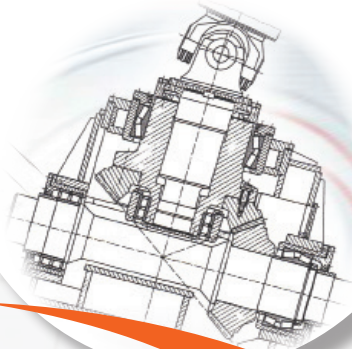


BEARINGS EUROPE | NBI®

Application
engineering



Multi-location
manufacturing plants



India Spain China

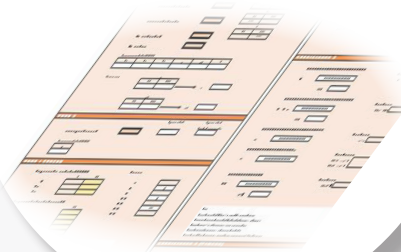
Highly skilled
person in each
key position

Personalized service.
Multi-location sales offices



desoft **vitope**

Own design software



Premium  brand

FOR INFORMATION ONLY
NUR ZUR INFORMATION

NBI CUSTOMER
DRAWINGS
ZEICHNUNG
FÜR KUNDEN

THIS DRAWING WILL NOT BE
EXCHANGED IN CASE OF AMENDMENTS
DIESE ZEICHNUNG WIRD IM FALLE VON
ÄNDERUNGEN NICHT AUSGETAUSCHT

Axial Displacement "s"
Axialer Verschiebeweg "s"

PEZIFIKATIONEN



Manufacturing plants

NBI Bearings Europe
Central office, R&D, designing manufacturing plant, warehouse and sales office in Oquendo (Spain)

NBI India
Manufacturing plant and warehouse in Ahmedabad (India)

NBI Changzhou
Manufacturing plant, warehouse and sales office in Wujin

Jerry Bearings Transmission Technology
Roller manufacturing plant in Zhejiang (China)

Sales offices, SQA

Europa and LATAM
local sales support in Spain, Romania, Italy, Turkey, Germany, Brazil, Mexico, Chile, Peru and Colombia

India local sales support
In East, North, West and South

Application and service engineering
in Bucharest (Romania), Ahmedabad and East India

NBI SQA center
Laboratories and SQA office in Wafangdian and Shandong (China)

The company

NBI is a **Premium brand** serving the market since 2002.

Key positions are covered by professionals with vast experience in the bearing industry and +700 employees worldwide. The main features of NBI Bearings Europe to be highlighted are:

Commercial capacity:

- Focused on supplying bearings for high technical requirement applications to OEM customers. A large list of leading OEM clients' referrals backs NBI's reputation.
- Sales and customer service teams, formed by more than 30 people providing a personalized service, are located in Spain, China, Romania, Brazil, India and Europe.
- Romania-based highly experienced application engineering team that provides the best pre-sales & after-sales technical assistance.
- Distribution centers for on-time deliveries in Spain, China and India.

Technical expertise:

- Own design and R&D teams in Spain that have supported the development of a new proprietary design software. Product portfolio that covers CRB, SRB, TRB, CRTB, SPB and CF. NBI is continuously adding new items to its Enhanced bearing line.
- Manufacturing plants in Spain, China and India.
- Fully equipped metrology, metallographic and other tests laboratories.

Financial position:

- Solid financial health thanks to a robust cash position.
- Publicly listed in the BME Growth (Spanish stock exchange market for small and medium sized companies) since 2015 with stable core shareholders.

Strategic alliances:

- NBI maintains a strategic partnership with Cronos (Chinese bearing manufacturer), in which the two current majority shareholders and co-founders of NBI also own an equity stake.

Industrial division

Our industrial division focused on designing, manufacturing and supplying components and assembled parts mainly to industrial, aerospace market and automotive sector. NBI selects and invests in the optimum technology for each process and component.

Our team is currently comprised by 350 people with vast experience.

NBI created its new industrial group in order to vertically integrate the required technologies to manufacture bearing components. The industrial group is made up of:

- **NBI industrial Elorrio** stamping plant that provides NBI with the knowledge, expertise and capacity to design and produce cages in-house and to design manufacturing processes

NBI decided to enlarge the scope of its activities by founding the Industrial division, which is formed by two different business units: Metal transformation and Precision machining.

