RKB BEARING INDUSTRIES

RKB FOUR-ROW CYLINDRICAL ROLLER BEARINGS:

MULTIROLL NEW REINFORCED EXECUTION AF2D CLASS FOR ROLLING MILL STANDS

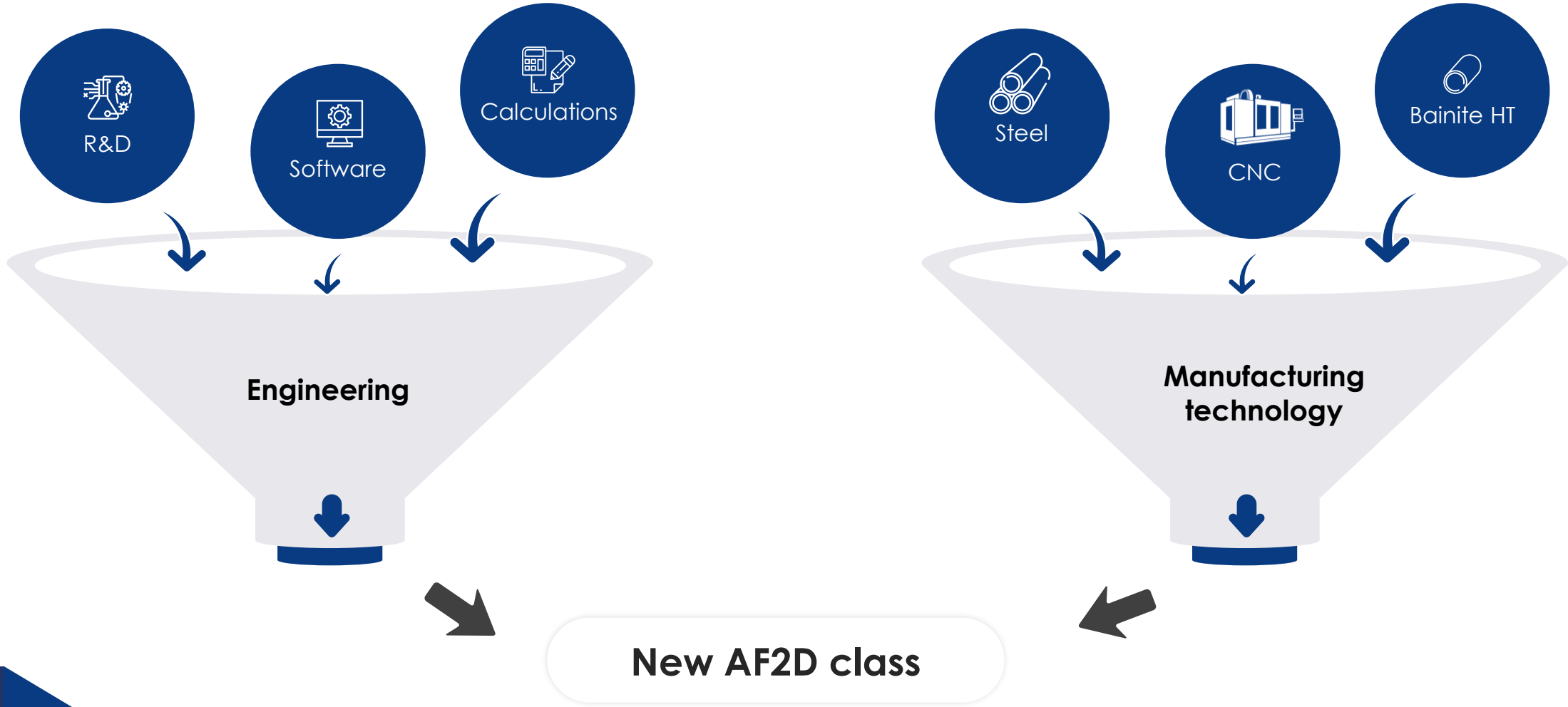
AB_Rev.02
Application Engineering
02/09/2020

RKB AF2D DESIGN – HISTORY

Activity	2013		2014		2015		2016		2017		2018		2019	
	1st sem.	2nd sem.	1st sem.	2nd sem.	1st sem.	2nd sem.	1st sem.	2nd sem.	1st sem.	2nd sem.	1st sem.	2nd sem.	1st sem.	2nd sem.
First AF2D Design														
First AD2 design – Engineering														
First AD2 design - Testing														
First AD2 design – Manufacturing														
First AD2 design – Continuous improvement														
New AF2D Design														
New AF2D design – Engineering														
New AF2D design – Testing														
New AF2D design – Manufacturing														
New AF2D design – Continuous improvement														

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

RKB LATEST TECHNOLOGY



RKB NEW AF2D – BEARING DESIGN

Bearing Design:

