RKB FOUR-ROW CYLINDRICAL ROLLER BEARINGS:
MULTIROLL NEW REINFORCED EXECUTION AF2D CLASS FOR ROLLING MILL STANDS
## RKB AF2D Design – History

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The RKB AF2D design has been improved over the years!!!
RKB LATEST TECHNOLOGY

New AF2D class
RKB NEW AF2D – BEARING DESIGN

Bearing Design:

- Inner ring in one or two pieces, available with cylindrical or tapered bore
- Two double pronged machined steel cages*, guided on rollers

*made from:
- ISO C30
- ISO C35
- ISO C40
- ISO C45
- ISO 400-18
RKB NEW AF2D – BEARING ASSEMBLY

Outer Assembly - R

1st outer ring  ↓  1st cage  ↓  2nd cage  ↓  2nd outer ring

1st row of rollers  2nd row of rollers  3rd row of rollers  4th row of rollers

Inner Assembly - L

Inner ring
New AF2D class

- Easy bearing assembly (non-separable design)
- Rolling mill automated assembly (robot)
- High bearing service life required
ROLLING MILL STAND

RKB R 313811 mounted on Danieli stand (Mexico) with oil mist lubrication

RKB R 635194 mounted on SMS Meer stand (Germany) with grease lubrication
The poor precision of the automatic assembly process (robot) leads to MANY early failures on not optimized multiroll bearings!!!
ROLLING MILL STAND ASSEMBLY - THEORY

A. **Bearing inner ring fitted on roll**

B. **Theoretical bearing outer ring assembly fitted on chock**

Residual bearing diametral clearance after mounting of the inner ring on roll seat.
ROLLING MILL STAND ASSEMBLY - REALITY

A Bearing inner ring fitted on roll

B Theoretical bearing outer ring assembly fitted on chock

C Real bearing outer ring assembly fitted on chock (very poor alignment!!!)

Residual bearing diametral clearance after mounting of the inner ring on roll seat
COMMON DAMAGES ON NOT OPTIMIZED MULTIROLL

- Roller damage!
- Inner ring raceway damage!
- Cage tenon fracture!
- Cage tenon damage!
RKB SOLUTION – NEW AF2D DESIGN

RKB R 313891 cage from ISO 400-18
CNC milling technology of the highest level

RKB R 313891 cage FEM analysis (Ansys)
Designing phase

RKB R 313811 mounting assistance (Mexico)
On-field experience
RKB SOLUTION – NEW AF2D DESIGN

RKB R 313812
rollers profile

Advanced super-finishing technology
(Longer service life)

RKB R 313812
outer ring
crowned raceway profile

Advanced grinding technology
(Longer service life)

RKB R 313812 stress edge effect reduction for rollers and raceway due to profiles optimization (X and Y axes are dimensionless)

Optimization

R&D

R&D
RKB SOLUTION – NEW AF2D DESIGN

CMM measurement for cage manufacturing homologation process

Advanced cage inspection (manufacturing process quality)
Bainite treatment
For rings and rollers

Continuous furnace for bainite hardening (HB) treatment

Salt baths for bainite hardening (HB) treatment

Liquid nitrogen tank for controlled atmosphere furnace

Better resistance to impacts, wear and fatigue
(compared to standard through-hardened martensite steel microstructure)

For further information refer to the related educational video “RKB special heat treatments for heavy duty applications”
RKB SOLUTION – NEW AF2D DESIGN

- Higher cage tenon stiffness
- Enhanced cage manufacturing precision
- Cage pocket optimization for reduced roller drop and better piloting

- Superfinished rollers
- Optimized roller profile
Multi row cylindrical roller bearings

313811 AF2DS12Z/4A/S

Main boundary dimensions (mm)

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<tr>
<th>d</th>
<th>200</th>
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<tr>
<td>D</td>
<td>250</td>
</tr>
<tr>
<td>B</td>
<td>102</td>
</tr>
<tr>
<td>C</td>
<td>102</td>
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<tr>
<td>F</td>
<td>226</td>
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Technical data

