

Largest split toroidal roller bearing in the world

Applied in a Plug&Grind® XL
to transform maintenance
in cement grinding

Discover how Atlantic Bearing Services (ABS) engineered an application-driven system under its ACB Custom Bearings brand. By combining split spherical and split toroidal roller bearing technologies, ABS developed a solution designed to significantly reduce future bearing replacement downtime and enhance the long-term operational reliability of the Plug&Grind® XL mill.

atlantic-bearing.com



ACB
ATLANTIC CUSTOM BEARINGS

220 K

Metric Tons / Year

Plant Capacity

950mm/37.4"
Bore

World's Largest Split
Toroidal Roller Bearing

7,425 kN
1.67 million lbf

Dynamic Load

Fixed-Side Spherical
Roller Bearing

70% Less
Downtime

1–2 Days for Future
Bearing Replacement



Engineering Brief: The Plug&Grind® XL Context

The challenge was not to replace a bearing, but to rethink how maintenance is executed in a modular mill environment. While traditional cement grinding mills rely on hydrodynamic or hydrostatic journal bearings—Babbitt-lined pads operating on an oil film—the Plug&Grind® XL represents a different approach.

Manufactured by Cemengal, it is a modular, containerized grinding solution: a 3.0 m × 9.5 m

ball mill driven by a 1,100 kW motor, producing 220,000 metric tons of cement per year within a compact, transportable footprint.

For this architecture, rolling-element bearings were selected on the trunnions instead of conventional journal bearings—a forward-looking decision aligned with the requirements of modular mills: lower friction, high radial load capacity with displacement capability, simplified lubrication, and a reduced support footprint.

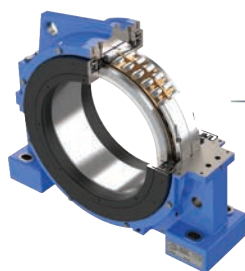
Over time, operational stress revealed critical maintenance challenges, including

premature bearing wear, lubrication loss due to sealing deficiencies, and the difficulty of replacing bearings within a confined modular structure. These issues called for a more maintainable solution.

When the scheduled bearing replacement coincided with a mill ferrule replacement under warranty, ABS was commissioned with a precise engineering brief: upgrade the existing rolling-element concept, simplify future bearing replacements, improve sealing integrity, and deliver a custom solution engineered for long-term maintainability.

The ABS Solution: Three Components, One Integrated System

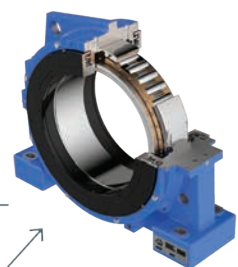
ABS engineered a tailored bearing support system specifically for the Plug&Grind® XL. This solution integrates three coordinated components designed to optimize load management, accommodate axial displacement, and simplify long-term maintenance.



Split Spherical Roller Bearing (SRB)



Custom Split Housing

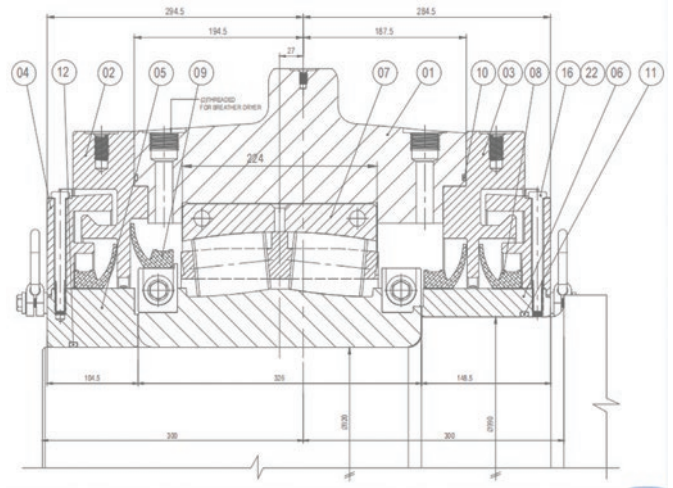


Split Toroidal Roller Bearing (STRB)