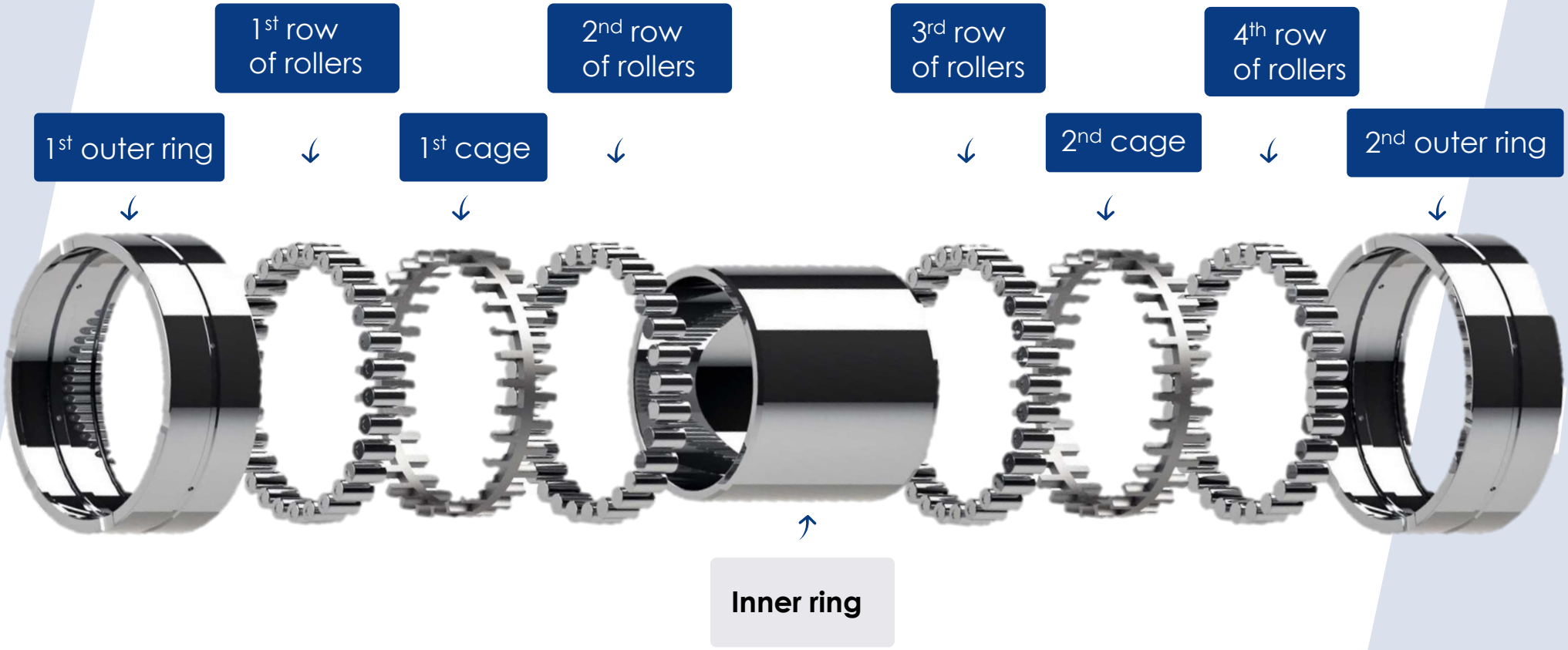
- Inner ring in one or two pieces, available with cylindrical or tapered bore
- Two double pronged machined steel cages*, guided on rollers

made from:

- ISO C30
- ISO C35
- ISO C40
- ISO C45
- ISO 400-18

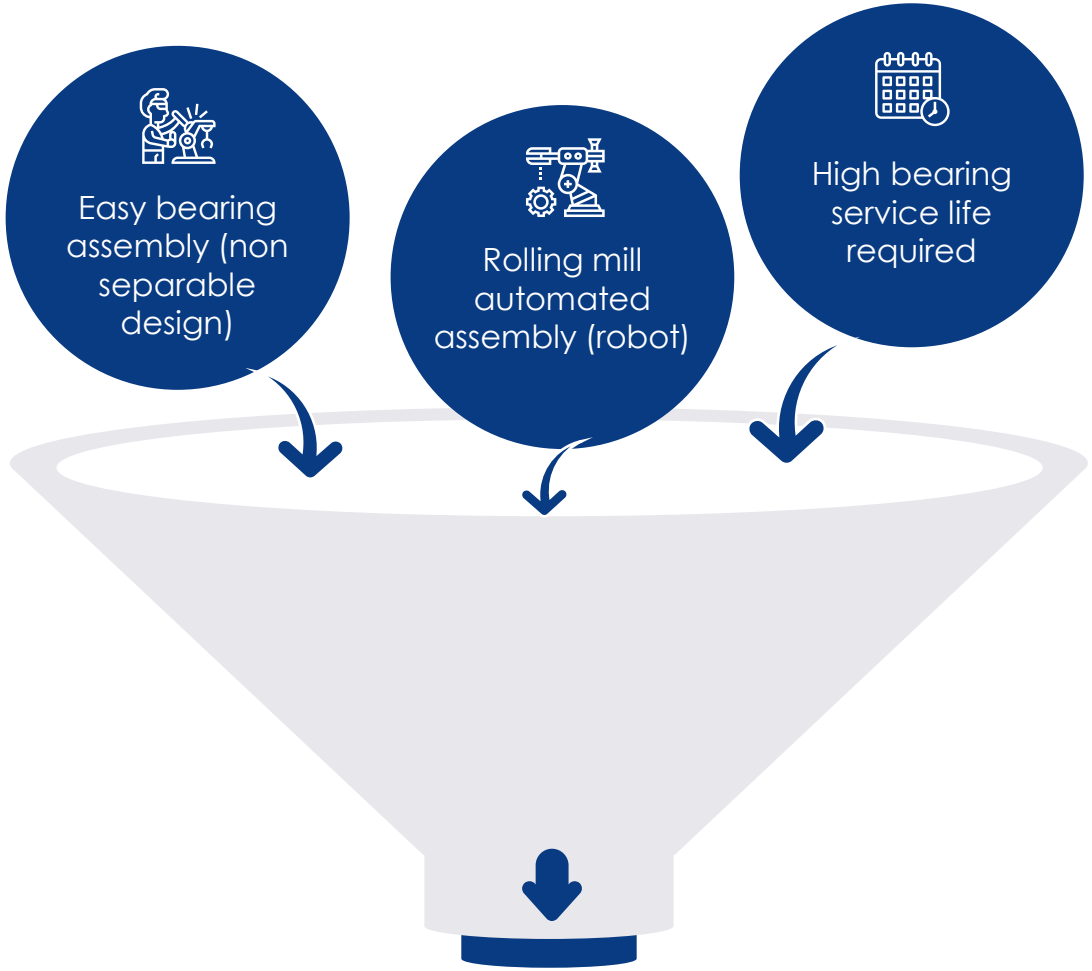
RKB NEW AF2D – BEARING ASSEMBLY

Outer Assembly - R



Inner Assembly - L

RKB APPLICATION GUIDELINES

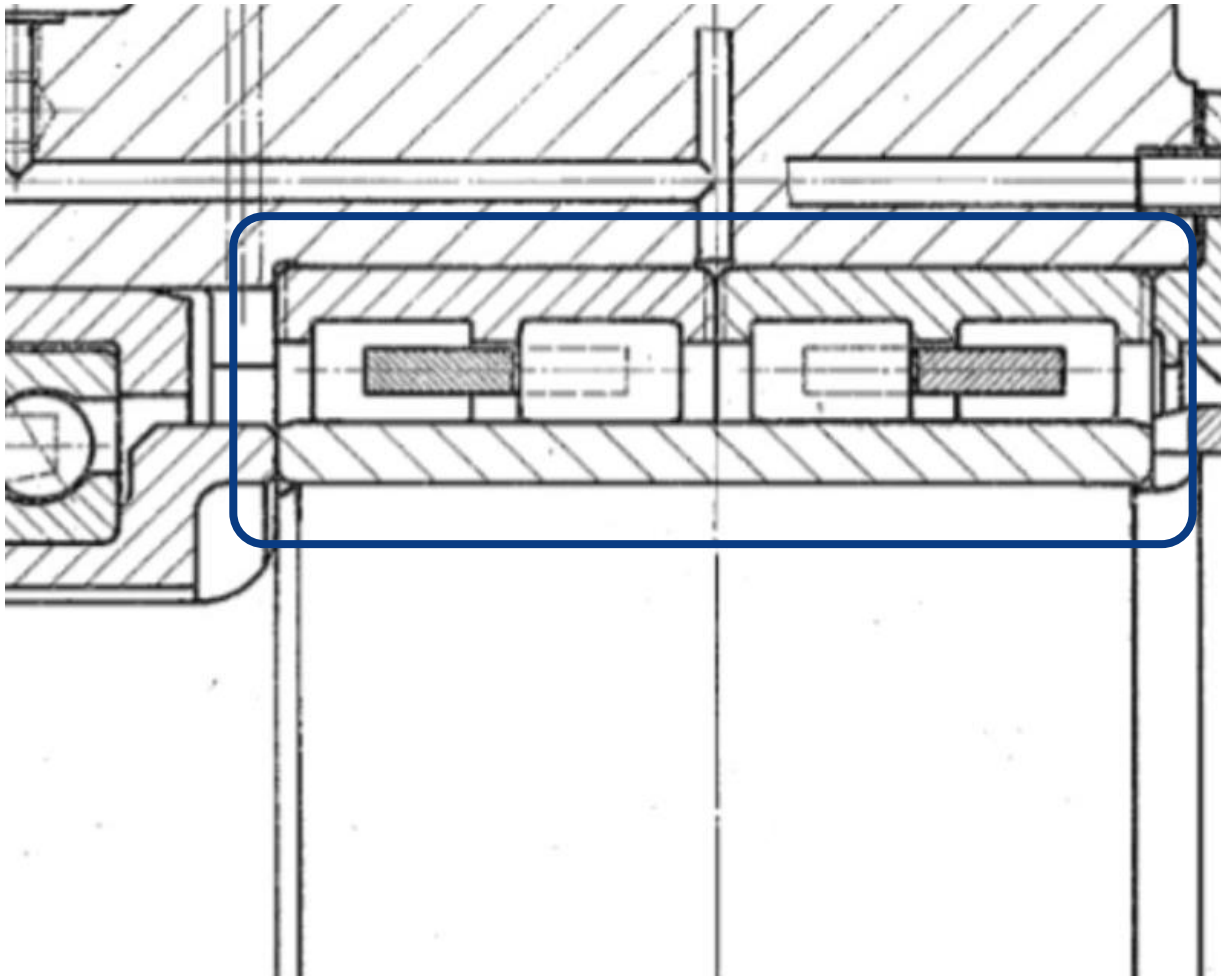


New AF2D class

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

