The Original

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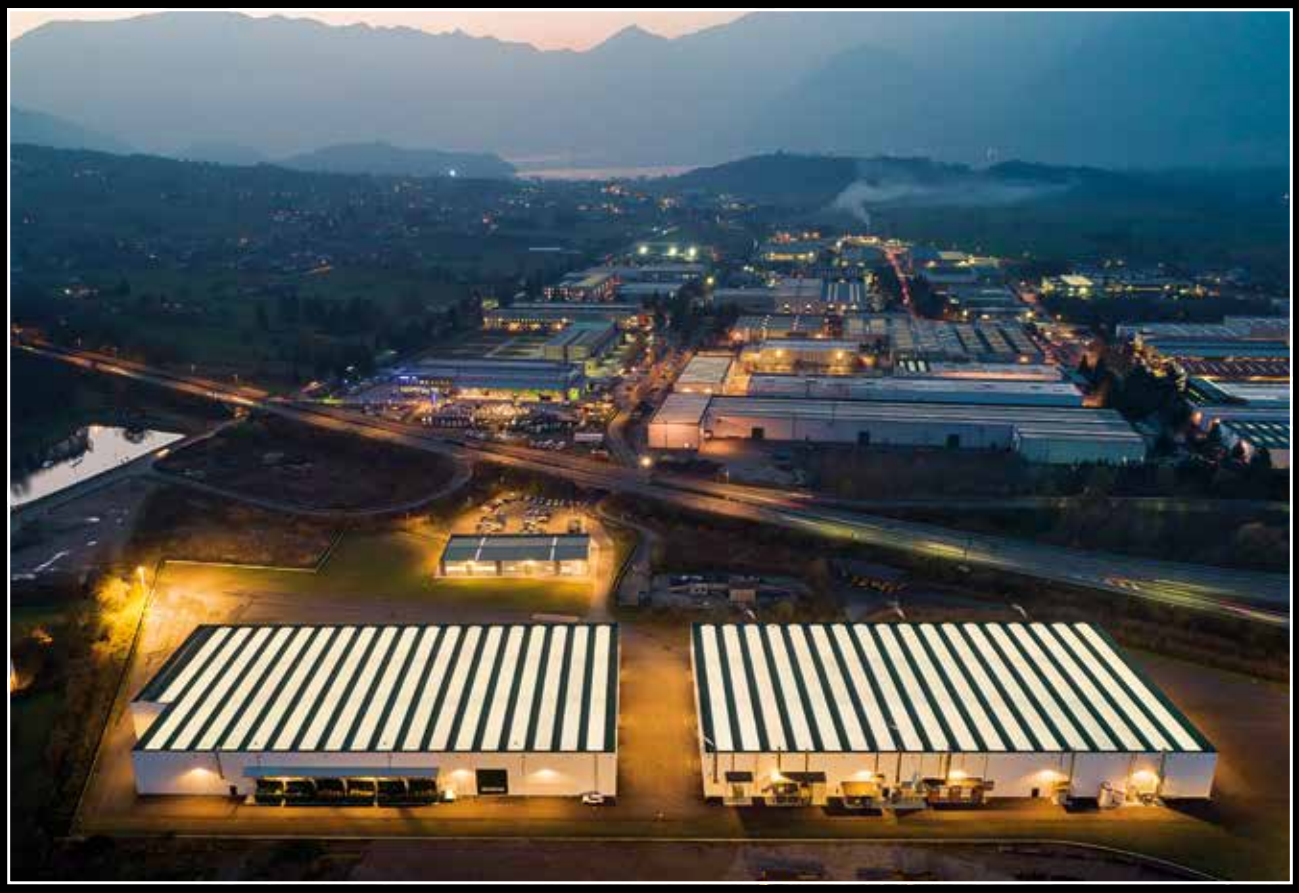
TECH FORGED PRODUCTS



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Contents

Bearing Applications

Galperti Tech Forged Products is a subsidiary of Galperti Group. Galperti Group has successfully operated for many years in the petrochemical and energy industries. Galperti Tech Forged Products manufactures large diameter ball and roller bearings utilized in many applications such as:

