

Gauges

Contents

Gauges **286**
Ring gauges, series GRA 30 286
Internal clearance gauges, series GB 30 290
Internal clearance gauges, series GB 49 293

Gauges

Conventional measuring methods and instruments are not always suitable for checking the seatings for rolling bearings, or measuring clearance or preload. SKF has therefore developed a range of gauges specially designed to meet the needs of rolling bearing applications.

Ring gauges of series GRA 30 and taper gauges of series DMB can be used to check the most commonly occurring tapered seatings. Measurements can be made quickly and accurately. Whilst a ring gauge can only be used to check tapered seatings for one particular bearing size, the taper gauges of series DMB can be used for a given range of diameters, as well as for tapers other than 1:12.

In order to be able to adjust the radial internal clearance or preload of cylindrical roller bearings with tapered bore when mounting, it is necessary to be able to accurately measure the circumscribed, or inscribed circle diameter of the rollers (diameter over or under the rollers). SKF gauges of series GB 30 and GB 49 enable these measurements to be made. They are simple to use and have high measuring accuracy.

Detailed information on taper gauges of series DMB and other SKF measuring equipment will be supplied on request.

Ring gauges, series GRA 30

SKF ring gauges of series GRA 30 are practical aids for checking the tapered shaft seatings for bearings of series NN 30 K that are commonly used in machine tool applications. The gauges can also be used to check the shaft seatings for bearings of series N 10 K, but more particularly those of series NNU 49 BK; the width of the latter series differs only slightly from that of series NN 30 K.

The ring gauges are available for tapered seatings up to 200 mm diameter, see product table, **pages 288 – 289**. For seatings with diameters larger than 200 mm, the requisite rings would be difficult to handle because of their weight, and the use of a taper gauge is recommended.

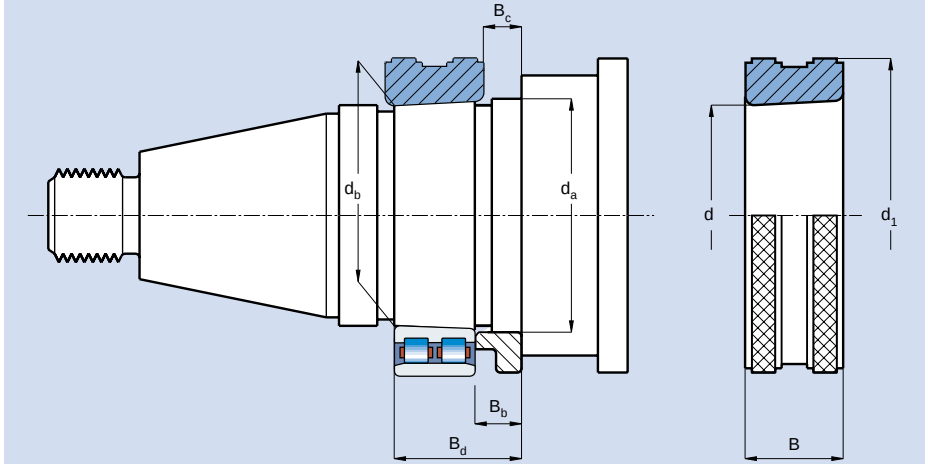
Measuring

The gauging or reference face of ring gauges series GRA 30 is at the large end of the bore and is used to determine the position of the tapered seating relative to a reference surface on the shaft. This reference surface may be either in front of, or behind the gauging face of the ring gauge. Suitable dimensions for the tapered seating can be obtained from the product table. Where there is a free choice of dimensions it should be remembered that the reference length B_c should always be longer than the dimension B_b, the width of the intermediate ring, by an amount corresponding to the difference $B_c - B_b$, as the bearing will be driven up further than the ring gauge, on to the seating, when the bearing is being mounted. The final value of the dimension B_b is determined during mounting, taking into account the desired bearing internal clearance.

