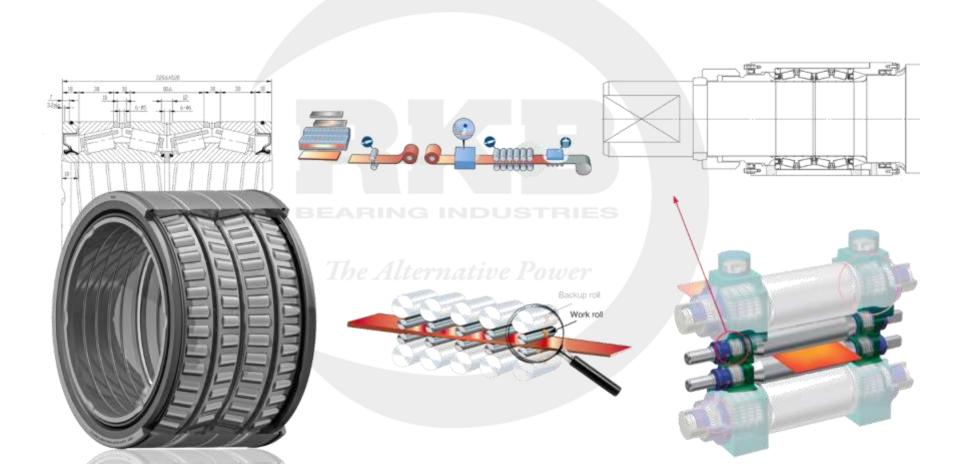




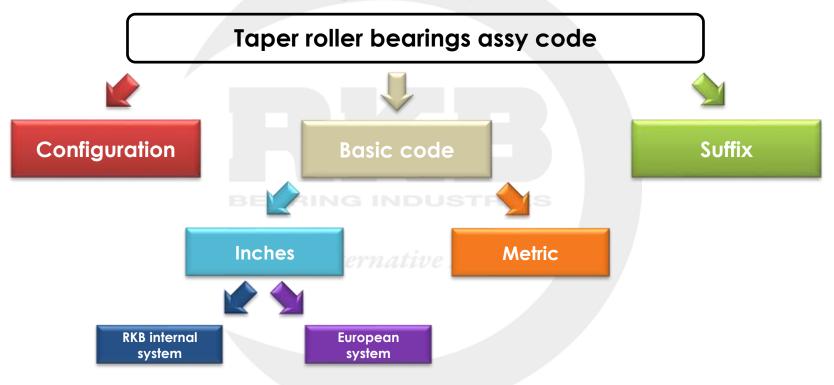
RKB EXECUTIVE HEADQUARTERS AND TECHNOLOGICAL CENTER - BALERNA (SWITZERLAND)



RKB taper roller bearings assy

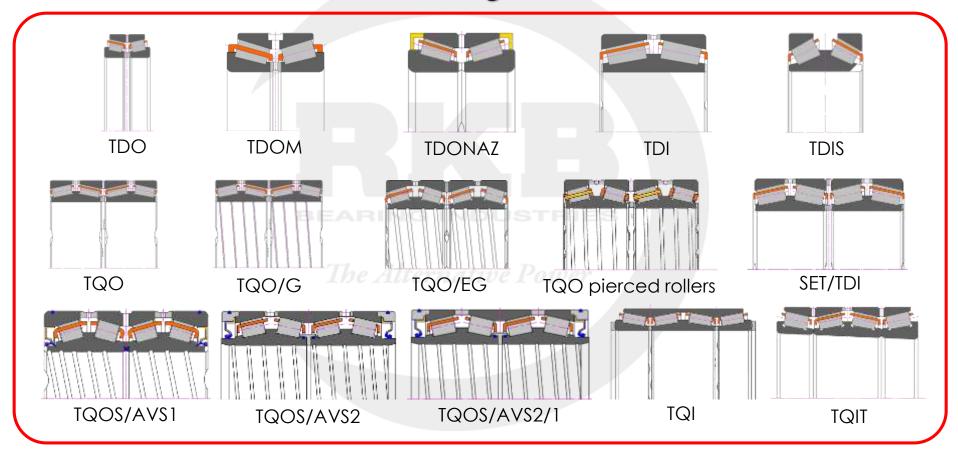


RKB taper roller bearings assy: designation system



Example: **TDO** 081406/508750 AAHA1ZBBT2B K1453015

RKB taper roller bearings assy: designs



RKB taper roller bearings assy: inches basic code internal system

Inches basic code: XX YY ZZ / AA BB CC ... Suffix ... KDDD EE FF

d = XX,CC inch K factor = D,DD

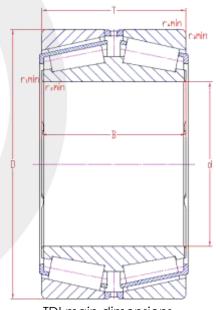
D = YY,AA inch $r_{1,2} = E,E$ mm

T = ZZ,BB inch $r_{3.4} = F,F$ mm

Example:

TDI 081407/127562 A1AZBBT2BK1761564

d = 8,62 inch = 218,95 mm K factor = 1,76 D = 14,12 inch = 358,65 mm $r_{1,2} = 1,5 \text{ mm}$ $r_{3,4} = 6,4 \text{ mm}$



TDI main dimensions

RKB taper roller bearings assy: suffix system

The RKB suffix system for multi-row taper roller bearings is composed of two different parts:

- Bearing version (corresponding to different executions)
- Bearing features

Version	Features
AA AA1	HA1÷4 = case-hardened steel
AB AA2	HB1÷3 = bainite treatment
AC AA3	PT1:4 = phosphate treatment
•••	ZB = ZB rollers profile
•••	VL = Victory Line (RKB premium brand)
•••	BT2B = double-row taper roller bearing
•••	BT4B = four-row taper roller bearing

Example:

TDI 081407/127562 A1AZBBT2B K1761564





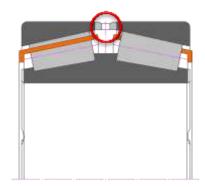




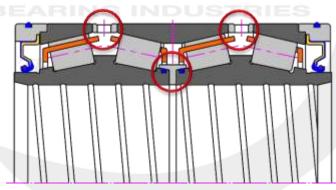
- . Inner and outer rings
- 2. Outer ring
- 3. Innerring
- 4. Inner and outer rings and rolling elements

RKB taper roller bearings assy: B.E.P. and M.E.P. definitions

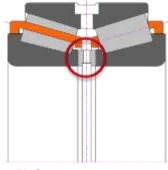
All of the multi-row taper roller bearings manufactured by RKB are supplied correctly assembled, with the axial internal clearance (B.E.P. - Bench End Play) required. Usually the correct B.E.P. range is obtained by RKB adjusting the width of the spacers between cones and cups, but in some designs, with no spacers between cones and cups, the B.E.P. is preadjusted by RKB. When the bearing is mounted on the shaft and in the housing with interference fit, the axial internal clearance is reduced. The remaining axial internal clearance after mounting is called M.E.P. (Mounted End Play).



TDI cup spacer



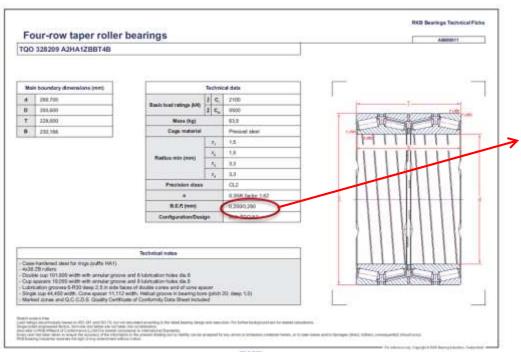
TQOS/AVS2 cone and cup spacers



TDOM cone spacer

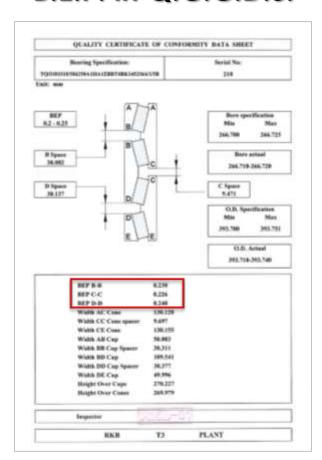
RKB taper roller bearings assy: **B.E.P.** in Technical Fiches

RKB supplies the B.E.P. value in its Technical Fiches and Q.C.C.D.S. (if available):



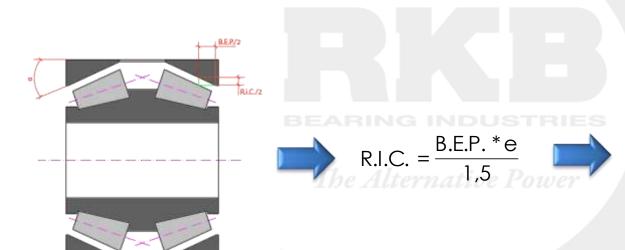
e	0,35/K factor 1,62	
B.E.P (mm)	0,200/0,280	

RKB taper roller bearings assy: B.E.P. in Q.C.C.D.S.



RKB taper roller bearings assy: from B.E.P. to R.I.C.