Deck cranes

Wind turbines

Harbor cranes

Solar generators

Forest machines

Chain making machines

Stacker reclaimers

Arctic loading towers

Bucket wheels

Aerial platforms

Shiploader

Concrete pump

Crawler crane

Gangway

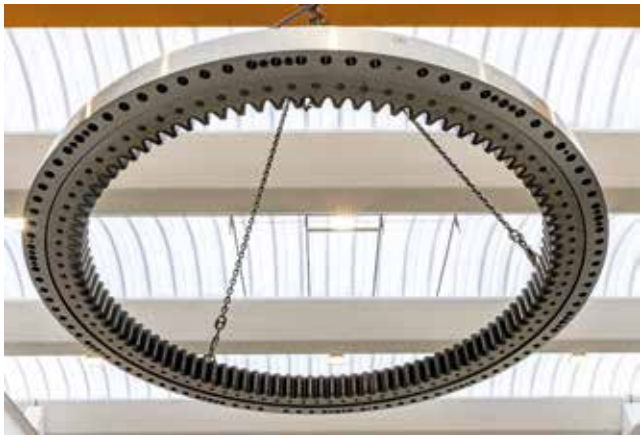
Swivel joint

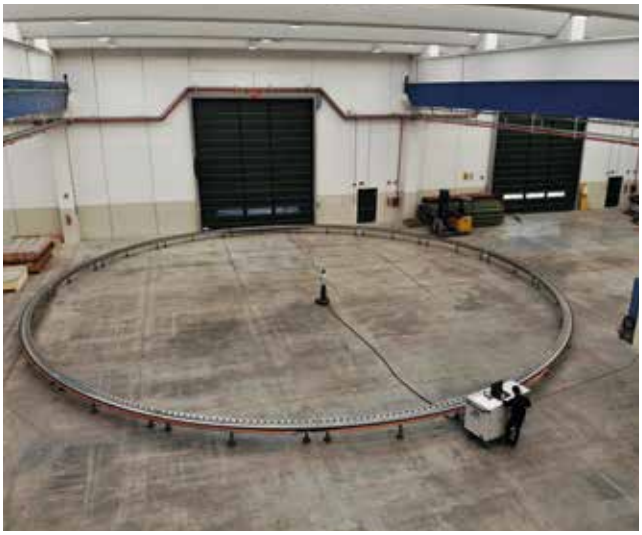
- Access platforms
- Antennas
- Amusement rides
- Bogie bearing for vehicles
- Boom conveyor
- Bottle filling machines
- Bridge cranes
- Canning and bottling machines
- Crane-hook rotators
- Concrete pumps
- Deck cranes
- Deck winches
- Defense applications
- Dragline
- Earth-drilling machines
- Excavators
- Floating cranes
- Forklift equipment
- Harbor cranes
- Ladle cars
- Manipulators
- Mobile cranes
- Moorings
- Offshore cranes
- Packaging machines
- Plastic film extruders and winders
- Railway cranes
- Rotable trolleys
- Reclaimers
- Robots
- Scrapers
- Shiploaders/-unloaders
- Shipyard cranes
- Swivel
- Stackers
- Steel mill equipment
- Tower cranes
- Tunnel boring machines
- Turntables
- Water treatment
- Welding positioners
- Etc.

Product and Processes Information

Galperti Tech Forged Products manufactures excellence in large diameter slew bearings. Excellence is met using state of the art design, manufacturing and testing methods, maximizing the value of the experienced senior engineers' knowledge and the most reliable calculation methods. Design verification is performed with the newest CAD/CAM design tools and FEA analysis programs. A fully integrated server based computerized system allows manufacturing control on all manufacturing phases, supply chain survey and project management.

Different applications and requirements ask customized solutions for slew bearings. This means different rolling bodies' sizes and types and their combination, different rolling bodies' races paths and design. Inner or outer gears, no gear, may be required as well. Galperti Tech Forged Products manufacturing capability to manufacture slew bearings with the mentioned customized solutions dimensionally ranges from 250 mm minimum to 6.200 mm maximum outer diameter.





Segmented gear ring

Female pinion

Male pinion

Linear rack single side tooth

Linear rack dual side tooth

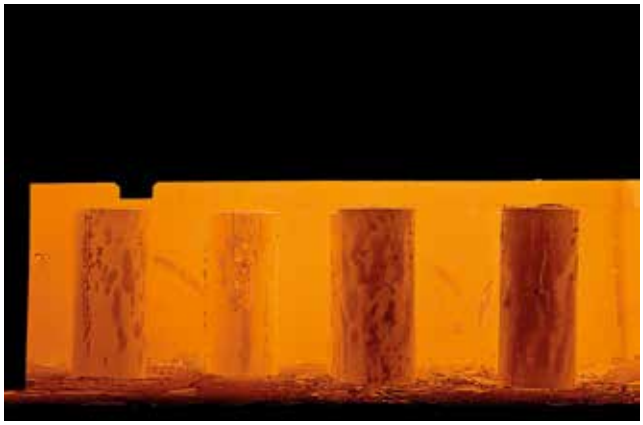
Manufacturing Process

Galperti Tech Forged Products benefits largely being a subsidiary of Galperti Group. This means that a vertical integrated process allows in house processes of manufacturing with full control sourcing only the steel heats or ingots from selected European Steel Mills, plus consumables

Forging Process

Material sourcing

Steel cutting



Heating

Handling

Open dye press

Rolling

Heat Treating Process

Furnace heating and water or polymer quenching

Forged rings ready for machining

Material Certifications

Certain application as, for instance Marine Applications may require stricter certification of the product, including material certification of tensile strength and impact test values performed on specimen taken from the rolled and heat treated rings, with witnessing inspectors of Certification Bodies, e.g. Lloyds Register, DNV, BV, TüV, API, etc. Galperti Group Laboratory can perform characterization tests on materials.

Tensile test

Charpy Test

Tensile test outcome

Steel grain check

Steel alloy chemistry check

The following certificates and test reports are available on demand:

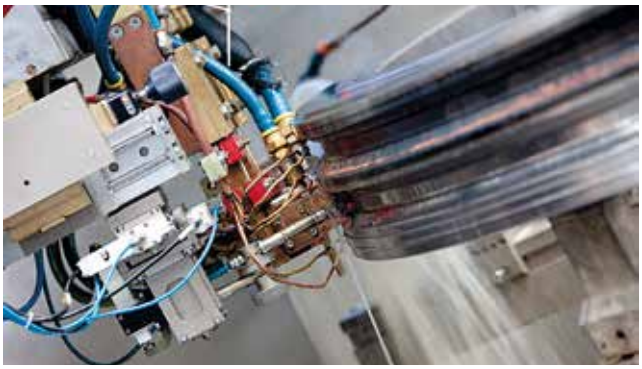
- Ring-Material Certificate: Chemical Composition and Physical Properties certificate of Heat Treatment
- Ultrasonic Test
- Magnetic particle Inspection
- Hardness Test
- Torque Test Record
- Certificate of Compliance: Toleranced dia., Total Height, Position of Holes, Axial Clearance, Radial Clearance, Axial Runout, Radial Runout
- Mechanical Tests on Bearing Rings: Tensile Strength Test, Impact Notch Test.

For further Test Certificate, please refer to Galperti Tech Forged Products Design and Quality Department.

Machining Process

- A slew bearing includes the following main elements:
- Inner ring, shaped in turning operation from a forged ring
- Outer ring, shaped in turning operation from a forged ring
- Drills for grease zercs and lubricant refill
- Integral inner or outer gear cut by gear cutting process
- Drills for fasteners (thru or tapped)
- Drills for filler plug(s) and filler plug(s)
- Balls and/or rollers added during the assembling process
- Polymer based spacers or polymer/metal cages added during the assembling process
- Rubber based sealing systems added during the assembling process

Turning



Induction hardening

Gear cutting

Drilling

Hard turning

Grind finishing

Long products turning

Welding Overlay

Oil and gas and marine applications may require a corrosion resistance weld overlay to protect the structural material of the manufactured parts, due to the extremely aggressive compounds flowing in the pipelines and the relevant accessory parts. In addition, extreme saline contamination may require in the most crucial parts of devices manufactured by Galperti Tech Forged Products, extreme protective barriers. This is the case where superalloys as Inconels or others will be welded by layers on the parts needing this protective coat of material. Proper welding will respect the prescriptions in terms of welding parameters specified by good engineering practice in force for this matter
This critical process is 100% controlled by nondestructive Quality Checks as highlighted in the Para. Quality Verifications (please refer to the relevant Para.)
After the material overlay applied by welding, further machining will remove the excess of material and give the final shape to the relevant area of appliance.