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<tr>
<th>Basic load ratings (kN)</th>
<th>( C_{0} )</th>
<th>( C_{p} )</th>
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<td>3189</td>
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| Mass (kg) | 41.0 |

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<tr>
<th>Cage material</th>
<th>Steel</th>
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<th>Min chamber dimensions (mm)</th>
<th>( r_1 )</th>
<th>( r_2 )</th>
<th>( d )</th>
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| Precision class | P6 |

| Bearing clearance (mm) | 0.21/0.270 |

Technical notes

- Two outer rings each with three integral tabs. One inner ring
- Two double preloaded reinforced meshed steel cages guided on rollers
- Optimized roller profile for improved load distribution. Crowned raceways
- Annular groove and lubrication holes in outer rings
- Stappals in the side faces of outer rings
- Beine hardened outer and inner rings and rolling elements
- Bearing rings heat stabilized for operating temperatures up to 200 °C

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RKB NEW AF2D – THE NEW STANDARD IN THE FIELD

**SMS MEER** horizontal stand for rebars from 9.5 to 19.1 mm diameter (France)

**DANIELI** horizontal stand for corrugated steel bars (grade 42) production (Italy)

**SIEMENS VAI** horizontal stand for S240, S340, S400 and S500 rebars from 5.5 to 28 mm diameter (Malaysia)

- Longer bearing fatigue life
- Prevention of bearing cage damages (due to automatic mounting process)

TCO (Total Cost of Ownership)
Please consider a bearing mounted, dimensioned and properly maintained and lubricated with oil mist or air-oil systems.

Under these working conditions, RKB AF2D design reached 16.5 m/s of laminated product linear speed.

For higher speed values, please consult RKB TTU.

For section rolling mill, AF2D design obtained satisfactory results for all speed ranges!

For bar rolling mill, AF2D design obtained satisfactory results for all speed ranges!
RKB MULTI-ROLL – ALTERNATIVE DESIGNS AVAILABLE

**F2CII**
- Design used for large-sized bearings
- Two-piece ribless inner ring with lubrication grooves in side faces
- Two-piece outer ring with separate side flanges and a central spacer
- Two-piece pin-type steel cage with lightened design for optimized lubrication
- Pierced rollers design for increased carrying capacities
- Available also with four window-type machined brass cages (EVO)

**D2CII**
- Design used for medium- and large-sized bearings
- Two-piece ribless inner ring with lubrication grooves in side faces
- Two-piece outer ring with separate side flanges and a central spacer
- Double pronged machined brass cage
- Available also with machined steel cage (DF2CII)
- Annular groove and lubrication holes in outer ring
- Design for facilitated mounting and dismounting

**GB2DX**
- Designed for rolling mill stands with automatic roll changing device
- One-piece ribless inner ring with increased length of chamfers to facilitate mounting
- Two-piece outer ring with integral ribs
- Two-piece reinforced window-type machined brass cage with integral rivets (AVH) for optimized roller drop
- Long-short roller arrangement for better load distribution and reduced edge stress
- Optimized for oil lubrication and automatic grease lubrication systems
# RKB MULTI-ROLL – DESIGN SELECTION GUIDE

RKB selection guide, suitable only for long product rolling mill stands

### Bearing Working Conditions

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<tr>
<th></th>
<th>High Load</th>
<th>High Speed</th>
<th>Misalignment</th>
<th>Oil Lubrication*</th>
<th>Grease Lubrication</th>
<th>Bearing Robot Mounting Process</th>
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<td>AF2D/B (double pronged machined steel cage)</td>
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<td>GB2D (window-type cage)</td>
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**Legend:**  
+ Caution  
++ Good  
+++ Excellent  
* Typically oil mist or air-oil systems
For further information please contact:

info@rkbeurope.com

www.rkbbearings.com