Permissible Speeds for Ball Bearing Inserts

The limiting speed of ball bearing inserts is determined by two key factors. The first factor is the fit between the bearing and the shaft. The shaft tolerance impacts the tightness or looseness of the overall fit. The second factor is the design of the bearing. Between both factors, a tighter fit will allow for higher permissible speeds.

Bearing and Shaft Fit: Light load and slow-moving applications, a loose fit is appropriate. Typical shaft tolerances in these types of applications are h7, h8 and h9. For higher speed and heavy load applications, a j7 tolerance is the most appropriate fit. (See Table C for comparison of tolerance values)

Bearing Design: The overall bearing design impacts the permissible speed as well. Comparing values for the appropriate bearing design will validate the fit for your application. Using the below chart with j7 tolerances you can calculate limiting speeds of all tolerances. (See Table B to calculate h7, h8 & h9 tolerances).

Size	Dual "B" Type Seal (UC/HC/ER Series)	"K" Type Seal (SA/SB Series)	TRL (R3) Seal
201 -203	5800	6700	2000
204	5800	6000	1800
205	5100	5600	1680
206 / X05	4300	4500	1000
207 / X06	4000	4000	900
208 / X07	3600	3600	800
209 / X08	3300	3400	770
210 / X09	2800	3000	680
211 / X10	2500	2600	570
212 / X11	2300		510
213 / X12	2200		500
214 / X13	2100		470
215 / X14	2000		450
216 / X15	1900		430
217	1800		400
218	1700		380

Table A. Limiting Speeds (using shaft with j7 tolerance)

Calculating Limiting Speed with Loose Fit Shaft Tolerances h7, h8, h9

Use the factors in Table A and Table B to determine limiting speeds of h7, h8 and h9 shaft tolerances.

Table A x Table B = Limiting Speed

For Example: UC206-20 with dual seal design installed on a shaft with h8 fit

4300 x 0.5 = 2,140 RPM Limiting Speed

Factor by Type	Shaft Tolerance		
	h7	h8	h9
Standard Set Screw	0.75	0.5	0.2
TRL Seal (R3)	1	1	0.9
Eccentric Locking Collar	1	1	1
Premere-Loc (Concentric Locking)	1	1	1
High Temperature (HT)	1	1	0.7

Table B. Limiting Speeds using shaft with h7, h8, h9 tolerance

Tolerance	Upper Range (µm)	Lower Range (µm)
j7	+12 to +20	-6 to -15
h7	0	-18 to -35
h8	0	-27 to -54
h9	0	-43 to -87

Table C. Shaft Tolerance Range for shafts from ½ in. or 10mm. to 3.5 in. or 90mm.