Welding overlays

Welding overlays parts

Welded overlays on chamfer/bewel

Small internal diameter welding overlays

Quality Verifications

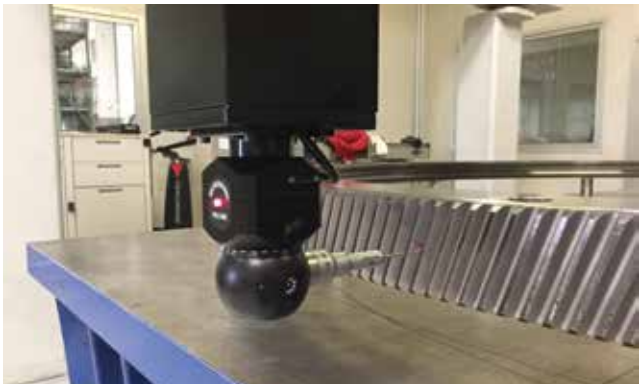
Galperti Tech Forged Products aims to supply by designing and manufacturing, the highest standard of quality parts. To guarantee to the User that this level of Quality is met, it will perform the required Quality Verifications.
The parts will therefore undergo to non-destructive examination at various steps of its manufacturing process. Dedicated personnel of the Quality Department trained and qualified according to ISO 9712 will perform said examinations.
Conventional manual or automatic ultrasonic tests are conducted to check volumetrically the forgings and the weld overlay for integrity and absence of defects. Manual magnetic test examination or automatic magnetic test bench are used to detect superficial/sub-superficial discontinuities at various manufacturing stages. An alternative to magnetic test or for non-ferromagnetic material, manual dye penetrant examination (colour contrast or fluorescent method) can be used for the same purpose. Portable hardness test equipment, UT instrument for the hardness depth determination, instruments for coating check and measuring machines are available devices in the plant, dedicated to the controls during all manufacturing steps ensuring high quality products meeting customer requirements.

Ultrasonic material defect test

Ultrasonic induction hardening depth verification

Magnetic particle crack check

Surface hardness test



Dimensional check

Dimensional verification large size

Assembling and Testing

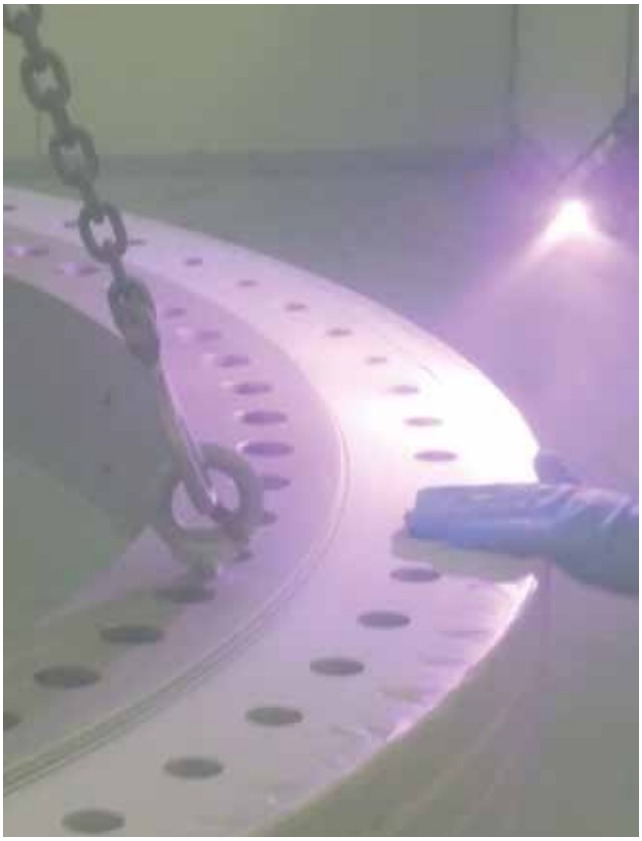
Galperti Tech Forged Products inspects 100% of the manufactured bearing for functionality. If one bearing does not meet the design performance, the Quality Dept. will identify, remove and segregate it. Upon completion of a technical analysis, a technical team will decide to rectify or rebuild the bearing.

