must not be exceeded. If no value for $F_{or,per}$ is given, the basic static load rating C_{orw} is used as a substitute. The radial load acting on the bearing must not exceed this value.

In addition to the permissible radial load of the bearing, the permissible radial load of the mating track must also be taken into consideration (Design of mating track, page 848).

Load carrying capacity and life

The methods for calculating the rating life are:

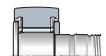
- the basic rating life to DIN ISO 281
- the adjusted basic rating life to DIN ISO 281
- the expanded calculation of the adjusted reference life to DIN ISO 281-4.

These methods are described in Technical Principles, Load carrying capacity and life.

For yoke type track rollers, stud type track rollers and yoke type track rollers based on balls, the following values must be replaced:

- $C_r = C_{rw}$
effective dynamic load rating, see page 836
- $C_{0r} = C_{0rw}$
effective static load rating, see page 836
- $C_{ur} = C_{urw}$
fatigue limit load as track roller according to the dimension tables.

Other formulae for calculating the basic rating life



$$L_s = 0,0314 \cdot D \cdot \left(\frac{C_{rw}}{P_r} \right)^p$$

or

$$L_h = 26,18 \cdot \frac{D}{H \cdot n_{osc}} \cdot \left(\frac{C_{rw}}{P_r} \right)^p$$

or

$$L_h = 52,36 \cdot \frac{D}{\bar{v}} \cdot \left(\frac{C_{rw}}{P_r} \right)^p$$

L_s 10^5 m
Basic rating life in 10^5 metres

L_h h
Basic rating life in operating hours

C_{rw} N
Effective dynamic load rating.

C_{rw} is that load of constant magnitude and direction which a sufficiently large group of apparently identical track rollers can endure for a basic rating life of one million revolutions

P_r N
Equivalent dynamic load (radial load)

p –
Life exponent:

$p = 3$ for yoke and stud type track rollers based on balls
 $p = 10/3$ for yoke and stud type track rollers based on needle or cylindrical rollers

n min^{-1}
Operating speed

D mm
Outside diameter of track roller

H m
Single stroke length for reciprocating motion

n_{osc} min^{-1}
Number of return strokes per minute

\bar{v} m/min
Mean travel velocity.

Yoke type track rollers Stud type track rollers

Operating life The operating life is the life actually achieved by a rolling bearing. This can deviate significantly from the calculated basic rating life. This may be due to wear and/or fatigue as a result of:

- deviating operating conditions
- misalignment between the track roller and mating track
- insufficient or excessive operating clearance
- contamination of the track roller
- inadequate lubrication
- excessive operating temperature
- oscillating bearing motion with a very small pivoting angle – false brinelling
- wear between the outer ring outside surface and the mating track
- high vibration and false brinelling
- very high shock loads – leading to static overloading
- prior damage during installation.

Due to the variety of installation and operating conditions, it is not possible to precisely predetermine the operating life. The most reliable way of arriving at a close estimate is by comparison with similar applications.

Static load safety factor The parameter for the static load is the static load safety factor S_0 . It indicates the security against impermissible permanent deformation of the bearing:

$$S_0 = \frac{C_{0rw}}{F_{0r}}$$

S_0 –
Static load safety factor
 C_{0rw} N
Effective static load rating: see dimension tables
 F_{0r} N
Maximum radial load on track roller.

Track rollers are regarded as highly loaded at a static load safety factor of $S_0 < 8$.

Caution! Static load safety factors of $S_0 < 1$ cause plastic deformation of the rolling elements and the raceway, which can impair smooth running. This is only permissible for bearings with small rotary motions or in secondary applications.

For a static load safety factor $S_0 < 2$, please contact us.

Minimum load In order to ensure that the outer ring is driven and no slippage occurs or the track roller does not lift from the mating track, track rollers must be subjected to a minimum load in dynamic operation.

Caution! In general, the minimum load is calculated using the ratio $C_{0rw}/F_r < 60$.

Skewed running

Skewed running leads to additional axial load on the rolling bearing and axial slippage in the rolling contact between the outer ring and mating track, *Figure 8*. Depending on the skewed running angle α and lubrication, wear may occur in this case.

A complete loss of adhesive friction between the outer ring and raceway with correspondingly severe wear is to be expected with a skewed running angle $\alpha \geq 1,4 \cdot 10^{-4} \cdot p_H$ ($^{\circ}$) or $\alpha \geq 2,5 \cdot 10^{-3} \cdot p_H$ (mrad).

α $^{\circ}$ or mrad

Skewed running angle

p_H N/mm²

Hertzian pressure according to the nomogram, page 849.

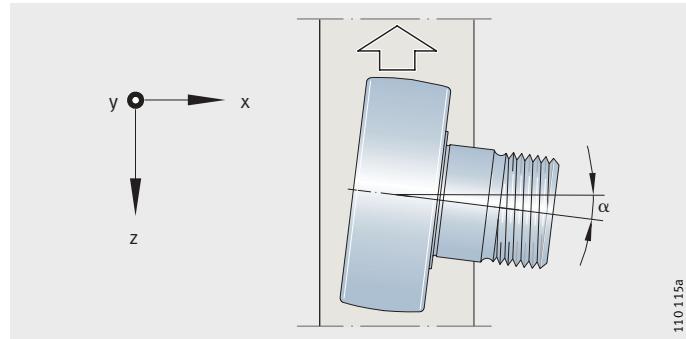


Figure 8
Skewed running angle α

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Tilting

If tilting occurs during running, increased edge stresses occur, especially in track rollers with cylindrical outer rings.

Track rollers with a crowned outer ring are less sensitive to tilting and should therefore be used in preference to track rollers with a cylindrical outer ring.

In practice, track rollers with cylindrical outside surfaces and tilting angles of $\beta > 0,1^{\circ}$ (1,7 mrad) and track rollers with crowned outside surfaces and tilting angles of $\beta > 0,25^{\circ}$ (4,4 mrad) have proved susceptible to damage, *Figure 9*.

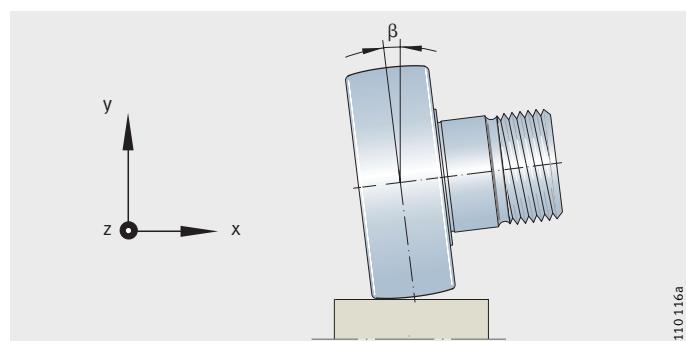


Figure 9
Tilting angle β

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Yoke type track rollers Stud type track rollers

| | |
|--|--|
| Speeds | The maximum permissible speed for track rollers is largely determined by the permissible operating temperature of the rolling bearings. The temperature thus depends on the type of bearing, the load, the lubrication conditions and the cooling conditions. |
| Speed during continuous operation | The speeds n_{DG} in the dimension tables are guide values. They were determined for: <ul style="list-style-type: none">■ grease lubrication■ loads during continuous operation of $< 0,05 \cdot C_{0rw}$■ skewed running angles of $\alpha < 0,03^\circ$ ($< 0,5$ mrad)■ ambient temperatures of $+20^\circ\text{C}$■ outer ring temperatures of $+70^\circ\text{C}$■ lubricated mating track■ no external axial load. The speed must be reduced if the following apply: <ul style="list-style-type: none">■ loads higher than $0,05 \cdot C_{0rw}$■ additional axial forces – skewed running■ insufficient heat dissipation. Higher speeds can be achieved with intermittent operation and oil impulse lubrication. |
| Speed with lip seals | The speed of track rollers with lip seals is additionally restricted by the permissible sliding speed at the seal lip. |

Frictional torque

The frictional torque M_R of a track roller depends on many influencing factors such as load, speed and track roller type, as well as the lubrication conditions and seal friction. Due to the wide range of these influencing factors, the frictional torque can only be calculated approximately.

For track rollers without contact seals, the frictional torque can be calculated under normal operating conditions and moderate speed range using the following formula:

$$M_R = f \cdot F_r \cdot \frac{d_M}{2}$$

M_R Nmm
Frictional torque of track roller

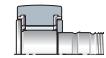
f –
Coefficient of friction, see table

F_r N
Radial load

d_M mm
Mean bearing diameter $(d + D)/2$ of the track roller.

Caution!

The values in the table Coefficient of friction f are valid for track rollers under radial load and without seals.



If sealed track rollers are used, higher values must be expected.

Additional axial forces – e.g. under large skewed running angles – can lead to a substantial increase in the values, especially in the case of track rollers based on needle rollers. Track rollers based on balls can support axial loads without a significant change in friction.

Coefficient of friction f

| Type of track roller | Coefficient f |
|---|-----------------|
| Ball bearing, single row | 0,0015 to 0,002 |
| Ball bearing, double row | 0,002 to 0,003 |
| Cylindrical roller bearing, full complement | 0,002 to 0,003 |
| Needle roller bearing with cage | 0,003 to 0,004 |
| Needle roller bearing, full complement | 0,005 to 0,007 |

Displacement resistance

When a track roller rolls on a track, it must overcome not only the friction within the bearing but also the rolling friction between the outer ring and the track.

The displacement resistance F_v is determined according to the following formula:

$$F_v = \frac{2 \cdot (f_R \cdot F_r + M_R)}{D}$$

F_v N
Displacement resistance

f_R mm
Coefficient of rolling friction for tracks made from hardened steel:
 $f_R = 0,05$ mm

F_r N
Radial load

M_R Nmm
Frictional torque of track roller

D mm
Outside diameter of track roller, see dimension tables.

Yoke type track rollers Stud type track rollers

Lubrication Yoke and stud type track rollers based on ball bearings are greased using a lithium soap grease with a mineral oil base to GA13. For yoke and stud type track rollers based on needle and cylindrical rollers, a lithium complex soap grease with a mineral oil base and EP additives to GA08 is used. Greases for initial greasing: see Technical Principles, Lubrication.

| Arcanol rolling bearing greases for relubrication | Arcanol grease | Designation to DIN 51825 | Type of grease | Track roller |
|---|----------------|--------------------------|---|--|
| | LOAD220 | KP2N-20 | Lithium-calcium soap grease with mineral oil base | Yoke and stud type track rollers based on needle and cylindrical rollers |
| | MULTI3 | K3N-30 | Lithium soap grease with mineral oil base | Yoke and stud type track rollers based on balls |

Two contact zones in track rollers For track rollers, two contact zones must be lubricated and considered separately:
■ the rolling elements and the rolling element raceway
■ the outside surface of the track roller and the mating track.
The contact zone between the rolling elements and the rolling element raceway is covered in Technical Principles, Lubrication.

Lubrication of mating track For lubrication of the mating track, all lubricants suitable for rolling bearing lubrication may be used. However, there are applications in which the mating track must not be lubricated.

Caution! If the contact point cannot be lubricated, wear must be anticipated, especially under high loads and at high speeds.

Oil lubrication For oil lubrication, oils of type CLP to DIN 51517 are recommended.

Grease lubrication For grease lubrication, lithium soap greases to DIN 51825 should be used. Relubrication intervals can only be determined under operating conditions.
Relubrication must be carried out at the latest when fretting corrosion first occurs – this can be identified by a reddish discolouration of the mating track or the outer ring.

Solid lubricants/anti-friction coatings These materials can also be used for lubrication. However, these only provides effective lubrication for a significantly shorter period than oil or grease lubrication under high traverse speeds or speeds.

Central lubrication adapter for stud type track rollers

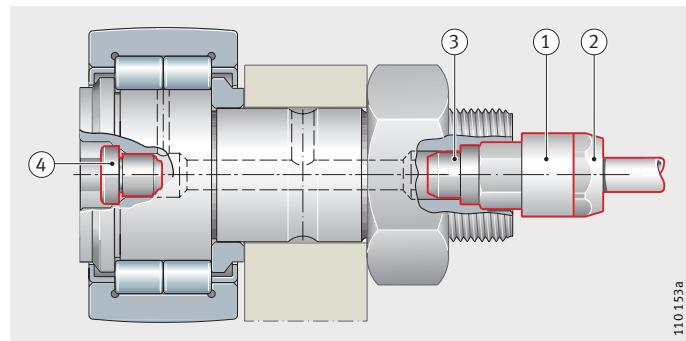
If a central lubrication system is to be used, a patented central lubrication adapter can be used to connect the standard roller stud of stud type track rollers with hexagonal sockets on both sides, *Figure 10*. This comprises a connection adapter with a hexagonal end and a rapid-fit connection cartridge.

The connection adapter is connected to the roller stud on one end of the stud type track roller by replacing the funnel type lubrication nipple with the fitting cylinder. The hexagonal end prevents rotation of the adapter. The other end of the stud type track roller is closed off using the supplied funnel type lubrication nipple, *Figure 10*.

The connection adapter has an M10×1 internal thread. This is used for screw mounting and sealing of the rapid-fit connection cartridge. The rapid-fit connection cartridge gives rigid retention and sealing of the plastic tube. It is therefore not necessary to screw the pipe and adapter onto each other.

- ① Connection adapter with M10×1 internal thread
- ② Rapid-fit connection cartridge
- ③ Fitting cylinder
- ④ Funnel type lubrication nipple

Figure 10
Central lubrication adapter/
funnel type lubrication nipple



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Dimensions of adapter: see table and *Figure 11*.

Dimensions of adapter

| Central lubrication adapter Designation | W | L | l_1 max. | l_2 | l_3 approx. | For polyamide pipe DIN 73 378 $d_1 \times s_{nom}$ ¹⁾ |
|--|----|----|---------------|-------|------------------|--|
| AP8 | 8 | 27 | 16 | 22 | 4 | 4×0,75 |
| AP10 | 10 | 27 | 15 | 22 | 5 | 4×0,75 |
| AP14 | 14 | 25 | 8 | 20 | 6 | 4×0,75 |

¹⁾ Hard PA pipes should preferably be used.
Note the operating limits in DIN 73 378 and the manufacturer's guidance.
Maximum excess pressure for pipes made from PA 11/12 at +23 °C:
31 bar to 62 bar. Maximum excess pressure when using other screw-in
connectors: 80 bar.

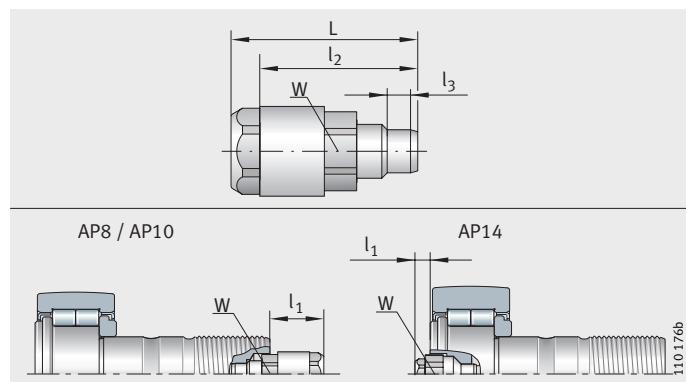


Figure 11
Central lubrication adapter –
dimensions

Yoke type track rollers Stud type track rollers

Simplified calculation of relubrication intervals

The table Allocation to stud type track rollers shows the relubrication quantity for central lubrication using flowable grease and its conversion to the number of relubrication impulses for conventional metering nipple sizes.

The data are valid for a lithium soap flowable grease with EP additives and mineral oil base of classes ISO VG 100 to ISO VG 220 and NLGI classes 00 or 000.

Allocation to stud type track rollers

| Series ¹⁾ | Outside diameter D mm | Central lubrication adapter | Re- lubrication quantity g ²⁾ | Relubrication impulses for metering nipple of size | |
|----------------------|-----------------------------|-----------------------------------|---|--|--------------------|
| | | | | 30 mm ³ | 50 mm ³ |
| NUKR/NUKRE | 35 and 40 | AP8 | 1,1 | 40 | 24 |
| | 47 and 52 | AP10 | 2,4 | 89 | 53 |
| | 62 to 90 | AP14 | 7,3 | 271 | 163 |
| KR/KRE | 35 and 40 | AP8 | 1,2 | 44 | 27 |
| | 47 and 52 | AP10 | 1,6 | 60 | 36 |
| | 62 to 90 | AP14 | 6 | 222 | 133 |
| KRV/KRVE | 35 and 40 | AP8 | 0,7 | 26 | 16 |
| | 47 and 52 | AP10 | 1 | 37 | 22 |
| | 62 to 90 | AP14 | 3,2 | 120 | 72 |

¹⁾ For stud type track rollers with hexagonal socket on both sides.

²⁾ Relubrication quantity and relubrication intervals for central lubrication using flowable grease for the majority of applications.

Note the quantity required to fill the feed lines.

Relubrication periods

The approximate relubrication periods for single shift operation and a majority of load cases are shown in the table Relubrication period for calculation of relubrication intervals.

The number of relubrication impulses derived from the table Allocation to stud type track rollers should be evenly distributed within these periods.

Relubrication period for calculation of relubrication intervals¹⁾

| Load ratio C_{0rw}/P_r | Maximum operating speed n_{max} in % of n_{DG} | | | |
|-----------------------------|---|----------|----------|---------|
| | 10 | 25 | 50 | 100 |
| $5 > C_{0rw}/P_r \geq 3$ | 6 months | – | – | – |
| $10 > C_{0rw}/P_r \geq 5$ | 1 year | 4 months | 1 month | – |
| $C_{0rw}/P_r \geq 10$ | 1 year | 8 months | 2 months | 14 days |

¹⁾ The data are valid for single shift operation; the relubrication quantity and relubrication intervals are valid for the majority of applications.

They are based on approximate calculation of the relubrication interval t_{RF} ; for relubrication interval see Technical Principles, Lubrication.

Periods in single shift operation

| Months | Weeks | Working days | Working hours |
|--------|-------|--------------|---------------|
| 1/2 | 2 | 10 | 80 |
| 1 | 4 | 20 | 160 |
| 2 | 8 | 40 | 320 |
| 4 | 16 | 80 | 640 |
| 6 | 24 | 120 | 960 |
| 8 | 32 | 160 | 1280 |
| 12 | 48 | 240 | 1920 |

**Fitting of
central lubrication adapter**

Caution!

The unused relubrication hole in the roller stud must be closed off using the funnel type lubrication nipple supplied.

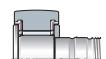
Only the lubrication nipples supplied should be used.

The central lubrication adapter should preferably be pressed in using a lever press under low, uniform pressure or, if necessary, carefully driven with a plastic hammer using light blows into the unused hexagonal socket bore of the roller stud; note the press-in depth l_3 and position of the hexagon, *Figure 11* and table Dimensions of adapter, page 843.

Fit the stud type track roller. Cut the plastic pipe straight across and insert it into the cartridge until it stops.

Caution!

Only use polyamide pipe to DIN 73 378. Check the seating of the pipe. Note maximum pressures, maximum temperatures and minimum bending radius. Maximum pipe length to distributor approx. 1 m.



Yoke type track rollers Stud type track rollers

Adjacent construction for yoke type track rollers

For stud type track rollers without an inner ring, the rolling element raceway on the shaft or stud must be hardened and ground. The surface hardness must be $670 \text{ HV} + 170 \text{ HV}$, the hardening depth CHD or Rht must be sufficiently large.

Design of shaft or stud: see table Tolerances and surface for the shaft or stud raceway.

Tolerances and surface for the shaft or stud raceway

| Diameter tolerance of shafts or studs | | Roughness max. | Roundness max. | Parallelism max. |
|--|-------------------------|------------------------------------|---------------------------------|---------------------------------|
| Without inner ring | With inner ring | | | |
| k5 | g6 (with point load) | $R_a 0,4 \text{ (} R_z 2 \text{)}$ | 25% of diameter tolerance | 50% of diameter tolerance |

Location of yoke type track rollers without axial guidance

For yoke type track rollers without axial guidance, the outer ring and needle roller and cage assembly must be laterally guided, *Figure 12*. The axial contact surfaces for the outer rings must be precision machined, wear-resistant and lubricated ($R_a 2$ recommended).

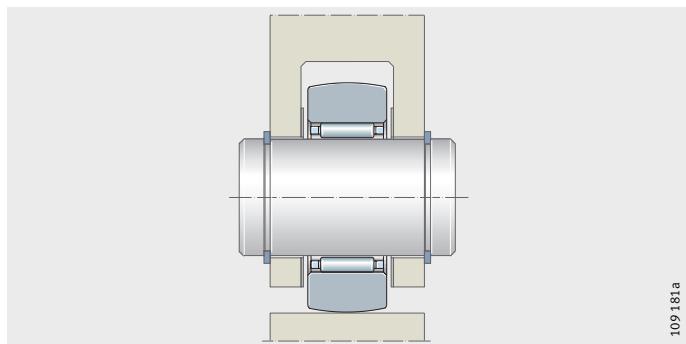


Figure 12

Lateral guidance of outer ring and needle roller and cage assembly

Location of yoke type track rollers with axial guidance

Yoke type track rollers with axial guidance must be axially clamped in place. The thrust washers must be axially supported if axial loads occur. The dimension d_2 according to the dimension table must be observed, *Figure 13*.

Yoke type track rollers NATR and NATV can be located using conventional fasteners such as snap rings, *Figure 13*.

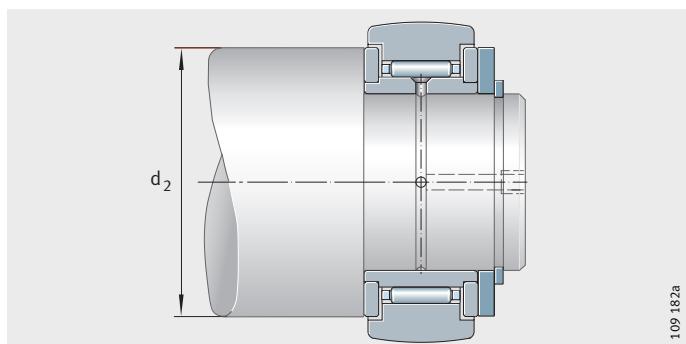


Figure 13

Location by snap rings

For NNTR..-2ZL, NUTR, PWTR..-2RS, the inner ring and thrust washer must be axially located, *Figure 14*.

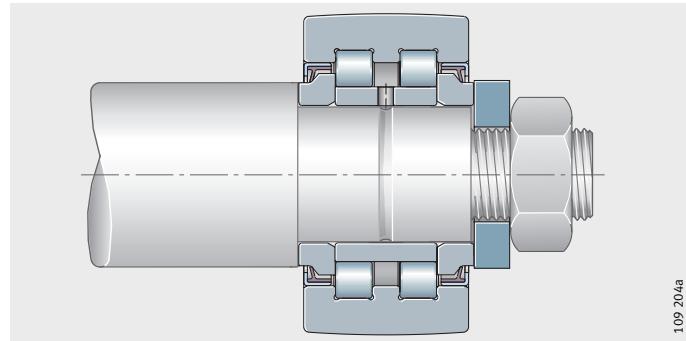
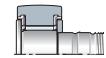


Figure 14
Clamping of
inner ring and thrust washer

Adjacent construction for stud type track rollers

The bore tolerance H7 produces a clearance fit since the stud tolerance is h7 for studs without eccentric collar and h9 for studs with eccentric collar.



The locating surfaces for stud type track rollers must be flat, perpendicular and of sufficient height. The strength of the nut locating surface must be sufficiently high. The dimension must not be less than the dimension d_2 in the dimension tables.

The entry chamfer on the locating bore must not be more than $0,5 \times 45^\circ$.

Axial location

Stud type track rollers must be axially secured using a hexagonal nut. The nuts – grade 8 to ISO 4 032 (M6, M8) or ISO 8 673 – are not included in delivery; the nuts must be ordered separately.

If heavy vibration occurs, the stud type track rollers can be located using self-locking nuts to DIN 985 or special locking washers.

Caution!

For self-locking nuts, the higher tightening torque must be observed – the advice given by the nut manufacturer must be followed.

Position of lubrication hole

The position of the radial lubrication hole is indicated by the INA logo, *Figure 15*. This must not be positioned in the loaded zone.

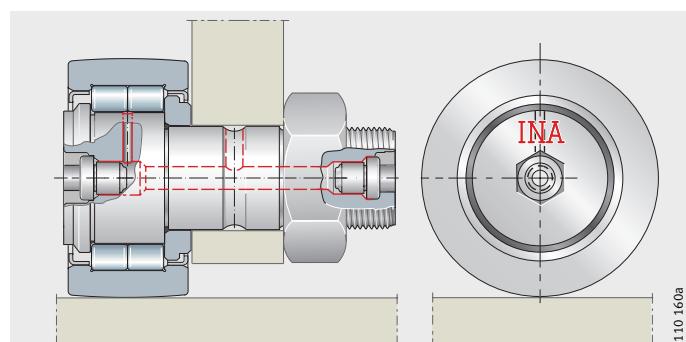


Figure 15
Position of lubrication hole

Yoke type track rollers Stud type track rollers

Design of mating track

When designing the mating track – material (strength), heat treatment, surface – the Hertzian pressure p_H must be taken into consideration. It is dependent on the load, the contact geometry (point contact or line contact) and the modulus of elasticity of the materials.

Nomogram

The Hertzian pressure p_H can be derived from the nomogram, *Figure 17*, or can be calculated.

The nomogram is valid for mating tracks made from steel. For mating tracks made from other materials see table Correction factor k , page 850.

Other conditions:

- Point contact
- Radius of curvature $R = 500$; radius of curvature $R > 500$, see page 850
- Mating track flat in the direction of the track roller axis
- Signs according to *Figure 16*.

Example

- Stud type track roller NUKR35 with optimised INA profile, $D = 35 \text{ mm}$
- Outer ring width $C = 18 \text{ mm}$
- Load $F_r = 2500 \text{ N}$
- Cam plate, radius $r_L = 80 \text{ mm}$.

Curvature sum

$$\frac{1}{r_L} + \frac{2}{D} = \frac{1}{80} + \frac{2}{35} = 0,07 \text{ mm}^{-1}$$

$$p_{H500} = 1250 \text{ N/mm}^2$$

$$p_{H\text{opt.INA profile}} \approx 1250 \text{ N/mm}^2 \cdot k_{pH}$$

$$= 1250 \text{ N/mm}^2 \cdot 0,85$$

$$= 1063 \text{ N/mm}^2$$

(1025 N/mm² from calculation program BEARINX[®]), k_{pH} see page 850.

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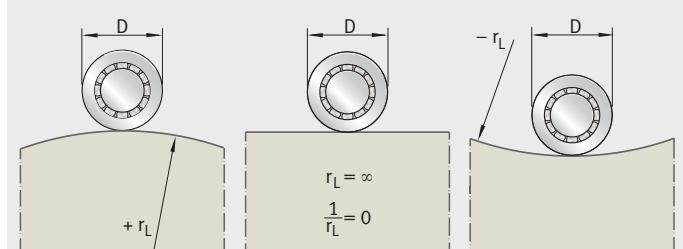


Figure 16
Raceway radii and signs

F_r Radial load
 D mm
 Outside diameter of the yoke/stud type track roller
 r_L mm
 Raceway radius (*Figure 16*)
 p_H N/mm²
 Hertzian pressure.

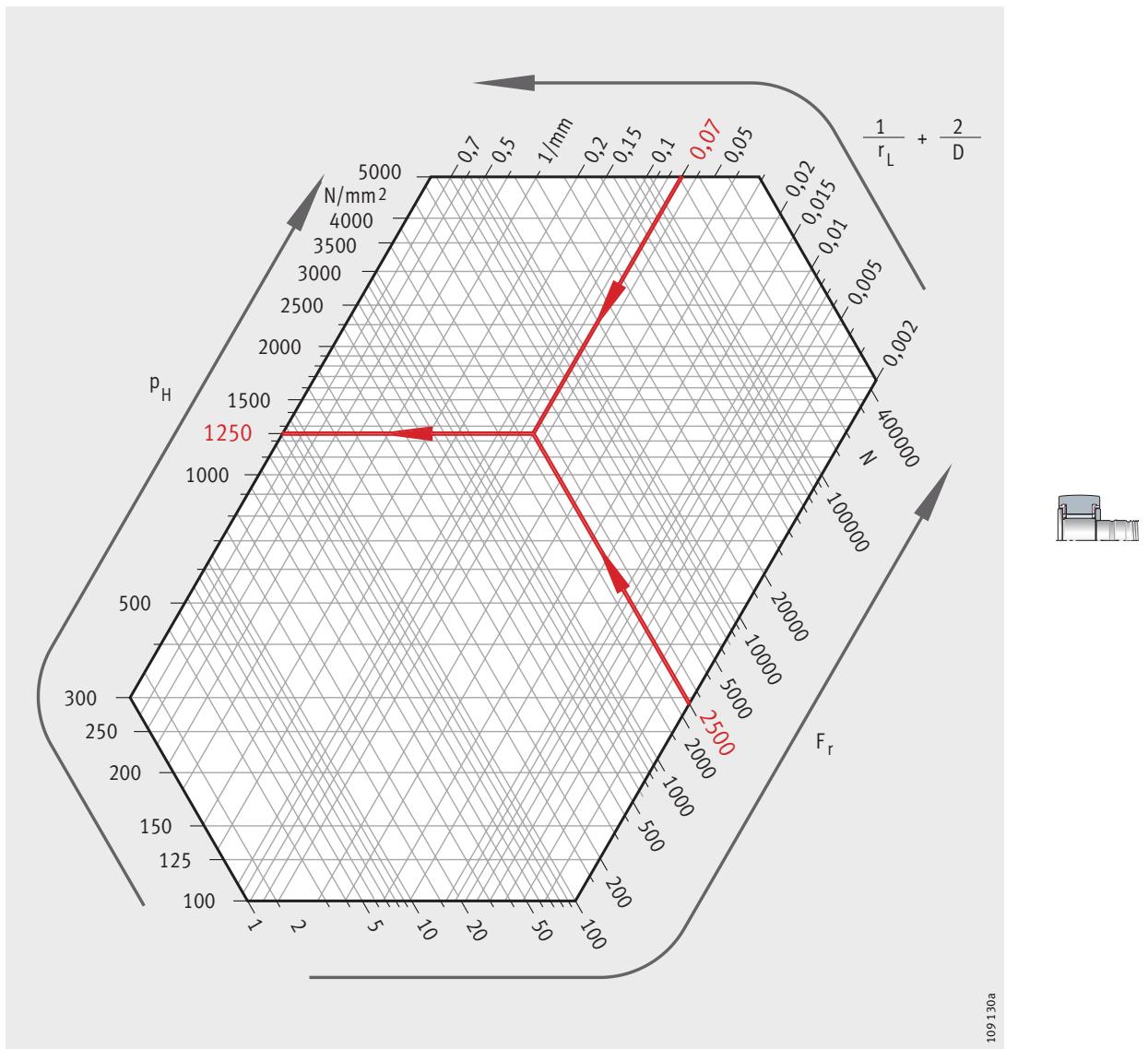


Figure 17
Nomogram for
determining Hertzian pressure
Calculation example (red)

109130a

Yoke type track rollers Stud type track rollers

Track rollers with optimised INA profile

For the optimised INA profile, the following calculation provides sufficiently precise values; for k_{pH} see table Pressure factor:

$$p_{Hopt.\text{INA profile}} \approx k_{pH} \cdot p_{H500}$$

Pressure factor k_{pH}

| Outer ring width C mm | Pressure factor k_{pH} |
|-----------------------------|-----------------------------|
| 10 incl. 15 | 1 |
| over 15 incl. 20 | 0,85 |
| over 20 incl. 30 | 0,83 |
| over 30 incl. 35 | 0,8 |

Curvature radius $R > 500$

For $R > 500$ mm, the following applies:

$$p_{HR} = p_{H500} \cdot \left(\frac{500}{R} \right)^{0,185}$$

Materials for mating track

The mating track is subjected to high load during overrolling. This produces high Hertzian contact pressures. The strength and surface hardness of the material must be matched to this load.

For raceways subjected to high loads, through hardened steels, case hardened steels and steels for flame or induction hardening are recommended.

For raceways subjected to low loads, construction steels and cast steel or cast iron materials can be used:

$$p_H = k \cdot p_H (\text{steel/steel})$$

p_H N/mm²
Max. Hertzian pressure

k –
Correction factor for mating track material.

Correction factor k

| Material | Correction factor for | |
|----------|-----------------------|--------------|
| | Point contact | Line contact |
| GG-20 | 0,74 | 0,8 |
| GG-30 | 0,81 | 0,85 |
| GG-40 | 0,85 | 0,88 |
| GGG-40 | 0,92 | 0,94 |
| GGG-60 | 0,94 | 0,96 |
| GGG-80 | 0,96 | 0,97 |

Guide values for permissible Hertzian pressure

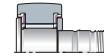
Selection of materials – guide values for permissible Hertzian pressure – is shown in the table Materials/guide values. The values were determined on steel test samples with achieved loadings of 10^7 .

Based on calculation of the load carrying capacity of rolling bearings, this gives:

- $P_{H\text{stat.}}$
for predominantly static load
- $P_{H\text{dyn.}}$
for predominantly dynamic load.

Materials/guide values

| Material | Hertzian pressure | | $R_{p0,2}$ N/mm^2 | |
|-------------------------------|--|---------------------------------------|-------------------------------|-------|
| | $P_{H\text{stat.}}$ N/mm^2 | $P_{H\text{dyn.}}$ N/mm^2 | | |
| Cast iron | GG-15 | 850 | 340 | 120 |
| | GG-20 | 1 050 | 420 | 150 |
| | GG-25 | 1 200 | 480 | 190 |
| | GG-30 | 1 350 | 540 | 220 |
| | GG-35 | 1 450 | 580 | 250 |
| | GG-40 | 1 500 | 600 | 280 |
| Spheroidal graphite cast iron | GGG-40 | 1 000 | 490 | 250 |
| | GGG-50 | 1 150 | 560 | 320 |
| | GGG-60 | 1 400 | 680 | 380 |
| | GGG-70 | 1 550 | 750 | 440 |
| | GGG-80 | 1 650 | 800 | 500 |
| Cast steel | GS-38 | 780 | 380 | 200 |
| | GS-45 | 920 | 450 | 230 |
| | GS-52 | 1 050 | 510 | 260 |
| | GS-60 | 1 250 | 600 | 300 |
| | GS-62 | 1 300 | 630 | 350 |
| | GS-70 | 1 450 | 700 | 420 |
| Construction steel | St 37-2 | 690 | 340 | 235 |
| | St 44-2 | 860 | 420 | 275 |
| | St 52-3 | 980 | 480 | 355 |
| Quenched and tempered steel | C 45 V | 1 400 | 670 | 500 |
| | Cf 53 V | 1 450 | 710 | 520 |
| | Cf 56 V | 1 550 | 760 | 550 |
| | C 60 V | 1 600 | 780 | 580 |
| | 46 Cr 2 V | 1 750 | 850 | 650 |
| | 42 CrMo 4 V | 2 000 | 980 | 900 |
| | 50 CrV 4 V | 2 000 | 980 | 900 |
| Hardened steel | 100 Cr 6 H | 4 000 | 1 500 | 1 900 |
| | 16 MnCr 5 E | 4 000 | 1 500 | 770 |
| | Cf 53 Hl | 4 000 | 1 500 | 730 |
| | Cf 56 Hl | 4 000 | 1 500 | 760 |



Yoke type track rollers

Stud type track rollers

| | |
|-----------------------------|---|
| Hardenable materials | The following materials with a purity level corresponding to that of alloyed construction steels may be used: <ul style="list-style-type: none">■ Through hardening steels to ISO 683-17, e.g. 100Cr6. In special cases, surface hardening of these rolling bearing steels is possible.■ Case hardening steels to ISO 683-17, e.g. 17MnCr5 or EN 10 084, e.g. 16MnCr5. In addition to the Hardenability, the core strength must also be taken into consideration. For case hardening, a fine grained hardening structure and a case hardening depth CHD according to the formula below is necessary.■ Steels for flame or induction hardening to ISO 683-17, e.g. Cf54 or DIN 17 212, e.g. Cf53. For flame or induction hardening, only the parts of the machine component to be used as raceways must be hardened. The material should be quenched and tempered before hardening. The effective hardening depth Rht is determined using the formula below. |
|-----------------------------|---|

| | |
|---|---|
| Heat treatment of the mating track | The following apply for hardened mating tracks: <ul style="list-style-type: none">■ a surface hardness of 670 HV + 170 HV■ a hardening depth CHD or Rht according to the following formulae<ul style="list-style-type: none">– in accordance with DIN 50190, the depth of the hardened surface zone at which there is still a hardness of 550 HV■ hardness curves presented in schematic form in <i>Figure 18</i> and <i>Figure 19</i>■ a hardening depth of $\geq 0,3$ mm. |
|---|---|

The formulae are based on the hardness curves normally achieved with professional heat treatment.

Case hardening:

$$CHD \geq 2,73 \cdot 10^{-5} \cdot \frac{p_H}{\left(\frac{1}{r_L} + \frac{2}{D} \right)}$$

Flame and induction hardening:

$$Rht \geq 10^{-5} \cdot \frac{\left(4,4 \cdot \frac{p_H^2}{R_{p0,2}} - 3,5 \cdot p_H \right)}{\left(\frac{1}{r_L} + \frac{2}{D} \right)}$$

p_H N/mm²

Max. Hertzian pressure

CHD mm

Case hardening depth

Rht mm

Effective hardening depth

D mm

Outside diameter of track roller, see dimension tables

$R_{p0,2}$ N/mm²

Proof stress of mating track material, see table, page 851

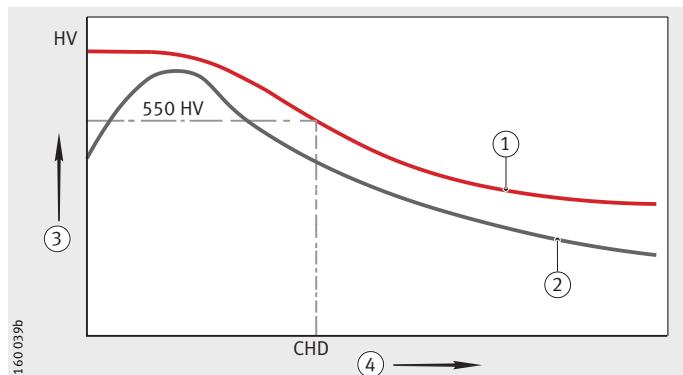
r_L mm

Radius of mating track –

the raceway must be flat in the direction of the track roller axis,
see also *Figure 16*, page 848.

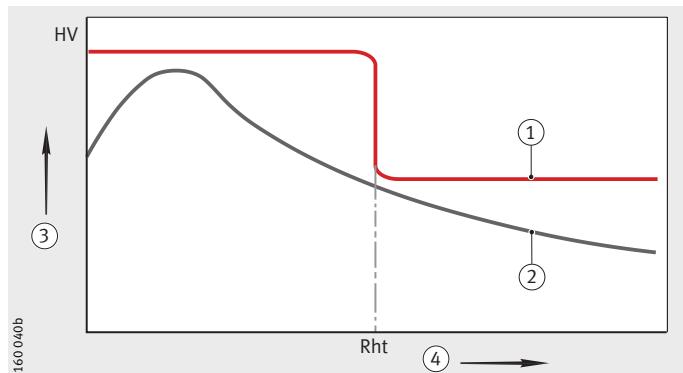
① Case hardening
 ② Required hardness
 ③ Hardness
 ④ Distance from surface
 CHD = case hardening depth with hardness 550 HV

Figure 18
Case hardening depth CHD – hardness curve



① Flame or induction hardening
 ② Required hardness
 ③ Hardness
 ④ Distance from surface
 Rht = effective hardening depth

Figure 19
Effective hardening depth Rht – hardness curve



INA guideways as mating tracks

These guideways are ready-to-fit units from the INA linear range. They are to the appropriate grade Q20 for yoke and stud type track rollers and correspond to the dimensions of standard profiles:

- parallelism 20 µm/m
- surface quality $R_a 0,8$
- hardness 58 HRC to 62 HRC
- angular misalignment between the raceways max. 1 mrad (1 µm/mm)
- deviations of the guideway cross-section +0,015/+0,05
- length tolerance of the individual guideway +1 mm/m.

Enquiries

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 Telephone 0180 5003872
 Fax 0180 5003873

Yoke type track rollers Stud type track rollers

Protection of mating track

Caution!

The mating track should be protected against contamination – covers or if necessary wipers, for example made from felt, should be placed ahead of the track roller, *Figure 20*.

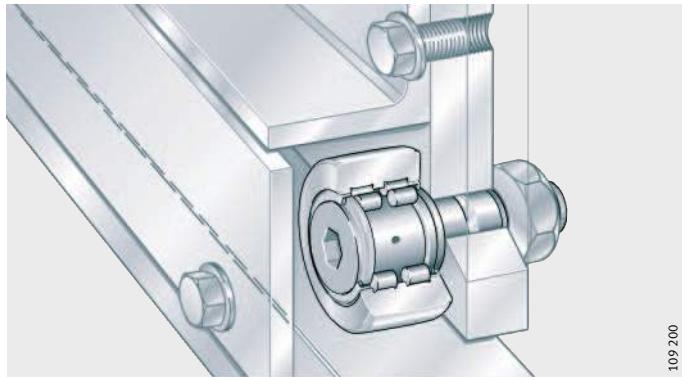


Figure 20

Protection of mating track
against contamination

Fitting

Track rollers are precision machine elements. These products must be very carefully handled before and during fitting. Their trouble-free operation depends largely on the care taken during fitting.

The assembly area must be kept clean and free from dust.

Caution!

Protect bearings from dust, contaminants and moisture.

Contaminants have a detrimental influence on the running and operating life of rolling bearings.

Do not cool the bearings excessively. Moisture due to condensation can lead to corrosion in the bearings and bearing seats.

Check the seat of the axis for dimensional and geometrical accuracy and cleanliness.

Lightly oil the bearing ring seating surfaces or rub with solid lubricant.

After fitting, charge ungreased rolling bearings with lubricant.

Check the correct functioning of the bearing arrangement.

Fitting tools

- Induction heaters;
note the manufacturer's guidance on grease and seals
- Heating cupboard; heating up to +80 °C
- Mechanical or hydraulic press;
use fitting sleeves that cover the whole circumference of the bearing ring end faces
- Hammer and fitting sleeve;
blows should only be applied concentrically to the sleeve.

Caution!

Fitting forces must never be directed through the rolling elements.

Direct blows on the bearing rings must be avoided. It must be ensured that the seals are not damaged during fitting.

Guidelines for dismantling

Dismantling should be taken into consideration in the original design of the bearing position.

If the bearing is to be reused:

- do not apply direct blows to the bearing rings
- do not apply dismantling forces through the rolling elements
- carefully clean the bearings after dismantling
- do not use a concentrated or "hard" flame.

Fitting and dismantling of yoke type track rollers (needle and cylindrical roller types)

If the tolerances are unfavourable, the yoke type track roller should be pressed onto the shaft or stud using a press, *Figure 21*. The inner ring must be fitted such that the pressing-in force is distributed uniformly on the end face of the inner ring.

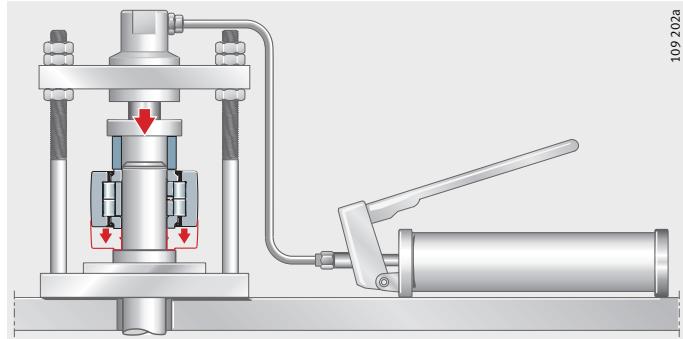
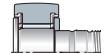


Figure 21
Fitting a yoke type track roller
using a press –
yoke type track roller NUTR

The bearing should be fitted such that the lubrication holes are positioned in the unloaded zone. For yoke type track rollers PWTR and NNTR, there is no need for defined positioning of the lubrication hole.



Yoke type track rollers NUTR, PWTR and NNTR should be axially secured as instructed; example according to *Figure 22*.

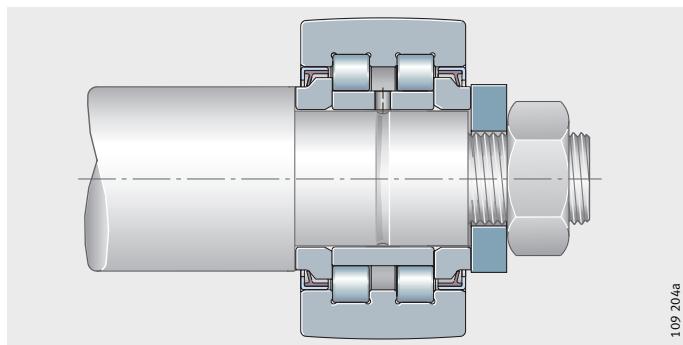


Figure 22
Axial location –
yoke type track roller PWTR..-2RS

Fitting and dismantling of stud type track rollers (needle and cylindrical roller types)

Caution!

The stud type track roller should be fitted using a press if possible (similar to *Figure 21*).

Blows on the flange of the roller stud must be avoided.

The position of the lubrication hole is indicated by the INA logo. It must not lie in the loaded zone, see *Figure 15*, page 847.

Yoke type track rollers Stud type track rollers

Drive fit lubrication nipple for stud type track rollers

Caution!

Stud type track rollers are supplied with loose drive fit lubrication nipples that must be pressed in correctly before fitting the bearings.

Only these lubrication nipples should be used, see *Figure 23* and table Drive fit lubrication nipples.

If relubrication is to be carried out via the locating bore, the axial lubrication holes in the stud type track roller must be closed off using the lubrication nipples before fitting, *Figure 23*.

For lubrication, only needle-point nozzles with an opening angle of max. 60° should be used.

Central lubrication adapter for stud type track rollers: see page 843.

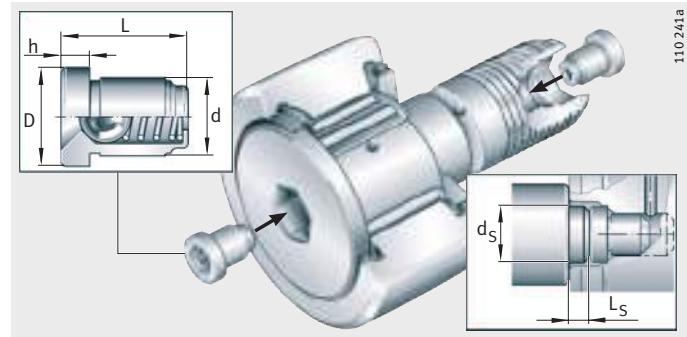


Figure 23

Stud type track roller KR..PP with drive fit lubrication nipple and dimensions for pressing mandrel

Drive fit lubrication nipples

| Lubrication nipple | Dimensions in mm | | | | | | Suitable for outside diameter D |
|-----------------------|------------------|---|-----|-------------------|--------------------|-------|---------------------------------------|
| | D | d | L | h | d_s $\pm 0,1$ | l_s | |
| NIPA1 | 6 | 4 | 6 | 1,5 ¹⁾ | — | — | 16 and 19 |
| NIPA1×4,5 | 4,7 | 4 | 4,5 | 1 | 4,5 | 5 | 22 to 32 |
| NIPA2×7,5 | 7,5 | 6 | 7,5 | 2 | 7,5 | 6 | 35 to 52 |
| NIPA3×9,5 | 10 | 8 | 9,5 | 3 | 10 | 9 | 62 to 90 |

¹⁾ Projection of lubrication nipple, see page 869, figure bottom left.

Axial location of stud type track rollers

Stud type track rollers must be axially secured using a hexagon nut. The slot or hexagonal socket on the ends of the roller stud can be used to hold the bearing by means of a key while tightening the fixing nut and to adjust the eccentric collar, *Figure 24*.

Caution!

It is absolutely essential that the tightening torque for the fixing nuts as specified in the dimension table is adhered to. It is only in this way that the permissible radial load can be ensured.

If the tightening torque cannot be adhered to, an interference fit is required.

If heavy vibration occurs, self-locking nuts to DIN 985 or special locking washers can be used.

Caution!

For self-locking nuts, the higher tightening torque must be observed – the advice given by the nut manufacturer must be followed.

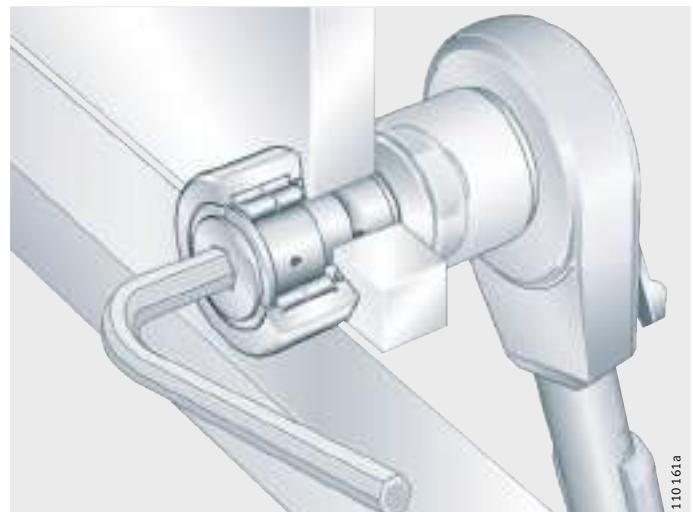


Figure 24

Holding the bearing using an Allen key

Stud type track rollers with eccentric collar

The highest point on the eccentric collar is indicated by the INA logo, see *Figure 15*, page 847.

Yoke type track rollers Stud type track rollers

Initial operation/relubrication

Stud type track rollers have a lubrication hole for relubrication:

- on the flange side of the roller stud
- on the thread-side end face – from an outside diameter of 22 mm
- on the shank of the roller stud – from an outside diameter of 30 mm with an additional lubrication groove.

Caution!

Stud type track rollers with an eccentric collar cannot be relubricated via the shank. The eccentric collar covers the lubrication hole.

For lubrication, only grease guns with needle-point nozzles having an opening angle of max. 60°, *Figure 25* should be used.

Before initial operation, the lubrication holes and feed pipes must be filled with grease in order to ensure corrosion protection and lubrication can be carried out at the same time.

Relubrication of yoke and stud type track rollers may present difficulties if a rolling element is located over the radial lubrication hole. Relubrication should therefore be carried out with the bearing still warm from operation and rotating if safe to do so, before the bearing comes to rest if safe to do so and before extended breaks in operation.

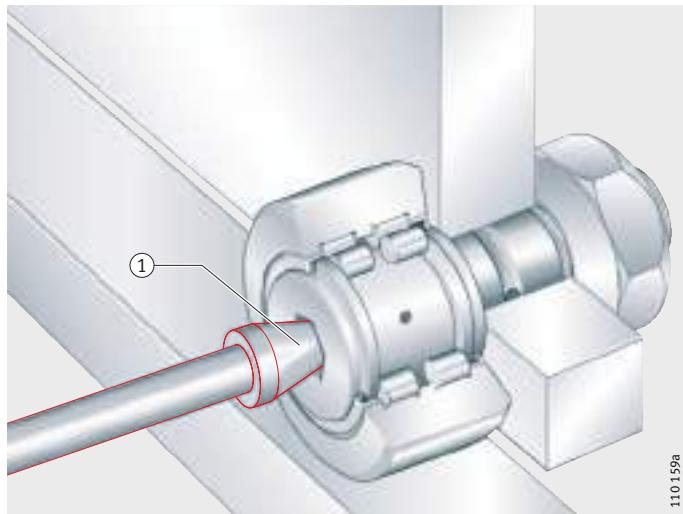
The grease used for relubrication should be the same as that used for initial greasing; if a different grease is to be used, its miscibility and compatibility must be checked, see page 842.

Relubrication should continue until a fresh collar of grease appears at the seal gaps. Old grease must be able to leave the bearing unhindered.

① Needle-point nozzle,
opening angle $\leq 60^\circ$

Figure 25

Relubrication using a grease gun



110159a

Anti-corrosion protection by Corrotect® plating

Track rollers are often subjected to aggressive media. In such applications, corrosion protection is therefore a decisive factor in achieving a long operating life of the bearings.

In principle, corrosion-resistant steels may be used for track rollers. In many applications, however, the INA special plating Corrotect® is more cost-effective. For a comprehensive description of the plating, see Technical Principles, Anti-corrosion protection, page 104.

Corrotect® is an extremely thin, electroplated surface coating – coating thickness 0,5 µm to 3 µm.

The coating is effective against moisture, contaminated water, salt spray and weakly alkaline and weakly acidic cleaning agents.

Yoke type track rollers PWTR and stud type track rollers PWKR with the suffix RR are coated as standard with Corrotect®. Other yoke and stud type track rollers with Corrotect® plating are treated as special designs.

Figure 26 shows an uncoated stud type track roller after a salt spray test, *Figure 27* shows a stud type track roller with Corrotect® coating after the salt spray test.

Fitting of coated track rollers

In order to reduce the press-in force required, the surface of the parts should be lightly greased – the tolerances are increased by the thickness of the plating.

Caution!

Before fitting, the compatibility of track rollers with Corrotect® plating with the media concerned should be checked.

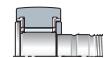


Figure 26
NUKR52 without
plating after salt spray test



Figure 27
PWKR52-2RS-RR
with Corrotect® plating after
salt spray test

Yoke type track rollers Stud type track rollers

Accuracy The dimensional and geometrical tolerances correspond to tolerance class PN in accordance with DIN 620, for KR(E) and KRV to ISO 7 063.

The following deviations from DIN 620 apply:

- the diameter tolerance of the profiled outside surface 0/-0,05 mm
- for NNTR, the diameter tolerance to h10
- for NATR, NATV, NUTR, PWTR..-2RS, the width tolerance B to h12
- for NATR, NATV, the roundness of the inner ring
- for stud type track rollers, the tolerance of the shank diameter to h7 and the eccentric collar diameter to h9.

For PWTR..-2RS-RR and PWKR..-2RS-RR, the tolerances are increased by the thickness of the INA special plating Corrotect®.

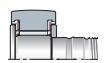
Radial internal clearance The radial internal bearing clearance corresponds approximately to class C2, for STO and NA22..-2RSR to class CN.

**Radial internal clearance to
DIN 620-4**

| Bore d mm | | Radial internal clearance | | | | | | | |
|-----------------|-------|---------------------------|----------|------|----------|------|----------|------|------|
| | | CN μm | C3 μm | | C4 μm | | C2 μm | | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. | max. |
| - | 24 | 20 | 45 | 35 | 60 | 50 | 75 | 0 | 25 |
| 24 | 30 | 20 | 45 | 35 | 60 | 50 | 75 | 0 | 25 |
| 30 | 40 | 25 | 50 | 45 | 70 | 60 | 85 | 5 | 30 |
| 40 | 50 | 30 | 60 | 50 | 80 | 70 | 100 | 5 | 35 |
| 50 | 65 | 40 | 70 | 60 | 90 | 80 | 110 | 10 | 40 |
| 65 | 80 | 40 | 75 | 65 | 100 | 90 | 125 | 10 | 45 |
| 80 | 100 | 50 | 85 | 75 | 110 | 105 | 140 | 15 | 50 |
| 100 | 120 | 50 | 90 | 85 | 125 | 125 | 165 | 15 | 55 |
| 120 | 140 | 60 | 105 | 100 | 145 | 145 | 190 | 15 | 60 |

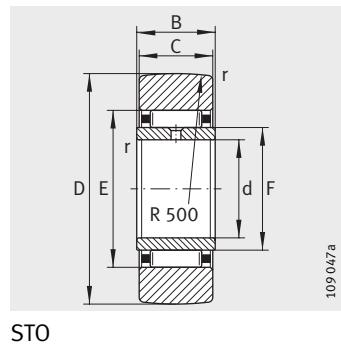
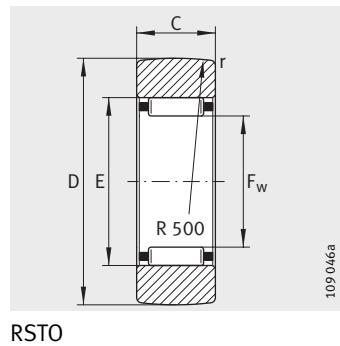
Enveloping circle For RSTO and RNA22..-2RSR, the needle roller enveloping circle F_w is in the tolerance zone F6.

The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the adjacent construction.



Yoke type track rollers

Without axial guidance



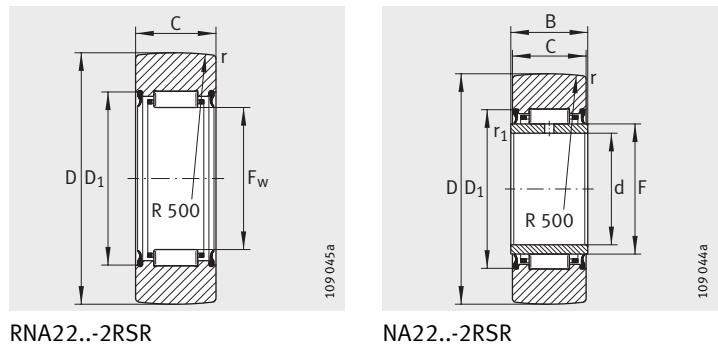
Dimension table · Dimensions in mm

| Without inner ring Designation | Mass m ≈g | With inner ring Designation | Mass m ≈g | Dimensions | | | | | | Basic load ratings | | Fatigue limit load C _{urw} N | Speed n _{DG} min ⁻¹ | |
|--------------------------------|--------------|-----------------------------|--------------|------------|----|------|----|-----------------------------------|----|--------------------|------------------------|---------------------------------------|---|--------|
| | | | | D | d | C | B | F ¹⁾ F _w | E | r min. | dyn. C _{rw} N | stat. C _{0rw} N | | |
| RSTO5-TV | 8,5 | — | — | 16 | — | 7,8 | — | 7 | 10 | 0,3 | 2 550 | 2 550 | 310 | 16 000 |
| RSTO6-TV | 12,5 | STO6-TV | 17 | 19 | 6 | 9,8 | 10 | 10 | 13 | 0,3 | 3 750 | 4 750 | 570 | 10 000 |
| RSTO8-TV | 21 | STO8-TV | 26 | 24 | 8 | 9,8 | 10 | 12 | 15 | 0,3 | 4 200 | 5 400 | 700 | 8 000 |
| RSTO10 | 42 | STO10 | 49 | 30 | 10 | 11,8 | 12 | 14 | 20 | 0,3 | 8 400 | 9 200 | 1 170 | 5 500 |
| RSTO12 | 49 | STO12 | 57 | 32 | 12 | 11,8 | 12 | 16 | 22 | 0,3 | 9 000 | 10 100 | 1 300 | 4 500 |
| RSTO15 | 50 | STO15 | 63 | 35 | 15 | 11,8 | 12 | 20 | 26 | 0,3 | 9 100 | 10 700 | 1 370 | 3 300 |
| RSTO17 | 88 | STO17 | 107 | 40 | 17 | 15,8 | 16 | 22 | 29 | 0,3 | 14 200 | 17 700 | 2 190 | 2 800 |
| RSTO20 | 130 | STO20 | 152 | 47 | 20 | 15,8 | 16 | 25 | 32 | 0,3 | 16 200 | 21 500 | 2 700 | 2 400 |
| RSTO25 | 150 | STO25 | 177 | 52 | 25 | 15,8 | 16 | 30 | 37 | 0,3 | 16 400 | 22 900 | 2 850 | 1 800 |
| RSTO30 | 255 | STO30 | 308 | 62 | 30 | 19,8 | 20 | 38 | 46 | 0,6 | 23 300 | 34 500 | 3 950 | 1 300 |
| RSTO35 | 375 | STO35 | 441 | 72 | 35 | 19,8 | 20 | 42 | 50 | 0,6 | 25 500 | 40 000 | 4 650 | 1 100 |
| RSTO40 | 420 | STO40 | 530 | 80 | 40 | 19,8 | 20 | 50 | 58 | 1 | 23 900 | 39 000 | 4 950 | 850 |
| RSTO45 | 453 | STO45 | 576 | 85 | 45 | 19,8 | 20 | 55 | 63 | 1 | 25 500 | 43 000 | 5 000 | 750 |
| RSTO50 | 481 | STO50 | 617 | 90 | 50 | 19,8 | 20 | 60 | 68 | 1 | 26 000 | 46 000 | 5 400 | 650 |

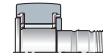
¹⁾ F = Raceway diameter of the inner ring,
F_w = Needle roller enveloping circle in tolerance zone F6.

