



# NTN-SNR at AUTOMECHANIKA Frankfurt 2018

Product range roll-out and  
continuous innovation

PRESS KIT

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## I. NTN-SNR LEADER IN THE AUTOMOTIVE SEGMENT

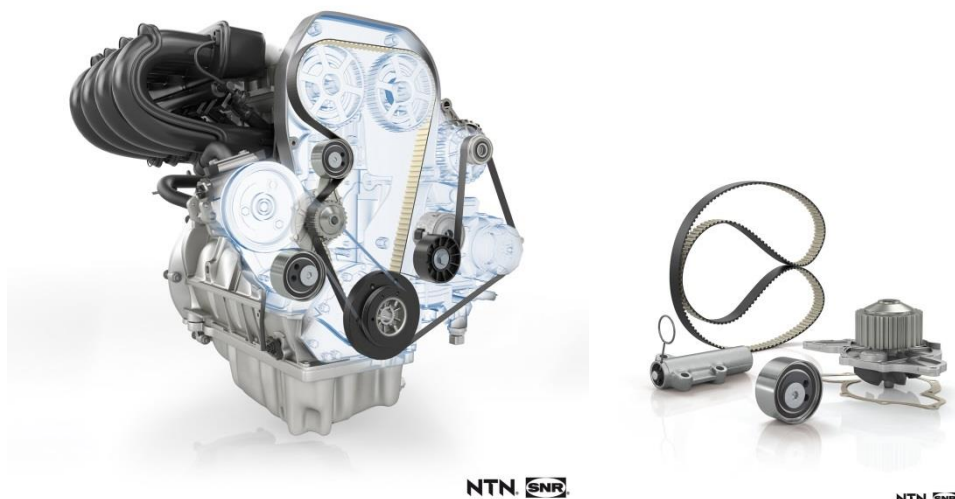
NTN-SNR is a specialist in the automotive segment, with 70% of its operations dedicated to vehicles, and supplies practically all of the automotive manufacturers in the world. It exerts a forceful presence on this market as the multi-faceted specialist in OEM and aftermarket. In so doing, NTN-SNR offers a complete range for its *Powertrain*, *Chassis* and *Driveline* product lines, whereby its most successful products include its latest generation bearings and its super high performance timing belt tensioners, as well as transmission bearings and parts. Leader in the European vehicle market, NTN-SNR has become a legitimate supplier of original equipment parts for Asian vehicle brands in Europe – in both the OEM and aftermarket segments. Moreover, NTN-SNR is a partner in development programs for electric vehicles and for the innovations of tomorrow aimed at reducing CO2 emissions. In that context, it has developed an in-wheel motor which is being used on a number of different prototype vehicles. It also perfected the PCS Hub Joint, an innovation which earned an award in 2015 and which significantly reduces the weight and package space of the CV joint assembly. This year, NTN-SNR is presenting a ceramic ball wheel bearing for a limited edition vehicle for road and track use.

## ROLL-OUT OF A SPECIALISED MANUFACTURER'S FULL RANGE

NTN-SNR markets more than 7,000 part numbers and provides for the continuous development of its product lines, adding 400 to 500 parts every year. The NTN-SNR automotive aftermarket product ranges cover 80,000 vehicle models, or 96% of all registered vehicles in Europe. Its offering is presented in three modules: *Powertrain*, *Chassis* and *Driveline*

NTN-SNR also develops specific product lines for HGV applications. That range is continuously expanding, having doubled the number of part numbers over the course of the past three years. A large expansion of the range of HGV bearings was launched, as well as a complete range of more than 220 part numbers of bearings for transmissions and gearboxes. A new phase of development is under way, notably aimed at the Asian HGV market.

### *Powertrain* module, #PerformanceInside



> Timing belt kits, rollers, belts, water pumps

### *The guarantee of a premium manufacturer and innovation specialist*

As a major manufacturer of OEM tensioners and idlers, NTN-SNR supplies super high performance rollers to meet the most demanding requirements (a roller can turn at speeds of up to 15,000 rpm), as well as OEM quality belts. NTN-SNR capitalises on its role as an original equipment manufacturer by supplying OEM quality parts. Its range of timing belt and accessory belt systems is one of the largest on the market: timing belt kits and accessory kits, timing belt kits with water pumps, rollers, accessory belts, damper pulleys and overrunning alternator pulleys, air conditioner bearings.