The Technical Fiches provided by RKB supply all the information necessary to calculate the radial internal clearance (R.I.C.) of the bearing starting from the B.E.P. and the e values:



B.E.P. scheme of a TDI

R.I.C_{min} = 0,350*
$$\frac{0,39}{1,5}$$
 = 0,09 1mm

R.I.C_{max} =
$$0.400*\frac{0.39}{1.5} = 0.104$$
mm

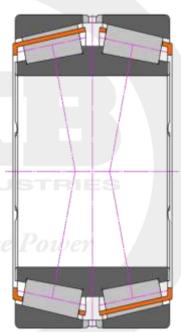
R.I.C. =
$$0.091/0.104$$
mm

RKB double-row taper roller bearings: bearing selection

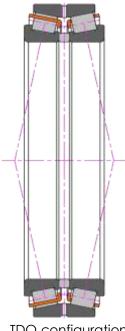
The RKB double-row taper roller bearings are available in two different arrangements:

- Face-to-face (TDI)
- Back-to-back (TDO)

In the TDI configuration the load lines are converging as the axis of rotation is approached. This arrangement doesn't increase the stiffness of the assembly and the bearing cannot support overturning moments. Reversely, in the TDO configuration, the contact angle is diverging as the axis of rotation is approached, increasing the stiffness of the assembly. This type of arrangement is suitable to resist overturning moments.



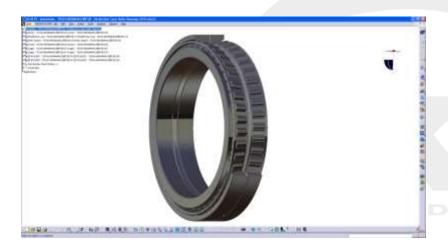
TDI configuration (face-to-face)

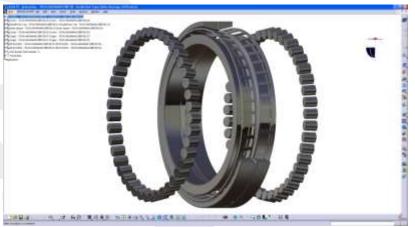


TDO configuration (back-to-back)

TDO design





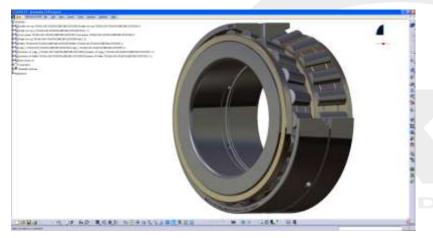


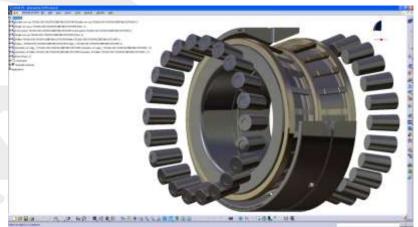
The Alternative Power

The RKB TDO configuration consists of a double-row taper roller bearing composed of two single cones, one double cup, two pressed steel cages, two rows of back-to-back rollers and one cone spacer (plain or with annular groove and lubrication holes). The width of the cone spacer permits to obtain the correct B.E.P. The TDO bearings with a blind hole in the double cup are particularly suitable to be mounted with a loose fit in the housing, due to the hole counter bored that allows the insertion of a pin to avoid sliding between the double cup and the housing.

TDOM design





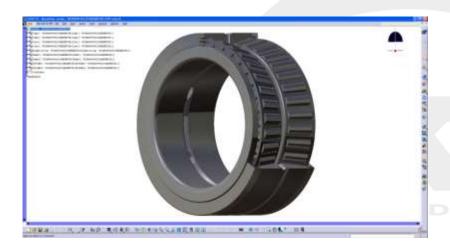


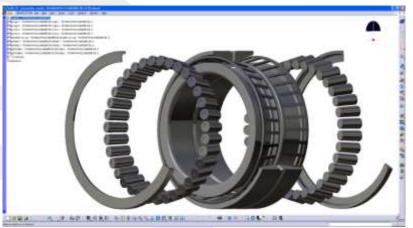
The Alternative Power

The RKB TDOM configuration consists of a double-row taper roller bearing composed of two single cones, one double cup, two machined brass cages, two rows of back-to-back rollers and one cone spacer (with annular groove and lubrication holes). The width of the cone spacer permits to obtain the correct B.E.P. The TDOM bearings with a blind hole in the double cup are designed to be mounted with a loose fit in the housing due to the hole counter bored that allows the insertion of a pin to avoid sliding between the double cup and the housing.

