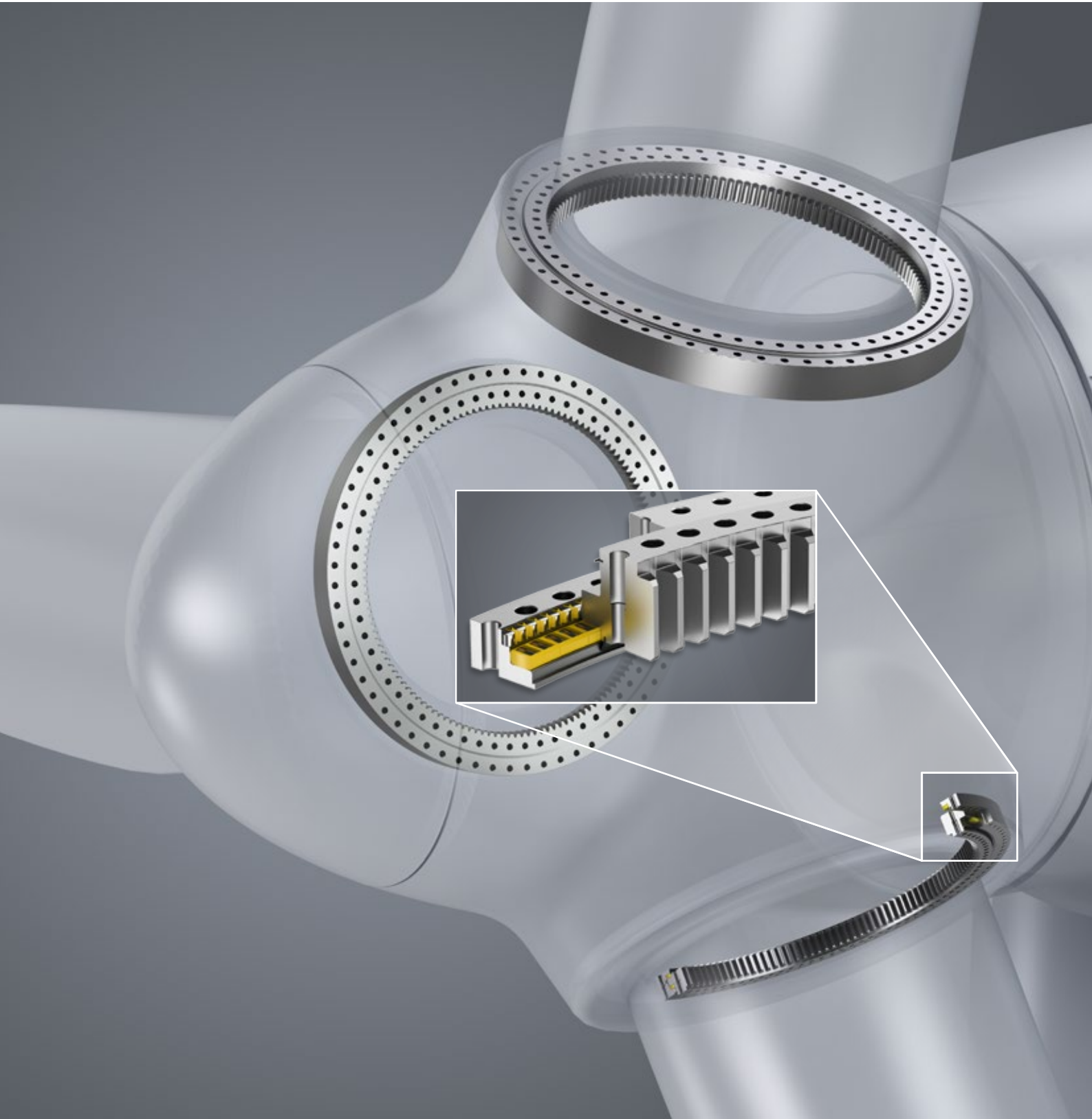


Higher capacity and additional cost savings

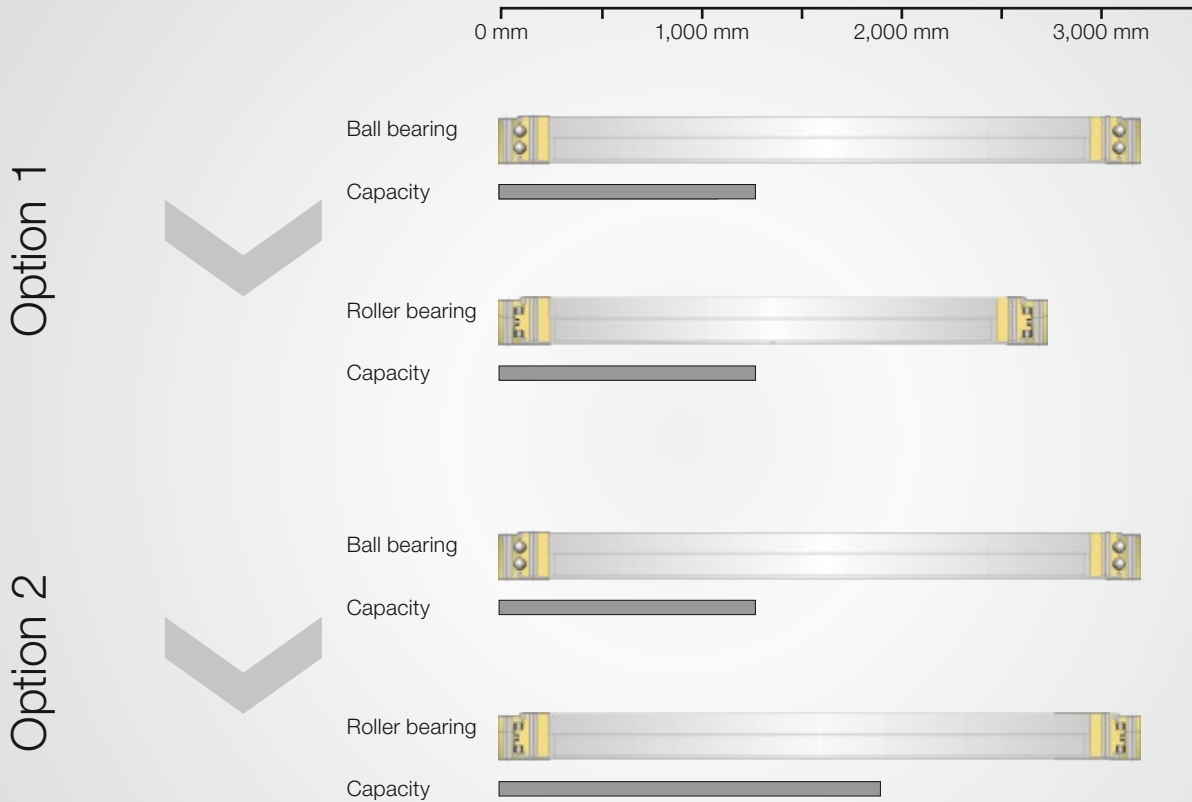
Three-row roller bearings for pitch systems



LIEBHERR

Three-row roller bearings for higher load capacity and more cost efficiency

Wind turbines are growing steadily in an effort to attain higher energy yields. The options of adapting existing designs to the growing dimensions and more demanding load profiles has however limits – particularly in regard to rotor blade bearings. Therefore, in addition to the current single-row and double-row four-point bearings, offers Liebherr now also three-row roller bearings for pitch systems. This highly increases the potential in terms of dimensioning and load capacity.



The diagram above illustrates the relationship between the diameter and the capacity for the ball and roller bearing.

Internal analyses have shown that the potential advantages of the roller bearing over the ball bearing can be realized across all turbine platforms, with a tendency to increase with turbine size. As an example, a generic 6-MW system showed a potential of a 10% increase in capacity and 20% reduction of bearing diameter*.

* The capacity increase and overall savings potential will vary depending on the turbine since the benefits are directly influenced by the respective loading conditions and the interface construction. Therefore, each turbine needs to be assessed specifically to determine the actual advantages of implementing a three-row roller bearing.

Option 1