- **NTN-SNR – world leader in hydraulic tensioner rollers**

Today NTN-SNR's timing belt system aftermarket range covers 98% of all registered vehicles in Europe. It comprises more than 1250 products, including nearly 700 timing belt kits with or without a water pump. With regard to timing belt rollers and tensioner rollers, NTN is the world leader in hydraulic rollers/tensioners/idlers supplied as original equipment to the major vehicle manufacturers such as VAG, Toyota, Mercedes, Hyundai and many others. Moreover, NTN provides bearings for use in the OEM rollers of other automotive suppliers. NTN-SNR's innovations also include a hydraulic tensioner roller with a variable damping mechanism (cf. page 15 in the section "Innovation").

- **Rigorous level of requirements and broad product range for belts and water pumps**

Both belts and water pumps uphold the same demanding performance standards which serve as the hallmark of NTN-SNR. The timing belts incorporated in the aftermarket kits come from major original equipment manufacturers. This makes it possible to offer the largest OEM range and extremely high performance products, specifically of the latest generation, such as Teflon belts, for example. The same applies to the water pumps included in the kits, which undergo demanding quality and reliability testing.

## Chassis module, #SecurityInside



NTN SNR



NTN SNR

>CV joints, suspension components, mechatronic sensors, wheel bearings

### *OEM quality of a leader to ensure maximum safety*

NTN-SNR is a leader in wheel bearing technology, especially with the latest generation of bearings, and is establishing recognised expertise in brake discs with integrated bearings. It has a strong presence on the market for suspension kits. In 2016, it incorporated its new CV joint range (complete CV joint assemblies, CV joints, bellows kits) into the **Chassis** module. In all of these chassis components, NTN-SNR primarily focuses on ensuring the uncompromising safety of vehicle handling, and thereby of the driver.

### ▪ Premium quality suspension components made in France

Counting original equipment and aftermarket together, the Seynod factory in Haute-Savoie, France, produces nearly 30 million suspension parts each year. As one of the leaders in this market, with a 35% market share in Europe, NTN-SNR applies its know-how and demanding original equipment quality standards to the benefit of its aftermarket suspension kits. Each part is produced in premium quality. They are made of hardened steels as well as high quality plastics, rubbers and lubricants. They are subjected to 100% quality control. Automatic measurement and inspection is conducted throughout the assembly process and a final visual inspection is performed before packaging.

### ▪ NTN aftermarket CV joints

Relying on the know-how of NTN Transmission Europe, NTN-SNR launched its range of CV joints for the automotive aftermarket. The NTN Group is no. 2 in the world in the production of OEM CV joint kits today, with 40 million CV joints per year manufactured in 14 factories around the world. More than five million of those CV joints are manufactured for installation as original equipment in Europe – essentially all of them at the factory in Le Mans (Sarthe, France). NTN-SNR leverages its expertise, notably with its 8-ball joint technology, which makes it possible to reduce the package space of the CV joint and provide better acoustic performance.

The first phase of this product launch is focused on Europe. The range includes three families:

- **Complete transmission kit** : shaft, inboard and outboard CV joints
- **Constant-velocity joint kit**: for the wheel side (bowl assembly with boots)
- **Boots kit** : inboard and outboard

At the end of this year, NTN-SNR will also enlarge its range with 80 to 100 new products to supply spare parts for vehicle models which are no longer in series production and which are reaching the age where CV joints may require replacement.



### ▪ 250 speed sensors and all the mechatronics expertise of NTN-SNR

NTN-SNR is the first wheel bearing manufacturer to launch a line of 250 wheel speed sensors to complete its Automotive Aftermarket range. 65% of those product numbers relate to active sensors and 35% relate to passive sensors, thereby covering the full spectrum of Hall effect and magneto-resistive technologies on the market. That broad range addresses more than 6,500 vehicle applications and will soon be extended by more than 100 additional part numbers. This mechatronics expertise, the reliability of 100% quality-controlled production, and NTN-SNR's expertise in the co-development of sensor/encoder pairs together with the major automakers now enables the company to guarantee total compatibility between wheel bearing and sensor.

More than 90% of vehicles on the road today are equipped with wheel speed sensors. A vehicle has from two to four such sensors – in most cases installed opposite the bearing. All latest-generation bearings are equipped with this technology, which requires the presence of 4 sensors per vehicle.

