5. Boundary dimensions and bearing number codes

5.1 Boundary dimensions

A rolling bearing's major dimensions, known as "boundary dimensions", are shown in **Fig. 5.1** through **Fig. 5.3**. To facilitate international bearing interchangeability and economical bearing production, bearing boundary dimensions have been standardized by the International Organization for Standardization (ISO). In Japan, rolling bearing boundary dimensions are regulated by Japanese Industrial Standards (JIS B 1512 series).

Boundary dimensions which have been standardized include: bearing bore diameter, outside diameter, width/height, and chamfer dimensions - all important dimensions when considering the compatibility of shafts, bearings, and housings. However, as a general rule, bearing internal construction dimensions are not covered by these standards.

For metric series rolling bearings there are 90 standardized bore diameters (d) ranging in size from 0.6 to 2 500 mm.

Outside diameter dimensions (D) for radial bearings with standardized bore diameter dimensions are covered in the "diameter series"; their corresponding width dimensions (B) are covered in the "width series". For thrust bearings there is no width series; instead, these dimensions are covered in the "height series". The combination of all these series is known as the "dimension series". All series numbers are shown in **Table 5.1**.

Although many rolling bearing dimensions are standardized and have been listed here for purposes of future standardization, there are many standard bearing dimensions which are not presently manufactured.

Boundary dimensions for radial bearings and thrust bearings are shown in the attached tables (refer to page H-2 through page H-19).

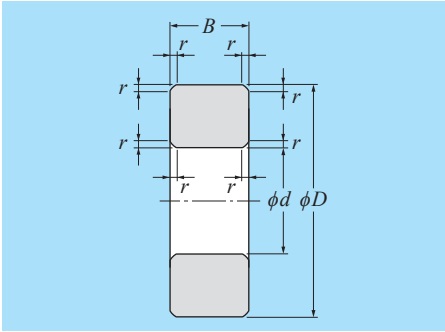

Fig. 5.1 Radial bearings (excluding tapered roller bearings)

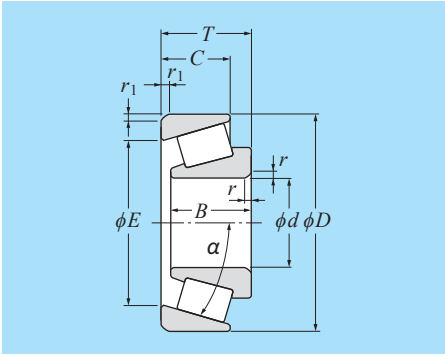

Fig. 5.2 Tapered roller bearings

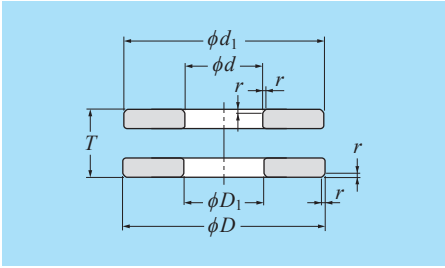

Fig. 5.3 Single direction thrust bearings

Table 5.1 Dimension series numbers

	Dimension series				
	Diameter series (outside diameter dimensions)		Width series (width dimensions)	Height series (height dimensions)	Reference diagram
Radial bearings (excluding tapered roller bearings)	Code	7.8.9.0.1.2.3.4	8.0.1.2.3.4.5.6	——	Fig. 5.4
	Dimension	Small ◄——► Large	Small ◄——► Large		
Tapered roller bearings	Code	9. 0. 1. 2. 3	0. 1. 2. 3	——	Fig. 5.5
	Dimension	Small ◄——► Large	Small ◄——► Large		
Thrust bearings	Code	0. 1. 2. 3. 4	——	7. 9. 1. 2	Fig. 5.6
	Dimension	Small ◄——► Large		Small ◄——► Large	

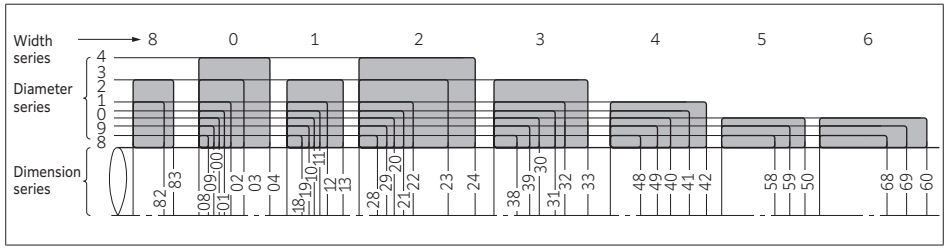

Fig. 5.4 Dimension series for radial bearings (excluding tapered roller bearings; diameter series 7 has been omitted)