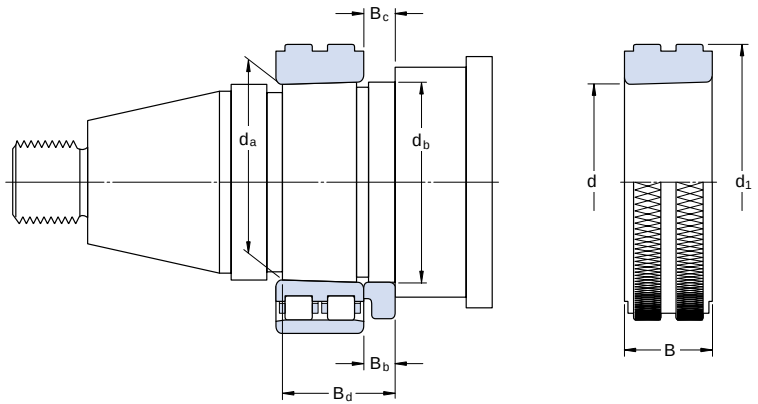
Ring gauges can also be used to check whether the reference surface of the shaft shoulder is at right angles to the centreline of the tapered seating, as well as to check the position and diameter of the seating. This is achieved by measuring the distance between the gauging surface of the ring gauge and the reference surface of the shaft using end measures. Errors of form, of the taper are checked using marking blue (→ **fig 1**).

Measuring tapered seats with a GRA 30 series gauge

Fig 1



Ring gauges, GRA 30 series



Bearing Designation	Bearing seating Dimensions d_a	d_b	B_b	B_c Nominal	Tolerance	B_d	Ring gauge Dimensions d	d_1	B	Mass	Designation
–	mm						mm			kg	–
NN 3005 K	25,1	27	4	4,2	±0,1	19	25	46	16	0,13	**GRA 3005**
NN 3006 K	30,1	32	6	6,2	±0,1	24	30	52	19	0,18	**GRA 3006**
NN 3007 K	35,1	37	6	6,2	±0,1	25	35	57	20	0,21	**GRA 3007**
NN 3008 K	40,1	42	8	8,2	±0,1	28	40	62	21	0,26	**GRA 3008**
NN 3009 K	45,1	47	8	8,2	±0,1	30	45	67	23	0,31	**GRA 3009**
NN 3010 K	50,1	52	8	8,2	±0,1	30	50	72	23	0,34	**GRA 3010**
NN 3011 K	55,15	57	8	8,3	±0,12	32,5	55	77	26	0,42	**GRA 3011**
NN 3012 K	60,15	62	10	10,3	±0,12	34,5	60	82	26	0,45	**GRA 3012**
NN 3013 K	65,15	67	10	10,3	±0,12	34,5	65	88	26	0,51	**GRA 3013**
NN 3014 K	70,15	73	10	10,3	±0,12	38,5	70	95	30	0,69	**GRA 3014**
NN 3015 K	75,15	78	10	10,3	±0,12	38,5	75	100	30	0,73	**GRA 3015**
NN 3016 K	80,15	83	12	12,3	±0,12	44,5	80	105	34	0,88	**GRA 3016**
NN 3017 K	85,2	88	12	12,4	±0,15	44	85	112	34	1	**GRA 3017**
NN 3018 K	90,2	93	12	12,4	±0,15	47	90	120	37	1,3	**GRA 3018**
NN 3019 K	95,2	98	12	12,4	±0,15	47	95	128	37	1,55	**GRA 3019**
NN 3020 K	100,2	103	12	12,4	±0,15	47	100	135	37	1,7	**GRA 3020**
NN 3021 K	105,2	109	12	12,4	±0,15	51	105	142	41	2,1	**GRA 3021**
NN 3022 K	110,25	114	12	12,5	±0,15	54,5	110	150	45	2,6	**GRA 3022**

Bearing Designation	Bearing seating Dimensions d_a	d_b	B_b	B_c Nominal	Tolerance	B_d	Ring gauge Dimensions d	d_1	B	Mass	Designation
–	mm						mm			kg	–
NN 3024 K	120,25	124	15	15,5	±0,15	58,5	120	162	46	3,05	**GRA 3024**
NN 3026 K	130,25	135	15	15,5	±0,15	64,5	130	175	52	3,95	**GRA 3026**
NN 3028 K	140,3	145	15	15,6	±0,15	65	140	188	53	4,75	**GRA 3028**
NN 3030 K	150,3	155	15	15,6	±0,15	68	150	200	56	5,6	**GRA 3030**
NN 3032 K	160,3	165	15	15,6	±0,15	72	160	215	60	6,8	**GRA 3032**
NN 3034 K	170,3	176	15	15,6	±0,15	79	170	230	67	8,8	**GRA 3034**
NN 3036 K	180,35	187	20	20,7	±0,15	90,5	180	245	74	11,5	**GRA 3036**
NN 3038 K	190,35	197	20	20,7	±0,18	91,5	190	260	75	13	**GRA 3038**
NN 3040 K	200,35	207	20	20,7	±0,18	98,5	200	270	82	15	**GRA 3040**

Internal clearance gauges, series GB 30

SKF gauges of series GB 30 are available for use with double row cylindrical roller bearings NN 3006 K to NN 3040 K inclusive, and may also be used for the single row bearings of series N10 K.