TDONAZ design



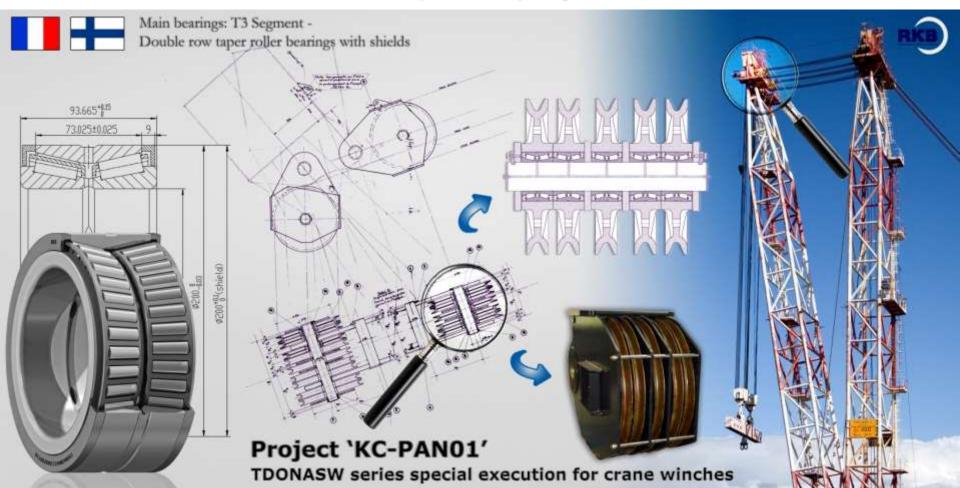




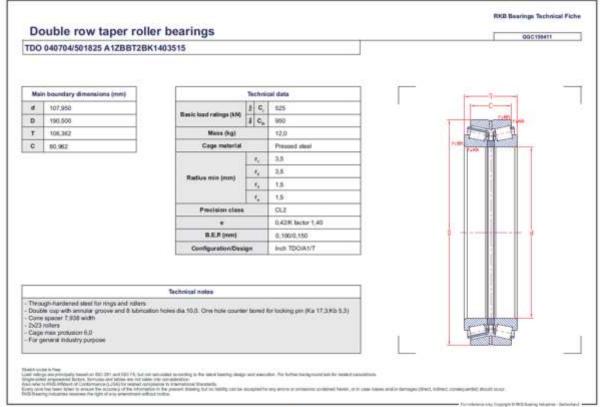
The Alternative Power

The RKB TDONAZ configuration consists of a double-row taper roller bearing composed of two single cones, one double cup, two pressed steel cages, two rows of back-to-back rollers and two pressed steel shields. There are no spacers and the bearing is supplied with the correct B.E.P.

RKB special project



RKB double-row taper roller bearings: example of Technical Fiche



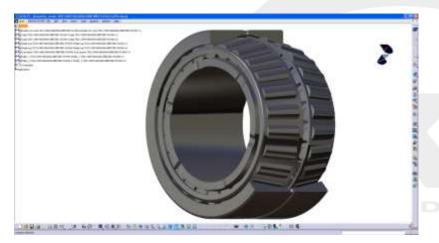


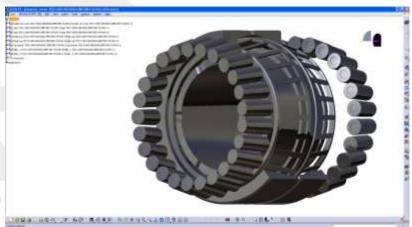
RKB double-row taper roller bearings: product samples



TDI design



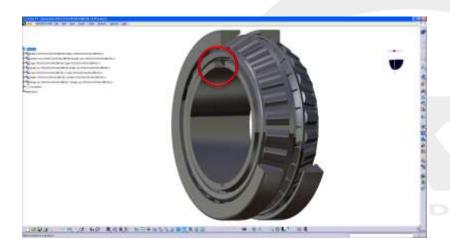


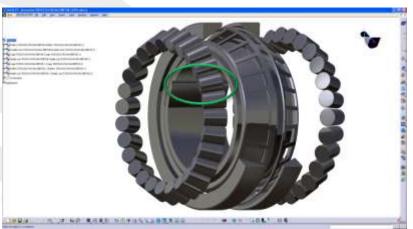


The Alternative Power

The RKB TDI configuration consists of a double-row taper roller bearing composed of two single cups, one double cone, two pressed steel cages, two rows of face-to-face rollers and one cup spacer. The width of the cup spacer permits to obtain the correct B.E.P.

TDIS design

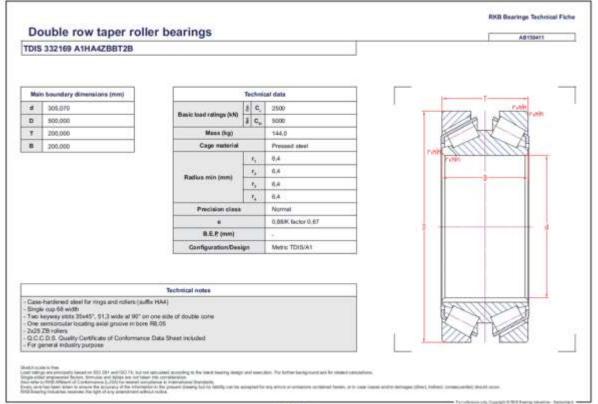




The Alternative Power

The RKB TDIS configuration is a double-row taper roller bearing composed of two single cups, one double cone, two pressed steel cages and two rows of face-to-face rollers. Compared to TDI, TDIS configuration has a B.E.P. equal to zero due to the lacking of a spacer between the two cups and a higher contact angle to increase the axial load capability of the bearing. This type of bearing is usually mounted with a loose fit on the shaft. For this reason, RKB produces this type of bearing with one or two keyway slots (red circle) in the bore or with one semicircular locating axial groove (green ellipse) to locate circumferentially the bearing.

