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Ball Bearing Units

Ball Bearing Units offer a convenient method of applying highly reliable rolling contact bearings to applications without the necessity of manufacturing a bearing housing.

Generally Ball Bearing Units have following features.

- Self-aligning capability
- Sealed
- Easy to mount and dismount
- Interchangeability with foreign made units
- Many types suitable for applications
  Additionally NACHI Ball Bearing Units have the advantages of case of use and high reliability.
- Anti-rotation pin on outer ring
- Eccentric collar type is also available
- Base for mount locating pin
  Since Ball Bearings for units have the same geometry as deep groove ball bearings, load rating, reliability and other functions are equal with that of deep-groove ball bearings.

1. Designations

Number arrangement of Bearing Units and Ball bearings is shown as follows.

(1) Bearing Unit Numbers

C UK P 210 C CT4HR5 +H2310

- **Accessory No.**
  Adapter sleeves
  Frame of take-up type
- **Supplementary symbol**
  Internal clearance
  For high or low temperature
- **Bearing dimension series no.**
- **Housing type symbol**
  Pillow, Flange, Take-up, Cartridge and Hanger
- **Cover symbol**
  C : Pressed steel or cast iron cover with seal
  E : End cover of pressed steel
  CE: End cover of cast iron
- **Bearing type symbol**
  Cylindrical bore (With eccentric collar)
  Tapered bore
- **Covered housing symbol**
  C: For cast iron cover

(2) Ball Bearing Numbers

UG 208 C3HR4 +ER

- **Accessory symbol**
  Eccentric collar ER, AR
  Adapter sleeves
- **Supplementary symbol**
  Internal clearance
  For high or low temperature
- **Dimension series**
  First number:
  Diameter series no.
  2nd and 3rd number:
  Bore diameter no.
- **Type symbol**
  Set screw type: UC, B
  Eccentric collar type: KH, U, UG
  Adapter sleeve type: UK

Note: For type B bearings, a last digit of bore diameter number is used as dimension series number.

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Contents of dimension tables (1)

Symbol ○: Pressed steel cover type is available. ●: Cast iron cover type is available.

Housing type \ Ball bearing type		UC (MUC) page 527	UK+H page 529		B page 531	KH AE page 531	U, MU+ER page 533	UG+ER page 535	Ball bearing type \ Housing type
Cast Iron Series Standard Pillow block Type	P	UCP ○ ● page 417	UKP ○ ● page 421		BP page 425	–	–	UGP page 427	P
Cast Iron Series Thick Body Pillow block for Shock Applications	IP	UCIP ○ ● page 429	UKIP ○ ● page 431		–	–	–	–	IP
Cast Steel Series Pillow block for Heavy Loads	PK	UCPK ● page 433	UKPK ● page 425		–	–	–	–	PK
Cast Iron Series Pillow block with High Center Height	PH	UCPH page 437	–		–	–	–	–	PH
Cast Iron Series Pillow block with Small Base	PA	UCPA page 439	–		–	–	–	–	PA
Cast Iron Series Pillow block for Free-end	EP	UCEP page 441	–		–	–	–	–	EP
Cast Iron Series Light Weight Pillow block for Light Load	LLP	–	–		BLLP page 443	KHLLP page 443	–	–	LLP
Stainless Steel Series Standard Pillow block	MP	MUCP page 445	–		–	–	–	–	MP
Alloy Series (Silver series) Compact Pillow block for Light Load	P (PZ3)	–	–		–	–	UP (MUP) page 447	–	P (PZ3)
Pressed Steel Series Pillow block for Extremely Light Load	PP	–	–		BPP page 449	KHPP page 449	–	–	PP
Cast Iron Series Square Flange Type	F	UCF ○ ● page 451	UKF ○ ● page 455		BF page 459	–	–	UGF page 461	F
Cast Iron Series Square Flange with Spigot Joint	FS	UCFS ● page 463	UKFS ● page 465		–	–	–	–	FS
Cast Iron Series Round Flange Type	FC	UCFC ○ ● page 467	UKFC ○ ● page 471		BFC page 473	–	–	UGFC page 475	FC

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Contents of dimension tables (2)

Symbol ○: Pressed steel cover type is available. ●: Cast iron cover type is available.