Since then, NBI has added two new companies with complementary technologies:

- **NBI industrial Aida** together with NBI industrial Elorrio is part of the Metal transformation business unit. Aida's activity is specialized in the design and production of precision boiler components and assemblies for a wide range of industries

- **NBI aerospace Galindo** is the latest incorporation to the Precision machining business unit. Its purpose is to design and manufacture precision tooling and machining components and assemblies for the aerospace industry

At the end of 2020, the group acquired and created **NBI industrial Oradea** creating a new business unit in the supply of aluminium components chiefly for the automotive sector. This company has incorporated to the Group the know-how in process of foundry and aluminium casting and machining.

Metal transformation business unit

Company	Acquisition year	Description
NBI industrial Elorrio S.A.U.	2016	Technical office and metal stamping plant.
Aida ingeniería S.L.	2018	Technical office and boiler-making plant.

Precision machining business unit

Company	Acquisition year	Description
Industrias Metalúrgicas Galindo, S.L.	2020	Technical office and precision machining plant.

Aluminium injection and machining business unit

Company	Acquisition year	Description
NBI industrial Oradea S.R.L.	2020	Aluminium injection and machining plant
NBI Aluminium S.L.	2020	Technical and sales office of aluminium injection and machining

Team members with over 60 years of accumulated experience in the bearing field fully committed to provide best-in-class engineering assistance to NBI's customers, both OEMs and end-users from a large area of processing industries.

Bearing performance improvement in every application

- Computer simulations and full application analysis by considering all conditions and influences of known environmental factors.
- Selection of the best bearing solution for new applications.
- Evaluation of bearing performance when changing operating parameters or system redesigning.
- Bearing performance optimization.



Lubrication analysis

- Current lubricants' performance evaluation and improvement measures.
- Recommendations for the best lubrication solutions in new applications.



Advanced calculation capabilities

Analytical and simulation tools used by NBI: Romax, E+asyc (developed by NBI) and Ansys.



NBI[®]

Application Engineering

Homologation process

Going through bearing selection, homologation and validation processes together with the customer's technical team.



Technical trainings and seminars

Sharing NBI's expertise for the benefit of its clients' technical and maintenance staff.



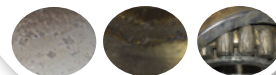
Services of measuring and other features performance analysis

Analysis and reporting submission backed by NBI's fully equipped metrology, metallographic and other tests laboratories.



Bearing damage analysis

Finding out and understanding the causes of bearing damage.



Advanced calculation capabilities

NBI's application engineering team provides each client with the best technical advice whatever the situation:

- For new applications under development.
- For changes in the parameters of the operational regime of the machines.
- For solving repetitive bearing damages in specific positions within a client's applications.
- For a better understanding on how certain environmental factors influence the bearings performance.

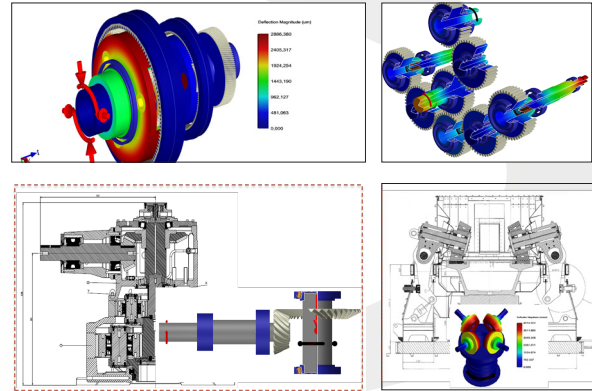


FOR GEARBOXES, DRIVELINES AND VARIOUS OTHER APPLICATIONS

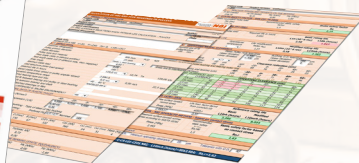
Innovative solutions

Strategic partnership with Romax. Working very closely with the development team of Romax to improve and add new features. Currently, NBI has 6 licenses.

Using state-of-the-art computer analysis tools, NBI is capable of running accurate computer simulations of customer's application and perform a complex analysis of the bearing system.



**NBI's
PROPRIETARY
SOFTWARE**



ADVANCED BEARING-ROPE SHEAVES CALCULATION SYSTEM

Considering design & operational factors, such as sheave material & geometry, rope load, wrap and fleet angles and working temperature.

NBI can calculate

Lifetime rating based on ISO/TS 16281.

Static safety factor based on loads and contact stress.

Operating radial clearance due to the interference produced by bearing with sheave and bushing.