RKB double-row taper roller bearings: example of Technical Fiche





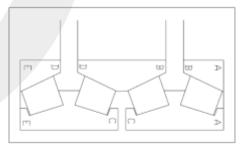
RKB taper roller bearings assy: serial number, mounting sequence and marked zones

The serial number (red circle) indicates a single part in a production lot. RKB applies the serial number only to some types of bearings, especially those made up of several different parts (e.g. four-row taper roller bearings).

RKB produces various types of bearings composed of several parts assembled together in a well-defined sequence that ensures the correct functioning of the bearing. The mounting sequence is necessary especially for TQO and TQOS bearings where the B.E.P. is adjusted by the spacers width.



Serial number



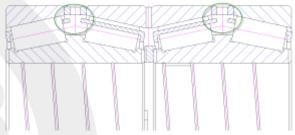
Mounting sequence

RKB taper roller bearings assy: serial number, mounting sequence and marked zones

In addition, the correct assembly of the bearing components permits to obtain the correct B.E.P. and have the axis of the lubrication holes of cup spacers equally spaced between the single cup and the double cup.

The marked zones are four special references made on the side surface of the bearing outer ring at intervals of 90°. In most applications, the radial load on the outer ring acts always along the same direction; therefore, only a small portion of the ring itself is under load. This way, the bearing may face early failure. To avoid this issue, fully exploit bearing potential and extend its life, according to the scheduled maintenance program, it is necessary to rotate the bearing outer ring of a notch (90°) so that the working area of the outer ring regularly changes.

Of course the same concept does not apply to the inner ring, since it rotates with the shaft and therefore the load acts always on a different portion of material.



Position of cup spacers

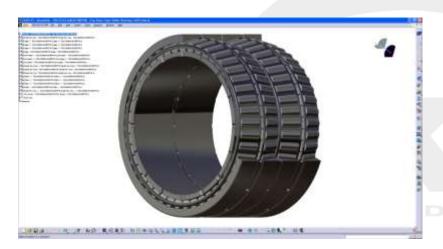


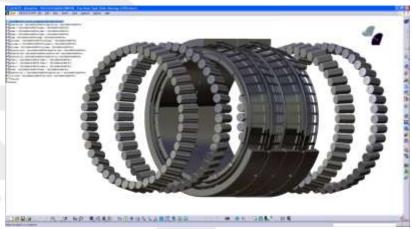
Marked zones on a TQOS

For further information refer also to the educational video "RKB multi-row bearings: mounting and maintenance operations"

TQO design





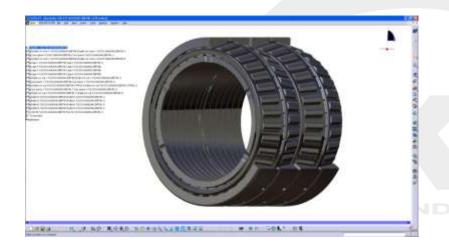


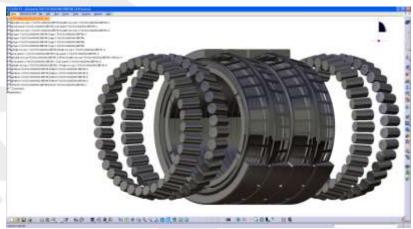
The Alternative Power

The RKB TQO configuration is a four-row taper roller bearing composed of two double cones, one double cup, two single cups, four pressed steel cages, four rows of rollers, one cone spacer (also available with lubrication grooves) and two cup spacers (with annular groove and lubrication holes). The paired rollers are in face-to-face configuration.

TQO/G design





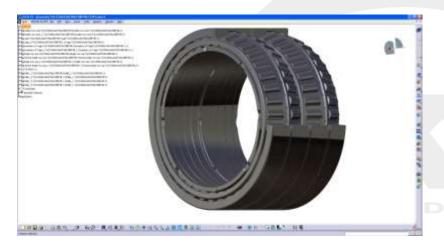


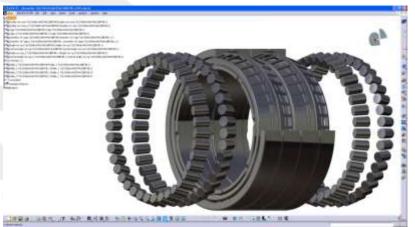
The Alternative Power

The RKB TQO/G configuration is a four-row taper roller bearing composed of two double cones with helical groove in bore, one double cup, two single cups, four pressed steel cages, four rows of rollers, one cone spacer (also available with lubrication grooves) and two cup spacers (with annular groove and lubrication holes). The paired rollers are in face-to-face configuration. When the bearing is mounted on the shaft with a loose fit, RKB performs the helical groove in bearing bore to reduce the wear between the two parts. The wear reduction is obtained by interposing oil in the contact zone between the shaft and the two double cones.