SKF gauges of series GB 30 are made in two different designs, depending on size. The illustration above the table on **page 291** shows the design of gauges GB 3006 to GB 3020 inclusive. These can be used to measure the envelope diameter of the roller set (i.e. the diameter over the rollers when in contact with the inner ring raceway) to an accuracy of 1 µm. The larger gauges, sizes GB 3021 to GB 3040 inclusive, have the design that is shown in the right-hand illustration above the table on **page 292**, and a measuring accuracy of 2 µm.

The body of gauges up to, and including size GB 3020 is in two parts; that of the larger sizes is slotted.

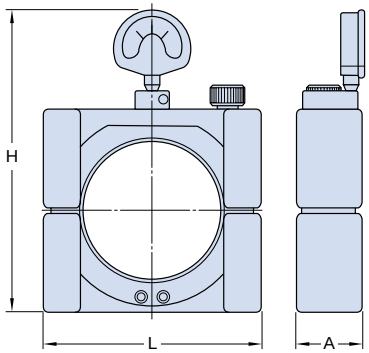
The gauge body has two diametrically opposed gauging zones that are ground on its bore diameter. The body can be expanded by means of an adjustment screw. This enables the gauge to be pushed over the inner ring with roller and cage assembly without damaging the rollers and gauging surfaces. The measuring ring that is screwed to one half of the gauging ring, transmits the diameter measured by both halves of the gauging ring to the indicator dial.

Measuring

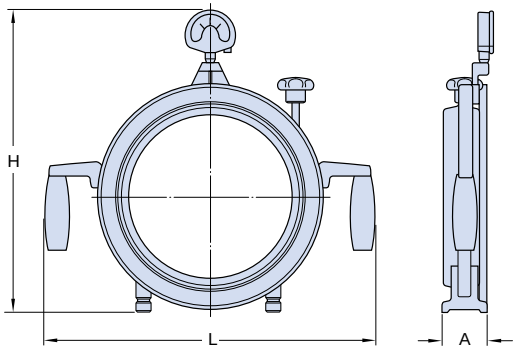
Using a bore gauge, the raceway diameter of the mounted outer ring is measured, and the recorded dimension transferred to the centres of the gauging zones, taking into account the desired radial internal clearance or preload. The indicator of the GB 30 gauge is then set to zero. The inner ring with roller and cage assembly is pushed on to its tapered journal, and driven up until the indicator on the pre-set gauge again shows zero, when the gauge is placed in position around the roller set.

Mounting instructions

Detailed instruction for mounting cylindrical roller bearings with a separable outer ring, and the adjustment of clearance or preload using a gauge of series GB 30 will be found in the Chapter Principles of bearing selection and application, section mounting and dismounting, **pages 93 – 96**.



Bearing Designation	Gauge Dimensions			Mass	Designation
	L	H	A		
–	mm			kg	–
NN 3006 K	107	175	36	2	**GB 3006**
NN 3007 K	112	180	37	2	**GB 3007**
NN 3008 K	117	185	39	2	**GB 3008**
NN 3009 K	129	197	40	2,5	**GB 3009**
NN 3010 K	134	202	40	2,5	**GB 3010**
NN 3011 K	144	212	43	3,5	**GB 3011**
NN 3012 K	152	222	44	4	**GB 3012**
NN 3013 K	157	225	44	4	**GB 3013**
NN 3014 K	164	232	48	5	**GB 3014**
NN 3015 K	168	236	48	5	**GB 3015**
NN 3016 K	176	244	52	6	**GB 3016**
NN 3017 K	185	253	53	6,5	**GB 3017**
NN 3018 K	198	266	56	8	**GB 3018**
NN 3019 K	203	271	56	9	**GB 3019**
NN 3020 K	212	280	56	9	**GB 3020**



Bearing Designation	**Gauge** Dimensions			Mass	Designation
	L	H	A		
–	mm			kg	–
NN 3021 K	322	350	46	10,5	**GB 3021**
NN 3022 K	332	362	46	11	**GB 3022**
NN 3024 K	342	376	48	12	**GB 3024**
NN 3026 K	364	396	54	13	**GB 3026**
NN 3028 K	378	410	54	14,5	**GB 3028**
NN 3030 K	391	426	58	15	**GB 3030**
NN 3032 K	414	446	60	16	**GB 3032**
NN 3034 K	430	464	62	17	**GB 3034**
NN 3036 K	454	490	70	17,5	**GB 3036**
NN 3038 K	468	504	70	18	**GB 3038**
NN 3040 K	488	520	74	19	**GB 3040**