## Expertise and reliability fiabilité

### NTN-SNR's speed sensors provide

- Know-how in the field of original manufacturers' equipment
- Expertise in this technology based on 30 years of patents
- Expertise through co-developing the sensor/encoder unit with leading manufacturers
- Security in development: test benches for the sensors in NTN-SNR factories (thermal resistance tests (-40°C to +150°C), sealing tests, vibrations, mechanical resistance, etc.)
- R&D teams in France
- 100% inspections on manufactured products
- A perfect complement to the leading range

## 20 years of ASB® Active Sensor Bearing

ASB® equipped with a speed sensor was launched in 1997 and is emblematic NTN-SNR's innovative capabilities.

### A major innovation

With needs linked to the growth in the 1980s of assisted braking systems, SNR had the idea to develop an encoder sensor that was coupled to the bearing to measure the speed of the wheels. A patent was filed in 1984. With the ASB® incorporated into the sealing joint, a magnetic crown allows for highly accurate measurements of wheel rotation speed. This information is used in all applications of onboard electronics: ABS, ASR, ESP, GPS, etc.

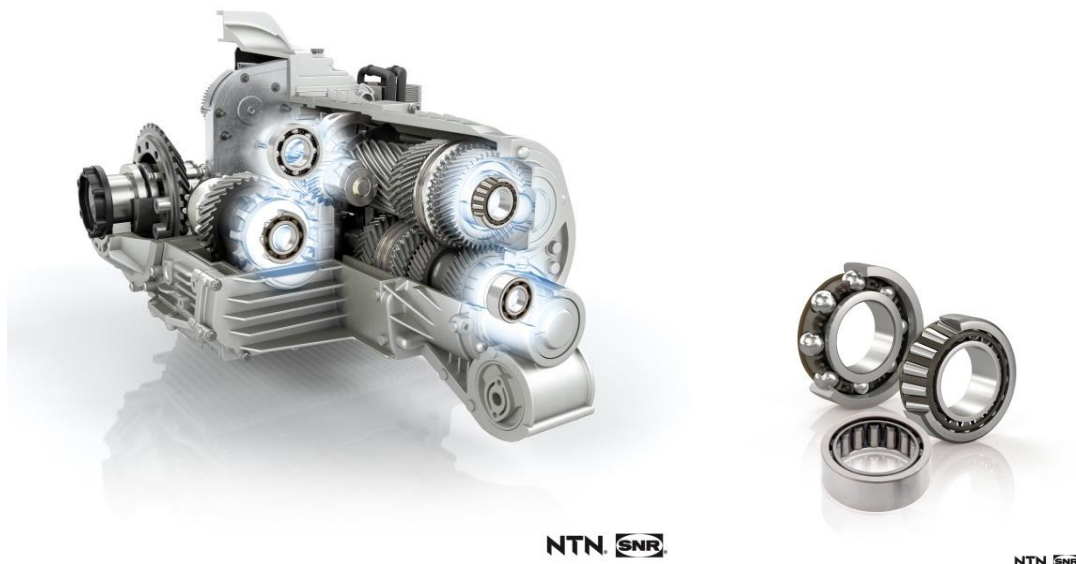
### An international professional standard

1988 saw the start of the first development phase, and then from 1992 onwards, SNR implemented an original innovation and marketing strategy that resulted in creating an open professional standard. It then built up a coalition of car manufacturers and also integrated other bearings manufacturers. Launched in 1997, ASB® can therefore be adopted by many major manufacturers and, through an iterative process, has established itself as the global standard for measuring wheel speed.





## Driveline module, #ReliabilityInside



>Gearbox bearings, clutch release bearings

### 100% from NTN-SNR original equipment

NTN-SNR markets extremely reliable bearings adapted to each type of gearbox, with very low tolerances in order to guarantee that all free play is eliminated. 100% of the part numbers produced as original equipment is supplied for the aftermarket. NTN-SNR factories produce more than 160 million gearbox bearings and clutch release bearings every year.

Those bearings perfectly satisfy not only the harsh demands of their functional environment, but also specific requirements relative to mechanical strength, performance, acoustics, etc. In OEM, NTN-SNR also supplies clutch release bearings to the biggest manufacturers and provides those products to the automotive aftermarket. They include advanced technologies such as angular contact bearings, polyamide cages optimised to withstand acceleration forces, and seals designed for extended service life in highly contaminated environments. Here too, the reliability, performance and innovative capability of the original equipment manufacturing operations carry over directly to the aftermarket.