TQO/EG design



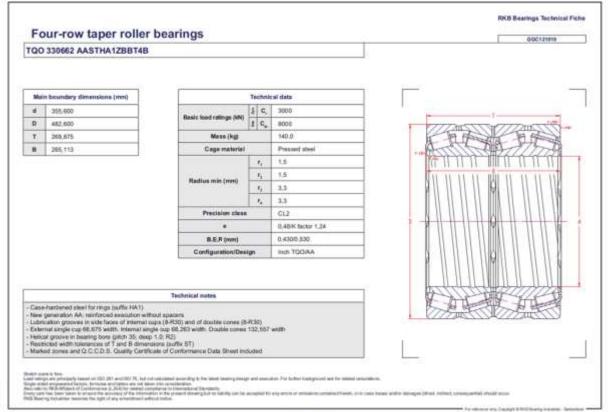




The Alternative Power

The RKB TQO/EG configuration is a four-row taper roller bearing composed of two double cones with helical groove in bore, two central single cups, two single cups, four pressed steel cages and four rows of rollers. This type of configuration differs from the other types of TQO by the absence of spacers. The B.E.P. is obtained adjusting the dimensions of the cones and the cups. The paired rollers are in face-to-face configuration.

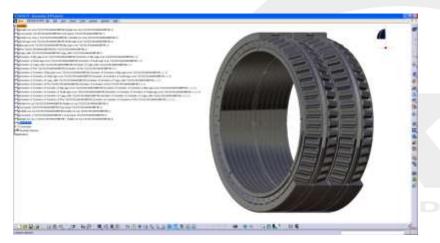
RKB four-row taper roller bearings: example of Technical Fiche

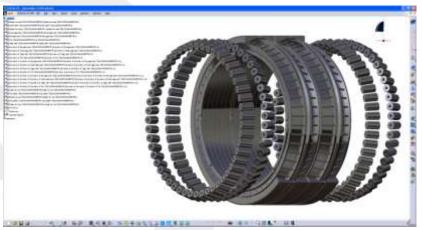




TQO pierced rollers design



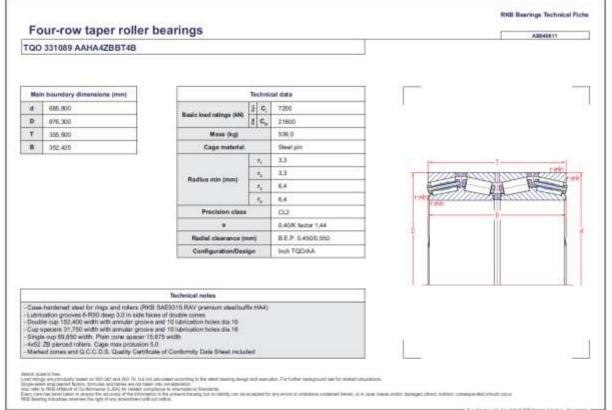




The Alternative Power

The RKB TQO pierced rollers configuration is a four-row taper roller bearing composed of two double cones with helical groove in bore, one double cup, two single cups, four rows of pierced rollers, one cone spacer and two cup spacers (with annular groove and lubrication holes). The rollers are enclosed between two rings of steel and guided with pins passing through the center of the roller. The pins are threaded in one side and welded in the other one to ensure maximum reliability. This configuration is particularly suitable for large size bearings and permits to increase the number of rollers compared to the configuration with pressed steel cages, improving C_r and C_{0r} values. The paired rollers are in face-to-face configuration.

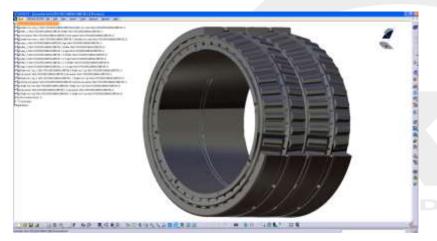
RKB four-row taper roller bearings: example of Technical Fiche

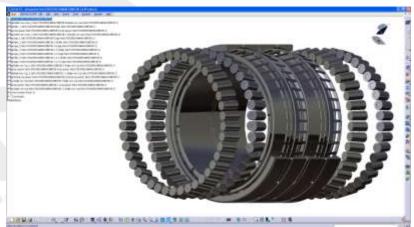




Set 2xTDI design

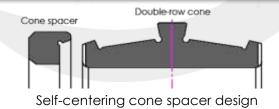






The Alternative Power

The RKB Set 2xTDI configuration consists of two paired double-row taper roller bearings (TDI), separated by two different spacers, one between the two internal cups and one between the two cones. To easily mount the bearing on the shaft, RKB designs and produces the cone spacers with a conical profile which is self-centering on the cone shoulder.