Coating & Painting

Zinc coating and paint automatic transfer machine

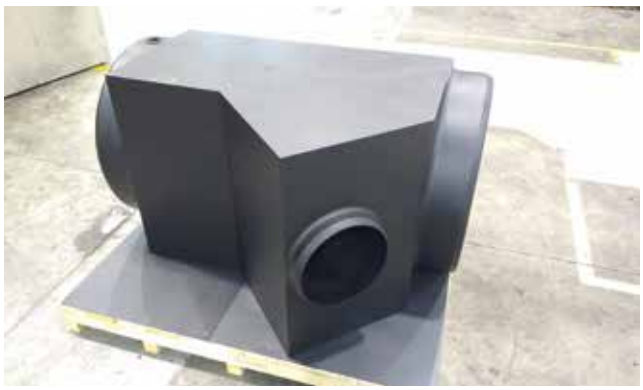
Automatic paint

Automatic zinc coating



Manual zinc coating

Manual paint



Forged Wye rust preventative paint

Packing & Delivering

Packing


Packing

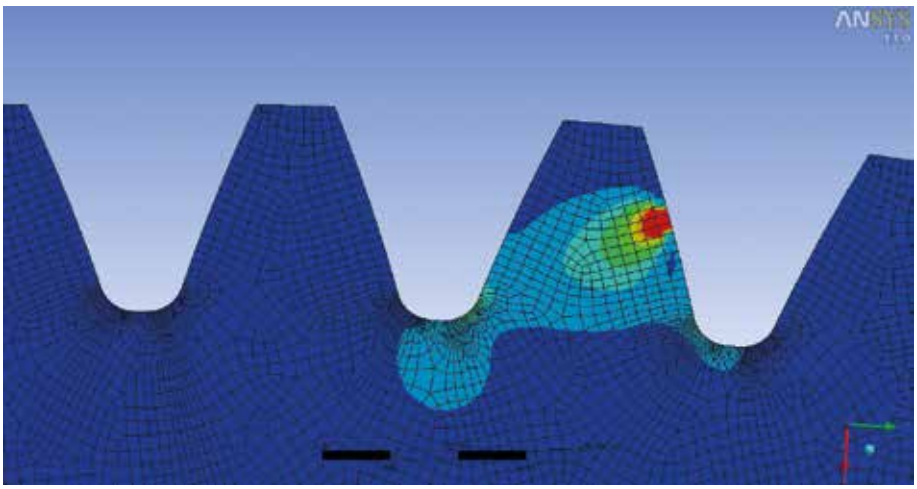

Forged spool packing

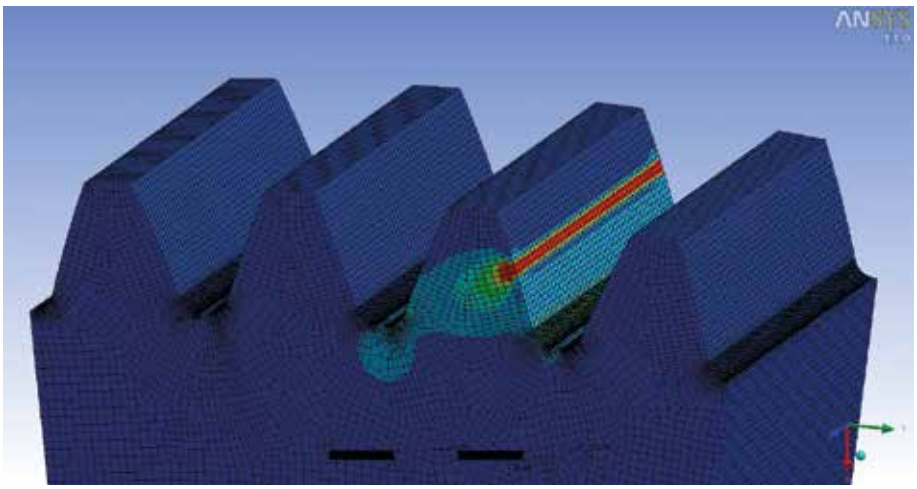

Delivery Area


Delivery

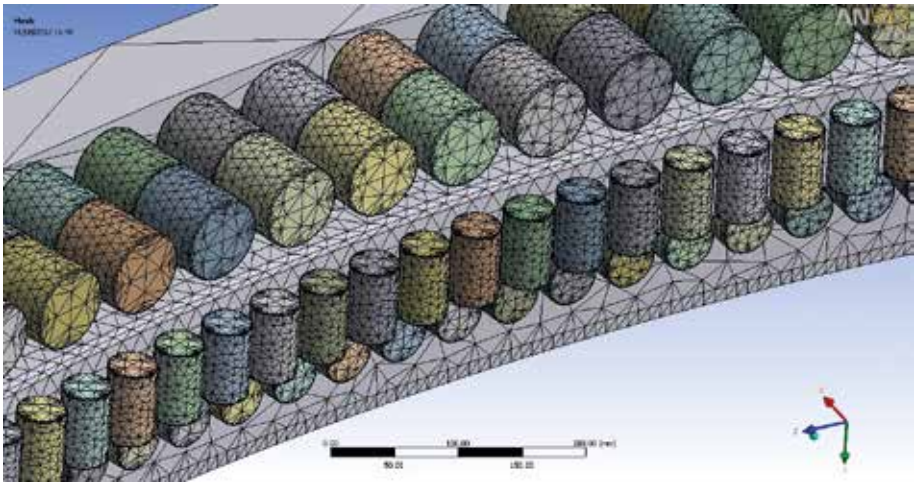
Bearing Design

Galperti Tech Forged Products has internal design capability. Design can be performed on customized existing product or new product. The design phase allows Galperti Tech Forged Products to calculate the performance of each and every slew bearing giving the customer the evidence to that the bearing can keep the requested loads and moments, meet the requested torque value and lifetime. Said calculations apply to the slew bearing ball or roller type raceway and to the teeth of the gear.