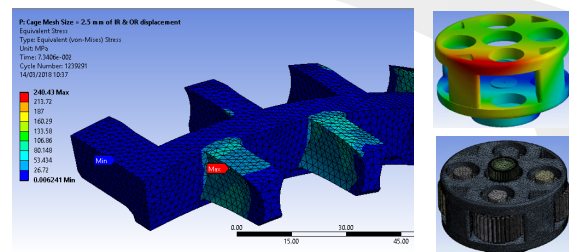
Contact stress between bearing and sheave.



FINITE ELEMENT ANALYSIS

Advanced modelling and simulation

Calculations account for the impact of all operating conditions, bearings micro-geometry, and environmental factors such as non asymmetric housings or shafts or other flexible components, for the most accurate results.



Homologation process

NBI goes through bearing selection, homologation and validation processes together with the customer's technical team.

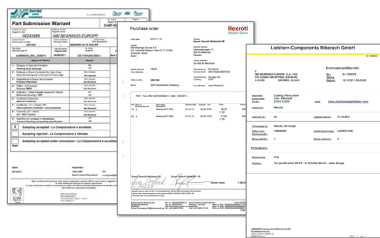
- Feasibility evaluation, risk assessments, FMEA.
- Bearing performance analysis & solution validation under the customer's specific application working conditions.
- Bearing drawings and features discussion.
- Definition of the certification process and the documentation related to new solutions and product development per industry standards, considering customer scope (detailed homologation documentation, sample test, field test, plant audit...)



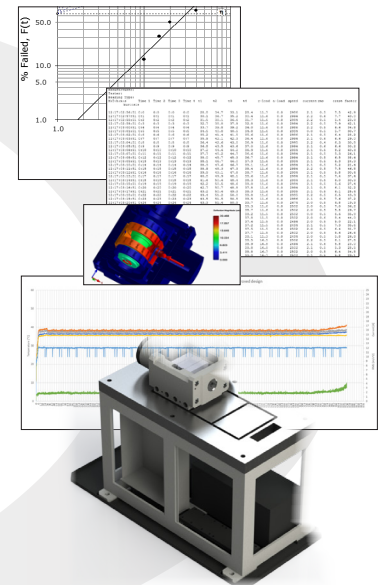
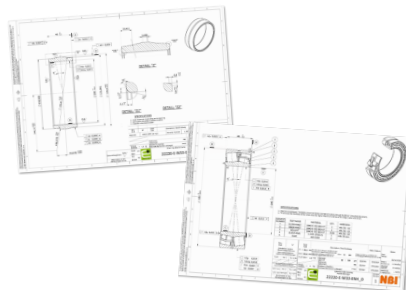
Material sample test report



Dimensional sample test report



Approval certificates



Bearing life test

Technical trainings and seminars

NBI's team offers a full-range of training options encompassing every aspect of bearings' technology to all levels of audiences: engineering, designing, maintenance teams, mounting staff or any others.

NBI's application engineering team is devoted to share its knowledge and expertise with everyone is interested in finding out more about bearings.

- Bearing basics: types, features, selection principles, enhancements.
- Bearing life & performance optimization.
- Bearing arrangement and mounting concepts.
- Best practices in bearings operation and maintenance:
 - Lubrication.
 - Installation and removal.
 - Bearing damage analysis.
- And any other technical topics tailored to each customer's needs.

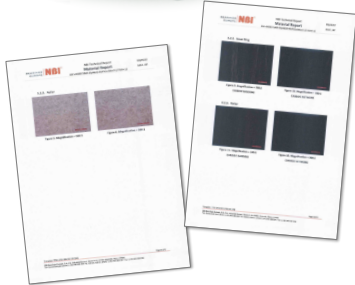
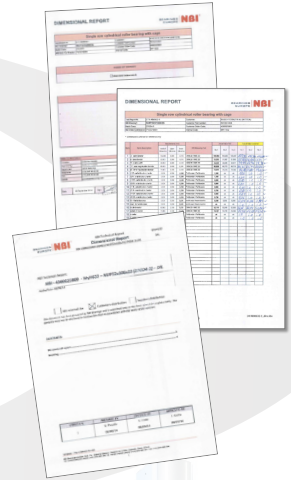
For industries such as oil & gas, cement & aggregates, power transmission, power generation, heavy lifting, steel, among others.



In-house metallographic, metrology and other tests laboratories equipped with the latest technology. Strategic partnership with some of the most advanced Spanish technological centers: CEIT and Tekniker BRTA. These fully equipped laboratories are shared by the application engineering, design, R&D and manufacturing teams.