Smaller diameter with same capacity with the following benefits:

- Weight reduction compared to four-point ball bearing
- Reduction of the bolt circle diameter
- Same life span and load capacity
- Extensive savings potential for entire hub system:
smaller hub size, reduced system weight and lower transport costs



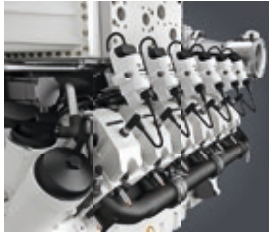
Option 2

Higher capacity with same bolt diameter with following benefits:

- Same interface as for the four-point ball bearing
- Comparable bearing weight
- The higher capacity and longer service life of the roller bearing offer a significant advantage for wind turbines with Individual Pitch Control (IPC)
- Up to 30% higher capacity with the same diameter of the blade root



Liebherr Components



Gas engines



Diesel engines



Fuel injection systems



Axial piston hydraulics



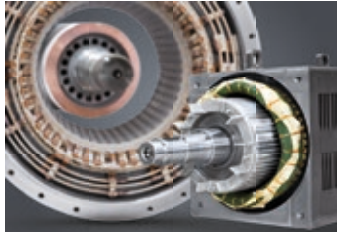
Hydraulic cylinders



Large diameter bearings



Gearboxes and winches



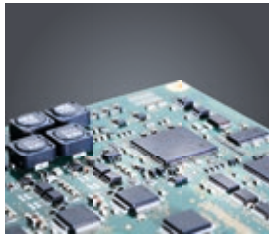
Electric machines



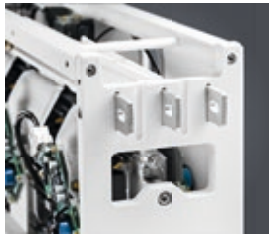
Remanufacturing



Human machine interfaces



Control electronics



Power electronics



Switchgear



Software

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to our customers at Liebherr-Components AG and the regional sales and distribution branches.

Liebherr is your partner for joint success: from the product idea to development, manufacture and commissioning right through to customer service solutions like remanufacturing.

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