



APPENDIX II BEARING RATINGS & FITTING PRACTICE

BEARING RATINGS

The following load rating information applies to radial, angular contact and tapered roller bearings, but not specifically to thrust bearings. When determining load ratings, remember that all ratings are not absolute.

STATIC LOAD RATING

The static load rating is the *Radial* load that will cause a certain amount of immediate damage to the internal operating surfaces of the bearing. This level of surface damage is acceptable in most cases but in some demanding situations may cause too much noise, so a much lower load limitation may be necessary. A higher load may be feasible if subsequent noise is not intolerable.

Actual noise levels are very dependent upon speed so if the speed is low, more surface damage can be accepted. Also, tolerable noise levels vary depending upon the application.

The static load rating has nothing to do with allowable *Axial* or *Thrust* loading. In most cases, axial ratings are much lower than those in this catalog so please consult NTN when such loads approach 25% of this rating.

DYNAMIC LOAD RATING

The dynamic load rating has no direct significance other than that it is a number which, along with speed, must be used in an equation to calculate theoretical bearing life. Load usage of this magnitude is usually very inappropriate. Life will be too short and the bearing may become noisy if the static load rating is exceeded. The rating can be used to compare different bearings if the life equations that apply to them are the same.

LIMITING SPEEDS

Limiting speeds are shown for oil and grease and contact seals when appropriate. However, many factors are omitted in this simplified rating that can affect the actual limit in a given case. Although many applications can run at much higher speeds, it is prudent to take precautions and consult NTN when speeds exceed 75% of the limit.



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FITTING PRACTICE

The following five tables list the most likely suggestions for shaft and housing bore diameters for the more popular bearing series. The values in the tables provide the allowable deviations from the nominal diameters for most normal conditions.

UNUSUAL CONDITIONS

Different fits may be required for unusual conditions of loading, speed, temperature, housing or shaft material, wall thickness, vibration, poor surface finish and so on. For example, tighter fits are required for heavy loads, vibration, hollow shafts or thin housings, light alloy or plastic housings, etc. Consult NTN when in doubt.

ROTATING LOADS

The tables assume that the direction of load is constant. Where load rotates, reverse the rotating and stationary fits.

EFFECT ON CLEARANCES

The fits shown will usually work well with standard or C3 clearance bearings. Minor fit differences of .0001" or .0002" can usually be ignored but greater differences may require the use of other clearance classes.

AN EXAMPLE to illustrate the use of the tables:

A 6218 ball bearing has a **nominal** 90mm bore and a **nominal** inch bore of 3.5433". Assuming normal conditions, its shaft size is found in table 1. The 5th column, shows +7 to +1. These deviations applied to the **nominal** 3.5433" give a shaft size range of 3.5440" to 3.5434".



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STANDARD SHAFT SIZES
Deviation from Nominal Sizes in Units of 0.0001 inch

Nominal Bearing Bore				Radial Loads									
				Pure Axial Loads		Stationary Shaft		Rotating Shaft					
mm		inch						Ball Bearings		Cylindrical and Tapered Rollers		Spherical Rollers	
over	incl	over	incl	max	min	max	min	max	min	max	min	max	min
3	6	0.1181	0.2362	+2	-1	-2	-5	+1	-1				
6	10	0.2362	0.3937	+3	-1	-2	-6	+2	-1				
10	18	0.3937	0.7087	+3	-1	-2	-7	+2	-1	+4	0		
18	30	0.7087	1.1811	+4	-2	-3	-8	+4	+1	+4	+1		
30	40	1.1811	1.5748	+4	-2	-4	-10	+5	+1	+5	+1	+5	+1
40	50	1.5748	1.9685	+4	-2	-4	-10	+5	+1	+8	+4	+8	+4
50	65	1.9685	2.5591	+5	-3	-4	-11	+6	+1	+9	+4	+9	+4
65	80	2.5591	3.1496	+5	-3	-4	-11	+6	+1	+9	+4	+12	+4
80	100	3.1496	3.9370	+5	-4	-5	-13	+7	+1	+11	+5	+14	+5
100	120	3.9370	4.7244	+5	-4	-5	-13	+7	+1	+14	+5	+18	+9
120	140	4.7244	5.5118	+6	-4	-6	-15	+8	+1	+16	+6	+20	+11
140	180	5.5118	7.0866	+6	-4	-6	-15	+8	+1	+20	+11	+27	+17
180	250	7.0866	9.8425	+6	-5	-6	-17	+9	+2	+24	+12	+31	+20
250	280	9.8425	11.0236	+6	-6	-7	-19	+11	+2	+26	+13	+35	+22
280	315	11.0236	12.4016	+6	-6	-7	-19	+11	+2	+26	+13	+51	+39

TABLE 2 – TAPERED ROLLER BEARINGS (INCH SERIES)

Nominal Bearing Bore		Rotating Shaft		Stationary Shaft	
over	incl	max	min	max	min
0	3	+15	+10	0	-5
3	12	+25	+15	0	-10
12	24	+50	+30	0	-20

"J" prefix tapers are metric - see above.

TABLE 3 – INSERT BEARINGS SET SCREW & LOCKING COLLAR TYPES

Nominal Bearing Bore (Inches)		Low Speed		Medium Speed		High Speed	
over	incl	max	min	max	min	max	min
0	.7	0	-10	0	-7	+7	+3
.7	1.2	0	-13	0	-8	+7	+3
1.2	2.0	0	-15	0	-10	+10	+4
2.0	3.2	0	-18	0	-12	+12	+4
3.2	4.8	0	-21	0	-14	+14	+5
Speed = Bore x RPM		2500 max		3500 max		7000 max	



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STANDARD HOUSING BORE SIZES
Deviation from Nominal Sizes in Units of 0.0001 inch

TABLE 4 – METRIC RADIAL BEARINGS											
Nominal Bearing O.D.				Stationary Housing				Rotating Housing			
mm		Inch		Normal		Heated Shaft		Normal		Thin Wall Housing	
over	incl	over	incl	max	min	max	min	max	min	max	min
10	18	0.3937	0.7087	+7	0	+10	+3	-2	-9	-4	-11
18	30	0.7087	1.1811	+8	0	+11	+3	-3	-11	-5	-13
30	50	1.1811	1.9685	+10	0	+14	+4	-3	-13	-6	-16
50	80	1.9685	3.1496	+12	0	+16	+4	-3	-15	-9	-21
80	120	3.1496	4.7244	+14	0	+19	+5	-4	-18	-11	-25
120	180	4.7244	7.0866	+16	0	+22	+6	-6	-22	-12	-28
180	250	7.0866	9.8425	+18	0	+24	+6	-8	-26	-14	-32
250	315	9.8425	12.4016	+20	0	+27	+7	-8	-28	-14	-34
315	400	12.4016	15.7480	+22	0	+29	+7	-8	-30	-17	-39
400	500	15.7480	19.6850	+25	0	+33	+8	-9	-34	-19	-44

TABLE 5 – TAPERED ROLLER BEARINGS (INCH SERIES)						
Nominal Cup O.D. Inch		Stationary Housing		Rotating Housing		
over	incl	max	min	max	min	
0	3	+10	0	-5	-15	
3	5	+10	0	-10	-20	
5	12	+20	0	-10	-20	
12	24	+30	+10	-10	-20	

"J" prefix tapers are metric - see above.