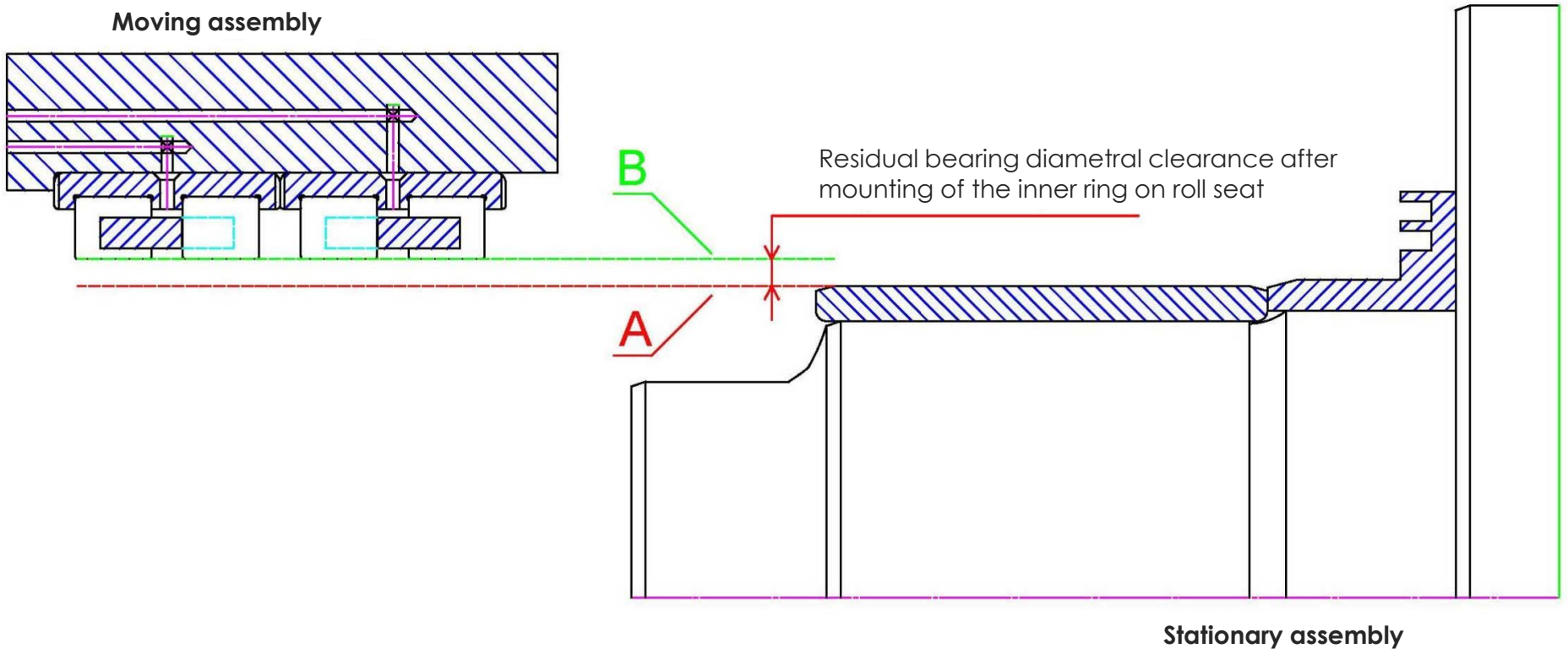


ROLLING MILL STAND ASSEMBLY PROBLEM

Assembly device of **Pomini** rolling mill stand (Italy) for stainless steel bars

The poor precision of the automatic assembly process (robot) leads to MANY early failures on not optimized multiroll bearings!!!