Yoke type track rollers

Without axial guidance,
sealed



| Dimension table - Dimensions in mm | | | | | | | | | | | | | |
|------------------------------------|-----------------|------------|----|------|----|-----------------|---------------|-----|---------------|-----------------------|-------------------------|---|--|
| Without inner ring Designation | Mass m ≈g | Dimensions | | | | | | | | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
| | | D | d | C | B | $F^1)$ F_w | D_1 min. | r | r_1 min. | dyn. C_{rw} N | stat. C_{orw} N | | |
| RNA22/6-2RSR | 18 | 19 | 6 | 11,8 | 12 | 10 | 16 | 0,3 | 0,3 | 3 900 | 3 650 | 520 | 9 000 |
| RNA22/8-2RSR | 29 | 24 | 8 | 11,8 | 12 | 12 | 18 | 0,3 | 0,3 | 4 800 | 4 800 | 860 | 7 000 |
| RNA2200-2RSR | 52 | 30 | 10 | 13,8 | 14 | 14 | 20 | 0,6 | 0,3 | 7 000 | 8 000 | 1 170 | 5 500 |
| RNA2201-2RSR | 57 | 32 | 12 | 13,8 | 14 | 16 | 22 | 0,6 | 0,3 | 7 500 | 9 000 | 1 030 | 4 700 |
| RNA2202-2RSR | 60 | 35 | 15 | 13,8 | 14 | 20 | 26 | 0,6 | 0,3 | 7 600 | 9 500 | 1 380 | 3 400 |
| RNA2203-2RSR | 94 | 40 | 17 | 15,8 | 16 | 22 | 28 | 1 | 0,3 | 9 900 | 13 700 | 1 870 | 3 000 |
| RNA2204-2RSR | 152 | 47 | 20 | 17,8 | 18 | 25 | 33 | 1 | 0,3 | 15 200 | 18 300 | 2 600 | 2 300 |
| RNA2205-2RSR | 179 | 52 | 25 | 17,8 | 18 | 30 | 38 | 1 | 0,3 | 15 700 | 19 900 | 2 850 | 1 800 |
| RNA2206-2RSR | 284 | 62 | 30 | 19,8 | 20 | 35 | 43 | 1 | 0,3 | 18 400 | 25 500 | 3 300 | 1 400 |
| RNA2207-2RSR | 432 | 72 | 35 | 22,7 | 23 | 42 | 50 | 1,1 | 0,6 | 23 000 | 35 500 | 4 800 | 1 100 |
| RNA2208-2RSR | 530 | 80 | 40 | 22,7 | 23 | 48 | 57 | 1,1 | 0,6 | 27 500 | 40 500 | 5 000 | 850 |

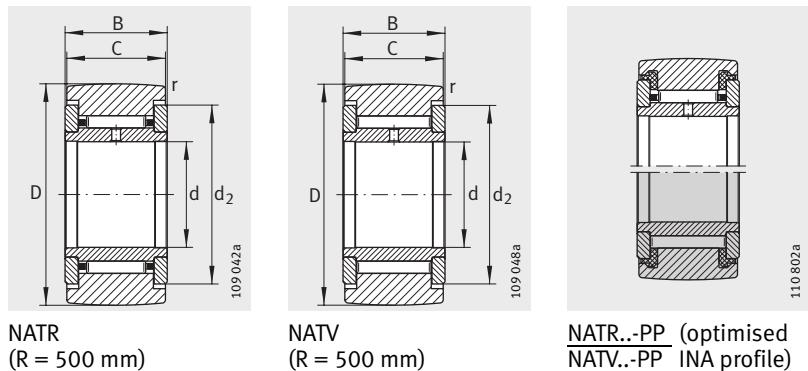


| Dimension table - Dimensions in mm | | | | | | | | | | | | | |
|------------------------------------|-----------------|------------|----|------|----|-----------------|---------------|-----|---------------|-----------------------|-------------------------|---|--|
| With inner ring Designation | Mass m ≈g | Dimensions | | | | | | | | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
| | | D | d | C | B | $F^1)$ F_w | D_1 min. | r | r_1 min. | dyn. C_{rw} N | stat. C_{orw} N | | |
| NA22/6-2RSR | 22 | 19 | 6 | 11,8 | 12 | 10 | 16 | 0,3 | 0,3 | 3 900 | 3 650 | 520 | 9 000 |
| NA22/8-2RSR | 34 | 24 | 8 | 11,8 | 12 | 12 | 18 | 0,3 | 0,3 | 4 800 | 4 800 | 860 | 7 000 |
| NA2200-2RSR | 60 | 30 | 10 | 13,8 | 14 | 14 | 20 | 0,6 | 0,3 | 7 000 | 8 000 | 1 170 | 5 500 |
| NA2201-2RSR | 67 | 32 | 12 | 13,8 | 14 | 16 | 22 | 0,6 | 0,3 | 7 500 | 9 000 | 1 030 | 4 700 |
| NA2202-2RSR | 75 | 35 | 15 | 13,8 | 14 | 20 | 26 | 0,6 | 0,3 | 7 600 | 9 500 | 1 380 | 3 400 |
| NA2203-2RSR | 112 | 40 | 17 | 15,8 | 16 | 22 | 28 | 1 | 0,3 | 9 900 | 13 700 | 1 870 | 3 000 |
| NA2204-2RSR | 177 | 47 | 20 | 17,8 | 18 | 25 | 33 | 1 | 0,3 | 15 200 | 18 300 | 2 600 | 2 300 |
| NA2205-2RSR | 209 | 52 | 25 | 17,8 | 18 | 30 | 38 | 1 | 0,3 | 15 700 | 19 900 | 2 850 | 1 800 |
| NA2206-2RSR | 324 | 62 | 30 | 19,8 | 20 | 35 | 43 | 1 | 0,3 | 18 400 | 25 500 | 3 300 | 1 400 |
| NA2207-2RSR | 505 | 72 | 35 | 22,7 | 23 | 42 | 50 | 1,1 | 0,6 | 23 000 | 35 500 | 4 800 | 1 100 |
| NA2208-2RSR | 628 | 80 | 40 | 22,7 | 23 | 48 | 57 | 1,1 | 0,6 | 27 500 | 40 500 | 5 000 | 850 |
| NA2210-2RSR | 690 | 90 | 50 | 22,7 | 23 | 58 | 68 | 1,1 | 0,6 | 28 000 | 42 500 | 5 300 | 650 |

¹⁾ F = Raceway diameter of the inner ring,
 F_w = Needle roller enveloping circle in tolerance zone F6.

Yoke type track rollers

With axial guidance



Dimension table · Dimensions in mm

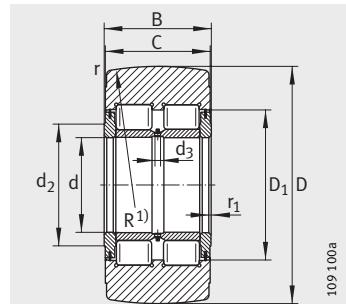
| Desig-nation ¹⁾ | Mass m ≈g | Desig-nation ²⁾ | Mass m ≈g | Dimensions | | | | | | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
|----------------------------|-----------------|----------------------------|-----------------|------------|----|----|----|----------------|-----------|-----------------------|-------------------------|--------------------------------------|--|
| | | | | D | d | B | C | d ₂ | r min. | dyn. C_{rw} N | stat. C_{0rw} N | | |
| NATR5 | 14 | NATR5-PP | 14 | 16 | 5 | 12 | 11 | 12,5 | 0,15 | 3 150 | 3 300 | 415 | 14 000 |
| NATV5 | 15 | NATV5-PP | 15 | 16 | 5 | 12 | 11 | 12,5 | 0,15 | 4 900 | 6 500 | 860 | 3 800 |
| NATR6 | 20 | NATR6-PP | 19 | 19 | 6 | 12 | 11 | 15 | 0,15 | 3 500 | 3 900 | 485 | 11 000 |
| NATV6 | 21 | NATV6-PP | 21 | 19 | 6 | 12 | 11 | 15 | 0,15 | 5 400 | 7 900 | 1 040 | 3 100 |
| NATR8 | 41 | NATR8-PP | 38 | 24 | 8 | 15 | 14 | 19 | 0,3 | 5 500 | 6 400 | 810 | 7 500 |
| NATV8 | 42 | NATV8-PP | 41 | 24 | 8 | 15 | 14 | 19 | 0,3 | 7 800 | 11 400 | 1 430 | 2 500 |
| NATR10 | 64 | NATR10-PP | 61 | 30 | 10 | 15 | 14 | 23 | 0,6 | 6 800 | 8 400 | 1 070 | 5 500 |
| NATV10 | 65 | NATV10-PP | 64 | 30 | 10 | 15 | 14 | 23 | 0,6 | 9 500 | 14 600 | 1 840 | 2 100 |
| NATR12 | 71 | NATR12-PP | 66 | 32 | 12 | 15 | 14 | 25 | 0,6 | 6 900 | 8 800 | 1 720 | 4 500 |
| NATV12 | 72 | NATV12-PP | 69 | 32 | 12 | 15 | 14 | 25 | 0,6 | 9 700 | 15 400 | 1 950 | 1 800 |
| NATR15 | 104 | NATR15-PP | 95 | 35 | 15 | 19 | 18 | 27,6 | 0,6 | 9 800 | 14 100 | 1 700 | 3 600 |
| NATV15 | 109 | NATV15-PP | 101 | 35 | 15 | 19 | 18 | 27,6 | 0,6 | 12 800 | 23 000 | 2 900 | 1 600 |
| NATR17 | 144 | NATR17-PP | 139 | 40 | 17 | 21 | 20 | 31,5 | 1 | 10 900 | 15 500 | 1 850 | 2 900 |
| NATV17 | 152 | NATV17-PP | 147 | 40 | 17 | 21 | 20 | 31,5 | 1 | 14 800 | 26 500 | 3 050 | 1 400 |
| NATR20 | 246 | NATR20-PP | 236 | 47 | 20 | 25 | 24 | 36,5 | 1 | 15 500 | 25 500 | 3 000 | 2 400 |
| NATV20 | 254 | NATV20-PP | 245 | 47 | 20 | 25 | 24 | 36,5 | 1 | 20 600 | 42 000 | 5 200 | 1 300 |
| NATR25 | 275 | NATR25-PP | 271 | 52 | 25 | 25 | 24 | 41,5 | 1 | 15 400 | 26 500 | 3 010 | 1 800 |
| NATV25 | 285 | NATV25-PP | 281 | 52 | 25 | 25 | 24 | 41,5 | 1 | 20 500 | 44 000 | 5 400 | 1 000 |
| NATR30 | 470 | NATR30-PP | 444 | 62 | 30 | 29 | 28 | 51 | 1 | 23 400 | 38 500 | 4 650 | 1 300 |
| NATV30 | 481 | NATV30-PP | 468 | 62 | 30 | 29 | 28 | 51 | 1 | 30 500 | 62 000 | 7 800 | 850 |
| - | - | NATR35-PP | 547 | 72 | 35 | 29 | 28 | 58 | 1,1 | 25 000 | 44 000 | 5 300 | 1 000 |
| - | - | NATV35-PP | 630 | 72 | 35 | 29 | 28 | 58 | 1,1 | 33 000 | 71 000 | 8 900 | 750 |
| - | - | NATR40-PP | 795 | 80 | 40 | 32 | 30 | 66 | 1,1 | 32 500 | 58 000 | 7 000 | 850 |
| - | - | NATV40-PP | 832 | 80 | 40 | 32 | 30 | 66 | 1,1 | 41 000 | 88 000 | 11 000 | 650 |
| - | - | NATR50-PP | 867 | 90 | 50 | 32 | 30 | 76 | 1,1 | 31 500 | 59 000 | 7 100 | 650 |
| - | - | NATV50-PP | 969 | 90 | 50 | 32 | 30 | 76 | 1,1 | 40 000 | 92 000 | 11 600 | 550 |

¹⁾ Bearings with gap seals and radius of curvature of R = 500 mm.

²⁾ Bearings with plastic axial plain washer and optimised INA profile.
Permissible operating temperature: -30 °C to +100 °C (continuous operation).

Yoke type track rollers

With axial guidance,
sealed

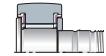


NNTR..-2ZL

Dimension table · Dimensions in mm

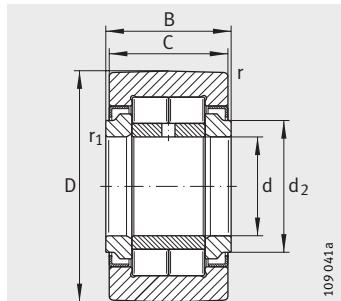
| Designation ¹⁾ | Mass m ≈kg | Dimensions | | | | | | Mounting dimensions | | | Number of lubrication holes | Basic load ratings | | Speed n_{DG} min ⁻¹ |
|----------------------------|------------------|------------|-----|-----|-----|-----------|------------------------|---------------------|----------------|----------------|-----------------------------|-----------------------|-------------------------|--|
| | | D | d | B | C | r min. | r ₁ min. | d ₂ | D ₁ | d ₃ | | dyn. C_{rw} N | stat. C_{0rw} N | |
| NNTR50X130X65-2ZL | 5,2 | 130 | 50 | 65 | 63 | 3 | 2 | 63 | 80 | 3 | 3 | 192 000 | 250 000 | 1 100 |
| NNTR55X140X70-2ZL | 6,4 | 140 | 55 | 70 | 68 | 3 | 2 | 73 | 91 | 4 | 3 | 223 000 | 300 000 | 850 |
| NNTR60X150X75-2ZL | 7,8 | 150 | 60 | 75 | 73 | 3 | 2 | 78 | 97 | 4 | 3 | 255 000 | 350 000 | 800 |
| NNTR65X160X75-2ZL | 8,8 | 160 | 65 | 75 | 73 | 3 | 2 | 82 | 103 | 5 | 3 | 275 000 | 370 000 | 700 |
| NNTR70X180X85-2ZL | 13 | 180 | 70 | 85 | 83 | 3 | 2 | 92 | 115 | 5 | 3 | 350 000 | 490 000 | 600 |
| NNTR80X200X90-2ZL | 16,8 | 200 | 80 | 90 | 88 | 4 | 2 | 102 | 127 | 5 | 3 | 410 000 | 580 000 | 500 |
| NNTR90X220X100-2ZL | 22,5 | 220 | 90 | 100 | 98 | 4 | 2,5 | 119 | 146 | 5 | 3 | 495 000 | 720 000 | 400 |
| NNTR100X240X105-2ZL | 28 | 240 | 100 | 105 | 103 | 4 | 2,5 | 132 | 160 | 6 | 6 | 560 000 | 830 000 | 340 |
| NNTR110X260X115-2ZL | 35,6 | 260 | 110 | 115 | 113 | 4 | 2,5 | 143 | 174 | 6 | 6 | 670 000 | 1 020 000 | 300 |
| NNTR120X290X135-2ZL | 52,8 | 290 | 120 | 135 | 133 | 4 | 3 | 155 | 191 | 8 | 6 | 890 000 | 1 370 000 | 260 |
| NNTR130X310X146-2ZL | 65,2 | 310 | 130 | 146 | 144 | 5 | 3 | 165 | 204 | 8 | 6 | 1 020 000 | 1 600 000 | 240 |

1) Radius of curvature R = 10 000 for NNTR50X130X65-2ZL to NNTR110X260X115-2ZL
R = 15 000 for NNTR120X290X135-2ZL and NNTR130X310X146-2ZL.



Yoke type track rollers

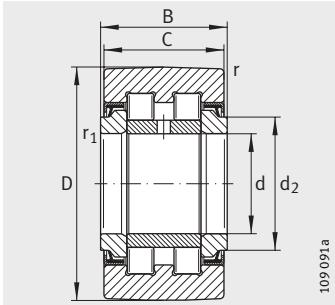
With axial guidance,
sealed



NUTR
(optimised INA profile)

Dimension table · Dimensions in mm

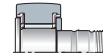
| Designation | Mass $\approx g$ | Dimensions | | | | | | | Basic load ratings | | | | Fatigue limit load C_{urw} N | Speed n_{DG} min^{-1} |
|---------------------|---------------------|------------|----|----|----|-------|-----|-------|--------------------|-----------------------|-------------------------|-------------------------|---|--|
| | | D | d | B | C | d_2 | r | r_1 | min. | dyn. C_{rw} N | stat. C_{0rw} N | dyn. F_{rper} N | stat. F_{0rper} N | |
| NUTR15 | 99 | 35 | 15 | 19 | 18 | 20 | 0,6 | 0,3 | 15 000 | 16 800 | 8 600 | 16 800 | 2 220 | 6 500 |
| PWTR15-2RS | 99 | 35 | 15 | 19 | 18 | 20 | 0,6 | 0,3 | 11 600 | 11 300 | 9 400 | 11 300 | 1 780 | 6 000 |
| NUTR17 | 147 | 40 | 17 | 21 | 20 | 22 | 1 | 0,5 | 18 400 | 22 600 | 13 100 | 22 600 | 2 900 | 5 500 |
| PWTR17-2RS | 147 | 40 | 17 | 21 | 20 | 22 | 1 | 0,5 | 13 200 | 13 800 | 13 800 | 13 800 | 2 200 | 5 000 |
| NUTR1542 | 158 | 42 | 15 | 19 | 18 | 20 | 0,6 | 0,3 | 18 100 | 21 900 | 21 900 | 21 900 | 2 900 | 6 500 |
| PWTR1542-2RS | 158 | 42 | 15 | 19 | 18 | 20 | 0,6 | 0,3 | 13 500 | 14 100 | 14 100 | 14 100 | 2 230 | 6 000 |
| NUTR1747 | 220 | 47 | 17 | 21 | 20 | 22 | 1 | 0,5 | 21 300 | 28 000 | 28 000 | 28 000 | 3 600 | 5 500 |
| PWTR1747-2RS | 220 | 47 | 17 | 21 | 20 | 22 | 1 | 0,5 | 14 800 | 16 400 | 16 400 | 16 400 | 2 600 | 5 000 |
| NUTR20 | 245 | 47 | 20 | 25 | 24 | 27 | 1 | 0,5 | 28 000 | 35 000 | 16 400 | 33 000 | 4 400 | 4 200 |
| PWTR20-2RS | 245 | 47 | 20 | 25 | 24 | 27 | 1 | 0,5 | 23 200 | 25 500 | 18 300 | 25 500 | 3 600 | 3 800 |
| NUTR2052 | 321 | 52 | 20 | 25 | 24 | 27 | 1 | 0,5 | 31 500 | 41 000 | 38 500 | 41 000 | 5 200 | 4 200 |
| PWTR2052-2RS | 321 | 52 | 20 | 25 | 24 | 27 | 1 | 0,5 | 25 500 | 29 500 | 29 500 | 29 500 | 4 150 | 3 800 |
| NUTR25 | 281 | 52 | 25 | 25 | 24 | 31 | 1 | 0,5 | 29 000 | 37 500 | 17 300 | 34 500 | 4 700 | 4 200 |
| PWTR25-2RS | 281 | 52 | 25 | 25 | 24 | 31 | 1 | 0,5 | 24 200 | 28 000 | 19 300 | 28 000 | 3 900 | 3 800 |
| NUTR2562 | 450 | 62 | 25 | 25 | 24 | 31 | 1 | 0,5 | 35 500 | 50 000 | 50 000 | 50 000 | 6 300 | 4 200 |
| PWTR2562-2RS | 450 | 62 | 25 | 25 | 24 | 31 | 1 | 0,5 | 29 000 | 36 000 | 36 000 | 36 000 | 5 000 | 3 800 |
| NUTR30 | 465 | 62 | 30 | 29 | 28 | 38 | 1 | 0,5 | 40 000 | 50 000 | 23 500 | 46 500 | 6 300 | 2 600 |
| PWTR30-2RS | 465 | 62 | 30 | 29 | 28 | 38 | 1 | 0,5 | 35 000 | 39 500 | 25 500 | 39 500 | 5 400 | 2 200 |



PWTR..-2RS
(optimised INA profile)

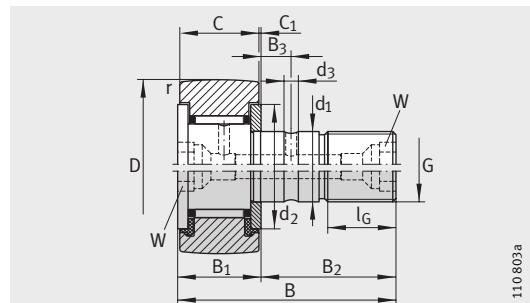
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | | | Basic load ratings | | | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
|----------------------|-----------------|------------|----|----|----|----------------|-----|----------------|-----------------------|-------------------------|-------------------------|---------------------------|---|--|
| | | D | d | B | C | d ₂ | r | r ₁ | dyn. C_{rw} N | stat. C_{orw} N | dyn. F_{rper} N | stat. F_{orper} N | | |
| NUTR3072 | 697 | 72 | 30 | 29 | 28 | 38 | 1 | 0,5 | 47 500 | 64 000 | 64 000 | 64 000 | 8 100 | 2 600 |
| PWTR3072-2RS | 697 | 72 | 30 | 29 | 28 | 38 | 1 | 0,5 | 41 000 | 49 000 | 49 000 | 49 000 | 6 700 | 2 200 |
| NUTR35 | 630 | 72 | 35 | 29 | 28 | 44 | 1,1 | 0,6 | 44 500 | 60 000 | 32 000 | 60 000 | 7 600 | 2 100 |
| PWTR35-2RS | 630 | 72 | 35 | 29 | 28 | 44 | 1,1 | 0,6 | 38 500 | 46 500 | 34 500 | 46 500 | 6 300 | 1 800 |
| NUTR3580 | 836 | 80 | 35 | 29 | 28 | 44 | 1,1 | 0,6 | 51 000 | 72 000 | 72 000 | 72 000 | 9 100 | 2 100 |
| PWTR3580-2RS | 836 | 80 | 35 | 29 | 28 | 44 | 1,1 | 0,6 | 43 500 | 55 000 | 55 000 | 55 000 | 7 500 | 1 800 |
| NUTR40 | 816 | 80 | 40 | 32 | 30 | 50,5 | 1,1 | 0,6 | 55 000 | 75 000 | 30 500 | 60 000 | 9 400 | 1 600 |
| PWTR40-2RS | 816 | 80 | 40 | 32 | 30 | 50,5 | 1,1 | 0,6 | 44 500 | 53 000 | 35 000 | 53 000 | 7 100 | 1 500 |
| NUTR45 | 883 | 85 | 45 | 32 | 30 | 55,2 | 1,1 | 0,6 | 56 000 | 78 000 | 31 500 | 61 000 | 9 700 | 1 400 |
| PWTR45-2RS | 883 | 85 | 45 | 32 | 30 | 55,2 | 1,1 | 0,6 | 45 000 | 55 000 | 36 000 | 55 000 | 7 400 | 1 300 |
| NUTR4090 | 1 129 | 90 | 40 | 32 | 30 | 50,5 | 1,1 | 0,6 | 66 000 | 95 000 | 84 000 | 95 000 | 11 900 | 1 600 |
| PWTR4090-2RS | 1 129 | 90 | 40 | 32 | 30 | 50,5 | 1,1 | 0,6 | 52 000 | 66 000 | 66 000 | 66 000 | 8 800 | 1 500 |
| NUTR50 | 950 | 90 | 50 | 32 | 30 | 59,8 | 1,1 | 0,6 | 57 000 | 81 000 | 32 000 | 62 000 | 10 100 | 1 300 |
| PWTR50-2RS | 950 | 90 | 50 | 32 | 30 | 59,8 | 1,1 | 0,6 | 45 500 | 57 000 | 37 000 | 57 000 | 7 700 | 1 100 |
| NUTR45100 | 1 396 | 100 | 45 | 32 | 30 | 55,2 | 1,1 | 0,6 | 71 000 | 107 000 | 106 000 | 107 000 | 13 300 | 1 400 |
| PWTR45100-2RS | 1 396 | 100 | 45 | 32 | 30 | 55,2 | 1,1 | 0,6 | 56 000 | 74 000 | 74 000 | 74 000 | 9 900 | 1 300 |
| NUTR50110 | 1 690 | 110 | 50 | 32 | 30 | 59,8 | 1,1 | 0,6 | 76 000 | 120 000 | 120 000 | 120 000 | 14 900 | 1 300 |
| PWTR50110-2RS | 1 690 | 110 | 50 | 32 | 30 | 59,8 | 1,1 | 0,6 | 59 000 | 82 000 | 82 000 | 82 000 | 11 000 | 1 100 |



Needle roller stud type track rollers

With axial guidance



Dimension table · Dimensions in mm

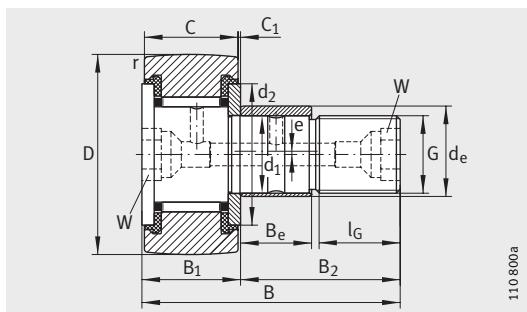
| Designation | Mass m ≈g | With eccentric collar Designation | Mass m ≈g | Dimensions | | | | | | | | | | |
|--------------------------|-----------------|--------------------------------------|-----------------|------------|----------------|----|----------------|----------------|----------------|----|----------------|------|----------------|---|
| | | | | D | d ₁ | B | B ₁ | B ₂ | B ₃ | C | C ₁ | r | d ₂ | |
| | | | | h7 | max. | | | | | | | min. | | |
| KR16 ³⁾ | 19 | – | – | 16 | 6 | 28 | 12,2 | 16 | – | 11 | 0,6 | 0,15 | 12,5 | – |
| KR16-PP ³⁾ | 18 | KRE16-PP ³⁾ | 20 | 16 | 6 | 28 | 12,2 | 16 | – | 11 | 0,6 | 0,15 | 12,5 | – |
| KR16-SK-PP ⁴⁾ | 19 | – | – | 16 | 6 | 28 | 12,2 | 16 | – | 11 | 0,6 | 0,15 | 12,5 | – |
| KRV16-PP ³⁾ | 19 | – | – | 16 | 6 | 28 | 12,2 | 16 | – | 11 | 0,6 | 0,15 | 12,5 | – |
| KR19 ³⁾ | 29 | – | – | 19 | 8 | 32 | 12,2 | 20 | – | 11 | 0,6 | 0,15 | 15 | – |
| KR19-PP ³⁾ | 29 | KRE19-PP ³⁾ | 32 | 19 | 8 | 32 | 12,2 | 20 | – | 11 | 0,6 | 0,15 | 15 | – |
| KR19-SK-PP ⁴⁾ | 29 | – | – | 19 | 8 | 32 | 12,2 | 20 | – | 11 | 0,6 | 0,15 | 15 | – |
| KRV19-PP ³⁾ | 31 | – | – | 19 | 8 | 32 | 12,2 | 20 | – | 11 | 0,6 | 0,15 | 15 | – |
| KR22 | 45 | – | – | 22 | 10 | 36 | 13,2 | 23 | – | 12 | 0,6 | 0,3 | 17,5 | – |
| KR22-PP | 43 | KRE22-PP | 47 | 22 | 10 | 36 | 13,2 | 23 | – | 12 | 0,6 | 0,3 | 17,5 | – |
| KRV22-PP | 45 | – | – | 22 | 10 | 36 | 13,2 | 23 | – | 12 | 0,6 | 0,3 | 17,5 | – |
| KR26 | 59 | – | – | 26 | 10 | 36 | 13,2 | 23 | – | 12 | 0,6 | 0,3 | 17,5 | – |
| KR26-PP | 57 | KRE26-PP | 62 | 26 | 10 | 36 | 13,2 | 23 | – | 12 | 0,6 | 0,3 | 17,5 | – |
| KRV26-PP | 59 | – | – | 26 | 10 | 36 | 13,2 | 23 | – | 12 | 0,6 | 0,3 | 17,5 | – |
| KR30 | 92 | – | – | 30 | 12 | 40 | 15,2 | 25 | 6 | 14 | 0,6 | 0,6 | 23 | 3 |
| KR30-PP | 88 | KRE30-PP | 93 | 30 | 12 | 40 | 15,2 | 25 | 6 | 14 | 0,6 | 0,6 | 23 | 3 |
| KRV30-PP | 91 | – | – | 30 | 12 | 40 | 15,2 | 25 | 6 | 14 | 0,6 | 0,6 | 23 | 3 |
| KR32 | 103 | – | – | 32 | 12 | 40 | 15,2 | 25 | 6 | 14 | 0,6 | 0,6 | 23 | 3 |
| KR32-PP | 98 | KRE32-PP | 104 | 32 | 12 | 40 | 15,2 | 25 | 6 | 14 | 0,6 | 0,6 | 23 | 3 |
| KRV32-PP | 101 | – | – | 32 | 12 | 40 | 15,2 | 25 | 6 | 14 | 0,6 | 0,6 | 23 | 3 |

¹⁾ Drive fit lubrication nipples are supplied loose. Only these lubrication nipples should be used.

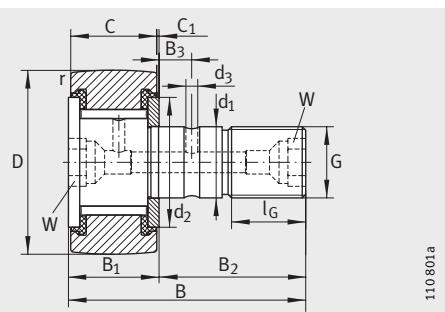
2) Nominal dimension for hexagonal socket.

③ Relubrication hole only on the flange-side end face with slot for countertensioning during fitting

4) Hexagonal socket only on the flange-side end face. No relubrication facility.

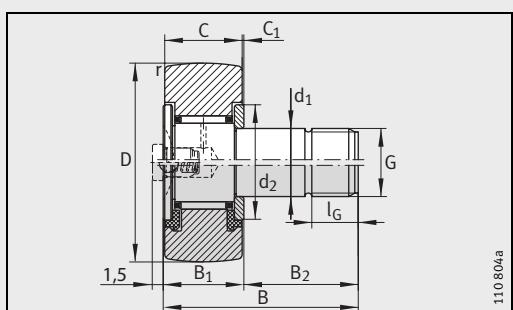
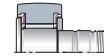


from D = 22 mm KRE..-PP (optimised INA profile)

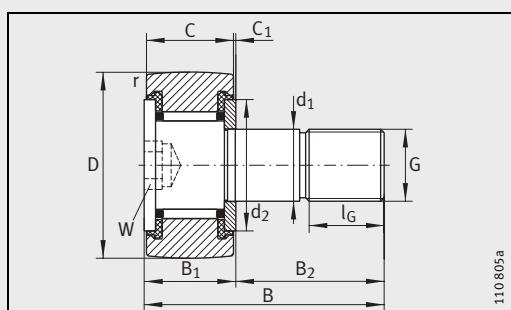


from D = 22 mm KRV..-PP (optimised INA profile)

| G | l _G | W ²⁾ | Eccentric collar | | | Drive fit lubrication nipple ¹⁾ | Nut tightening torque M _A Nm | Basic load ratings | | Fatigue limit load C _{urw} N | Speed n _{DG} min ⁻¹ |
|-----------|----------------|-----------------|----------------------|----------------|-----|--|---|--------------------|--------|--|---|
| | | | d _e h9 | B _e | e | | | dyn. | stat. | | |
| M6(X1) | 8 | — | — | — | — | NIPA1 | 3 | 3 150 | 3 300 | 415 | 14 000 |
| M6(X1) | 8 | — | 9 | 7 | 0,5 | NIPA1 | 3 | 3 150 | 3 300 | 415 | 14 000 |
| M6(X1) | 8 | 4 | — | — | — | — | 3 | 3 150 | 3 300 | 415 | 14 000 |
| M6(X1) | 8 | — | — | — | — | NIPA1 | 3 | 4 900 | 6 500 | 860 | 3 800 |
| M8(X1,25) | 10 | — | — | — | — | NIPA1 | 8 | 3 500 | 3 900 | 485 | 11 000 |
| M8(X1,25) | 10 | — | 11 | 9 | 0,5 | NIPA1 | 8 | 3 500 | 3 900 | 485 | 11 000 |
| M8(X1,25) | 10 | 4 | — | — | — | — | 8 | 3 500 | 3 900 | 485 | 11 000 |
| M8(X1,25) | 10 | — | — | — | — | NIPA1 | 8 | 5 400 | 7 900 | 1 040 | 3 100 |
| M10X1 | 12 | 5 | — | — | — | NIPA1X4,5 | 15 | 4 500 | 5 200 | 650 | 8 000 |
| M10X1 | 12 | 5 | 13 | 10 | 0,5 | NIPA1X4,5 | 15 | 4 500 | 5 200 | 650 | 8 000 |
| M10X1 | 12 | 5 | — | — | — | NIPA1X4,5 | 15 | 6 200 | 9 100 | 1 110 | 2 600 |
| M10X1 | 12 | 5 | — | — | — | NIPA1X4,5 | 15 | 5 100 | 6 200 | 770 | 8 000 |
| M10X1 | 12 | 5 | 13 | 10 | 0,5 | NIPA1X4,5 | 15 | 5 100 | 6 200 | 770 | 8 000 |
| M10X1 | 12 | 5 | — | — | — | NIPA1X4,5 | 15 | 7 300 | 11 300 | 1 380 | 2 600 |
| M12X1,5 | 13 | 6 | — | — | — | NIPA1X4,5 | 22 | 6 800 | 8 400 | 1 070 | 5 500 |
| M12X1,5 | 13 | 6 | 15 | 11 | 0,5 | NIPA1X4,5 | 22 | 6 800 | 8 400 | 1 070 | 5 500 |
| M12X1,5 | 13 | 6 | — | — | — | NIPA1X4,5 | 22 | 9 500 | 14 600 | 1 840 | 2 100 |
| M12X1,5 | 13 | 6 | — | — | — | NIPA1X4,5 | 22 | 7 100 | 8 900 | 1 140 | 5 500 |
| M12X1,5 | 13 | 6 | 15 | 11 | 0,5 | NIPA1X4,5 | 22 | 7 100 | 8 900 | 1 140 | 5 500 |
| M12X1,5 | 13 | 6 | — | — | — | NIPA1X4,5 | 22 | 10 000 | 15 800 | 1 990 | 2 100 |



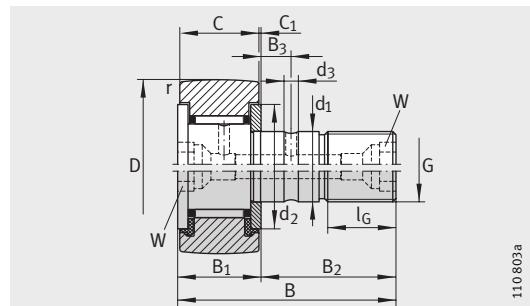
KR16..-PP, KR19..-PP (KRV16..-PP, KRV19..-PP)



KR16-SK-PP, KR19-SK-PP

Needle roller stud type track rollers

With axial guidance



KR (R = 500 mm)
KR..-PP (optimised INA profile)

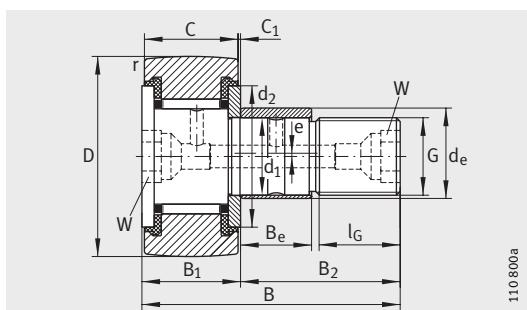
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | With eccentric collar Designation | Mass m ≈g | Dimensions | | | | | | | | | | |
|-----------------|-----------------|---|-----------------|------------|----------------|-----|----------------|----------------|----------------|----|----------------|------|----------------|----------------|
| | | | | D | d ₁ | B | B ₁ | B ₂ | B ₃ | C | C ₁ | r | d ₂ | d ₃ |
| | | | | h7 | max. | | | | | | | min. | | |
| KR35 | 173 | – | – | 35 | 16 | 52 | 19,6 | 32,5 | 8 | 18 | 0,8 | 0,6 | 27,6 | 3 |
| KR35-PP | 164 | KRE35-PP | 177 | 35 | 16 | 52 | 19,6 | 32,5 | 8 | 18 | 0,8 | 0,6 | 27,6 | 3 |
| KRV35-PP | 166 | – | – | 35 | 16 | 52 | 19,6 | 32,5 | 8 | 18 | 0,8 | 0,6 | 27,6 | 3 |
| KR40 | 247 | – | – | 40 | 18 | 58 | 21,6 | 36,5 | 8 | 20 | 0,8 | 1 | 31,5 | 3 |
| KR40-PP | 239 | KRE40-PP | 255 | 40 | 18 | 58 | 21,6 | 36,5 | 8 | 20 | 0,8 | 1 | 31,5 | 3 |
| KRV40-PP | 247 | – | – | 40 | 18 | 58 | 21,6 | 36,5 | 8 | 20 | 0,8 | 1 | 31,5 | 3 |
| KR47-PP | 381 | KRE47-PP | 400 | 47 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 36,5 | 4 |
| KRV47-PP | 390 | – | – | 47 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 36,5 | 4 |
| KR52-PP | 454 | KRE52-PP | 473 | 52 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 36,5 | 4 |
| KRV52-PP | 463 | – | – | 52 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 36,5 | 4 |
| KR62-PP | 770 | KRE62-PP | 798 | 62 | 24 | 80 | 30,6 | 49,5 | 11 | 29 | 0,8 | 1 | 44 | 4 |
| KRV62-PP | 787 | – | – | 62 | 24 | 80 | 30,6 | 49,5 | 11 | 29 | 0,8 | 1 | 44 | 4 |
| KR72-PP | 1 010 | KRE72-PP | 1 038 | 72 | 24 | 80 | 30,6 | 49,5 | 11 | 29 | 0,8 | 1,1 | 44 | 4 |
| KRV72-PP | 1 027 | – | – | 72 | 24 | 80 | 30,6 | 49,5 | 11 | 29 | 0,8 | 1,1 | 44 | 4 |
| KR80-PP | 1 608 | KRE80-PP | 1 665 | 80 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 53 | 4 |
| KRV80-PP | 1 636 | – | – | 80 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 53 | 4 |
| KR90-PP | 1 975 | KRE90-PP | 2 032 | 90 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 53 | 4 |
| KRV90-PP | 2 003 | – | – | 90 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 53 | 4 |

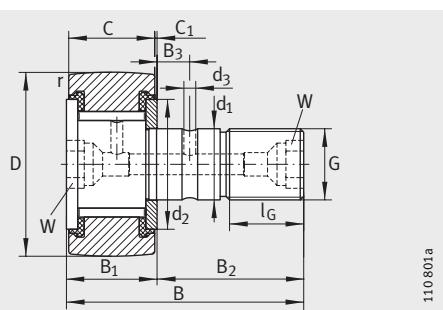
¹⁾ Drive fit lubrication nipples are supplied loose. Only these lubrication nipples should be used.

²⁾ Nominal dimension for hexagonal socket.

Suitable central lubrication adapter for connection to a central lubrication system, see page 843.



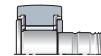
KRE..-PP (optimised INA profile)



KRV..-PP (optimised INA profile)

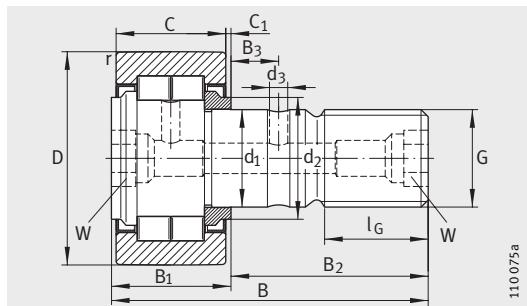
110801a

| G | l _G | W ²⁾ | Eccentric collar | | | Drive fit lubrication nipple ¹⁾ | Nut tightening torque M _A Nm | Basic load ratings | | Fatigue limit load C _{urw} N | Speed n _{DG} min ⁻¹ |
|---------|----------------|-----------------|----------------------|----------------|-----|--|---|--------------------|--------------------------------|--|---|
| | | | d _e h9 | B _e | e | | | dyn. | stat. C _{0rw} N | | |
| M16X1,5 | 17 | 8 | — | — | — | NIPA2X7,5 | 58 | 9 800 | 14 100 | 1 700 | 3 600 |
| M16X1,5 | 17 | 8 | 20 | 14 | 1 | NIPA2X7,5 | 58 | 9 800 | 14 100 | 1 700 | 3 600 |
| M16X1,5 | 17 | 8 | — | — | — | NIPA2X7,5 | 58 | 12 800 | 23 000 | 2 900 | 1 600 |
| M18X1,5 | 19 | 8 | — | — | — | NIPA2X7,5 | 87 | 10 900 | 15 500 | 1 850 | 2 900 |
| M18X1,5 | 19 | 8 | 22 | 16 | 1 | NIPA2X7,5 | 87 | 10 900 | 15 500 | 1 850 | 2 900 |
| M18X1,5 | 19 | 8 | — | — | — | NIPA2X7,5 | 87 | 14 800 | 26 500 | 3 050 | 1 400 |
| M20X1,5 | 21 | 10 | 24 | 18 | 1 | NIPA2X7,5 | 120 | 15 500 | 25 500 | 3 000 | 2 400 |
| M20X1,5 | 21 | 10 | — | — | — | NIPA2X7,5 | 120 | 20 600 | 42 000 | 5 200 | 1 300 |
| M20X1,5 | 21 | 10 | 24 | 18 | 1 | NIPA2X7,5 | 120 | 16 700 | 29 000 | 3 400 | 2 400 |
| M20X1,5 | 21 | 10 | — | — | — | NIPA2X7,5 | 120 | 22 600 | 48 000 | 5 900 | 1 300 |
| M24X1,5 | 25 | 14 | 28 | 22 | 1 | NIPA3X9,5 | 220 | 26 500 | 48 000 | 6 100 | 1 900 |
| M24X1,5 | 25 | 14 | — | — | — | NIPA3X9,5 | 220 | 34 000 | 75 000 | 9 800 | 1 100 |
| M24X1,5 | 25 | 14 | 28 | 22 | 1 | NIPA3X9,5 | 220 | 28 000 | 53 000 | 6 700 | 1 900 |
| M24X1,5 | 25 | 14 | — | — | — | NIPA3X9,5 | 220 | 36 500 | 85 000 | 11 100 | 1 100 |
| M30X1,5 | 32 | 14 | 35 | 29 | 1,5 | NIPA3X9,5 | 450 | 39 000 | 77 000 | 9 900 | 1 300 |
| M30X1,5 | 32 | 14 | — | — | — | NIPA3X9,5 | 450 | 49 500 | 117 000 | 15 300 | 850 |
| M30X1,5 | 32 | 14 | 35 | 29 | 1,5 | NIPA3X9,5 | 450 | 41 000 | 83 000 | 10 600 | 1 300 |
| M30X1,5 | 32 | 14 | — | — | — | NIPA3X9,5 | 450 | 52 000 | 129 000 | 16 900 | 850 |



Cylindrical roller stud type track rollers

With axial guidance



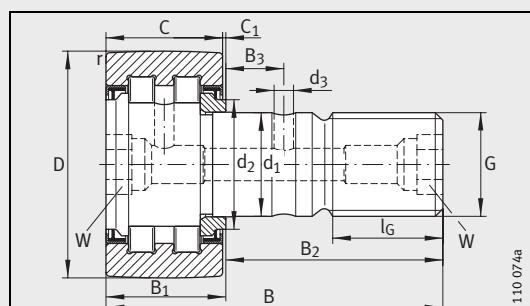
NUKR (optimised INA profile)

Dimension table · Dimensions in mm

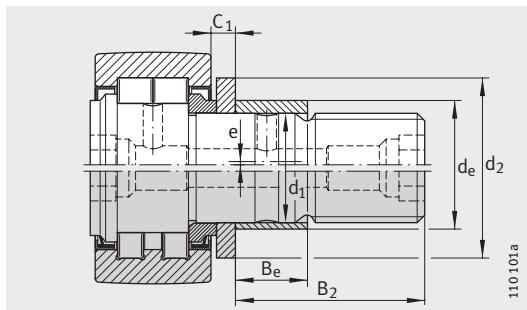
| Designation | Mass m ≈g | With eccentric collar Designation | Mass m ≈g | Dimensions | | | | | | | | | | | |
|-------------------|-----------------|---|-----------------|------------|----------------|-----|----------------|----------------|----------------|----|----------------|-----|------|----------------|----------------|
| | | | | D | d ₁ | B | B ₁ | B ₂ | B ₃ | C | C ₁ | r | min. | d ₂ | d ₃ |
| NUKR35 | 164 | – | – | 35 | 16 | 52 | 19,6 | 32,5 | 7,8 | 18 | 0,8 | 0,6 | 20 | 3 | M16X1,5 |
| – | – | NUKRE35 | 177 | 35 | 16 | 52 | 22,6 | 29,5 | – | 18 | 3,8 | 0,6 | 27,6 | – | M16X1,5 |
| PWKR35-2RS | 164 | – | – | 35 | 16 | 52 | 19,6 | 32,5 | 7,8 | 18 | 0,8 | 0,6 | 20 | 3 | M16X1,5 |
| – | – | PWKRE35-2RS | 177 | 35 | 16 | 52 | 22,6 | 29,5 | – | 18 | 3,8 | 0,6 | 27,6 | – | M16X1,5 |
| NUKR40 | 242 | – | – | 40 | 18 | 58 | 21,6 | 36,5 | 8 | 20 | 0,8 | 1 | 22 | 3 | M18X1,5 |
| – | – | NUKRE40 | 258 | 40 | 18 | 58 | 24,6 | 33,5 | – | 20 | 3,8 | 1 | 30 | – | M18X1,5 |
| PWKR40-2RS | 242 | – | – | 40 | 18 | 58 | 21,6 | 36,5 | 8 | 20 | 0,8 | 1 | 22 | 3 | M18X1,5 |
| – | – | PWKRE40-2RS | 258 | 40 | 18 | 58 | 24,6 | 33,5 | – | 20 | 3,8 | 1 | 30 | – | M18X1,5 |
| NUKR47 | 380 | NUKRE47 | 400 | 47 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 27 | 4 | M20X1,5 |
| PWKR47-2RS | 380 | PWKRE47-2RS | 400 | 47 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 27 | 4 | M20X1,5 |
| NUKR52 | 450 | NUKRE52 | 470 | 52 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 31 | 4 | M20X1,5 |
| PWKR52-2RS | 450 | PWKRE52-2RS | 470 | 52 | 20 | 66 | 25,6 | 40,5 | 9 | 24 | 0,8 | 1 | 31 | 4 | M20X1,5 |
| NUKR62 | 795 | NUKRE62 | 824 | 62 | 24 | 80 | 30,6 | 49,5 | 11 | 28 | 1,3 | 1 | 38 | 4 | M24X1,5 |
| PWKR62-2RS | 795 | PWKRE62-2RS | 824 | 62 | 24 | 80 | 30,6 | 49,5 | 11 | 28 | 1,3 | 1 | 38 | 4 | M24X1,5 |
| NUKR72 | 1020 | NUKRE72 | 1050 | 72 | 24 | 80 | 30,6 | 49,5 | 11 | 28 | 1,3 | 1,1 | 44 | 4 | M24X1,5 |
| PWKR72-2RS | 1020 | PWKRE72-2RS | 1050 | 72 | 24 | 80 | 30,6 | 49,5 | 11 | 28 | 1,3 | 1,1 | 44 | 4 | M24X1,5 |
| NUKR80 | 1600 | NUKRE80 | 1670 | 80 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 47 | 4 | M30X1,5 |
| PWKR80-2RS | 1600 | PWKRE80-2RS | 1670 | 80 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 47 | 4 | M30X1,5 |
| NUKR90 | 1960 | NUKRE90 | 2020 | 90 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 47 | 4 | M30X1,5 |
| PWKR90-2RS | 1960 | PWKRE90-2RS | 2020 | 90 | 30 | 100 | 37 | 63 | 15 | 35 | 1 | 1,1 | 47 | 4 | M30X1,5 |

1) Drive fit lubrication nipples are supplied loose.
Only these lubrication nipples should be used.

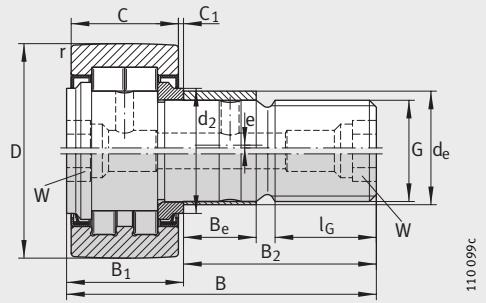
2) Nominal dimension for hexagonal socket.
Suitable central lubrication adapter for connection
to a central lubrication system, see page 843.



PWKR..-2RS (optimised INA profile)

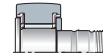


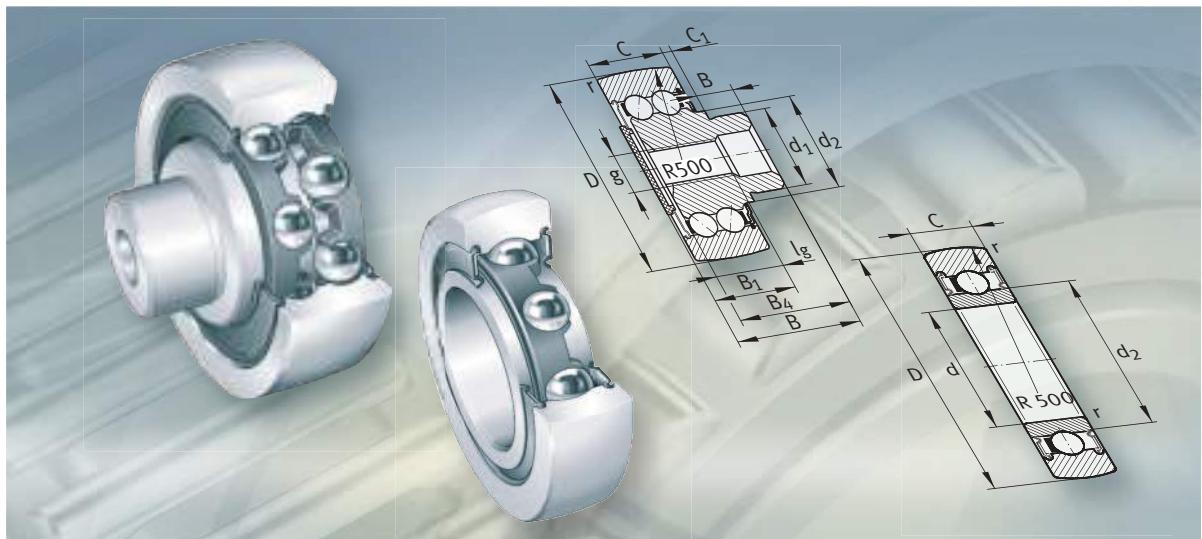
NUKRE35/NUKRE40
PWKRE35..2RS/PWKRE40..2RS
(optimised INA profile)



NUKRE
PWKRE..2RS
(optimised INA profile)

| l_G | W ²⁾ | Eccentric collar | | | Drive fit lubrication nipple ¹⁾ | Nut tightening torque M_A Nm | Basic load ratings | | | | Fatigue limit load C_urw N | Speed n_D G min ⁻¹ |
|-----|-----------------|------------------|-----|-----|--|--|--------------------|---------------------|----------------------|------------------------|-------------------------------------|-------------------------------------|
| | | d_e h9 | B_e | e | | | dyn. C_rw N | stat. C_0rw N | dyn. F_r per N | stat. F_0r per N | | |
| | | — | — | — | NIPA2X7,5 | 58 | 15 000 | 16 800 | 8 600 | 16 800 | 2 220 | 6 500 |
| 17 | 8 | — | — | — | NIPA2X7,5 | 58 | 15 000 | 16 800 | 8 600 | 16 800 | 2 220 | 6 500 |
| 17 | 8 | 20 | 12 | 1 | NIPA2X7,5 | 58 | 11 600 | 11 300 | 9 400 | 11 300 | 1 780 | 6 000 |
| 17 | 8 | 20 | 12 | 1 | NIPA2X7,5 | 58 | 11 600 | 11 300 | 9 400 | 11 300 | 1 780 | 6 000 |
| 19 | 8 | — | — | — | NIPA2X7,5 | 87 | 18 400 | 22 600 | 13 100 | 22 600 | 2 900 | 5 500 |
| 19 | 8 | 22 | 14 | 1 | NIPA2X7,5 | 87 | 18 400 | 22 600 | 13 100 | 22 600 | 2 900 | 5 500 |
| 19 | 8 | — | — | — | NIPA2X7,5 | 87 | 13 200 | 13 800 | 13 800 | 13 800 | 2 200 | 5 000 |
| 19 | 8 | 22 | 14 | 1 | NIPA2X7,5 | 87 | 13 200 | 13 800 | 13 800 | 13 800 | 2 200 | 5 000 |
| 21 | 10 | 24 | 18 | 1 | NIPA2X7,5 | 120 | 28 000 | 35 000 | 16 400 | 33 000 | 4 400 | 4 200 |
| 21 | 10 | 24 | 18 | 1 | NIPA2X7,5 | 120 | 23 200 | 25 500 | 18 300 | 25 500 | 3 600 | 3 800 |
| 21 | 10 | 24 | 18 | 1 | NIPA2X7,5 | 120 | 29 000 | 37 500 | 17 300 | 34 500 | 4 700 | 4 200 |
| 21 | 10 | 24 | 18 | 1 | NIPA2X7,5 | 120 | 24 200 | 28 000 | 19 300 | 28 000 | 3 900 | 3 800 |
| 25 | 14 | 28 | 22 | 1 | NIPA3X9,5 | 220 | 40 000 | 50 000 | 23 500 | 46 500 | 6 300 | 2 600 |
| 25 | 14 | 28 | 22 | 1 | NIPA3X9,5 | 220 | 35 000 | 39 500 | 25 500 | 39 500 | 5 400 | 2 200 |
| 25 | 14 | 28 | 22 | 1 | NIPA3X9,5 | 220 | 44 500 | 60 000 | 32 000 | 60 000 | 7 600 | 2 600 |
| 25 | 14 | 28 | 22 | 1 | NIPA3X9,5 | 220 | 38 500 | 46 500 | 46 500 | 46 500 | 6 300 | 2 200 |
| 32 | 14 | 35 | 29 | 1,5 | NIPA3X9,5 | 450 | 69 000 | 98 000 | 47 500 | 96 000 | 12 100 | 1 800 |
| 32 | 14 | 35 | 29 | 1,5 | NIPA3X9,5 | 450 | 56 000 | 70 000 | 53 000 | 70 000 | 9 100 | 1 800 |
| 32 | 14 | 35 | 29 | 1,5 | NIPA3X9,5 | 450 | 79 000 | 117 000 | 77 000 | 117 000 | 14 400 | 1 800 |
| 32 | 14 | 35 | 29 | 1,5 | NIPA3X9,5 | 450 | 63 000 | 82 000 | 82 000 | 82 000 | 10 700 | 1 800 |

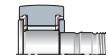




Ball bearing track rollers

Ball bearing track rollers

| | Page |
|-------------------------------------|---|
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| Design and safety guidelines | Adjacent construction for yoke type track rollers..... 881 Adjacent construction for stud type track rollers..... 881 Fitting..... 882 |
| Accuracy | Radial internal clearance 883 |
| Dimension tables | Yoke type track rollers, single row 884 Yoke type track rollers, double row 885 Stud type track rollers 888 Stud type track rollers, with eccentric collar..... 890 Track rollers with plastic outer tyre 892 |



Product overview Yoke type track rollers, stud type track rollers

Yoke type track rollers

Single row and double row
Lip seals/
sealing shields

LR6, LR60,
LR2



LR50, LR52, LR53



Stud type track rollers

Single row and double row
Without eccentric collar
Lip seals/
sealing shield and cover

ZL2..-DRS

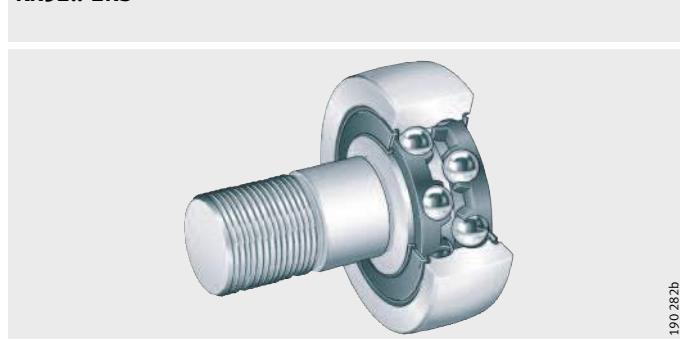


ZL52..-DRS



Lip seals

KR52..-2RS



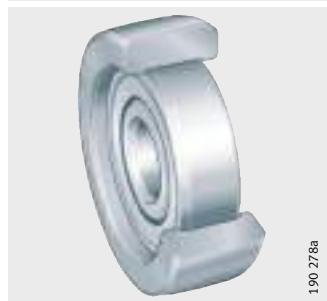
With eccentric collar/
sealing shields

ZLE52..-2Z



Track rollers with plastic outer tyre
Cylindrical or crowned outside surface
Lip seals/sealing shields

KLRU



KLRZ



109 209a

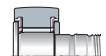
Other products

Track rollers with profiled outer ring

LFR5



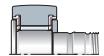
190 279a



Ball bearing track rollers

| | |
|---|--|
| Features | <p>Ball bearing track rollers are self-retaining, single or double row units with particularly thick-walled outer rings. In addition to high radial forces, these bearings can also support axial forces in both directions.</p> <p>The outer rings have a crowned or cylindrical outside surface. Designs with a crowned outside surface are used where they are inclined in relation to the mating track and edge stresses must be avoided.</p> <p>Ball bearing track rollers are available with an inner ring, with a stud and with a plastic tyre on the outer ring.</p> |
| Yoke type track rollers | <p>Yoke type track rollers have outer rings with a crowned or cylindrical outside surface, inner rings and ball and cage assemblies with plastic cages. They are similar in construction to deep groove or angular contact ball bearings and are mounted on shafts or studs. Yoke type track rollers LR6, LR60 and LR2 are single row units, LR50, LR52 and LR53 are double row units.</p> |
| Outer ring outside surface profile | <p>Yoke type track rollers with a crowned outside surface have a curvature radius of $R = 500$ mm.</p> <p>Yoke type track rollers with a cylindrical outside surface have the suffix X.</p> |
| With anti-corrosion protection | <p>For applications requiring increased protection against corrosion, yoke type track rollers with the INA special plating Corrotect® are available by agreement as a special design.</p> <p>For further information on Corrotect®, see page 859.</p> |
| Sealing/lubricant | <p>Yoke type track rollers with the suffix 2RSR have lip seals on both sides. In some sizes, RS seals are fitted for reasons of space.</p> <p>Double row yoke type track rollers with the suffix 2Z have sealing shields on both sides, bearings with the suffix 2RS have lip seals on both sides.</p> <p>The yoke type track rollers are greased using a lithium soap grease to GA13. Double row yoke type track rollers can in some cases be relubricated via the inner ring.</p> |
| Stud type track rollers with or without eccentric collar | <p>Stud type track rollers have outer rings with a crowned outside surface, heavy-section roller studs and ball and cage assemblies with plastic cages. The stud type track rollers are available with and without an eccentric collar.</p> <p>For ease of fitting, the roller stud has a thread or a threaded bore. For countertensioning during fitting, there is a slot, hexagonal socket or a flat area on the external thread.</p> <p>Track rollers ZL2 are single row units, track rollers ZL52, ZLE52 and KR52 are double row units.</p> |
| Outer ring outside surface profile | <p>The stud type track rollers have a curvature radius of $R = 500$ mm.</p> |

| | |
|---|--|
| Without eccentric collar | Stud type track rollers without an eccentric collar are suitable for applications where a defined requirement for adjustment in relation to the mating track on the adjacent construction is not required. |
| With eccentric collar | <p>Stud type track rollers ZLE52 have an eccentric collar. The eccentric collar can be used to set the outside surface of the outer ring clearance-free against the mating track. This gives optimum geometrical locking between the track roller and mating track. Furthermore, larger manufacturing tolerances can be tolerated in the adjacent construction. In addition, more uniform load distribution is achieved when using more than one stud type track roller.</p> <p>For countertensioning during fitting, this series has flat areas on both sides of the roller stud.</p> |
| Sealing/lubricant | <p>Stud type track rollers ZL2 and ZL52 have lip seals on the stud side and the suffix DRS. The opposite side can be sealed using the plastic cover supplied.</p> <p>Series KR52 is sealed on both sides by lip seals and has the suffix 2RS.</p> <p>Stud type track rollers ZLE52 have sealing shields on both sides and the suffix 2Z.</p> <p>The stud type track rollers are greased using a lithium soap grease to GA13, ZLE52 can be lubricated via the roller stud.</p> |
| Track rollers with plastic outer tyre | <p>Track rollers KLRU and KLRZ comprise single row deep groove ball bearings with a shrink-fitted polyamide outer ring (PA). Polyamide can tolerate higher specific contact pressures than elastomer and is relatively resistant to abrasion.</p> <p>These track rollers are mounted on shafts or studs and are used where low loads are present and the bearings are required to run particularly quietly.</p> |
| Outer ring outside surface profile | <p>Track rollers KLRU have an outer ring with a crowned outside surface. The curvature radius is indicated in the dimension table.</p> <p>Series KLRZ has a cylindrical outside surface.</p> |
| Maximum radial load Caution! | The maximum radial load is determined by the permissible contact pressure; $F_{r\text{per}}$ must not be exceeded. |
| Sealing/lubricant | <p>The track rollers have gap seals on both sides with the suffix 2Z or lip seals with the suffix 2RSR.</p> <p>They are greased using a lithium soap grease to GA13 and cannot be relubricated.</p> |



Ball bearing track rollers

| Operating temperature | Track rollers are suitable for a temperature range from –20 °C to +120 °C, restricted by the grease, cage material and sealing ring material. Note the information on operating temperature range in Technical Principles, Lubrication. | | | | | | | | | | | | | | | | | | | | | |
|------------------------------|---|----------------|-------------|--------|-----|---------------------------|----------|----|--|----------------|---|------------------------|----------|-----|---|----------|------|--|----------|----|-------------------------------|----------|
| Caution! | Track rollers with plastic tyre KLRU and KLRZ are suitable for operating temperatures from –20 °C to +80 °C, restricted by the grease, cage material, sealing ring material and the plastic tyre. | | | | | | | | | | | | | | | | | | | | | |
| Suffixes | Suffixes for the available designs: see table. | | | | | | | | | | | | | | | | | | | | | |
| Available designs | <table border="1"><thead><tr><th>Suffix</th><th>Description</th><th>Design</th></tr></thead><tbody><tr><td>DRS</td><td>Lip seal on the stud side</td><td>Standard</td></tr><tr><td>RR</td><td>Corrosion-resistant design with INA special plating Corrotect®</td><td>Special design</td></tr><tr><td>X</td><td>Cylindrical outer ring</td><td>Standard</td></tr><tr><td>2RS</td><td>Lip seals on both sides giving axial sealing action</td><td>Standard</td></tr><tr><td>2RSR</td><td>Lip seals on both sides giving radial sealing action</td><td>Standard</td></tr><tr><td>2Z</td><td>Sealing shields on both sides</td><td>Standard</td></tr></tbody></table> | Suffix | Description | Design | DRS | Lip seal on the stud side | Standard | RR | Corrosion-resistant design with INA special plating Corrotect® | Special design | X | Cylindrical outer ring | Standard | 2RS | Lip seals on both sides giving axial sealing action | Standard | 2RSR | Lip seals on both sides giving radial sealing action | Standard | 2Z | Sealing shields on both sides | Standard |
| Suffix | Description | Design | | | | | | | | | | | | | | | | | | | | |
| DRS | Lip seal on the stud side | Standard | | | | | | | | | | | | | | | | | | | | |
| RR | Corrosion-resistant design with INA special plating Corrotect® | Special design | | | | | | | | | | | | | | | | | | | | |
| X | Cylindrical outer ring | Standard | | | | | | | | | | | | | | | | | | | | |
| 2RS | Lip seals on both sides giving axial sealing action | Standard | | | | | | | | | | | | | | | | | | | | |
| 2RSR | Lip seals on both sides giving radial sealing action | Standard | | | | | | | | | | | | | | | | | | | | |
| 2Z | Sealing shields on both sides | Standard | | | | | | | | | | | | | | | | | | | | |
| Other products | INA also supplies profiled track rollers LFR5 in which the outer ring has a gothic arch profile. These profiled track rollers are preferably used with a shaft or circular section mating track. | | | | | | | | | | | | | | | | | | | | | |
| Enquiries | Please direct enquiries to: Schaeffler KG Linear Technology Division 66406 Homburg (Saar) Internet www.ina.com E-Mail info.linear@schaefller.com Telephone 0180 5003872 Fax 0180 5003873 | | | | | | | | | | | | | | | | | | | | | |

Design and safety guidelines

Caution!