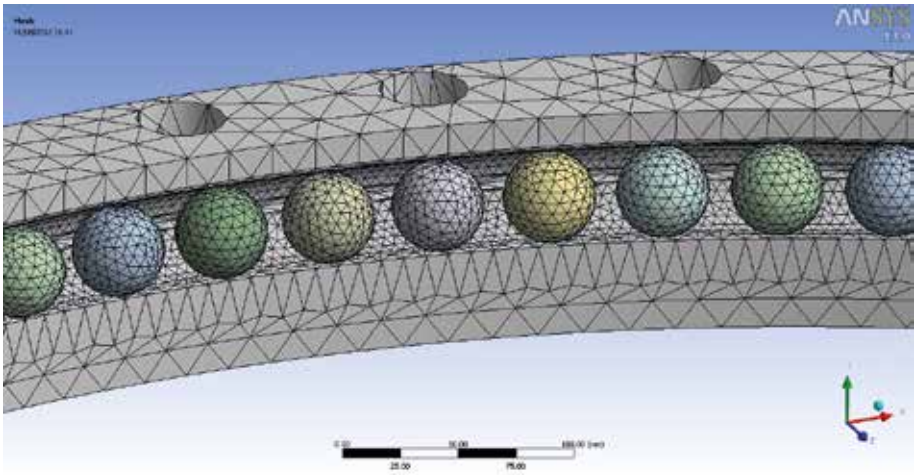


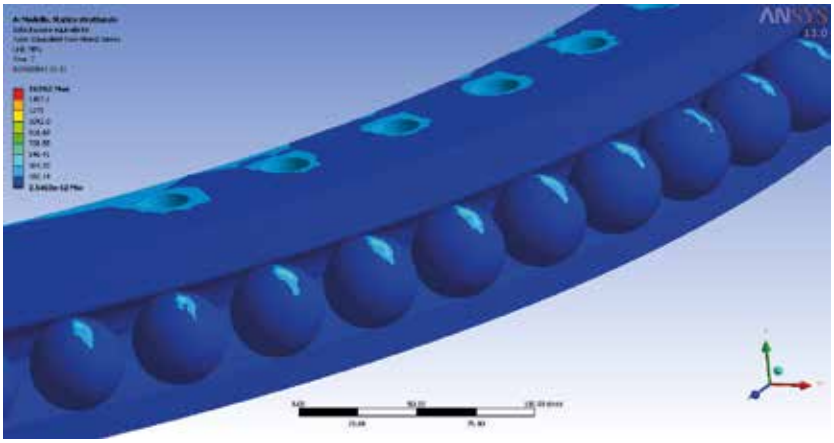


CAD generated drawings illustrate the slew bearing lay-out and summarize the main parameter and information of the slew bearing.
Galperti Tech Forged Products design requires input data to allow proper dimensioning of the mechanical parts and heat treatment processes parameters determination. A Questionnaire is therefore needed to collect all the data the Customer can fill in. Subsequently to the completeness of the supplied data and its level of confidence, Galperti Tech will be able to process the design phase prior to build the slew bearing.
Galperti Tech Forged Products technicians can apply conventional load and stress calculation methods thru empirical formulas.

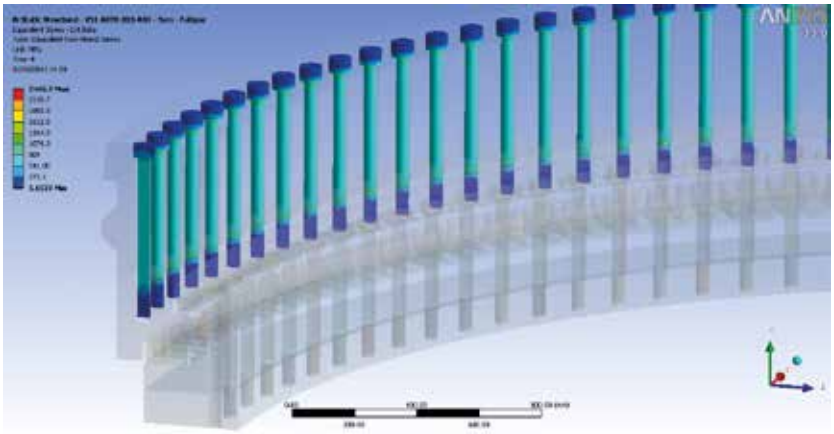


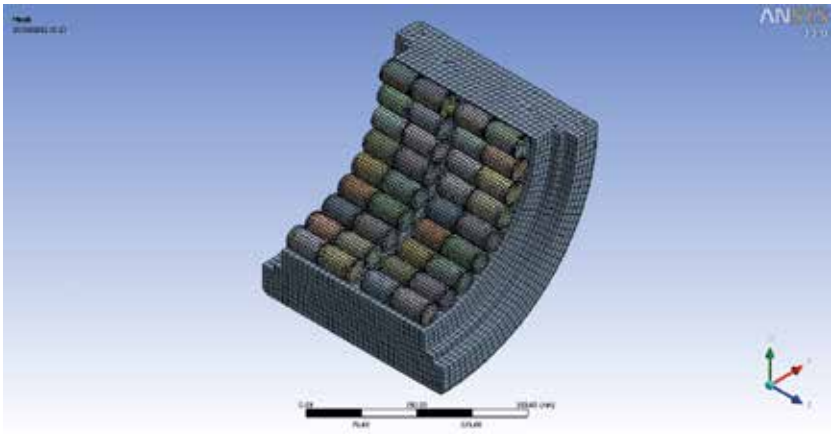
The raceway design determines the load capacity of the slew bearing so that all raceways are induction hardened. Scan induction hardening process leaves a "soft spot" which is where the junction from the induction harden start and stop pattern is. For more information regarding the soft spot topic, please see para. "Hardness Gap" at page 42.