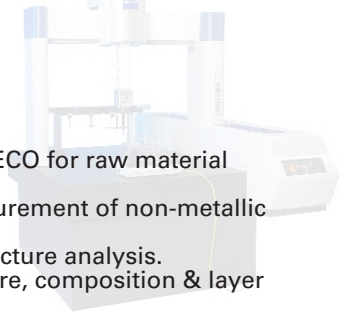
Metrology laboratory

- Conditioned quality room equipped with temperature and humidity control systems.
- ZEISS coordinate measurement machine 3D for rings, cages, rolling elements and models.
- Taylor Hobson roundness testers for small and large rings as well as for harmonics.
- Taylor Hobson profilometer-roughness testers for small and large bearings.
- Optical comparator to measure contour form.
- Trimos high precision calibration system for creating own masterpieces and in-house calibration of measurement devices.



Metallographic laboratory

- Spectrometer and elementary inorganic analyzers LECO for raw material composition.
- Inverted optical brightfield microscope for the measurement of non-metallic inclusions, carbides, grain size and microstructure.
- Scanning electron microscope for fracture & substructure analysis.
- Focus Ion Beam (FIB) equipment for material structure, composition & layer thickness analysis.
- Hardness tester for HRB, HRC & HV.
- X-ray fluorescence measuring system for zinc coating thickness measurement.
- Magnetic particle test bench for detecting superficial and sub-superficial cracks.
- Submerged ultrasonic bearing automatic inspection for internal defects.
- Nital etching for grinding burns inspection.
- X-ray diffractometer for the detection of stresses and retained austenite content.
- Dilatometer for thermal stabilization & simulation of heat treatments.



Other tests laboratory

- Accelerated bearing life testers for small and medium sizes.
- Equipment to measure and evaluate capacities and behavior of different sealing systems for bearings.
- Tailor-made machine to test adherence between fabric and steel.
- Salt fog chamber for evaluating different advanced anti-corrosion coatings performance.
- Virtual tool for bearing performance analysis.



NBI has developed a proprietary software, **E+desoft** to design CRB, SRB and TRB series.

NBI is continuously working on improving internal standards, internal design and analyzing alternative design configurations. The aim is to achieve maximum load capacity and thus to prolong the bearing life.

Strategic partnership with some of the most advanced Spanish technological centers: CEIT and Tekniker BRTA.



NBI's raw material standards & NBI's dimensions and tolerance standards

- International bearing and steel standards.
- Technical and scientific researches.
- Application engineering team's findings.
- Clients' application specific requirements or feedback.
- Accumulated knowledge based on experience, internal developments and analysis.
- Findings obtained from tribology projects.
- Benchmarking.
- Cooperation with suppliers of raw material and bearing components.
- Cooperation with heat treatment, grinder and hard turning equipment suppliers.
- Models 3D + finite elements: E+asyc, Romax and Ansys.

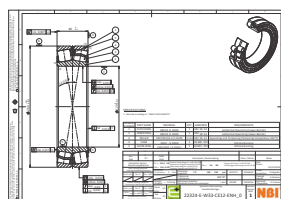


NBI's internal design and analysis

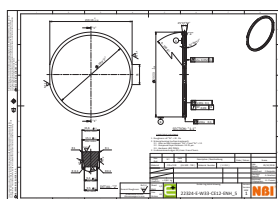
- Clients' application specific requirements.
- Application engineering and design teams' findings and accumulated experience.
- Different configuration alternatives obtained by E+desoft.
- Simulations to define the best configuration: E+asyc, Romax and Ansys.
- Define the most suitable heat treatment and choose optimum steel type.
- Define when needed the most suitable surface coating.
- Choose when needed the optimal grease.
- The tailor-made best solution to suit client's needs.



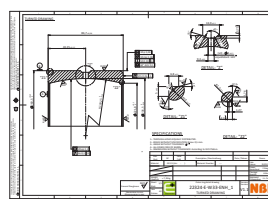
NBI's components manufacturing drawings and specifications



Assembly drawing

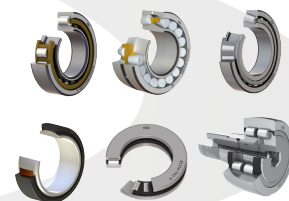


Component drawing



Manufacturing drawing

Prototypes



Validation process



- Define field test parameters in cooperation with the client or based on own application engineering and design teams' accumulated experience.
- Define test type and conditions for validation: life test, vibration test, salt test or any other specific test.
- Verification by a proprietary virtual tool for bearing performance (E+vitope).