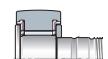
For reliable and problem-free operation of track rollers, it is essential that attention is paid to the following items:

- Installation as yoke or stud type track roller, page 836
- Permissible dynamic or static radial load, page 836
- Load carrying capacity and life, page 837
- Operating life, page 838
- Minimum load, page 838
- Skewed running and tilting, page 839
- Speeds, page 840
- Lubrication, page 842.

Adjacent construction for yoke type track rollers

Yoke type track rollers LR can be axially clamped or located by means of conventional fasteners – such as snap rings.

The abutment surfaces for the bearings must be flat and perpendicular. Due to the contact pressure occurring, the actual dimension must not be less than the dimension d_2 according to the dimension tables.



Shaft tolerances

In general, track rollers have point load on the inner ring. In order to ensure adequate support and to substantially avoid fretting corrosion, shaft tolerances to h6 are suitable.

Adjacent construction for stud type track rollers

Caution!

Stud type track rollers ZL and KR must be axially clamped.

The abutment surfaces for the nut must have sufficiently high strength and the tightening torque M_A for the fixing nut given in the dimension table must be observed. The roller stud can only transmit the permissible radial load if the correct tightening torque is applied.

If the tightening torque cannot be adhered to, an interference fit is required.

The abutment surfaces for the track rollers must be flat and perpendicular. Due to the contact pressure occurring, the actual dimension must not be less than the dimension d_2 according to the dimension table.

The entry chamfer on the locating bore must not be more than $0,5 \times 45^\circ$.

Bore tolerance

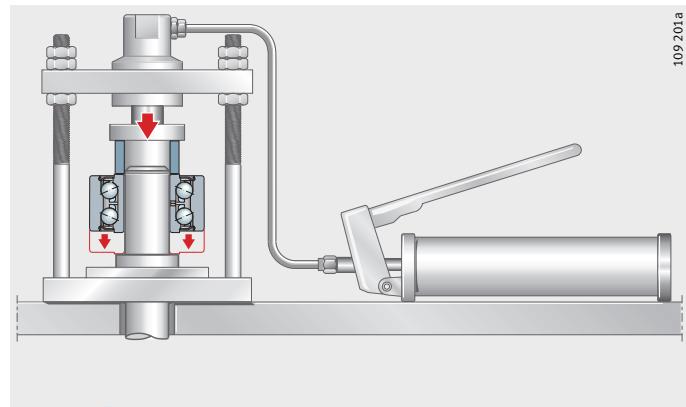
For the locating bore, tolerances according to the table Stud and bore tolerances are suitable.

Stud and bore tolerances

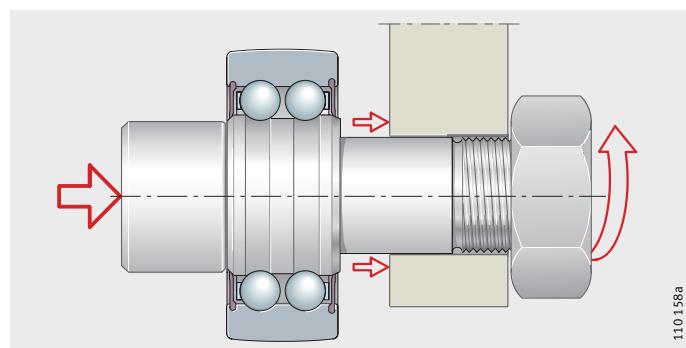
| Series | Tolerance | |
|--------|-----------|--------------------|
| | Shank | Bore (recommended) |
| ZL2 | r6 | H7 |
| ZL52 | r6 | H7 |
| KR52 | h7 | H7 |
| ZLE52 | h9 | H7 |

Ball bearing track rollers

- Fitting** If the tolerances are unfavourable, the yoke type track roller should be pressed onto the shaft or stud using a press, *Figure 1*.
The inner ring must be fitted such that the pressing-in force is distributed uniformly on the end face of the inner ring.
- Caution!** Fitting forces must never be directed through the rolling elements.
Ensure that the seals are not damaged.
The yoke type track rollers must be secured axially.



- Stud type track rollers** Stud type track rollers are fitted and dismantled by methods to those used for yoke type track rollers, *Figure 2*.
- Caution!** The tightening torques given in the dimension table must be observed. It is only in this way that the permissible radial load can be ensured.
Screws and nuts of grade 8.8 or better must be used.



Accuracy

The dimensional and geometrical tolerances correspond to tolerance class PN to DIN 620.

In a deviation from DIN 620, the diameter tolerance of the profiled outside surface is $-0,05$ mm.

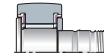
Stud tolerance for stud type track rollers and bore tolerances, see table Stud and bore tolerances, page 881.

Radial internal clearance

Radial internal clearance
to DIN 620-4

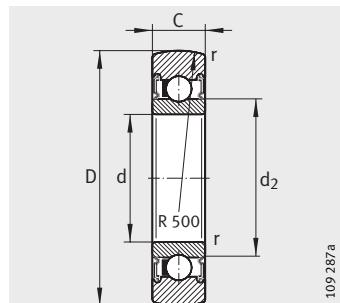
The radial internal clearance corresponds to class CN.

| Bore | | Radial internal clearance | | | | | | | | | |
|---------|-------|---------------------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|
| d mm | | C2 μm | | CN μm | | C3 μm | | C4 μm | | C5 μm | |
| over | incl. | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| 2,5 | 10 | 0 | 7 | 2 | 13 | 8 | 23 | 14 | 29 | 20 | 37 |
| 10 | 18 | 0 | 9 | 3 | 18 | 11 | 25 | 18 | 33 | 25 | 45 |
| 18 | 24 | 0 | 10 | 5 | 20 | 13 | 28 | 20 | 36 | 28 | 48 |
| 24 | 30 | 1 | 11 | 5 | 20 | 13 | 28 | 23 | 41 | 30 | 53 |
| 30 | 40 | 1 | 11 | 6 | 20 | 15 | 33 | 28 | 46 | 40 | 64 |
| 40 | 50 | 1 | 11 | 6 | 23 | 18 | 36 | 30 | 51 | 45 | 73 |
| 50 | 65 | 1 | 15 | 8 | 28 | 23 | 43 | 38 | 61 | 55 | 90 |



Yoke type track rollers

Single row



LR6..-2RSR, LR2..-2RSR,
LR2..X-2RSR¹⁾

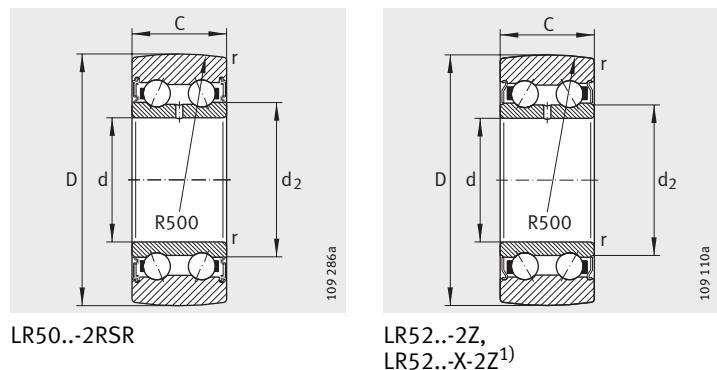
Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
|----------------------------------|-----------------|------------|----|----|----------------|-----------|-----------------------|-------------------------|---|--|
| | | D | d | C | d ₂ | r min. | dyn. C_{rw} N | stat. C_{orw} N | | |
| LR604-2RSR | 10 | 13 | 4 | 4 | 6,1 | 0,2 | 870 | 350 | 14,5 | 24 000 |
| LR605-2RSR | 10 | 16 | 5 | 5 | 7,5 | 0,2 | 1 220 | 510 | 21,1 | 23 000 |
| LR606-2RSR | 10 | 19 | 6 | 6 | 8,7 | 0,3 | 1 830 | 790 | 32,5 | 22 000 |
| LR607-2RSR | 10 | 22 | 7 | 6 | 9 | 0,3 | 2 130 | 880 | 35,5 | 20 000 |
| LR608-2RSR | 20 | 24 | 8 | 7 | 10 | 0,3 | 2 750 | 1 240 | 52 | 19 000 |
| LR6000-2RSR | 20 | 28 | 10 | 8 | 14,6 | 0,3 | 3 650 | 2 490 | 157 | 17 000 |
| LR6001-2RSR | 30 | 30 | 12 | 8 | 16,6 | 0,3 | 3 850 | 2 750 | 173 | 16 000 |
| LR200-2RS | 50 | 32 | 10 | 9 | 15,4 | 0,6 | 4 400 | 2 150 | 89 | 13 000 |
| LR200-X-2RS¹⁾ | 50 | 32 | 10 | 9 | 15,4 | 0,6 | 4 400 | 2 150 | 89 | 13 000 |
| LR201-2RSR | 50 | 35 | 12 | 10 | 18,3 | 0,6 | 5 600 | 2 700 | 112 | 12 000 |
| LR201-X-2RSR¹⁾ | 50 | 35 | 12 | 10 | 18,3 | 0,6 | 5 600 | 2 700 | 112 | 12 000 |
| LR202-2RSR | 70 | 40 | 15 | 11 | 21 | 0,6 | 6 600 | 3 350 | 133 | 11 000 |
| LR202-X-2RSR¹⁾ | 70 | 40 | 15 | 11 | 21 | 0,6 | 6 600 | 3 350 | 133 | 11 000 |
| LR203-2RSR | 110 | 47 | 17 | 12 | 24 | 0,6 | 8 500 | 4 450 | 185 | 9 000 |
| LR203-X-2RSR¹⁾ | 110 | 47 | 17 | 12 | 24 | 0,6 | 8 500 | 4 450 | 185 | 9 000 |
| LR204-2RSR | 150 | 52 | 20 | 14 | 29 | 1 | 10 600 | 5 700 | 238 | 8 000 |
| LR204-X-2RSR¹⁾ | 150 | 52 | 20 | 14 | 29 | 1 | 10 600 | 5 700 | 238 | 8 000 |
| LR205-2RSR | 230 | 62 | 25 | 15 | 33,5 | 1 | 12 500 | 7 100 | 290 | 7 000 |
| LR205-X-2RSR¹⁾ | 230 | 62 | 25 | 15 | 33,5 | 1 | 12 500 | 7 100 | 290 | 7 000 |
| LR206-2RS | 330 | 72 | 30 | 16 | 37,4 | 1 | 16 600 | 9 700 | 400 | 5 500 |
| LR206-X-2RS¹⁾ | 330 | 72 | 30 | 16 | 37,4 | 1 | 16 600 | 9 700 | 400 | 5 500 |
| LR207-2RS | 400 | 80 | 35 | 17 | 42,4 | 1,1 | 20 400 | 12 100 | 500 | 4 500 |
| LR207-X-2RS¹⁾ | 400 | 80 | 35 | 17 | 42,4 | 1,1 | 20 400 | 12 100 | 500 | 4 500 |
| LR209-2RS | 500 | 90 | 45 | 19 | 53,2 | 1,1 | 22 400 | 13 700 | 560 | 3 600 |
| LR209-X-2RS¹⁾ | 500 | 90 | 45 | 19 | 53,2 | 1,1 | 22 400 | 13 700 | 560 | 3 600 |

¹⁾ Track roller with cylindrical outside surface.

Yoke type track rollers

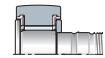
Double row



| Designation | Mass m ≈g | Dimensions | | | | | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
|---------------------------------|-----------------|------------|----|------|----------------|-----|-----------------------|-------------------------|---|--|
| | | D | d | C | d ₂ | r | dyn. C_{rw} N | stat. C_{orw} N | | |
| LR50/5-2RSR | 10 | 17 | 5 | 7 | 8,2 | 0,2 | 1 690 | 940 | 39 | 12 000 |
| LR50/6-2RSR | 20 | 19 | 6 | 9 | 9,3 | 0,3 | 2 700 | 1 370 | 56 | 11 000 |
| LR50/7-2RSR | 20 | 22 | 7 | 10 | 10,5 | 0,3 | 3 350 | 1 720 | 70 | 10 000 |
| LR50/8-2RSR²⁾ | 30 | 24 | 8 | 11 | 10,5 | 0,3 | 4 300 | 2 390 | 99 | 10 000 |
| LR5000-2RS | 30 | 28 | 10 | 12 | 13,5 | 0,3 | 4 800 | 2 850 | 118 | 9 000 |
| LR5001-2RS | 30 | 30 | 12 | 12 | 15,5 | 0,3 | 5 100 | 3 100 | 128 | 8 500 |
| LR5200-2Z | 70 | 32 | 10 | 14 | 15,4 | 0,6 | 6 800 | 4 100 | 170 | 11 000 |
| LR5200-X-2Z¹⁾ | 70 | 32 | 10 | 14 | 15,4 | 0,6 | 6 800 | 4 100 | 170 | 11 000 |
| LR5200-2RS | 70 | 32 | 10 | 14 | 15,4 | 0,6 | 6 800 | 4 100 | 170 | 8 000 |
| LR5002-2RS | 50 | 35 | 15 | 13 | 20,4 | 0,3 | 6 600 | 4 150 | 172 | 7 000 |
| LR5201-2Z | 80 | 35 | 12 | 15,9 | 17,1 | 0,6 | 8 700 | 5 200 | 215 | 10 000 |
| LR5201-X-2Z¹⁾ | 80 | 35 | 12 | 15,9 | 17,1 | 0,6 | 8 700 | 5 200 | 215 | 10 000 |
| LR5201-2RS | 80 | 35 | 12 | 15,9 | 17,1 | 0,6 | 8 700 | 5 200 | 215 | 7 500 |
| LR5003-2RS | 70 | 40 | 17 | 14 | 21,6 | 0,3 | 7 800 | 5 300 | 218 | 6 000 |
| LR5202-2Z | 110 | 40 | 15 | 15,9 | 20 | 0,6 | 10 000 | 6 300 | 260 | 10 000 |
| LR5202-X-2Z¹⁾ | 110 | 40 | 15 | 15,9 | 20 | 0,6 | 10 000 | 6 300 | 260 | 10 000 |
| LR5202-2RS | 110 | 40 | 15 | 15,9 | 20 | 0,6 | 10 000 | 6 300 | 260 | 7 000 |

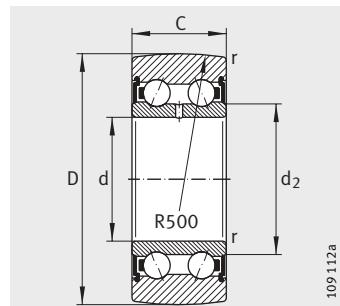
¹⁾ Track roller with cylindrical outside surface.

²⁾ Without lubrication hole.

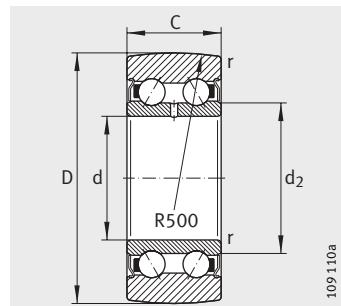


Yoke type track rollers

Double row



LR50..-2RS, LR52..-2RS,
LR53..-2RS



LR52..-2Z, LR53..-2Z,
LR52..-X-2Z¹⁾

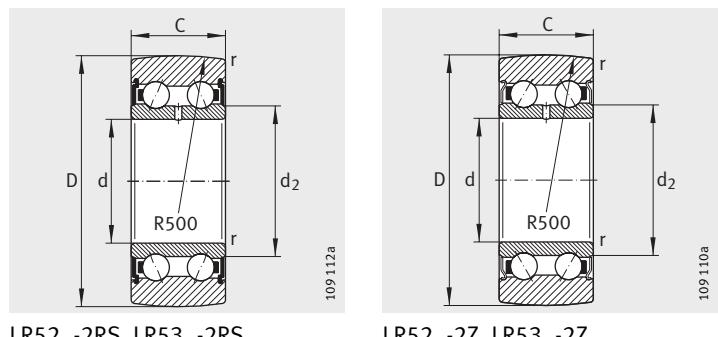
Dimension table (continued) - Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
|---------------------------------|-----------------|------------|----|------|----------------|-----------|-----------------------|-------------------------|---|--|
| | | D | d | C | d ₂ | r min. | dyn. C_{rw} N | stat. C_{0rw} N | | |
| LR5004-2RS | 120 | 47 | 20 | 16 | 25,2 | 0,6 | 11 700 | 7 700 | 315 | 5 500 |
| LR5203-2Z | 170 | 47 | 17 | 17,5 | 22,5 | 0,6 | 12 800 | 8 300 | 345 | 7 500 |
| LR5203-X-2Z¹⁾ | 170 | 47 | 17 | 17,5 | 22,5 | 0,6 | 12 800 | 8 300 | 345 | 7 500 |
| LR5203-2RS | 170 | 47 | 17 | 17,5 | 22,5 | 0,6 | 12 800 | 8 300 | 345 | 5 500 |
| LR5005-2RS | 150 | 52 | 25 | 16 | 29,8 | 0,6 | 11 800 | 8 200 | 335 | 4 700 |
| LR5204-2Z | 230 | 52 | 20 | 20,6 | 26,5 | 1 | 16 200 | 10 700 | 440 | 7 000 |
| LR5204-X-2Z¹⁾ | 230 | 52 | 20 | 20,6 | 26,5 | 1 | 16 200 | 10 700 | 440 | 7 000 |
| LR5204-2RS | 230 | 52 | 20 | 20,6 | 26,5 | 1 | 16 200 | 10 700 | 440 | 5 000 |
| LR5303-2RS | 210 | 52 | 17 | 22,2 | 23,5 | 1 | 17 600 | 11 300 | 465 | 4 700 |
| LR5006-2RS | 250 | 62 | 30 | 19 | 35,5 | 1 | 16 100 | 11 900 | 495 | 4 000 |
| LR5205-2Z | 340 | 62 | 25 | 20,6 | 30,3 | 1 | 18 800 | 13 200 | 540 | 6 500 |
| LR5205-X-2Z¹⁾ | 340 | 62 | 25 | 20,6 | 30,3 | 1 | 18 800 | 13 200 | 540 | 6 500 |
| LR5205-2RS | 340 | 62 | 25 | 20,6 | 30,3 | 1 | 18 800 | 13 200 | 540 | 4 500 |
| LR5304-2Z | 340 | 62 | 20 | 22,2 | 29 | 1,1 | 21 600 | 14 800 | 620 | 6 500 |
| LR5304-2RS | 340 | 62 | 20 | 22,2 | 29 | 1,1 | 21 600 | 14 800 | 620 | 4 500 |
| LR5007-2RS | 300 | 68 | 35 | 20 | 41,7 | 1 | 17 900 | 13 300 | 550 | 4 300 |

¹⁾ Track roller with cylindrical outside surface.

Yoke type track rollers

Double row



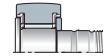
LR52..-2RS, LR53..-2RS

LR52..-2Z, LR53..-2Z,
LR52..-X-2Z¹⁾

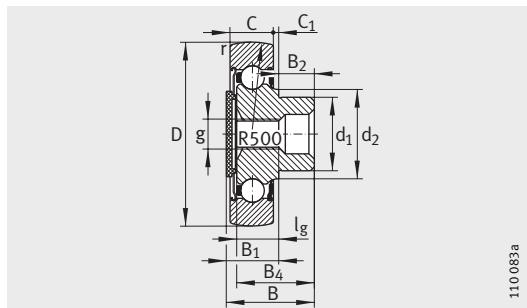
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | Basic load ratings | | | Fatigue limit load C_{urw} | Speed n_{DG} min ⁻¹ |
|---------------------------------|-----------------|------------|----|------|----------------|-----------|-----------------------|-------------------------|-------------------|------------------------------------|--|
| | | D | d | C | d ₂ | r min. | dyn. C_{rw} N | stat. C_{orw} N | $F_{r\ per}$ N | | |
| LR5206-2Z | 510 | 72 | 30 | 23,8 | 37,4 | 1 | 25 000 | 18 000 | — | 740 | 5 000 |
| LR5206-X-2Z¹⁾ | 510 | 72 | 30 | 23,8 | 37,4 | 1 | 25 000 | 18 000 | — | 740 | 5 000 |
| LR5206-2RS | 510 | 72 | 30 | 23,8 | 37,4 | 1 | 25 000 | 18 000 | — | 740 | 3 500 |
| LR5305-2Z | 500 | 72 | 25 | 25,4 | 34,4 | 1,1 | 28 000 | 19 900 | — | 830 | 5 500 |
| LR5305-2RS | 500 | 72 | 25 | 25,4 | 34,4 | 1,1 | 28 000 | 19 900 | — | 830 | 3 900 |
| LR5207-2Z | 660 | 80 | 35 | 27 | 42,4 | 1,1 | 31 000 | 22 800 | — | 940 | 3 900 |
| LR5207-X-2Z¹⁾ | 660 | 80 | 35 | 27 | 42,4 | 1,1 | 31 000 | 22 800 | — | 940 | 3 900 |
| LR5207-2RS | 660 | 80 | 35 | 27 | 42,4 | 1,1 | 31 000 | 22 800 | — | 940 | 2 800 |
| LR5306-2Z | 670 | 80 | 30 | 30,2 | 41,4 | 1,1 | 36 000 | 25 500 | — | 1 060 | 4 300 |
| LR5306-2RS | 670 | 80 | 30 | 30,2 | 41,4 | 1,1 | 36 000 | 25 500 | — | 1 060 | 3 100 |
| LR5208-2Z | 750 | 85 | 40 | 30,2 | 48,4 | 1,1 | 35 000 | 26 000 | 20 800 | 1 070 | 3 500 |
| LR5208-X-2Z¹⁾ | 750 | 85 | 40 | 30,2 | 48,4 | 1,1 | 35 000 | 26 000 | 20 800 | 1 070 | 3 500 |
| LR5208-2RS | 750 | 85 | 40 | 30,2 | 48,4 | 1,1 | 35 000 | 26 000 | 20 800 | 1 070 | 2 500 |
| LR5307-2Z | 970 | 90 | 35 | 34,9 | 47,7 | 1,5 | 44 000 | 32 500 | — | 1 350 | 3 600 |
| LR5307-2RS | 970 | 90 | 35 | 34,9 | 47,7 | 1,5 | 44 000 | 32 500 | — | 1 350 | 2 500 |
| LR5308-2Z | 1 200 | 100 | 40 | 36,5 | 52,4 | 1,5 | 55 000 | 40 500 | — | 1 690 | 3 300 |
| LR5308-2RS | 1 200 | 100 | 40 | 36,5 | 52,4 | 1,5 | 55 000 | 40 500 | — | 1 690 | 2 300 |

¹⁾ Track roller with cylindrical outside surface.

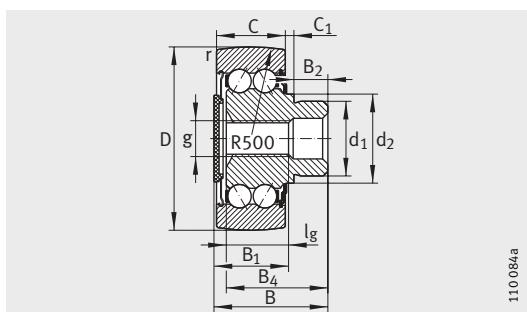


Stud type track rollers

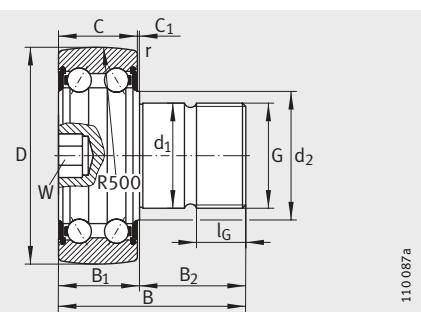


ZL2..-DRS

| Dimension table · Dimensions in mm | | | | | | | | | | | | |
|------------------------------------|-----------------|------------|----------------|------|------------------------|----------------|----------------|------|----------------|----------------|-----|---------|
| Designation | Mass m ≈g | Dimensions | | | | | | | | | | |
| | | D | d ₁ | B | B ₁ max. | B ₂ | B ₄ | C | C ₁ | d ₂ | r | G |
| ZL5201-DRS | 90 | 35 | 14 | 33,2 | 19,5 | 14 | 31 | 15,9 | 2,6 | 17,1 | 0,6 | — |
| KR5201-2RS | 120 | 35 | 12 | 49,2 | 17 | 32,5 | — | 15,9 | 0,8 | 17,1 | 0,6 | M12X1,5 |
| ZL5202-DRS | 80 | 40 | 16 | 23,8 | 14 | 10 | 21,5 | 11 | 2 | 20 | 0,6 | — |
| ZL5202-DRS | 120 | 40 | 16 | 36,2 | 20,5 | 16 | 34 | 15,9 | 3,5 | 20 | 0,6 | — |
| KR5202-2RS | 190 | 40 | 16 | 53,2 | 17 | 36,5 | — | 15,9 | 0,8 | 20 | 0,6 | M16X1,5 |
| ZL5203-DRS | 120 | 47 | 18 | 26,5 | 14,5 | 12 | 24,5 | 12 | 2 | 22,9 | 0,6 | — |
| ZL5203-DRS | 190 | 47 | 18 | 39,5 | 21,5 | 18 | 37,5 | 17,5 | 3,5 | 22,9 | 0,6 | — |
| KR5203-2RS | 290 | 47 | 18 | 58,8 | 18,5 | 40,5 | — | 17,5 | 0,8 | 22,9 | 0,6 | M18X1,5 |
| ZL5204-DRS | 170 | 52 | 20 | 30,7 | 17 | 14 | 28,5 | 14 | 2 | 26,8 | 1 | — |
| ZL5204-DRS | 250 | 52 | 20 | 45,3 | 25,5 | 20 | 43 | 20,6 | 4 | 26,8 | 1 | — |
| KR5204-2RS | 380 | 52 | 20 | 63,6 | 22,5 | 41,5 | — | 20,6 | 1,5 | 26,8 | 1 | M20X1,5 |
| ZL5205-DRS | 250 | 62 | 25 | 33,8 | 18 | 16 | 31 | 15 | 2 | 30,3 | 1 | — |
| ZL5205-DRS | 380 | 62 | 25 | 50,4 | 25,5 | 25 | 47,5 | 20,6 | 4 | 30,3 | 1 | — |
| KR5205-2RS | 580 | 62 | 24 | 70,9 | 21,5 | 49,5 | — | 20,6 | 0,8 | 30,3 | 1 | M24X1,5 |
| ZL5206-DRS | 550 | 72 | 30 | 59 | 29 | 30 | 56,5 | 23,8 | 4,5 | 37,3 | 1 | — |
| KR5206-2RS | 800 | 72 | 24 | 74,1 | 25 | 49,5 | — | 23,8 | 0,8 | 37,3 | 1 | M24X1,5 |
| ZL5207-DRS | 710 | 80 | 35 | 69,2 | 33,5 | 36 | 66,5 | 27 | 5,5 | 42,4 | 1,1 | — |
| KR5207-2RS | 1200 | 80 | 30 | 91 | 28 | 63 | — | 27 | 1 | 42,4 | 1,1 | M30X1,5 |

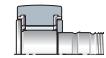


ZL52..-DRS



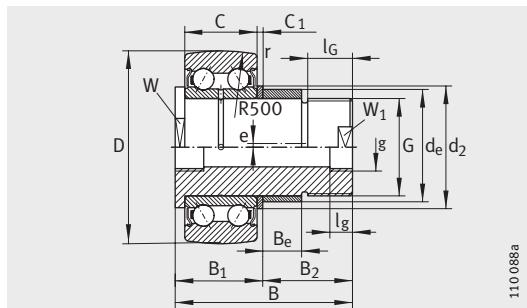
KR52..-2RS

| l_g | g | l_g | W | Tightening torque M_A Nm | Basic load ratings | | Fatigue limit load C_{urw} N | Speed n_{DG} min ⁻¹ |
|-------|-----|-------|----|----------------------------------|-----------------------|-------------------------|--------------------------------------|--|
| | | | | | dyn. C_{rw} N | stat. C_{0rw} N | | |
| – | M8 | 14 | – | – | 8 700 | 5 200 | 260 | 7 500 |
| 17 | – | – | 6 | 45 | 8 700 | 5 200 | 260 | 7 500 |
| – | M8 | 15 | – | – | 6 600 | 3 350 | 139 | 8 500 |
| – | M8 | 15 | – | – | 10 000 | 6 300 | 320 | 7 000 |
| 19 | – | – | 8 | 70 | 10 000 | 6 300 | 320 | 7 000 |
| – | M8 | 16 | – | – | 8 500 | 4 450 | 185 | 6 500 |
| – | M8 | 15 | – | – | 12 800 | 8 400 | 425 | 5 500 |
| 21 | – | – | 8 | 115 | 12 800 | 8 400 | 425 | 5 500 |
| – | M10 | 18 | – | – | 10 600 | 5 700 | 238 | 6 000 |
| – | M10 | 18 | – | – | 16 100 | 10 700 | 540 | 5 000 |
| 21 | – | – | 10 | 160 | 16 100 | 10 700 | 540 | 5 000 |
| – | M10 | 19 | – | – | 12 500 | 7 100 | 290 | 5 500 |
| – | M10 | 18 | – | – | 18 800 | 13 300 | 670 | 4 500 |
| 25 | – | – | 10 | 290 | 18 800 | 13 200 | 660 | 4 500 |
| – | M16 | 20 | – | – | 25 000 | 18 100 | 910 | 3 500 |
| 25 | – | – | 10 | 290 | 25 000 | 18 100 | 910 | 3 500 |
| – | M16 | 20 | – | – | 31 000 | 22 800 | 1 160 | 2 800 |
| 32 | – | – | 12 | 600 | 31 000 | 22 800 | 1 160 | 2 800 |



Stud type track rollers

With eccentric collar

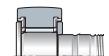


ZLE52..-2Z

Dimension table · Dimensions in mm

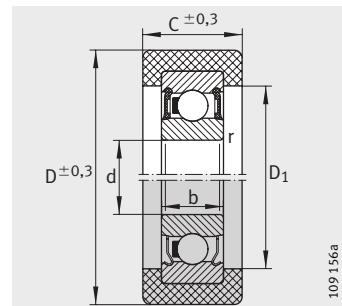
| Designation | Mass m ≈g | Dimensions | | | | | | | | | | |
|-------------------|-----------------|------------|----------------|------|------------------------|----------------|------|----------------|----------------|-----------|----|----------------|
| | | D | d _e | B | B ₁ max. | B ₂ | C | C ₁ | d ₂ | r min. | W | W ₁ |
| ZLE5201-2Z | 250 | 35 | 18 | 65,5 | 20,5 | 45 | 15,9 | 2 | 25 | 0,6 | 15 | 9 |
| ZLE5202-2Z | 350 | 40 | 22 | 66,5 | 21,5 | 45 | 15,9 | 2,5 | 27 | 0,6 | 17 | 10 |
| ZLE5204-2Z | 460 | 52 | 24 | 76 | 26 | 50 | 20,6 | 2,5 | 30 | 1 | 22 | 17 |
| ZLE5205-2Z | 640 | 62 | 24 | 88 | 32 | 56 | 20,6 | 8 | 30 | 1 | 22 | 17 |
| ZLE5207-2Z | 1 300 | 80 | 35 | 99 | 35 | 64 | 27 | 3 | 45 | 1,1 | 40 | 27 |

| | | | | | | Tightening torque M _A Nm | Basic load ratings | | Fatigue limit load C _{urw} N | Speed n _{DG} min ⁻¹ |
|-----|----------------|------|----------------|---------|------------------------|---|------------------------------|--------------------------------|---|---|
| e | B _e | g | l _g | G | l _G min. | | dyn. C _{rw} N | stat. C _{0rw} N | | |
| 1 | 18 | M6 | 6 | M12X1,5 | 24 | 30 | 8 700 | 5 200 | 260 | 10 000 |
| 1 | 16 | M8X1 | 8 | M14 | 25 | 40 | 10 000 | 6 300 | 320 | 10 000 |
| 1 | 18 | M8X1 | 8 | M20X1,5 | 29 | 150 | 16 200 | 10 700 | 540 | 7 000 |
| 1 | 25 | M8X1 | 8 | M20X1,5 | 28 | 150 | 18 800 | 13 200 | 670 | 6 500 |
| 1,5 | 29 | M8X1 | 8 | M30X1,5 | 32 | 540 | 31 000 | 22 800 | 1 160 | 3 900 |

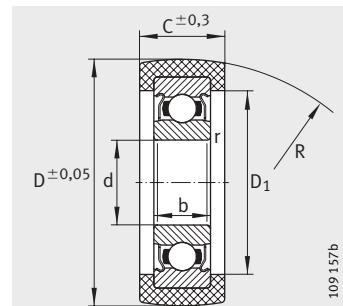


Track rollers

With plastic outer tyre



KLRZ..-2RSR
KLRZ..-2Z



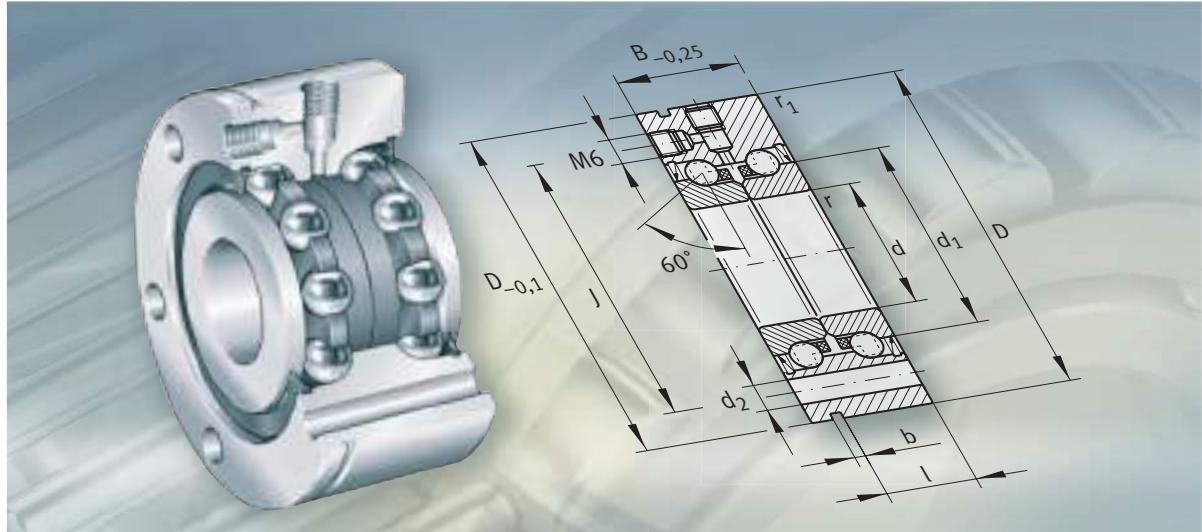
KLRU..-2Z

Dimension table · Dimensions in mm

| Designation | Mass m ≈g | Dimensions | | | | | | | Basic load ratings of track roller ¹⁾ $F_{r\text{ per}}$ N | Deep groove ball bearing fitted | Basic load ratings of deep groove ball bearing | |
|--------------------------|-----------------|-------------|----|----|----|----------------|-----|-----------|---|---------------------------------|--|------------------------|
| | | D | d | C | b | D ₁ | R | r min. | | | dyn. C_r N | stat. C_{0r} N |
| KLRU08X28X11-2Z | 16 | 27,5 | 8 | 11 | 7 | 20 | 500 | 0,3 | 250 | 608-2Z | 3 200 | 1 250 |
| KLRZ10X30X10-2Z | 50 | 30 | 10 | 10 | 8 | 24 | — | 0,3 | 250 | 6000-2Z | 4 600 | 1 970 |
| KLRU12X35X12-2Z | 30 | 34,8 | 12 | 12 | 8 | 26 | 300 | 0,3 | 340 | 6001-2Z | 5 100 | 2 370 |
| KLRZ12X41X16-2RSR | 50 | 41 | 12 | 16 | 10 | 29,5 | — | 0,6 | 500 | 6201-2RSR | 7 100 | 3 100 |
| KLRU12X47X20-2Z | 45 | 46,8 | 12 | 20 | 10 | 28,5 | 300 | 0,6 | 500 | 6201-2Z | 7 100 | 3 100 |
| KLRU15X47X20-2Z | 50 | 46,8 | 15 | 20 | 11 | 31,5 | 300 | 0,6 | 500 | 6202-2Z | 7 700 | 3 500 |

¹⁾ Valid for installation as track roller.

The values apply for operating temperatures up to max. +40 °C.



Bearings for screw drives

Axial angular contact ball bearings
Needle roller/axial cylindrical roller bearings
Seal carrier assemblies
Precision locknuts

Bearings for screw drives

| | | |
|--|-------|------------|
| Matrix for preselection of bearings | | 896 |
|--|-------|------------|

A matrix structured in terms of applications allows rapid preselection of the suitable bearing for a specific application.

| | | |
|--|-------|------------|
| Axial angular contact ball bearings | | 898 |
|--|-------|------------|

Axial angular contact ball bearings are precision bearings for screw drives. Depending on the series, they can support high radial forces as well as axial forces from one or both sides. The inner ring is matched to the ball and cage assemblies and the outer ring. As a result, the bearings can be set to a defined axial preload. Contact seals protect the rolling element system against contamination and moisture. For higher speeds, gap seals can be used.

The bearings are available with and without fixing holes in the outer ring. Bearings with holes are screw mounted directly on the adjacent construction. This solution is particularly economical since there is no need for the locating bore otherwise required or for the bearing cover with the associated matching work.

For applications in the handling sector, for woodworking machinery and transport type screw drives, a bearing arrangement with a lower level of precision is often sufficient. For this purpose, there are versions with less stringent tolerances.

| | | |
|--|-------|------------|
| Needle roller/axial cylindrical roller bearings | | 950 |
|--|-------|------------|

Needle roller/axial cylindrical roller bearings are double direction precision axial cylindrical roller bearings with a radial bearing component. The inner ring, outer ring and cylindrical roller and cage assemblies are matched to each other such that the bearings can be set to a defined axial preload using a precision locknut.

The bearings are available with and without fixing holes in the outer ring. Bearings with holes are screw mounted directly on the adjacent construction. The large contact surface and the small pitch of the holes allows a connection to the adjacent construction that is extremely rigid and with low tendency to settling. The bearing cover that would otherwise be required to hold the bearing, and the matching work required, can therefore be dispensed with.

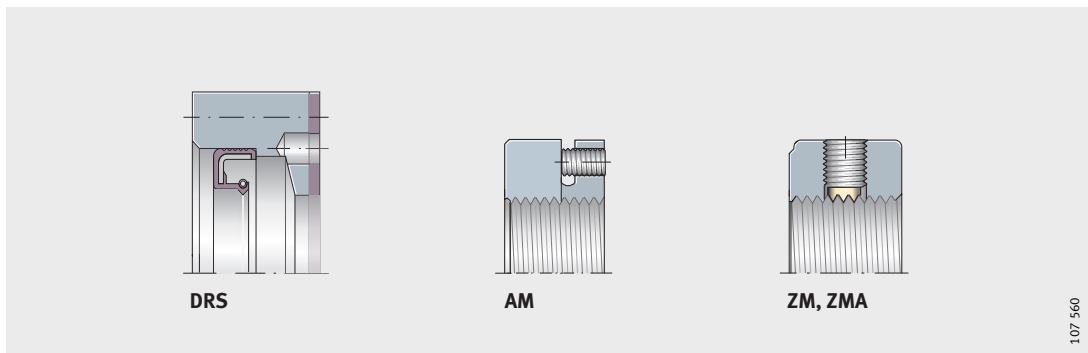
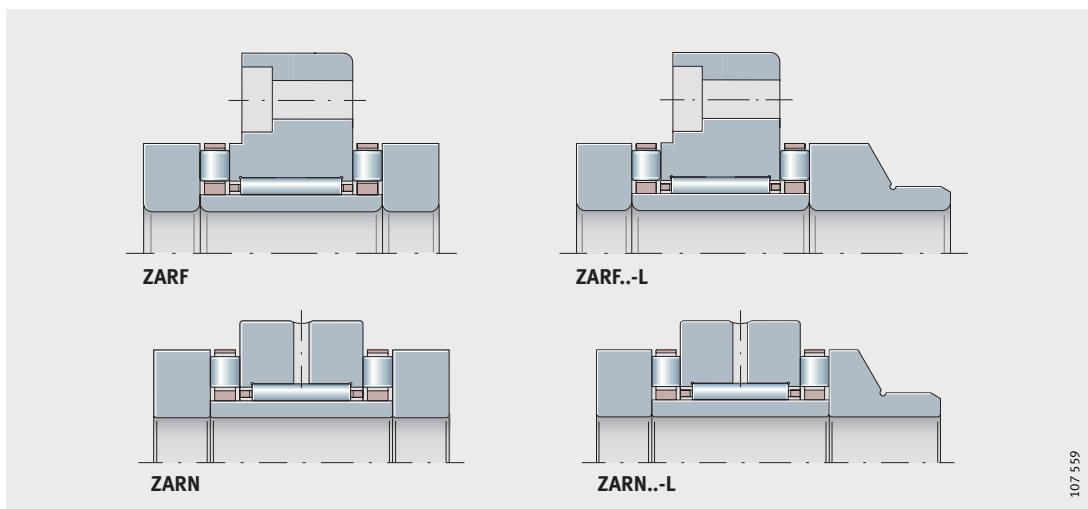
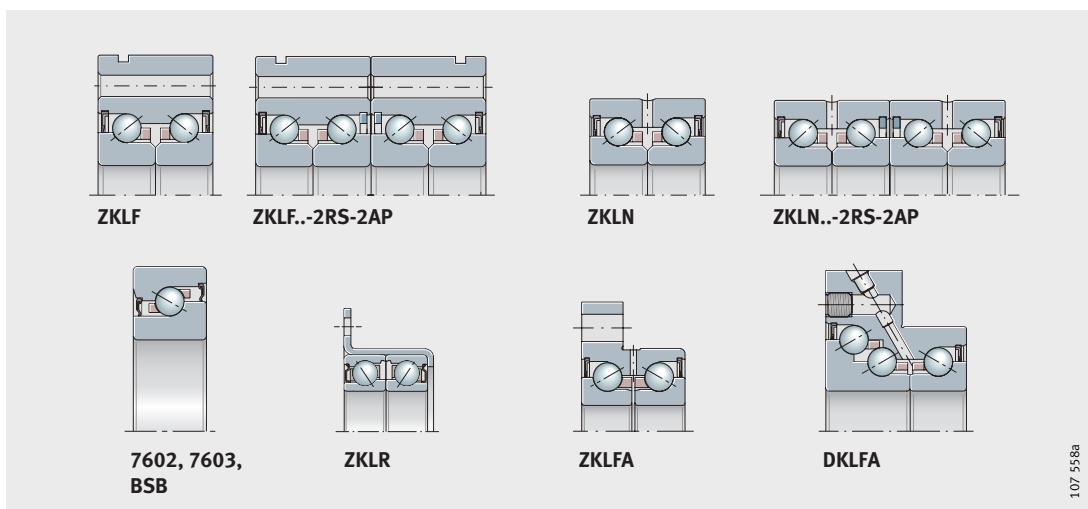
Needle roller/axial cylindrical roller bearings are also available with a stepped, extended shaft locating washer on one side. These bearings are used where the axial support of the shaft locating washer is insufficient or a seal raceway is required.

| | | |
|---|-------|------------|
| Seal carrier assemblies Precision locknuts | | 976 |
|---|-------|------------|

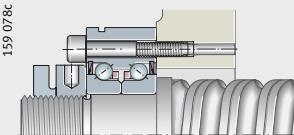
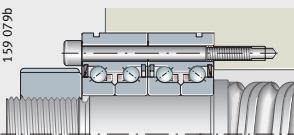
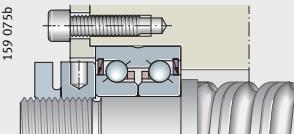
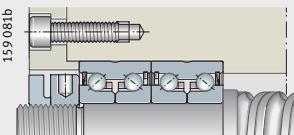
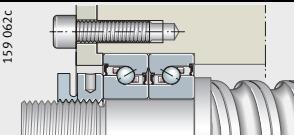
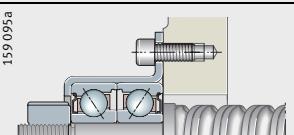
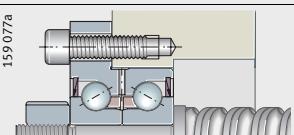
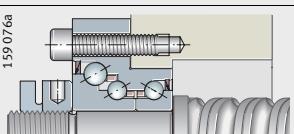
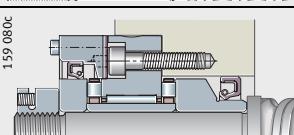
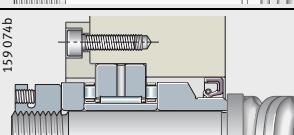
Seal carrier assemblies DRS are complete sealing sets that are screw mounted on the outer ring of needle roller/axial cylindrical roller bearings ZARF(L). They are precisely centred in this position and seal the bearings against external influences.

The precision locknuts AM, ZM, ZMA for axial or radial locking are used to set bearings for screw drives to a defined axial preload.

They are also used where high axial forces must be supported and high runout accuracy and rigidity are required.



Matrix for preselection of bearings

| Application | Series |
|---|---|
| For standard applications |  159 078c ZKLF..-2Z ZKLF..-2RS ZKLF..-2RS-PE |
| |  159 079c ZKLF..-2RS-2AP |
| |  159 075c ZKLN..-2Z ZKLN..-2RS ZKLN..-2RS-PE |
| |  159 081c ZKLN..-2RS-2AP |
| |  159 062c 7602 7602-2RS 7603 7603-2RS BSB BSB-2RS |
| For special applications |  159 093c ZKLR..-2Z ZKLR..-2RS |
| |  159 077c ZKLFA..-2Z ZKLFA..-2RS |
| |  159 076c DKLFA..-2RS |
| For applications requiring very high accuracy and rigidity |  159 080c ZARF (L) |
| |  159 074c ZARN (L) |

Definition of symbols

- +++ very good
- ++ good
- + satisfactory
- sufficient

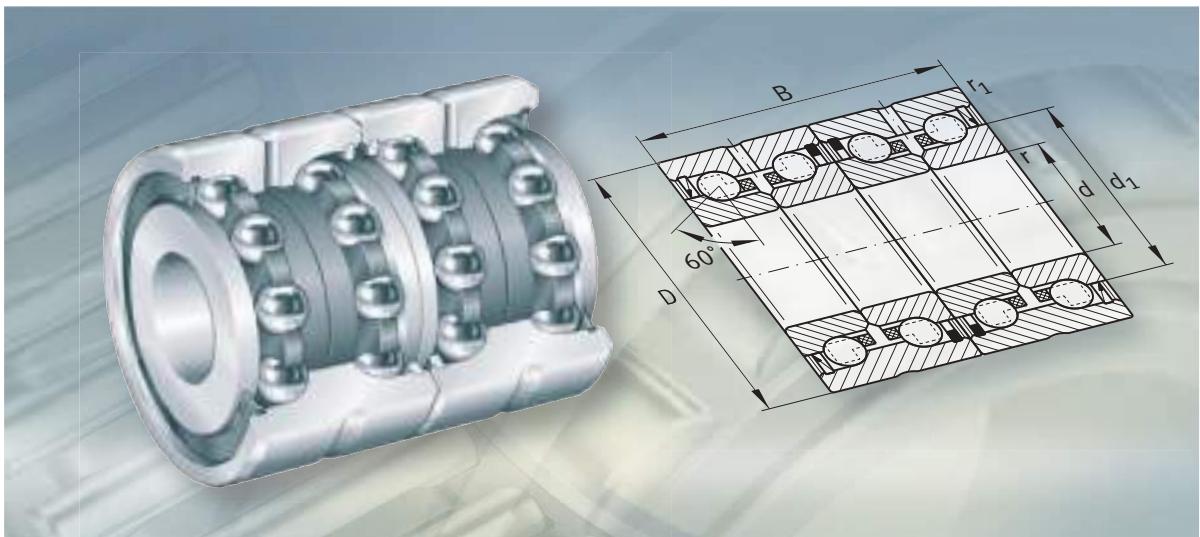
Caution!

This selection matrix is a general overview for preliminary assessment of whether bearings can be considered for the required purpose. For the specific application, the data in the product sections and the technical principles must always be taken into consideration.

| Features | Characteristics | | | | | | For description, see page |
|--|----------------------------------|-------------------------------------|--|--|----------------------------------|-----|---|
| | High runout accuracy | High speeds and low friction | High rigidity and load carrying capacity | Work on adjacent construction and mounting | Low lubricant consumption | | |
| <ul style="list-style-type: none"> - Outer ring for flange mounting - Gap seals or contact seals on both sides - Greased, with relubrication facility - Most economical type of screw drive bearing arrangement | ++ ++ + | +++ ++ ++ | ++ + + | +++ +++ +++ | ++ ++ ++ | 902 | |
| <ul style="list-style-type: none"> - As ZKLF, but in matched pair - Significantly higher load carrying capacity and rigidity than ZKLF | ++ | ++ | ++ | ++ | ++ | 903 | |
| <ul style="list-style-type: none"> - Gap seals or contact seals on both sides - Greased, with relubrication facility - Easier to fit than single row bearings, e.g. for plummer block housings | ++ ++ + | +++ ++ ++ | ++ + + | ++ + + | ++ ++ ++ | 904 | |
| <ul style="list-style-type: none"> - As ZKLN, but in matched pair - Significantly higher load carrying capacity and rigidity than ZKLN | ++ | ++ | ++ | + | ++ | 904 | |
| <ul style="list-style-type: none"> - Open or sealed on both sides - Highly suitable for mounting in pairs to form wide range of contact angle combinations | ++ ++ ++ ++ ++ ++ | +++ ++ +++ ++ +++ ++ | ++ + + + + + | -- -- -- -- -- - | ++ ++ ++ ++ ++ ++ | 906 |  |
| <ul style="list-style-type: none"> - Particularly economical alternative to solutions with individual ball bearings - Gap seals or contact seals on both sides - Simple to fit - For applications with comparatively low loads, but high positional accuracy | + + | +++ ++ | - | +++ +++ | ++ ++ | 907 | |
| <ul style="list-style-type: none"> - Outer ring for flange mounting - Stepped outer ring with flattened areas on both sides - Gap seals or contact seals on both sides | ++ ++ | +++ ++ | ++ + | +++ +++ | ++ ++ | 908 | |
| <ul style="list-style-type: none"> - Higher load capacity on one side - Outer ring for flange mounting - Sealed on both sides - For vertical axes - For locating/locating bearing arrangements | + | ++ | ++ | +++ | ++ | 908 | |
| <ul style="list-style-type: none"> - Outer ring for flange mounting - Very high accuracy, rigidity and load carrying capacity - Bearing prepared for sealing | +++ | + | +++ | + | - | 953 | |
| <ul style="list-style-type: none"> - Very high accuracy, rigidity and load carrying capacity - Bearing prepared for sealing | +++ | + | +++ | - | - | 954 | |



FAG



Axial angular contact ball bearings

Axial angular contact ball bearings

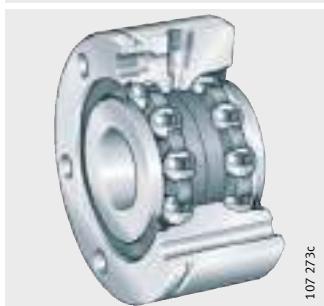
| | Page |
|-------------------------------------|--|
| Product overview | Axial angular contact ball bearings..... 900 |
| Features | Double row axial ang. contact ball bearings, screw mount..... 902 Double row axial ang. contact ball bearings, cover mount 904 Single row axial ang. contact ball bearings, for matching..... 906 Angular contact ball bearing unit, screw mount 907 Double row axial angular contact ball bearings with flange, screw mount 908 Triple row axial angular contact ball bearings with flange, screw mount 908 Operating temperature 909 Cages 909 Suffixes 909 |
| Design and safety guidelines | Basic rating life 910 Static load safety factor 911 Resultant bearing load – diagrams 912 Maximum radial load on screw connections for ZKLF 917 Permissible static axial load for ZKLF 917 Design of adjacent construction 918 Speeds 918 Friction 918 Lubrication 919 Mounting guidelines 920 |
| Dimension tables | Axial angular contact ball bearings, screw mount 924 Axial ang. cont. ball brgs., screw mount, wider tolerances 926 Axial angular contact ball bearings, screw mount, pairs..... 928 Axial angular contact ball bearings, cover mount 930 Axial ang. cont. ball brgs., cover mount, wider tolerances 934 Axial angular contact ball bearings, screw mount, pairs..... 936 Axial angular contact ball bearings, single direction 938 Axial angular contact ball bearings, single direction 942 Angular contact ball bearing units, screw mount..... 944 Double row axial angular contact ball bearings with flange, screw mount 946 Triple row axial angular contact ball bearings with flange, screw mount 948 |



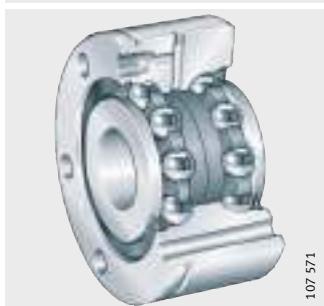
Product overview Axial angular contact ball bearings

**Double row,
for screw mounting**
Lip seals or gap seals

ZKLF..-2RS, ZKLF..-2Z

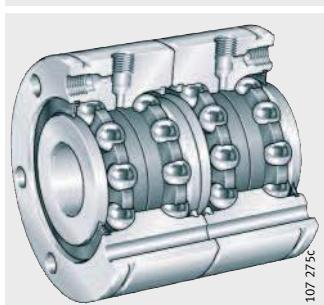


ZKLF..-2RS-PE



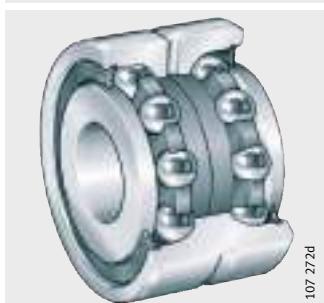
Matched pair

ZKLF..-2RS-2AP



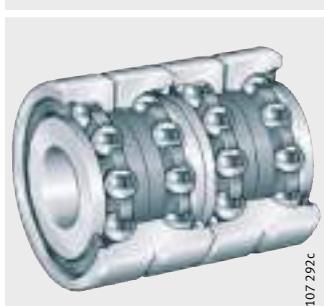
**Double row,
not for screw mounting**
Lip seals or gap seals

**ZKLN..-2RS, ZKLN..-2Z
ZKLN..-2RS-PE**



Matched pair

ZKLN..-2RS-2AP



**Single row,
for matching in pairs**
Without/with lip seals

7602, 7603, BSB

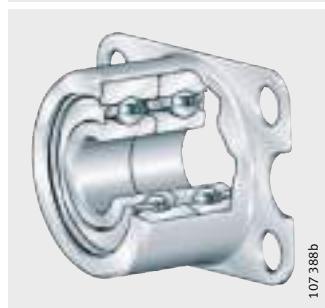


**7602..-2RS, 7603..-2RS,
BSB..-2RS**



**Double row angular
contact ball bearing unit,
for screw mounting**
Lip seals or gap seals

**ZKLR..-2RS
ZKLR..-2Z**



**Double or triple row,
flange with flattened areas,
for screw mounting**
Double row
Lip seals or gap seals

**ZKLFA..-2RS
ZKLFA..-2Z**



107 274d

**Triple row
Lip seals**

DKLFA..-2RS



107 279d

Axial angular contact ball bearings

Features

Screw drive bearing arrangements are subjected to requirements that often cannot be optimally fulfilled by the design construction of conventional bearings. For the design of bearing arrangements for the highly dynamic operating conditions in screw drives that have high accuracy, high load carrying capacity, high rigidity, low friction, are easy to fit and maintenance-free or low-maintenance, there is a wide range of INA/FAG axial angular contact ball bearings. With this well thought-out product range, ideal application-specific solutions can be found to all the technical and economic demands placed on the bearing arrangements of screw drives.

