

# H P In Reliability

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## Select better bearings

Buying machinery and associated components should be done with a good deal of forethought. "No pain, no gain," said an anonymous observer millennia ago. If you turn procurement responsibilities over to a nontechnical employee, ask yourself whether he or she has been both enabled and empowered to place the purchase order with the most appropriate vendor, and if the resulting purchase meets your reliability improvement goals and expectations.

Suppose you need bearings for centrifugal pumps. They're ANSI pumps, a bit on the small side, and bearings get replaced every two years or so. You tell the purchasing agent to buy replacement bearings "just like the one that came out of the pumps." The present bearings were marked 5310 E2RSNR/C3. Let me ask: Is that *really* what you want? Table 1 explains the nomenclature, and if you've kept track of recent developments, you might question the wisdom of using feature "E," the  $\hat{U}$  slot, in a pump bearing. Note also the manufacturer's Note 2: His standard cage is one-piece steel, which is  $\hat{U}bY\hat{Z}$  but which is  $\hat{U}bY$  but what about the occasional polyamide (TN9) which may not be as forgiving as metallic cages? And didn't you want shields instead of seals, since your ndm-value (mean diameter x shaft rpm) will be 80mm times 3,600 rpm, or 288,000? Remember that at values above 175,000 continuously operated equipment should be relubricated periodically, and seals deprive you of this relube option.

**Table 1. One manufacturer's nomenclature for 2-row and contact ball bearings**

52XX, 53XX, 54XX	Double row angular contact ball bearing
XX	Basic size (i.e., 5 x 05 = 25 mm)
A	Conrad type bearing
E	Filling slot type bearing
Z	Shield
RS	Seal
N	Snap ring groove in bearing outer race
NR	Snap ring groove with snap ring
C3	Internal clearance/endplay greater than normal

Note: 1) Standard grease in double sealed/shielded bearings is Chevron SR1 #2.  
 2) Standard cage is one-piece, steel snap-in type cage, polyamide (TN9) and brass cages (M) standard in some sizes.

Example: 5310 E2RSNR/C3

**Table 2. Nomenclature and experience-based recommendations for angular contact bearing pairs in centrifugal pumps.**

Shaft fit	k5		j5		h5
	J6	H6, RF	J6	H6, RF	
Housing fit	J6	H6, RF	J6	H6, RF	RF
ndm value up to 250,000	BECBM BECBY		BECBJ BECBP		BECBM BEGBY BEGBP
250,000 to 450,000			BECBM BEGAM	BEGAY BEGAP	
450,000 to 650,000	BECBM	BEGAM			not recommended area

RF = radially free. This means that there is a radial gap between the bearing outer ring and the housing.

For ndm values lower than 450,000, housing fits J6, H6 may be replaced with J7, H7 respectively.

Applies to solid steel shafts/steel or cast iron housings.

Applies to bearing bore size 20 to 100 mm (including 100 mm).

Applies to applications with inner ring temperature no more than 10°C warmer than the outer ring temperature.

Circulating oil lubrication or other means for improved cooling may be necessary for control of bearing operating temperature, in particular, at high speeds.

72XX, 73XX Angular contact ball bearing  
 XX Basic size (i. e., 5 X 05 = 25 mm)  
 B 40° contact angle  
 E Extra high capacity CB—Normal axial clearance  
 GA—Light preload  
 GB—Moderate preload

Cages  
 Y Pressed brass  
 P Glass fiber reinforced polyamide 6.6  
 M

Example 7305 BECBY for clearance bearing  
 7305 BEGBY for preloaded bearing

Or let's assume you need angular contact thrust bearings for some of your API 610 pumps. Did you instruct the purchasing agent to simply "buy as usual," or did you calculate the ndm-value? If some of your bearings in the ndm-range from 200,000 to 650,000 and you've opted to use k5/j6 shaft and housing fits respectively, you may consider asking the purchasing department to buy type "BECBM" bearings from the knowledgeable manufacturer whose in-depth research led to the compilation of Table 2. Here, the letter "B" means a 40° contact angle, while a letter "C" as an immediate  $\hat{U}$  would refer to a 15° angle. The respective load carrying capabilities could differ by factors as high as 8:1! "CB" means that our angular contact bearing incorporates normal axial clearance, and "M" tells us that the cages are made of machined brass.

You would disallow cages made of polyamide 6.6 if you wanted a more forgiving bearing, but did you inform your purchasing department of that decision?

Let's get to the point: We believe you should have a Machinery Component Specification. Next month we'll assist you in developing one for ball bearings. ■

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