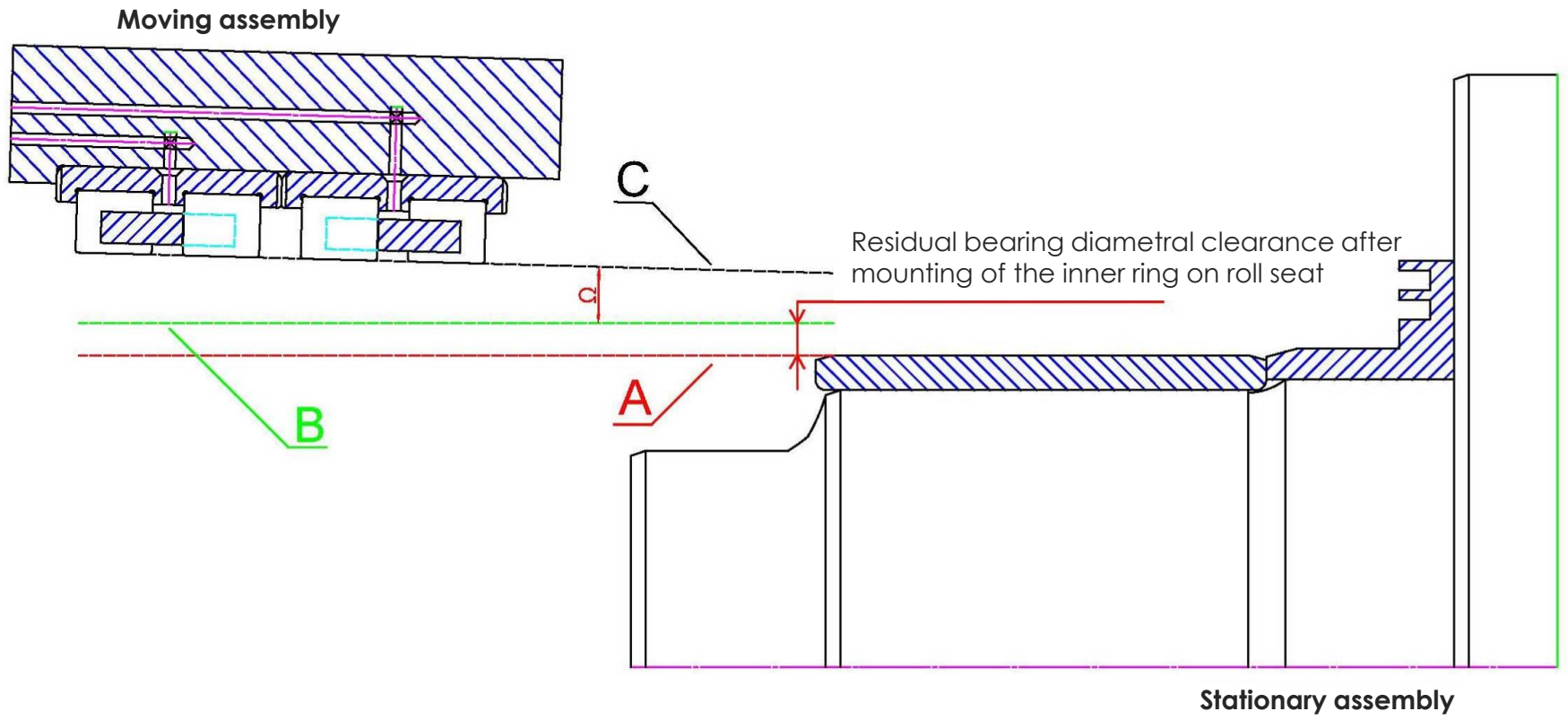
ROLLING MILL STAND ASSEMBLY - THEORY



A Bearing inner ring fitted on roll

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

ROLLING MILL STAND ASSEMBLY - REALITY



A Bearing inner ring fitted on roll

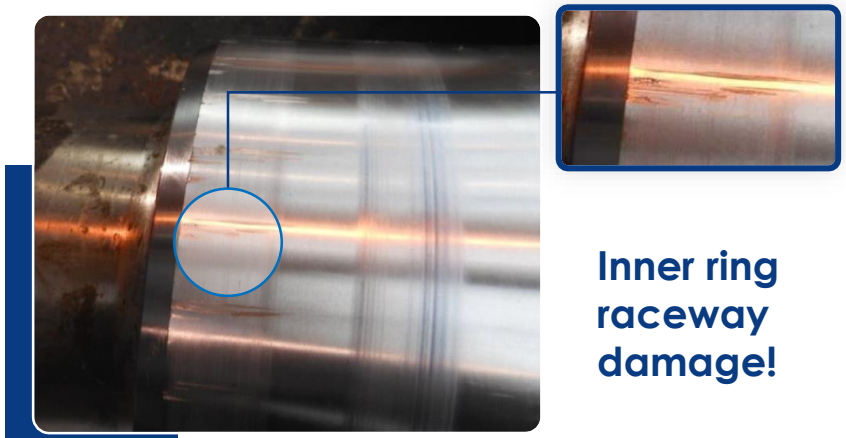
B **Theoretical** bearing outer ring assembly fitted on chock

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

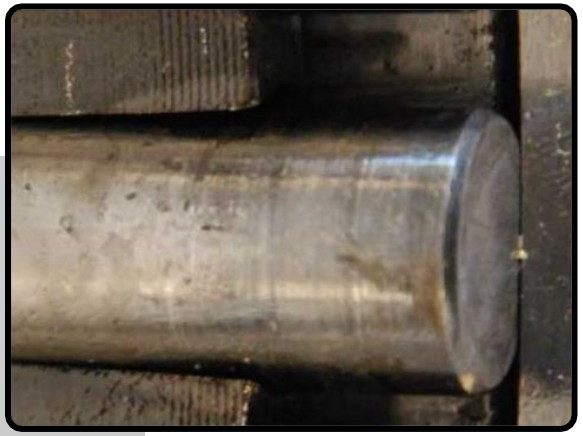
COMMON DAMAGES ON NOT OPTIMIZED MULTIROLL

Roller damage!

Cage tenon fracture!

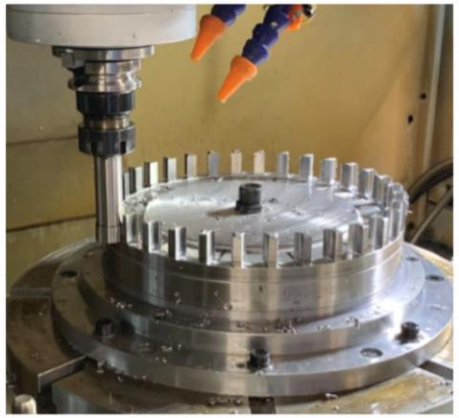


Inner ring raceway damage!