Single row and multi-row designs

Axial angular contact ball bearings are available as single, double or triple row ready-to-fit units. They are self-retaining and comprise thick-walled, geometrically stable outer rings, ball and cage assemblies and one-piece or two-piece inner rings. In several series, the outer ring has through holes for simple flange mounting to the adjacent construction.

The bearing rings are matched to each other such that a defined preload is achieved when the rings are clamped in place using a precision locknut.

Radial and axial load carrying capacity

Due to the contact angle of 60°, the bearings can support not only radial forces but high axial forces as well.

Double row axial angular contact ball bearings, for screw mounting

Axial angular contact ball bearings ZKLF are screw mounted directly on the adjacent construction or in a radial locating bore, *Figure 1* and *Figure 2*. The cover that would otherwise be required and the associated matching work can therefore be dispensed with.

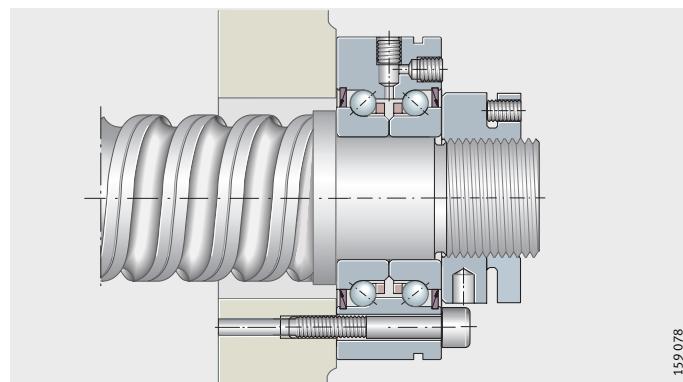
In order to aid removal of the bearings from a locating bore, the outer ring has a circumferential extraction slot.

Relubrication is facilitated by radial and axial threaded connectors with detachable grub screws.

**ZKLF..-2RS
ZKLF..-2Z**

Figure 1

Outer ring screw mounted on flat adjacent construction, preloaded using locknut



159078

With less stringent tolerances

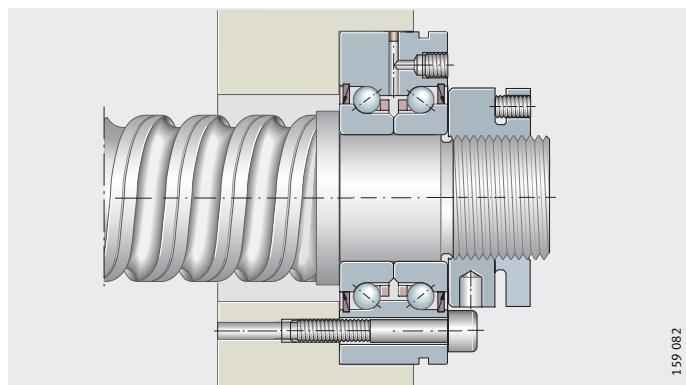
Axial angular contact ball bearings ZKLF..-2RS-PE correspond to series ZKLF but have a runout tolerance within P5 to DIN 620, less stringent diameter tolerances and the suffix PE. They are used where a lower positional accuracy is acceptable. As a result, the adjacent construction does not need to be as accurate with these bearings.

Relubrication is facilitated by an axial threaded connector. The radial lubrication duct is firmly closed off.

ZKLF..-2RS-PE

Figure 2

Outer ring screw mounted in bore, preloaded using locknut



Heavy series

Axial angular contact ball bearings ZKLF..-2RS and ZKLF..-2Z are also available in a heavy series. For the same shaft diameter, they have a larger cross-section and thus higher basic load ratings.

Matched pairs

Bearings of series ZKLF..-2RS-2AP comprise a matched pair of bearings ZKLF..-2RS, *Figure 3*. The individual bearings are matched to each other.

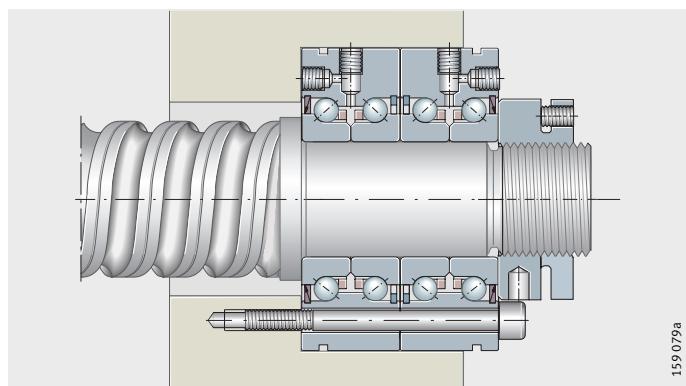
Matched bearings have an arrow marking on the outside surface of the outer rings. When the bearings are arranged correctly, the lip seals face outwards. During fitting, the hole pattern of the two bearings must match, not the marking.



ZKLF..-2RS-2AP

Figure 3

Matched pair, outer ring screw mounted in bore, preloaded using locknut



Sealing/lubricant

Bearings with the suffix 2RS have lip seals and highly effective sealing.

Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds.

The bearings are greased using a lithium soap grease to GA28 and can be lubricated via the lubrication connectors in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life.

Axial angular contact ball bearings

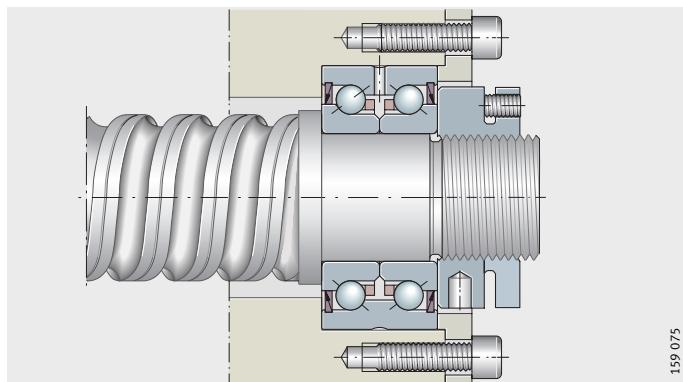
Double row axial angular contact ball bearings, not for screw mounting

ZKLN..-2RS
ZKLN..-2Z

Figure 4

Outer ring located using cover, preloaded using locknut

Axial angular contact ball bearings ZKLN are mounted in a housing bore, *Figure 4*. The bearing outer ring is axially located by a cover.



With less stringent tolerances

Axial angular contact ball bearings ZKLN..-2RS-PE correspond to series ZKLN but have a runout tolerance within P5 to DIN 620, less stringent diameter tolerances and the suffix PE. They are used where a lower positional accuracy is acceptable. As a result, the adjacent construction does not need to be as accurate with these bearings.

Heavy series

Axial angular contact ball bearings ZKLN..-2RS and ZKLN..-2Z are also available in a heavy series. For the same shaft diameter, they have a larger cross-section and thus higher basic load ratings.

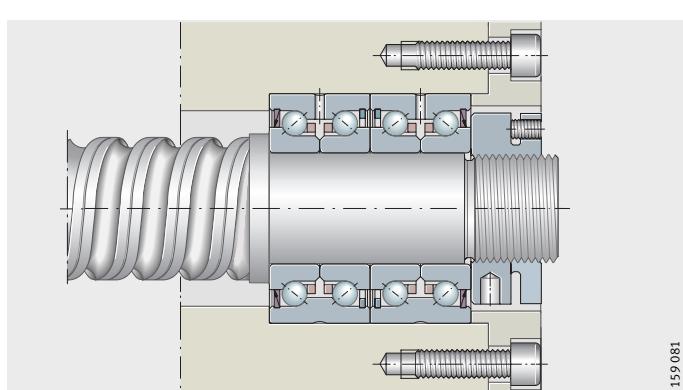
Matched pairs

Bearings of series ZKLN..-2RS-2AP comprise a matched pair of bearings ZKLN..-2RS, *Figure 5*. The individual bearings are matched to each other. Matched bearings have an arrow marking on the outside surface of the outer rings. When the bearings are arranged correctly, the lip seals face outwards. The bearing outer rings are axially clamped by a cover, *Figure 5*.

ZKLN..-2RS-2AP

Figure 5

Matched pair, outer rings located using cover, preloaded using locknut



| | |
|--------------------------|--|
| Sealing/lubricant | Bearings with the suffix 2RS have lip seals and highly effective sealing. Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds. The bearings are greased using a lithium soap grease to GA28 and can be lubricated via a lubrication slot and lubrication holes in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life. |
|--------------------------|--|



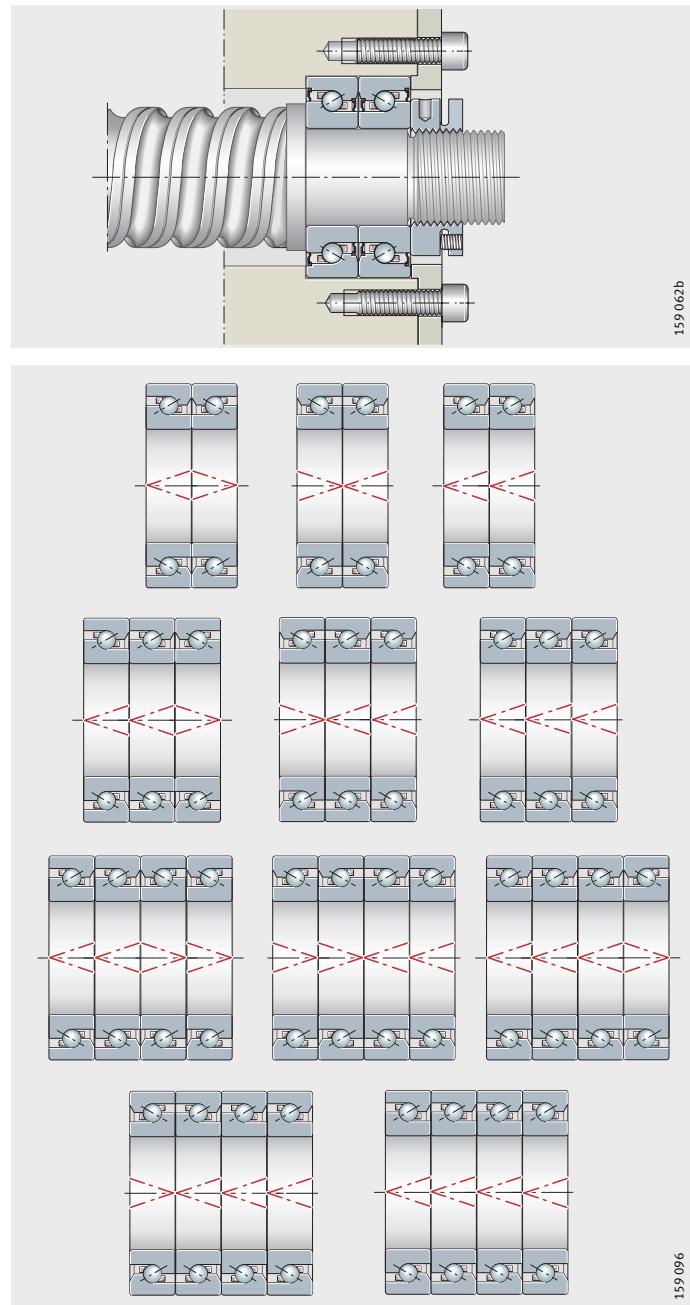
Axial angular contact ball bearings

Single row axial angular contact ball bearings, for combination in pairs

7602..-2RS, 7603..-2RS, BSB..-2RS

Figure 6
Single row axial angular contact ball bearings, two-bearing set in O arrangement

Bearings 7602, 7603 and BSB are designed as universal bearings, *Figure 6* and *Figure 7*. They can be combined in a wide range of sets for different requirements, *Figure 7*.



7602, 7603, BSB

Figure 7
Set combinations

Sealing/lubricant

Single row axial angular contact ball bearings are not sealed and are not supplied greased. However, some sizes are fitted with seals. These bearings are greased for life with Arcanol L55.

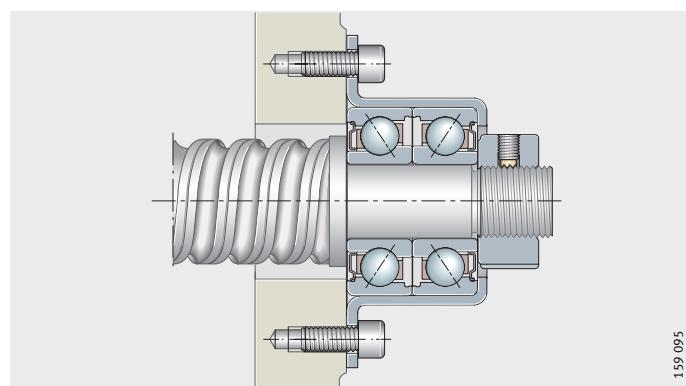
Angular contact ball bearing unit, for screw mounting

Angular contact ball bearing units ZKLR are low-cost bearings and therefore particularly economical. They comprise a deep drawn sheet steel housing with an integral matched pair of angular contact ball bearings in an X arrangement, *Figure 8*. The housing is plated with Corrotect® and is thus protected against rust. The ball bearings are sealed on both sides by lip seals or gap seals. The bearing assembly is preloaded clearance-free.

ZKLR..-2RS
ZKLR..-2Z

Figure 8

Angular contact ball bearing unit



Particularly easy to fit

The units are particularly easy to fit.

They:

- are directly flange mounted, for example on the milled face of the adjacent construction. This eliminates the need for precise, costly fits and additional flange covers for seating and axial location of the bearings
- require no additional parts for location of the bearings in the housing
- reduce errors in fitting due to the smaller number of components compared to conventional solutions
- are self-aligning by means of the screw drive nut during fitting. This effectively eliminates any warping due to misalignment of the bearing seats
- have a defined preload. It is not necessary to preload the bearing during fitting as is usually the case with screw drive bearing arrangements
- require only clearance-free axial location on the threaded spindle.



Sealing/lubricant

Bearings with the suffix 2RS have lip seals and highly effective sealing. Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds. The bearings are greased using a lithium soap grease to DIN 51825-K2N-40.

Areas of application

The units are highly suitable, due to their dimensions and design, for space-saving and simple bearing arrangements in highly dynamic screw drives, for example:

- in inspection and measuring equipment
- in small machine tools
- in medical and laboratory equipment
- in precision engineering and electronic components manufacture
- where complete units will give a simpler bearing arrangement.

Axial angular contact ball bearings

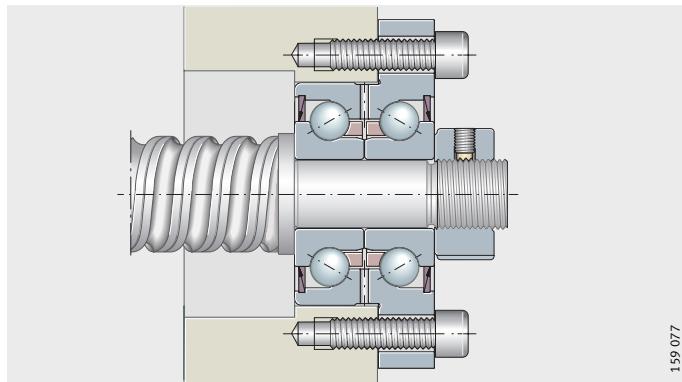
Double row axial angular contact ball bearings with flange, for screw mounting

ZKLFA..-2RS
ZKLFA..-2Z

Figure 9

Outer ring screw mounted on adjacent construction, preloaded using locknut

Series ZKLFA has a stepped outer ring. It can therefore be screw mounted easily on the adjacent construction, *Figure 9*. The flange has flattened areas on both sides, so the radial design envelope in the adjacent construction can be kept very small.



Sealing/lubricant

Bearings with the suffix 2RS have lip seals and highly effective sealing. Bearings with the suffix 2Z are sealed using gap seals and are suitable for higher speeds.

The bearings are greased using a lithium soap grease to GA28 and can be lubricated via a lubrication slot and lubrication holes in the outer ring. For the majority of applications, the initial greasing is sufficient for the whole bearing operating life.

Triple row axial angular contact ball bearings with flange, for screw mounting

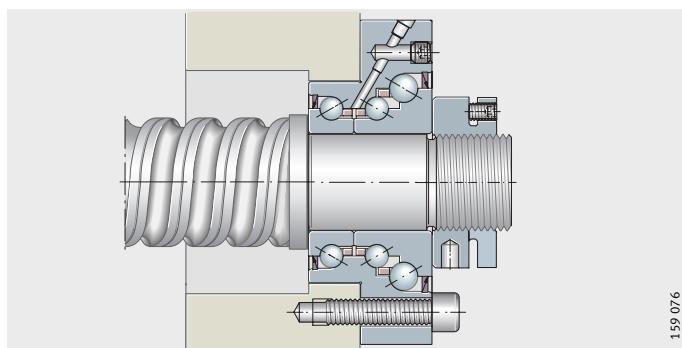
DKLFA..-2RS

Figure 10

Outer ring screw mounted on adjacent construction, preloaded using locknut

Axial angular contact ball bearings DKLFA..-2RS have, in addition to two rows of balls with a contact angle of 60° in an O arrangement, an extra row of balls, *Figure 10*. Due to this additional row, the bearings can support higher axial loads in one direction.

Due to the stepped outer ring, the bearings can be easily flange mounted on the adjacent construction. The flange has flattened areas on both sides. As a result, it requires only a small design envelope in the adjacent construction.



Caution! In order to make full use of the load carrying capacity of bearings DKLFA..-2RS, their design requires that they are subjected to continuous load in the main load direction. They are therefore used mainly in screw drives with a locating/locating bearing arrangement and tensioned spindles or in vertically arranged screw drive bearing arrangements.

For design of the bearing arrangement, please contact us.

Sealing/lubricant The bearings have lip seals on both sides. They are greased using a lithium soap grease to GA28. If necessary, lubrication can be carried out via a threaded connector for central lubrication systems on the flange side.

Caution! For calculation of relubrication intervals based on a stated load spectrum (speed, load, operating duration, environmental conditions), please contact us.

Operating temperature Sealed axial angular contact ball bearings are suitable for operating temperatures from -30°C to $+120^{\circ}\text{C}$, restricted by the grease, the seal material and the plastic cages in the ball and cage assemblies.

Caution! The operating temperature influences the dynamic bearing characteristics. The values given in the dimension table are based on a room temperature of $+20^{\circ}\text{C}$.

Cages The axial angular contact ball bearings have plastic cages. The cage design is not indicated in the suffix. In series 7602, 7603 and BSB, the polyamide cages are indicated by the suffix TVP/T.



Suffixes Suffixes for the available designs: see table.

Available designs

| Suffix | Description |
|--------|--|
| PE | Less stringent bearing design |
| T, TVP | Polyamide cage, guided by balls |
| 2AP | Axial angular contact ball bearings, matched pair (ZKLN, ZKLF) |
| 2RS | Contact seals on both sides |
| 2Z | Gap seals on both sides |

Axial angular contact ball bearings

Design and safety guidelines Basic rating life

The decisive factors in determining the bearing size are the basic rating life, the static load safety factor and the axial limiting load. The basic rating life L and L_h are calculated as follows:

$$L = \left(\frac{C}{P} \right)^p$$

$$L_h = \frac{16666}{n} \cdot \left(\frac{C}{P} \right)^p$$

L 10^6 revolutions
Basic rating life in millions of revolutions

L_h h
Basic rating life in operating hours

C_r, C_a N

Basic dynamic radial or axial load rating according to dimension table
 C_r is valid for a contact angle $\alpha \leq 45^\circ$, C_a is valid for a contact angle $\alpha > 45^\circ$

P N
Equivalent dynamic bearing load

p –
Life exponent $p = 3$

n min^{-1}
Operating speed.

Resultant and equivalent bearing load P for ZKLR

| Bearing unit designation | Factor P |
|--------------------------|---|
| ZKLR0624-2Z | $P = 140 + 0,13 F_a^{1,4} + 0,003 \cdot F_r^{1,9}$ |
| ZKLR0828-2Z | $P = 210 + 0,28 F_a^{1,27} + 0,002 \cdot F_r^{1,9}$ |
| ZKLR1035-2Z | $P = 240 + 0,47 F_a^{1,17} + 0,0015 \cdot F_r^{1,9}$ |
| ZKLR1244-2RS | $P = 580 + 0,046 F_a^{1,3} + 0,076 \cdot F_r^{1,28}$ |
| ZKLR1547-2RS | $P = 540 + 0,011 F_a^{1,5} + 0,022 \cdot F_r^{1,45}$ |
| ZKLR2060-2RS | $P = 960 + 0,0082 F_a^{1,5} + 0,017 \cdot F_r^{1,45}$ |

Static limiting load diagrams for ZKLR

The easy-to-use static limiting load diagrams allow quick verification of the bearing size of series ZKLR – as a function of the axial and radial operating load, Figure 21 to Figure 23, page 916. The decisive requirement is that the intersection between the axial and radial load must be below the limit line.

Example: If the operating loads F_a and F_r are below the limit line, the bearing size is suitable for the application, see example Figure 23, page 916.

Resultant and equivalent bearing load P for ZKLN, ZKLF, ZKLFA, DKLFA, BSB, 7602, 7603

The bearings are axially preloaded to a defined value if the recommended precision locknuts are used and the correct nut tightening torque is applied. The resultant axial bearing load $F_{a\ res}$ is determined from the axial operating load F_{ab} and taking account of the axial preload according to *Figure 11* to *Figure 15*, page 912 and page 913. For series 7602, 7603 and BSB, the $F_{a\ res}$ diagrams are based on two-bearing sets in an O or X arrangement, *Figure 7*, page 906. For calculation of other set combinations, please contact us.

Caution!

A load in excess of the limit value will lead to the rolling element row without load lifting off the raceway. As a result, higher wear will occur under rapid acceleration. For extreme moment loads and statically overdefined systems (locating/locating bearing arrangements), please contact us. The calculation program BEARINX® can give a precise design in this case.

Axial and radial operating loads

Under purely axial load, $P = F_{a\ res}$. If additional radial operating loads are present, the equivalent bearing load P must be calculated using the following formula:

$$P = X \cdot F_r + Y \cdot F_{a\ res}$$

The values X and Y are given in the following table:

Factors X and Y

| Load ratio | Factor | |
|------------------------------------|--------|------|
| | X | Y |
| $\frac{F_{a\ res}}{F_r} \leq 2,17$ | 1,9 | 0,55 |
| $\frac{F_{a\ res}}{F_r} > 2,17$ | 0,92 | 1 |



Load varying in steps

If the load values vary in steps, the equivalent load P and speed n are calculated using the following formulae (q = time duration %):

$$P = \sqrt{\frac{q_1 \cdot n_1 \cdot P_1^p + \dots + q_z \cdot n_z \cdot P_z^p}{q_1 \cdot n_1 + \dots + q_z \cdot n_z}}$$

$$n = \frac{q_1 \cdot n_1 + \dots + q_z \cdot n_z}{100}$$

Static load safety factor

The static load safety factor S_0 indicates the security against impermissible permanent deformations in the bearing.

It is determined using the following formula:

$$S_0 = \frac{C_0}{P_0}$$

S_0
Static load safety factor

C_{0r}, C_{0a}
Basic static radial or axial load rating according to dimension table

C_{0r} is valid for a contact angle $\alpha \leq 45^\circ$, C_{0a} is valid for a contact angle $\alpha > 45^\circ$

P_0
Maximum static load of bearing.

Caution!

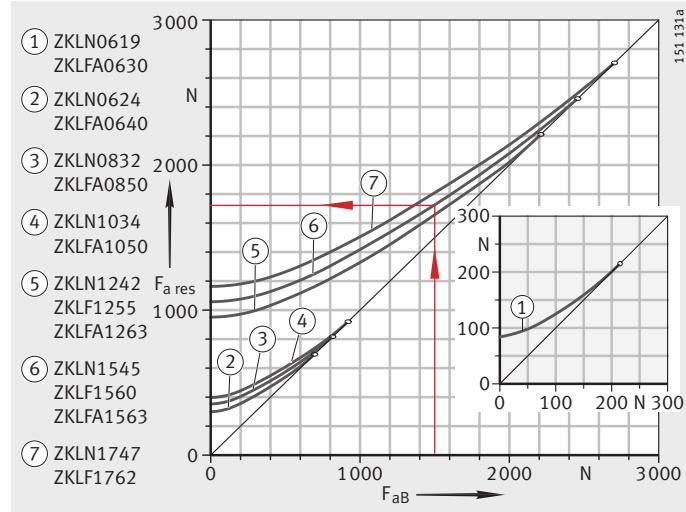
In machine tools, S_0 should be ≥ 4 .

Axial angular contact ball bearings

Resultant bearing load – diagrams

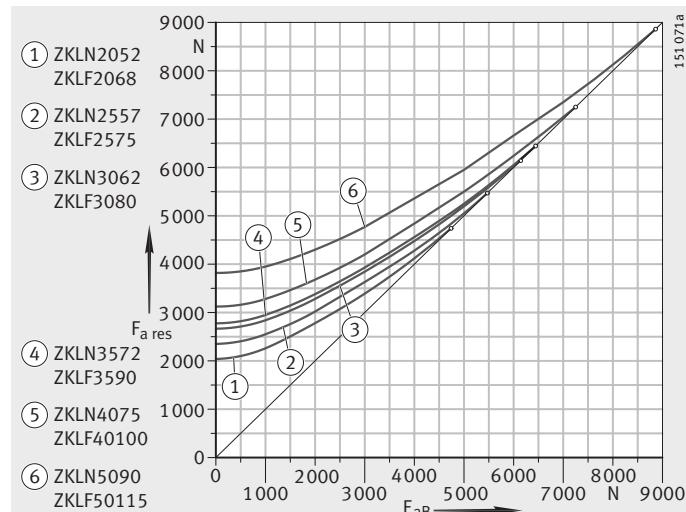
Example 1
Bearing ZKLN1545
Axial operating load F_{aB} = 1,5 kN
 $F_{a\text{res}}$ = approx. 1,75 kN
Loading by operating load and preload
 F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
° = limit value

Figure 11
Resultant bearing load
ZKLN, ZKLF and ZKLFA,
up to $d = 17$ mm



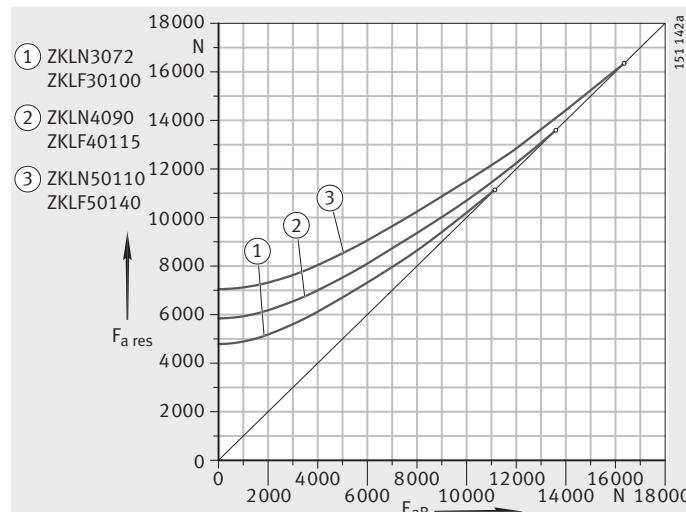
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
° = limit value

Figure 12
Resultant bearing load
ZKLN, ZKLF,
from $d = 20$ mm to 50 mm



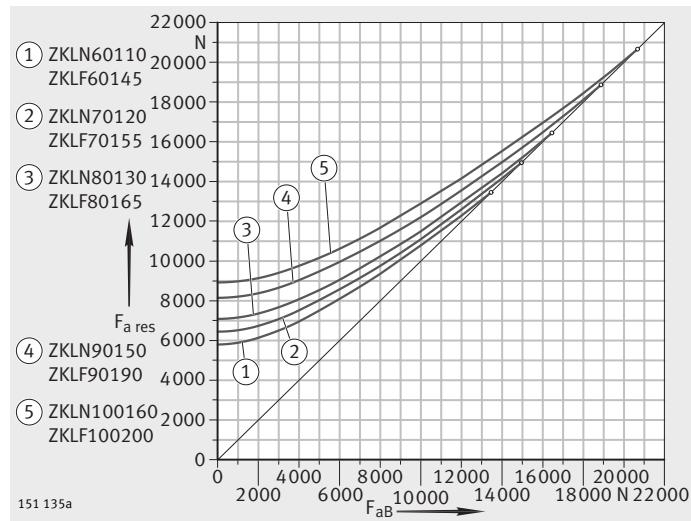
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
° = limit value

Figure 13
Resultant bearing load
ZKLN, ZKLF, heavy series



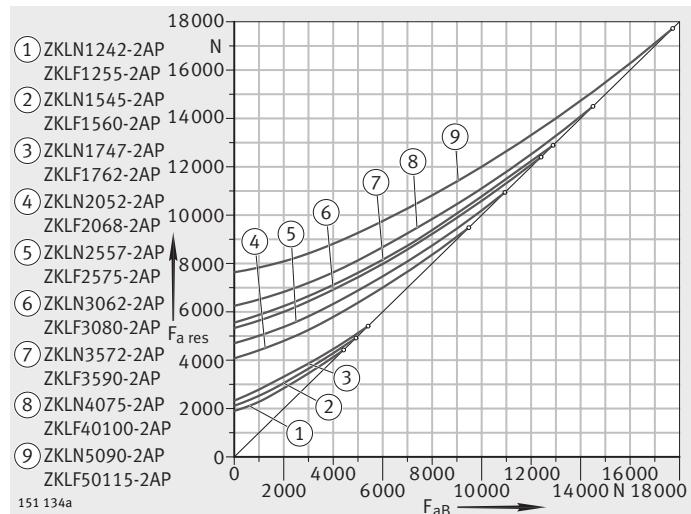
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

Figure 14
Resultant bearing load
ZKLN, ZKLF, from $d = 60$ mm



F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

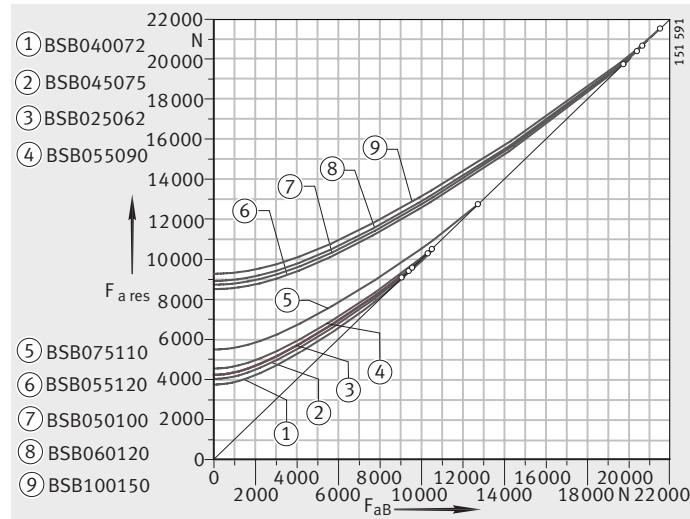
Figure 15
Resultant bearing load
ZKLN..-2AP and ZKLF..-2AP



Axial angular contact ball bearings

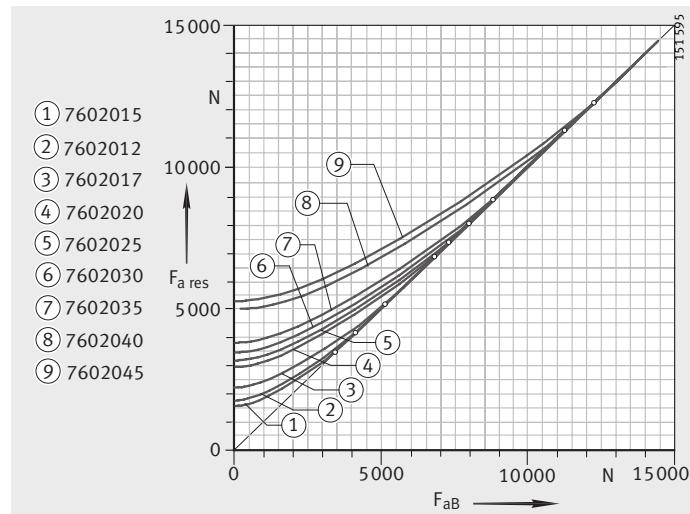
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

Figure 16
Resultant bearing load
BSB



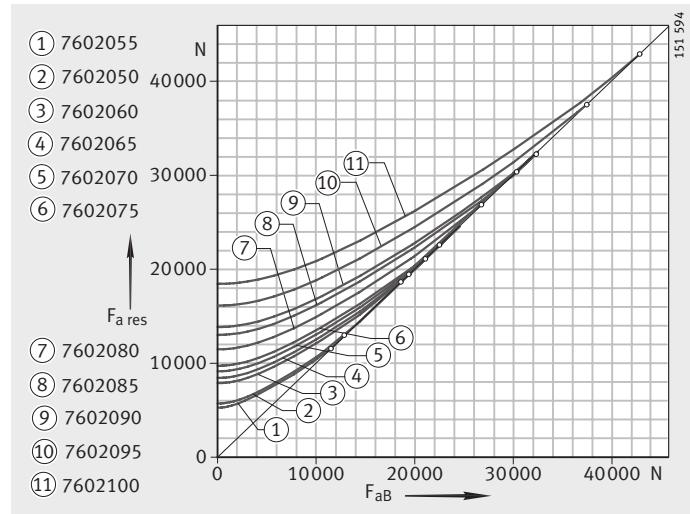
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

Figure 17
Resultant bearing load
7602012 to 7602045



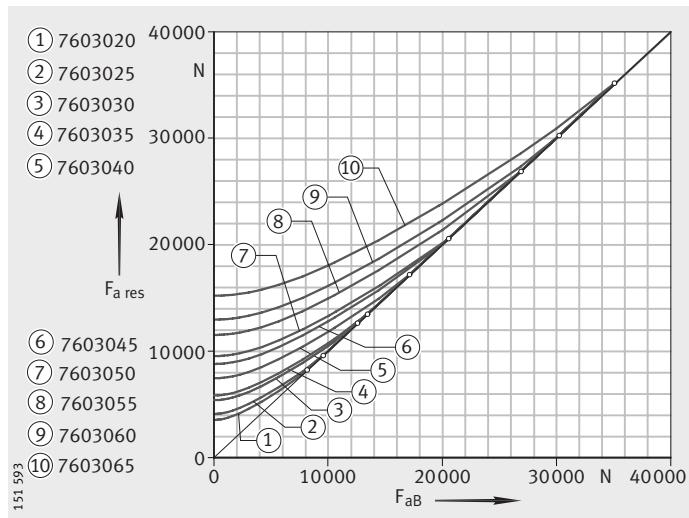
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

Figure 18
Resultant bearing load
7602050 to 7602100



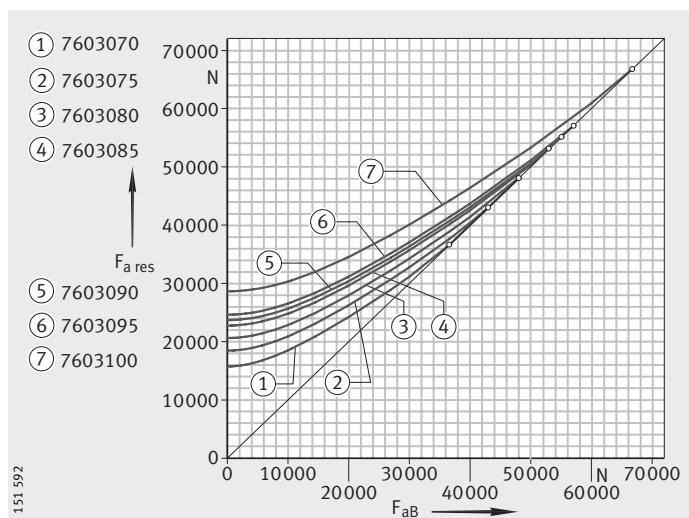
F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

Figure 19
Resultant bearing load
7603020 to 7603065



F_{aB} = operating load
 $F_{a\text{res}}$ = resultant bearing load
 \circ = limit value

Figure 20
Resultant bearing load
7603070 to 7603100

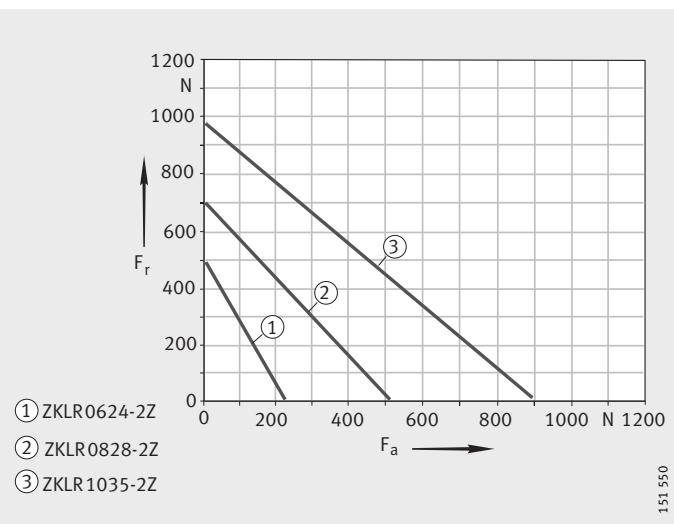


Axial angular contact ball bearings

F_r = radial load
 F_a = axial load

Figure 21

Static limiting load diagrams ZKLR

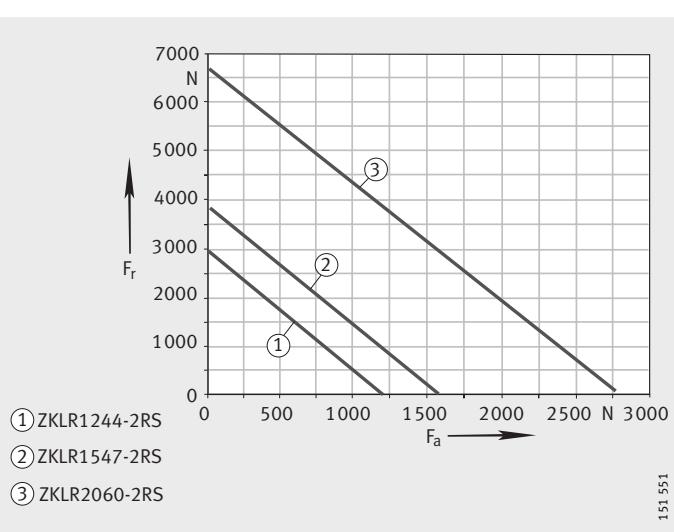


151 550

F_r = radial load
 F_a = axial load

Figure 22

Static limiting load diagrams ZKLR



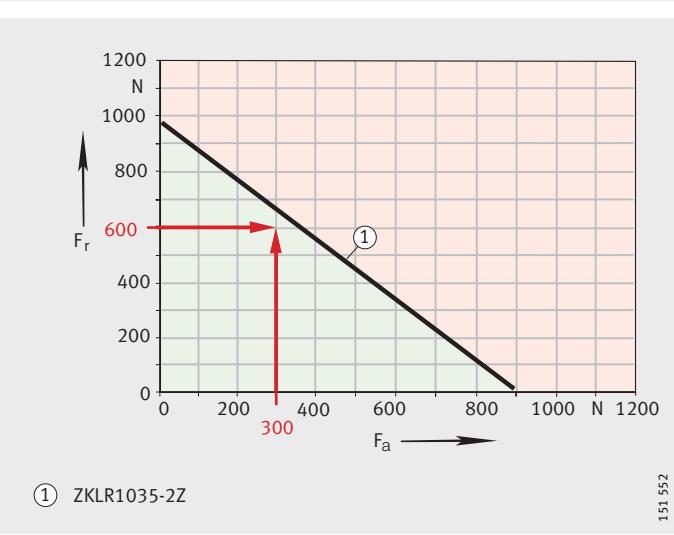
151 551

$F_r = 600$ N
 $F_a = 300$ N

Bearing is suitable in static terms since the intersection F_a/F_r is below the limit line.

Figure 23

Static limiting load diagram – example ZKLR1035-2Z



151 552

Maximum radial load on screw connections for ZKLF

If bearings of series ZKLF are screw mounted on a flat adjacent construction, the maximum radial load that can be supported by the screw connections must be taken into consideration.

If the screws used are as stated in the dimension tables to DIN EN ISO 4 762, the maximum radial load that can be supported before the outer ring moves is restricted to approx. $0,1 \times C_{0a}$. If the outer ring is additionally bonded in place, for example using Loctite 638, the maximum radial load that can be supported increases to approx. $0,5 \times C_{0a}$.

If the maximum radial loads that can be supported (without any axial load content) are considered in relation to the rolling element set, it can be seen that:

- With a static load safety factor of $S_0 \geq 4$ as required for machine tools, the load that can be supported by the screw connections of the outer ring is in any case greater than the radial load restricted by the rolling element set.

This means that (at least in theory) radial loads can be supported that, in relation to the rolling element set, will lead to a static load safety factor of $S_0 \leq 1$ (incipient plastic deformation of rolling elements), if the outer ring is additionally bonded in place.

This means that, under normal design criteria and with the decisive static load safety factor for the corresponding areas of application (e.g. $S_0 = 4$ for machine tools), the rolling element set is always the decisive criterion.



Permissible static axial load for ZKLF

For bearings of series ZKLF, the permissible static axial load in the direction of the screw connections, *Figure 24*, is:

$$P_{0\text{per}} \leq \frac{C_{0a}}{2}$$

The basic static axial load rating C_{0a} is stated in the dimension tables.

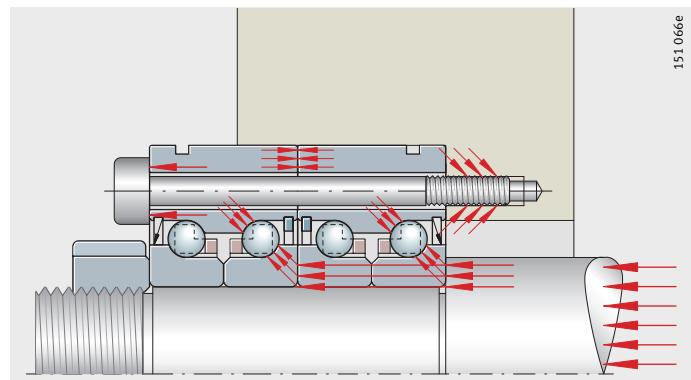


Figure 24

Static axial load in the direction of the screw connections

Axial angular contact ball bearings

| | |
|--|---|
| Design of adjacent construction | The adjacent construction (the shaft and housing) must be designed in accordance with the data in the dimension tables. The abutment diameters for the shaft and housing shoulders d_a and D_a must be in accordance with the dimension tables. |
| Caution! | D_a and d_a are recommended minimum abutment diameters. If these values are not used, the rib diameter d_1 according to the dimension table must be observed. |
| Matched bearings | In matched bearing pairs of series ZKLN and ZKLF, the depth of the housing bore must be defined such that the outer ring of the outermost bearing is radially supported to at least $\frac{1}{4}$ of its width. |
| Speeds | The limiting speeds n_G given in the dimension tables are based on the following conditions: <ul style="list-style-type: none">■ bearing preloaded, no external operating load■ operating duration 25%■ max. equilibrium temperature +50 °C. Under favourable environmental influences, a bearing with gap seals (suffix 2Z) can be used instead of contact seals. The limiting speed of these bearings is approximately twice that of axial angular contact ball bearings with contact seals. |
| Friction | In most applications, preloading of bearings by means of the locknut tightening torque gives sufficiently accurate setting values. The reference here is the tightening torque M_A according to the dimension table in conjunction with an INA precision locknut. The frictional torque M_{RL} given in the dimension tables is a guide value. The frictional torques are based, for bearings of series ZKLN, ZKLF, ZKLFA, DKLFA, 7602..-2RS, 7603..-2RS, BSB..-2RS and ZKLR on grease lubrication, measured at a speed of $n = 5 \text{ min}^{-1}$. For unsealed bearings of series 7602, 7603 and BSB, the frictional torque M_{RL} is based on lightly oiled raceways. For dimensioning of the drive, the starting frictional torque and the frictional torque at high speeds of 2 to $3 \times M_{RL}$ must be taken into consideration. |
| Seal friction | In axial angular contact ball bearings with contact seals (suffix 2RS), the extent of seal friction must not be neglected. Sealing influences the limiting speeds. |
| Frictional energy | The frictional energy N_R of the bearings can be calculated as follows: $N_R = \frac{M_{RL} \cdot n}{9,55}$ <p style="margin-left: 150px;">N_R Frictional energy M_{RL} Bearing frictional torque n Operating speed.</p> <p>In any analysis of the thermal balance, the various operating speeds n_i must be taken into consideration with their time durations q_i.</p> |

| | |
|-------------------------------|--|
| Lubrication | Bearings for screw drives can be lubricated with grease or oil. In machine tools, however, the mean bearing temperature should not exceed +50 °C. If this is the case, a lubrication method without heat dissipation such as grease lubrication or oil impulse lubrication can be selected. |
| Caution! | For higher bearing temperatures and unsealed bearings, recirculating oil lubrication should be used. |
| Grease lubrication | Bearings with a relubrication facility of series ZKLN, ZKLF, ZKLFA and DKLFA are greased with a lithium soap grease to GA28 and are preferably run with grease lubrication. In most cases, the initial greasing is sufficient for the whole operating life of the bearing. Under certain application conditions, relubrication may be necessary. In this case, Arcanol MULTITOP is suitable. The initial greasing is compatible with greases with a mineral oil base. For checking by calculation of the grease operating life or relubrication interval, please contact us. |
| Relubrication interval | The relubrication intervals cannot be determined precisely in advance. They are dependent to a significant extent on the operating conditions and the environmental influences such as temperature, contamination, dust, water, etc. |
| Caution! | <p>Bearings must always be relubricated:</p> <ul style="list-style-type: none"> ■ before and after long stoppage periods ■ in conditions of high humidity ■ within the defined lubrication intervals as stated in the technical proposal letter. <p>For the following conditions, please contact us:</p> <ul style="list-style-type: none"> ■ if the bearings are stationary ■ vibrations ■ very small oscillating movements. |
| Relubrication quantity | If bearings of series ZKLN, ZKLF, ZKLFA and DKLFA must be relubricated due to the application conditions, please contact us regarding the relubrication quantities. |
| Oil lubrication | Other lubrication methods such as oil impulse lubrication or recirculating oil lubrication are also possible. For oil lubrication, good results have been obtained with oils CLP to DIN 51517 and HLP to DIN 51524 in classes ISO VG 32 to ISO VG 100. If oil impulse lubrication is intended for series ZKLN and ZKLF, gap seals are advantageous. They prevent contamination entering the bearing and allow oil to leave the bearing. This prevents overlubrication. |



Axial angular contact ball bearings

Mounting guidelines

Caution!

Bearings should only be fitted and dismantled in accordance with the Fitting and Maintenance Manual TPI 100. This TPI is available upon request.

During fitting of bearings, mounting forces should be applied only to the bearing ring to be fitted. Mounting forces must never be directed through the rolling elements or sealing rings.

The characteristics of the bearings are only valid when used in combination with INA precision locknuts and the associated tightening torques given in the dimension tables.

Axial angular contact ball bearings are self-retaining and the individual bearing components are matched to each other. The inner rings must not be removed from the bearing during fitting and dismantling. If individual bearing components are removed from the bearing, please contact us before carrying out any reassembly.

Location of outer ring using ring nut for 7602, 7603, BSB

Axial angular contact ball bearings 7602, 7603 and BSB must be located clearance-free in the housing and on the shaft and must be axially preloaded during fitting. The axial preload force must be distributed evenly over the circumference in order to avoid deformation of the raceways.

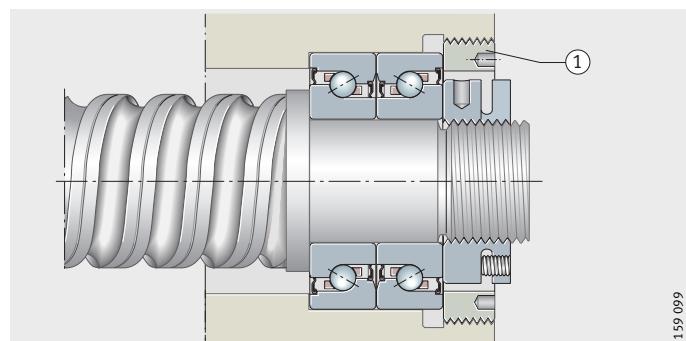
Outer rings are axially tensioned to the preload force given in the dimension table by means of a ring nut (not supplied), *Figure 25*. The ring nut must be secured against loosening (e.g. using Loctite 638).

Ring nuts with a runout of max. 5 μm apply the preload force evenly over the bearing rings and should therefore be used in preference to location by means of a cover.

① Ring nut
7602, 7603, BSB

Figure 25

Two-bearing set in O arrangement, locknut, ring nut



Location of outer ring using a cover

Clamping of the outer rings using a cover and cap screws leads to deformation of the raceways, *Figure 26*. In order to minimise the deformation and achieve the calculated life:

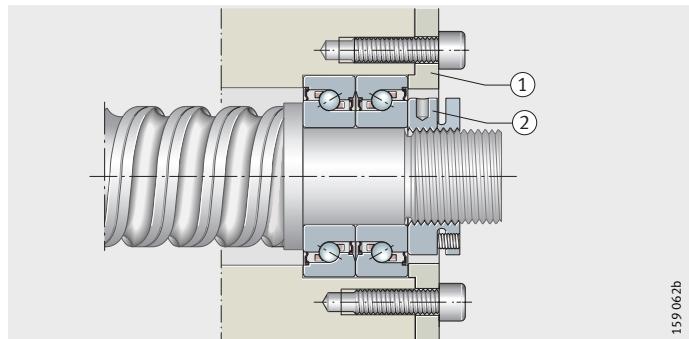
- the cover should be designed with adequate rigidity
- the number of fixing screws should be selected in accordance with the load but at least four should be used
- the screws should be tightened in a cross-wise sequence in four stages (finger tight, 40%, 70%, 100% of M_A).

Caution!

Observe the axial preload force in the dimension table. If other values are used, this will influence the bearing preload, bearing friction and heat generation in the bearing position.

① Cover
② Locknut
7602, 7603, BSB

Figure 26
Two-bearing set in O arrangement,
locknut, cover



159 062b

Location of inner ring using locknut

Axial angular contact ball bearings must be axially preloaded during fitting by means of a precision locknut.

When preloading the bearings by means of the bearing inner rings using the recommended precision locknut, the tightening torques given in the dimension tables must be observed. The tightening torques for the individual bearing sizes are only valid for the INA precision locknuts listed.

The preload force for series DKLFA is determined specifically on the basis of the operating conditions (load spectrum). Please contact us.

In order to counteract settling, it is recommended that the locknut should initially be tightened to twice the tightening torque M_A and then relieved of load again. It should only then be tightened again to the stated tightening torque M_A . Finally, the precision locknut should be secured against rotation by the torque-controlled tightening of the set screws.



The characteristics of the bearings are only valid if the preload forces specified in the dimension tables are observed.

The tightening torques for INA precision locknuts required for this purpose are also given in the dimension tables.

Caution!

If other suitable locknuts are used, the manufacturer's guidance on calculation of the necessary tightening torque should be observed. Only locknuts with a minimum accuracy of the end face to the thread of 5 μm should be used.

Fixing screws

The fixing screws for the outer ring must be tightened in a crosswise sequence. They may be loaded up to 70% of their elastic limit.

If the bearing outer ring is supported by an additional housing cover, it must be ensured that the fixing screws are sufficiently well dimensioned.

Axial angular contact ball bearings

Fitting of angular contact ball bearing units

Caution!

Angular contact ball bearing units ZKLR require no additional preload after fitting. They can often therefore be located on the spindle simply by means of clearance-free clamping.

The type of axial location depends on the load to be supported.

The adjacent construction can be a milled flat face or, if necessary, even an unmachined screw mounting surface without radial centring.

Fitting

Locate the bearing unit using a locknut ① or clearance-free clamping on the threaded spindle ②, Figure 27.

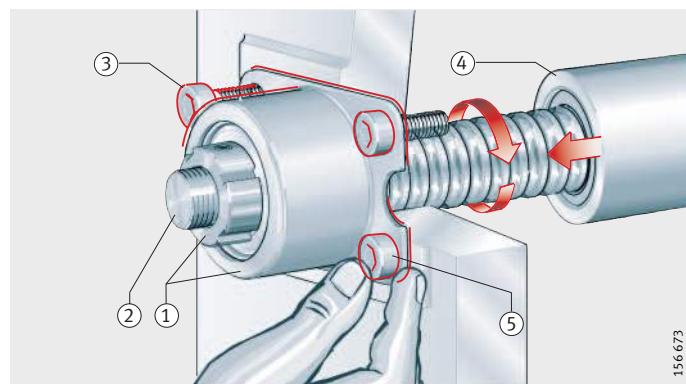
Screw mount the bearing unit on the adjacent construction; tighten the screws only finger tight ③.

Move the screw drive nut ④ towards the bearing unit (the position of the screw drive is the datum for the linear guidance system, the nut serves as a functional element for alignment). The bearing will align itself to the optimum radial position (due to the constraining forces exerted by the datum).

Screw the bearing unit to the adjacent construction using the tightening torque specified in the assembly drawing ⑤.

- ① Locknut
 - ② Threaded spindle
 - ③ Tightening of fixing screws finger tight
 - ④ Screw drive nut
 - ⑤ Tightening of fixing screws
- ZKLR

Figure 27
Fitting of bearing unit

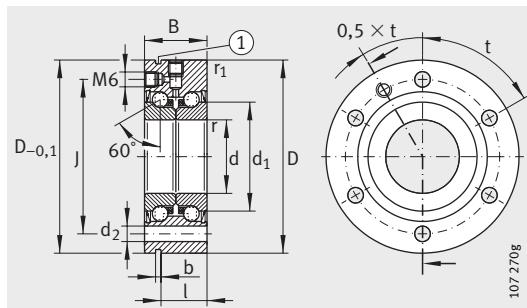


156 673



Axial angular contact ball bearings

For screw mounting



ZKLF..-2RS, ZKLF..-2Z, ($d \leq 50 \text{ mm}$)

(1) Extraction slot

Pitch t: see dimension table

Dimension table · Dimensions in mm

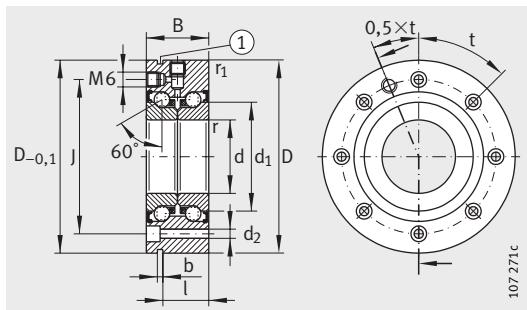
| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | Mounting dimensions | | Fixing screws ¹⁾ DIN 912-10.9 | |
|-----------------------------------|------------------|------------------|-----------|----|----------------|-----|----------------|-----|----------------|---|----|---------------------|----------------|---|----------|
| | | d | D | B | d ₁ | r | r ₁ | J | d ₂ | b | l | D _a | d _a | Size | Quantity |
| ZKLF1255-2RS | 0,37 | 12-0,005 | 55-0,01 | 25 | 25 | 0,3 | 0,6 | 42 | 6,8 | 3 | 17 | 33 | 16 | M6 | 3 |
| ZKLF1255-2Z | 0,37 | 12-0,005 | 55-0,01 | 25 | 25 | 0,3 | 0,6 | 42 | 6,8 | 3 | 17 | 33 | 16 | M6 | 3 |
| ZKLF1560-2RS | 0,43 | 15-0,005 | 60-0,01 | 25 | 28 | 0,3 | 0,6 | 46 | 6,8 | 3 | 17 | 35 | 20 | M6 | 3 |
| ZKLF1560-2Z | 0,43 | 15-0,005 | 60-0,01 | 25 | 28 | 0,3 | 0,6 | 46 | 6,8 | 3 | 17 | 35 | 20 | M6 | 3 |
| ZKLF1762-2RS | 0,45 | 17-0,005 | 62-0,01 | 25 | 30 | 0,3 | 0,6 | 48 | 6,8 | 3 | 17 | 37 | 23 | M6 | 3 |
| ZKLF1762-2Z | 0,45 | 17-0,005 | 62-0,01 | 25 | 30 | 0,3 | 0,6 | 48 | 6,8 | 3 | 17 | 37 | 23 | M6 | 3 |
| ZKLF2068-2RS | 0,61 | 20-0,005 | 68-0,01 | 28 | 34,5 | 0,3 | 0,6 | 53 | 6,8 | 3 | 19 | 43 | 25 | M6 | 4 |
| ZKLF2068-2Z | 0,61 | 20-0,005 | 68-0,01 | 28 | 34,5 | 0,3 | 0,6 | 53 | 6,8 | 3 | 19 | 43 | 25 | M6 | 4 |
| ZKLF2575-2RS | 0,72 | 25-0,005 | 75-0,01 | 28 | 40,5 | 0,3 | 0,6 | 58 | 6,8 | 3 | 19 | 48 | 32 | M6 | 4 |
| ZKLF2575-2Z | 0,72 | 25-0,005 | 75-0,01 | 28 | 40,5 | 0,3 | 0,6 | 58 | 6,8 | 3 | 19 | 48 | 32 | M6 | 4 |
| ZKLF3080-2RS | 0,78 | 30-0,005 | 80-0,01 | 28 | 45,5 | 0,3 | 0,6 | 63 | 6,8 | 3 | 19 | 53 | 40 | M6 | 6 |
| ZKLF3080-2Z | 0,78 | 30-0,005 | 80-0,01 | 28 | 45,5 | 0,3 | 0,6 | 63 | 6,8 | 3 | 19 | 53 | 40 | M6 | 6 |
| ZKLF30100-2RS³⁾ | 1,63 | 30-0,005 | 100-0,01 | 38 | 51 | 0,3 | 0,6 | 80 | 8,8 | 3 | 30 | 64 | 47 | M8 | 8 |
| ZKLF30100-2Z | 1,63 | 30-0,005 | 100-0,01 | 38 | 51 | 0,3 | 0,6 | 80 | 8,8 | 3 | 30 | 64 | 47 | M8 | 8 |
| ZKLF3590-2RS | 1,13 | 35-0,005 | 90-0,01 | 34 | 52 | 0,3 | 0,6 | 75 | 8,8 | 3 | 25 | 62 | 45 | M8 | 4 |
| ZKLF3590-2Z | 1,13 | 35-0,005 | 90-0,01 | 34 | 52 | 0,3 | 0,6 | 75 | 8,8 | 3 | 25 | 62 | 45 | M8 | 4 |
| ZKLF40100-2RS | 1,46 | 40-0,005 | 100-0,01 | 34 | 58 | 0,3 | 0,6 | 80 | 8,8 | 3 | 25 | 67 | 50 | M8 | 4 |
| ZKLF40100-2Z | 1,46 | 40-0,005 | 100-0,01 | 34 | 58 | 0,3 | 0,6 | 80 | 8,8 | 3 | 25 | 67 | 50 | M8 | 4 |
| ZKLF40115-2RS³⁾ | 2,2 | 40-0,005 | 115-0,01 | 46 | 65 | 0,6 | 0,6 | 94 | 8,8 | 3 | 36 | 80 | 56 | M8 | 12 |
| ZKLF40115-2Z³⁾ | 2,2 | 40-0,005 | 115-0,01 | 46 | 65 | 0,6 | 0,6 | 94 | 8,8 | 3 | 36 | 80 | 56 | M8 | 12 |
| ZKLF50115-2RS | 1,86 | 50-0,005 | 115-0,01 | 34 | 72 | 0,3 | 0,6 | 94 | 8,8 | 3 | 25 | 82 | 63 | M8 | 6 |
| ZKLF50115-2Z | 1,86 | 50-0,005 | 115-0,01 | 34 | 72 | 0,3 | 0,6 | 94 | 8,8 | 3 | 25 | 82 | 63 | M8 | 6 |
| ZKLF50140-2RS³⁾ | 4,7 | 50-0,005 | 140-0,01 | 54 | 80 | 0,6 | 0,6 | 113 | 11 | 3 | 45 | 98 | 63 | M10 | 12 |
| ZKLF50140-2Z³⁾ | 4,7 | 50-0,005 | 140-0,01 | 54 | 80 | 0,6 | 0,6 | 113 | 11 | 3 | 45 | 98 | 63 | M10 | 12 |
| ZKLF60145-2Z | 4,3 | 60-0,005 | 145-0,015 | 45 | 85 | 0,6 | 0,6 | 120 | 8,8 | 3 | 35 | 100 | 82 | M8 | 8 |
| ZKLF70155-2Z | 4,9 | 70-0,008 | 155-0,015 | 45 | 85 | 0,6 | 0,6 | 130 | 8,8 | 3 | 35 | 110 | 92 | M8 | 8 |
| ZKLF80165-2Z | 5,3 | 80-0,008 | 165-0,015 | 45 | 105 | 0,6 | 0,6 | 140 | 8,8 | 3 | 35 | 120 | 102 | M8 | 8 |
| ZKLF90190-2Z | 8,7 | 90-0,008 | 190-0,015 | 55 | 120 | 0,6 | 0,6 | 165 | 11 | 3 | 45 | 138 | 116 | M10 | 8 |
| ZKLF100200-2Z | 9,3 | 100-0,008 | 200-0,015 | 55 | 132 | 0,6 | 0,6 | 175 | 11 | 3 | 45 | 150 | 128 | M10 | 8 |

¹⁾ Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

²⁾ Mass moment of inertia for rotating inner ring.