Housing type \ Ball bearing type		UC (MUC) page 527	UK+H page 529		B page 531	KH AE page 531	U, MU+ER page 533	UG+ER page 535	Ball bearing type \ Housing type
Cast Iron Series Rhombic Flange Type	FL	UCFL ○ ● page 477	UKFL ○ ● page 481		BFL page 485	–	–	UGFL page 487	FL
Cast Iron Series Light Weight Rhombic Flange for Light Load	LFL	–	–		BLFL page 489	KHLFL page 489	–	–	LFL
Stainless Steel Series Rhombic Flange for Anti-Corrosion	MFL	MUCFL page 491	–		–	–	–	–	MFL
Alloy Series (Silver Series) Compact Rhombic Flange for Light Load	FL (FLZ3)	–	–		–	–	UFL (MUFL) page 493	–	FL (FLZ3)
Pressed Steel Series Round Flange for Extremely Light Load	PF	–	–		BPF page 495	KHPF page 495	–	–	PF
Pressed Steel Series Rhombic Flange for Extremely Light Load	PFL	–	–		BPFL page 497	KHPFL page 497	–	–	PFL
Cast Iron Series Transformed Rhombic Flange, Adjustable Center	FA	UCFA page 499	–		–	–	–	–	FA
Cast Iron Series One Side Flange Type	FK	UCFK page 501	–		–	–	–	–	FK
Cast Iron Series Standard Take-Up Type	T	UCT ○ ● page 503	UKT ○ ● page 507		BT page 511	–	–	–	T
Cast Iron Series Take-Up Type with Frame of Angle Steel	T + WB	UCT+WB page 513	–		–	–	–	–	T + WB
Cast Iron Series Take-Up Type with Frame of Light Channel Steel	TL + WL	UCTL+WL page 515	–		–	–	–	–	TL + WL
Cast Iron Series Take-Up Type with Frame of Channel Steel	TU + WU	UCTU+WU page 517	–		–	–	–	–	TU + WU
Cast Iron Series Cartridge Type	C	UCC page 521	UKC page 523		–	–	–	–	C
Cast Iron Series Hanger Type	ECH	UCECH page 525	–		–	–	–	–	ECH

2. Tolerance

Tolerances for ball bearings and housings are shown as follows.

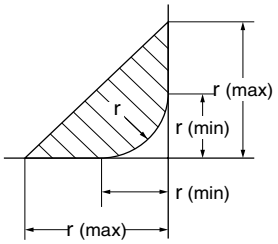
(1) Ball Bearing Tolerances

Tolerances of inner ring	Cylindrical bore: See Table 1 Tapered bore: See Table 5.7.1 (Page 63) 1/12 taper bore
Tolerances of outer ring	Tolerance class 0 of Table 5.1.2 (Page 55) Note: The lower limit of ΔD_{mp} is not applied within a distance of 1/4 of outer ring width from side faces.
Chamfer dimensions	See Table 2

Table 1. Tolerance of Inner Ring (Cylindrical bore) Unit: μm

Bore dia. Nominal d (mm)		Single plane mean bore dia. deviation Δd_{mp}		Bore dia. variation in a single radial plane V_{dp}	Deviation of a single inner ring width ΔB_s		Radial runout of assembled bearing inner ring K_{ia} (referaence)	Deviation of (1) eccentric value of inner ring eccentric face ΔH_s
Over	Incl.	High	Low	Max	High	Low	Max	
6	10	+12	0	8	0	–120	15	±100
10	18	+15	0	10	0	–120	15	±100
18	31.75	+18	0	12	0	–120	18	±100
31.75	50.8	+21	0	14	0	–120	20	±100
50.8	80	+24	0	16	0	–150	25	±100
80	120	+28	0	19	0	–200	30	–
120	180	+33	0	22	0	–250	35	–

Note: (1) This deviation is used on the eccentric locking collar type bearings.



Remark: The exact shape of the chamfer is not specified, but its contour will be in the area shown with oblique lines.