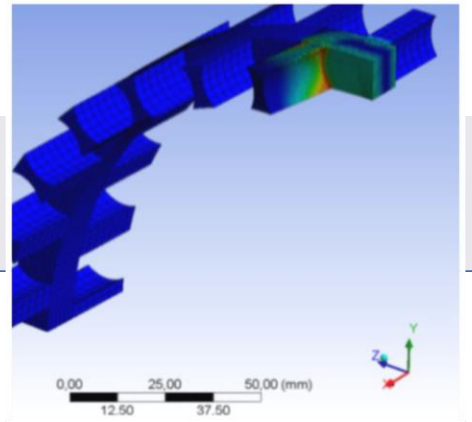
Cage tenon damage!

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)**

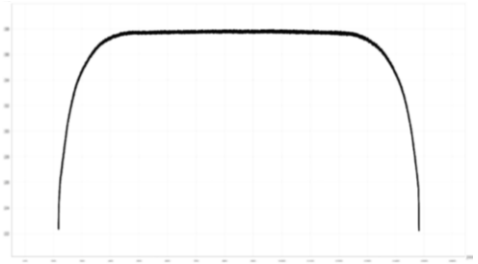
Designing phase

RKB R 313811 mounting assistance (Mexico)

On-field experience

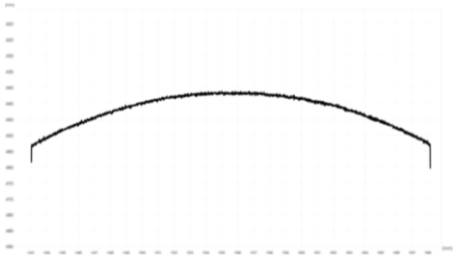
RKB SOLUTION – NEW AF2D DESIGN

RKB R 313812
rollers profile



Advanced super-finishing technology
(Longer service life)

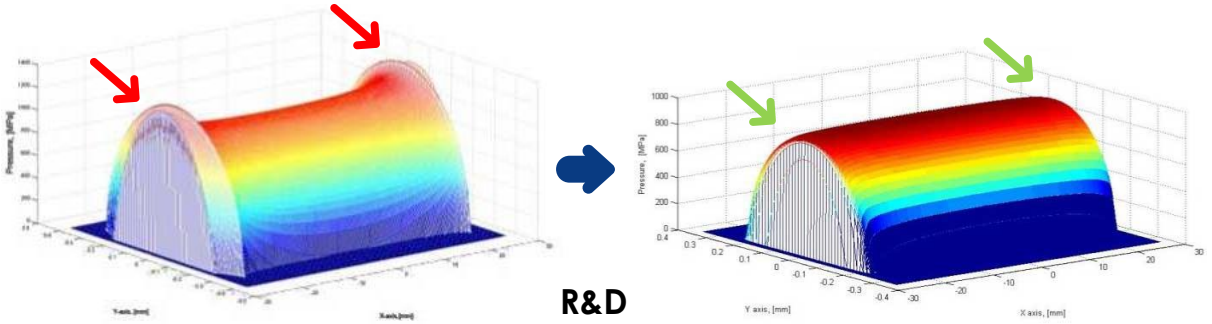
RKB R 313812
outer ring
crowned raceway
profile



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)

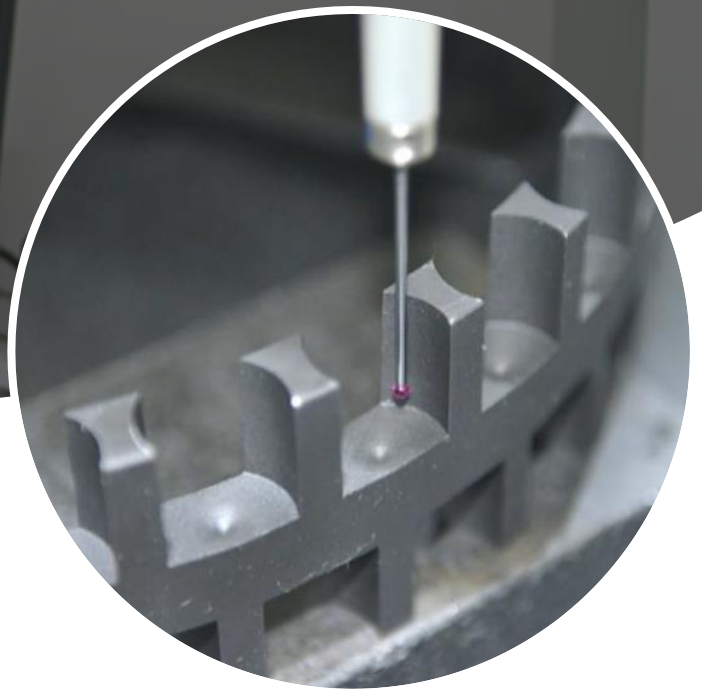
Optimization



R&D

RKB SOLUTION – NEW AF2D DESIGN

CMM measurement for cage manufacturing homologation process



Advanced cage inspection (manufacturing process quality)

