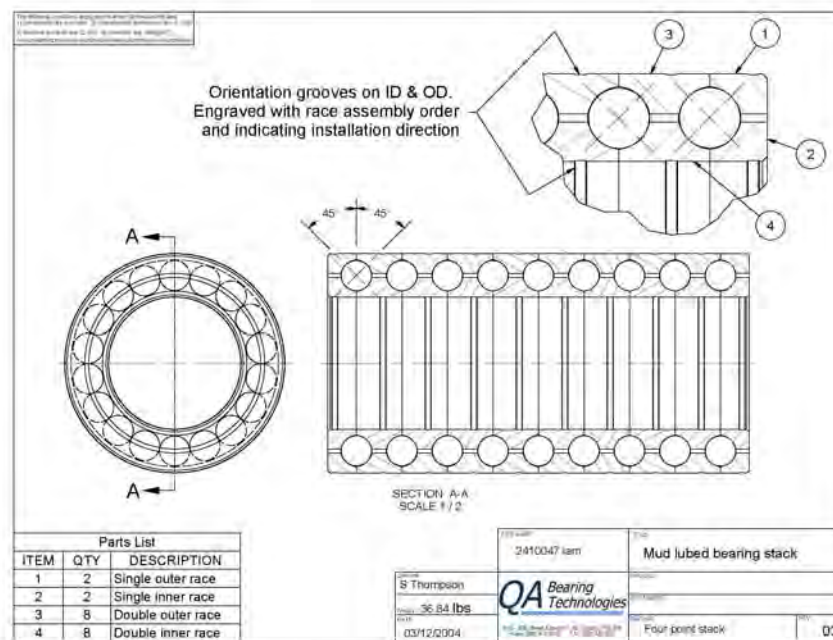


## The unitized mud lubricated angular contact bearing

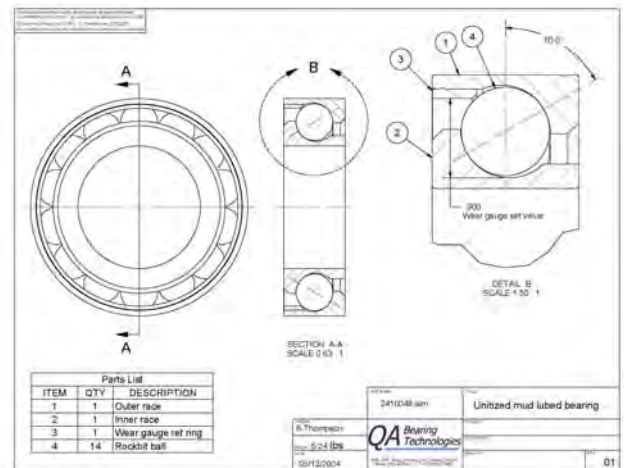
The traditional thrust bearing used in mud lubricated downhole motors is a four point angular contact ball bearing stack. This bearing is made up of a series of separable inner and outer races that need to remain in matched sets, both in respect to their position in the stack and their orientation. QA Bearing Technologies places identification grooves on the ID and OD of our bearing races to assist in this matching and orientation requirement. The loose balls needed to make up an assembly must also come from the same manufacturing batch, or there is the risk that a few oversized balls would carry the entire load. The handling of so many loose balls and races from different motor rebuilds often causes what is termed an “infant mortality” when a rebuilt motor fails after only a few hours of operation.



In addition, the typical contact angle for these four point bearing stacks is 45°. This is because all four raceway shoulders must be high enough for ball contact. While it’s true that the four points of contact provide a dual acting bearing, with the same capacity in both on and off bottom load directions, it is limited in thrust capacity per row of balls.

To determine if a bearing should be reused with the existing balls, or if a set of races could be reused with a new set of balls, the bearing must be stacked with the correct matching and orientation of all the races. The endplay of the assembly is checked to determine if it is within a set of predetermined limits. If the endplay exceeds these limits, a new set of balls should be used or the races scrapped and the new balls kept for another bearing. This takes time, effort, and often causes maintenance problems.

To address these issues, QA Bearing Technologies has developed a unitized mud lubricated angular contact ball bearing. The design has a single high angle of contact (typically 60°) in thrust. The thrust shoulders have been increased to accept the higher contact angle, and a chamfer on the outer shoulder edge of both races provides additional space for mud flow through the assembly. A full complement of large Rockbit balls is used in the bearing. The assembly is physically held together with a patent pending “wear gauge retaining ring”. This ring keeps the bearing in a unitized assembly until such time as the balls have worn to a predetermined amount. At this point of component wear the bearing will disassemble as the gauge ring ID is able to pass over the worn balls. A disassembled bearing is to be considered “worn out” and should be replaced with the other bearings used in its stack. No measurements or matching of races is necessary, and no loose balls are required.



A number of unitized mud lubricated ball bearings can be assembled into a stack. The high contact angle produces a much higher thrust capacity; however, a number of bearings must be mounted facing in the opposite direction to account for the off bottom thrust load.

The result is a mud lubricated bearing stack that is less expensive to operate, easier to maintain, and better suited to the drilling loads in the application.