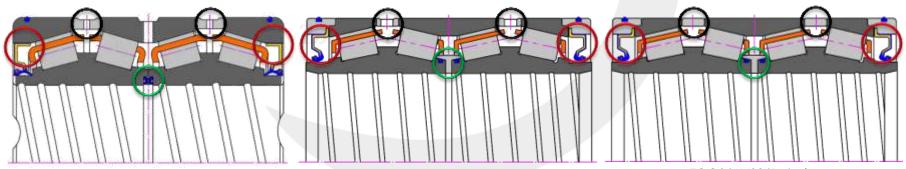
TQOS designs



RKB produces 3 different types of TQOS designs:

- TQOS/AVS1
- TQOS/AVS2
- TQOS/AVS2/1

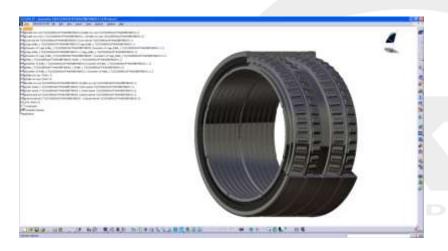
The main differences between the AVS1 and the AVS2 designs lie in the different method used to block the lateral seals (red circles) and to separate (and seal) the cones (green circles). Moreover, the AVS2 design provides a better lateral sealing efficiency and an optimized tapered guiding profile design of the cone spacer, to facilitate maintenance operations and improve sealing efficiency. The RKB AVS2 design is available in two variants, one with annular grooves and lubrications holes in cup spacers (AVS2), and one without annular grooves and lubrication holes (AVS2/1; black circles).

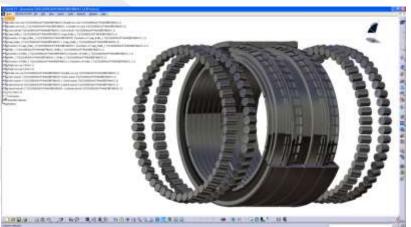


TQOS/AVS1 design TQOS/AVS2 design TQOS/AVS2/1 design

TQOS/AVS1 design





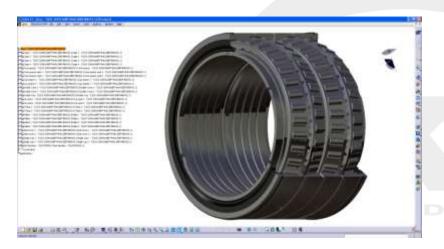


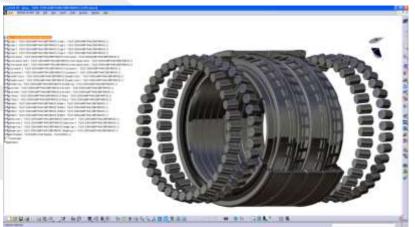
The Alternative Power

The RKB TQOS AVS/1 configuration consists of a four-row taper roller bearing composed of two double cones with helical groove in bore (the inner part of the bearing is sealed with a cone seal set AVS – Anti-Vortex System), one double cup, four pressed steel cages, four rows of rollers, two cup spacers (with annular groove and lubrication holes), two lateral seals, two one-side extended cups and two "O" type seal rings. The paired rollers are in face-to-face configuration.