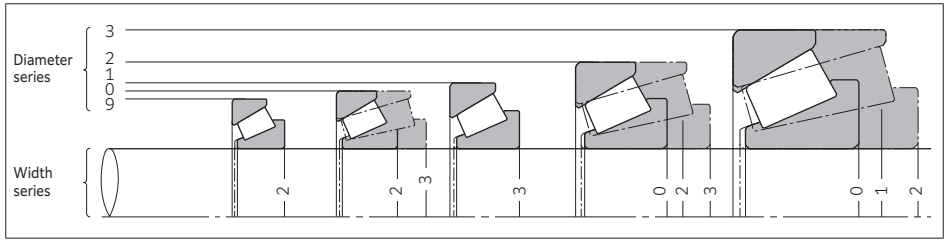

Fig. 5.5 Dimension series for tapered roller bearings (based on JIS B 1534)

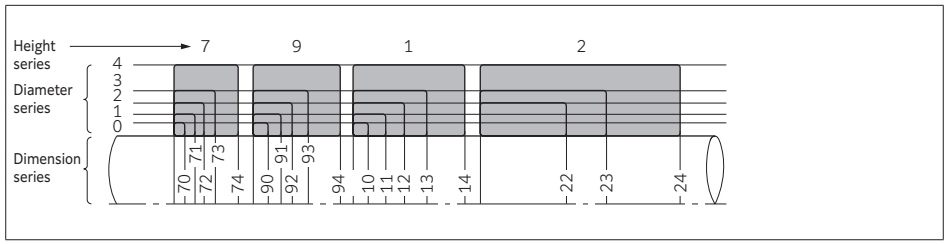

Fig. 5.6 Dimension series for thrust bearings (excluding diameter series 5)

5.2 Bearing numbers

Rolling bearing part numbers indicate **bearing type**, **dimensions**, **tolerances**, **internal construction**, and other related specifications. Bearing numbers are comprised of a "**basic number**" followed by "**supplementary codes**". The makeup and order of bearing numbers is shown in **Table 5.2**.

The **basic number** indicates general information about a bearing, such as its fundamental type, boundary dimensions, series number, bore diameter code and contact angle. The **supplementary codes** derive from prefixes and suffixes which indicate a bearing's tolerances, internal clearances, and related specifications.

(Bearing number examples)

6 2 05 ZZ C3 /2AS

- Grease: Alvania Grease S2
- Radial internal clearance C3
- Double side steel shield
- Nominal bore diameter 25 mm
- Diameter series 2
- **Deep groove ball bearing**

2 3 0 34 EA D1

- With oil inlet and oil groove
- ULTAGE™ series window type pressed steel cage
- Nominal bore diameter 170 mm
- Diameter series 0
- Width series 3
- **Spherical roller bearing**

7 0 12 B DB /GM P6

- Tolerances JIS Class 6
- Medium preload
- Back-to-back arrangement
- Contact angle 40°
- Nominal bore diameter 60 mm
- Diameter series 0
- **Angular contact ball bearing**

2 4 0 /750 B K30

- Bore diameter : tapered inner ring bore, standard taper ratio 1:30
- Type B
- Nominal bore diameter 750 mm
- Diameter series 0
- Width series 4
- **Spherical roller bearing**

NU 3 20 G1 C3

- Radial internal clearance C3
- High strength machined brass rivetless cage with square holes
- Nominal bore diameter 100 mm
- Diameter series 3
- **Cylindrical roller bearing NU type**

5 1 1 20 L1 P5

- Tolerances JIS Class 5
- High strength, machined brass cage
- Nominal bore diameter 100 mm
- Diameter series 1
- Height series 1
- **Single direction thrust ball bearing**

4T– 3 0 2 08

- Nominal bore diameter 40 mm
- Diameter series 2
- Width series 0
- **Tapered roller bearing**
- Spec. 4T

"ULTAGE™" (a name created from the combination of "ultimate", signifying refinement, and "stage", signifying **NTN**'s intention that this series of products be employed in diverse applications) is the general name for **NTN**'s new generation of bearings that are noted for their industry-leading performance.