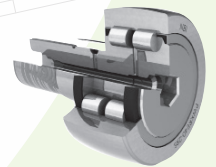
Launch to the market



ENHANCED+: new bearing line

NBI combines experience in designing and producing bearings with the latest technology in material research and manufacturing technology to create a new bearing line with superior benefits:

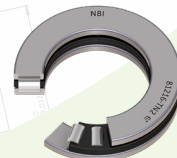
- Improved dynamic load capacity and consequently, longer operating time.
- Reduced friction and lower operating temperature.
- Downsizing possibility.
- Lower overall costs.



Cam Follower (CF)



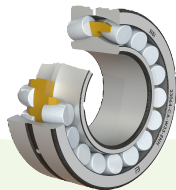
Spherical Plain Bearing (SPB)



Cylindrical Roller Thrust Bearing (CRTB)



Taper Roller Bearing (TRB)



Spherical Roller Bearing (SRB)



Cylindrical Roller Bearing (CRB)

NBI's design capacity has been backed by market feedback regarding the CRB Enhanced+ bearing line. The last milestone achieved by NBI has been **ENHANCED+ SRB**.

Premium steel and improved heat treatment

Achieving an optimized microstructure and hardness uniformity on the functional section by:

- Selecting of through hardening steel type according to the rings' and rollers' thickness.
- Restricting chemical composition to closely control inclusions size and quantity.
- Narrowing carbides threshold.
- Optimizing heat treatment.

Benefits: improves bearing performance for shock loads, provides a better resistance to debris contamination and prolongs bearing life.

Manufacturing tighter internal tolerances

Reduced and controlled internal geometry tolerances optimize the components' guidance and reduce friction and wear.

Benefits: cooler run reduces noise and vibrations.

Improved surface finishes

Superfinishing of the rollers and inner race generates constant surface features, favorable lubricant distribution and lube film. The enhanced grinding of the outer race optimizes the rollers' traction and reduces the rollers' skewing tendency in intense dynamic application conditions.

Benefits: reduces friction and prolongs bearing life.



Heavy-duty, maximum capacity design

Optimized internal design (number of rollers, roller length and diameter) increases the contact surface area and improves the capacity to carry loads.

Benefits: improves bearing performance for high loads.

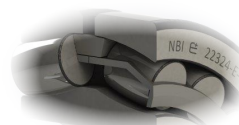
Optimized oscillation ratios

Improved contact lowers the torque, assures an optimal load distribution, reduces stress concentrations and the rollers' skewing tendency.

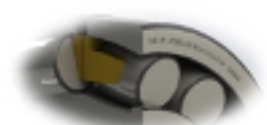
Benefits: minimizes wear, improves bearing performance for high loads and prolongs bearing life.

Different cage designs

Cage constructions from brass or steel, guided on rollers, inner ring or outer ring in order to fulfill different application conditions.



Steel cage benefits: lightweight, high stiffness and impact resilience. Nitriding treatment **benefits:** superior toughness and wear resistance.



Brass cage with optimized pocket design benefits: better guidance of rollers out of load zone, reduced friction with rollers and improved lubricant flow.

Quality of raw material is one of the most critical factors to ensure an enhanced bearing life.

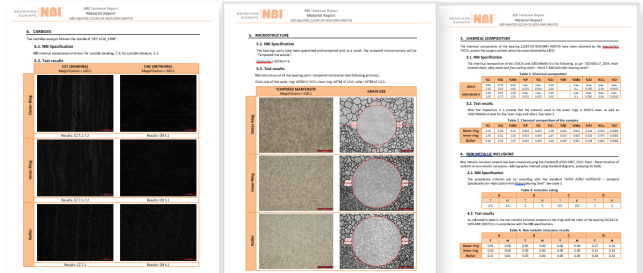
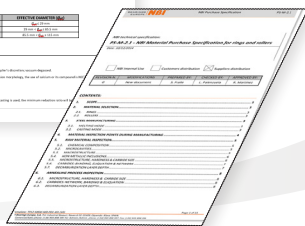
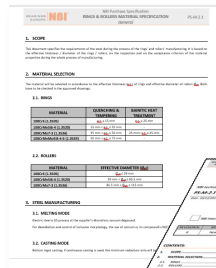
NBI improves rolling contact fatigue life with:

- Enhanced cleanliness. Inclusions size and quantity closely controlled by restricting the chemical composition. Narrower carbides threshold.
- Selection of through hardening steel type according to the rings' and rollers' thickness and improved heat treatment to achieve a better microstructure and hardness uniformity on the functional section.