## ROLL-OUT OF AN EXPANDING TRUCK RANGE

### The full range of a global group

NTN-SNR is a key partner of the major HGV manufacturers in Europe for original equipment wheel, gearbox and differential bearings. It is a major supplier to Mercedes-Benz, for example, and to Volvo Trucks. With the NTN Group, it also supplies OEM parts to many Japanese constructors of light commercial vehicles, such as Isuzu, and in the USA with the Bower brand. So with this new aftermarket range, NTN-SNR is addressing the demanding expectations of a market where it is a major player.

NTN-SNR supplies a range of aftermarket gearbox bearings that has been particularly well-received by the market. It has also significantly expanded its line of wheel bearings.

The HGV market presents specific needs and requires advanced technical expertise. Truck manufacturers and fleet operators demand maximum quality and reliable operation.

The NTN-SNR range comprises specific OEM-quality products that withstand heavy loads over long distances. They perfectly satisfy these vehicles' demanding specifications and match their life cycle.

NTN-SNR continues to develop this Truck range in order to provide more complete coverage of Asian, European and American vehicles.

### Gearbox bearings

NTN-SNR carries over 220 gearbox bearing part numbers, all of which refer exclusively to NTN bearings. These specific products cover the needs of Mercedes-Benz (Daimler), ZF and Renault Trucks. A second, recently implemented phase involves bearings for Asian HGV brands.

Today, NTN-SNR covers the four main Asian brands present on the European market (including Russia) and the Middle East: Isuzu Motors, UD Trucks (formerly Nissan Diesel), Mitsubishi Fuso Truck and Hino Motors. NTN expertise is being used to develop both product families (wheel and gearbox) intended for those Asian markets.

### Expansion of the wheel bearing range

NTN-SNR is increasing the number of HGV wheel bearing articles available for the aftermarket to 142 items in all. Those bearings include HDS\* bearings, some of which are used as OEM components in premium HGV models such as the Actros of Mercedes-Benz.

\*Heavy Duty Specific

## PRIORITY PLACED ON SERVICES – INNOVATION AND SUPPORT

Along with technical innovation, the quality of services and customer focus are the other mainstays of the NTN-SNR strategy. So in the automotive aftermarket area, NTN-SNR is rolling out a range of innovative services, as well as brochures on the analysis of technical failures, Tech'Info bulletins, installation recommendations, and a new, more ergonomic and intuitive online catalogue. Moreover, every innovation or new product from NTN-SNR is incorporated into the TechScaN'R application and also catalogued and documented in best practice guides. In parallel, the eShop website, which enables users to place orders online with instant information about the availability of the requested products, has been completely redesigned. With this range of services, which will continue to expand, NTN-SNR is demonstrating its intention, first and foremost, to be a partner to its customers, today and over the long haul

### A wide range of automotive services

- **TechScaN'R,**

Application available from AppleStore and Google Play, TechScaN'R provides access to information about a component through recognition of the NTN-SNR part number listed on the box, in catalogues, or on any other type of support, without the need for other add-ons, links or supplementary markers. The user simply scans the part number – that's all it takes to obtain all pertinent NTN-SNR technical information.

- **Video tutorials** showing NTN-SNR installation procedures (covering more than 800 products)
- **Augmented reality display** of part items
- **Installation instructions** including complete manufacturer's data and replacement intervals
- **Installation assistance** with step-by-step procedures and simple diagrams
- **Vehicle applications** for items in the range

TechScaN'R now covers nearly 6,000 items – practically the entire NTN-SNR product range



- **e-Shop**

The NTN-SNR website was completely redesigned in 2017 and incorporates the updated version of its online ordering (B2B) website, the e-Shop. The latter displays all Group brands, new products and catalogue updates for the major business segments of the NTN-SNR Group. Using their secure access, NTN-SNR customers can place their orders online when they wish, whilst taking advantage of up-to-date information in real time with regard to both product availability and order tracking. The e-Shop is available in eight languages (German, English, Brazilian, Spanish, French, Italian, Polish and Russian). Its usage rate can range from 20% to 80%, depending on the country.

- **TechInfos and automotive failure analysis bulletins**

NTN-SNR provides its repair shop and dealer customers with TechInfos: technical data sheets focusing on removal and installation procedures. With very complete technical information covering all of the steps to follow for the installation and optimal use of the components, these bulletins help service personnel extend the service life of parts through preventive maintenance.

More than 300 TechInfos are now available in different languages for 70 part numbers in the *Powertrain*, *Chassis* and *Driveline* modules – and that does not include the technical documentation analysing the top 20 most common failures in the *Wheel* and *Timing/Accessory* ranges.