³⁾ Heavy series.

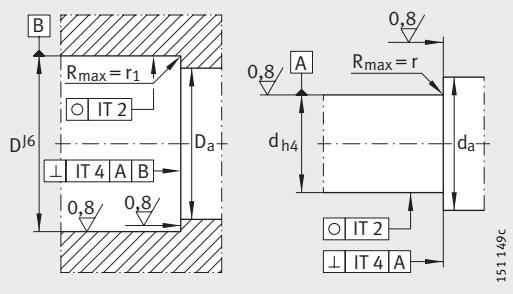
⁴⁾ Only valid in conjunction with INA precision locknuts.



ZKLF..-2Z, (60 mm \leq d \leq 100 mm)

① Extraction slot

Pitch t: see dimension table



Design of adjacent construction

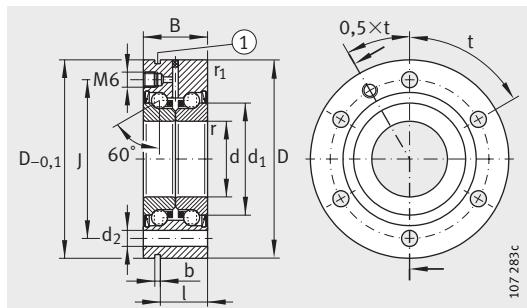
| Pitch t | Basic load ratings axial | | Limiting speed n_G grease | Bearing frictional torque M_{RL} | Rigid- ity axial c_{aL} | Tilting rigid- ity c_{KL} | Mass moment of inertia ²⁾ M_m | Axial runout μm | Recommended INA locknut; to be ordered separately | | | |
|-------------------|-----------------------------|-------------------|--------------------------------------|---|------------------------------------|--------------------------------------|---|----------------------------------|--|--|-------------------------------------|--------|
| | dyn. C_a | stat. C_{0a} | | | | | | | Designation | Tight- ening torque ⁴⁾ M_A Nm | Axial pre- load force N | |
| Quan- tity x t | N | N | min ⁻¹ | Nm | N/μm | Nm/ mrad | kg · cm ² | μm | | | | |
| 3X120° | 16 900 | 24 700 | 3 800 | 0,16 | 375 | 50 | 0,068 | 2 | ZM12 | — | 8 | 5 038 |
| 3X120° | 16 900 | 24 700 | 7 600 | 0,08 | 375 | 50 | 0,068 | 2 | ZM12 | — | 8 | 5 038 |
| 3X120° | 17 900 | 28 000 | 3 500 | 0,2 | 400 | 65 | 0,102 | 2 | ZM15 | AM15 | 10 | 5 484 |
| 3X120° | 17 900 | 28 000 | 7 000 | 0,1 | 400 | 65 | 0,102 | 2 | ZM15 | AM15 | 10 | 5 484 |
| 3X120° | 18 800 | 31 000 | 3 300 | 0,24 | 450 | 80 | 0,132 | 2 | ZM17 | AM17 | 15 | 7 157 |
| 3X120° | 18 800 | 31 000 | 6 600 | 0,12 | 450 | 80 | 0,132 | 2 | ZM17 | AM17 | 15 | 7 157 |
| 4X 90° | 26 000 | 47 000 | 3 000 | 0,3 | 650 | 140 | 0,273 | 2 | ZM20 | AM20 | 18 | 9 079 |
| 4X 90° | 26 000 | 47 000 | 5 400 | 0,15 | 650 | 140 | 0,273 | 2 | ZM20 | AM20 | 18 | 9 079 |
| 4X 90° | 27 500 | 55 000 | 2 600 | 0,4 | 750 | 200 | 0,486 | 2 | ZM25 | AM25 | 25 | 9 410 |
| 4X 90° | 27 500 | 55 000 | 4 700 | 0,2 | 750 | 200 | 0,486 | 2 | ZM25 | AM25 | 25 | 9 410 |
| 6X 60° | 29 000 | 64 000 | 2 200 | 0,5 | 850 | 300 | 0,73 | 2,5 | ZM30 | AM30 | 32 | 10 451 |
| 6X 60° | 29 000 | 64 000 | 4 300 | 0,25 | 850 | 300 | 0,73 | 2,5 | ZM30 | AM30 | 32 | 10 451 |
| 8X 45° | 59 000 | 108 000 | 2 100 | 0,8 | 950 | 400 | 1,91 | 2,5 | ZMA30/52 | AM30 | 65 | 19 509 |
| 8X 45° | 59 000 | 108 000 | 4 000 | 0,4 | 950 | 400 | 1,91 | 2,5 | ZMA30/52 | AM30 | 65 | 19 509 |
| 4X 90° | 41 000 | 89 000 | 2 000 | 0,6 | 900 | 400 | 1,51 | 2,5 | ZM35 | AM35/58 | 40 | 10 770 |
| 4X 90° | 41 000 | 89 000 | 3 800 | 0,3 | 900 | 400 | 1,51 | 2,5 | ZM35 | AM35/58 | 40 | 10 770 |
| 4X 90° | 43 000 | 101 000 | 1 800 | 0,7 | 1 000 | 550 | 2,26 | 2,5 | ZM40 | AM40 | 55 | 13 412 |
| 4X 90° | 43 000 | 101 000 | 3 300 | 0,35 | 1 000 | 550 | 2,26 | 2,5 | ZM40 | AM40 | 55 | 13 412 |
| 12X 30° | 72 000 | 149 000 | 1 600 | 1,3 | 1 200 | 750 | 5,5 | 2,5 | ZMA40/62 | AM40 | 110 | 25 185 |
| 12X 30° | 72 000 | 149 000 | 3 100 | 0,65 | 1 200 | 750 | 5,5 | 2,5 | ZMA40/62 | AM40 | 110 | 25 815 |
| 6X 60° | 46 500 | 126 000 | 1 500 | 0,9 | 1 250 | 1 000 | 5,24 | 2,5 | ZM50 | AM50 | 85 | 17 009 |
| 6X 60° | 46 500 | 126 000 | 3 000 | 0,45 | 1 250 | 1 000 | 5,24 | 2,5 | ZM50 | AM50 | 85 | 17 009 |
| 12X 30° | 113 000 | 250 000 | 1 200 | 2,6 | 1 400 | 1 500 | 15,2 | 2,5 | ZMA50/75 | AM50 | 150 | 29 436 |
| 12X 30° | 113 000 | 250 000 | 2 500 | 1,3 | 1 400 | 1 500 | 15,2 | 2,5 | ZMA50/75 | AM50 | 150 | 29 436 |
| 8X 45° | 84 000 | 214 000 | 3 000 | 1 | 1 300 | 1 650 | 13,7 | 3 | ZMA60/98 | AM60 | 100 | 17 893 |
| 8X 45° | 88 000 | 241 000 | 2 800 | 1,2 | 1 450 | 2 250 | 19,8 | 3 | ZMA70/110 | AM70 | 130 | 19 717 |
| 8X 45° | 91 000 | 265 000 | 2 700 | 1,4 | 1 600 | 3 000 | 27,6 | 3 | ZMA80/120 | AM80 | 160 | 20 604 |
| 8X 45° | 135 000 | 395 000 | 2 300 | 2,3 | 1 700 | 4 400 | 59,9 | 3 | ZMA90/130 | AM90 | 200 | 25 198 |
| 8X 45° | 140 000 | 435 000 | 2 150 | 2,6 | 1 900 | 5 800 | 85,3 | 3 | ZMA100/140 | AM100 | 250 | 28 760 |



Axial angular contact ball bearings

For screw mounting

Less stringent tolerances



ZKLF..-2RS-PE

① Extraction slot

Pitch t: see dimension table

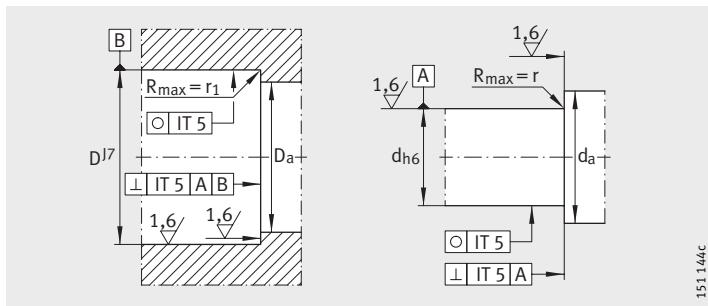
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | Mounting dimensions | | Fixing screws ¹⁾ DIN 912-10.9 | |
|-------------------------|------------------|------------|-----------------------|----|----------------|-----------|------------------------|----|----------------|---|----|---------------------|----------------|---|------|
| | | d -0,01 | D -0,25 | B | d ₁ | r min. | r ₁ min. | J | d ₂ | b | l | D _a | d _a | max. | min. |
| ZKLF1255-2RS-PE | 0,37 | 12 | 55 _{-0,013} | 25 | 25 | 0,3 | 0,6 | 42 | 6,8 | 3 | 17 | 33 | 16 | M6 | 3 |
| ZKLF1560-2RS-PE | 0,43 | 15 | 60 _{-0,013} | 25 | 28 | 0,3 | 0,6 | 46 | 6,8 | 3 | 17 | 35 | 20 | M6 | 3 |
| ZKLF1762-2RS-PE | 0,45 | 17 | 62 _{-0,013} | 25 | 30 | 0,3 | 0,6 | 48 | 6,8 | 3 | 17 | 37 | 23 | M6 | 3 |
| ZKLF2068-2RS-PE | 0,61 | 20 | 68 _{-0,013} | 28 | 34,5 | 0,3 | 0,6 | 53 | 6,8 | 3 | 19 | 43 | 25 | M6 | 4 |
| ZKLF2575-2RS-PE | 0,72 | 25 | 75 _{-0,013} | 28 | 40,5 | 0,3 | 0,6 | 58 | 6,8 | 3 | 19 | 48 | 32 | M6 | 4 |
| ZKLF3080-2RS-PE | 0,78 | 30 | 80 _{-0,013} | 28 | 45,5 | 0,3 | 0,6 | 63 | 6,8 | 3 | 19 | 53 | 40 | M6 | 6 |
| ZKLF3590-2RS-PE | 1,13 | 35 | 90 _{-0,015} | 34 | 52 | 0,3 | 6,8 | 75 | 8,8 | 3 | 25 | 62 | 45 | M8 | 4 |
| ZKLF40100-2RS-PE | 1,46 | 40 | 100 _{-0,015} | 34 | 58 | 0,3 | 6,8 | 80 | 8,8 | 3 | 25 | 67 | 50 | M8 | 4 |
| ZKLF50115-2RS-PE | 1,86 | 50 | 115 _{-0,015} | 34 | 72 | 0,3 | 6,8 | 94 | 8,8 | 3 | 25 | 82 | 63 | M8 | 6 |

1)
Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

2)
Mass moment of inertia for rotating inner ring.

3)
Only valid in conjunction with INA precision locknuts.



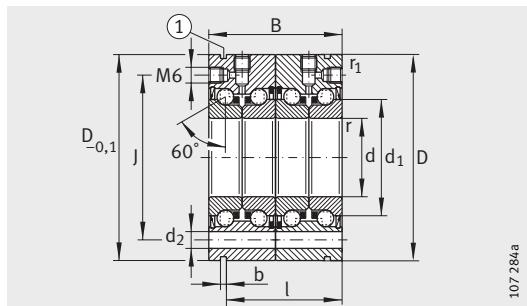
Design of adjacent construction

| Pitch t | Basic load ratings axial | | Limiting speed n_G grease | Bearing frictional torque M_{RL} | Rigid- ity axial c_{aL} | Tilting rigidity c_{kL} | Mass moment of inertia ²⁾ M_m | Axial runout | Recommended INA locknut; to be ordered separately | | |
|--------------|-----------------------------|-------------------|--------------------------------------|---|------------------------------------|---------------------------------|---|-----------------|--|--|-------------------------------------|
| | dyn. C_a | stat. C_{0a} | | | | | | | Designation | Tight- ening torque ³⁾ M_A Nm | Axial pre- load force N |
| Quantity x t | N | N | min ⁻¹ | Nm | N/μm | Nm/ mrad | kg · cm ² | μm | | | |
| 3X120° | 16 900 | 24 700 | 3800 | 0,16 | 375 | 50 | 0,068 | 5 | ZM12 – | 8 | 5 038 |
| 3X120° | 17 900 | 28 000 | 3500 | 0,2 | 400 | 65 | 0,102 | 5 | ZM15 AM15 | 10 | 5 484 |
| 3X120° | 18 800 | 31 000 | 3300 | 0,24 | 450 | 80 | 0,132 | 5 | ZM17 AM17 | 15 | 7 157 |
| 4X 90° | 26 000 | 47 000 | 3000 | 0,3 | 650 | 140 | 0,273 | 5 | ZM20 AM20 | 18 | 9 079 |
| 4X 90° | 27 500 | 55 000 | 2600 | 0,4 | 750 | 200 | 0,486 | 5 | ZM25 AM25 | 25 | 9 410 |
| 6X 60° | 29 000 | 64 000 | 2200 | 0,5 | 850 | 300 | 0,73 | 5 | ZM30 AM30 | 32 | 10 451 |
| 4X 90° | 41 000 | 89 000 | 2000 | 0,6 | 900 | 400 | 1,51 | 5 | ZM35 AM35/58 | 40 | 10 770 |
| 4X 90° | 43 000 | 101 000 | 1800 | 0,7 | 1000 | 550 | 2,26 | 5 | ZM40 AM40 | 55 | 13 412 |
| 6X 60° | 46 500 | 126 000 | 1500 | 0,9 | 1250 | 1000 | 5,24 | 5 | ZM50 AM50 | 85 | 17 009 |



Axial angular contact ball bearings

For screw mounting
Matched pair



ZKLF..-2RS-2AP
① Extraction slot

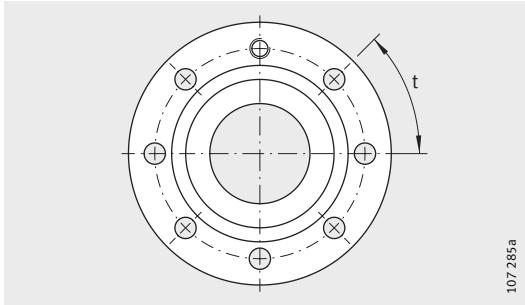
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | Mounting dimensions | | Fixing screws ¹⁾ DIN 912-10.9 | |
|--------------------------|------------------|------------|-----|----|------|----------------|-----|----------------|-----|----------------|---|----|---------------------|----------------|---|----------|
| | | | d | D | B | d ₁ | r | r ₁ | J | d ₂ | l | b | D _a | d _a | Size | Quantity |
| ZKLF1762-2RS-2AP | 0,9 | 17 | 62 | 50 | 30 | 0,3 | 0,6 | 48 | 6,8 | 42 | 3 | 37 | 23 | M6X60 | 5 | |
| ZKLF2068-2RS-2AP | 1,22 | 20 | 68 | 56 | 34,5 | 0,3 | 0,6 | 53 | 6,8 | 47 | 3 | 43 | 25 | M6X70 | 7 | |
| ZKLF2575-2RS-2AP | 1,44 | 25 | 75 | 56 | 40,5 | 0,3 | 0,6 | 58 | 6,8 | 47 | 3 | 48 | 32 | M6X70 | 7 | |
| ZKLF3080-2RS-2AP | 1,56 | 30 | 80 | 56 | 45,5 | 0,3 | 0,6 | 63 | 6,8 | 47 | 3 | 53 | 40 | M6X70 | 11 | |
| ZKLF3590-2RS-2AP | 2,26 | 35 | 90 | 68 | 52 | 0,3 | 0,6 | 75 | 8,8 | 59 | 3 | 62 | 45 | M8X80 | 7 | |
| ZKLF40100-2RS-2AP | 2,92 | 40 | 100 | 68 | 58 | 0,3 | 0,6 | 80 | 8,8 | 59 | 3 | 67 | 50 | M8X80 | 7 | |
| ZKLF50115-2RS-2AP | 3,72 | 50 | 115 | 68 | 72 | 0,3 | 0,6 | 94 | 8,8 | 59 | 3 | 82 | 63 | M8X80 | 11 | |

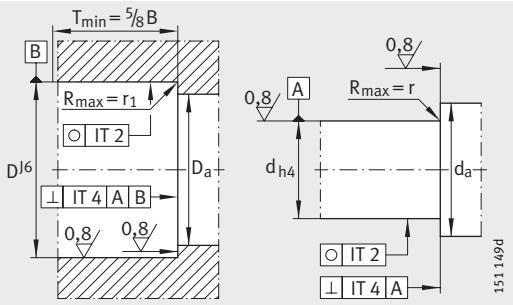
¹⁾ Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

²⁾ Mass moment of inertia for rotating inner ring.

³⁾ Only valid in conjunction with INA precision locknuts.



Hole pattern
Pitch t: see dimension table



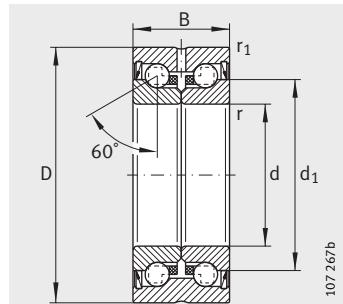
Design of adjacent construction

| Pitch t | Basic load ratings axial | | Limiting speed n_G grease | Bearing frictional torque M_{RL} | Rigid- ity axial c_{aL} | Tilting rigidity c_{kL} | Mass moment of inertia ²⁾ M_m | Axial runout μm | Recommended INA locknut; to be ordered separately | | |
|------------------|-----------------------------|-------------------|--------------------------------------|---|------------------------------------|---------------------------------|---|----------------------------------|--|---|-------------------------------------|
| | dyn. C_a | stat. C_{0a} | | | | | | | Designation | Tight- ening torque ³⁾ $N\text{Nm}$ | Axial pre- load force N |
| Quantity Xt | N | N | min^{-1} | Nm | N/ μm | Nm/ mrad | $\text{kg} \cdot \text{cm}^2$ | μm | | | |
| 6X60° | 30 500 | 62 000 | 3300 | 0,36 | 800 | 200 | 0,264 | 2 | ZM17 AM17 | 15 | 7 157 |
| 8X45° | 42 000 | 94 000 | 3000 | 0,45 | 1150 | 320 | 0,564 | 2 | ZMA20/38 AM20 | 18 | 9 079 |
| 8X45° | 44 500 | 111 000 | 2600 | 0,6 | 1300 | 450 | 0,972 | 2 | ZMA25/45 AM25 | 25 | 9 410 |
| 12X30° | 47 500 | 127 000 | 2200 | 0,75 | 1500 | 620 | 1,46 | 2,5 | ZMA30/52 AM30 | 32 | 10 451 |
| 8X45° | 66 000 | 177 000 | 2000 | 0,9 | 1600 | 900 | 3,02 | 2,5 | ZMA35/58 AM35/58 | 40 | 10 770 |
| 8X45° | 70 000 | 202 000 | 1800 | 1,05 | 1750 | 1200 | 4,52 | 2,5 | ZMA40/62 AM40 | 55 | 13 412 |
| 12X30° | 76 000 | 250 000 | 1500 | 1,35 | 2200 | 2250 | 10,48 | 2,5 | ZMA50/75 AM50 | 85 | 17 009 |



Axial angular contact ball bearings

Not for screw mounting



ZKLN..-2RS

ZKLN..-2Z

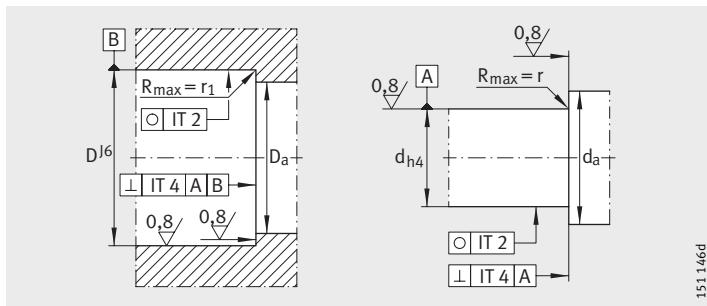
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | Mounting dimensions | | Basic load ratings axial | |
|----------------------------------|------------------|--------------------------------------|-------------|------------|----------------|-----------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|
| | | d -0,005 | D -0,010 | B -0,25 | d ₁ | r min. | r ₁ min. | D _a max. | d _a min. | dyn. C _a N | stat. C _{0a} N |
| ZKLN0619-2Z | 0,02 | 6^{+0,002} -0,003 | 19 | 12 | 12 | 0,3 | 0,3 | 16 | 9 | 4 900 | 6 100 |
| ZKLN0624-2RS | 0,03 | 6^{+0,002} -0,003 | 24 | 15 | 14 | 0,3 | 0,6 | 19 | 9 | 6 900 | 8 500 |
| ZKLN0624-2Z | 0,03 | 6^{+0,002} -0,003 | 24 | 15 | 14 | 0,3 | 0,6 | 19 | 9 | 6 900 | 8 500 |
| ZKLN0832-2RS | 0,09 | 8 | 32 | 20 | 19 | 0,3 | 0,6 | 26 | 11 | 12 500 | 16 300 |
| ZKLN0832-2Z | 0,09 | 8 | 32 | 20 | 19 | 0,3 | 0,6 | 26 | 11 | 12 500 | 16 300 |
| ZKLN1034-2RS | 0,1 | 10 | 34 | 20 | 21 | 0,3 | 0,6 | 28 | 14 | 13 400 | 18 800 |
| ZKLN1034-2Z | 0,1 | 10 | 34 | 20 | 21 | 0,3 | 0,6 | 28 | 14 | 13 400 | 18 800 |
| ZKLN1242-2RS | 0,2 | 12 | 42 | 25 | 25 | 0,3 | 0,6 | 33 | 16 | 17 000 | 24 700 |
| ZKLN1242-2Z | 0,2 | 12 | 42 | 25 | 25 | 0,3 | 0,6 | 33 | 16 | 17 000 | 24 700 |
| ZKLN1545-2RS | 0,21 | 15 | 45 | 25 | 28 | 0,3 | 0,6 | 35 | 20 | 17 900 | 28 000 |
| ZKLN1545-2Z | 0,21 | 15 | 45 | 25 | 28 | 0,3 | 0,6 | 35 | 20 | 17 900 | 28 000 |
| ZKLN1747-2RS | 0,22 | 17 | 47 | 25 | 30 | 0,3 | 0,6 | 37 | 23 | 18 800 | 31 000 |
| ZKLN1747-2Z | 0,22 | 17 | 47 | 25 | 30 | 0,3 | 0,6 | 37 | 23 | 18 800 | 31 000 |
| ZKLN2052-2RS | 0,31 | 20 | 52 | 28 | 34,5 | 0,3 | 0,6 | 43 | 25 | 26 000 | 47 000 |
| ZKLN2052-2Z | 0,31 | 20 | 52 | 28 | 34,5 | 0,3 | 0,6 | 43 | 26 | 26 000 | 47 000 |
| ZKLN2557-2RS | 0,34 | 25 | 57 | 28 | 40,5 | 0,3 | 0,6 | 48 | 32 | 27 500 | 55 000 |
| ZKLN2557-2Z | 0,34 | 25 | 57 | 28 | 40,5 | 0,3 | 0,6 | 48 | 32 | 27 500 | 55 000 |
| ZKLN3062-2RS | 0,39 | 30 | 62 | 28 | 45,5 | 0,3 | 0,6 | 53 | 40 | 29 000 | 64 000 |
| ZKLN3062-2Z | 0,39 | 30 | 62 | 28 | 45,5 | 0,3 | 0,6 | 53 | 40 | 29 000 | 64 000 |
| ZKLN3072-2RS²⁾ | 0,72 | 30 | 72 | 38 | 51 | 0,3 | 0,6 | 64 | 47 | 59 000 | 108 000 |
| ZKLN3072-2Z²⁾ | 0,72 | 30 | 72 | 38 | 51 | 0,3 | 0,6 | 64 | 47 | 59 000 | 108 000 |
| ZKLN3572-2RS | 0,51 | 35 | 72 | 34 | 52 | 0,3 | 0,6 | 62 | 45 | 41 000 | 89 000 |
| ZKLN3572-2Z | 0,51 | 35 | 72 | 34 | 52 | 0,3 | 0,6 | 62 | 45 | 41 000 | 89 000 |

¹⁾ Mass moment of inertia for rotating inner ring.

²⁾ Heavy series.

³⁾ Only valid in conjunction with INA precision locknuts.



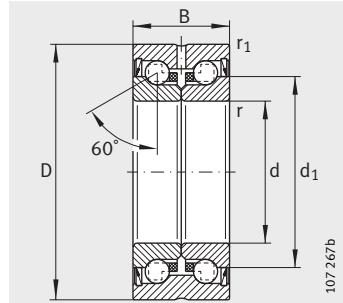
Design of adjacent construction

| Limiting speed n_G grease min ⁻¹ | Bearing frictional torque M_{RL} Nm | Rigidity axial C_{aL} N/ μ m | Tilting rigidity C_{kL} Nm/mrad | Mass moment of inertia ¹⁾ M_m kg · cm ² | Axial runout μ m | Recommended INA locknut; to be ordered separately | | |
|---|---|--|---|---|-------------------------|--|--|--------------------------|
| | | | | | | Designation | Tightening torque ³⁾ M_A Nm | Axial preload force N |
| 14 000 | 0,01 | 150 | 4 | 0,0019 | 2 | ZM06 | – | 916 |
| 6 800 | 0,04 | 200 | 8 | 0,0044 | 2 | ZM06 | – | 2 404 |
| 12 000 | 0,02 | 200 | 8 | 0,0044 | 2 | ZM06 | – | 2 404 |
| 5 100 | 0,08 | 250 | 20 | 0,02 | 2 | ZM08 | – | 4 |
| 9 500 | 0,04 | 250 | 20 | 0,02 | 2 | ZM08 | – | 2 216 |
| 4 600 | 0,12 | 325 | 25 | 0,029 | 2 | ZM10 | – | 4 891 |
| 8 600 | 0,06 | 325 | 25 | 0,029 | 2 | ZM10 | – | 4 891 |
| 3 800 | 0,16 | 375 | 50 | 0,068 | 2 | ZM12 | – | 5 038 |
| 7 600 | 0,08 | 375 | 50 | 0,068 | 2 | ZM12 | – | 5 038 |
| 3 500 | 0,2 | 400 | 65 | 0,102 | 2 | ZM15 | AM15 | 5 484 |
| 7 000 | 0,1 | 400 | 65 | 0,102 | 2 | ZM15 | AM15 | 5 484 |
| 3 300 | 0,24 | 450 | 80 | 0,132 | 2 | ZM17 | AM17 | 7 157 |
| 6 600 | 0,12 | 450 | 80 | 0,132 | 2 | ZM17 | AM17 | 7 157 |
| 3 000 | 0,3 | 650 | 140 | 0,273 | 2 | ZM20 | AM20 | 9 079 |
| 5 400 | 0,15 | 650 | 140 | 0,273 | 2 | ZM20 | AM20 | 9 079 |
| 2 600 | 0,4 | 750 | 200 | 0,486 | 2 | ZM25 | AM25 | 9 410 |
| 4 700 | 0,2 | 750 | 200 | 0,486 | 2 | ZM25 | AM25 | 9 410 |
| 2 200 | 0,5 | 850 | 300 | 0,73 | 2,5 | ZM30 | AM30 | 10 451 |
| 4 300 | 0,25 | 850 | 300 | 0,73 | 2,5 | ZM30 | AM30 | 10 451 |
| 2 100 | 0,8 | 950 | 400 | 1,91 | 2,5 | ZMA30/52 | AM30 | 19 509 |
| 4 000 | 0,4 | 950 | 400 | 1,91 | 2,5 | ZMA30/52 | AM30 | 19 509 |
| 2 000 | 0,6 | 900 | 400 | 1,51 | 2,5 | ZM35 | AM35/58 | 10 770 |
| 3 800 | 0,3 | 900 | 400 | 1,51 | 2,5 | ZM35 | AM35/58 | 10 770 |



Axial angular contact ball bearings

Not for screw mounting



ZKLN..-2RS
ZKLN..-2Z

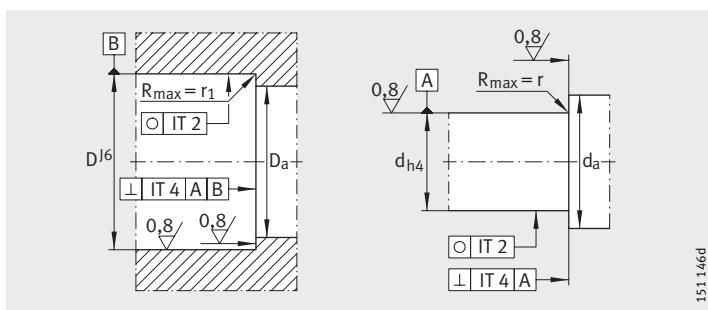
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | Mounting dimensions | | Basic load ratings axial | |
|-----------------------------------|------------------|------------------|-----------|----|----------------|-----|----------------|---------------------|----------------|-----------------------------|-------------------------------|
| | | d | D | B | d ₁ | r | r ₁ | D _a | d _a | dyn. C _a N | stat. C _{0a} N |
| ZKLN4075-2RS | 0,61 | 40-0,005 | 75-0,01 | 34 | 58 | 0,3 | 0,6 | 67 | 50 | 43 000 | 101 000 |
| ZKLN4075-2Z | 0,61 | 40-0,005 | 75-0,01 | 34 | 58 | 0,3 | 0,6 | 67 | 50 | 43 000 | 101 000 |
| ZKLN4090-2RS²⁾ | 0,95 | 40-0,005 | 90-0,01 | 46 | 65 | 0,6 | 0,6 | 80 | 56 | 72 000 | 149 000 |
| ZKLN4090-2Z²⁾ | 0,95 | 40-0,005 | 90-0,01 | 46 | 65 | 0,6 | 0,6 | 80 | 56 | 72 000 | 149 000 |
| ZKLN5090-2RS | 0,88 | 50-0,005 | 90-0,01 | 34 | 72 | 0,3 | 0,6 | 82 | 63 | 46 500 | 126 000 |
| ZKLN5090-2Z | 0,88 | 50-0,005 | 90-0,01 | 34 | 72 | 0,3 | 0,6 | 82 | 63 | 46 500 | 126 000 |
| ZKLN50110-2RS²⁾ | 2,5 | 50-0,005 | 110-0,01 | 54 | 80 | 0,6 | 0,6 | 98 | 63 | 113 000 | 250 000 |
| ZKLN50110-2Z²⁾ | 2,5 | 50-0,005 | 110-0,01 | 54 | 80 | 0,6 | 0,6 | 98 | 63 | 113 000 | 250 000 |
| ZKLN60110-2Z | 2,2 | 60-0,008 | 110-0,015 | 45 | 85 | 0,6 | 0,6 | 100 | 82 | 84 000 | 214 000 |
| ZKLN70120-2Z | 2,4 | 70-0,008 | 120-0,015 | 45 | 95 | 0,6 | 0,6 | 110 | 92 | 88 000 | 241 000 |
| ZKLN80130-2Z | 2,7 | 80-0,008 | 130-0,015 | 45 | 105 | 0,6 | 0,6 | 120 | 102 | 91 000 | 265 000 |
| ZKLN90150-2Z | 4,5 | 90-0,008 | 150-0,015 | 55 | 120 | 0,6 | 0,6 | 138 | 116 | 135 000 | 395 000 |
| ZKLN100160-2Z | 4,9 | 100-0,008 | 160-0,015 | 55 | 132 | 0,6 | 0,6 | 150 | 128 | 140 000 | 435 000 |

¹⁾ Mass moment of inertia for rotating inner ring.

²⁾ Heavy series.

³⁾ Only valid in conjunction with INA precision locknuts.



Design of adjacent construction

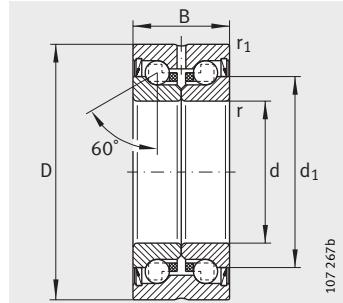
| Limiting speed n_G grease min ⁻¹ | Bearing frictional torque M_{RL} Nm | Rigidity axial c_{aL} N/ μ m | Tilting rigidity c_{kL} Nm/mrad | Mass moment of inertia ¹⁾ M_m kg · cm ² | Axial runout μ m | Recommended INA locknut; to be ordered separately | | |
|---|---|--|---|---|-------------------------|--|--|--------------------------|
| | | | | | | Designation | Tightening torque ³⁾ M_A Nm | Axial preload force N |
| 1800 | 0,7 | 1 000 | 550 | 2,26 | 2,5 | ZM40 AM40 | 55 | 13 412 |
| 3 300 | 0,35 | 1 000 | 550 | 2,26 | 2,5 | ZM40 AM40 | 55 | 13 412 |
| 1 600 | 1,3 | 1 200 | 750 | 5,5 | 2,5 | ZMA40/62 AM40 | 110 | 25 185 |
| 3 100 | 0,65 | 1 200 | 750 | 5,5 | 2,5 | ZMA40/62 AM40 | 110 | 25 185 |
| 1 500 | 0,9 | 1 250 | 1 000 | 5,24 | 2,5 | ZM50 AM50 | 85 | 17 009 |
| 3 000 | 0,45 | 1 250 | 1 000 | 5,24 | 2,5 | ZM50 AM50 | 85 | 17 009 |
| 1 200 | 2,6 | 1 400 | 1 500 | 15,2 | 2,5 | ZMA50/75 AM50 | 150 | 29 436 |
| 2 500 | 1,3 | 1 400 | 1 500 | 15,2 | 2,5 | ZMA50/75 AM50 | 150 | 29 436 |
| 3 000 | 1 | 1 300 | 1 650 | 13,7 | 3 | ZMA60/98 AM60 | 100 | 17 893 |
| 2 800 | 1,2 | 1 450 | 2 250 | 19,8 | 3 | ZMA70/110 AM70 | 130 | 19 171 |
| 2 700 | 1,4 | 1 600 | 3 000 | 27,6 | 3 | ZMA80/120 AM80 | 160 | 20 604 |
| 2 300 | 2,3 | 1 700 | 4 400 | 59,9 | 3 | ZMA90/130 AM90 | 200 | 25 198 |
| 2 150 | 2,6 | 1 900 | 5 800 | 85,3 | 3 | ZMA100/140 AM100 | 250 | 28 760 |



Axial angular contact ball bearings

Not for screw mounting

Less stringent tolerances



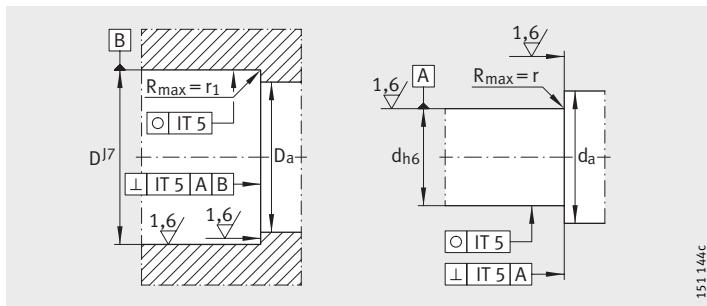
ZKLN..-2RS-PE

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | Mounting dimensions | | Basic load ratings axial | |
|------------------------|------------------|------------|----------------------|----|----------------|-----------|------------------------|------------------------|------------------------|-----------------------------|-------------------------------|
| | | d -0,01 | D -0,25 | B | d ₁ | r min. | r ₁ min. | D _a max. | d _a min. | dyn. C _a N | stat. C _{0a} N |
| ZKLN0624-2RS-PE | 0,03 | 6 | 24- _{0,01} | 15 | 14 | 0,3 | 0,6 | 19 | 9 | 6 900 | 8 500 |
| ZKLN1034-2RS-PE | 0,1 | 10 | 34- _{0,011} | 20 | 21 | 0,3 | 0,6 | 28 | 14 | 13 400 | 18 800 |
| ZKLN1242-2RS-PE | 0,2 | 12 | 42- _{0,011} | 25 | 25 | 0,3 | 0,6 | 33 | 16 | 16 900 | 24 700 |
| ZKLN1545-2RS-PE | 0,21 | 15 | 45- _{0,011} | 25 | 28 | 0,3 | 0,6 | 35 | 20 | 17 900 | 28 000 |
| ZKLN1747-2RS-PE | 0,22 | 17 | 47- _{0,011} | 25 | 30 | 0,3 | 0,6 | 37 | 23 | 18 800 | 31 000 |
| ZKLN2052-2RS-PE | 0,31 | 20 | 52- _{0,013} | 28 | 34,5 | 0,3 | 0,6 | 43 | 25 | 26 000 | 47 000 |
| ZKLN2557-2RS-PE | 0,34 | 25 | 57- _{0,013} | 28 | 40,5 | 0,3 | 0,6 | 48 | 32 | 27 500 | 55 000 |
| ZKLN3062-2RS-PE | 0,39 | 30 | 62- _{0,013} | 28 | 45,5 | 0,3 | 0,6 | 53 | 40 | 29 000 | 64 000 |
| ZKLN3572-2RS-PE | 0,51 | 35 | 72- _{0,013} | 34 | 52 | 0,3 | 0,6 | 62 | 45 | 41 000 | 89 000 |
| ZKLN5090-2RS-PE | 0,88 | 50 | 90- _{0,015} | 34 | 72 | 0,3 | 0,6 | 82 | 63 | 46 500 | 126 000 |

¹⁾ Mass moment of inertia for rotating inner ring.

²⁾ Only valid in conjunction with INA precision locknuts.



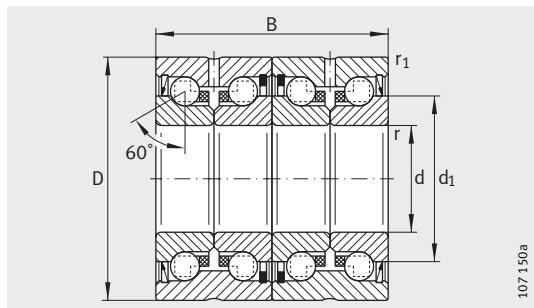
Design of adjacent construction



| Limiting speed n_G grease min ⁻¹ | Bearing frictional torque M_{RL} Nm | Rigidity axial C_{aL} N/ μ m | Tilting rigidity C_{kL} Nm/mrad | Mass moment of inertia ¹⁾ M_m kg · cm ² | Axial runout μ m | Recommended INA locknut; to be ordered separately | | |
|---|---|--|---|---|-------------------------|--|--|--------------------------|
| | | | | | | Designation | Tightening torque ²⁾ M_A Nm | Axial preload force N |
| 6800 | 0,04 | 200 | 8 | 0,0044 | 5 | ZM06 | – | 2 404 |
| 4600 | 0,12 | 325 | 25 | 0,029 | 5 | ZM10 | – | 6 |
| 3800 | 0,16 | 375 | 50 | 0,068 | 5 | ZM12 | – | 8 |
| 3500 | 0,2 | 400 | 65 | 0,102 | 5 | ZM15 | AM15 | 10 |
| 3300 | 0,24 | 450 | 80 | 0,132 | 5 | ZM17 | AM17 | 15 |
| 3000 | 0,3 | 650 | 140 | 0,273 | 5 | ZM20 | AM20 | 18 |
| 2600 | 0,4 | 750 | 200 | 0,486 | 5 | ZM25 | AM25 | 25 |
| 2200 | 0,5 | 850 | 300 | 0,73 | 5 | ZM30 | AM30 | 32 |
| 2000 | 0,6 | 900 | 400 | 1,51 | 5 | ZM35 | AM35/38 | 40 |
| 1500 | 0,9 | 1 250 | 1 000 | 5,24 | 5 | ZM50 | AM50 | 85 |
| | | | | | | | | 17 009 |

Axial angular contact ball bearings

Not for screw mounting
Matched pair



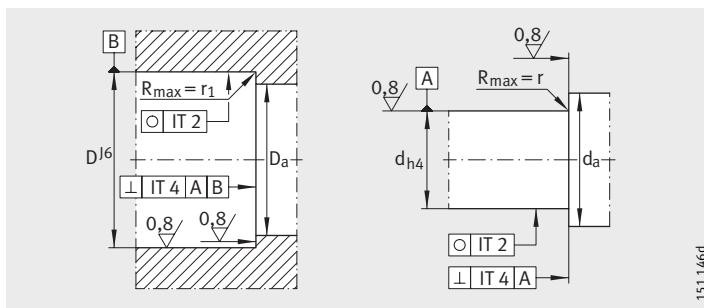
ZKLN..-2RS-2AP

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | Mounting dimensions | | Basic load ratings axial | |
|-------------------------|------------------|------------|----|----|----------------|-----|----------------|---------------------|----------------|-----------------------------|--------------------------|
| | | d | D | B | d ₁ | r | r ₁ | D _a | d _a | dyn. C _a | stat. C _{0a} |
| ZKLN1747-2RS-2AP | 0,44 | 17 | 47 | 50 | 30 | 0,3 | 0,6 | 37 | 23 | 30 500 | 62 000 |
| ZKLN2052-2RS-2AP | 0,62 | 20 | 52 | 56 | 34,5 | 0,3 | 0,6 | 43 | 25 | 42 000 | 94 000 |
| ZKLN2557-2RS-2AP | 0,68 | 25 | 57 | 56 | 40,5 | 0,3 | 0,6 | 48 | 32 | 44 500 | 111 000 |
| ZKLN3062-2RS-2AP | 0,78 | 30 | 62 | 56 | 45,5 | 0,3 | 0,6 | 53 | 40 | 47 500 | 127 000 |
| ZKLN3572-2RS-2AP | 1,02 | 35 | 72 | 68 | 52 | 0,3 | 0,6 | 62 | 45 | 66 000 | 177 000 |
| ZKLN4075-2RS-2AP | 1,22 | 40 | 75 | 68 | 58 | 0,3 | 0,6 | 67 | 50 | 70 000 | 202 000 |
| ZKLN5090-2RS-2AP | 1,76 | 50 | 90 | 68 | 72 | 0,3 | 0,6 | 82 | 63 | 76 000 | 250 000 |

¹⁾ Mass moment of inertia for rotating inner ring.

²⁾ Only valid in conjunction with INA precision locknuts.



Design of adjacent construction

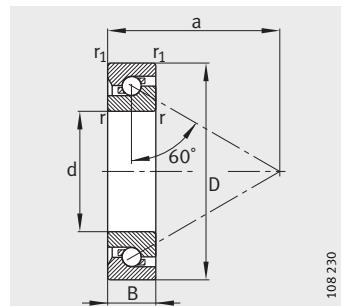
| Limiting speed n_G grease min ⁻¹ | Bearing frictional torque M_{RL} Nm | Rigidity axial C_{aL} N/ μ m | Tilting rigidity C_{kL} Nm/mrad | Mass moment of inertia ¹⁾ M_m kg · cm ² | Axial runout μ m | Recommended INA locknut; to be ordered separately | | |
|---|---|--|---|---|-------------------------|--|--|--------------------------|
| | | | | | | Designation | Tightening torque ²⁾ M_A Nm | Axial preload force N |
| 3300 | 0,36 | 800 | 200 | 0,264 | 2 | ZM17 AM17 | 15 | 7157 |
| 3000 | 0,45 | 1150 | 320 | 0,546 | 2 | ZMA20/38 AM20 | 18 | 9079 |
| 2600 | 0,6 | 1300 | 450 | 0,972 | 2 | ZMA25/45 AM25 | 25 | 9410 |
| 2200 | 0,75 | 1500 | 620 | 1,46 | 2,5 | ZMA30/52 AM30 | 32 | 10451 |
| 2000 | 0,9 | 1600 | 900 | 3,02 | 2,5 | ZMA35/58 AM35/58 | 40 | 10770 |
| 1800 | 1,05 | 1750 | 1200 | 4,52 | 2,5 | ZMA40/62 AM40 | 55 | 13412 |
| 1500 | 1,35 | 2200 | 2250 | 10,48 | 2,5 | ZMA50/75 AM50 | 85 | 17009 |



Axial angular contact ball bearings

Single direction

Unsealed



7602, 7603, BSB

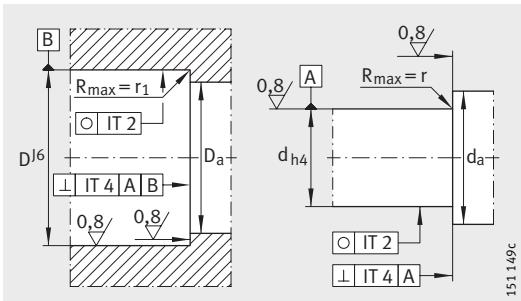
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | Mounting dimensions | | Basic load ratings axial | |
|--------------------|------------------|-----------------|-----------|---------|---------------------------|--------|------------------------|-----------------------|------------------------------|------------------------------|
| | | d | D | B | r, r ₁ min. | a ≈ | D _a H12 | d _a h12 | stat. C _a N | dyn. C _{0a} N |
| 7602012-TVP | 0,042 | 12-0,004 | 32-0,006 | 10-0,08 | 0,6 | 24 | 27 | 17 | 12 200 | 20 700 |
| 7602015-TVP | 0,052 | 15-0,004 | 36-0,006 | 11-0,08 | 0,6 | 27,5 | 30 | 20,5 | 13 100 | 24 700 |
| 7602017-TVP | 0,074 | 17-0,004 | 40-0,006 | 12-0,08 | 0,6 | 31 | 34,5 | 23 | 17 200 | 32 500 |
| 7602020-TVP | 0,139 | 20-0,005 | 47-0,006 | 14-0,12 | 1 | 36 | 39,5 | 27,5 | 19 100 | 38 000 |
| BSB020047T | 0,13 | 20-0,005 | 47-0,006 | 15-0,12 | 1 | 36,5 | 39,5 | 27,5 | 20 800 | 43 000 |
| 7603020-TVP | 0,17 | 20-0,005 | 52-0,007 | 15-0,12 | 1,1 | 39,5 | 43,5 | 30,5 | 25 500 | 53 000 |
| 7602025-TVP | 0,147 | 25-0,005 | 52-0,007 | 15-0,12 | 1 | 41 | 45 | 32 | 23 200 | 50 000 |
| BSB025062-T | 0,24 | 25-0,005 | 62-0,007 | 15-0,12 | 1 | 46,5 | 52 | 38 | 29 500 | 68 000 |
| 7603025-TVP | 0,275 | 25-0,005 | 62-0,007 | 17-0,12 | 1,1 | 47,5 | 52 | 38 | 29 500 | 68 000 |
| BSB030062-T | 0,22 | 30-0,005 | 62-0,007 | 15-0,12 | 1 | 47,5 | 52,5 | 39,5 | 27 500 | 66 000 |
| 7602030-TVP | 0,232 | 30-0,005 | 62-0,007 | 16-0,12 | 1 | 48 | 52,5 | 39,5 | 27 500 | 66 000 |
| 7603030-TVP | 0,409 | 30-0,005 | 72-0,007 | 19-0,12 | 1,1 | 55,5 | 61 | 45 | 36 500 | 89 000 |
| BSB035072-T | 0,3 | 35-0,006 | 72-0,007 | 15-0,12 | 1 | 54 | 60,5 | 46,5 | 31 500 | 81 000 |
| 7602035-TVP | 0,339 | 35-0,006 | 72-0,007 | 17-0,12 | 1,1 | 55 | 60,5 | 46,5 | 31 500 | 81 000 |
| 7603035-TVP | 0,546 | 35-0,006 | 80-0,007 | 21-0,12 | 1,5 | 61,5 | 67 | 51 | 38 000 | 100 000 |
| BSB040072-T | 0,26 | 40-0,006 | 72-0,007 | 15-0,12 | 1 | 56 | 62,5 | 49 | 29 500 | 82 000 |
| 7602040-TVP | 0,418 | 40-0,006 | 80-0,007 | 18-0,12 | 1,1 | 62,5 | 69,5 | 53,5 | 39 000 | 106 000 |
| BSB040090-T | 0,65 | 40-0,006 | 90-0,008 | 20-0,12 | 1,5 | 67 | 75,5 | 56,5 | 52 000 | 138 000 |
| 7603040-TVP | 0,751 | 40-0,006 | 90-0,008 | 23-0,12 | 1,5 | 68,5 | 75,5 | 56,5 | 52 000 | 138 000 |
| BSB045075-T | 0,26 | 45-0,006 | 75-0,007 | 15-0,12 | 1 | 59,5 | 68 | 52 | 30 000 | 85 000 |
| 7602045-TVP | 0,488 | 45-0,006 | 85-0,008 | 19-0,12 | 1,1 | 66 | 73 | 57 | 39 500 | 111 000 |
| BSB045100-T | 0,81 | 45-0,006 | 100-0,008 | 20-0,12 | 1,5 | 75 | 85,5 | 64,5 | 62 000 | 172 000 |
| 7603045-TVP | 0,992 | 45-0,006 | 100-0,008 | 25-0,12 | 1,5 | 77,5 | 85,5 | 64,5 | 62 000 | 172 000 |
| 7602050-TVP | 0,557 | 50-0,006 | 90-0,008 | 20-0,12 | 1,1 | 71,5 | 79 | 63 | 41 000 | 122 000 |
| BSB050100-T | 0,75 | 50-0,006 | 100-0,008 | 20-0,12 | 1,5 | 75 | 85,5 | 64,5 | 62 000 | 172 000 |
| 7603050-TVP | 1,29 | 50-0,006 | 110-0,008 | 27-0,12 | 2 | 85,5 | 94 | 72 | 72 000 | 203 000 |
| BSB055090-T | 0,38 | 55-0,007 | 90-0,008 | 15-0,15 | 1,0 | 70,5 | 80 | 65 | 33 500 | 98 000 |
| 7602055-TVP | 0,74 | 55-0,007 | 100-0,008 | 21-0,15 | 1,5 | 77,5 | 85,5 | 69,5 | 42 000 | 132 000 |
| BSB055120-T | 1,2 | 55-0,007 | 120-0,008 | 20-0,15 | 2,0 | 86 | 97,5 | 77 | 63 000 | 188 000 |
| 7603055-TVP | 1,67 | 55-0,007 | 120-0,008 | 29-0,15 | 2 | 91,5 | 101 | 77 | 85 000 | 255 000 |

¹⁾ Valid for matched pair of bearings in O or X arrangement.

²⁾ Valid for individual bearing with stated preload force, bearing lightly oiled.

³⁾ Only valid in conjunction with INA precision locknuts.



Design of adjacent construction

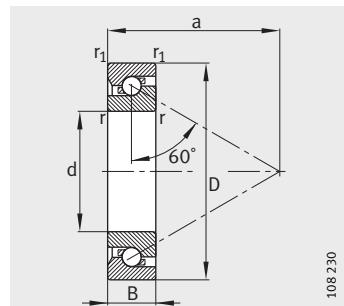
| Limiting speed n_G grease min ⁻¹ | Bearing frictional torque ²⁾ M_{RL} Nm | Rigidity ¹⁾ axial c_{aL} N/ μ m | Axial runout μ m | Recommended INA locknut; to be ordered separately | | |
|---|---|---|-------------------------|--|--|--------------------------|
| | | | | Designation | Tightening torque ³⁾ M_A Nm | Axial preload force N |
| 8 000 | 0,015 | 476 | 2 | ZM12 AM12 | 8 | 5 676 |
| 6 700 | 0,02 | 516 | 2 | ZM15 AM15 | 10 | 5 777 |
| 6 000 | 0,03 | 596 | 2 | ZM17 AM17 | 15 | 7 888 |
| 5 000 | 0,05 | 703 | 2 | ZM20 AM20 | 18 | 8 387 |
| 5 600 | 0,05 | 703 | 2 | ZM20 AM20 | 18 | 8 387 |
| 4 500 | 0,06 | 787 | 2 | ZM20 AM20 | 25 | 9 423 |
| 4 500 | 0,065 | 772 | 2 | ZM25 AM25 | 25 | 9 341 |
| 4 300 | 0,085 | 917 | 2 | ZM25 AM25 | 40 | 11 837 |
| 3 800 | 0,085 | 917 | 2 | ZM25 AM25 | 40 | 11 837 |
| 4 200 | 0,085 | 893 | 2 | ZM30 AM30 | 32 | 10 200 |
| 3 800 | 0,085 | 893 | 2 | ZM30 AM30 | 32 | 10 200 |
| 3 200 | 0,13 | 1073 | 2 | ZM30 AM30 | 55 | 13 517 |
| 3 700 | 0,115 | 1020 | 2 | ZM35 AM35 | 40 | 11 064 |
| 3 200 | 0,115 | 1020 | 2 | ZM35 AM35 | 40 | 11 064 |
| 3 000 | 0,17 | 1192 | 2 | ZM35 AM35 | 65 | 12 781 |
| 3 500 | 0,115 | 1016 | 2 | ZM40 AM40 | 40 | 11 214 |
| 2 800 | 0,17 | 1190 | 2 | ZM40 AM40 | 55 | 12 943 |
| 3 100 | 0,225 | 1292 | 2 | ZM40 AM40 | 110 | 20 710 |
| 2 600 | 0,225 | 1292 | 2 | ZM40 AM40 | 110 | 20 710 |
| 3 300 | 0,13 | 1072 | 2 | ZM45 AM45 | 50 | 9 799 |
| 2 600 | 0,19 | 1247 | 2 | ZM45 AM45 | 65 | 14 970 |
| 2 700 | 0,3 | 1473 | 2 | ZM45 AM45 | 120 | 19 287 |
| 2 200 | 0,3 | 1473 | 2 | ZM45 AM45 | 120 | 19 287 |
| 2 400 | 0,23 | 1360 | 2 | ZM50 AM50 | 85 | 16 535 |
| 2 700 | 0,33 | 1473 | 2 | ZM50 AM50 | 120 | 17 670 |
| 2 000 | 0,36 | 1601 | 2 | ZM50 AM50 | 150 | 28 928 |
| 2 800 | 0,19 | 1246 | 3 | ZM55 AM55 | 60 | 11 369 |
| 2 200 | 0,25 | 1394 | 3 | ZM55 AM55 | 85 | 15 647 |
| 2 400 | 0,36 | 1553 | 3 | ZM55 AM55 | 110 | 16 361 |
| 1 900 | 0,46 | 1723 | 3 | ZM55 AM55 | 130 | 31 446 |



Axial angular contact ball bearings

Single direction

Unsealed



7602, 7603, BSB

108 230

Dimension table (continued) - Dimensions in mm

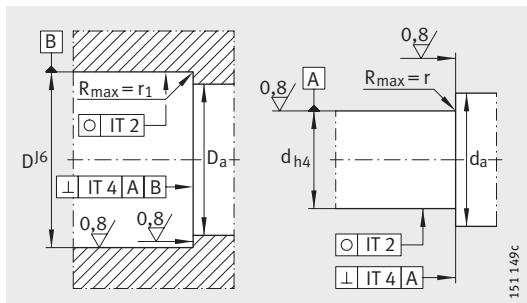
| Designation ⁴⁾ | Mass m ≈kg | Dimensions | | | | | Mounting dimensions | |
|---------------------------|------------------|------------------|-----------|----------|---------------------------|--------|-----------------------|-----------------------|
| | | d | D | B | r, r ₁ min. | a ≈ | D _a H12 | d _a h12 |
| 7602060-TVP | 0,94 | 60-0,007 | 110-0,008 | 22-0,15 | 1,5 | 86 | 96 | 77 |
| BSB060120-T | 1,1 | 60-0,007 | 120-0,009 | 22-0,15 | 1,5 | 88 | 100,5 | 79,5 |
| 7603060-TVP | 2,08 | 60-0,007 | 130-0,009 | 31-0,15 | 2,1 | 98 | 107,5 | 82,5 |
| 7602065-TVP | 1,19 | 65-0,007 | 120-0,009 | 23-0,15 | 1,5 | 92,5 | 103 | 84 |
| 7603065-TVP | 2,58 | 65-0,007 | 140-0,009 | 33-0,15 | 2,1 | 107,5 | 118,5 | 91,5 |
| 7602070-TVP | 1,3 | 70-0,007 | 125-0,009 | 24-0,15 | 1,5 | 96,5 | 108 | 87 |
| 7603070-TVP | 3,16 | 70-0,007 | 150-0,009 | 35-0,15 | 2,1 | 113 | 124,5 | 95,5 |
| BSB075110-T | 0,47 | 75-0,007 | 110-0,008 | 15-0,15 | 1,5 | 87,5 | 99,5 | 85 |
| 7602075-TVP | 1,42 | 75-0,007 | 130-0,009 | 25-0,15 | 1,5 | 102,5 | 114,5 | 93,5 |
| 7603075-TVP | 3,74 | 75-0,007 | 160-0,01 | 37-0,15 | 2,1 | 123 | 135,5 | 105,5 |
| 7602080-TVP | 1,72 | 80-0,007 | 140-0,009 | 26-0,15 | 2 | 109 | 122 | 100 |
| 7603080-TVP | 4,5 | 80-0,007 | 170-0,01 | 39-0,15 | 2,1 | 129,5 | 143 | 111 |
| 7602085-TVP | 2,17 | 85-0,008 | 150-0,009 | 28-0,2 | 2 | 117 | 131 | 107 |
| 7603085-TVP | 5,24 | 85-0,008 | 180-0,01 | 41-0,2 | 3 | 136 | 151 | 116 |
| 7602090-TVP | 2,67 | 90-0,008 | 160-0,01 | 30-0,2 | 2 | 124 | 138,5 | 113,5 |
| 7603090-TVP | 6,18 | 90-0,008 | 190-0,011 | 43-0,2 | 3 | 142,5 | 157,5 | 122,5 |
| 7602095-TVP | 3,25 | 95-0,008 | 170-0,01 | 32-0,2 | 2,1 | 131 | 146,5 | 119,5 |
| 7603095-TVP | 7,22 | 95-0,008 | 200-0,011 | 45-0,2 | 3 | 150 | 165 | 130 |
| BSB100150-T | 1,4 | 100-0,008 | 150-0,009 | 22,5-0,2 | 2 | 119,5 | 135 | 114,5 |
| 7602100-TVP | 3,9 | 100-0,008 | 180-0,01 | 34-0,2 | 2,1 | 138 | 154,5 | 125,5 |
| 7603100-TVP | 8,78 | 100-0,008 | 215-0,011 | 47-0,2 | 3 | 161 | 178 | 140 |

¹⁾ Valid for matched pair of bearings in O or X arrangement.