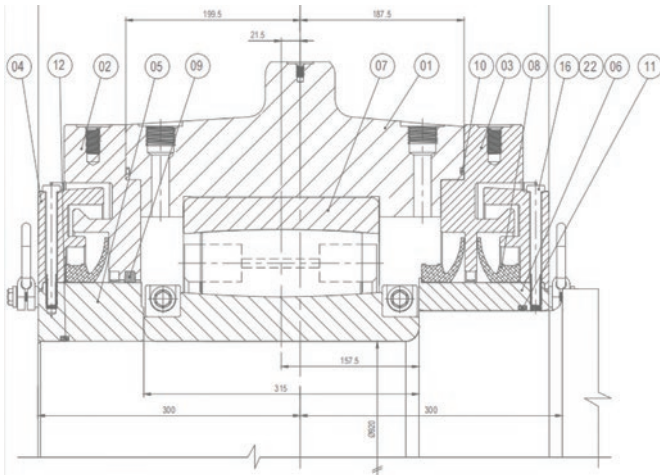
FIXED SIDE

Split Spherical Roller Bearing (SRB)

Bore: 37.4" | Dynamic Load Rating: 1.67 million lbf



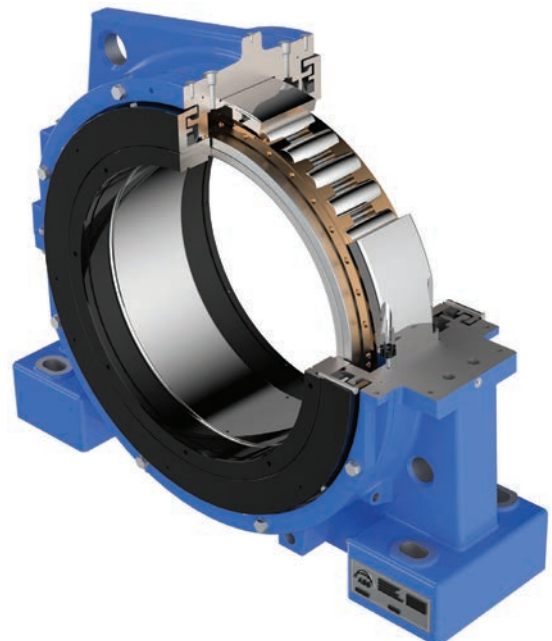
This bearing supports the mill's primary radial loads while ensuring axial positioning at the fixed location. To facilitate maintenance, the inner ring, the rolling assembly, and the outer ring are all divided into two halves. This split design simplifies on-site replacement by allowing the entire unit to be assembled directly around the shaft in its operating position. The angled inner ring cuts facilitate precise alignment while maintaining structural continuity and uniform load distribution across the double row of barrel rollers. Furthermore, the precision-machined brass cage ensures consistent roller guidance and stability under sustained high-load conditions.



FREE SIDE - WORLD'S LARGEST

Split Toroidal Roller Bearing (STRB)

Bore: 37.4" | Dynamic Load Rating: 1.67 million lbf



Designed to handle axial displacement independently of radial loads, this bearing seamlessly manages thermal expansion as the mill shell heats up. Because the toroidal rollers are not constrained by axial shoulders, they glide freely along the raceway, eliminating structural stress and internal load build-up. This ensures exceptionally stable operation even under extreme thermal fluctuations. Furthermore, with a 950 mm bore, this unit holds the distinction of being the world's largest split toroidal roller bearing.



Custom Split Housings

Engineered Around the Mill

These custom-engineered bearings demand equally specialized split housings.

ABS designed these housings from the ground up, adapting the internal bore geometry to accept the new bearing envelopes while improving stress distribution at the trunnion interfaces. This approach directly addresses the structural conditions identified during the project assessment and contributes to more stable load distribution during operation.