## II. INNOVATIONS – CERAMIC BALL WHEEL BEARINGS FOR JAGUAR- LAND-ROVER AND HYDRAULIC TENSIONER ROLLERS FOR STOP&START

NTN-SNR is pursuing a development strategy anchored along three major axes: strong innovation; presence in key strategic and future markets supported by numerous investments; and a wide offer of services that emphasizes quality and customer focus. R&D is the spearhead of NTN-SNR's competitiveness. For the automotive market, its primary objective is to reduce CO2 emissions through solutions which make it possible to lower energy consumption and through the development of intelligent bearings with mechatronic enhancements. It is also developing solutions for electric vehicles. At Automechanika 2018, NTN-SNR is unveiling its new ceramic ball wheel bearing, which was specially developed for Jaguar-Land-Rover in the context of the limited edition Jaguar XE SV Project 8. This ceramic bearing has been selected by a jury of professionals in the top 5 Automechanika Innovation Awards out of 120 entries in competition. It is also presenting its automatic tensioner roller with variable damping mechanism.

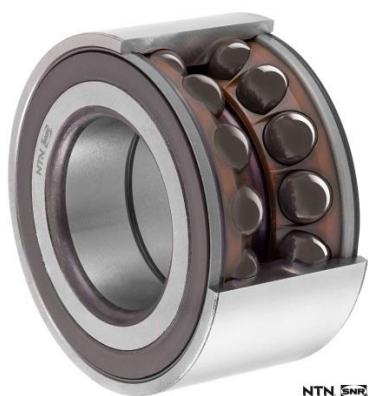
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## CONTINUOUS INNOVATION AT NTN-SNR

### Ceramic bearings from NTN-SNR for the Jaguar XE SV Project8

#### *World premiere on a series production vehicle for road and track use*

NTN-SNR was selected by Jaguar's Special Vehicle Operation (SVO) to participate in the new XE SV Project 8. This new Jaguar is a high-performance sports version of the XE saloon. Jaguar developed this new version of the XE, so owners may drive the car on both road and track.



**automechanika**

Innovation Award  
Finalist 2018

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#### ▪ **State-of-the-art technology**

Drawing from its expertise in aeronautics and competitive auto racing, NTN-SNR used ceramic ball technology in the wheel bearings for the Jaguar XE SV Project 8. Actually, this technology had already been developed and tested in single seater race cars and 24 hour Le Mans race cars. The main benefit of this technology is the considerable weight savings of 210 grams per bearing: the 840-gram overall reduction contributes to the performance of this sports car, where weight is a major factor. In addition, ceramic ball bearings allow for better rigidity of the bearing when it is fitted to the vehicle. That extra rigidity helps reduce deformation of the bearing when the vehicle is being used on the race track. This helps, in turn, to ensure the excellent dynamics required in the chassis of a vehicle with a top speed of nearly 200 mph. The ceramic balls used in the bearing also generate far less friction than a normal steel ball, allowing the bearing to rotate much easier. The reduced friction improves both performance and fuel consumption.

#### ▪ **Extreme test plan and series production prospects**

These large diameter wheel bearings are cartridge-type bearings fitted using a press to push them into an aluminium knuckle. One of the main difficulties that NTN-SNR had to solve was the difference in expansion coefficients between the aluminium of the knuckle, the steel of the bearing and the ceramic balls. The preload of the bearing was adjusted to obtain accurate compensation values and to check the integrity of the bearings under additional stresses on the test bench. That rigorous testing enabled NTN-SNR to supply bearings with an expected lifetime of 280,000 miles, as per the strict

specifications requested by Jaguar. NTN-SNR's complete test plan addressed all concerns associated with these materials and with this stress level. These specifically included false brinelling (lubrication problems) and stiffness tests under cornering forces to prevent any plasticisation that would cause permanent deformation.

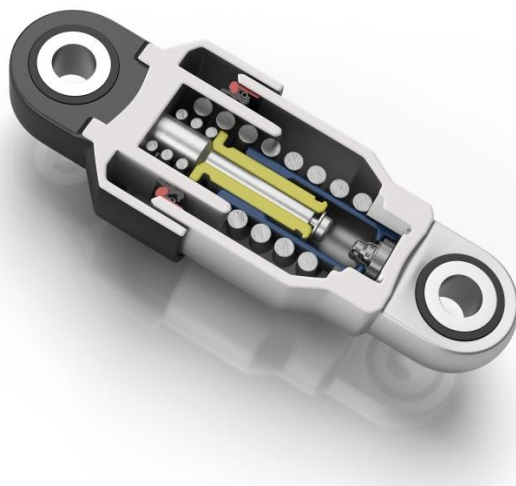
The bearing rings are manufactured at the production facility in Annecy-Seynod (Haute-Savoie, France), where the balls are also installed, and then lubrication and final inspection are carried out in the prototype shop of the R&D centre in Annecy.