Table 5.2 Bearing number composition and arrangement

Supplementary prefix code

Special application/ material/ heat treatment code

- 4T- 4T tapered roller bearings
- E- Bearings using carburizing (case hardened) steel
- F- Stainless steel bearings
- TS2- Dimension stabilized bearing for high temperature use (to 160 °C)
- TS3- Dimension stabilized bearing for high temperature use (to 200 °C)
- TS4- Dimension stabilized bearing for high temperature use (to 250 °C)

Basic number

Bearing series

Bearing series code	Dimension series code: Width/height series [1]	Dimension series code: Diameter series
Deep groove ball bearings (type code 6)		
67	(1)	7
68	(1)	8
69	(1)	9
160	(0)	0
60	(1)	0
62	(0)	2
63	(0)	3
Angular contact ball bearings (type code 7)		
78	(1)	8
79	(1)	9
70	(1)	0
72	(0)	2
73	(0)	3
Self aligning ball bearings (type code 1, 2)		
12	(0)	2
13	(0)	3
22	(2)	2
23	(2)	3
Cylindrical roller bearings (type code NU, N, NF, NNU, NN, etc.)		
NU10	1	0
NU2	(0)	2
NU22	2	2
NU3	(0)	3
NU23	2	3
NU4	(0)	4
NNU49	4	9
NN30	3	0
Tapered roller bearings (type code 3)		
329X	2	9
320X	2	0
302	0	2
322	2	2
303	0	3
303D	0	3
313X	1	3
323	2	3
Spherical roller bearings (type code 2)		
239	3	9
230	3	0
240	4	0
231	3	1
241	4	1
222	2	2
232	3	2
213	1	3
223	2	3
Single direction thrust ball bearings (type code 5)		
511	1	1
512	1	2
513	1	3
514	1	4
Thrust cylindrical roller bearings (type code 8)		
811	1	1
812	1	2
893	9	3
Thrust spherical roller bearings (type code 2)		
292	9	2
293	9	3
294	9	4

Bore diameter code

Code	Bore diameter mm
/0.6	0.6
/1.5	1.5
/2.5	2.5
1	1
⋮	⋮
9	9
00	10
01	12
02	15
03	17
/22	22
/28	28
/32	32
04	20
05	25
06	30
⋮	⋮
88	440
92	460
96	480
/500	500
/530	530
/560	560
⋮	⋮
/2 360	2 360
/2 500	2 500

Contact angle code

Code [1]	Contact angle
Angular contact ball bearing	
(A)	Standard contact angle 30°
B	Standard contact angle 40°
C	Standard contact angle 15°
Tapered roller bearing	
(B)	Contact angle over 10° to/including 17°
C	Contact angle over 17° to/including 24°
D	Contact angle over 24° to/including 32°

1) Codes in ( ) are not shown in nominal numbers.
Note: Please consult **NTN** Engineering concerning bearing series codes, and supplementary prefix/suffix codes not listed in the above table.

Supplementary suffix codes

Internal modifications code

- U Internationally interchangeable tapered roller bearings
- R Non-internationally interchangeable tapered roller bearings
- ST Low torque tapered roller bearings
- HT Angular contact ball bearings and cylindrical roller bearings for high axial loads
- E High load capacity cylindrical roller bearing
- EA ULTAGE™ series cylindrical roller bearings
- E ULTAGE™ series spherical roller bearings
- UTG ULTAGE™ series Large size tapered roller bearing

Cage code

- L1 High strength, machined brass cage
- F1 Machined carbon steel cage
- G1 High strength machined brass rivetless cage with square holes
- G2 Pin type cage
- J Pressed steel cage
- T2 Resin cage
- A Pressed steel cage (ULTAGE™ series spherical roller bearings)
- M High strength, machined brass cage (ULTAGE™ series spherical roller bearings)

Seal / Shield code

- LB One-side synthetic rubber seal (non-contact type)
- LLB Double-side synthetic rubber seal (non-contact type)
- LU One-side synthetic rubber seal (contact type)
- LLU Double-side synthetic rubber seal (contact type)
- LH One-side synthetic rubber seal (low-torque type)
- LLH Double-side synthetic rubber seal (low-torque type)
- Z One-side steel Shield
- ZZ Double-side steel Shield

Raceway external configuration code

- K Tapered inner ring bore, standard taper ratio 1:12
- K30 Tapered inner ring bore, standard taper ratio 1:30
- N With snap ring groove
- NR Snap ring
- D With oil inlet
- D1 With oil inlet and oil groove

Duplex arrangement code

- DB Back-to-back arrangement
- DF Face-to-face arrangement
- DT Tandem arrangement
- D2 Two matched, paired bearings
- +α Spacer (α = spacer's standard width dimensions)

Internal clearance [2] Preload code

- C2 Internal clearance less than normal
- (CN) Normal clearance
- C3 Internal clearance greater than normal
- C4 Internal clearance greater than C3
- C5 Internal clearance greater than C4
- CM Radial internal clearance for electric motor use
- /GL Light preload
- /GN Normal preload
- /GM Medium preload
- /GH Heavy preload