RKB SOLUTION – NEW AF2D DESIGN

Bainite treatment

For rings and rollers

Continuous furnace for bainite hardening (HB) treatment

Salt baths for bainite hardening (HB) treatment

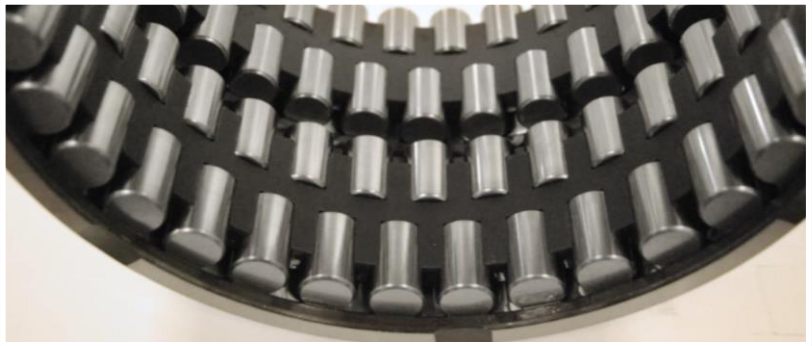
Liquid nitrogen tank for controlled atmosphere furnace

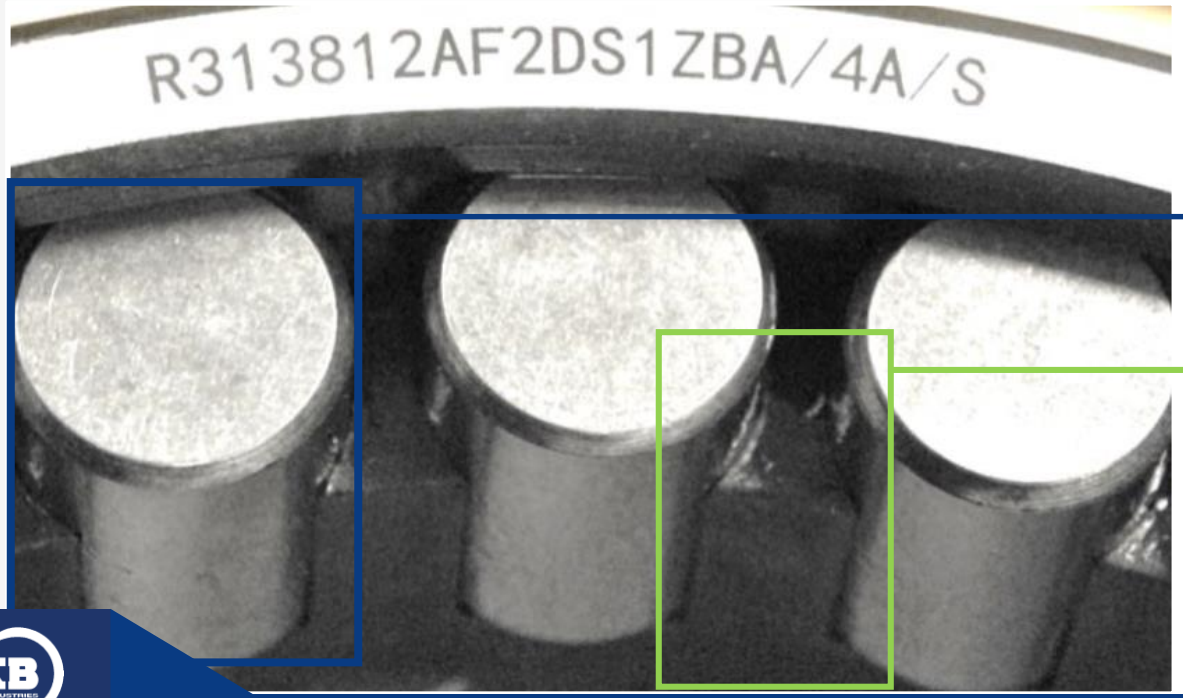
Better resistance to impacts, wear and fatigue

(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





- Superfinished rollers
- Optimized roller profile

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

RKB NEW AF2D – TF EXAMPLE

RKB Bearings Technical Fiche

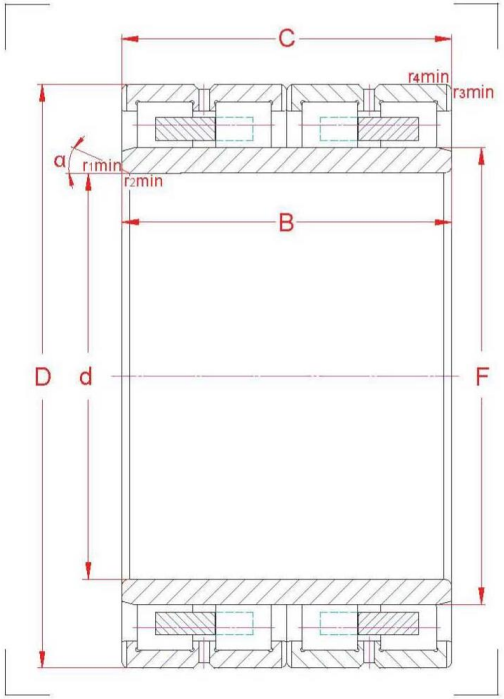
Multi row cylindrical roller bearings

R00	GR020919	MA020919

313811 AF2DS1ZB/4A/S

Main boundary dimensions (mm)	
d	200
D	290
B	192
C	192
F	226

Technical data					
Basic load ratings (kN)	Dyn.	C_r	1526		
	Stat.	C_{0r}	3190		
Mass (kg)			41,0		
Cage material			Steel		
Min chamfer dimensions (mm)		r_1	2,1	α (deg)	–
		r_2	2,1		
		r_3	2,1		
		r_4	2,1		
Precision class			P6		
e			-		
Bearing clearance (mm)			0,210/0,270		