Table 2. Chamfer dimension Limits

Chamfer dimension Nominal r	r		Corner of shaft R
	Max	Min	Max
0.5	0.8	0.3	0.3
1	1.5	0.6	0.6
1.5	2	1	1
2	2.5	1.5	1
2.5	3	2	1.5
3	3.5	2.5	2
3.5	4	2.5	2
4	4.5	3	2.5
5	6	4	3

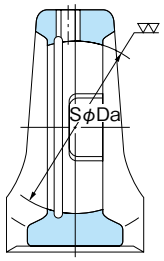
(2) Bearing Unit Housing Tolerances

Spherical bearing seating of cast iron housing	See Table 3
Others	See NACHI Bearing Units Catalog

Table 3. Tolerance of cast iron housing Unit: μm

Spherical bearing seating diameter nominal Da (mm)		Tolerance symbol H7			Tolerance symbol J7			Tolerance symbol K7		
		Deviation of single plane mean dia. of bearing seating ΔD_{am}		Bearing seating dia. variation in a single radial plane VD_{ap}	Deviation of single plane mean dia. of bearing seating ΔD_{am}		Bearing seating dia. variation in a single radial plane VD_{ap}	Deviation of single plane mean dia. of bearing seating ΔD_{am}		Bearing seating dia. variation in a single radial plane VD_{ap}
Over	Incl.	High	Low	Max	High	Low	Max	High	Low	Max
30	50	+25	0	10	+14	–11	10	+ 7	–18	10
50	80	+30	0	12	+18	–12	12	+ 9	–21	12
80	120	+35	0	14	+22	–13	14	+10	–25	14
120	180	+40	0	16	+26	–14	16	+12	–28	16
180	250	+46	0	18	+30	–16	18	+13	–33	18
250	315	+52	0	20	+36	–16	20	+16	–36	20

Notes: 1 Spherical bearing seat dimensions are divided into H7 for clearance fits and J7 and K7 for light interference fits. As NACHI bearings equipped with an anti-rotation pin to prevent outer race rotation, H7 is HACHI standard for the dimension.
2 For rotating outer ring load or fluctuating load applications, J7 or K7 fitting practice should be used.
3 Silver series of special alloy material are supplied with special tolerance.



3. Radial clearance of Ball Bearings

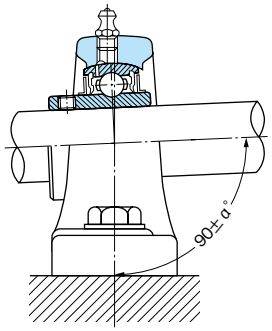
Cylindrical bore	See Table 6.1 (page 64); Radial internal clearance of deep-groove ball bearings (with cilindrical bore)
Tapered bore	CT2: CN for cylindrical bore CTN: C3 for cylindrical bore CT3: C4 for cylindrical bore They are considered the inner ring expansion by fitting with an adapter sleeve.

4. Shaft Tolerance

For cylindrical bore bearings	● Normal load: Shaft tolerance h7, h8 or js7 ● Heavy or shock load: Shaft tolerance k6, k7 or m6
For tapered bore bearings with an adaptor sleeve	● Shaft tolerance h9

5. Maximum permissible misalignment angle

Normal permissible misalignment angle α is ±1.5°～2.5° because it is restricted by grease supply.
Even if grease is not supplied, it is desirable to use the same limiting value. If larger angles are needed, its angle is permissible to about ±5°.
The maximum misalignment angle of bearing units with a housing cover is ±1.0°～1.8°, beyond this angle the inner diameter of the cover will interfere the shaft.
To prevent the unequal contact between seals and shaft, excessive heat generation and dust intrusion, the misalignment angle should be minimized.



6. Maximum permissible operating temperature

Since Bearing units are sometimes used at higher or lower temperature than normal, NACHI prepares the special specification shown in Table 4.
In case of Bearing units with high temperature specification, the decrease in basic load rating should be considered, and radial clearance should be larger than normal clearance.
NACHI standard radial clearance for high temperature applications is C3 HR4, C4 HR5 and C4 HR23 for cylindrical bore bearings and CT3 HR4, CT4 HR23 for tapered bore bearings.
If there is a large temperature difference between the inner ring and outer ring, radial internal clearance should be determined reasonably.

Notes 1. If operating temperature exceeds 150°C, careful investigation, including radial internal clearance is required. In such case, Please consult NACHI with operating conditions.
2. The grease shown in Table 4 must be supplied for relubrication. If different greases are mixed, lubrication ability can deteriorate. Before supplying different grease, please consult NACHI or the grease manufactures.