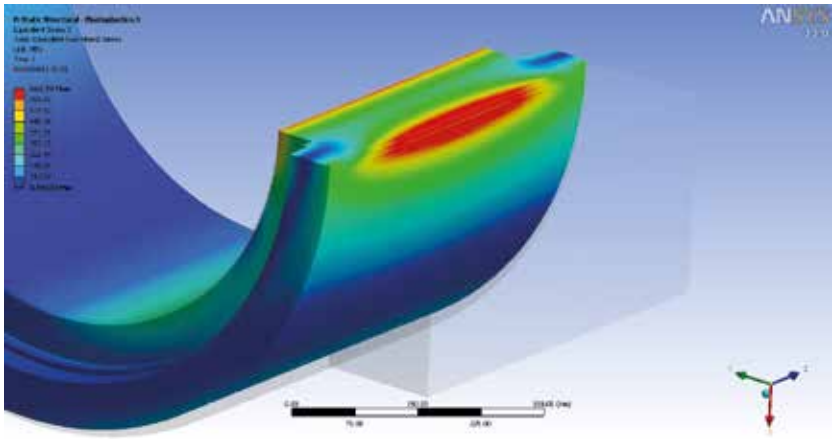


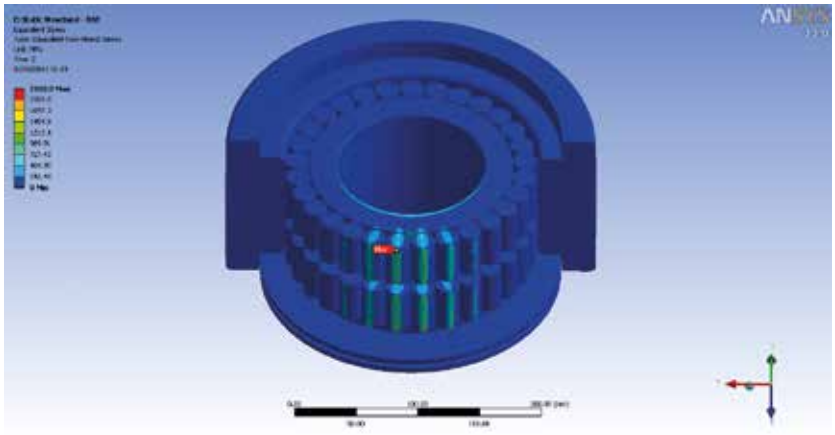


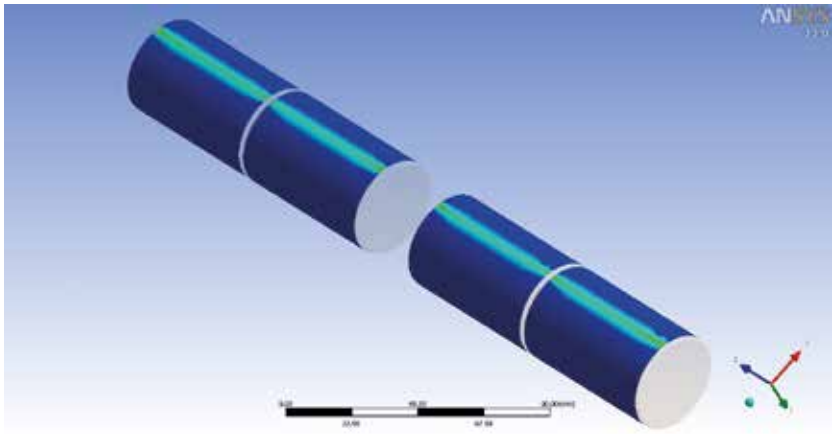
In some circumstances or upon request of the customer specification, Finite Element Analysis can be performed. This occurring, a section or the full 3D model of the slew bearing will be divided by a mesh, boundary conditions will be imposed and the loads or soliciting stresses will be applied.
The FEA calculation will show the stresses and strain response of the slew bearing to the inputed loads in a specific assembly and bolting condition.



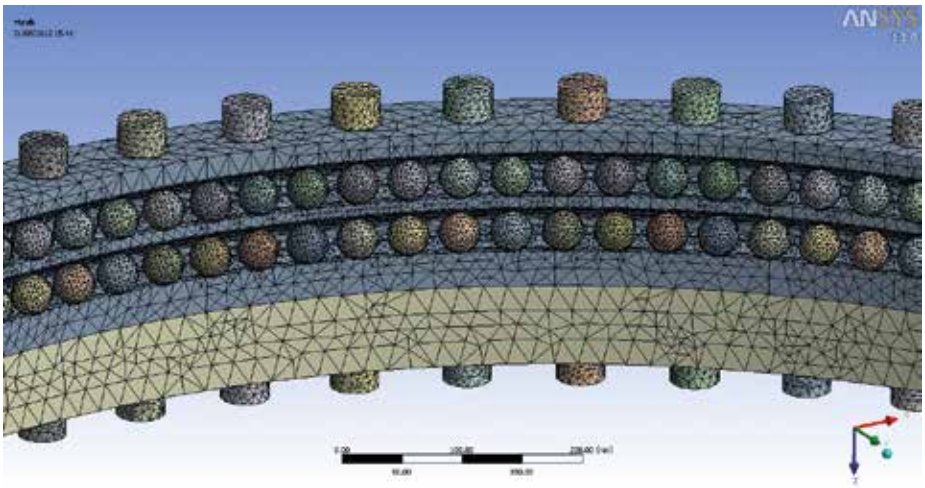


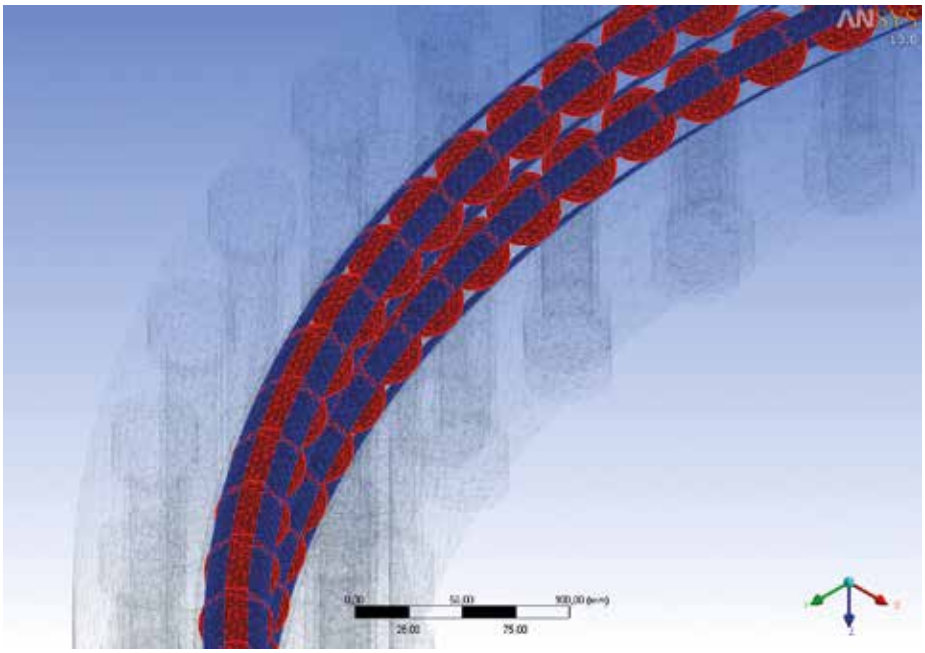






To allow proper design verification, a full set of input data is needed. These can be supplied filling with the requested data the questionnaire you can find in the following page.