Internal clearance gauges, series GB 49

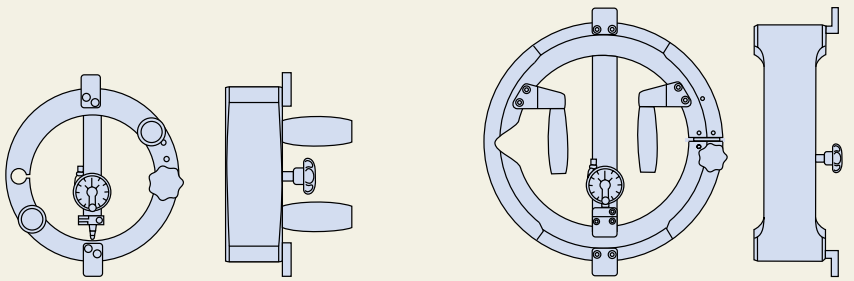
SKF gauges of series GB 49 are available for use with double row cylindrical roller bearings NNU 4920 BK to NNU 4960 BK inclusive.

There are two different designs of the gauge, depending on size. The illustration on the left-hand above the product table **page 295** shows the design of gauges GB 4920 to GB 4938 inclusive, and are used to measure the internal diameter of the roller set, when the rollers are in contact with the outer ring raceway, to an accuracy of 1 µm. The illustration on the right-hand above the product table **page 295** shows the design of larger gauges, GB 4940 to GB 4960, and have a measuring accuracy of 2 µm.

The body of gauges of series GB 49 is slotted, so that both gauging ring halves can be brought to bear on the roller set with the appropriate pressure, as a result of the inherent resilience of the material. The outside cylindrical surface of the gauging ring has two ground gauging zones at diametrically opposed positions. An adjustment screw permits the body of the gauge to be compressed, so that the gauge can be positioned inside the roller set without damaging the rollers or the gauging surfaces (→ **fig 2**).

Internal clearance gauges GB 49

Fig 2

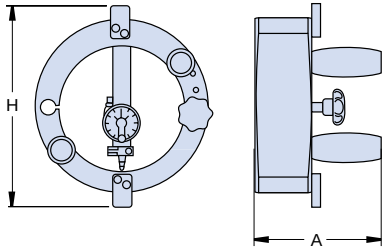


Measuring

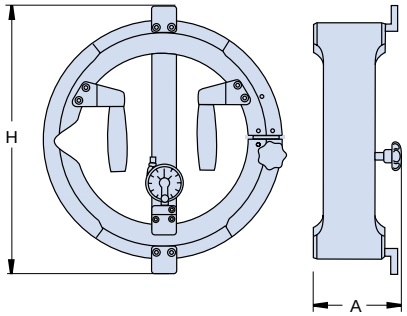
After the gauge has been inserted in the roller and cage assembly, the adjustment screw is loosened until the two gauging surfaces are in contact with the roller set.

The indicator of the gauge is then set to zero.

The measured diameter inside the roller set is then taken by using a stirrup gauge and the indicator of the stirrup gauge set to zero. The inner ring is then driven up on its seating, on the spindle, until the indicator of the stirrup gauge, with which, the inner ring raceway is measured, shows the deviation from zero corresponding to the desired radial internal clearance or preload.



GB 4920 to GB 4938



GB 4940 to GB 4960

Bearing Designation	**Gauge** Dimensions		Mass	Designation
	A	H		
–	mm		kg	–
NNU 4920 BK	128	138	2,5	**GB 4920**
NNU 4921 BK	128	143	3	**GB 4921**
NNU 4922 BK	128	148	3	**GB 4922**
NNU 4924 BK	133	162	3,5	**GB 4924**
NNU 4926 BK	138	176	4	**GB 4926**
NNU 4928 BK	138	186	4,5	**GB 4928**
NNU 4930 BK	148	204	6	**GB 4930**
NNU 4932 BK	148	212	6,5	**GB 4932**
NNU 4934 BK	148	224	8	**GB 4934**
NNU 4936 BK	157	237	9,5	**GB 4936**
NNU 4938 BK	157	248	10,5	**GB 4938**
NNU 4940 BK	105	263	12	**GB 4940**
NNU 4944 BK	105	283	13	**GB 4944**
NNU 4948 BK	105	303	14	**GB 4948**
NNU 4952 BK	120	340	15	**GB 4952**
NNU 4956 BK	120	360	17	**GB 4956**
NNU 4960 BK	135	387	19	**GB 4960**