This project has been added to NTN-SNR's research plan and has helped to accelerate the development of ceramic wheel bearing technology, which will no doubt soon be used on other, series production vehicles.

## Automatic tensioner roller with variable damping mechanism

### *Advanced technology for Start&Stop engines*

NTN-SNR has developed a hydraulic accessories belt tensioner roller with a variable damping mechanism for engines using the integrated Start & Stop starter function ISG (Integrated Starter Generator). This extremely innovative roller is now ready for series production.



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#### ▪ Hydraulic innovation

NTN-SNR offers a roller that applies different operating modes to adapt to specific belt tension requirements according to the phase of engine operation – mainly constant load and restart.

A flap system varies the flow of oil depending on the forces applied to the roller. The resulting variable damping adjusts the stiffness of the tensioner roller in response to the belt.

#### ▪ Innovative variable tension for Stop&Start engines

This ability to apply different tensions is particularly well-suited to engines equipped with a starter-generator that provides the Stop&Start function. Along with conventional accessory belt drive via the crankshaft pulley under normal, constant-load operation, such engines add large, repeated tension

spikes while driving the belt via the starter-generator during the restart phase.

NTN-SNR's automatic tensioner roller with variable damping mechanism provides significant benefits:

- A perceptible reduction in fuel consumption and lower CO<sub>2</sub> emissions as a result of reduced friction under normal, constant-load operation.
- Appropriate belt tension at all times, resulting in extended service life of materials.
- Guaranteed reliability equal to current systems.
- Cost equal to conventional rollers.
- **Innovation ready for OEM production and aftermarket**

80% of the components of NTN-SNR's automatic tensioner roller with variable damping mechanism are identical to those of a conventional tensioner roller. Its overall design is the same and it weighs only 7 grams more. That means it can be incorporated directly without the need to modify the engine design: automatic and conventional rollers are perfectly interchangeable. The pre-series and reliability test phases have been completed and series production can begin immediately.

## Other innovations for the automotive market

In anticipation of coming technological transformations in the automotive sector, NTN-SNR's technical teams are investing in many research and development projects aimed at overcoming future challenges. Their primary objective is to reduce CO<sub>2</sub> emissions by means of solutions which reduce energy consumption and developments in the field of electric vehicles. Moreover, their mechatronics expertise also positions them on the leading edge of autonomous vehicle development, as evidenced by their participation in the design of a lidar system for level 3 "eyes off" self-driving cars.

- **Lidar** (Laser Imaging Detection and Ranging), or laser-based radar, makes it possible to create 3D images of the environment. Capable of mapping distances with precision down to a few centimetres, this technology is crucial to the development of autonomous vehicles. NTN-SNR perfected an angular sensor that measures the displacement of rotating lidar mirrors with extreme precision. The NTN-SNR system combines two elements: a two-track magnetic encoder installed on the rotor and a fixed sensor that determines the angular position. With more than 5,000 signals per revolution, NTN-SNR's extremely high-resolution encoder measures angular position with a precision of 0.125°. In addition, the second track makes it possible to measure the "absolute" position of the mirror with a pulse.



- The **inverted conical bearing** for automotive applications is a patented innovation which reduces drag torque and help reduce CO<sub>2</sub> emissions. This bearing is in the study and testing phase at major European automotive manufacturers.



- In 2016, NTN-SNR's **in-wheel motor** enabled collaboration with the Haute-Savoie-based constructor Lazareth to develop the electric version of their famous sport tricycle, the E-Wazuma. With the same manufacturer, NTN-SNR had already developed a small urban vehicle after earning Automechanika Awards in Frankfurt in 2012.



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- The **PCS Hub Joint** is an NTN-SNR innovation that uses a system of precisely adjusted splines to improve the connection between the CV joint and the bearing. This results in significant weight savings and reduced package space for the equivalent power transmission. Having received the Silver Trophy of the International Grands Prix for Automotive Innovation at the Equip'Auto trade fair, the PCS Hub Joint is now in the pre-series prototype phase at a major automaker, one step before manufacturing for series production vehicles.