TQOS/AVS2 and TQOS/AVS2/1 designs



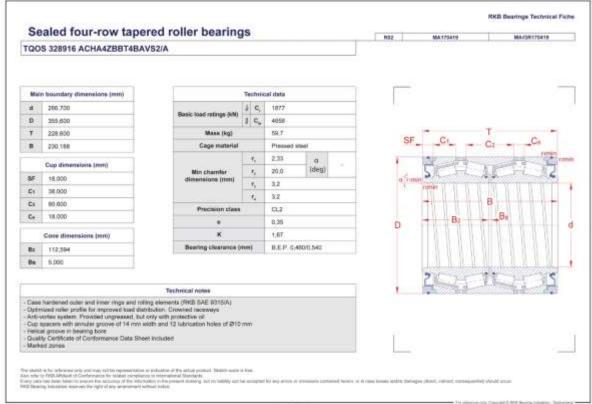




The Alternative Power

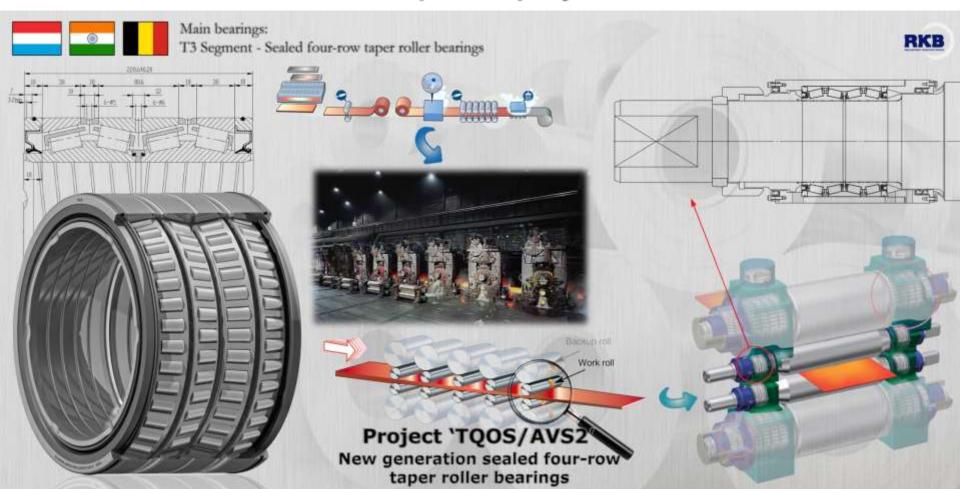
The RKB TQOS/AVS2 and AVS2/1 configurations consist of a four-row taper roller bearing composed of two double cones with helical groove in bore, separated by a cone spacer seal set (AVS – Anti-Vortex System), one double cup, two single cups, four pressed steel cages, four rows of rollers, two cup spacers (with annular groove and lubrication holes available only in the TQOS/AVS2 design), two lateral seals, two separable flanges and two "O" type seal rings. The paired rollers are in face-to-face configuration.

RKB four-row taper roller bearings: example of Technical Fiche





RKB special project



RKB four-row taper roller bearings: product samples

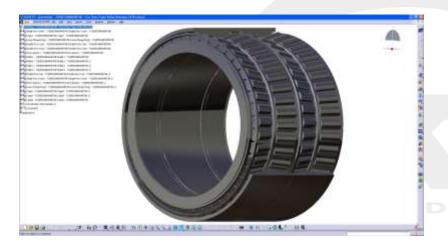


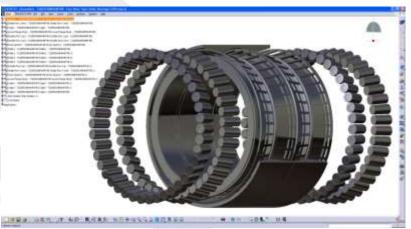


RKB TQO bearing RKB TQO bearing

TQI design





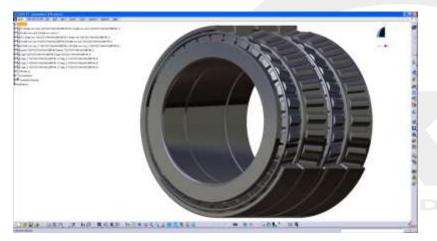


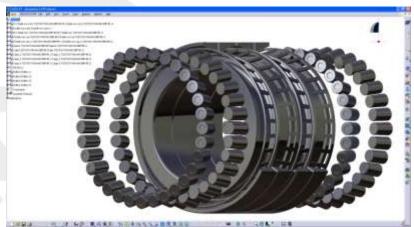
The Alternative Power

The RKB TQI configuration consists of a four-row taper roller bearing composed of one double cone, two single cones, two cone spacers, four pressed steel cages, four rows of rollers, two double cups and two loose flange rings. The paired rollers are in back-to-back configuration. This arrangement is recommended for all those applications where high rigidity and resistance to overturning moments are required.

TQIT design







The Alternative Power

The RKB TQIT configuration consists of a tapered bore four-row taper roller bearing composed of one double cone, two single cones, four pressed steel cages, four rows of rollers, two double cups (available with annular groove and lubrication holes) and one cup spacer (available with annular groove and lubrication holes). The paired rollers are in back-to-back configuration. The main difference between TQIT and TQI lies in the bore, which is tapered in TQIT and cylindrical in TQI.

RKB taper roller bearings assy: improved bearing steels

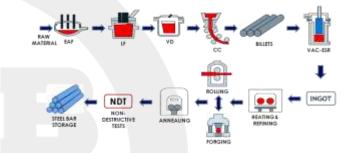


RKB can produce its multi-row taper roller bearings using two different types of steel:

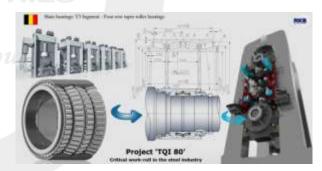
- •SAE 52100 (through-hardened steel)
- •SAE 9315 (case-hardened steel)

The SAE 52100 is a through-hardened steel commonly used to manufacture rolling bearings for standard applications. In case of bearings subjected to heavy loads, shocks or vibrations (e.g. rolling mill stands), RKB recommends casehardened steel (SAE 9315). In addition, the use of the Vacuum Degassing Electroslag Remelting process (VAC-ESR) through our RAV protocol has made possible to obtain two new types of steel gifted with better levels of cleanliness and non-metallic inclusions:

- •RKB Type.RAV or ISO 100CrMo7 (through-hardened steel)
- •RKB SAE 9315.RAV (case-hardened steel)



RAV steel manufacturing process



RKB special project in the steel industry

The Alternative Power



FOR FURTHER DETAILS
DO NOT HESITATE TO CONTACT
RKB TECHNICAL DEPARTMENT