NBI approaches this critical issue with a very experienced own team, working in close cooperation with some of the best Spanish technological centers. With the aim of developing and defining:

Raw material standards

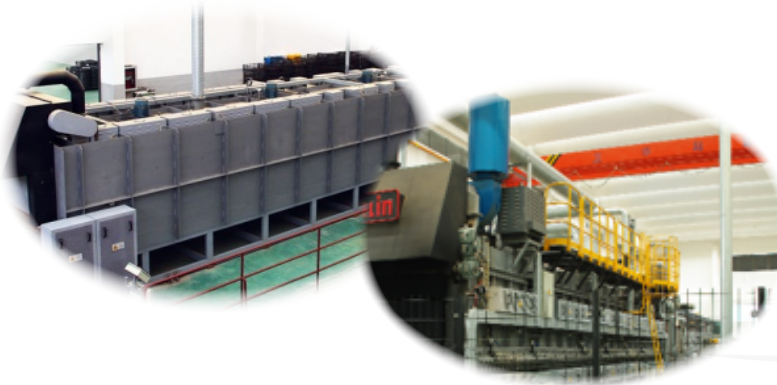
Steel, brass, polyamide, and others.



Quality control inspection procedure throughout the whole bearing manufacturing process

Purchase of steel, rings' and rollers' forging, annealing and heat treatment, cages' surface coating.

TYPE OF INSPECTION	
RAW MATERIAL	Chemical Composition
	Macrostructure
	Non metallic inclusions
	Microcavity
	Microstructure, Hardness (HRB / HBW) & Carbide size
AFTER ANNEALING	Carbides: network, banding & eliquation
	Decarburization layer depth
	Microstructure, Hardness (HRB / HBW) & Carbide size
AFTER HEAT TREATMENT	Carbides: network & banding
	Decarburization layer depth
	Quenching & tempering
	Microstructure
	Hardness (HRC / HV)
	Bainitic heat treatment
	Microstructure
	Hardness (HRC / HV)
	Carbides Network
	Decarburization layer depth



The latest state-of-the-art heat treatment technology and equipment

NBI is equipped with an Aichelin salt heat treatment furnace in the Chinese factory. NBI plans to install a heat treatment line in its Indian bearing plant and in its Spanish plant.

The most advanced heat treatment recipes according to each specific application requirements.

- **Martensitic hardening:** high hardness.
- **Bainitic hardening:** strength to resist fracture and absorb shocks.
- **Case hardening:** can endure heavy shocks loads.

Surface coating standards according to each specific application requirements

- **Zinc coating:** to minimize corrosion.
- **Black oxide:** for running-in and under poor lubrication.
- **Hard chromium:** to resist corrosion, wear and friction.
- **PTFE:** for starting up and to reduce stick-slip phenomenon.
- **DLC:** for high mechanical strength, reduced wear and optimal friction properties.
- **Nitriding / Nitrocarburizing:** increases the resistance against fatigue, wear and corrosion.



The most suitable equipment for NBI's metallographic laboratory

Each factory has its own fully equipped laboratory.



Investment up to now of 10 million euros.

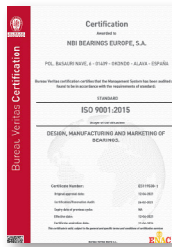
2.500 m² surface for manufacturing (total area 8.500 m²).

Equipped with the latest European technology, that allows to achieve high-precision bearings.

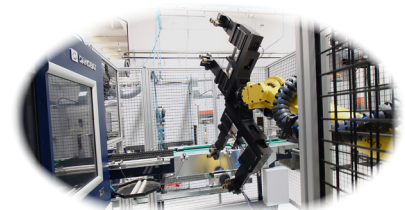
Team formed of managers and operators with many years of experience in bearing production.

In-house metallographic, metrology and other tests laboratories equipped with the latest technology.

Long-term investment plan in place 6m€ to reach 1 meter OD bearing.



Certified with: ISO 9001:2015



Robotized grinding lines



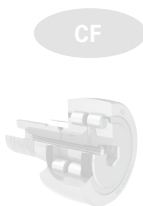
General view manufacturing plant



CNC grinding line



CRTB



CF



CRB



SRB



TRB



SPB

Current capacity (mm)
Inner diameter 80 ÷ 240
Outer diameter 100 ÷ 400

Incoming capacity (mm)
Inner diameter 240 -700
Outer diameter 400 ÷ 1.000



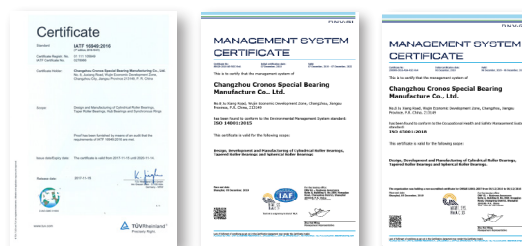
Investment up to 40m€

25.000 m2 surface for manufacturing (total area 35.000 m2)