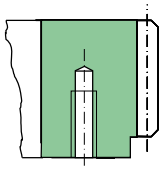


Bearing Types

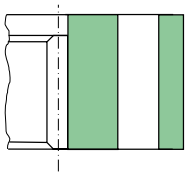
Galperti Tech Forged Products technical capability allows to manufacturing different types and configurations of slew bearings, integral or split type and geared rings, integral or segmented. More types are available or can be custom designed and manufactured on demand. Pinions are in Galperti Tech Forged Products scope either as a stand-alone product or as a matching supply with the previously cited items. Galperti Tech Forged Products mainly manufactured types are the following:

Geared rings

V51.----

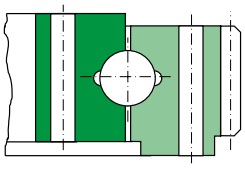


V52.----

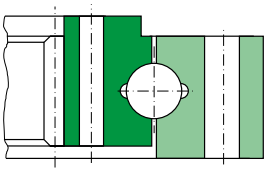


Four-point contact bearings

V41.----



V42.----



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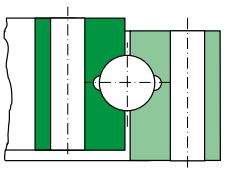
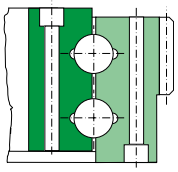


Eight-point contact bearings

V81.----



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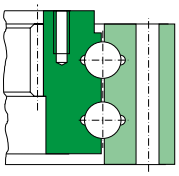
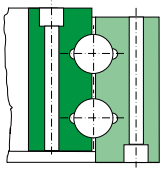
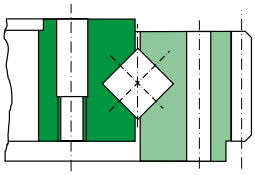


V83.----



Cross-roller bearings

V01.----



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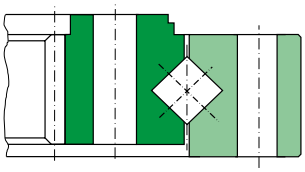
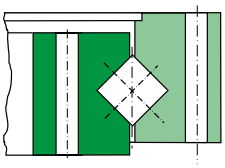
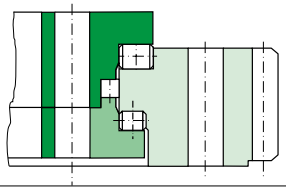


V03.----



3-Row roller bearing

V91.----



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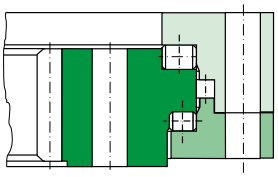

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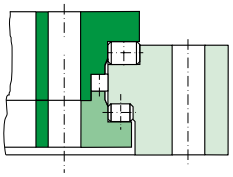
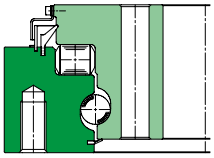


Combined Bearings

V70.----



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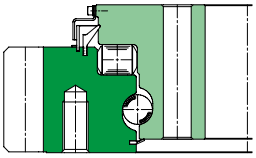

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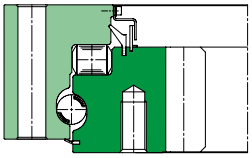
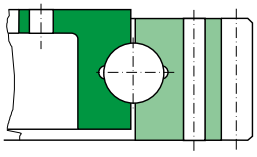


Profile Bearings

V11.----



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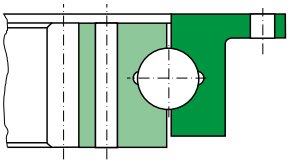
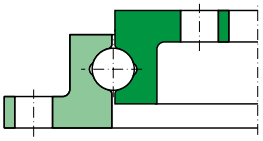


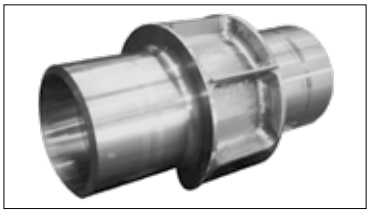
V13.----

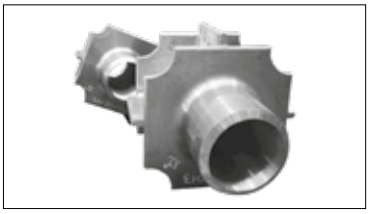


We also design other bearing types for special applications

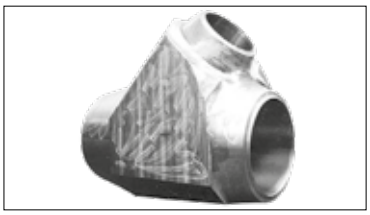
Special Forged Products

Galperti Tech Forged Products strength in Design and its Manufacturing capability empowered by the flexibility of its machining machines and means allows in house design and manufacture of a large variety of forged products, serving a Broad range of market segments as offshore and onshore wind power, oil and gas, steel mill lines accessories and defense.