- **Dylico2** is an extremely reliable CO<sub>2</sub> emissions modelling software program that calculates variations in CO<sub>2</sub> emissions from a vehicle depending on the type of bearings it uses.

### III. RESPONSIBLE PRODUCTION USING STATE-OF-THE-ART TECHNOLOGY

Always on the leading edge of technology, NTN-SNR's continuous investments keep its production facilities competitive. Strong proponent of the "factor of the future" combining robotics, computers, workstation ergonomics and lean management, NTN-SNR has also implemented an overall CSR policy encompassing environmental, social and societal performance as well as upholding ethical standards. This is specifically reflected in the certifications obtained by its different production sites.

## CONTINUOUS INVESTMENT IN THE AUTOMOTIVE MARKET

### Alès, factory 4.0, labelled “Showcase for the Industry of the Future”

Most NTN-SNR automotive components are manufactured in France, where it has two large production centres. One is in Annecy (Haute-Savoie) and the other is in Alès (Gard), where NTN-SNR invested 20 million euros in a 7,000-m<sup>2</sup> production unit which opened at the end of 2013 and is completely dedicated to latest generation bearings. That strategic investment responds to the massive implementation of this technological transformation among all major European, Asian and American manufacturers. With production lines featuring radically new technologies and ergonomics, this factory earned the label “Showcase for the Industry of the Future”.

### Seynod – a new press and assembly lines of the latest generation

Many millions of euros have been invested in the Seynod 1 factory to ensure optimal production quality for the latest generation of suspension components. A new press generating 600 tonnes of force performs a high-precision stamping process for greater productivity. In-line heat treatment is always carried out on-site, and the production process has just recently been supplemented by two new assembly lines of the latest generation. The site took delivery of the second of those two lines on 7 February 2018. Counting original equipment and aftermarket together, the Seynod factory produces nearly 30 million suspension parts each year.

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### Le Mans supplies more CV joints for the aftermarket

In 2016, the NTN Transmission Europe factory in Le Mans, France, which produces most of the 5 million CV joints per year supplied to Europe, saw its production capacity increased by three additional blocks with 15 lines.

## REDUCING THE ENVIRONMENTAL FOOTPRINT

### ISO 14001 certification of all production sites

All NTN-SNR production sites the world over are certified according to ISO 14001. That standard applies the principle of continuous improvement in environmental performance by limiting the environmental impact of company operations.

### ISO 50001 certification of all French sites

In January 2016, the energy performance of all NTN-SNR sites in France was certified according to ISO 50001. That certification acknowledges NTN-SNR's dedicated work aimed at reducing energy consumption and greenhouse gas emissions. Another goal is to extend the ISO 50001 certification to the three NTN-SNR sites located outside France.

Since 2014, the worldwide energy performance of NTN-SNR has improved by 2.5%.

NTN-SNR is a member of the business counsel of Club Air Climat du Grand Annecy (Greater Annecy Area Air-Climate Club), which has 60 members. A consulting body created by the municipal counsel of the City of Annecy, the Club Air Climat deals with specific issues relative to the conservation of fossil fuels, the reduction of greenhouse gas emissions, the development of renewable energies and climate change.

### Waste reduction and recycling program

NTN-SNR has implemented the "Opti-déchets" waste management plan, which aims to recover and/or recycle all waste produced by the company. It encompasses a whole range of activities: improved production processes and industrial procedures based on sorting and waste management (the reprocessing of metal chips into recyclable bricks, for example). Today, 98% of all waste undergoes some form of recycling and NTN-SNR's goal is to maintain that share above 95% on a permanent basis.

## IV. NTN-SNR, MAJOR PLAYER IN BEARINGS AND IN MOTION

NTN-SNR ROULEMENTS, headquartered in Annecy (Haute-Savoie, France), has been a part of the NTN Corporation since the latter acquired SNR in 2007. NTN Corporation, with a turnover of more than 5.4 billion euros, is a world leader in the design, development and manufacture of bearings (no. 3 worldwide) and CV joints (no. 2 worldwide). NTN-SNR is responsible for the management and development of all NTN operations in the EMEA region and in Brazil. Active in the industrial, automotive and aeronautics markets, NTN employs some 6,000 people in Europe, where it operates 13 production sites, including 7 in France. NTN-SNR is pursuing a development strategy anchored along three major axes: strong innovation; presence in key strategic and future markets supported by numerous investments; and a wide offer of services that emphasizes quality and customer focus.