Latest technology to achieve high-precision bearings equipped with an Aichelin through hardening line and case carburizing line for multi row roller bearings
Fully automatic roller production plant (CR, SR)



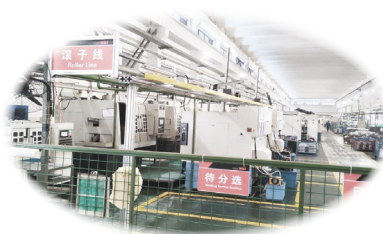
Large sizes grinding line



Certified with: IATF 16949:2016. TÜV,
ISO 14001:2015. DNV and ISO 45001:2018. DNV



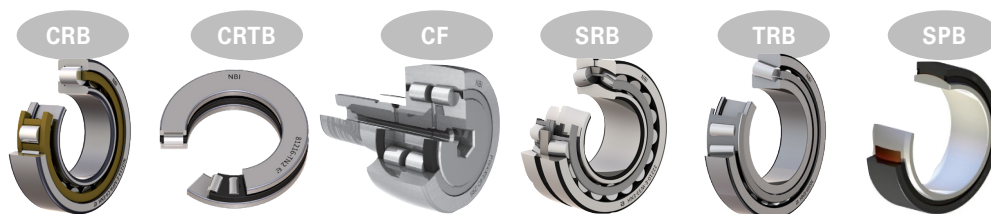
CRB small sizes grinding line



CRB medium sizes grinding line



Roller production workshop (CR, SR)



Current capacity (mm)
Inner diameter 15 ÷ 1.400
Outer diameter 30 ÷ 1.600
Specialized in CRB and TRB



Current Factory

Investment up to 10m€

- 3.000 m² surface for manufacturing
- 2 bearings grinding lines
- SR roller grinding lines
- Steel cages production line



Proposed Layout



Factory under construction

In 2025:

- Committed investment 6m€
- 10.000 m² new plant
- under construction
- New grinding line (Planetary bearings)
- Heat treatment line



Certified with: ISO 9001:2015. TÜV



Automatic CRB-TRB grinding line



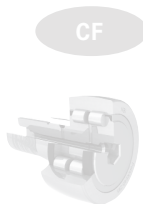
SRB grinding line



Laboratories



CRTB



CF



CRB



SRB



TRB



SPB

Current capacity (mm)

SRB-TRB
Inner diameter 40 ÷ 125
Outer diameter 100 ÷ 210

CRB

Inner diameter 40 ÷ 125
Outer diameter 100 ÷ 210

Incoming capacity (mm)

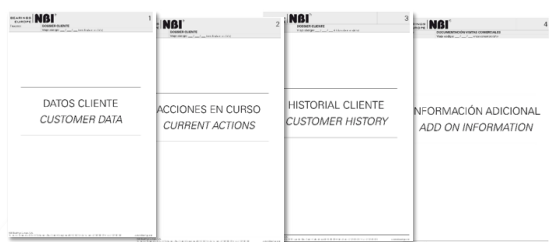
Planetary bearings
Inner diameter 25 ÷ 90
Outer diameter 60 ÷ 140

SRB

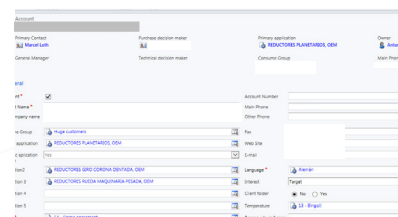
Inner diameter 120 ÷ 200
Outer diameter < 500

Team formed by 30 people, a combination of Key Account Managers (KAM) and Customer Service (CS). Focused on and fully dedicated to satisfy customer's needs.

- A team of two people assigned to each customer for a better understanding of their needs and to make communication easier. One KAM / one CS (speaking customer's language fluently).
- Very close team regularly visiting and phoning to maintain a fluent and direct personal relation with the customer's purchase team.
 - To keep offers, orders, deliveries and frame agreements updated.
 - To take care of each account and provide a quick response. Flexibility to adapt as much as possible to each customer's needs.
- NBI's newsletters to keep clients updated.
- Each client's information is centralized and easily accessible in CRM of NBI. Very systematic business method.