Connecting Piece


Connecting Piece


Buckle Arrestor

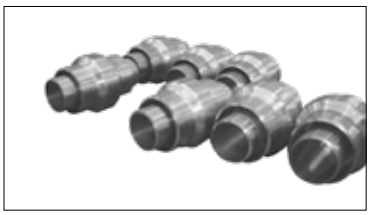

Wye

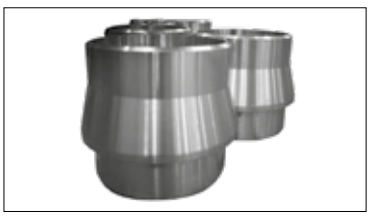

Utility Swivel


Flanged Block

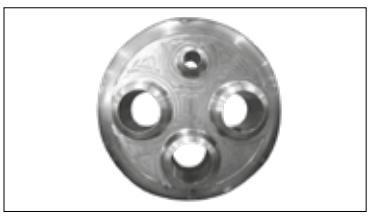

Chain Stopper

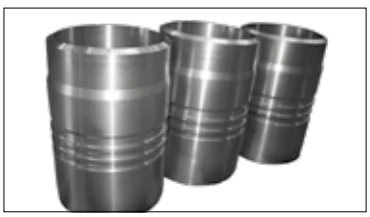

Piping Pipe Groove

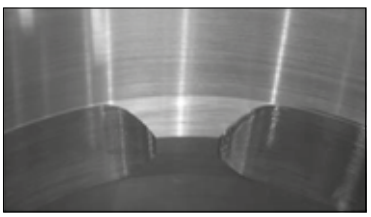

Bulkheads

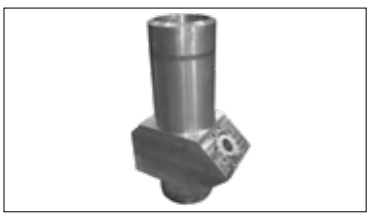

Forged Anchor


Forged Pipes


Multilines Bulkhead


Forged Machined End


Internal Of End Pieces


Spools


Hang Off


Semi Finished Forged Ring


J-Lay Collars


Upper clamp assembly

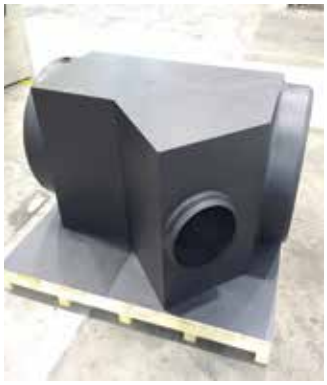

Forged tee


Forged elbows


Forged fittings


Forged tee w pup pieces


End connector


Forged wye


Heat exchanger head


Box


C-head


Forged shafts

Misalignment flange

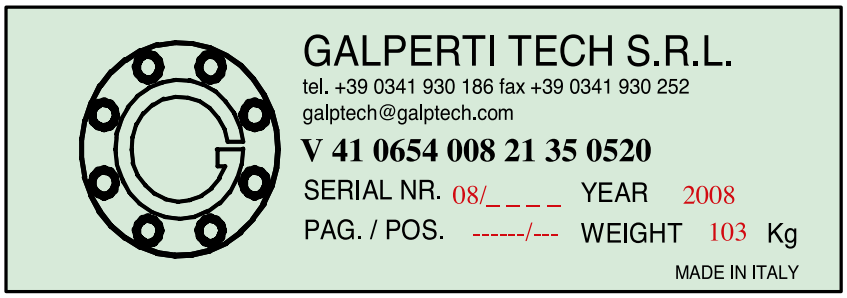
Welding

Spool

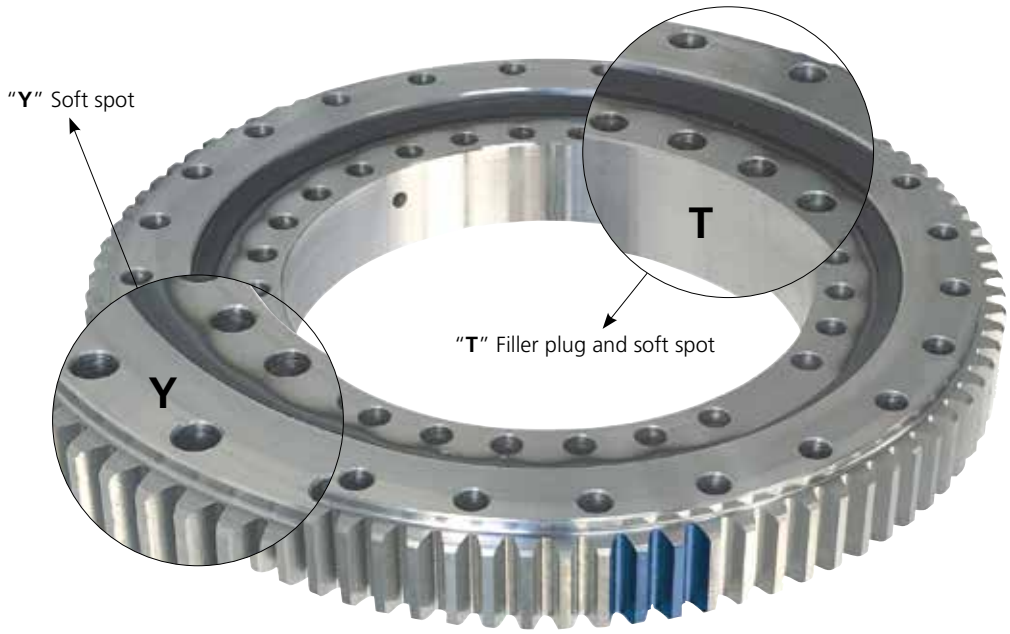
Product Identification

Galperti Tech manufactured slew bearings are all identified with an ID plate. The ID plate is showing the main data that allow to identify each manufactured bearing and keep traceability of the individual bearing through its life.
The ID plate shows:

Bearing type - drawing number
Manufacturing date
Galperti Tech Forged Products job number
Serial number



The drawing number identifies the type of bearing and is a manufacturer code.
The manufacturing date refers to the date of the slew bearing finishing after successful testing.
The serial number identifies the single bearing and includes the batch and year and individual numbering.


"Y" Soft spot
T
"T" Filler plug and soft spot
Y

Drawing Number

All information regarding the slew bearing are in the drawing, so referring to it during all communications keeps the information flow easy and quick, either in the manufacturing or in the service phase of the slew bearing life.
The drawing number coding main details are in the following coding sketch

V4	1	0434	000	0	1	20	0434
PRODUCT FAMILY:	GEAR:	OUTER DIAMETER: [mm]	INDEX:	STATUS:	PLAYS:	ROLLER/BALL DIAMETER: [mm]	ROLLING DIAMETER: [mm]
V0 Roller **V1** Profile **V4** Single row of balls **V5** Geared rim **V7** Combined ball/roller **V8** Dual row of balls **V9** Three rows of rollers	**1** External gear **2** Internal gear **3** No gear			**0** Development **1** Prototype **2** Production **3** Spare part	**1** Normal **2** Reduced play **3** No play **4** Pre-loaded	**16** = Ball/roller D16.00 **18** = Roller D18.00 **20** = Ball/roller D20.00 **22** = Ball D22.00 **25** = Ball/roller D25.00 **30** = Ball D30.00 **32** = Ball/roller D32.00 **35** = Ball D35.00 **36** = Ball/roller D36.00 **40** = Ball/roller D40.00 **45** = Ball D45.00 **50** = Ball/roller D50.00 **60** = Ball/roller D60.00 **70** = Ball/roller D70.00 **80** = Ball D80.00	

NOTE
The information regarding the rolling bodies and raceway diameters is needed to determine the service life

Quality Assurance

Galperti Tech Forged Products is ISO 9001 certified and the product specification comply with the highest standards required by the market.
The bearings are supplied with certification according to EN 10204 2.2, EN 10204 3.1.B or EN 10204 3.1.C.

ISO 9001:2015

ISO 45001:2018

ISO 14001:2015

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