### 100 years of share values

### 100 years of history to launch into the future

In 2018, NTN-SNR is joining the exclusive club of the one-hundred-year-old companies in France with its double anniversary: one for NTN Corporation and one for NTN-SNR, which has been headquartered in Annecy since 1918. This centenary is the symbol of a company that is embarking on the challenges of tomorrow. Human, investments, innovations, social and environmental commitment are the key words of NTN-SNR's future project. As a mechatronics pioneer, NTN-SNR is fully committed to the factory of the future and new technologies to equip new mobility, aircrafts of tomorrow, and an even more technological and demanding industry. With the passion, expertise and commitment of women and man within it, NTN-SNR is committed to offering them a common ambition that gives meaning to each of their actions.

# NTN-SNR, THE POWER OF A GLOBAL GROUP

## NTN Corporation

NTN Corporation is a world leader in the manufacture and marketing of bearings, constant velocity joints, and precision equipment. The share of its turnover drawn from each of its market is as follows:

- Automotive industry (70.3%)
- Automotive aftermarket (15.3%)
- Construction of industrial machinery (14.4%).

As of the end of March 2017, the Group had 46 production sites worldwide.

The share of turnover drawn from each of its geographic regions is as follows: Japan (29.4%), America (27.5%), Europe (24.2%) and the rest of the world (ROW - 18.9%).

**Number of employees** 24,665 people

NTN-SNR is responsible for the management and development of all NTN operations in the EMEA region and in Brazil.

That integration ensures coherence and reinforced governance as well as a product range breadth and a development of expertise that positions NTN-SNR among the leaders in the geographic zones in alignment with the global ambition of the Group.

## Some key dates:

**1918:** Start of activities at SRO in Annecy, France

**1918:** Establishment of NTN in Japan

**1946:** Acquisition of the Société Nouvelle de Roulements by Renault-Création

**2000:** All SNR sites certified according to ISO14001

**2007:** NTN holds a share of the capital of SNR

**2008:** NTN becomes majority shareholder with 51% of the capital of SNR

**2010:** NTN increases its share of SNR's capital to 80% SNR ROULEMENTS becomes NTN-SNR ROULEMENTS

**2018:** 100th anniversary of the NTN Corporation and NTN-SNR

## OTHER INDUSTRIAL ACTIVITIES OF NTN-SNR

### Activities in the general industry segment

High-speed rail record-holder with 574 km/h, NTN-SNR is recognised as the development partner to the firms of the largest target markets for bearings. In the rail sector, NTN-SNR equips the high-speed trains of the major manufacturers, including the TGV of Alstom, as well as the new regional train programs. It is present in heavy equipment and machinery used in construction and civil engineering, in mining and quarries and in the steel industry, for which it has developed very high performance bearings, including the ULTAGE® range. It is reinforcing its presence in machine tools with a new investment in a production facility in Germany. Add to that the markets for agricultural machinery, agri-food equipment, packaging and paper mills, as well as those for pumps, motors and turbines and mechanical transmission. And finally, on the future-oriented market of renewable energies, NTN-SNR is a major partner of the major constructors of wind turbines and equips several solar power stations.

### Activities in the aerospace segment

A partner in the first flight of the Airbus A380, the world's largest cargo plane, NTN-SNR bearings equip major aeronautics and space programs, including the European space launch vehicle Ariane and the CFM 56 turbofan engine, which is still the one most widely used by Airbus and Boeing. Above all, it is present in the developments of the engines of tomorrow: in particular, NTN-SNR is a developer for SNECMA's LEAP engine, which conducted its first flights on the Airbus A320neo in 2015 and on the Boeing B737 MAX in January 2016. It also supplies components for Pratt & Whitney GTF and Rolls Royce Trent 1000 and 7000 engines, which, together with the LEAP, equip most aircraft programs today. NTN-SNR is also a leader in helicopter power transmission. Having experienced continuous growth in the market for the past several years, it invested over 27 million euros in 2015 to expand and modernise its aircraft components production facility in Argonay (Haute-Savoie, France) according to the "Factory of the Future" model.



## Pictures



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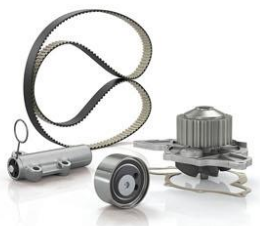
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