To maximize reliability, a reinforced multi-stage sealing system protects against cement dust and moisture while retaining lubricant. This advanced design ensures consistent

contamination control and significantly extends service intervals.

The modular split-housing design allows for future bearing replacements without removing the housings, streamlining long-term maintenance.

The Split Bearing Advantage: Maintenance Reimagined

Traditional large rolling bearings are single-piece components, making replacement a

costly and complex endeavor. The process requires lifting the mill shell and exposing the shaft, a multi-day operation involving hydraulic tooling and highly skilled crews.

In contrast, the split format eliminates these bottlenecks. By allowing the bearing to be assembled directly around the shaft, it removes the need to lift the mill shell or disturb the drivetrain. This revolutionary design transforms a complex undertaking into a streamlined procedure, slashing downtime and significantly reducing specialized labor costs.



— Assembly, quality control, and measurement of the STRB and SRB at our Miami operations facility.

Conventional Bearing Replacement

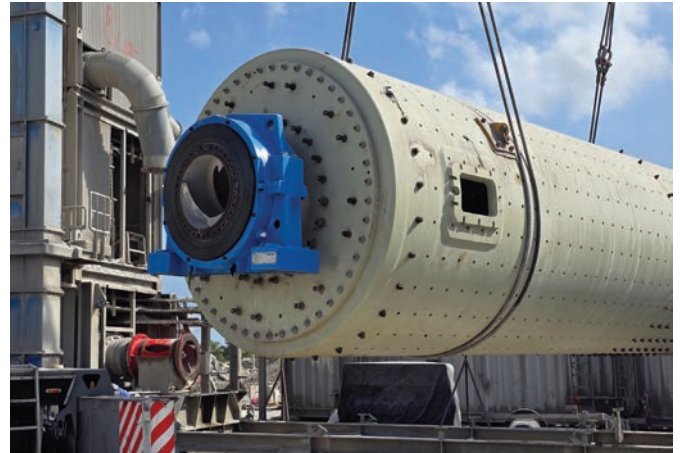
- Mill shell fully dismantled and lifted
- Crane and specialist rigging required
- Hydraulic press for bearing extraction
- 5–7 days planned downtime per cycle
- Housing removed and reinstalled each cycle

ABS Split Bearing Solution

- Mill remains in position, shaft stays mounted
- Portable lifting tools; no heavy-duty cranes required for replacements
- Bearing segments assembled in place
- 1–2 days planned downtime per cycle
- Housings remain permanently installed

The split design allows the bearings to be replaced in situ using portable lifting tools, eliminating the need for heavy-duty cranes and hydraulic presses while significantly reducing downtime.

PROVEN IN OPERATION: 6,000+ OPERATING HOURS



—Installation of the Plug&Grind® XL at the plant with the custom split bearing support system fully integrated.

Operational Impact

- Drastically reduces replacement time eliminating the need for heavy-duty cranes, hydraulic jacking, or specialized rigging in future cycles.
- Maximizes reliability – advanced multi-stage sealing ensures superior contamination exclusion and optimal lubrication retention.
- Extends service life – optimizes load distribution and environmental protection to significantly increase bearing longevity.
- Optimizes structural integrity – purpose-engineered housing geometry improves stress distribution at trunnion interfaces.
- Manages thermal expansion – seamlessly accommodates axial movement without introducing internal structural stress.
- Simplifies long-term maintenance – modular housings remain permanently in place, streamlining all future bearing replacements.



— The ACB Custom Bearings split bearing support system in operation

ABS Application-Driven Engineering for Heavy Industry

ABS is a global engineering company specializing in custom bearing and power transmission solutions for demanding industrial environments. Cement is one of several core sectors in which ABS supports critical equipment through application engineering, custom manufacturing, global supply, and field services.

Through its specialized brands—ACB Custom Bearings, AEC Engineering Chains, and MGS Gears—ABS designs and manufactures custom bearings, engineering chains, gears, and gearboxes for critical applications across heavy industry worldwide.

atlantic-bearing.com