Customer file



CRM

Sales offices locations

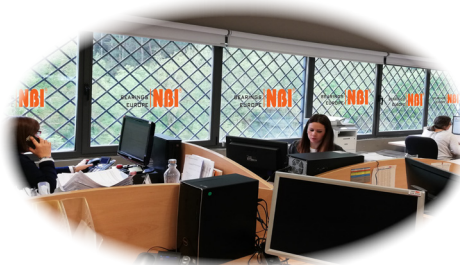
NBI's team is present around the world in order to attend client's queries and propose solutions in the quickest and most efficient manner. NBI's sales offices, together with its dealers' network, are ready to provide an outstanding personalized service no matter where the client is located.



Ahmedab (India)



Brasil



Oquendo (Spain)



Bucharest (Romania)



Wujin (China)

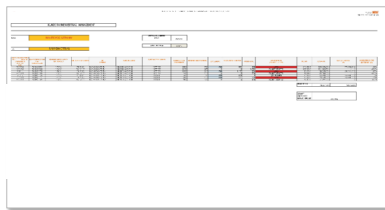
NBI proposes a commercial relationship based on frame agreements. It is a win-win flexible contract based on annual demands and commitments.

NBI's compromises

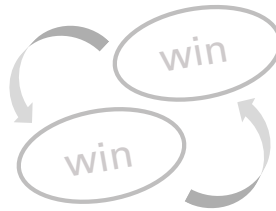
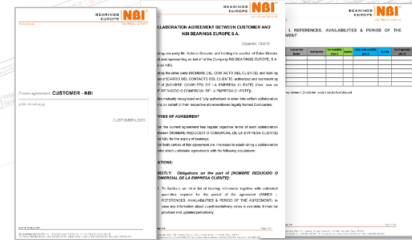
- Maintain a percentage of the agreed contract quantity as safety stock to satisfy unexpected demands.
- Provide price stability during the period of the agreement.
- Update every month information about orders evolution, delivery commitments and real consumes.
- Better adaptation to future deliveries (based on an initial estimation and adjusted by real figures).

Client's compromises

- Consume the quantities of the references to which the customer committed to in the period of the agreement.
- Provide a visibility of the next 3 months' confirmed deliveries.
- Update every month's estimations for the incoming 6 months to be able to react accordingly.



Frame agreement follow-up report

Frame agreement template

Multi-location distribution centers

- Clear understanding that NBI is a consolidator of its clients' stocks.
- Warehouse in Europe (Spain), India (Ahmedabad) and China (Wujin) to better attend region to region demands.



Oquendo (Spain)

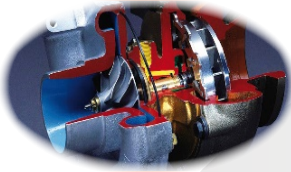


Wujin (China)



Ahmedabad (India)

NBI's extensive experience and in-depth knowledge in a wide range of applications has positioned it as the optimum solution for many leading machinery manufacturers.



OEM

- Heavy lifting & material handling
- Gearboxes & drives
- Wind power
- Railway
- Oil & gas
- Construction equipment
- Compressors & pumps
- Agricultural machinery
- Axles & transmissions
- Tube & wire
- Mechanical presses
- Hydraulics
- Aggregate machinery
- Paper machinery
- Mining machinery
- Steel industry equipment

MRO

- Mining
- Steel
- Sugar
- Aggregate & quarrying
- Pulp & paper equipment
- Energy



Distributors

Vision

Develop a solid group of companies focused on the **design, manufacturing and marketing of precision bearings and high value-added technical products that are especially aimed at industrial sectors.**

With a value proposition recognized by our clients and supported by the following pillars:

- **Extraordinary customer service.** Fulfill our quality commitments and delivery deadlines with close attention.
- **Continuous innovation** focused on own product design.
- **Pre-sales & after-sales** technical service as a differentiating element.
- **Supply chain** based on close and long-term relationships and **mutual trust.**
- **Operational excellence** focused on doing more with less.

Focused on achieving:

- **Satisfaction of our clients,** gain their trust and loyalty through multi-year agreements, and consequently achieve a win-win relationship.
- **Persons committed** and proud of working at NBI.
Own Culture and values.
- **Satisfied shareholders,** generating sustainable profitability in the medium-term always with absolute transparency.



gruponbi.com

Central Office: Pol. Industrial Basauri nave 25 - 01409 Oquendo (Álava) Spain.- Phone: (+34) 945 898 397

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NUR ZUR INFORMATION

NBI CUSTOMER
DRAWINGS
ZEICHNUNG
FÜR KUNDEN

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ÄNDERUNGEN NICHT AUSGETAUSCHT