²⁾ Valid for individual bearing with stated preload force, bearing lightly oiled.

³⁾ Only valid in conjunction with INA precision locknuts.

⁴⁾ Available by agreement.



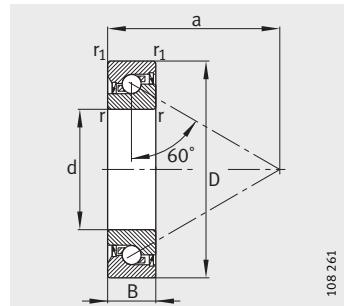
Design of adjacent construction

| Basic load ratings axial | | Limiting speed n_G grease | Bearing frictional torque ²⁾ M_{RL} | Rigidity ¹⁾ axial c_{aL} | Axial runout | Recommended INA locknut; to be ordered separately | | |
|--------------------------|----------------|-----------------------------|--|---------------------------------------|---------------|---|--|-----------------------|
| dyn. C_a | stat. C_{0a} | min^{-1} | Nm | N/ μm | μm | Designation | Tightening torque ³⁾ M_A Nm | Axial preload force N |
| N | N | | | | | | | |
| 58 000 | 183 000 | 2 000 | 0,35 | 1623 | 3 | ZM60 AM60 | 100 | 17 273 |
| 64 000 | 196 000 | 2 300 | 0,38 | 1623 | 3 | ZM60 AM60 | 120 | 15 356 |
| 92 000 | 270 000 | 1 800 | 0,54 | 1840 | 3 | ZM60 AM60 | 150 | 27 145 |
| 60 000 | 197 000 | 1 800 | 0,41 | 1753 | 3 | ZM65 AM65 | 110 | 18 203 |
| 106 000 | 330 000 | 1 600 | 0,7 | 2052 | 3 | ZM65 AM65 | 150 | 27 725 |
| 68 000 | 220 000 | 1 800 | 0,44 | 1753 | 3 | ZM70 AM70 | 115 | 19 632 |
| 117 000 | 360 000 | 1 600 | 0,76 | 2108 | 3 | ZM70 AM70 | 180 | 30 071 |
| 37 000 | 133 000 | 2 300 | 0,29 | 1534 | 3 | ZM75 AM75 | 140 | 12 357 |
| 70 000 | 236 000 | 1 600 | 0,48 | 1888 | 3 | ZM75 AM75 | 160 | 19 819 |
| 132 000 | 425 000 | 1 400 | 0,92 | 2335 | 3 | ZM75 AM75 | 200 | 32 191 |
| 81 000 | 275 000 | 1 500 | 0,6 | 2047 | 3 | ZM80 AM80 | 160 | 21 867 |
| 144 000 | 465 000 | 1 400 | 1,1 | 2466 | 3 | ZM80 AM80 | 220 | 33 617 |
| 95 000 | 340 000 | 1 400 | 0,76 | 2209 | 3 | ZM85 AM85 | 250 | 23 249 |
| 169 000 | 550 000 | 1 300 | 1,25 | 2539 | 3 | ZM85 AM85 | 280 | 36 911 |
| 102 000 | 365 000 | 1 400 | 0,79 | 2275 | 3 | ZM90 AM90 | 250 | 24 552 |
| 172 000 | 580 000 | 1 200 | 1,3 | 2654 | 3 | ZM90 AM90 | 300 | 37 503 |
| 116 000 | 410 000 | 1 300 | 0,95 | 2435 | 3 | — | — | 27 457 |
| 175 000 | 600 000 | 1 200 | 1,45 | 2770 | 3 | — | — | 38 299 |
| 73 000 | 265 000 | 1 800 | 0,6 | 2052 | 3 | ZM100 AM100 | 200 | 16 937 |
| 128 000 | 465 000 | 1 200 | 1,1 | 2594 | 3 | ZM100 AM100 | 255 | 28 724 |
| 201 000 | 700 000 | 1 100 | 1,7 | 2965 | 3 | ZM100 AM100 | 305 | 45 106 |



Axial angular contact ball bearings

Single direction
Sealed on both sides



7602..-2RS, 7603..-2RS,
BSB..-2RS

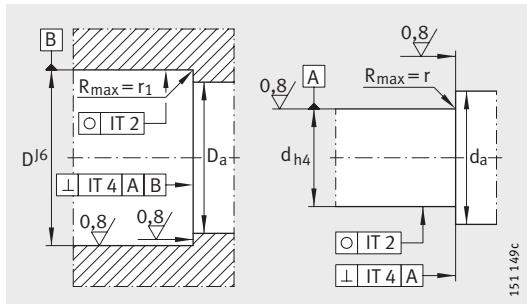
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | Mounting dimensions | |
|------------------------|------------------|------------------|-----------|----------|-------------------|------|-----------------------|------------------------|--|
| | | d | D | B | r, r ₁ | a | D _a H12 | d _a h12 | |
| 7602012-2RS-TVP | 0,042 | 12..0,004 | 32..0,006 | 10..0,08 | 0,6 | 24 | 27 | 17 | |
| 7602015-2RS-TVP | 0,052 | 15..0,004 | 35..0,006 | 11..0,08 | 0,6 | 27,5 | 30 | 20,5 | |
| 7602020-2RS-TVP | 0,12 | 20..0,005 | 47..0,006 | 14..0,12 | 1 | 36 | 39,5 | 27,5 | |
| 7603020-2RS-TVP | 0,17 | 20..0,005 | 52..0,007 | 15..0,12 | 1,1 | 36,5 | 43,5 | 30,5 | |
| 7602025-2RS-TVP | 0,15 | 25..0,005 | 52..0,007 | 15..0,12 | 1 | 41 | 45 | 32 | |
| BSB025062-2RS-T | 0,24 | 25..0,005 | 62..0,007 | 15..0,12 | 1 | 46,5 | 52 | 38 | |
| 7603025-2RS-TVP | 0,27 | 25..0,005 | 62..0,007 | 17..0,12 | 1,1 | 47,5 | 52 | 38 | |
| BSB030062-2RS-T | 0,22 | 30..0,005 | 62..0,007 | 15..0,12 | 1 | 47,5 | 52,5 | 39,5 | |
| 7602030-2RS-TVP | 0,23 | 30..0,005 | 62..0,007 | 16..0,12 | 1 | 48 | 52,5 | 39,5 | |
| BSB035072-2RS-T | 0,3 | 35..0,006 | 72..0,007 | 15..0,12 | 1 | 54 | 60,5 | 46,5 | |
| BSB040072-2RS-T | 0,26 | 40..0,006 | 72..0,007 | 15..0,12 | 1 | 56 | 62,5 | 49 | |

¹⁾ Valid for matched pair of bearings in O or X arrangement.

²⁾ Valid for individual bearing with stated preload force, bearing lightly oiled.

³⁾ Only valid in conjunction with INA precision locknuts.



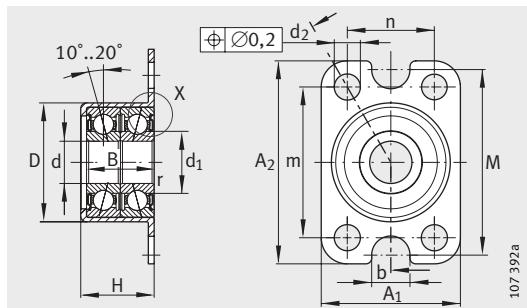
Design of adjacent construction

| Basic load ratings axial | | Limiting speed n_G grease | Bearing frictional torque ²⁾ M_{RL} | Rigidity ¹⁾ axial C_{aL} | Axial runout μm | Recommended INA locknut; to be ordered separately | | |
|--------------------------|----------------|-----------------------------|--|---------------------------------------|----------------------------|---|--|-----------------------|
| dyn. C_a | stat. C_{0a} | min^{-1} | Nm | N/ μm | μm | Designation | Tightening torque ³⁾ M_A Nm | Axial preload force N |
| 12 200 | 20 700 | 8 000 | 0,018 | 476 | 2 | ZM12 AM12 | 8 | 5 676 |
| 13 100 | 24 700 | 6 700 | 0,024 | 516 | 2 | ZM15 AM15 | 10 | 5 777 |
| 19 100 | 38 000 | 5 000 | 0,06 | 703 | 2 | ZM20 AM20 | 18 | 8 387 |
| 25 500 | 53 000 | 4 500 | 0,07 | 787 | 2 | ZM20 AM20 | 18 | 8 387 |
| 23 200 | 50 000 | 3 800 | 0,08 | 772 | 2 | ZM25 AM25 | 25 | 9 341 |
| 29 500 | 68 000 | 4 300 | 0,1 | 917 | 2 | ZM25 AM25 | 40 | 11 837 |
| 29 500 | 68 000 | 3 800 | 0,1 | 917 | 2 | ZM25 AM25 | 40 | 11 837 |
| 27 500 | 66 000 | 4 200 | 0,1 | 893 | 2 | ZM30 AM30 | 32 | 10 200 |
| 27 500 | 66 000 | 3 800 | 0,1 | 893 | 2 | ZM30 AM30 | 32 | 10 200 |
| 31 500 | 81 000 | 3 700 | 0,14 | 1 020 | 2 | ZM35 AM35 | 40 | 11 064 |
| 29 500 | 82 000 | 3 500 | 0,14 | 1 016 | 2 | ZM40 AM40 | 40 | 11 214 |



Angular contact ball bearing units

For screw mounting



ZKLR0624-2Z, ZKLR0828-2Z

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | |
|---------------------|------------------|-----------------|----------------|----------------|---------------------|------------|----------------|-----------|----------------|-----|----|----|----|------|
| | | d | A ₁ | A ₂ | D +0,03 -0,01 | B -0,25 | d ₁ | r min. | d ₂ | b | m | n | M | |
| ZKLR0624-2Z | 23 | 6-0,008 | 24 | 35 | 20,5 | 12 | 10,4 | 0,3 | 4,5 | 6,6 | 26 | 15 | 32 | 13 |
| ZKLR0828-2Z | 30 | 8-0,008 | 28 | 35 | 23,9 | 14 | 11,8 | 0,3 | 4,5 | 6,6 | 26 | 20 | 35 | 15,5 |
| ZKLR1035-2Z | 50 | 10-0,008 | 35 | 35 | 28,14 | 16 | 14,7 | 0,3 | 4,5 | - | 26 | 26 | - | 17,5 |
| ZKLR1244-2RS | 120 | 12-0,007 | 44 | 50 | 35,45 | 20 | 16,6 | 0,3 | 6,6 | - | 38 | 32 | - | 22 |
| ZKLR1547-2RS | 140 | 15-0,007 | 47 | 51 | 38,45 | 22 | 18 | 0,3 | 6,6 | - | 39 | 35 | - | 24 |
| ZKLR2060-2RS | 300 | 20-0,008 | 60 | 60 | 50,45 | 28 | 24,4 | 0,3 | 6,6 | - | 47 | 47 | - | 30 |

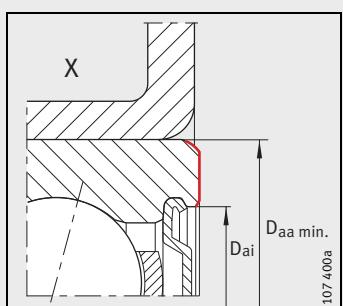
1) Tightening torque for the fixing screws as recommended by the manufacturer.
Screws must be ordered separately.

2) Mass moment of inertia for rotating inner ring.

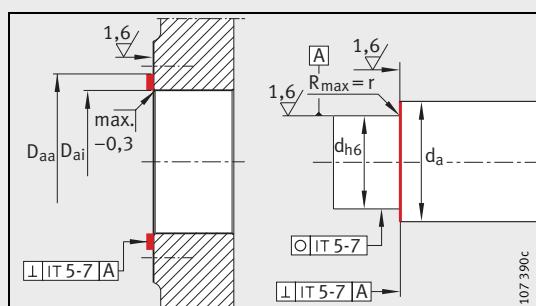
3) The locknut is only used to axially locate the bearing unit.
It has no influence on the bearing preload.

4) Stated geometrical tolerances only required in diameter area between D_{ai} and D_{aa}.

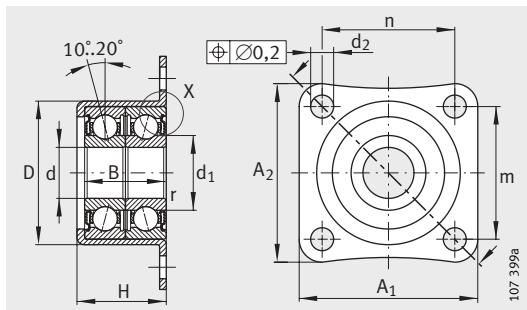
5) Only valid in conjunction with INA precision locknuts.



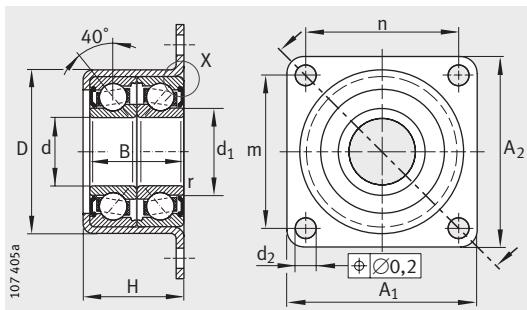
Axial abutment area of outer ring



Design of adjacent construction⁴⁾



ZKLR1035-2Z



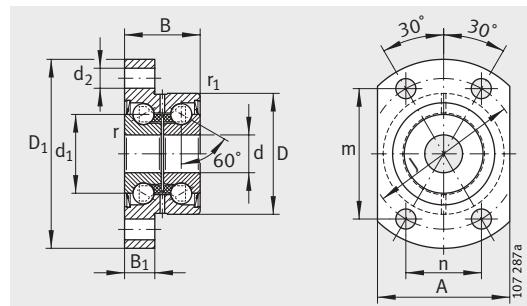
ZKLR1244-2RS, ZKLR1547-2RS, ZKLR2060-2RS

| | | | Fixing screws DIN 912 ¹⁾ | | Basic load ratings | | | | Bearing frictional torque | Rigidity axial | Mass moment of inertia ²⁾ | Recommended INA locknut; to be ordered separately ³⁾ | | |
|----------------|-----------------|-------------------------|--|---------------|------------------------|--------------------------|------------------------|--------------------------|---------------------------------|-------------------|--|---|------------------------------------|--|
| | | | | | radial | | axial | | | | | Design- nation | Tightening torque ⁵⁾ | |
| | | | Size | Quan- tity | dyn. C _r | stat. C _{0r} | dyn. C _a | stat. C _{0a} | | | | | | |
| d _a | D _{ai} | D _{aa} min. | M4 M6 | 4 2 | 3 850 | 1 870 | 1 340 | 1 250 | 0,04 | 17 | 0,0014 | ZM06 | 2 | |
| 8 | 16 | 19 | M4 M6 | 4 2 | 3 850 | 1 870 | 1 340 | 1 250 | 0,04 | 17 | 0,0014 | ZM06 | 2 | |
| 10,4 | 18 | 22 | M4 M6 | 4 2 | 4 900 | 2 280 | 1 810 | 1 520 | 0,08 | 20 | 0,0028 | ZM08 | 4 | |
| 12,4 | 22 | 26 | M4 | 4 | 7 400 | 3 600 | 2 550 | 2 420 | 0,12 | 26 | 0,0075 | ZM10 | 6 | |
| 14 | 27 | 32 | M6 | 4 | 13 600 | 8 500 | 13 200 | 17 900 | 0,16 | 200 | 0,0102 | ZM12 | 8 | |
| 17,5 | 29 | 35 | M6 | 4 | 16 700 | 10 700 | 16 400 | 22 400 | 0,2 | 130 | 0,0178 | ZM15 | 10 | |
| 24 | 39 | 47 | M6 | 4 | 28 000 | 19 100 | 27 500 | 40 000 | 0,3 | 250 | 0,263 | ZM20 | 18 | |



Double row axial angular contact ball bearings with flange

For screw mounting



ZKLFA..-2RS, ZKLFA..-2Z

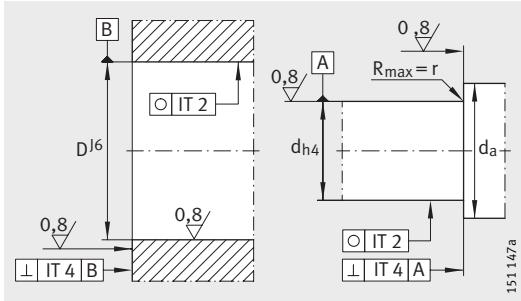
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | Mounting dimensions d _a | | |
|----------------------|------------------|------------|----|----|----------------|----------------|-----|----------------|----------------|----------------|------|----|------|--|----|----|
| | | d | D | B | d ₁ | D ₁ | r | r ₁ | B ₁ | d ₂ | m | J | n | | | |
| ZKLFA0630-2Z | 0,05 | 6 | 19 | 12 | 12 | 30 | 0,3 | 0,3 | 5 | 3,5 | 21 | 24 | 12 | 22 | 9 | 15 |
| ZKLFA0640-2RS | 0,08 | 6 | 24 | 15 | 14 | 40 | 0,3 | 0,6 | 6 | 4,5 | 27,5 | 32 | 16 | 27 | 9 | 18 |
| ZKLFA0640-2Z | 0,08 | 6 | 24 | 15 | 14 | 40 | 0,3 | 0,6 | 6 | 4,5 | 27,5 | 32 | 16 | 27 | 9 | 18 |
| ZKLFA0850-2RS | 0,17 | 8 | 32 | 20 | 19 | 50 | 0,3 | 0,6 | 8 | 5,5 | 34,5 | 40 | 20 | 35 | 11 | 25 |
| ZKLFA0850-2Z | 0,17 | 8 | 32 | 20 | 19 | 50 | 0,3 | 0,6 | 8 | 5,5 | 34,5 | 40 | 20 | 35 | 11 | 25 |
| ZKLFA1050-2RS | 0,18 | 10 | 32 | 20 | 21 | 50 | 0,3 | 0,6 | 8 | 5,5 | 34,5 | 40 | 20 | 35 | 14 | 27 |
| ZKLFA1050-2Z | 0,18 | 10 | 32 | 20 | 21 | 50 | 0,3 | 0,6 | 8 | 5,5 | 34,5 | 40 | 20 | 35 | 14 | 27 |
| ZKLFA1263-2RS | 0,3 | 12 | 42 | 25 | 25 | 63 | 0,3 | 0,6 | 10 | 6,8 | 46 | 53 | 26,5 | 45 | 16 | 31 |
| ZKLFA1263-2Z | 0,3 | 12 | 42 | 25 | 25 | 63 | 0,3 | 0,6 | 10 | 6,8 | 46 | 53 | 26,5 | 45 | 16 | 31 |
| ZKLFA1563-2RS | 0,31 | 15 | 42 | 25 | 28 | 63 | 0,3 | 0,6 | 10 | 6,8 | 46 | 53 | 26,5 | 45 | 20 | 34 |
| ZKLFA1563-2Z | 0,31 | 15 | 42 | 25 | 28 | 63 | 0,3 | 0,6 | 10 | 6,8 | 46 | 53 | 26,5 | 45 | 20 | 34 |

1) Tightening torque for the fixing screws as recommended by the manufacturer.
Screws must be ordered separately.

2) Mass moment of inertia for rotating inner ring.

3) Only valid in conjunction with INA precision locknuts.



Design of adjacent construction

| Fixing screws ¹⁾ DIN 912-10.9 | | Basic load ratings axial | | Limiting speed n_G grease | Bearing frictional torque | Rigidity axial | Tilting rigidity | Mass moment of inertia ²⁾ M_m | Axial runout | Recommended INA locknut; to be ordered separately | | | |
|---|---------------|-----------------------------|-------------------|--------------------------------------|---------------------------------|-------------------|---------------------|---|-----------------|--|---|--------------------------------|-------|
| | | dyn. C_a | stat. C_{0a} | | M_{RL} | c_{aL} | c_{kL} | | | Designation | Tight- ening torque ³⁾ | Axial pre- load force | |
| Size | Quan- tity | N | N | min ⁻¹ | Nm | N/ μm | Nm/ mrad | kg · cm ² | μm | M_A Nm | N | | |
| M3 | 4 | 4 900 | 6 100 | 14 000 | 0,01 | 150 | 4 | 0,0019 | 2 | ZM06 | – | 2 | 916 |
| M4 | 4 | 6 900 | 8 500 | 6 800 | 0,04 | 200 | 8 | 0,0044 | 2 | ZM06 | – | 2 | 2 404 |
| M4 | 4 | 6 900 | 8 500 | 12 000 | 0,02 | 200 | 8 | 0,0044 | 2 | ZM06 | – | 2 | 2 404 |
| M5 | 4 | 12 500 | 16 300 | 5 100 | 0,08 | 250 | 20 | 0,02 | 2 | ZM08 | – | 4 | 2 216 |
| M5 | 4 | 12 500 | 16 300 | 9 500 | 0,04 | 250 | 20 | 0,02 | 2 | ZM08 | – | 4 | 2 216 |
| M5 | 4 | 13 400 | 18 800 | 4 600 | 0,12 | 325 | 25 | 0,029 | 2 | ZM10 | – | 6 | 4 891 |
| M5 | 4 | 13 400 | 18 800 | 8 600 | 0,06 | 325 | 25 | 0,029 | 2 | ZM10 | – | 6 | 4 891 |
| M6 | 4 | 16 900 | 24 700 | 3 800 | 0,16 | 375 | 50 | 0,068 | 2 | ZM12 | – | 8 | 5 038 |
| M6 | 4 | 16 900 | 24 700 | 7 600 | 0,08 | 375 | 50 | 0,068 | 2 | ZM12 | – | 8 | 5 038 |
| M6 | 4 | 17 600 | 28 000 | 3 500 | 0,2 | 400 | 65 | 0,102 | 2 | ZM15 | AM15 | 10 | 5 484 |
| M6 | 4 | 17 900 | 28 000 | 7 000 | 0,1 | 400 | 65 | 0,102 | 2 | ZM15 | AM15 | 10 | 5 484 |

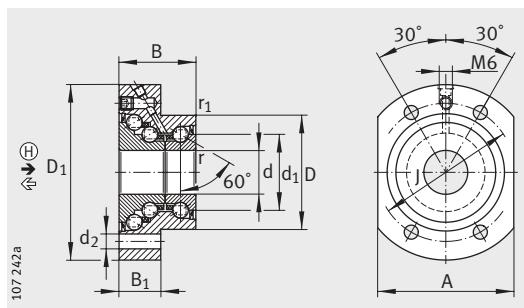


Triple row axial angular contact ball bearings with flange

For screw mounting

Caution!

The bearings require continuous load in the main load direction \textcircled{H} .



DKLFA..-2RS ($d \leq 20 \text{ mm}$)

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | Mounting dimensions | |
|------------------------------------|------------------|-------------|-------------|------------|----------------|----------------|-----|----------------|----------------|----------------|-----|-----|------|------------------------|--|
| | | d -0,010 | D -0,013 | B -0,25 | d ₁ | D ₁ | r | r ₁ | B ₁ | d ₂ | J | A | | | |
| | | min. | min. | | | | | | | | | | min. | max. | |
| DKLFA1575-2RS | 0,53 | 15 | 45 | 32 | 28 | 75 | 0,3 | 0,6 | 18 | 6,8 | 58 | 55 | 20 | 35 | |
| DKLFA2080-2RS | 0,7 | 20 | 52 | 35 | 34,5 | 80 | 0,3 | 0,6 | 19 | 6,8 | 63 | 62 | 25 | 43 | |
| DKLFA2590-2RS | 0,9 | 25 | 57 | 38 | 40,5 | 90 | 0,3 | 0,6 | 22 | 8,8 | 75 | 70 | 32 | 48 | |
| DKLFA30100-2RS | 1 | 30 | 62 | 38 | 45,5 | 100 | 0,3 | 0,6 | 22 | 8,8 | 80 | 72 | 40 | 53 | |
| DKLFA30110-2RS³⁾ | 2,5 | 30 | 75 | 56 | 51 | 110 | 0,3 | 0,6 | 35 | 8,8 | 95 | 85 | 47 | 64 | |
| DKLFA40115-2RS | 1,5 | 40 | 72 | 42 | 58 | 115 | 0,3 | 0,6 | 23 | 8,8 | 94 | 90 | 50 | 67 | |
| DKLFA40140-2RS³⁾ | 4,2 | 40 | 90 | 60 | 65 | 140 | 0,3 | 0,6 | 35 | 11 | 118 | 110 | 56 | 80 | |

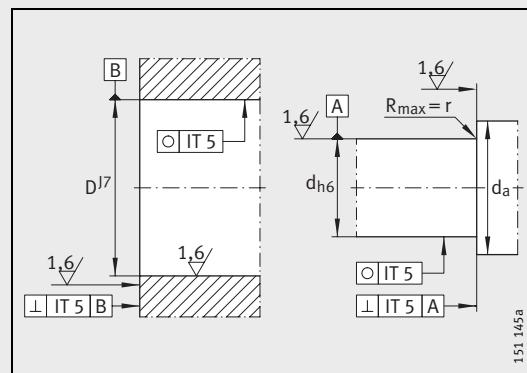
1) Tightening torque for the fixing screws as recommended by the manufacturer.
Screws must be ordered separately.

2) Mass moment of inertia for rotating inner ring.

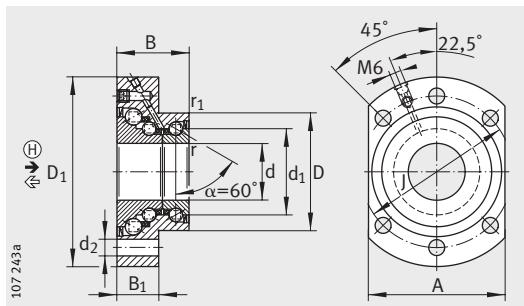
3) Heavy series.

INA locknuts (accessories)

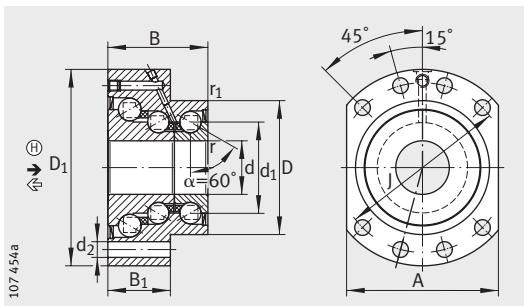
| Triple row angular contact ball bearing Designation | Recommended INA locknut; to be ordered separately Designation ① | ② |
|--|--|-----------------|
| DKLFA1575-2RS | AM15 | ZMA15/33 |
| DKLFA2080-2RS | AM20 | ZMA20/38 |
| DKLFA2590-2RS | AM25 | ZMA25/45 |
| DKLFA30100-2RS | AM30 | ZMA30/52 |
| DKLFA30110-2RS | AM30/65 | — |
| DKLFA40115-2RS | AM40 | ZMA40/62 |
| DKLFA40140-2RS | AM40/85 | — |
| | | ZM45 |



Design of adjacent construction

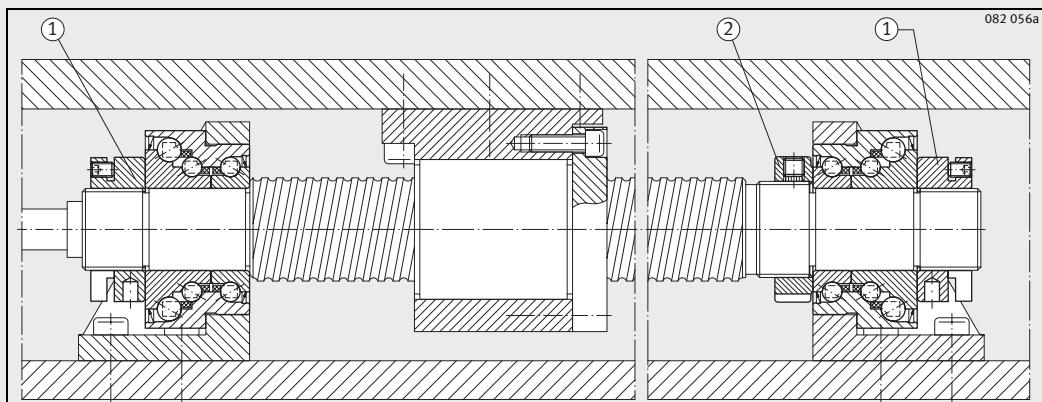


DKLFA..-2RS ($d \geq 25 \text{ mm}$)



DKLFA..-2RS
Heavy series

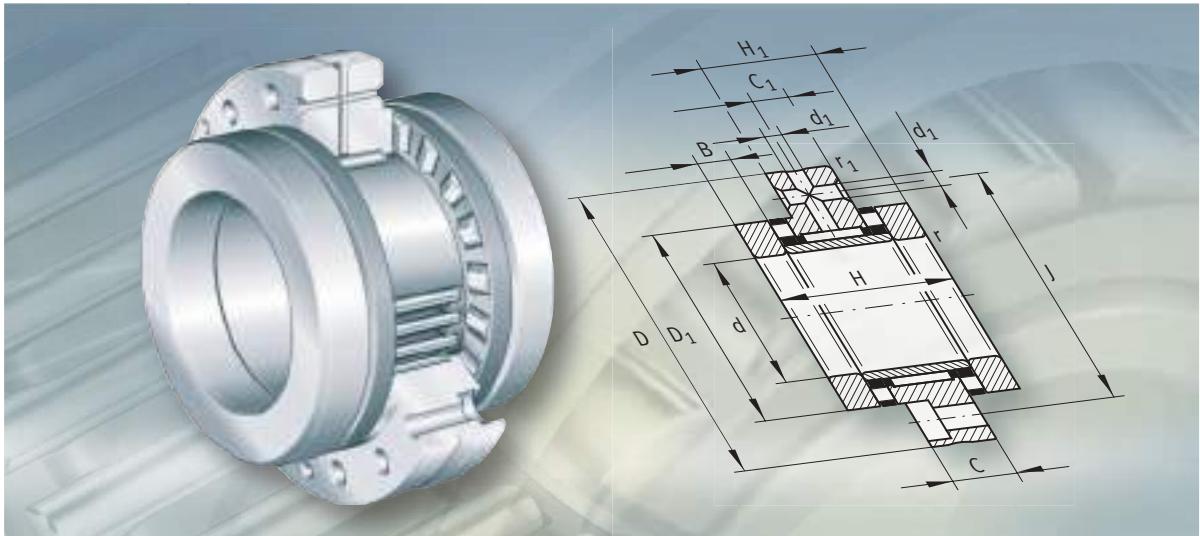
| Fixing screws ¹⁾ DIN 912-10.9 | | Basic load ratings | | | | n _G grease | Limiting speed | Bearing frictional torque | Rigidity axial | Rigidity axial | Tilting rigidity | Mass moment of inertia ²⁾ | Axial runout | | | | | | | | |
|---|----------|------------------------|--------------------------|------------------------|--------------------------|--------------------------|----------------|---------------------------|-----------------|-----------------|------------------|--------------------------------------|--------------|--|--|--|--|--|--|--|--|
| | | axial ↪ | | axial ⚡ | | | | | | | | | | | | | | | | | |
| | | dyn. C _a | stat. C _{0a} | dyn. C _a | stat. C _{0a} | | | | | | | | | | | | | | | | |
| Size | Quantity | N | N | N | N | | | M _{RL} | c _{aL} | c _{aL} | c _{kL} | M _m | Nm/mrad | | | | | | | | |
| M6 | 4 | 17 900 | 28 000 | 37 000 | 83 000 | 2600 | 0,35 | 0,35 | 500 | 950 | 140 | 0,278 | 5 | | | | | | | | |
| M6 | 4 | 26 000 | 47 000 | 44 500 | 110 000 | 2200 | 0,45 | 0,45 | 750 | 1100 | 260 | 0,553 | 5 | | | | | | | | |
| M8 | 6 | 27 500 | 55 000 | 52 000 | 144 000 | 2000 | 0,6 | 0,6 | 850 | 1200 | 370 | 1,12 | 5 | | | | | | | | |
| M8 | 6 | 29 000 | 64 000 | 55 000 | 165 000 | 1800 | 0,75 | 0,75 | 900 | 1400 | 500 | 1,7 | 5 | | | | | | | | |
| M8 | 8 | 59 000 | 108 000 | 106 000 | 250 000 | 1600 | 1,5 | 1,5 | 1 300 | 1 600 | 650 | 3,23 | 5 | | | | | | | | |
| M8 | 6 | 43 000 | 101 000 | 73 000 | 227 000 | 1500 | 1 | 1 | 1100 | 1700 | 1000 | 4,23 | 5 | | | | | | | | |
| M10 | 8 | 72 000 | 149 000 | 126 000 | 363 000 | 1200 | 2,5 | 2,5 | 1 800 | 2 000 | 1 370 | 9,32 | 5 | | | | | | | | |



Ball screw drive spindle with locating bearing arrangement on both sides
For meaning of circled numbers, see accessories table, page 948



FAG



Needle roller/ axial cylindrical roller bearings

Needle roller/ axial cylindrical roller bearings

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| | Needle roller/axial cylindrical roller bearings, light series 968 |
| | Needle roller/axial cylindrical roller bearings, heavy series 972 |

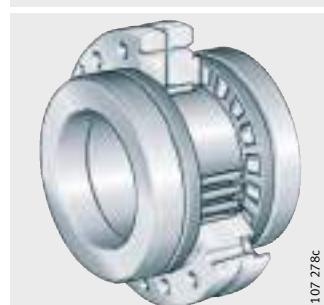


Product overview

Needle roller/ axial cylindrical roller bearings

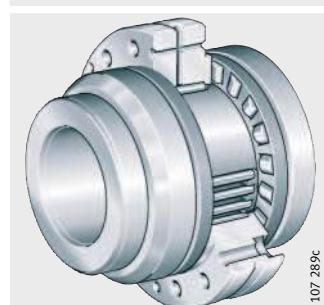
For screw mounting

ZARF



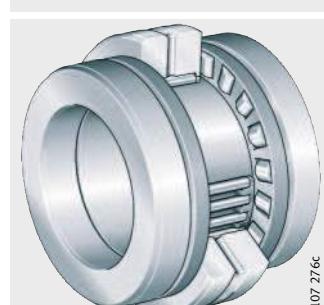
With extended
shaft locating washer

ZARF..-L



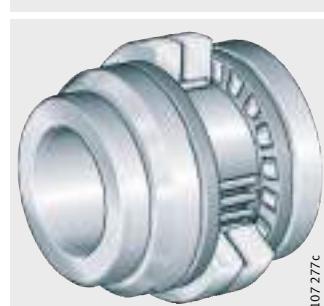
Not for screw mounting

ZARN

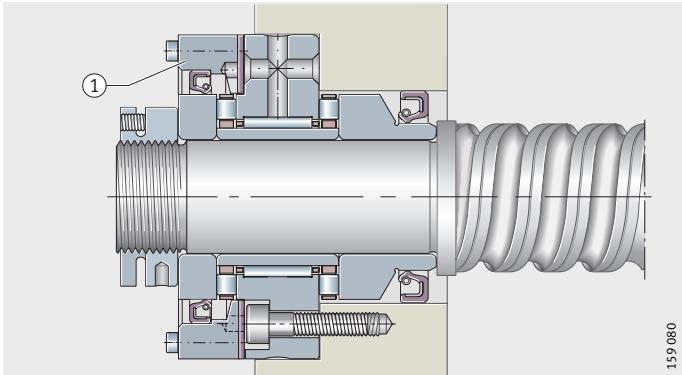


With extended
shaft locating washer

ZARN..-L



Needle roller/ axial cylindrical roller bearings

| | |
|--|---|
| Features | Needle roller/axial cylindrical roller bearings comprise an outer ring with radial and axial raceways, two shaft locating washers, an inner ring, a radial needle roller and cage assembly and two axial cylindrical roller and cage assemblies. The bearings are available in versions for screw mounting and not for screw mounting. |
| Radial and axial load carrying capacity | In addition to radial forces, the bearings can also support axial forces from both directions and tilting moments. |
| Preload/internal clearance | The outer ring, inner ring and axial cages are matched to each other such that the bearing is axially clearance-free after preloading by means of an INA precision locknut. The radial internal clearance is C2 according to DIN 620. |
| Needle roller/axial cylindrical roller bearings, for screw mounting | Needle roller/axial cylindrical roller bearings ZARF(L) have holes in the outer ring. These are used for screw mounting directly on the adjacent construction or in a radial locating bore, <i>Figure 1</i> . Due to screw mounting of the outer ring, the cover that would otherwise be required and the matching work can therefore be dispensed with. The bearings are preloaded against the shaft shoulder by means of a precision locknut AM or ZM(A). |
| With seal carrier assembly | In the interests of a simpler design, a seal carrier assembly DRS, <i>Figure 1</i> , ①, is recommended. The seal carrier assembly is centred on the outer ring and seals the bearing against outside influences. |
| ① Seal carrier assembly DRS ZARF..-L <i>Figure 1</i> With DRS Outer ring screw mounted in bore, preloaded using locknut. Stepped shaft locating washer with sealing ring |  |
| With extended shaft locating washer | ZARF..-L has an extended and stepped shaft locating washer, <i>Figure 1</i> . These series are used in preference where the shaft locating washers are not adequately supported axially by the shaft shoulder or the bearing unit cannot be sealed on the outside surface of the normal shaft locating washer due to space conditions in the adjacent construction. |
| Heavy series | ZARF(L) is also available in a heavy series. The heavy series has a larger cross-section for the same shaft diameter and therefore higher basic load ratings. |

Needle roller/ axial cylindrical roller bearings

Needle roller/axial cylindrical roller bearings, not for screw mounting

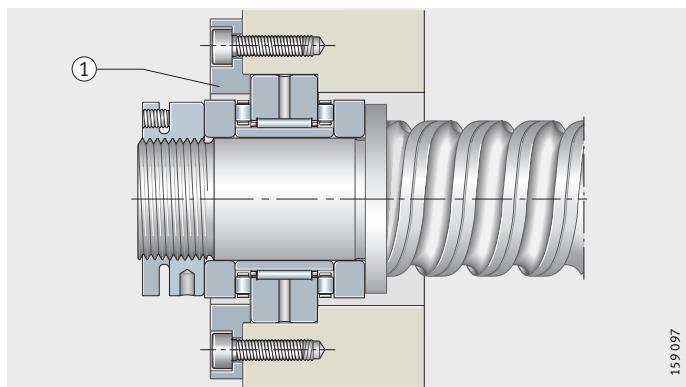
Series ZARN(L) is mounted in a housing bore and the outer ring is located using a cover, *Figure 2*.

The bearings are preloaded against the shaft shoulder by means of a precision locknut AM or ZM(A).

① Cover
ZARN

Figure 2

Outer ring located using cover,
preloaded using locknut



With extended shaft locating washer

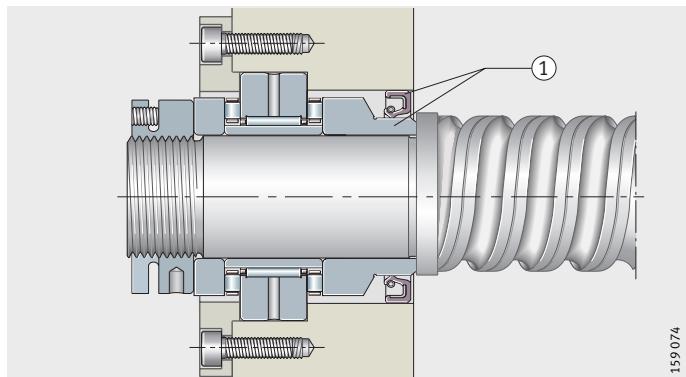
ZARN..-L has an extended and stepped shaft locating washer, *Figure 3*.

This series is used in preference where the shaft locating washer is not adequately supported axially by the shaft shoulder or the bearing unit cannot be sealed on the outside surface of the normal shaft locating washer due to space conditions in the adjacent construction.

① Extended,
stepped shaft locating washer with seal
ZARN..-L

Figure 3

Outer ring located using cover,
preloaded using locknut.
Stepped shaft locating washer
with sealing ring



Heavy series

ZARN(L) is also available in a heavy series.

The heavy series has a larger cross-section for the same shaft diameter and therefore higher basic load ratings.

Operating temperature

The bearings are suitable for operating temperatures from -30 °C to +120 °C.

Suffixes

Suffixes for the available designs: see table.

Available designs

| Suffix | Description |
|--------|---|
| L | Extended, stepped shaft locating washer |
| TV | Cages made from glass fibre reinforced polyamide 66 |

Design and safety guidelines

Basic rating life

The decisive factors in determining the bearing size are the basic rating life, the static load safety factor and the axial limiting load. The basic rating life L and L_h are calculated as follows:

$$L = \left(\frac{C}{P} \right)^p$$

$$L_h = \frac{16666}{n} \cdot \left(\frac{C}{P} \right)^p$$

L 10^6 revolutions
Basic rating life in millions of revolutions

L_h h
Basic rating life in operating hours

C_r, C_a N
Basic dynamic radial or axial load rating according to dimension table

P N
Equivalent dynamic bearing load

p –
Life exponent $p = 10/3$

n min^{-1}
Operating speed.

Resultant and equivalent bearing load

The resultant axial bearing load $F_{a\text{res}}$ is determined from the axial operating load F_{aB} and taking account of the axial preload, *Figure 4 to Figure 6*, page 956.



Under purely axial load, $P = F_{a\text{res}}$. If additional radial operating loads are present, these must be calculated separately using the radial basic load ratings.

The limit values up to which the axial load can be supported clearance-free are shown, *Figure 4 to Figure 6*.

Caution!

A load in excess of the limit value will lead to the rolling element row without load lifting off the raceway. As a result, higher wear will occur under rapid acceleration. For extreme moment loads and statically overdefined systems (locating/locating bearing arrangements), please contact us. The calculation program BEARINX® can give a precise design in this case.

Load varying in steps

If the load values vary in steps, the equivalent load P and speed n are calculated using the following formulae (q = time duration %):

$$P = P \sqrt{\frac{q_1 \cdot n_1 \cdot P_1^p + \dots + q_z \cdot n_z \cdot P_z^p}{q_1 \cdot n_1 + \dots + q_z \cdot n_z}}$$

$$n = \frac{q_1 \cdot n_1 + \dots + q_z \cdot n_z}{100}$$

Static load safety factor

The static load safety factor S_0 is calculated using the following formula (see also page 911):

$$S_0 = \frac{C_0}{P_0}$$

Caution!

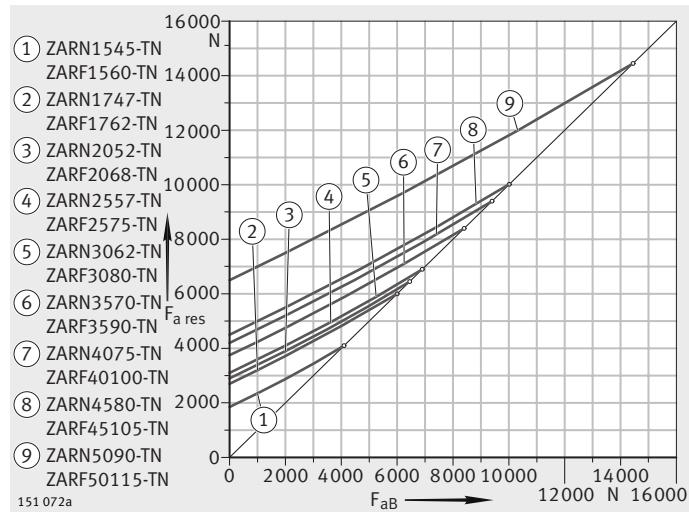
In machine tools, S_0 should be ≥ 4 .

Needle roller/ axial cylindrical roller bearings

Resultant bearing load – diagrams

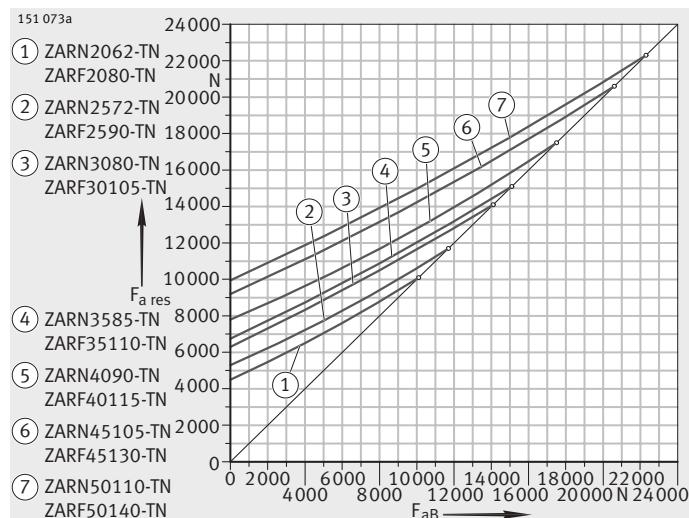
F_{aB} = operating load
 $F_{a\ res}$ = resultant bearing load
 \circ = limit value

Figure 4
 Resultant bearing load
 ZARN, ZARF, heavy series



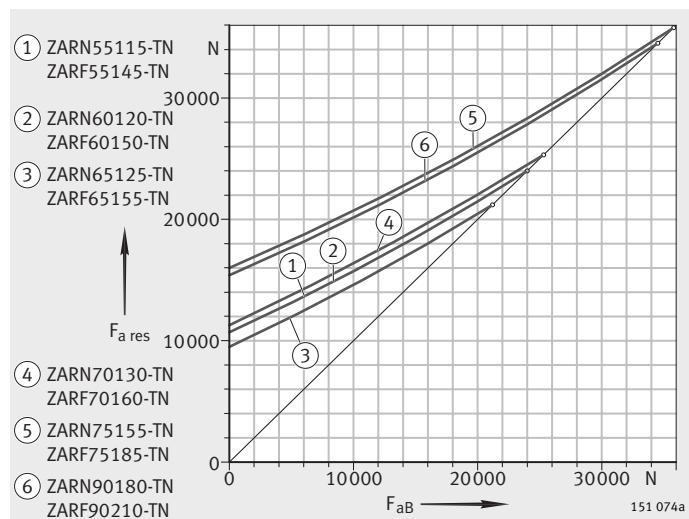
F_{aB} = operating load
 $F_{a\ res}$ = resultant bearing load
 \circ = limit value

Figure 5
 Resultant bearing load
 ZARN, ZARF,
 heavy series up to $d = 50$ mm



F_{aB} = operating load
 $F_{a\ res}$ = resultant bearing load
 \circ = limit value

Figure 6
 Resultant bearing load
 ZARN, ZARF,
 heavy series from $d = 55$ mm



| | |
|--|--|
| Design of adjacent construction | The adjacent construction (the shaft and housing) must be designed in accordance with the data in the dimension tables. The abutment diameters for the shaft and housing shoulders d_a and D_a must be in accordance with the dimension tables. |
| Caution! | The permissible contact pressure for the adjacent construction must be observed. Examples of possible lubricant feeds: see <i>Figure 7</i> and <i>Figure 8</i> , page 958. |
| Sealing of the bearing position | The bearings are sealed, <i>Figure 1</i> , page 953: <ul style="list-style-type: none"> ■ in the direction of the spindle by a rotary shaft seal on the outside surface machined free from spiral marks of the extended shaft locating washer (ZARN...L, ZARF...L) ■ in the direction of the drive by the seal carrier assembly DRS. |
| Speeds | The limiting speeds n_G given in the dimension tables are based on the following conditions: <ul style="list-style-type: none"> ■ bearing preloaded, no external operating load ■ operating duration 25% ■ max. equilibrium temperature +50 °C. |
| Caution! | The limiting speeds n_G are valid for oil lubrication with adequate cooling. |
| Friction | In most applications, preloading of bearings by means of the locknut tightening torque gives sufficiently accurate setting values. The reference here is the tightening torque M_A according to the dimension tables in conjunction with an INA precision locknut. The frictional torque M_{RL} given in the dimension tables is a guide value. It is based on lightly oiled bearings, measured at a speed of $n = 5 \text{ min}^{-1}$. For dimensioning of the drive, the starting frictional torque and the frictional torque at high speeds of 2 to 3 $\times M_{RL}$ must be taken into consideration. |
| Frictional torque and bearing preload | For applications in which the frictional torque is decisive (e.g. temperature development, frictional torque compensation between different bearing positions, etc.), it is recommended that the bearing preload should be set in accordance with the bearing frictional torque M_{RL} . |
| Frictional energy | The frictional energy N_R of the bearings can be calculated as follows: $N_R = \frac{M_{RL} \cdot n}{9,55}$ <p style="text-align: center;">N_R Frictional energy W M_{RL} Bearing frictional torque Nm n Operating speed. min^{-1}</p> <p>In any analysis of the thermal balance, the various operating speeds n_i must be taken into consideration with their time durations q_i.</p> |



Needle roller/ axial cylindrical roller bearings

Lubrication Needle roller/axial cylindrical roller bearings can be relubricated via the outer ring. They are supplied with oil-based or dry preservative and should preferably be lubricated with oil.

Good results have been obtained with oils CLP to DIN 51517 and HLP to DIN 51524 of classes ISO VG 32 to ISO VG 100.

Relubrication for grease lubrication Relubrication should be carried out with the bearing rotating and still warm from operation in order to achieve good replacement and distribution of grease.

The relubrication interval and quantity can only be determined under operating conditions since it is not possible to calculate all the influences in advance. Relubrication: see Fitting and Maintenance Manual TPI 100.

Caution! Where a vertical axis of rotation is used in conjunction with automatic lubrication systems, the lubrication impulse should be selected such that the supply to the upper axial bearing is sufficient.

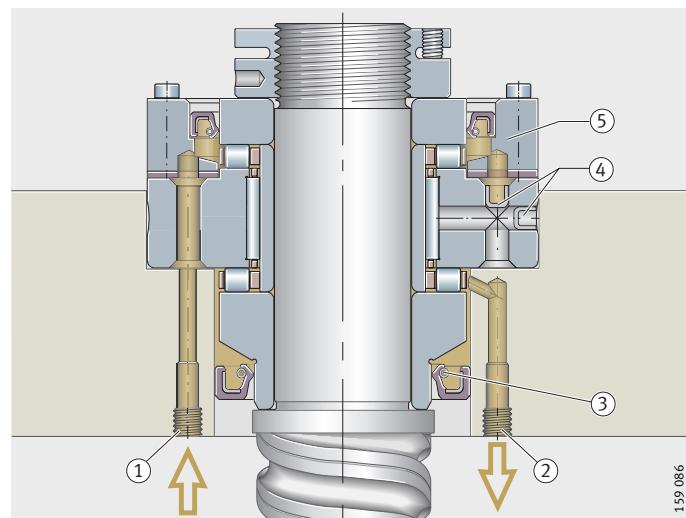
Lubricant feed Examples of lubricant feeds for ZARF(L) are shown in *Figure 7*, *Figure 8*.

Caution! Before initial operation, it must be ensured that all raceways are adequately supplied with lubricant.

- ① Oil inlet
- ② Oil outlet
- ③ Rotary shaft seal
- ④ Cover
- ⑤ Seal carrier assembly

ZARF..-L

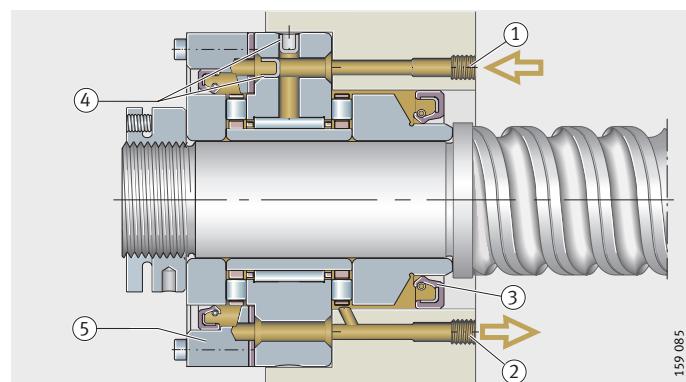
Figure 7
Lubricant feed for
vertical mounting position



- ① Oil inlet
- ② Oil outlet
- ③ Rotary shaft seal
- ④ Cover
- ⑤ Seal carrier assembly

ZARF..-L

Figure 8
Lubricant feed for
horizontal mounting position



Mounting guidelines

Caution!

Bearings should only be fitted and dismantled in accordance with Fitting and Maintenance Manual TPI 100. This TPI is available upon request.

During fitting of bearings, mounting forces should be applied only to the bearing ring to be fitted. Mounting forces must never be directed through the rolling elements.

The characteristics of the bearings are only valid when used in combination with INA precision locknuts and the associated tightening torques given in the dimension tables.

ZARN and ZARF are not self-retaining. The individual bearing components are matched to each other. The individual parts of different bearings must not be interchanged during fitting.

Setting the axial preload

Caution!

The preload in the axial component of ZARF (L) bearings is decisive for the function. It must therefore be set with sufficient accuracy.

Since direct force measurement of these values in fitting is not cost-effective, the axial preload is set indirectly using the following methods:

- either by means of the tightening torque M_A of the precision locknut. The frictional torque may deviate from the value given in the dimension table
- or by means of the bearing frictional torque M_{RL} .



Preloading by locknut

Needle roller/axial cylindrical roller bearings must be axially preloaded during fitting by means of a precision locknut.

When preloading the bearing unit by means of the bearing inner rings using the recommended precision locknut, the tightening torques given in the dimension tables must be observed or the preload must be set using the bearing frictional torque given in the dimension tables. The tightening torques given for the individual bearing sizes are only valid for the INA precision locknuts listed.

In order to counteract settling, it is recommended that the locknut should initially be tightened to twice the tightening torque M_A and then relieved of load again. It should only then be tightened again to the stated tightening torque M_A . Finally, the precision locknut should be secured against rotation by the torque-controlled tightening of the set screws.

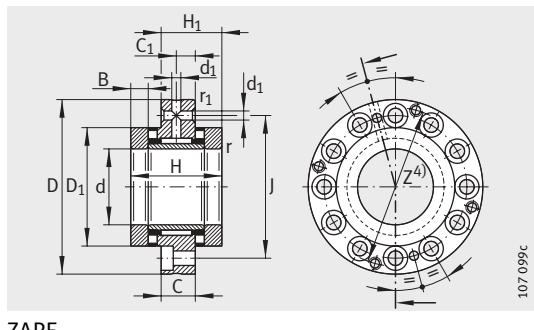
Fixing screws

The fixing screws for the outer ring must be tightened in a crosswise sequence. They may be loaded up to 70% of their elastic limit.

If the bearing outer ring is supported by an additional housing cover, it must be ensured that the fixing screws are sufficiently well dimensioned.

Needle roller/ axial cylindrical roller bearings

Light series
For screw mounting



ZARF

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | | | | |
|----------------------|------------------|------------|----|----|----------------|----------------|----------------|----|----------------|----------------|----------------|----------------|-----|----------------|----------------|-----|----------------|----------------|----|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | C ₁ | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ | d ₁ | J |
| ZARF1560-TV | 0,42 | 15 | 60 | 40 | 26 | — | — | 14 | 8 | 35 | — | — | 7,5 | — | — | 0,3 | 0,6 | 3,2 | 46 |
| ZARF1560-L-TV | 0,45 | 15 | 60 | — | — | 53 | 39 | 14 | 8 | 35 | 24 | 34 | 7,5 | 20,5 | 11 | 0,3 | 0,6 | 3,2 | 46 |
| ZARF1762-TV | 0,49 | 17 | 62 | 43 | 27,5 | — | — | 14 | 8 | 38 | — | — | 9 | — | — | 0,3 | 0,6 | 3,2 | 48 |
| ZARF1762-L-TV | 0,52 | 17 | 62 | — | — | 57 | 41,5 | 14 | 8 | 38 | 28 | 38 | 9 | 23 | 11 | 0,3 | 0,6 | 3,2 | 48 |
| ZARF2068-TV | 0,56 | 20 | 68 | 46 | 29 | — | — | 14 | 8 | 42 | — | — | 10 | — | — | 0,3 | 0,6 | 3,2 | 53 |
| ZARF2068-L-TV | 0,61 | 20 | 68 | — | — | 60 | 43 | 14 | 8 | 42 | 30 | 40 | 10 | 24 | 11 | 0,3 | 0,6 | 3,2 | 53 |
| ZARF2575-TV | 0,78 | 25 | 75 | 50 | 33 | — | — | 18 | 10 | 47 | — | — | 10 | — | — | 0,3 | 0,6 | 3,2 | 58 |
| ZARF2575-L-TV | 0,84 | 25 | 75 | — | — | 65 | 48 | 18 | 10 | 47 | 36 | 45 | 10 | 25 | 11 | 0,3 | 0,6 | 3,2 | 58 |
| ZARF3080-TV | 0,85 | 30 | 80 | 50 | 33 | — | — | 18 | 10 | 52 | — | — | 10 | — | — | 0,3 | 0,6 | 3,2 | 63 |
| ZARF3080-L-TV | 0,9 | 30 | 80 | — | — | 65 | 48 | 18 | 10 | 52 | 40 | 50 | 10 | 25 | 11 | 0,3 | 0,6 | 3,2 | 63 |

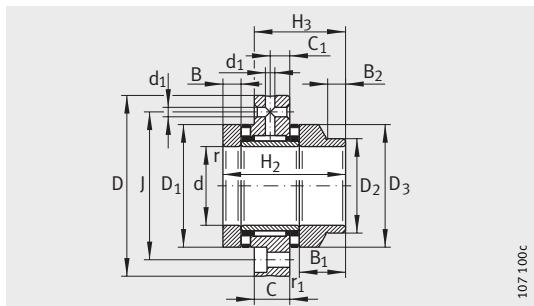
¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

²⁾ Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

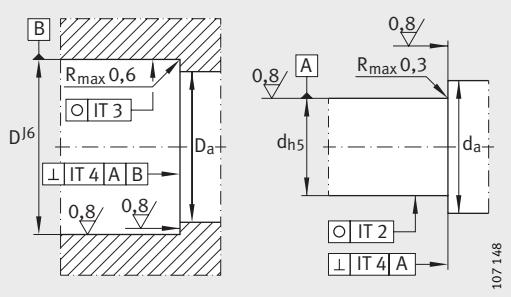
³⁾ Mass moment of inertia for rotating inner ring.

⁴⁾ Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

⁵⁾ Only valid in conjunction with INA precision locknuts.