Tolerance code [2]

(P0)	JIS Class 0
P6	JIS Class 6
P5	JIS Class 5
P4	JIS Class 4
P2	JIS Class 2
−4	ABMA Class 4
−2	ABMA Class 2
−3	ABMA Class 3
−0	ABMA Class 0
−00	ABMA Class 00

Lubrication

- /2AS Alvania Grease S2
- /3AS Alvania Grease S3
- /8A Alvania EP Grease 2
- /5K Multemp SRL
- /LX11 Barrierta JFE552
- /LP03 Solid grease

2) Codes in ( ) are not shown in nominal numbers.

5.2.1 Numbers of inch series tapered roller bearings

The composition of numbers of inch series tapered roller bearings is specified by the American Bearing Manufacturers Association (ABMA). The inner ring component (CONE) and the outer ring (CUP) each have a corresponding number. **Table 5.3** shows the composition of these numbers. Each corresponding code is also described in more detail below.

Table 5.3 Bearing number composition

Prefix code	Contact angle code	Series number	Serial number	Suffix code
XX	O	OOO	OO	XX

Note: X in the table is represented by letters, and O is represented by numbers.

XX O OOO OO XX

Load limit code

This code has 9 types from light loads to heavy loads:
EL, LL, L, LM, M, HM, H, HH, and EH.
"J" at the beginning of the code indicates metric bearings.

Contact angle code

This code indicates the contact angle of the series. The classification of each code is shown in **Table 5.3 (1)**.

Table 5.3 (1) Contact angle symbol

Code	Outer ring angle (contact angle × 2) Incl.	Below
1	0°	24°
2	24°	25°30′
3	25°30′	27°
4	27°	28°30′
5	28°30′	30°30′
6	30°30′	32°30′
7	32°30′	36°
8	36°	45°
9	45°(Excluding thrust bearings)	

Suffix code

This code consists of either one or two letters. It is used when the appearance and the inside of the standard type are changed.

Serial number

The serial number of the outer ring is 10 to 19.
The serial number of the inner ring is 30 to 49.
Serial numbers exceeding the above are 20 to 29. The outer ring starts from 20, and the inner ring starts from 29 in the opposite direction.

Series number

A number that is determined by internal specifications.

5.2.2 Numbers of metric tapered roller bearings based on ISO 355

Dimension series previously not covered by 3XX are regulated under JIS B 1512-3. These dimension series are specified in ISO 355 and consist of series codes of the angle, diameter, and width. In addition, the inner ring subunit and the outer ring are internationally interchangeable. The composition of bearing numbers are shown in **Table 5.4**. The series codes of the dimension series are shown in **Table 5.4 (1)** through **Table 5.4 (3)**.

Table 5.4 Bearing number composition

Tapered roller bearing code	Dimension series			Bore diameter code
	Angle series	Diameter series	Width series	
T	O	X	X	OOO

Note: X in the table is represented by letters, and O is represented by numbers.

T O X X OOO

Tapered roller bearing code

Angle series code

This code represents the contact angle.
The classification is shown in **Table 5.4 (1)**.

Diameter series code

This code represents the ratio of the bearing outside diameter to the bearing bore diameter. The classification is shown in **Table 5.4 (2)**.

Table 5.4 (1) Angle series code

Code	Contact angle α Over	Incl.
2	10°	13°52′
3	13°52′	15°59′
4	15°59′	18°55′
5	18°55′	23°
6	23°	27°
7	27°	30°

Table 5.4 (2) Diameter series code

Code	$\frac{D}{d^{0.77}}$ Over	Incl.
B	3.4	3.8
C	3.8	4.4
D	4.4	4.7
E	4.7	5
F	5	5.6
G	5.6	7

Note: Quantifiers
d : Nominal bore diameter
D: Nominal outside diameter

Bore diameter code

The bearing bore diameter is represented in mm.
Example) 040: bore diameter dimension 40 mm

Width series code

This code represents the ratio of the assembly width to the difference between the outside diameter and bore diameter of the single row bearing.
The classification is shown in **Table 5.4 (3)**.

Table 5.4 (3) Width series code

Code	$\frac{T}{(D-d)^{0.95}}$ Over	Incl.
B	0.50	0.68
C	0.68	0.80
D	0.80	0.88
E	0.88	1

Note: Quantifiers
d : Nominal bore diameter
D: Nominal outside diameter
T : Assembly width of single row bearing