Table 4. Operating Temperature Range

Series	Seal material	Grease	Operating temperature range (°C)	Slinger color
Silver series	Nitrile rubber (NBR)	Alvania Grease 3	– 10～+ 80	—
Standard	Nitrile rubber (NBR)	Alvania Grease 3	– 15～+100	Black
HR4 for high temperature	Nitrile rubber (NBR)	Superlube 3	Normal temperature～+120	Yellow
HR5 for high temperature	Silicone rubber	Superlube 3	Normal temperature～+200	Yellow
HR23 for high temperature	Silicone rubber	Fluorine-contained Grease	Normal temperature～+230	Black
CR2A for low temperature	Silicone rubber	Aero Shell Grease 7	- 40～+Normal temperature	White

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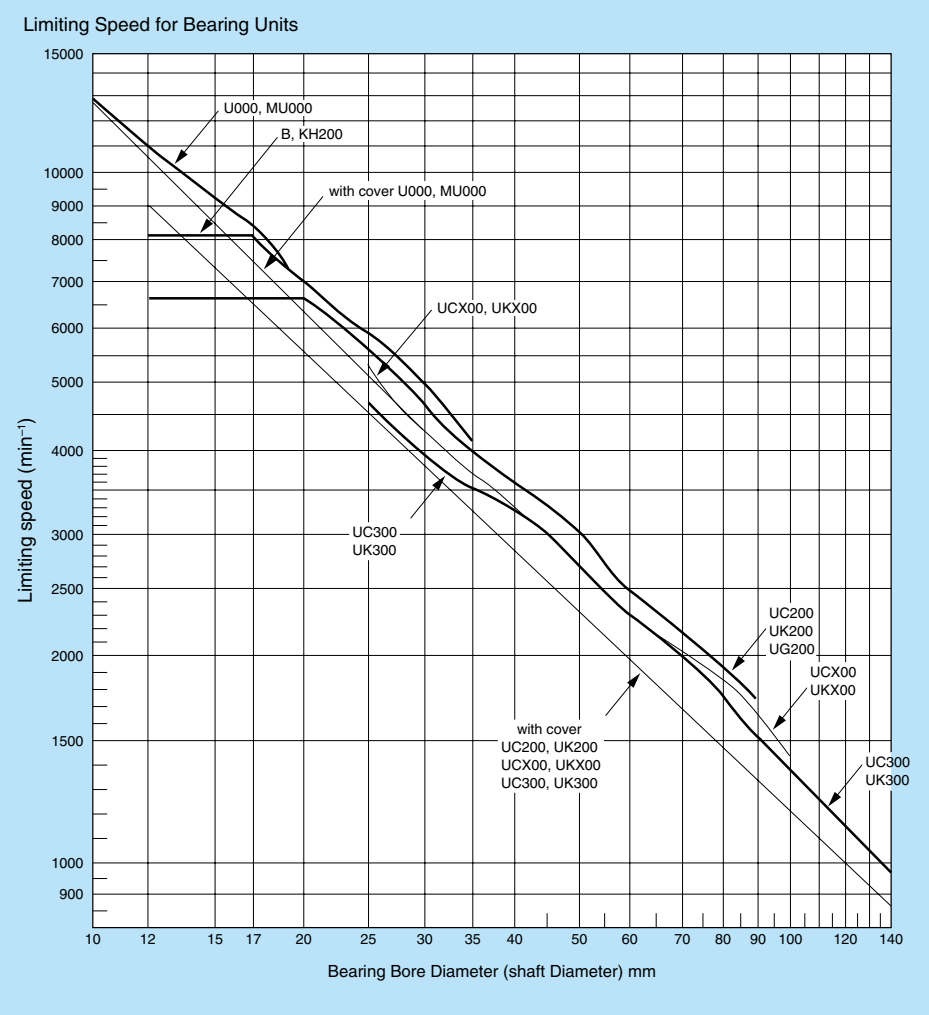
7. Speed limit

Limiting speed of bearings is determined by the slip speed limit between the seal and inner ring or shaft.
Limiting speed of bearings is shown in the chart below. But this limiting speed should be decreased, if there are differences between shaft center and bearing center or a mixing resistance of grease for HR23 specification.
When Bearing units are necessary to operate in excess of speed limit, please consult NACHI.