ZARF..-L



Design of adjacent construction

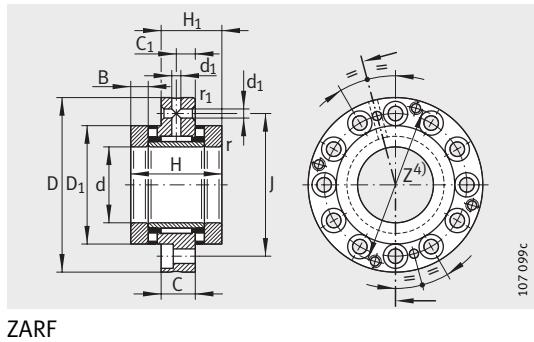
| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque M _{RL} | Rigidity axial c _{aL} | Tilting rigidity c _{kL} | Mass moment of inertia ³⁾ M _m | Axial runout |
|-----------------------------------|----------------|---------------------|-----------------------|---------------------|-----------------------|--------------------|-----------------------|---|--------------------------------|----------------------------------|---|--------------|
| | | axial | | radial | | | | | | | | |
| D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil | n _G grease | Nm | Nm/m ^μ | kg · cm ² | μm | |
| 36 | 28 | 24 900 | 53 000 | 13 000 | 17 500 | 8 500 | 2 200 | 0,35 | 1 400 | 110 | 0,24 | 1 |
| 36 | 22 | 24 900 | 53 000 | 13 000 | 17 500 | 8 500 | 2 200 | 0,35 | 1 400 | 110 | 0,274 | 1 |
| 39 | 28 | 26 000 | 57 000 | 14 000 | 19 900 | 7 800 | 2 100 | 0,4 | 1 600 | 160 | 0,373 | 1 |
| 39 | 26 | 26 000 | 57 000 | 14 000 | 19 900 | 7 800 | 2 100 | 0,4 | 1 600 | 160 | 0,464 | 1 |
| 43 | 33 | 33 500 | 76 000 | 14 900 | 22 400 | 7 000 | 2 000 | 0,5 | 1 800 | 230 | 0,615 | 1 |
| 43 | 28 | 33 500 | 76 000 | 14 900 | 22 400 | 7 000 | 2 000 | 0,5 | 1 800 | 230 | 0,683 | 1 |
| 48 | 39 | 35 500 | 86 000 | 22 600 | 36 000 | 6 000 | 1 900 | 0,55 | 1 900 | 350 | 0,989 | 1 |
| 48 | 34 | 35 500 | 86 000 | 22 600 | 36 000 | 6 000 | 1 900 | 0,55 | 1 900 | 350 | 1,15 | 1 |
| 53 | 44 | 39 000 | 101 000 | 24 300 | 41 500 | 5 500 | 1 800 | 0,65 | 2 200 | 520 | 1,46 | 1 |
| 53 | 38 | 39 000 | 101 000 | 24 300 | 41 500 | 5 500 | 1 800 | 0,65 | 2 200 | 520 | 1,7 | 1 |

| Designation | Recommended INA locknut; to be ordered separately | | | Rotary shaft seal to DIN 3 760; to be ordered separately | Fixing screws ²⁾ DIN 912-10.9 | |
|---------------|---|---|-----------------------|--|--|----------|
| | Designation | Tightening torque ⁵⁾ M _A Nm | Axial preload force N | | Size | Quantity |
| ZARF1560-TV | ZMA15/33 AM15 | 10 | 6 506 | – | M6 | 6 |
| ZARF1560-L-TV | ZMA15/33 AM15 | 10 | 6 506 | 24X35X7 | M6 | 6 |
| ZARF1762-TV | ZM17 AM17 | 12 | 7 078 | – | M6 | 6 |
| ZARF1762-L-TV | ZM17 AM17 | 12 | 7 078 | 28X40X7 | M6 | 6 |
| ZARF2068-TV | ZMA20/38 AM20 | 18 | 9 376 | – | M6 | 8 |
| ZARF2068-L-TV | ZMA20/38 AM20 | 18 | 9 376 | 30X42X7 | M6 | 8 |
| ZARF2575-TV | ZMA25/45 AM25 | 25 | 10 470 | – | M6 | 8 |
| ZARF2575-L-TV | ZMA25/45 AM25 | 25 | 10 470 | 36X47X7 | M6 | 8 |
| ZARF3080-TV | ZMA30/52 AM30 | 32 | 11 091 | – | M6 | 12 |
| ZARF3080-L-TV | ZMA30/52 AM30 | 32 | 11 091 | 40X52X7 | M6 | 12 |



Needle roller/ axial cylindrical roller bearings

Light series
For screw mounting



ZARF

Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | | | | |
|-----------------------|------------------|------------|-----|----|----------------|----------------|----------------|------|----------------|----------------|----------------|----------------|------|----------------|----------------|-----|----------------|----------------|----|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | C ₁ | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ | d ₁ | J |
| ZARF3590-TV | 1,12 | 35 | 90 | 54 | 35 | — | — | 18 | 10 | 60 | — | — | 11 | — | — | 0,3 | 0,6 | 3,2 | 73 |
| ZARF3590-L-TV | 1,25 | 35 | 90 | — | — | 70 | 51 | 18 | 10 | 60 | 45 | 58 | 11 | 27 | 12 | 0,3 | 0,6 | 3,2 | 73 |
| ZARF40100-TV | 1,35 | 40 | 100 | 54 | 35 | — | — | 18 | 10 | 65 | — | — | 11 | — | — | 0,3 | 0,6 | 3,2 | 80 |
| ZARF40100-L-TV | 1,45 | 40 | 100 | — | — | 70 | 51 | 18 | 10 | 65 | 50 | 63 | 11 | 27 | 12 | 0,3 | 0,6 | 3,2 | 80 |
| ZARF45105-TV | 1,7 | 45 | 105 | 60 | 40 | — | — | 22,5 | 12,5 | 70 | — | — | 11,5 | — | — | 0,3 | 0,6 | 6 | 85 |
| ZARF45105-L-TV | 1,85 | 45 | 105 | — | — | 75 | 55 | 22,5 | 12,5 | 70 | 56 | 68 | 11,5 | 26,5 | 12 | 0,3 | 0,6 | 6 | 85 |
| ZARF50115-TV | 2,1 | 50 | 115 | 60 | 40 | — | — | 22,5 | 12,5 | 78 | — | — | 11,5 | — | — | 0,3 | 0,6 | 6 | 94 |
| ZARF50115-L-TV | 2,45 | 50 | 115 | — | — | 78 | 58 | 22,5 | 12,5 | 78 | 60 | 78 | 11,5 | 29,5 | 12 | 0,3 | 0,6 | 6 | 94 |

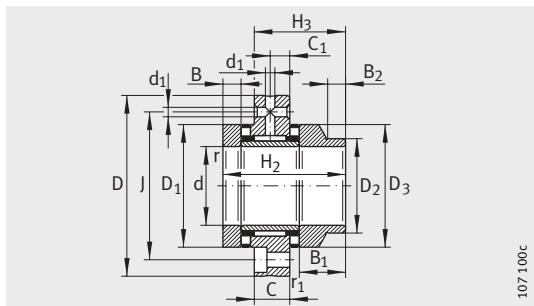
1) If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

2) Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

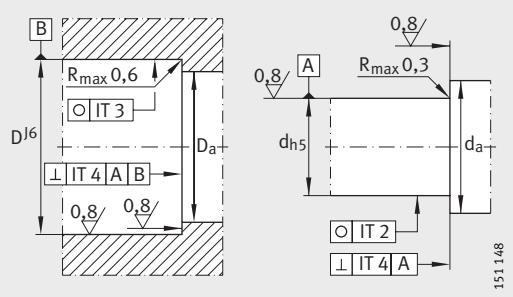
3) Mass moment of inertia for rotating inner ring.

4) Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

5) Only valid in conjunction with INA precision locknuts.



ZARF..-L



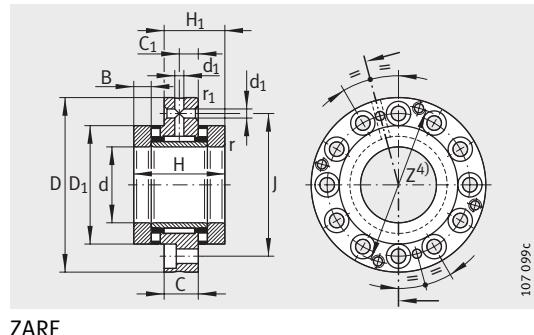
Design of adjacent construction

| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque M _{RL} | Rigidity axial c _{al} | Tilting rigidity c _{kL} | Mass moment of inertia ³⁾ M _m | Axial runout |
|-----------------------------------|----------------|---------------------|-----------------------|---------------------|-----------------------|--------------------------------------|---|---|--------------------------------|----------------------------------|---|--------------|
| | | axial | | radial | | | | | | | | |
| D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil min ⁻¹ | n _G grease min ⁻¹ | Nm | N/μm | Nm/mrad | kg · cm ² | μm |
| 61 | 50 | 56 000 | 148 000 | 26 000 | 47 000 | 4 800 | 1 700 | 0,9 | 2 600 | 740 | 2,8 | 1 |
| 61 | 43 | 56 000 | 148 000 | 26 000 | 47 000 | 4 800 | 1 700 | 0,9 | 2 600 | 740 | 3,21 | 1 |
| 66 | 55 | 59 000 | 163 000 | 27 500 | 53 000 | 4 400 | 1 600 | 1 | 2 800 | 1 030 | 3,78 | 1 |
| 66 | 48 | 59 000 | 163 000 | 27 500 | 53 000 | 4 400 | 1 600 | 1 | 2 800 | 1 030 | 4,35 | 1 |
| 71 | 60 | 61 000 | 177 000 | 38 000 | 74 000 | 4 000 | 1 500 | 1,2 | 3 000 | 1 340 | 5,33 | 1 |
| 71 | 54 | 61 000 | 177 000 | 38 000 | 74 000 | 4 000 | 1 500 | 1,2 | 3 000 | 1 340 | 6,03 | 1 |
| 79 | 67 | 90 000 | 300 000 | 40 000 | 82 000 | 3 600 | 1 200 | 2,2 | 4 800 | 2 470 | 8,42 | 1 |
| 79 | 58 | 90 000 | 300 000 | 40 000 | 82 000 | 3 600 | 1 200 | 2,2 | 4 800 | 2 470 | 10,46 | 1 |

| Designation | Recommended INA locknut; to be ordered separately | | | Rotary shaft seal to DIN 3 760; to be ordered separately | Fixing screws ²⁾ DIN 912-10.9 | |
|----------------|---|---------|---|--|--|----------|
| | Designation | | Tightening torque ⁵⁾ M _A Nm | | Size | Quantity |
| ZARF3590-TV | ZMA35/58 | AM35/58 | 42 | 12 486 | – | M6 12 |
| ZARF3590-L-TV | ZMA35/58 | AM35/58 | 42 | 12 486 | 45X60X8 | M6 12 |
| ZARF40100-TV | ZMA40/62 | AM40 | 55 | 14 240 | – | M8 8 |
| ZARF40100-L-TV | ZMA40/62 | AM40 | 55 | 14 240 | 50X65X8 | M8 8 |
| ZARF45105-TV | ZMA45/68 | AM45 | 65 | 15 765 | – | M8 8 |
| ZARF45105-L-TV | ZMA45/68 | AM45 | 65 | 15 765 | 56X70X8 | M8 8 |
| ZARF50115-TV | ZMA50/75 | AM50 | 85 | 18 410 | – | M8 12 |
| ZARF50115-L-TV | ZMA50/75 | AM50 | 85 | 18 410 | 60X80X8 | M8 12 |

Needle roller/ axial cylindrical roller bearings

Heavy series
For screw mounting



ZARF

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | | |
|-----------------------|------------------|------------|-----|----|----------------|----------------|----------------|------|----------------|----------------|----------------|----------------|------|----------------|----------------|-----|----------------|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | C ₁ | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ |
| ZARF2080-TV | 1,1 | 20 | 80 | 60 | 38 | — | — | 18 | 10 | 52 | — | — | 12,5 | — | — | 0,3 | 0,6 |
| ZARF2080-L-TV | 1,22 | 20 | 80 | — | — | 75 | 53 | 18 | 10 | 52 | 40 | 50 | 12,5 | 27,5 | 11 | 0,3 | 0,6 |
| ZARF2590-TV | 1,6 | 25 | 90 | 60 | 38 | — | — | 18 | 10 | 62 | — | — | 12,5 | — | — | 0,3 | 0,6 |
| ZARF2590-L-TV | 1,75 | 25 | 90 | — | — | 75 | 53 | 18 | 10 | 62 | 48 | 60 | 12,5 | 27,5 | 11 | 0,3 | 0,6 |
| ZARF30105-TV | 1,95 | 30 | 105 | 66 | 41 | — | — | 18 | 10 | 68 | — | — | 14 | — | — | 0,3 | 0,6 |
| ZARF30105-L-TV | 2,15 | 30 | 105 | — | — | 82 | 57 | 18 | 10 | 68 | 52 | 66 | 14 | 30 | 12 | 0,3 | 0,6 |
| ZARF35110-TV | 1,6 | 35 | 110 | 66 | 41 | — | — | 18 | 10 | 73 | — | — | 14 | — | — | 0,3 | 0,6 |
| ZARF35110-L-TV | 1,85 | 35 | 110 | — | — | 82 | 57 | 18 | 10 | 73 | 60 | 73 | 14 | 30 | 12 | 0,3 | 0,6 |
| ZARF40115-TV | 2,7 | 40 | 115 | 75 | 47,5 | — | — | 22,5 | 12,5 | 78 | — | — | 16 | — | — | 0,3 | 0,6 |
| ZARF40115-L-TV | 3 | 40 | 115 | — | — | 93 | 65,5 | 22,5 | 12,5 | 78 | 60 | 78 | 16 | 34 | 12 | 0,3 | 0,6 |
| ZARF45130-TV | 3,9 | 45 | 130 | 82 | 51 | — | — | 22,5 | 12,5 | 90 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARF45130-L-TV | 4,3 | 45 | 130 | — | — | 103 | 72 | 22,5 | 12,5 | 90 | 70 | 88 | 17,5 | 38,5 | 14 | 0,3 | 0,6 |

¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

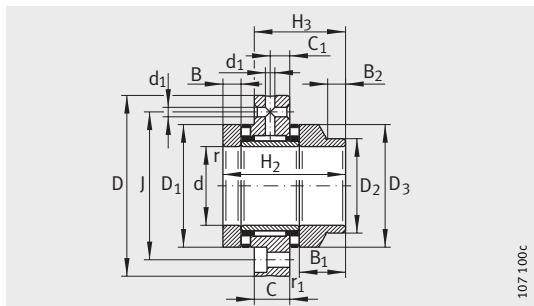
²⁾ Tightening torque of fixing screws according to manufacturer's data.

Screws are not included in the delivery.

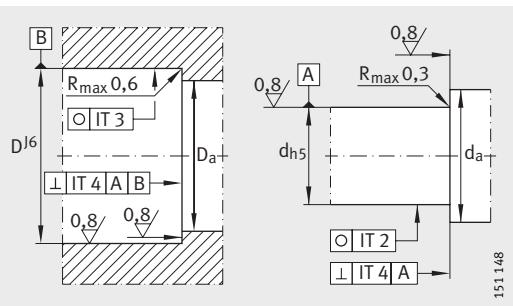
³⁾ Mass moment of inertia for rotating inner ring.

⁴⁾ Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

⁵⁾ Only valid in conjunction with INA precision locknuts.



ZARF..-L



Design of adjacent construction

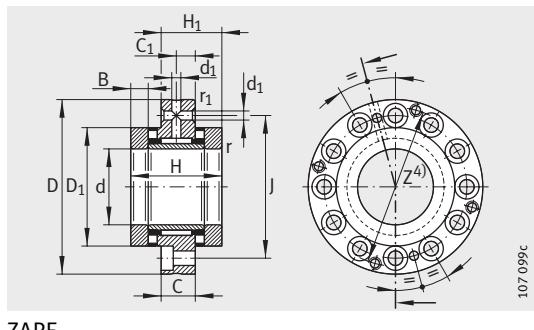


| | | Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque M _{RL} | Rigidity axial c _{aL} | Tilting rigidity c _{kL} | Mass moment of inertia ³⁾ M _m | Axial runout | | |
|----------------|-----|-----------------------------------|----------------|---------------------|-----------------------|---------------------|-----------------------|--------------------|-----------------------|---|--------------------------------|----------------------------------|---|--------------|----------------------|----|
| | | | | axial | | radial | | | | | | | | | | |
| d ₁ | J | D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil | n _G grease | min ⁻¹ | min ⁻¹ | Nm | N/μm | Nm/mrad | kg · cm ² | μm |
| 3,2 | 63 | 53 | 38 | 64 000 | 141 000 | 22 600 | 36 000 | 6 000 | 1 500 | 1,3 | 2 300 | 400 | 1,98 | 1 | | |
| 3,2 | 63 | 53 | 38 | 64 000 | 141 000 | 22 600 | 36 000 | 6 000 | 1 500 | 1,3 | 2 300 | 400 | 2,27 | 1 | | |
| 3,2 | 73 | 63 | 45 | 80 000 | 199 000 | 24 300 | 41 500 | 4 900 | 1 400 | 1,6 | 3 000 | 800 | 3,88 | 1 | | |
| 3,2 | 73 | 63 | 45 | 80 000 | 199 000 | 24 300 | 41 500 | 4 900 | 1 400 | 1,6 | 3 000 | 800 | 4,51 | 1 | | |
| 3,2 | 85 | 69 | 52 | 107 000 | 265 000 | 26 000 | 47 000 | 4 400 | 1 300 | 2,1 | 3 300 | 1 100 | 6,53 | 1 | | |
| 3,2 | 85 | 69 | 50 | 107 000 | 265 000 | 26 000 | 47 000 | 4 400 | 1 300 | 2,1 | 3 300 | 1 100 | 7,43 | 1 | | |
| 3,2 | 88 | 74 | 60 | 105 000 | 265 000 | 27 500 | 53 000 | 4 000 | 1 250 | 2,3 | 2 500 | 1 300 | 8,47 | 1 | | |
| 3,2 | 88 | 74 | 58 | 105 000 | 265 000 | 27 500 | 53 000 | 4 000 | 1 250 | 2,3 | 3 500 | 1 300 | 10,4 | 1 | | |
| 6 | 94 | 79 | 65 | 117 000 | 315 000 | 38 000 | 74 000 | 3 700 | 1 200 | 2,5 | 3 800 | 1 800 | 13,3 | 1 | | |
| 6 | 94 | 79 | 58 | 117 000 | 315 000 | 38 000 | 74 000 | 3 700 | 1 200 | 2,5 | 3 800 | 1 800 | 15,5 | 1 | | |
| 6 | 105 | 91 | 70 | 154 000 | 405 000 | 40 000 | 82 000 | 3 300 | 1 150 | 3,5 | 4 000 | 2 100 | 23,7 | 1 | | |
| 6 | 105 | 91 | 68 | 154 000 | 405 000 | 40 000 | 82 000 | 3 300 | 1 150 | 3,5 | 4 000 | 2 100 | 28,1 | 1 | | |

| Designation | Recommended INA locknut; to be ordered separately | | | | Rotary shaft seal to DIN 3 760; to be ordered separately | Fixing screws ²⁾ DIN 912-10.9 | |
|----------------|---|------|---|-----------------------|--|--|----|
| | Designation | | Tightening torque ⁵⁾ M _A Nm | Axial preload force N | | | |
| ZARF2080-TV | ZMA20/52 | AM20 | 38 | 18 448 | – | M6 | 12 |
| ZARF2080-L-TV | ZMA20/52 | AM20 | 38 | 18 448 | 40X52X7 | M6 | 12 |
| ZARF2590-TV | ZMA25/58 | AM25 | 55 | 20 790 | – | M6 | 12 |
| ZARF2590-L-TV | ZMA25/58 | AM25 | 55 | 20 790 | 48X62X8 | M6 | 12 |
| ZARF30105-TV | ZMA30/65 | AM30 | 75 | 24 287 | – | M8 | 12 |
| ZARF30105-L-TV | ZMA30/65 | AM30 | 75 | 24 287 | 52X68X8 | M8 | 12 |
| ZARF35110-TV | ZMA35/70 | AM35 | 100 | 27 480 | – | M8 | 12 |
| ZARF35110-L-TV | ZMA35/70 | AM35 | 100 | 27 480 | 60X75X8 | M8 | 12 |
| ZARF40115-TV | ZMA40/75 | AM40 | 120 | 29 834 | – | M8 | 12 |
| ZARF40115-L-TV | ZMA40/75 | AM40 | 120 | 29 834 | 60X80X8 | M8 | 12 |
| ZARF45130-TV | ZMA45/85 | AM45 | 150 | 33 549 | – | M8 | 12 |
| ZARF45130-L-TV | ZMA45/85 | AM45 | 150 | 33 549 | 70X90X10 | M8 | 12 |

Needle roller/ axial cylindrical roller bearings

Heavy series
For screw mounting



ZARF

Dimension table (continued) - Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | | | | |
|-----------------------|------------------|------------|-----|-----|----------------|----------------|----------------|------|----------------|----------------|----------------|----------------|------|----------------|----------------|-----|----------------|----------------|-----|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | C ₁ | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ | d ₁ | J |
| ZARF50140-TV | 4,2 | 50 | 140 | 82 | 51 | — | — | 22,5 | 12,5 | 95 | — | — | 17,5 | — | — | 0,3 | 0,6 | 6 | 113 |
| ZARF50140-L-TV | 4,65 | 50 | 140 | — | — | 103 | 72 | 22,5 | 12,5 | 95 | 75 | 93 | 17,5 | 38,5 | 14 | 0,3 | 0,6 | 6 | 113 |
| ZARF55145-TV | 4,5 | 55 | 145 | 82 | 51 | — | — | 22,5 | 12,5 | 100 | — | — | 17,5 | — | — | 0,3 | 0,6 | 6 | 118 |
| ZARF55145-L-TV | 5 | 55 | 145 | — | — | 103 | 72 | 22,5 | 12,5 | 100 | 80 | 98 | 17,5 | 38,5 | 14 | 0,3 | 0,6 | 6 | 118 |
| ZARF60150-TV | 4,7 | 60 | 150 | 82 | 51 | — | — | 22,5 | 12,5 | 105 | — | — | 17,5 | — | — | 0,3 | 0,6 | 6 | 123 |
| ZARF60150-L-TV | 5,35 | 60 | 150 | — | — | 103 | 72 | 22,5 | 12,5 | 105 | 90 | 105 | 17,5 | 38,5 | 16 | 0,3 | 0,6 | 6 | 123 |
| ZARF65155-TV | 5,1 | 65 | 155 | 82 | 51 | — | — | 22,5 | 12,5 | 110 | — | — | 17,5 | — | — | 0,3 | 0,6 | 6 | 128 |
| ZARF65155-L-TV | 5,7 | 65 | 155 | — | — | 103 | 72 | 22,5 | 12,5 | 110 | 90 | 108 | 17,5 | 38,5 | 16 | 0,3 | 0,6 | 6 | 128 |
| ZARF70160-TV | 5,2 | 70 | 160 | 82 | 51 | — | — | 22,5 | 12,5 | 115 | — | — | 17,5 | — | — | 0,3 | 0,6 | 6 | 133 |
| ZARF70160-L-TV | 5,95 | 70 | 160 | — | — | 103 | 72 | 22,5 | 12,5 | 115 | 100 | 115 | 17,5 | 38,5 | 16 | 0,3 | 0,6 | 6 | 133 |
| ZARF75185-TV | 9,4 | 75 | 185 | 100 | 62 | — | — | 27 | 15 | 135 | — | — | 21 | — | — | 0,3 | 1 | 6 | 155 |
| ZARF75185-L-TV | 10,6 | 75 | 185 | — | — | 125 | 87 | 27 | 15 | 135 | 115 | 135 | 21 | 46 | 16 | 0,3 | 1 | 6 | 155 |
| ZARF90210-TV | 13,7 | 90 | 210 | 110 | 69,5 | — | — | 32 | 17,5 | 160 | — | — | 22,5 | — | — | 0,3 | 1 | 8 | 180 |
| ZARF90210-L-TV | 15,1 | 90 | 210 | — | — | 135 | 94,5 | 32 | 17,5 | 160 | 130 | 158 | 22,5 | 47,5 | 16 | 0,3 | 1 | 8 | 180 |

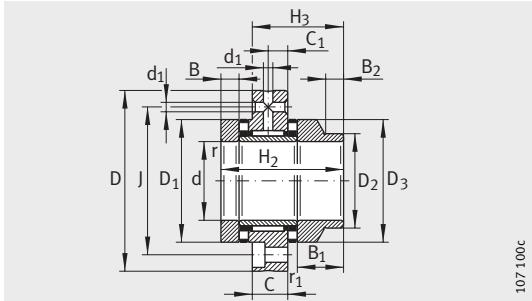
¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

²⁾ Tightening torque of fixing screws according to manufacturer's data.
Screws are not included in the delivery.

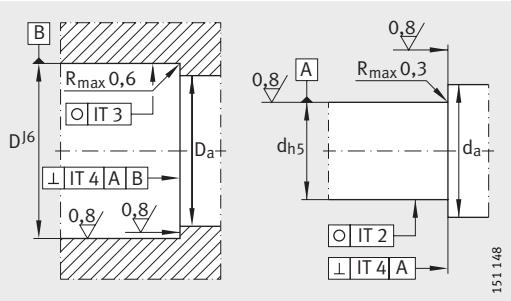
³⁾ Mass moment of inertia for rotating inner ring.

⁴⁾ Mounting dimension for seal carrier assembly DRS.
Seal carrier assemblies: see page 979 and page 983.

⁵⁾ Only valid in conjunction with INA precision locknuts.



ZARF..-L



Design of adjacent construction

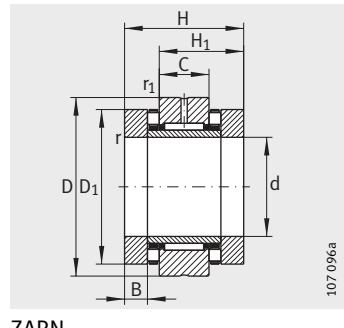
| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque | Rigidity axial | Tilting rigidity | Mass moment of inertia ³⁾ | Axial runout |
|-----------------------------------|----------------|------------------------|--------------------------|------------------------|--------------------------|--------------------|-----------------------|---------------------------|-----------------|------------------|--------------------------------------|--------------|
| | | axial | | radial | | | | | | | | |
| Da | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil | n _G grease | M _{RL} | c _{al} | c _{kL} | M _m | |
| max. | min. | N | N | N | N | min ⁻¹ | min ⁻¹ | Nm | N/μm | Nm/ mrad | kg · cm ² | μm |
| 96 | 75 | 172 000 | 480 000 | 42 000 | 90 000 | 3 100 | 1 100 | 3,8 | 4 600 | 2 900 | 29,8 | 1 |
| 96 | 73 | 172 000 | 480 000 | 42 000 | 90 000 | 3 100 | 1 100 | 3,8 | 4 600 | 2 900 | 35,3 | 1 |
| 101 | 85 | 177 000 | 500 000 | 44 000 | 98 000 | 2 900 | 1 000 | 4 | 4 900 | 3 600 | 36,1 | 1 |
| 101 | 78 | 177 000 | 500 000 | 44 000 | 98 000 | 2 900 | 1 000 | 4 | 4 900 | 3 600 | 43 | 1 |
| 106 | 90 | 187 000 | 550 000 | 44 500 | 92 000 | 2 700 | 950 | 4,2 | 5 300 | 4 300 | 43,8 | 1 |
| 106 | 88 | 187 000 | 550 000 | 44 500 | 92 000 | 2 700 | 950 | 4,2 | 5 300 | 4 300 | 54,5 | 1 |
| 111 | 97 | 172 000 | 500 000 | 54 000 | 104 000 | 2 600 | 900 | 4 | 4 800 | 4 000 | 51 | 1 |
| 111 | 88 | 172 000 | 500 000 | 54 000 | 104 000 | 2 600 | 900 | 4 | 4 800 | 4 000 | 60,1 | 1 |
| 116 | 100 | 201 000 | 630 000 | 56 000 | 119 000 | 2 400 | 800 | 4,8 | 5 800 | 6 000 | 62,2 | 1 |
| 116 | 98 | 201 000 | 630 000 | 56 000 | 119 000 | 2 400 | 800 | 4,8 | 5 800 | 6 000 | 77,3 | 1 |
| 136 | 113 | 290 000 | 890 000 | 72 000 | 132 000 | 2 100 | 700 | 8 | 6 600 | 8 500 | 149 | 2 |
| 136 | 110 | 290 000 | 890 000 | 72 000 | 132 000 | 2 100 | 700 | 8 | 6 600 | 8 500 | 188 | 2 |
| 161 | 130 | 325 000 | 1 030 000 | 98 000 | 210 000 | 1 800 | 700 | 10,5 | 7 700 | 14 500 | 312 | 2 |
| 161 | 125 | 325 000 | 1 030 000 | 98 000 | 210 000 | 1 800 | 700 | 10,5 | 7 700 | 14 500 | 372 | 2 |



| Designation | Recommended INA locknut; to be ordered separately | | | | Rotary shaft seal to DIN 3 760; to be ordered separately | Fixing screws ²⁾ DIN 912-10.9 | |
|----------------|---|--|---------------------------------|---------|---|---|----|
| | Designation | Tightening torque ⁵⁾ M _A Nm | Axial preload force N | Size | | Quantity | |
| | | | | | | | |
| ZARF50140-TV | ZMA50/92 | AM50 | 180 | 37 109 | – | M10 | 12 |
| ZARF50140-L-TV | ZMA50/92 | AM50 | 180 | 37 109 | 75X95X10 | M10 | 12 |
| ZARF55145-TV | ZMA55/98 | AM55 | 220 | 40 772 | – | M10 | 12 |
| ZARF55145-L-TV | ZMA55/98 | AM55 | 220 | 40 772 | 80X100X10 | M10 | 12 |
| ZARF60150-TV | ZMA60/98 | AM60 | 250 | 42 190 | – | M10 | 12 |
| ZARF60150-L-TV | ZMA60/98 | AM60 | 250 | 42 190 | 90X110X12 | M10 | 12 |
| ZARF65155-TV | ZMA65/105 | AM65 | 270 | 41 778 | – | M10 | 12 |
| ZARF65155-L-TV | ZMA65/105 | AM65 | 270 | 41 778 | 90X110X12 | M10 | 12 |
| ZARF70160-TV | ZMA70/110 | AM70 | 330 | 47 692 | – | M10 | 12 |
| ZARF70160-L-TV | ZMA70/110 | AM70 | 330 | 47 692 | 100X120X12 | M10 | 12 |
| ZARF75185-TV | ZMA75/125 | AM75 | 580 | 76 339 | – | M12 | 12 |
| ZARF75185-L-TV | ZMA75/125 | AM75 | 580 | 76 339 | 115X140X12 | M12 | 12 |
| ZARF90210-TV | ZMA90/155 | AM90 | 960 | 102 468 | – | M12 | 16 |
| ZARF90210-L-TV | ZMA90/155 | AM90 | 960 | 102 468 | 130X160X12 | M12 | 16 |

Needle roller/axial cylindrical roller bearings

Light series



107096a

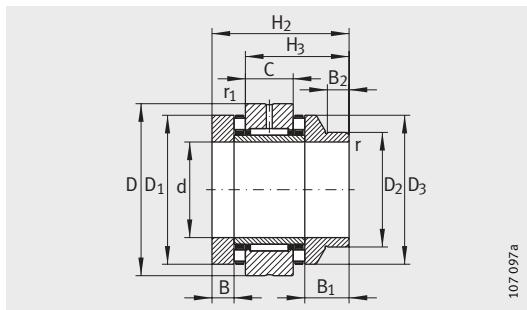
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | |
|---------------|------------------|------------|----|----|----------------|----------------|----------------|----|----------------|----------------|----------------|-----|----------------|----------------|-----------|------------------------|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r min. | r ₁ min. |
| ZARN1545-TV | 0,34 | 15 | 45 | 40 | 28 | — | — | 16 | 35 | — | — | 7,5 | — | — | 0,3 | 0,6 |
| ZARN1545-L-TV | 0,37 | 15 | 45 | — | — | 53 | 41 | 16 | 35 | 24 | 34 | 7,5 | 20,5 | 11 | 0,3 | 0,6 |
| ZARN1747-TV | 0,37 | 17 | 47 | 43 | 29,5 | — | — | 16 | 38 | — | — | 9 | — | — | 0,3 | 0,6 |
| ZARN1747-L-TV | 0,41 | 17 | 47 | — | — | 57 | 43,5 | 16 | 38 | 28 | 38 | 9 | 23 | 11 | 0,3 | 0,6 |
| ZARN2052-TV | 0,41 | 20 | 52 | 46 | 31 | — | — | 16 | 42 | — | — | 10 | — | — | 0,3 | 0,6 |
| ZARN2052-L-TV | 0,46 | 20 | 52 | — | — | 60 | 45 | 16 | 42 | 30 | 40 | 10 | 24 | 11 | 0,3 | 0,6 |
| ZARN2557-TV | 0,53 | 25 | 57 | 50 | 35 | — | — | 20 | 47 | — | — | 10 | — | — | 0,3 | 0,6 |
| ZARN2557-L-TV | 0,59 | 25 | 57 | — | — | 65 | 50 | 20 | 47 | 36 | 45 | 10 | 25 | 11 | 0,3 | 0,6 |
| ZARN3062-TV | 0,6 | 30 | 62 | 50 | 35 | — | — | 20 | 52 | — | — | 10 | — | — | 0,3 | 0,6 |
| ZARN3062-L-TV | 0,75 | 30 | 62 | — | — | 65 | 50 | 20 | 52 | 40 | 50 | 10 | 25 | 11 | 0,3 | 0,6 |

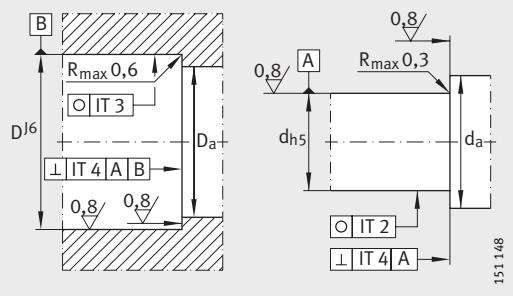
¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

²⁾ Mass moment of inertia for rotating inner ring.

³⁾ Only valid in conjunction with INA precision locknuts.



ZARN..-L



Design of adjacent construction

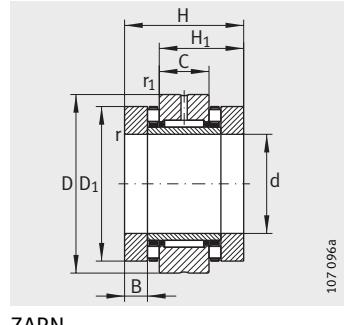
| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque | Rigidity axial | Tilting rigidity | Mass moment of inertia ²⁾ | Axial runout | |
|-----------------------------------|----------------|------------------------|--------------------------|------------------------|--------------------------|--------------------|-----------------------|---------------------------|-----------------|------------------|--------------------------------------|----------------------|----|
| | | axial | | radial | | | | | | | | | |
| D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil | n _G grease | M _{RL} | c _{aL} | c _{kL} | Nm/mrad | kg · cm ² | μm |
| max. | min. | N | N | N | N | min ⁻¹ | min ⁻¹ | Nm | N/μm | Nm/mrad | kg · cm ² | kg · cm ² | μm |
| 36 | 28 | 24 900 | 53 000 | 13 000 | 17 500 | 8 500 | 2 200 | 0,35 | 1 400 | 110 | 0,24 | 1 | |
| 36 | 22 | 24 900 | 53 000 | 13 000 | 17 500 | 8 500 | 2 200 | 0,35 | 1 400 | 110 | 0,274 | 1 | |
| 39 | 28 | 26 000 | 57 000 | 14 000 | 19 900 | 7 800 | 2 100 | 0,4 | 1 600 | 160 | 0,373 | 1 | |
| 39 | 26 | 26 000 | 57 000 | 14 000 | 19 900 | 7 800 | 2 100 | 0,4 | 1 600 | 160 | 0,464 | 1 | |
| 43 | 33 | 33 500 | 76 000 | 14 900 | 22 400 | 7 000 | 2 000 | 0,5 | 1 800 | 230 | 0,615 | 1 | |
| 43 | 28 | 33 500 | 76 000 | 14 900 | 22 400 | 7 000 | 2 000 | 0,5 | 1 800 | 230 | 0,683 | 1 | |
| 48 | 39 | 35 500 | 86 000 | 22 600 | 36 000 | 6 000 | 1 900 | 0,55 | 1 900 | 350 | 0,989 | 1 | |
| 48 | 34 | 35 500 | 86 000 | 22 900 | 36 000 | 6 000 | 1 900 | 0,55 | 1 900 | 350 | 1,15 | 1 | |
| 53 | 44 | 39 000 | 101 000 | 24 300 | 41 500 | 5 500 | 1 800 | 0,65 | 2 200 | 520 | 1,46 | 1 | |
| 53 | 38 | 39 000 | 101 000 | 24 300 | 41 500 | 5 500 | 1 800 | 0,65 | 2 200 | 520 | 1,7 | 1 | |



| Designation | Recommended INA locknut; to be ordered separately | | | | Rotary shaft seal to DIN 3 760; to be ordered separately |
|---------------|---|---|--------------------------|--------|---|
| | Designation | Tightening torque ³⁾ M _A Nm | Axial preload force N | | |
| ZARN1545-TV | ZMA15/33 | AM15 | 10 | 6 506 | – |
| ZARN1545-L-TV | ZMA15/33 | AM15 | 10 | 6 506 | 24X35X7 |
| ZARN1747-TV | ZM17 | AM17 | 12 | 7 078 | – |
| ZARN1747-L-TV | ZM17 | AM17 | 12 | 7 078 | 28X40X7 |
| ZARN2052-TV | ZMA20/38 | AM20 | 18 | 9 376 | – |
| ZARN2052-L-TV | ZMA20/38 | AM20 | 18 | 9 376 | 30X42X7 |
| ZARN2557-TV | ZMA25/45 | AM25 | 25 | 10 470 | – |
| ZARN2557-L-TV | ZMA25/45 | AM25 | 25 | 10 470 | 36X47X7 |
| ZARN3062-TV | ZMA30/52 | AM30 | 32 | 11 091 | – |
| ZARN3062-L-TV | ZMA30/52 | AM30 | 32 | 11 091 | 40X52X7 |

Needle roller/axial cylindrical roller bearings

Light series



ZARN

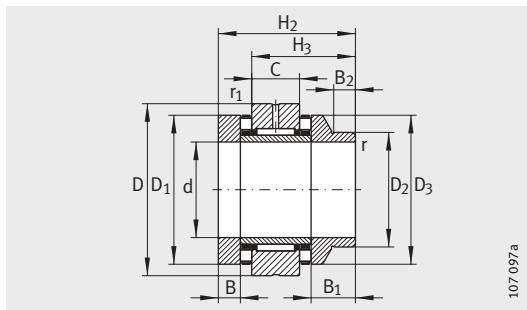
Dimension table (continued) - Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | |
|----------------------|------------------|------------|----|----|----------------|----------------|----------------|----|----------------|----------------|----------------|------|----------------|----------------|-----|----------------|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ |
| ZARN3570-TV | 0,8 | 35 | 70 | 54 | 37 | — | — | 20 | 60 | — | — | 11 | — | — | 0,3 | 0,6 |
| ZARN3570-L-TV | 0,93 | 35 | 70 | — | — | 70 | 53 | 20 | 60 | 45 | 58 | 11 | 27 | 12 | 0,3 | 0,6 |
| ZARN4075-TV | 0,9 | 40 | 75 | 54 | 37 | — | — | 20 | 65 | — | — | 11 | — | — | 0,3 | 0,6 |
| ZARN4075-L-TV | 1 | 40 | 75 | — | — | 70 | 53 | 20 | 65 | 50 | 63 | 11 | 27 | 12 | 0,3 | 0,6 |
| ZARN4580-TV | 1,12 | 45 | 80 | 60 | 42,5 | — | — | 25 | 70 | — | — | 11,5 | — | — | 0,3 | 0,6 |
| ZARN4580-L-TV | 1,27 | 45 | 80 | — | — | 75 | 57,5 | 25 | 70 | 56 | 68 | 11,5 | 26,5 | 12 | 0,3 | 0,6 |
| ZARN5090-TV | 1,43 | 50 | 90 | 60 | 42,5 | — | — | 25 | 78 | — | — | 11,5 | — | — | 0,3 | 0,6 |
| ZARN5090-L-TV | 1,78 | 50 | 90 | — | — | 78 | 60,5 | 25 | 78 | 60 | 78 | 11,5 | 29,5 | 12 | 0,3 | 0,6 |

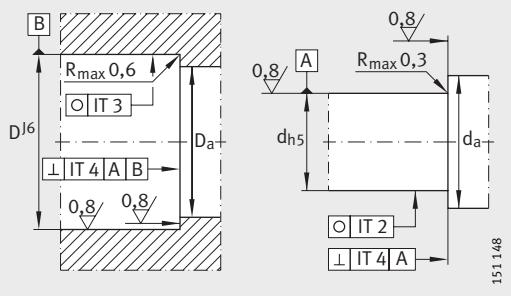
¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

²⁾ Mass moment of inertia for rotating inner ring.

³⁾ Only valid in conjunction with INA precision locknuts.



ZARN..-L



Design of adjacent construction

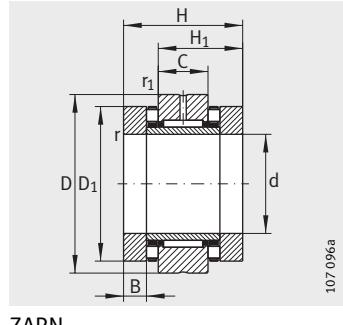


| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque | Rigidity axial | Tilting rigidity | Mass moment of inertia ²⁾ | Axial runout | |
|-----------------------------------|----------------|------------------------|--------------------------|------------------------|--------------------------|--------------------|-----------------------|---------------------------|-----------------|------------------|--------------------------------------|----------------------|----|
| | | axial | | radial | | | | | | | | | |
| D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil | n _G grease | M _{RL} | c _{aL} | c _{kL} | Nm/mrad | kg · cm ² | μm |
| 61 | 50 | 56 000 | 148 000 | 26 000 | 47 000 | 4 800 | 1 700 | 0,9 | 2 600 | 740 | 2,8 | 1 | |
| 61 | 43 | 56 000 | 148 000 | 26 000 | 47 000 | 4 800 | 1 700 | 0,9 | 2 600 | 740 | 3,21 | 1 | |
| 66 | 55 | 59 000 | 163 000 | 27 500 | 53 000 | 4 400 | 1 600 | 1 | 2 800 | 1 030 | 3,78 | 1 | |
| 66 | 48 | 59 000 | 163 000 | 27 500 | 53 000 | 4 400 | 1 600 | 1 | 2 800 | 1 030 | 4,35 | 1 | |
| 71 | 60 | 61 000 | 177 000 | 38 000 | 74 000 | 4 000 | 1 500 | 1,2 | 3 000 | 1 340 | 5,33 | 1 | |
| 71 | 54 | 61 000 | 177 000 | 38 000 | 74 000 | 4 000 | 1 500 | 1,2 | 3 000 | 1 340 | 6,03 | 1 | |
| 79 | 67 | 90 000 | 300 000 | 40 000 | 82 000 | 3 600 | 1 200 | 2,2 | 4 800 | 2 470 | 8,42 | 1 | |
| 79 | 58 | 90 000 | 300 000 | 40 000 | 82 000 | 3 600 | 1 200 | 2,2 | 4 800 | 2 470 | 10,46 | 1 | |

| Designation | Recommended INA locknut; to be ordered separately | | | Rotary shaft seal to DIN 3 760; to be ordered separately |
|---------------|---|---|--------------------------|--|
| | Designation | Tightening torque ³⁾ M _A Nm | Axial preload force N | |
| ZARN3570-TV | ZMA35/58 | AM35/58 | 42 | 12 486 |
| ZARN3570-L-TV | ZMA35/58 | AM35/58 | 42 | 12 486 |
| ZARN4075-TV | ZMA40/62 | AM40 | 55 | 14 240 |
| ZARN4075-L-TV | ZMA40/62 | AM40 | 55 | 14 240 |
| ZARN4580-TV | ZMA45/68 | AM45 | 65 | 15 765 |
| ZARN4580-L-TV | ZMA45/68 | AM45 | 65 | 15 765 |
| ZARN5090-TV | ZMA50/75 | AM50 | 85 | 18 410 |
| ZARN5090-L-TV | ZMA50/75 | AM50 | 85 | 18 410 |

Needle roller/axial cylindrical roller bearings

Heavy series



107096a

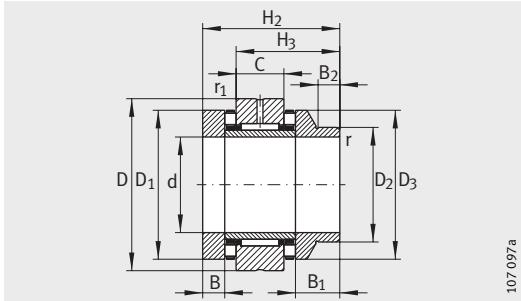
Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | |
|----------------|------------------|------------|-----|----|----------------|----------------|----------------|----|----------------|----------------|----------------|------|----------------|----------------|-----|----------------|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ |
| ZARN2062-TV | 0,87 | 20 | 62 | 60 | 40 | — | — | 20 | 52 | — | — | 12,5 | — | — | 0,3 | 0,6 |
| ZARN2062-L-TV | 0,99 | 20 | 62 | — | — | 75 | 55 | 20 | 52 | 40 | 50 | 12,5 | 27,5 | 11 | 0,3 | 0,6 |
| ZARN2572-TV | 1,17 | 25 | 72 | 60 | 40 | — | — | 20 | 62 | — | — | 12,5 | — | — | 0,3 | 0,6 |
| ZARN2572-L-TV | 1,32 | 25 | 72 | — | — | 75 | 55 | 20 | 62 | 48 | 60 | 12,5 | 27,5 | 11 | 0,3 | 0,6 |
| ZARN3080-TV | 1,5 | 30 | 80 | 66 | 43 | — | — | 20 | 68 | — | — | 14 | — | — | 0,3 | 0,6 |
| ZARN3080-L-TV | 1,7 | 30 | 80 | — | — | 82 | 59 | 20 | 68 | 52 | 66 | 14 | 30 | 12 | 0,3 | 0,6 |
| ZARN3585-TV | 1,65 | 35 | 85 | 66 | 43 | — | — | 20 | 73 | — | — | 14 | — | — | 0,3 | 0,6 |
| ZARN3585-L-TV | 1,8 | 35 | 85 | — | — | 82 | 59 | 20 | 73 | 60 | 73 | 14 | 30 | 12 | 0,3 | 0,6 |
| ZARN4090-TV | 2,09 | 40 | 90 | 75 | 50 | — | — | 25 | 78 | — | — | 16 | — | — | 0,3 | 0,6 |
| ZARN4090-L-TV | 2,39 | 40 | 90 | — | — | 93 | 68 | 25 | 78 | 60 | 78 | 16 | 34 | 12 | 0,3 | 0,6 |
| ZARN45105-TV | 3,02 | 45 | 105 | 82 | 53,5 | — | — | 25 | 90 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARN45105-L-TV | 3,42 | 45 | 105 | — | — | 103 | 74,5 | 25 | 90 | 70 | 88 | 17,5 | 38,5 | 14 | 0,3 | 0,6 |
| ZARN50110-TV | 3,3 | 50 | 110 | 82 | 53,5 | — | — | 25 | 95 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARN50110-L-TV | 3,75 | 50 | 110 | — | — | 103 | 74,5 | 25 | 95 | 75 | 93 | 17,5 | 38,5 | 14 | 0,3 | 0,6 |

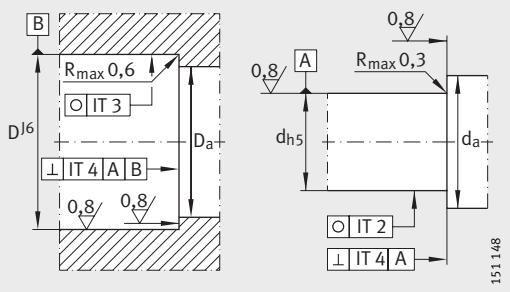
¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

²⁾ Mass moment of inertia for rotating inner ring.

³⁾ Only valid in conjunction with INA precision locknuts.



ZARN..-L



Design of adjacent construction

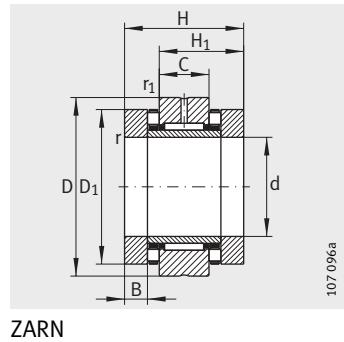
| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque | Rigidity axial | Tilting rigidity | Mass moment of inertia ²⁾ | Axial runout | |
|-----------------------------------|----------------|------------------------|--------------------------|------------------------|--------------------------|--------------------|-----------------------|---------------------------|-----------------|------------------|--------------------------------------|----------------------|----|
| | | axial | | radial | | | | | | | | | |
| D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil | n _G grease | M _{RL} | c _{aL} | c _{kL} | M _m | kg · cm ² | μm |
| max. | min. | N | N | N | N | min ⁻¹ | min ⁻¹ | Nm | N/μm | Nm/mrad | kg · cm ² | kg · cm ² | μm |
| 53 | 38 | 64 000 | 141 000 | 22 600 | 36 000 | 6 000 | 1 500 | 1,3 | 2 300 | 400 | 1,98 | 1 | |
| 53 | 38 | 64 000 | 141 000 | 26 600 | 36 000 | 6 000 | 1 500 | 1,3 | 2 300 | 400 | 2,27 | 1 | |
| 63 | 45 | 80 000 | 199 000 | 24 300 | 41 500 | 4 900 | 1 400 | 1,6 | 3 000 | 800 | 3,88 | 1 | |
| 63 | 45 | 80 000 | 199 000 | 24 300 | 41 500 | 4 900 | 1 400 | 1,6 | 3 000 | 800 | 4,51 | 1 | |
| 69 | 52 | 107 000 | 265 000 | 26 000 | 47 000 | 4 400 | 1 300 | 2,1 | 3 300 | 1 100 | 6,53 | 1 | |
| 69 | 50 | 107 000 | 265 000 | 26 000 | 47 000 | 4 400 | 1 300 | 2,1 | 3 300 | 1 100 | 7,43 | 1 | |
| 74 | 60 | 105 000 | 265 000 | 27 500 | 53 000 | 4 000 | 1 250 | 2,3 | 3 500 | 1 300 | 8,47 | 1 | |
| 74 | 58 | 105 000 | 265 000 | 27 500 | 53 000 | 4 000 | 1 250 | 2,3 | 3 500 | 1 300 | 10,4 | 1 | |
| 79 | 65 | 117 000 | 315 000 | 38 000 | 74 000 | 3 700 | 1 200 | 2,5 | 3 800 | 1 800 | 13,3 | 1 | |
| 79 | 58 | 117 000 | 315 000 | 38 000 | 74 000 | 3 700 | 1 200 | 2,5 | 3 800 | 1 800 | 15,5 | 1 | |
| 91 | 70 | 154 000 | 405 000 | 40 000 | 82 000 | 3 300 | 1 150 | 3,5 | 4 000 | 2 100 | 23,7 | 1 | |
| 91 | 68 | 154 000 | 405 000 | 40 000 | 82 000 | 3 300 | 1 150 | 3,5 | 4 000 | 2 100 | 28,1 | 1 | |
| 96 | 75 | 172 000 | 480 000 | 42 000 | 90 000 | 3 100 | 1 100 | 3,8 | 4 600 | 2 900 | 29,8 | 1 | |
| 96 | 73 | 172 000 | 480 000 | 42 000 | 90 000 | 3 100 | 1 100 | 3,8 | 4 600 | 2 900 | 35,3 | 1 | |



| Designation | Recommended INA locknut; to be ordered separately | | | | Rotary shaft seal to DIN 3 760; to be ordered separately |
|----------------|---|--|--------------------------|--------|---|
| | Designation | Tightening torque ³⁾ M_A Nm | Axial preload force N | | |
| ZARN2062-TV | ZMA20/52 | AM20 | 38 | 18 448 | — |
| ZARN2062-L-TV | ZMA20/52 | AM20 | 38 | 18 448 | 40X52X7 |
| ZARN2572-TV | ZMA25/58 | AM25 | 55 | 20 790 | — |
| ZARN2572-L-TV | ZMA25/58 | AM25 | 55 | 20 790 | 48X62X8 |
| ZARN3080-TV | ZMA30/65 | AM30 | 75 | 24 287 | — |
| ZARN3080-L-TV | ZMA30/65 | AM30 | 75 | 24 287 | 52X68X8 |
| ZARN3585-TV | ZMA35/70 | AM35 | 100 | 27 480 | — |
| ZARN3585-L-TV | ZMA35/70 | AM35 | 100 | 27 480 | 60X75X8 |
| ZARN4090-TV | ZMA40/75 | AM40 | 120 | 29 834 | — |
| ZARN4090-L-TV | ZMA40/75 | AM40 | 120 | 29 834 | 60X80X8 |
| ZARN45105-TV | ZMA45/85 | AM45 | 150 | 33 549 | — |
| ZARN45105-L-TV | ZMA45/85 | AM45 | 150 | 33 549 | 70X90X10 |
| ZARN50110-TV | ZMA50/92 | AM50 | 180 | 37 109 | — |
| ZARN50110-L-TV | ZMA50/92 | AM50 | 180 | 37 109 | 75X95X10 |

Needle roller/axial cylindrical roller bearings

Heavy series



ZARN

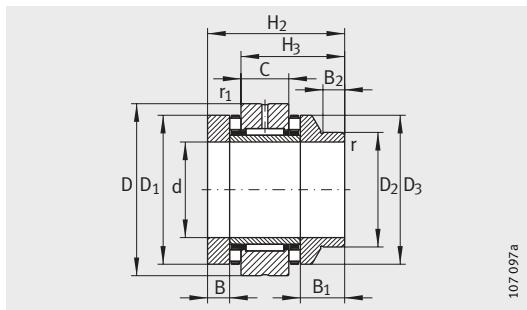
Dimension table (continued) · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | | | | | | | | |
|-----------------------|------------------|------------|-----|-----|----------------|----------------|----------------|----|----------------|----------------|----------------|------|----------------|----------------|-----|----------------|
| | | d | D | H | H ₁ | H ₂ | H ₃ | C | D ₁ | D ₂ | D ₃ | B | B ₁ | B ₂ | r | r ₁ |
| ZARN55115-TV | 3,5 | 55 | 115 | 82 | 53,5 | — | — | 25 | 100 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARN55115-L-TV | 4 | 55 | 115 | — | — | 103 | 74,5 | 25 | 100 | 80 | 98 | 17,5 | 38,5 | 14 | 0,3 | 0,6 |
| ZARN60120-TV | 3,7 | 60 | 120 | 82 | 53,5 | — | — | 25 | 105 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARN60120-L-TV | 4,85 | 60 | 120 | — | — | 103 | 74,5 | 25 | 105 | 90 | 105 | 17,5 | 38,5 | 16 | 0,3 | 0,6 |
| ZARN65125-TV | 4 | 65 | 125 | 82 | 53,5 | — | — | 25 | 110 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARN65125-L-TV | 4,6 | 65 | 125 | — | — | 103 | 74,5 | 25 | 110 | 90 | 108 | 17,5 | 38,5 | 16 | 0,3 | 0,6 |
| ZARN70130-TV | 4,1 | 70 | 130 | 82 | 53,5 | — | — | 25 | 115 | — | — | 17,5 | — | — | 0,3 | 0,6 |
| ZARN70130-L-TV | 4,85 | 70 | 130 | — | — | 103 | 74,5 | 25 | 115 | 100 | 115 | 17,5 | 38,5 | 16 | 0,3 | 0,6 |
| ZARN75155-TV | 7,9 | 75 | 155 | 100 | 65 | — | — | 30 | 135 | — | — | 21 | — | — | 0,3 | 1 |
| ZARN75155-L-TV | 9,1 | 75 | 155 | — | — | 125 | 90 | 30 | 135 | 115 | 135 | 21 | 46 | 16 | 0,3 | 1 |
| ZARN90180-TV | 11,8 | 90 | 180 | 110 | 72,5 | — | — | 35 | 160 | — | — | 22,5 | — | — | 0,3 | 1 |
| ZARN90180-L-TV | 13,2 | 90 | 180 | — | — | 135 | 97,5 | 35 | 160 | 130 | 158 | 22,5 | 47,5 | 16 | 0,3 | 1 |

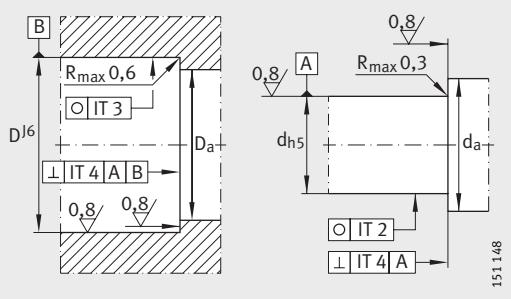
¹⁾ If rotary shaft seals are used, the outside diameter of the sealing ring must be taken into consideration.

²⁾ Mass moment of inertia for rotating inner ring.

³⁾ Only valid in conjunction with INA precision locknuts.



ZARN..-L



Design of adjacent construction

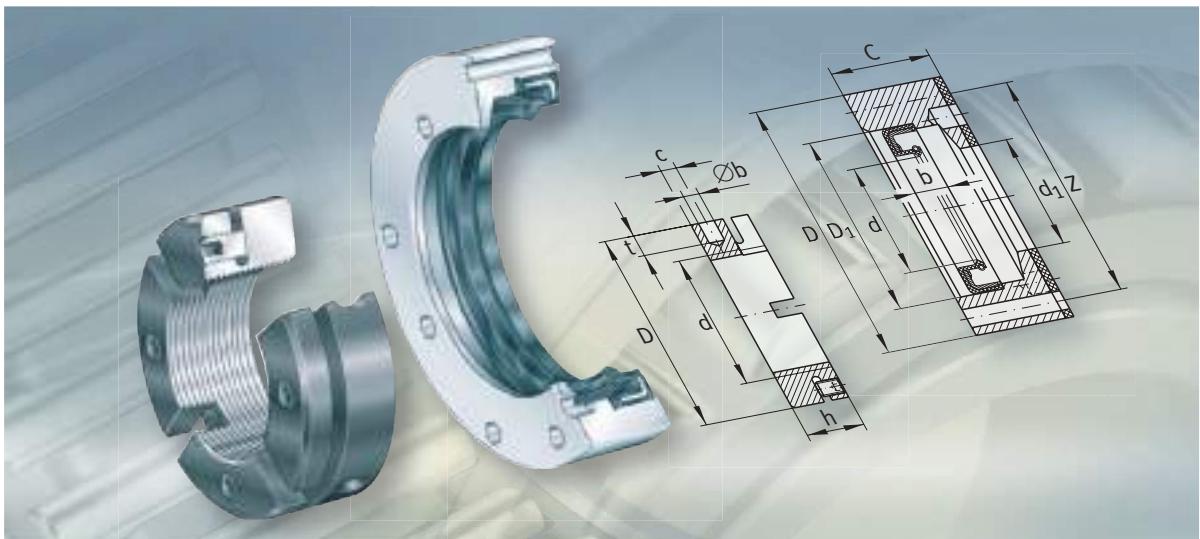
| Mounting dimensions ¹⁾ | | Basic load ratings | | | | Limiting speeds | | Bearing frictional torque M _{RL} | Rigidity axial c _{aL} | Tilting rigidity c _{kL} | Mass moment of inertia ²⁾ M _m | Axial runout |
|-----------------------------------|----------------|---------------------|-----------------------|---------------------|-----------------------|--------------------------------------|---|---|--------------------------------|----------------------------------|---|--------------|
| | | axial | | radial | | | | | | | | |
| D _a | d _a | dyn. C _a | stat. C _{0a} | dyn. C _r | stat. C _{0r} | n _G oil min ⁻¹ | n _G grease min ⁻¹ | Nm | N/μm | Nm/mrad | kg · cm ² | μm |
| 101 | 85 | 177 000 | 500 000 | 44 000 | 98 000 | 2 900 | 1 000 | 4 | 4 900 | 3 600 | 36,1 | 1 |
| 101 | 78 | 177 000 | 500 000 | 44 000 | 98 000 | 2 900 | 1 000 | 4 | 4 900 | 3 600 | 43 | 1 |
| 106 | 90 | 187 000 | 550 000 | 44 500 | 92 000 | 2 700 | 950 | 4,2 | 5 300 | 4 300 | 43,8 | 1 |
| 106 | 88 | 187 000 | 550 000 | 44 500 | 92 000 | 2 700 | 950 | 4,2 | 5 300 | 4 300 | 54,5 | 1 |
| 111 | 97 | 172 000 | 500 000 | 54 000 | 104 000 | 2 600 | 900 | 4 | 4 800 | 4 000 | 51 | 1 |
| 111 | 88 | 172 000 | 500 000 | 54 000 | 104 000 | 2 600 | 900 | 4 | 4 800 | 4 000 | 60,1 | 1 |
| 116 | 100 | 201 000 | 630 000 | 56 000 | 119 000 | 2 400 | 800 | 4,8 | 5 800 | 6 000 | 62,2 | 1 |
| 116 | 98 | 201 000 | 630 000 | 56 000 | 119 000 | 2 400 | 800 | 4,8 | 5 800 | 6 000 | 77,3 | 1 |
| 136 | 113 | 290 000 | 890 000 | 72 000 | 132 000 | 2 100 | 700 | 8 | 6 600 | 8 500 | 149 | 2 |
| 136 | 110 | 290 000 | 890 000 | 72 000 | 132 000 | 2 100 | 700 | 8 | 6 600 | 8 500 | 188 | 2 |
| 161 | 130 | 325 000 | 1 030 000 | 98 000 | 210 000 | 1 800 | 700 | 10,5 | 7 700 | 14 500 | 312 | 2 |
| 161 | 125 | 325 000 | 1 030 000 | 98 000 | 210 000 | 1 800 | 700 | 10,5 | 7 700 | 14 500 | 372 | 2 |



| Designation | Recommended INA locknut; to be ordered separately | | | Rotary shaft seal to DIN 3 760; to be ordered separately |
|-----------------------|---|---|-----------------------|--|
| | Designation | Tightening torque ³⁾ M _A Nm | Axial preload force N | |
| ZARN55115-TV | ZMA55/98 | AM55 | 220 | 40 772 |
| ZARN55115-L-TV | ZMA55/98 | AM55 | 220 | 40 772 |
| ZARN60120-TV | ZMA60/98 | AM60 | 250 | 42 190 |
| ZARN60120-L-TV | ZMA60/98 | AM60 | 250 | 42 190 |
| ZARN65125-TV | ZMA65/105 | AM65 | 270 | 41 778 |
| ZARN65125-L-TV | ZMA65/105 | AM65 | 270 | 41 778 |
| ZARN70130-TV | ZMA70/110 | AM70 | 330 | 47 692 |
| ZARN70130-L-TV | ZMA70/110 | AM70 | 330 | 47 692 |
| ZARN75155-TV | ZMA75/125 | AM75 | 580 | 76 339 |
| ZARN75155-L-TV | ZMA75/125 | AM75 | 580 | 76 339 |
| ZARN90180-TV | ZMA90/155 | AM90 | 960 | 102 246 |
| ZARN90180-L-TV | ZMA90/155 | AM90 | 960 | 102 246 |
| | | | | 130X160X12 |



FAG



Seal carrier assemblies Precision locknuts

Seal carrier assemblies Precision locknuts

| | Page |
|-------------------------------------|--|
| Product overview | Seal carrier assemblies, precision locknuts 978 |
| Features | Seal carrier assemblies 979 Operating temperature 979 Precision locknuts 980 |
| Design and safety guidelines | Breakaway torque 981 Ultimate axial load 981 Fitting and dismantling 981 |
| Accuracy | 982 |
| Dimension tables | Seal carrier assemblies DRS 983 Precision locknuts AM 984 Adapters AMS 985 Precision locknuts ZM, ZMA 986 |



Product overview Seal carrier assemblies Precision locknuts

Seal carrier assemblies

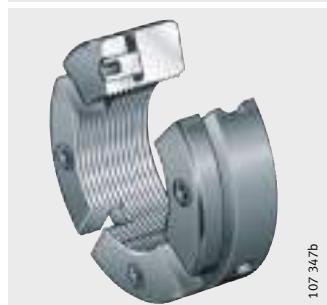
DRS



Precision locknuts

For axial locking

AM



For radial locking

ZM, ZMA



Seal carrier assemblies Precision locknuts

Features Seal carrier assemblies

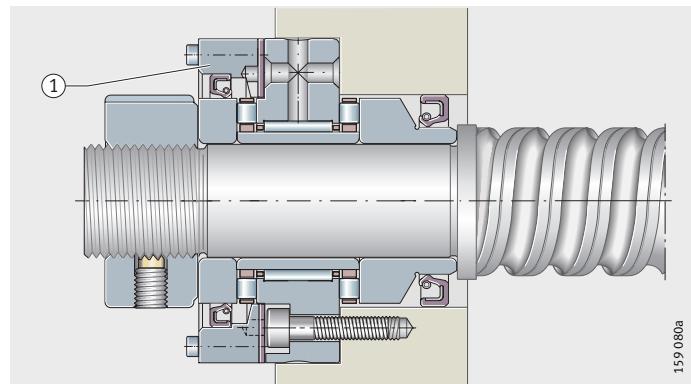
Seal carrier assemblies DRS are screw mounted to the outer ring of needle roller/axial cylindrical roller bearings ZARF(L) and precisely centred in this position, *Figure 1*, ①. They seal the bearings against outside influences.