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

The sketch is for reference only and may not be representative or indicative of the actual product. Sketch scale is free.
Also refer to RKB Affidavit of Conformance for related compliance to International Standards.
Every care has been taken to ensure the accuracy of the information in the present drawing, but no liability can be accepted for any errors or omissions contained herein, or in case losses and/or damages (direct, indirect, consequential) should occur.
RKB Bearing Industries reserves the right of any amendment without notice.

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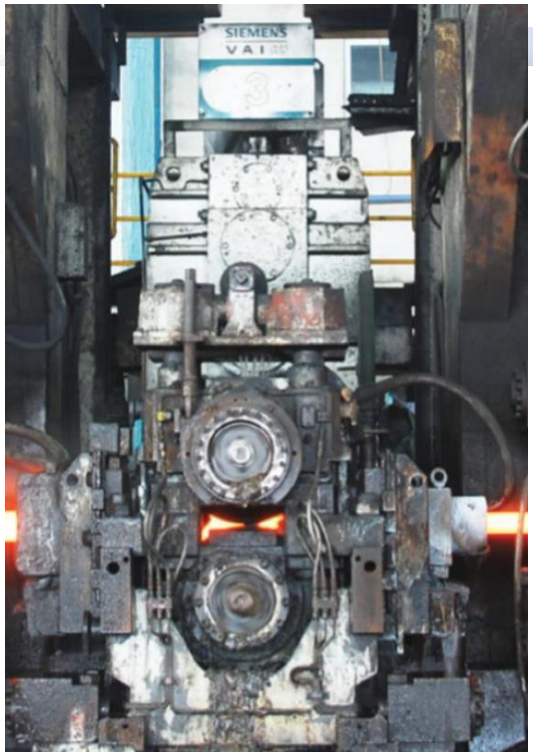
RKB NEW AF2D – THE NEW STANDARD IN THE FIELD

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)

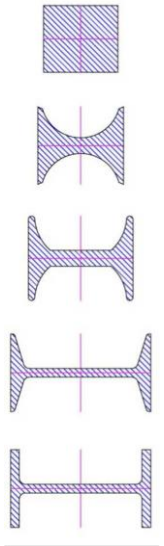
- Longer bearing fatigue life
- Prevention of bearing cage damages (due to automatic mounting process)

↓↓ TCO ↓↓
(Total Cost of Ownership)

RKB NEW AF2D – HIGH SPEED ROLLING MILL

Process

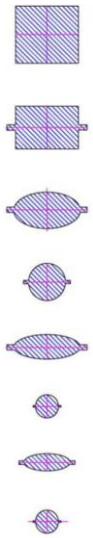
Speed



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

Process

Speed



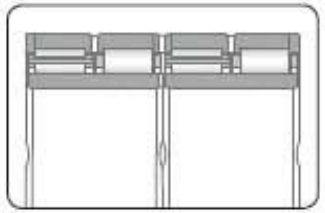
For bar rolling mill, AF2D design obtained satisfactory results **for all speed ranges!**

Please consider a bearing mounted, dimensioned and properly maintained and lubricated with oil mist or air-oil systems

Under theses working conditions, RKB AF2D design reached **16,5 m/s** of laminated product linear speed

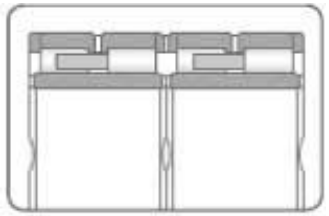
For higher speed values, please consult RKB TTU

RKB MULTI-ROLL – ALTERNATIVE DESIGNS AVAILABLE



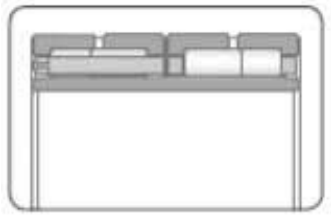
F2CII

- 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					
		High load	**High speed**	**Misalignment**	**Oil lubrication***	**Grease lubrication**	**Bearing robot mounting process**
RKB multi-roll design (suitable for long product rolling mill stands)	**A2D** (double pronged machined steel cage)	++	++	++	++	++	+
	AF2D/A (double pronged machined steel cage)	+++	++	+++	++	+++	++
	AF2D/B (double pronged machined steel cage)	++	+++	++	++	+++	++
	GB2D (window-type cage)	++	+++	+	+++	+	+++

Legend: + Caution ++ Good +++ Excellent

* Typically oil mist or air-oil systems

RKB BEARING INDUSTRIES

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