The sealing elements are supplied as a complete kit and comprise a seal carrier with an integral rotary shaft seal, a gasket and hexagonal socket cap screws for fixing the carrier to the central washer of the bearing.

① Seal carrier assembly DRS

DRS
ZMA
ZARF..-L

Figure 1
Needle roller/
axial cylindrical roller bearing,
seal carrier assembly, locknut



Operating temperature

Seal carrier assemblies are suitable for operating temperatures from -30 °C to +120 °C, restricted by the seal material.

Seal carrier assemblies Precision locknuts

Precision locknuts

Precision locknuts are used where high axial forces must be supported and high runout accuracy and rigidity are required, *Figure 2, ①, Figure 3, ①*.

The thread and the axial face of the locknut in contact with the rolling bearing are produced in a single clamping operation. This allows very high runout accuracy to be achieved.

Locknuts are available in the designs AM, ZM and ZMA. If handled correctly, they can be reused several times.

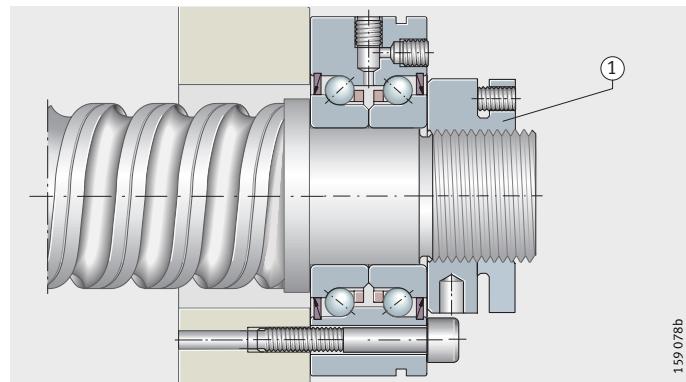
Axial locking by segments

Locknuts of series AM are divided into several segments for applying the locking forces. When the hexagonal socket set screws are tightened, the segments are elastically deformed. As a result, the thread flanks of the segments are pressed against the flanks of the shaft thread and give a high frictional force that acts to prevent loosening of the nut. The runout of the nut is not affected by this method of locking.

① Precision locknut AM

AM
ZKLF.-2RS

Figure 2
Axial angular
contact ball bearing ZKLF
with locknut



159 078b

Locking by radial locking pegs

Locknuts ZM and ZMA are secured against rotation by means of two radially acting locking pegs, *Figure 3, ①*. ZMA is the heavy series.

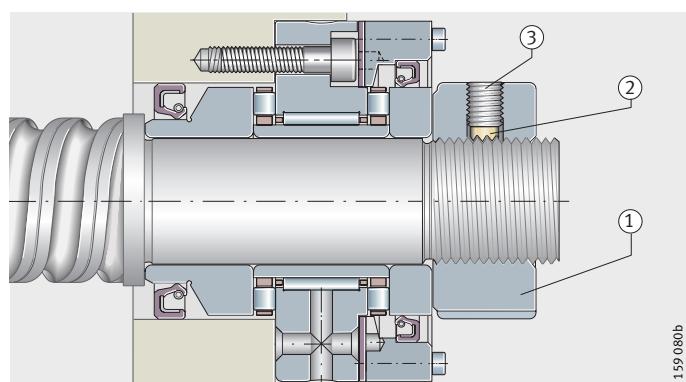
The locking pegs are manufactured together with the internal thread of the locknut. They mesh in the thread of the shaft without affecting the runout or damaging the thread, *Figure 3, ②*.

The locking pegs are secured by set screws with a hexagonal socket arranged concentrically over the locking pegs, *Figure 3, ③*.

① Precision locknut ZMA
② Locking peg
③ Set screw

DRS
ZMA
ZARF.-L

Figure 3
Needle roller/
axial cylindrical roller bearing ZARF
with seal carrier assembly, locknut



159 080b

Design and safety guidelines

Shaft threads for the precision locknuts must be precision machined; see table.

Recommended shaft thread

| Shaft thread | |
|--------------------------|------------------------|
| Tolerance class "medium" | Tolerance class "fine" |
| 6g DIN 13 T21-24 | 4h DIN 13 T21-24 |

Caution!

The journal thread must support the locknut over its whole width.

Breakaway torque

The breakaway torques M_L given in the dimension tables are based on a locknut tightened against a rigid shaft shoulder to the reference tightening torque M_{AL} and secured.

Ultimate axial load

The ultimate axial loads F_{ab} are valid for a journal thread with a tolerance of 6g or better and a minimum strength of 700 N/mm^2 . For dynamic loading, the permissible value can be taken as 75% of the ultimate axial load F_{ab} .

Fitting and dismantling

Caution!

For the fitting and dismantling of bearings and precision locknuts, the information in Fitting and Maintenance Manual TPI 100 must be observed.

Locknuts must be fully screwed onto the shaft thread.



Precision locknuts with axial locking

Locknuts AM can be tightened using a hook wrench to DIN 1810B that engages in four, six or eight holes around the circumference. The set screws are then tightened in a crosswise sequence to the specified tightening torque M_m using an Allan key. Dismantling is carried out by uniformly loosening set screws of all segments in order to prevent a single segment being left tensioned.

Caution!

Tightening by means of just one segment is not permissible. For tightening, an adapter of series AMS can be used that ensures uniform loading of all segments. The adapter AMS must be ordered separately, see dimension table, page 985.

For tightening using the adapter AMS, a hook wrench to DIN 1810A or to DIN 1810B can be used.

If precision locknuts AM are fitted using the adapter AMS, a maximum tightening torque of twice the value given in the dimension table for the bearing is permissible.

Segments can be axially deformed if the set screws are not tightened uniformly in a crosswise sequence or the locknut AM is not fully screwed onto the shaft thread. The specified tightening torque M_m according to the dimension table must be observed.

Seal carrier assemblies

Precision locknuts

Precision locknuts with radial locking

Locknuts ZM and ZMA can be tightened using a hook wrench to DIN 1810A that engages in one of the four slots around the circumference.

The two set screws are then tightened alternately to the specified tightening torque M_m using an Allan key; for M_m , see dimension tables for the bearings.

For dismantling, the two set screws are first loosened and the locking pegs loosened by light impacts with a plastic hammer on the outside surface of the locknut (in the vicinity of the screw holes).

The locknut can then be easily unscrewed without damaging the journal thread.

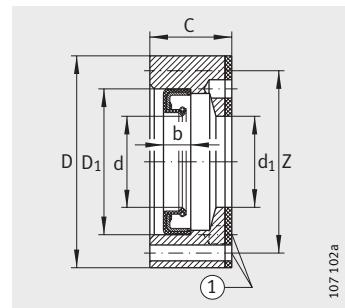
Accuracy

The accuracy of the precision locknuts is shown in the table.

Runout/thread

| Axial runout Thread/axial face μm | Metric ISO thread “fine” |
|--|-----------------------------|
| 5 | 5H, DIN 13 T21-24 |

Seal carrier assemblies



DRS¹⁾
 (1) 4 holes, offset by 90°

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | Rotary shaft seal | | | Corresponding bearing in standard or L design Designation |
|-----------------|------------------|------------|------|----------------|-----------------|-------------------|----------------|----|---|
| | | D | C | d ₁ | Z ²⁾ | d | D ₁ | b | |
| DRS1560 | 0,16 | 60 | 14 | 35 | 52,4 | 35 | 45 | 7 | M3X20 |
| DRS1762 | 0,18 | 62 | 15,5 | 38 | 54,4 | 38 | 47 | 7 | M3X25 |
| DRS2068 | 0,11 | 68 | 17 | 42 | 60,4 | 42 | 55 | 8 | M3X25 |
| DRS2080 | 0,2 | 80 | 22 | 52 | 73,4 | 52 | 68 | 8 | M3X30 |
| DRS2575 | 0,16 | 75 | 17 | 47 | 67,4 | 47 | 62 | 6 | M3X25 |
| DRS2590 | 0,3 | 90 | 22 | 62 | 81 | 62 | 75 | 10 | M3X30 |
| DRS3080 | 0,15 | 80 | 17 | 52 | 73,4 | 52 | 68 | 8 | M3X25 |
| DRS30105 | 0,35 | 105 | 25 | 68 | 95 | 68 | 85 | 10 | M4X35 |
| DRS3590 | 0,15 | 90 | 19 | 60 | 80 | 60 | 72 | 8 | M4X30 |
| DRS35110 | 0,3 | 110 | 25 | 73 | 101 | 73 | 95 | 10 | M3X30 |
| DRS40100 | 0,25 | 100 | 19 | 65 | 90 | 65 | 80 | 8 | M4X30 |
| DRS40115 | 0,5 | 115 | 27,5 | 78 | 106 | 78 | 100 | 10 | M3X35 |
| DRS45105 | 0,3 | 105 | 20 | 70 | 95 | 70 | 85 | 8 | M4X30 |
| DRS45130 | 0,7 | 130 | 31 | 90 | 120 | 90 | 110 | 12 | M4X40 |
| DRS50115 | 0,2 | 115 | 20 | 78 | 106 | 78 | 100 | 10 | M3X30 |
| DRS50140 | 0,8 | 140 | 30 | 95 | 127,5 | 95 | 115 | 13 | M5X40 |
| DRS55145 | 0,9 | 145 | 30 | 100 | 132,5 | 100 | 120 | 12 | M5X40 |
| DRS60150 | 0,9 | 150 | 30 | 105 | 137,5 | 105 | 125 | 12 | M5X40 |
| DRS65155 | 1 | 155 | 30 | 110 | 142,5 | 110 | 130 | 12 | M5X40 |
| DRS70160 | 1 | 160 | 30 | 115 | 147,5 | 115 | 135 | 13 | M5X40 |
| DRS75185 | 1,8 | 185 | 36 | 135 | 172,5 | 135 | 160 | 15 | M5X50 |
| DRS90210 | 2,7 | 210 | 38 | 160 | 194 | 160 | 180 | 15 | M5X50 |
| | | | | | | | | | ZARF90210-TV |

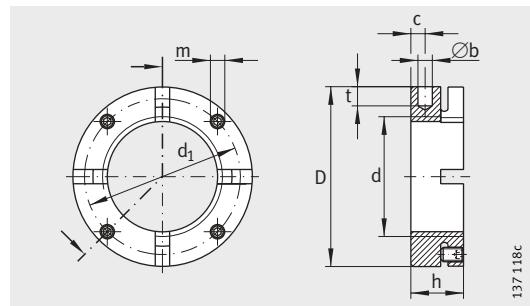


¹⁾ The seal carrier assembly is supplied as a kit comprising:

- seal carrier
- rotary shaft seal
- flange seal
- socket head screws.

²⁾ Four holes offset by 90°.

Precision locknuts



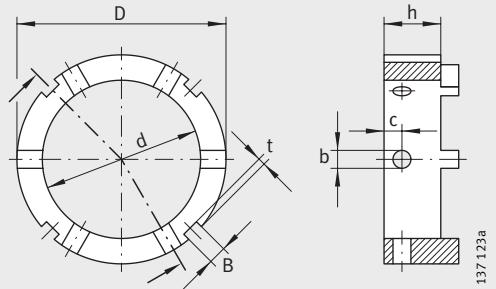
AM15 to AM40 with 4 segments
AM45 to AM90 with 6 segments
AM100 to AM130 with 8 segments

| Designation | Nut thread | Mass $m \approx \text{kg}$ | Dimensions | | | | | | | Grub screw Tightening torque M_m Nm | Locknut ¹⁾ | | | |
|-------------|------------|-------------------------------|------------|----|---|----|-------|----|-----|--|---|--|---|---|
| | | | D | h | b | t | d_1 | c | m | | Axial rupture load F_{aB} N | Tight- ening torque M_L at Nm | Reference tightening torque M_{AL} Nm | Mass moment of inertia M_M kg · cm ² |
| AM15 | M15X1 | 0,06 | 30 | 18 | 4 | 5 | 24 | 5 | M5 | 3 | 100 000 | 20 | 10 | 0,09 |
| AM17 | M17X1 | 0,07 | 32 | 18 | 4 | 5 | 26 | 5 | M5 | 3 | 120 000 | 25 | 15 | 0,11 |
| AM20 | M20X1 | 0,13 | 38 | 18 | 4 | 6 | 31 | 5 | M6 | 5 | 145 000 | 45 | 18 | 0,23 |
| AM25 | M25X1,5 | 0,16 | 45 | 20 | 5 | 6 | 38 | 6 | M6 | 5 | 205 000 | 60 | 25 | 0,49 |
| AM30 | M30X1,5 | 0,20 | 52 | 20 | 5 | 7 | 45 | 6 | M6 | 5 | 250 000 | 70 | 32 | 0,86 |
| AM30/65 | M30X1,5 | 0,50 | 65 | 30 | 6 | 8 | 45 | 6 | M6 | 5 | 400 000 | 70 | 32 | 2,8 |
| AM35/58 | M35X1,5 | 0,23 | 58 | 20 | 5 | 7 | 51 | 6 | M6 | 5 | 280 000 | 90 | 40 | 1,3 |
| AM35 | M35X1,5 | 0,33 | 65 | 22 | 6 | 8 | 58 | 6 | M6 | 5 | 330 000 | 100 | 40 | 2,4 |
| AM40 | M40X1,5 | 0,30 | 65 | 22 | 6 | 8 | 58 | 6 | M6 | 5 | 350 000 | 120 | 55 | 2,3 |
| AM40/85 | M40X1,5 | 0,75 | 85 | 32 | 6 | 8 | 58 | 6 | M6 | 5 | 570 000 | 120 | 55 | 7,6 |
| AM45 | M45X1,5 | 0,34 | 70 | 22 | 6 | 8 | 63 | 6 | M6 | 5 | 360 000 | 220 | 65 | 2,9 |
| AM50 | M50X1,5 | 0,43 | 75 | 25 | 6 | 8 | 68 | 8 | M6 | 5 | 450 000 | 280 | 85 | 4,3 |
| AM55 | M55X2 | 0,60 | 85 | 26 | 6 | 8 | 75 | 8 | M8 | 15 | 520 000 | 320 | 95 | 7,7 |
| AM60 | M60X2 | 0,65 | 90 | 26 | 6 | 8 | 80 | 8 | M8 | 15 | 550 000 | 365 | 100 | 9,4 |
| AM65 | M65X2 | 0,83 | 100 | 26 | 8 | 10 | 88 | 8 | M8 | 15 | 560 000 | 400 | 120 | 14,6 |
| AM70 | M70X2 | 0,79 | 100 | 28 | 8 | 10 | 90 | 9 | M8 | 15 | 650 000 | 450 | 130 | 14,7 |
| AM75 | M75X2 | 1,23 | 115 | 30 | 8 | 10 | 102 | 10 | M10 | 20 | 750 000 | 610 | 150 | 29 |
| AM80 | M80X2 | 0,93 | 110 | 30 | 8 | 10 | 98 | 10 | M10 | 20 | 670 000 | 770 | 160 | 21,3 |
| AM85 | M85X2 | 0,97 | 115 | 30 | 8 | 10 | 102 | 10 | M10 | 20 | 690 000 | 930 | 180 | 24,8 |
| AM90 | M90X2 | 1,53 | 130 | 32 | 8 | 10 | 118 | 13 | M10 | 20 | 900 000 | 1100 | 200 | 48 |
| AM100 | M100X2 | 1,12 | 130 | 30 | 8 | 10 | 118 | 10 | M10 | 20 | 740 000 | 1200 | 250 | 38 |
| AM110 | M110X2 | 1,22 | 140 | 30 | 8 | 10 | 128 | 10 | M10 | 20 | 770 000 | 1300 | 250 | 48 |
| AM120 | M120X2 | 1,56 | 155 | 30 | 8 | 10 | 142 | 10 | M10 | 20 | 880 000 | 1450 | 250 | 75 |
| AM130 | M130X2 | 1,67 | 165 | 30 | 8 | 10 | 152 | 10 | M10 | 20 | 900 000 | 1600 | 250 | 92 |

1) Note!

If precision locknuts AM are fitted using the adapter AMS,
a maximum tightening torque of twice the value given in the dimension table for the bearing is permissible.

Adapters



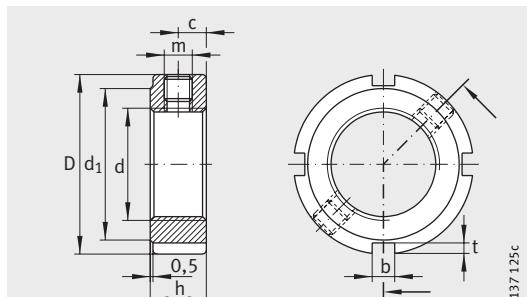
AMS

Dimension table · Dimensions in mm

| Designation | Mass m ≈kg | Dimensions | | | | | | | For precision locknuts |
|---------------|------------------|------------|----|-----|----------|----|----|-----|-------------------------------------|
| | | D | h | d | b H11 | c | B | t | |
| AMS20 | 0,047 | 32 | 14 | 22 | 4 | 5 | 4 | 2 | AM15, AM17, AM20 |
| AMS30 | 0,093 | 45 | 15 | 35 | 5 | 5 | 5 | 2 | AM25, AM30, AM35/58, AM30/65 |
| AMS40 | 0,217 | 65 | 16 | 45 | 6 | 6 | 6 | 2,5 | AM35, AM40 |
| AMS50 | 0,245 | 70 | 19 | 53 | 6 | 6 | 6 | 2,5 | AM45, AM50 |
| AMS60 | 0,37 | 85 | 20 | 65 | 6 | 6 | 7 | 3 | AM55, AM60 |
| AMS70 | 0,615 | 98 | 25 | 75 | 8 | 10 | 8 | 3,5 | AM65, AM70 |
| AMS80 | 0,755 | 110 | 25 | 85 | 8 | 10 | 8 | 3,5 | AM75, AM80, AM85 |
| AMS90 | 1,215 | 130 | 25 | 95 | 8 | 10 | 10 | 4 | AM90 |
| AMS110 | 0,74 | 130 | 25 | 110 | 8 | 10 | 10 | 4 | AM100, AM110 |
| AMS130 | 1,485 | 155 | 25 | 130 | 8 | 10 | 12 | 5 | AM120, AM130 |



Precision locknuts



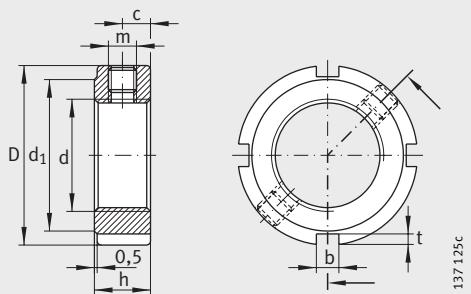
ZM, ZMA

Dimension table · Dimensions in mm

| Designation | Thread | Mass m ≈kg | Dimensions | | | | | | | Grub screw Tight- ening torque M _m Nm | Locknut | | | |
|--------------------|---------|------------------|------------|----|---|-----|----------------|------|----|--|--|---|--|--|
| | | | D | h | b | t | d ₁ | c | m | | Axial rupture load F _{aB} N | Tight- ening torque M _L at Nm | Reference tightening torque M _{AL} Nm | Mass moment of inertia M _M kg · cm ² |
| ZM06 | M6X0,5 | 0,01 | 16 | 8 | 3 | 2 | 11 | 4 | M4 | 1 | 17 000 | 20 | 2 | 0,004 |
| ZM08 ¹⁾ | M8X0,75 | 0,01 | 16 | 8 | 3 | 2 | 11 | 4 | M4 | 1 | 23 000 | 25 | 4 | 0,004 |
| ZM10 ¹⁾ | M10X1 | 0,01 | 18 | 8 | 3 | 2 | 14 | 4 | M4 | 1 | 31 000 | 30 | 6 | 0,006 |
| ZM12 | M12X1 | 0,015 | 22 | 8 | 3 | 2 | 18 | 4 | M4 | 1 | 38 000 | 30 | 8 | 0,013 |
| ZM15 | M15X1 | 0,018 | 25 | 8 | 3 | 2 | 21 | 4 | M4 | 1 | 50 000 | 30 | 10 | 0,021 |
| ZMA15/33 | M15X1 | 0,08 | 33 | 16 | 4 | 2 | 28 | 8 | M5 | 3 | 106 000 | 30 | 10 | 0,14 |
| ZM17 | M17X1 | 0,028 | 28 | 10 | 4 | 2 | 23 | 5 | M5 | 3 | 57 000 | 30 | 15 | 0,401 |
| ZM20 | M20X1 | 0,035 | 32 | 10 | 4 | 2 | 27 | 5 | M5 | 3 | 69 000 | 40 | 18 | 0,068 |
| ZMA20/38 | M20X1 | 0,12 | 38 | 20 | 5 | 2 | 33 | 10 | M5 | 3 | 174 000 | 40 | 18 | 0,297 |
| ZMA20/52 | M20X1 | 0,32 | 52 | 25 | 5 | 2 | 47 | 12,5 | M5 | 3 | 218 000 | 40 | 18 | 1,38 |
| ZM25 | M25X1,5 | 0,055 | 38 | 12 | 5 | 2 | 33 | 6 | M6 | 5 | 90 000 | 60 | 25 | 0,157 |
| ZMA25/45 | M25X1,5 | 0,16 | 45 | 20 | 5 | 2 | 40 | 10 | M6 | 5 | 211 000 | 60 | 25 | 0,572 |
| ZMA25/58 | M25X1,5 | 0,43 | 58 | 28 | 6 | 2,5 | 52 | 14 | M6 | 5 | 305 000 | 60 | 25 | 2,36 |
| ZM30 | M30X1,5 | 0,075 | 45 | 12 | 5 | 2 | 40 | 6 | M6 | 5 | 112 000 | 70 | 32 | 0,304 |
| ZMA30/52 | M30X1,5 | 0,22 | 52 | 22 | 5 | 2 | 47 | 11 | M6 | 5 | 270 000 | 70 | 32 | 1,1 |
| ZMA30/65 | M30X1,5 | 0,55 | 65 | 30 | 6 | 2,5 | 59 | 15 | M6 | 5 | 390 000 | 70 | 32 | 3,94 |
| ZM35 | M35X1,5 | 0,099 | 52 | 12 | 5 | 2 | 47 | 6 | M6 | 5 | 134 000 | 80 | 40 | 0,537 |
| ZMA35/58 | M35X1,5 | 0,26 | 58 | 22 | 6 | 2,5 | 52 | 11 | M6 | 5 | 300 000 | 80 | 40 | 1,66 |
| ZMA35/70 | M35X1,5 | 0,61 | 70 | 30 | 6 | 2,5 | 64 | 15 | M6 | 5 | 460 000 | 80 | 40 | 5,2 |
| ZM40 | M40X1,5 | 0,14 | 58 | 14 | 6 | 2,5 | 52 | 7 | M6 | 5 | 157 000 | 95 | 55 | 0,945 |
| ZMA40/62 | M40X1,5 | 0,27 | 62 | 22 | 6 | 2,5 | 56 | 11 | M8 | 15 | 310 000 | 95 | 55 | 2,07 |
| ZMA40/75 | M40X1,5 | 0,67 | 75 | 30 | 6 | 2,5 | 69 | 15 | M8 | 15 | 520 000 | 95 | 55 | 6,72 |
| ZM45 | M45X1,5 | 0,17 | 65 | 14 | 6 | 2,5 | 59 | 7 | M6 | 5 | 181 000 | 110 | 65 | 1,48 |
| ZMA45/68 | M45X1,5 | 0,35 | 68 | 24 | 6 | 2,5 | 62 | 12 | M8 | 15 | 360 000 | 110 | 65 | 3,2 |
| ZMA45/85 | M45X1,5 | 0,92 | 85 | 32 | 7 | 3 | 78 | 16 | M8 | 15 | 630 000 | 110 | 65 | 11,9 |
| ZM50 | M50X1,5 | 0,19 | 70 | 14 | 6 | 2,5 | 64 | 7 | M6 | 5 | 205 000 | 130 | 85 | 1,92 |
| ZMA50/75 | M50X1,5 | 0,43 | 75 | 25 | 6 | 2,5 | 68 | 12,5 | M8 | 15 | 415 000 | 130 | 85 | 4,89 |
| ZMA50/92 | M50X1,5 | 1,06 | 92 | 32 | 8 | 3,5 | 84 | 16 | M8 | 15 | 680 000 | 130 | 85 | 16,1 |
| ZM55 | M55X2 | 0,23 | 75 | 16 | 7 | 3 | 68 | 8 | M6 | 5 | 229 000 | 150 | 95 | 2,77 |
| ZMA55/98 | M55X2 | 1,17 | 98 | 32 | 8 | 3,5 | 90 | 16 | M8 | 15 | 620 000 | 150 | 95 | 20,5 |

¹⁾ When clamped, the grub screw protrudes by approx. 0,5 mm.

Precision locknuts



ZM, ZMA

Dimension table (continued) · Dimensions in mm

| Designation | Thread | Mass m ≈kg | Dimensions | | | | | | | Grub screw Tight- ening torque M _m Nm | Locknut | | | |
|-------------------|---------------|------------------|------------|----|----|-----|----------------|------|-----|--|--|---|--|--|
| | | | D | h | b | t | d ₁ | c | m | | Axial rupture load F _{aB} N | Tight- ening torque M _L at Nm | Reference tightening torque M _{AL} Nm | Mass moment of inertia M _M kg · cm ² |
| ZM60 | M60X2 | 0,25 | 80 | 16 | 7 | 3 | 73 | 8 | M6 | 5 | 255 000 | 180 | 100 | 3,45 |
| ZMA60/98 | M60X2 | 1,07 | 98 | 32 | 8 | 3,5 | 90 | 16 | M8 | 15 | 680 000 | 180 | 100 | 19,6 |
| ZM65 | M65X2 | 0,27 | 85 | 16 | 7 | 3 | 78 | 8 | M6 | 5 | 280 000 | 200 | 120 | 4,24 |
| ZMA65/105 | M65X2 | 1,21 | 105 | 32 | 8 | 3,5 | 97 | 16 | M8 | 15 | 750 000 | 200 | 120 | 25,6 |
| ZM70 | M70X2 | 0,36 | 92 | 18 | 8 | 3,5 | 85 | 9 | M8 | 15 | 305 000 | 220 | 130 | 6,61 |
| ZMA70/110 | M70X2 | 1,4 | 110 | 35 | 8 | 3,5 | 102 | 17,5 | M8 | 15 | 810 000 | 220 | 130 | 33 |
| ZM75 | M75X2 | 0,4 | 98 | 18 | 8 | 3,5 | 90 | 9 | M8 | 15 | 331 000 | 260 | 150 | 8,41 |
| ZMA75/125 | M75X2 | 2,11 | 125 | 38 | 8 | 3,5 | 117 | 19 | M8 | 15 | 880 000 | 260 | 150 | 62,2 |
| ZM80 | M80X2 | 0,46 | 105 | 18 | 8 | 3,5 | 95 | 9 | M8 | 15 | 355 000 | 285 | 160 | 11,2 |
| ZMA80/120 | M80X2 | 1,33 | 120 | 35 | 8 | 4 | 105 | 17,5 | M8 | 15 | 810 000 | 285 | 160 | 44,6 |
| ZM85 | M85X2 | 0,49 | 110 | 18 | 8 | 3,5 | 102 | 9 | M8 | 15 | 385 000 | 320 | 190 | 13,1 |
| ZM90 | M90X2 | 0,7 | 120 | 20 | 10 | 4 | 108 | 10 | M8 | 15 | 410 000 | 360 | 200 | 21,8 |
| ZMA90/130 | M90X2 | 2,01 | 130 | 38 | 10 | 4 | 120 | 19 | M8 | 15 | 910 000 | 360 | 200 | 64,1 |
| ZMA90/155 | M90X2 | 3,36 | 155 | 38 | 10 | 4 | 146 | 19 | M8 | 15 | 1 080 000 | 360 | 200 | 150 |
| ZM100 | M100X2 | 0,77 | 130 | 20 | 10 | 4 | 120 | 10 | M8 | 15 | 465 000 | 425 | 250 | 28,6 |
| ZMA100/140 | M100X2 | 2,23 | 140 | 38 | 12 | 5 | 128 | 19 | M10 | 20 | 940 000 | 425 | 250 | 82,8 |
| ZM105 | M105X2 | 1,05 | 140 | 22 | 12 | 5 | 126 | 11 | M10 | 20 | 495 000 | 475 | 300 | 44,5 |
| ZM110 | M110X2 | 1,09 | 145 | 22 | 12 | 5 | 133 | 11 | M10 | 20 | 520 000 | 510 | 350 | 50,1 |
| ZM115 | M115X2 | 1,13 | 150 | 22 | 12 | 5 | 137 | 11 | M10 | 20 | 550 000 | 550 | 400 | 56,2 |
| ZM120 | M120X2 | 1,28 | 155 | 24 | 12 | 5 | 138 | 12 | M10 | 20 | 580 000 | 600 | 450 | 68,4 |
| ZM125 | M125X2 | 1,33 | 160 | 24 | 12 | 5 | 148 | 12 | M10 | 20 | 610 000 | 640 | 500 | 76,1 |
| ZM130 | M130X2 | 1,36 | 165 | 24 | 12 | 5 | 149 | 12 | M10 | 20 | 630 000 | 700 | 550 | 84,3 |
| ZM140 | M140X2 | 1,85 | 180 | 26 | 14 | 6 | 160 | 13 | M12 | 38 | 690 000 | 800 | 600 | 133 |
| ZM150 | M150X2 | 2,24 | 195 | 26 | 14 | 6 | 171 | 13 | M12 | 38 | 750 000 | 900 | 650 | 188 |





High precision bearings for combined loads



Axial/radial bearings
Axial angular contact ball bearings
Axial/radial bearings
with integral angular measuring system

High precision bearings for combined loads

Axial/radial bearings 992

Axial/radial bearings are double direction axial bearings for screw mounting, with a radial guidance bearing. These ready-to-fit, pregreased units are very rigid, have high load carrying capacity and run with particularly high accuracy. They can support radial forces, axial forces from both directions and tilting moments free from clearance. The bearings are available in several series.

For applications with low speeds and small operating durations – such as indexing tables and swivel type milling heads – series YRT is generally the most suitable.

Where comparatively lower friction and high speeds are required, RTC bearings can be used. For higher requirements in accuracy, these bearings are also available with restricted axial runout accuracy.

For the bearing arrangements of direct drive axes, there is the series YRT_{Speed}. Due to their high limiting speeds and very low, uniform frictional torque across the whole speed range, these bearings are particularly suitable for combination with torque motors.

Axial angular contact ball bearings 992

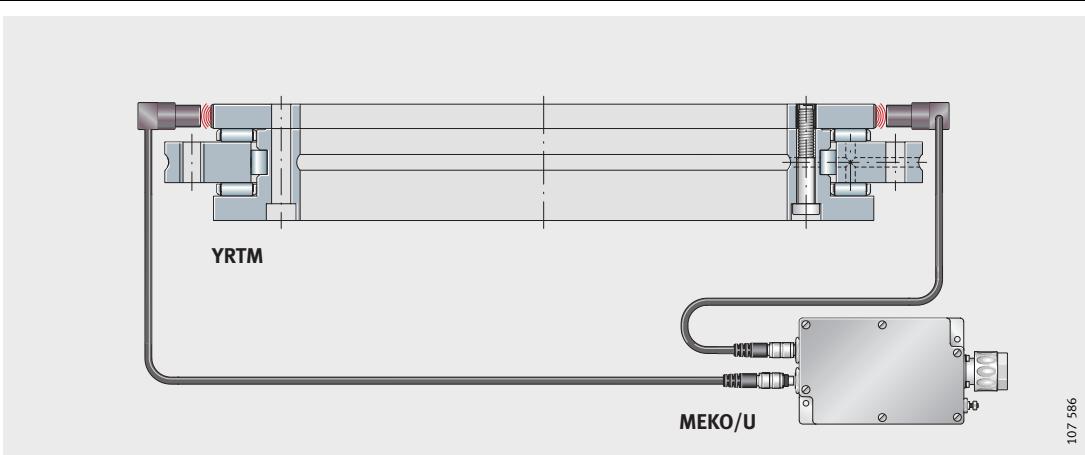
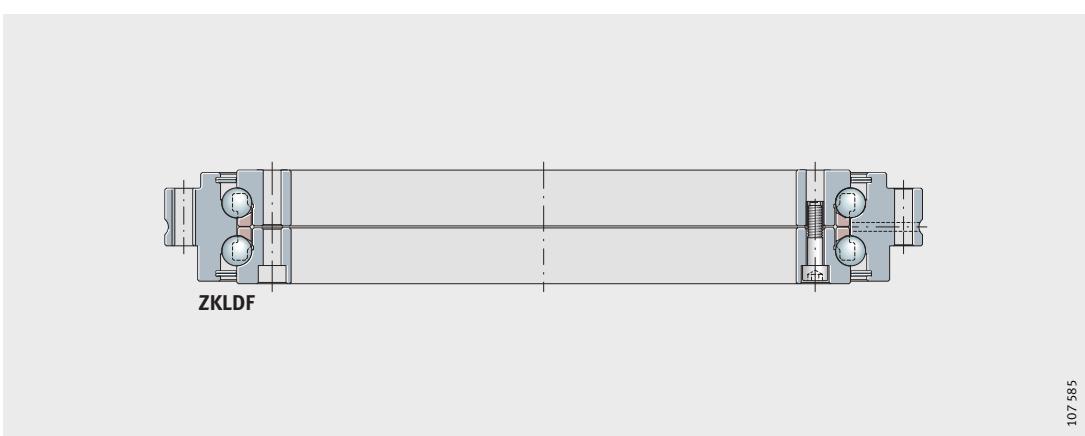
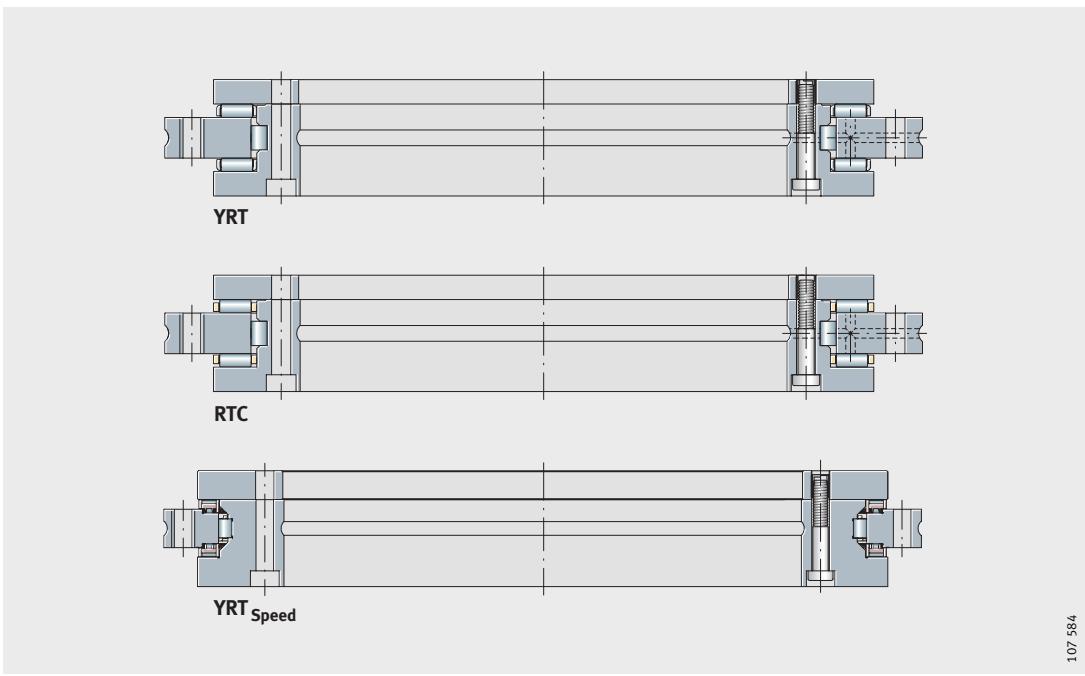
Axial angular contact ball bearings ZKLD are low-friction, ready-to-fit, pregreased bearing units with high accuracy for very high speeds, high axial and radial loads and high demands on tilting rigidity.

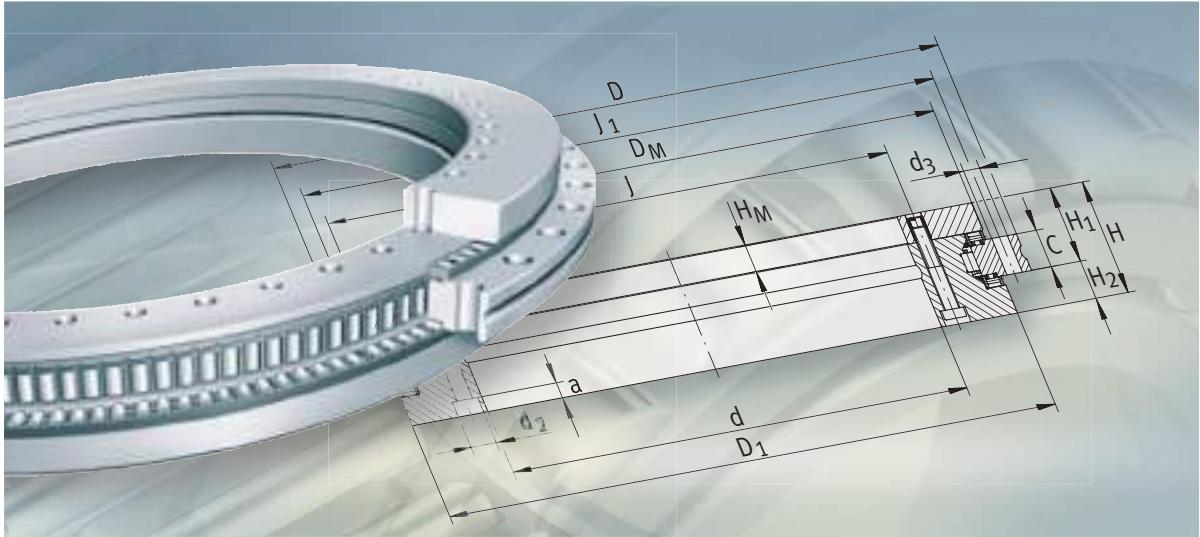
Axial angular contact ball bearings are particularly suitable for precision applications involving combined loads. Their preferred areas of use are bearing arrangements in rotary tables, milling, grinding and honing heads as well as measurement and testing equipment.

Axial/radial bearings with integral angular measuring system 1020

Axial/radial bearings with integral measuring system YRTM correspond in mechanical terms to series YRT but are additionally fitted with an angular measuring system. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means.

The unit comprises an axial/radial bearing with a dimensional scale and a MEKO/U electronic measuring system. The electronic measuring system consists of two measuring heads and an electronic evaluation system.





Axial/radial bearings

Axial angular contact ball bearings

Axial/radial bearings

Axial angular contact ball bearings

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Product overview

Axial/radial bearings Axial angular contact ball bearings

Axial/radial bearings

YRT



107 305a

RTC



107 520b

For higher speeds

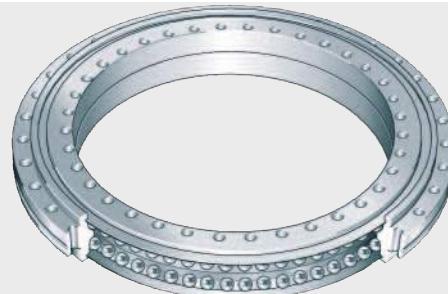
YRT_{Speed}



107 485c

Axial angular contact ball bearings

ZKLDF



107 306a

Axial/radial bearings

Axial angular contact ball bearings

Features

Axial/radial bearings YRT, RTC and YRT_{Speed} and axial angular contact ball bearings ZKLDF are ready-to-fit high precision bearings for high precision applications with combined loads. They can support radial loads, axial loads from both sides and tilting moments without clearance and are particularly suitable for bearing arrangements for running accuracy, such as rotary tables, face plates, milling heads and reversible clamps.

Due to the fixing holes in the bearing rings, the units are very easy to fit.

The bearings are radially and axially preloaded after fitting.

The mounting dimensions of all series are identical.

With angular measuring system

Axial/radial bearings are also available with an angular measuring system. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means, see page 1020.

Areas of application

For standard applications with low speeds and small operating durations – such as indexing tables and swivel type milling heads – series YRT is generally the most suitable, *Figure 1*. These bearings are available in two axial and radial runout accuracies.

Where comparatively lower friction and higher speeds are required, RTC bearings can be used, *Figure 1*. For higher requirements in accuracy, these bearings are also available with restricted axial runout accuracy.

For the bearing arrangements of direct drive axes, there is the series YRT_{Speed}. Due to their high limiting speeds and very low, uniform frictional torque across the whole speed range, these bearings are particularly suitable for combination with torque motors, *Figure 1*.

Axial angular contact ball bearings ZKLDF are particularly suitable for high speed applications with long operating duration, *Figure 1*. They are characterised by high tilting rigidity, low friction and low lubricant consumption.

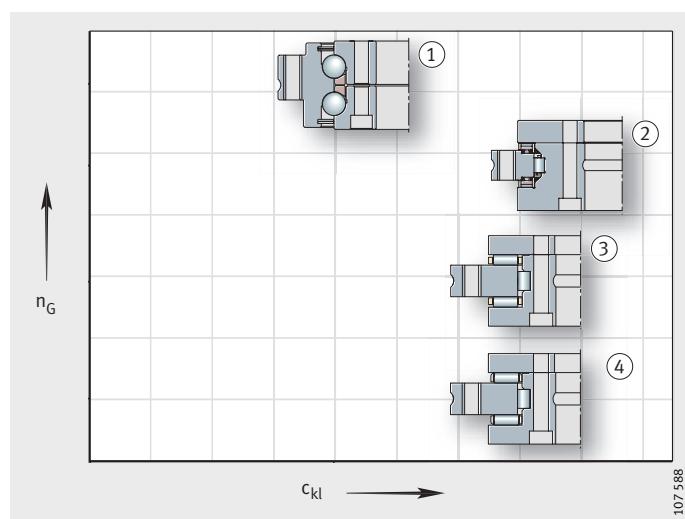


- ① ZKLDF
- ② YRT_{Speed}
- ③ RTC
- ④ YRT

n_G = limiting speed
 c_{kl} = tilting rigidity

Figure 1

Speed and tilting rigidity – comparison



107 588

Axial/radial bearings Axial angular contact ball bearings

| Axial/radial bearings | Axial/radial bearings YRT, RTC and YRT _{Speed} have an axial component and a radial component. The axial component comprises an axial needle roller or cylindrical roller and cage assembly, an outer ring, L-section ring and shaft locating washer and is axially preloaded after fitting. The radial component is a full complement (YRT, RTC) or cage-guided, preloaded cylindrical roller set. The outer ring, L-section ring and shaft locating washer have fixing holes. The unit is located by means of retaining screws for transport and safe handling. | | | | | | | | | | | | |
|--|--|------------------------------|-------------|--------|--------------------|---|------------------------------|--------------------|---|------------------------------|---|---|------------------------------|
| Sealing/lubricant | Axial/radial bearings are supplied without seals. Bearings of series YRT and YRT _{Speed} are greased using a lithium complex soap grease to GA08 and can be lubricated via the outer ring and L-section ring. Bearings of series RTC are greased with Arcanol MULTITOP. | | | | | | | | | | | | |
| Axial angular contact ball bearings | Axial angular contact ball bearings ZKLDF comprise a single-piece outer ring, a two-piece inner ring and two ball and cage assemblies with a contact angle of 60°. The outer ring and inner ring have fixing holes for screw mounting of the bearing on the adjacent construction. The unit is located by means of retaining screws for transport and safe handling. | | | | | | | | | | | | |
| Sealing/lubricant | Axial angular contact ball bearings have sealing shields on both sides. They are greased using a barium complex soap grease to DIN 51825-KPE2K-30 and can be lubricated via the outer ring. | | | | | | | | | | | | |
| Operating temperature | Axial/radial bearings and axial angular contact ball bearings are suitable for operating temperatures from -30 °C to +120 °C. | | | | | | | | | | | | |
| Suffixes | Suffixes and additional text for available designs: see table. | | | | | | | | | | | | |
| Available designs | <table border="1"><thead><tr><th>Suffixes</th><th>Description</th><th>Design</th></tr></thead><tbody><tr><td>H₁ ...</td><td>Reduced tolerance on mounting dimension H₁ (postscript: H₁ with tolerance ± ...) Restricted tolerance value according to table, page 1010</td><td>Special design¹⁾</td></tr><tr><td>H₂ ...</td><td>Reduced tolerance on mounting dimension H₂ (postscript: H₂ with tolerance ± ...) Restricted tolerance value according to table, page 1010</td><td>Special design¹⁾</td></tr><tr><td>-</td><td>Axial and radial runout tolerances restricted by 50% (additional text: axial/radial runout 50%)</td><td>Special design¹⁾</td></tr></tbody></table> | Suffixes | Description | Design | H ₁ ... | Reduced tolerance on mounting dimension H ₁ (postscript: H ₁ with tolerance ± ...) Restricted tolerance value according to table, page 1010 | Special design ¹⁾ | H ₂ ... | Reduced tolerance on mounting dimension H ₂ (postscript: H ₂ with tolerance ± ...) Restricted tolerance value according to table, page 1010 | Special design ¹⁾ | - | Axial and radial runout tolerances restricted by 50% (additional text: axial/radial runout 50%) | Special design ¹⁾ |
| Suffixes | Description | Design | | | | | | | | | | | |
| H ₁ ... | Reduced tolerance on mounting dimension H ₁ (postscript: H ₁ with tolerance ± ...) Restricted tolerance value according to table, page 1010 | Special design ¹⁾ | | | | | | | | | | | |
| H ₂ ... | Reduced tolerance on mounting dimension H ₂ (postscript: H ₂ with tolerance ± ...) Restricted tolerance value according to table, page 1010 | Special design ¹⁾ | | | | | | | | | | | |
| - | Axial and radial runout tolerances restricted by 50% (additional text: axial/radial runout 50%) | Special design ¹⁾ | | | | | | | | | | | |

¹⁾ Available by agreement.

Design and safety guidelines

Basic rating life

The load carrying capacity and life must be checked for the radial and axial bearing component.

Please contact us in relation to checking of the basic rating life. The speed, load and operating duration must be given.

Static load safety factor

The static load safety factor S_0 indicates the security against impermissible permanent deformations in the bearing.

It is determined as follows:

$$S_0 = \frac{C_{0r}}{F_{0r}} \text{ or } \frac{C_{0a}}{F_{0a}}$$

S_0 –

Static load safety factor

C_{0r}, C_{0a} – N

Basic static load rating according to dimension tables

F_{0r}, F_{0a} – N

Maximum static load on the radial or axial bearing.

Caution!

In machine tools and similar areas of application, S_0 should be > 4 .

Static limiting load diagrams

The static limiting load diagrams can be used:

- for rapid checking of the selected bearing size under predominantly static load
- for calculation of the tilting moment M_k that can be supported by the bearing in addition to the axial load.

The limiting load diagrams are based on a rolling element set with a static load safety factor $S_0 \geq 4$, as well as the screw and bearing ring strength.



Caution!

The static limiting load must not be exceeded when dimensioning the bearing arrangement. Example: see Figure 2.

Axial/radial bearings

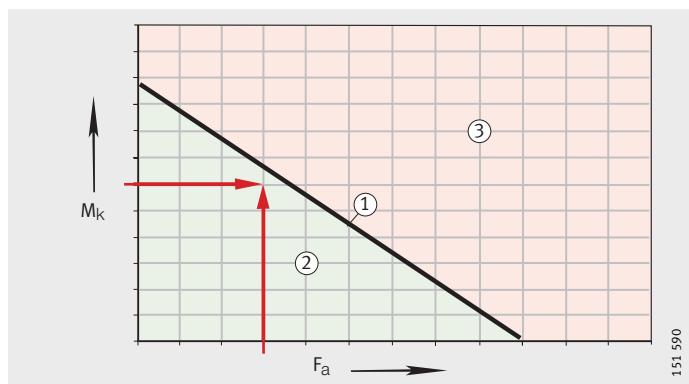
The static limiting load diagrams for YRT, YRTS and RTC are shown in Figure 3, page 998 to Figure 9, page 1000.

Axial angular contact ball bearings

The static limiting load diagrams for the series ZKLD are shown in Figure 10 and Figure 11, page 1001.

① Bearing/size
 ② Permissible range
 ③ Impermissible range
 $M_k = \text{max. tilting moment}$
 $F_a = \text{axial load}$

Figure 2
Static limiting load diagram – example



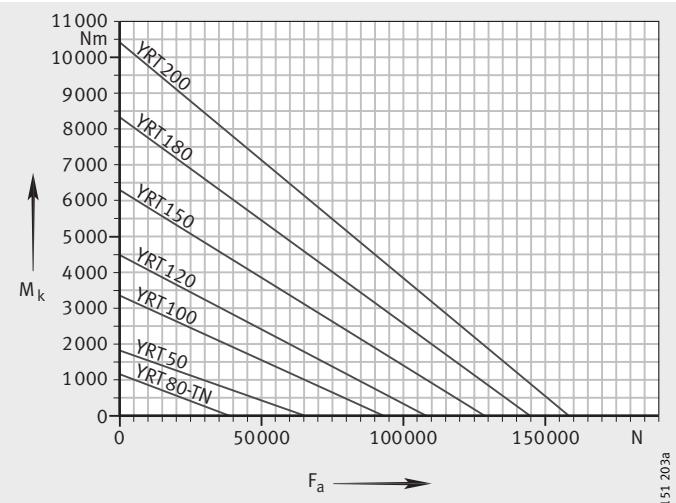
151 590

Axial/radial bearings Axial angular contact ball bearings

M_k = max. tilting moment
 F_a = axial load

Figure 3

Static limiting load diagram –
 YRT50 to YRT200

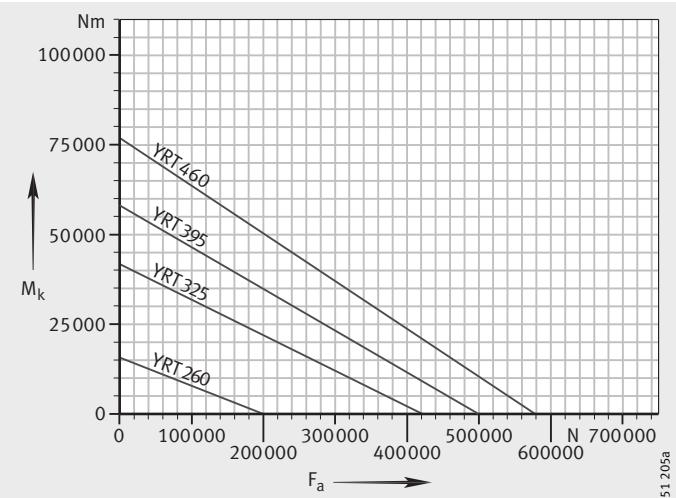


151 203a

M_k = max. tilting moment
 F_a = axial load

Figure 4

Static limiting load diagram –
 YRT260 to YRT460

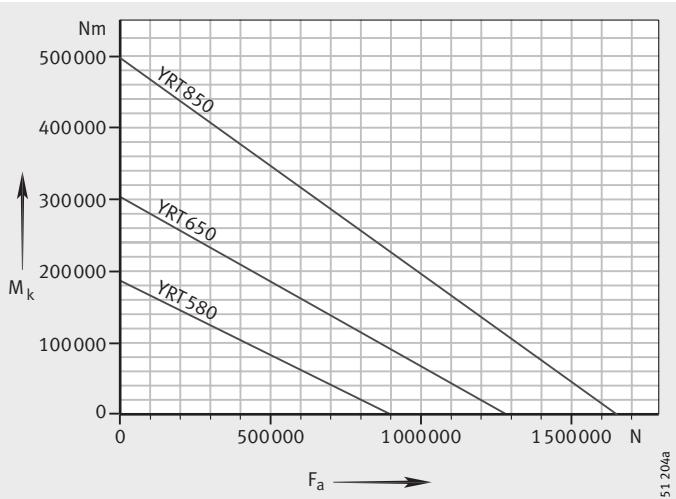


151 203a

M_k = max. tilting moment
 F_a = axial load

Figure 5

Static limiting load diagram –
 YRT580 to YRT850

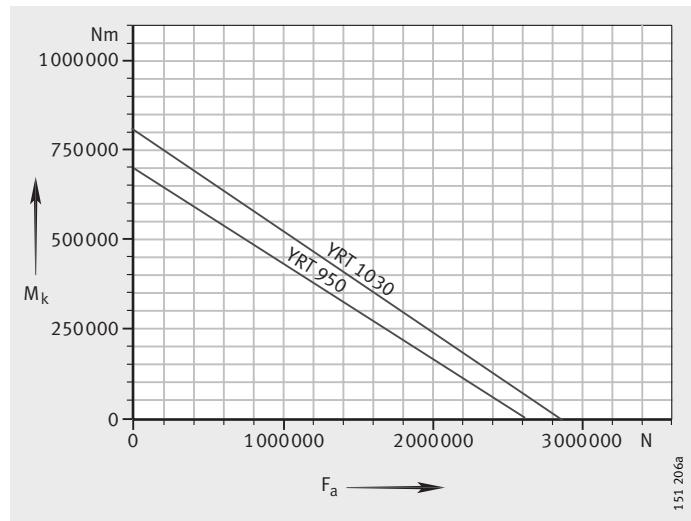


151 204a

M_k = max. tilting moment
 F_a = axial load

Figure 6

Static limiting load diagram –
YRT950 and YRT1030

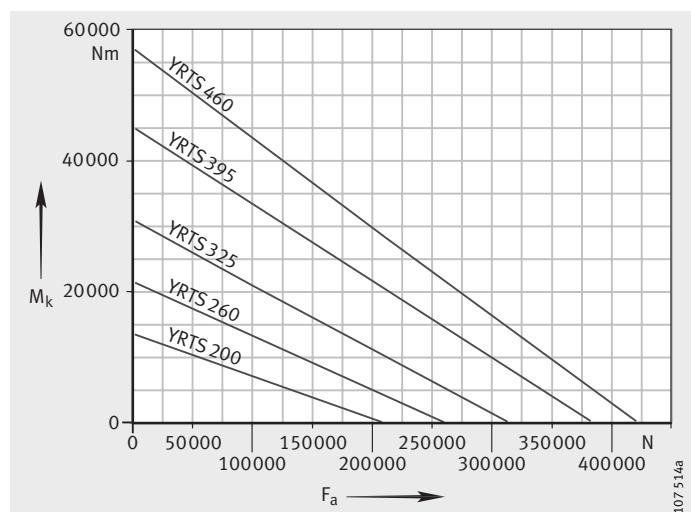


151 206a

M_k = max. tilting moment
 F_a = axial load

Figure 7

Static limiting load diagram –
YRT_{Speed}200 to YRT_{Speed}460



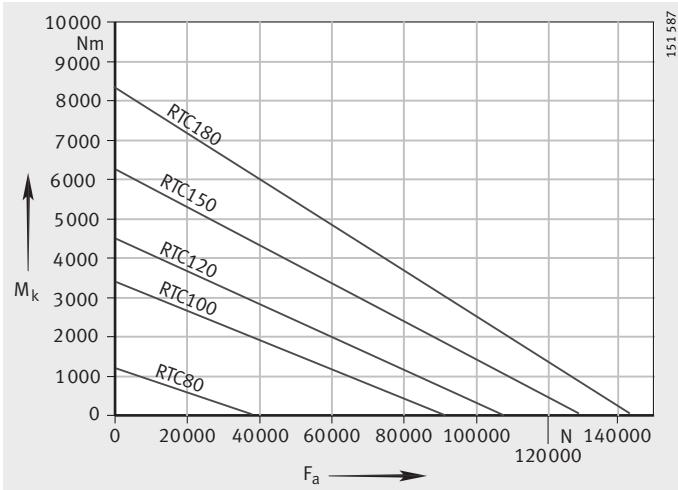
107 514a

Axial/radial bearings Axial angular contact ball bearings

M_k = max. tilting moment
 F_a = axial load

Figure 8

Static limiting load diagram –
 RTC80 to RTC180



M_k = max. tilting moment
 F_a = axial load

Figure 9

Static limiting load diagram –
 RTC200 to RTC460

