



Brand of **NTN** corporation

# SUSPENSION



# The product

## Suspension : technical concepts

### The functional role of the suspension module

Suspension plays a vital role in vehicle safety and good road holding.

- The suspension reacts directly to the road conditions.
- It influences road holding, steering and vehicle response.

This means that a mechanic needs to know how it works and how to make a correct diagnosis in order to ensure the safety and comfort of the occupants.

### Safety

Suspension systems ensure that the wheels stay in contact with the road under all circumstances (during acceleration, braking and turning). So if any suspension components are in poor condition, they could cause serious accidents due to the vehicle losing contact with the ground.

### Comfort

Thanks to the shock absorbers, suspension bearings and anti-roll bars, a flexible connection between components on both sides of the running gear is assured. This allows the suspension to absorb vibrations of the vehicle caused by irregularities in the road surface (bumps, pot holes).

### Performance : vehicle dynamics

Good driving dynamics mean that the response of the vehicle fulfils the expectations of the driver, particularly when changing direction.



## Different types of front suspension

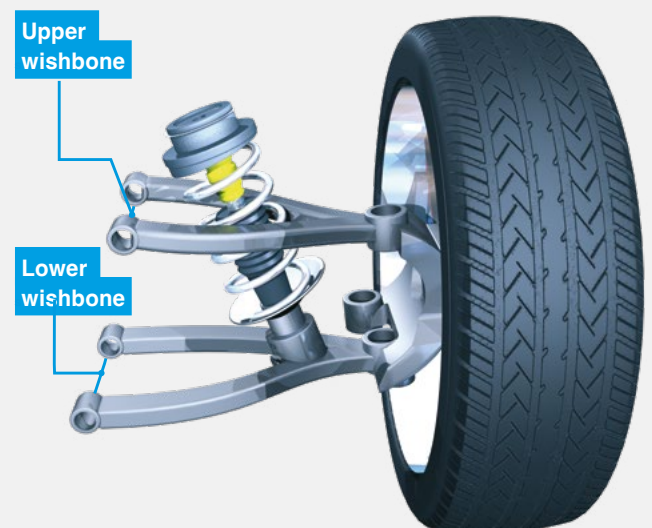
Originally, most suspensions were of the double wishbone type. The growth of the automotive industry and consumer demand drove manufacturers to develop simpler and less costly suspension systems.

This gave rise to the MacPherson strut suspension. Today, the following two technologies share the market.

### Double wishbone suspension

This technology provides superior comfort, dynamics and road holding characteristics.

Production costs are higher, however. That's why it is generally used on high-end models (such as the Mercedes E-Class and S-Class, BMW 5 and 7 Series, Audi A4, etc.) and high-performance racing cars. This type of construction does not require a suspension bearing, but includes an insulator in order to help dampen vibrations.



**THE STEERING ACTION IS INDEPENDENT OF THE SUSPENSION.**

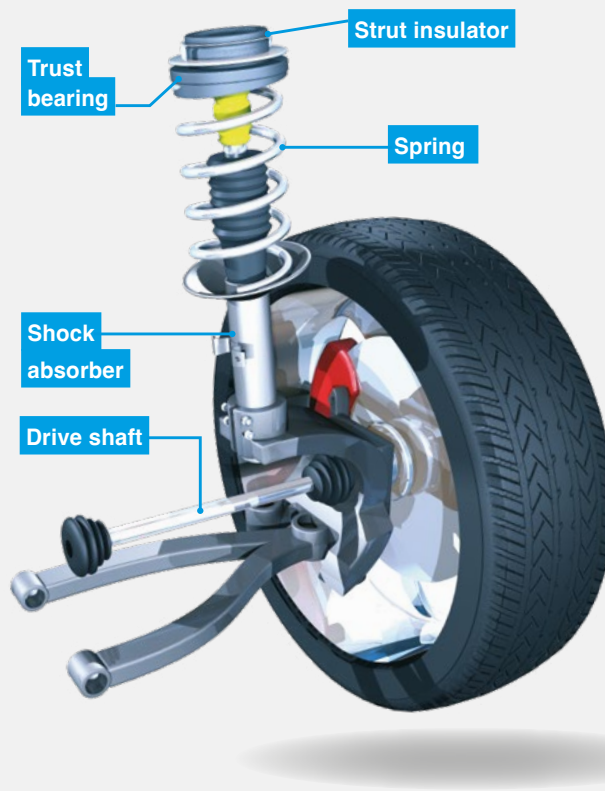
Distinguishing feature: upper wishbone

## MACPHERSON STRUT SUSPENSION

This type of "independent suspension" provides excellent stability and road holding under all driving conditions. It also evens out all shocks from the road to a minimum for greater control and better overall driving comfort. The MacPherson suspension comprises a strut assembly with an integrated spring and shock absorber which connects the top of the chassis to a lower wishbone. The wheel is attached to the lower end of the MacPherson strut, which also serves as the steering pivot via the suspension bearing. Guidage roue dépendant de la suspension d'où nécessité d'un roulement Indication: butée de suspension et 1 seul triangle, bloc filtrant, ressort, amortisseur.

Directional control of the wheel depends on the suspension, which is why a bearing is required. Distinguishing features: Suspension bearing and a single wishbone, bumpstop, spring, shock absorber.

### SUSPENSION BEARING WITH WHEEL AND SHOCK ABSORBER



## Automotive aftermarket potential:

Invented in the USA in the 1950s, the MacPherson strut suspension is now the most commonly used original equipment suspension system in the automotive industry: it represents more than 80% of the world market / 90 % of the European market..

Every year, some 80 million new cars are sold with MacPherson strut bearings installed in them. This is due to

the fact that a suspension bearing is a wearable part and is linked to shock absorber. Globally, only 1 in 3 are changed when the shock absorber is replaced, the market is slowly moving towards 1 in 2, the eventual aim is to replace the suspension bearing every time shock absorber changed.

That means huge potential for the automotive aftermarket.

## Evolution of the macpherson suspension bearing:

In response to market needs, NTN Europe has been able to develop its range with bearings which now include more and more functions (spring support, shock absorber bearing support...) and which respond in an innovative way

to the demands of the automotive manufacturers (smaller package space, ever greater level of comfort and road holding performance).



**GENERATION 0**  
STEEL BEARING WITH THE TOP MOUNT OF THE SHOCK ABSORBER



**GENERATION 1**  
STEEL BEARING ATTACHED TO THE UPPER OR LOWER SPRING SUPPORT



**GENERATION 2**  
STEEL BEARING WITH INTEGRAL UPPER SPRING SUPPORT



**GENERATION 2.5**  
STEEL BEARING WITH INTEGRAL UPPER SPRING SUPPORT AND SHOCK ABSORBER SUPPORT

# Replacement recommendations

## Why replace the suspension bearing and the insulator?

**Safety:** Enhanced road holding and full braking distances, (worn suspension : + 15% braking distance).

**Confort:** Softer and more precise steering (reduction of stresses) Lower vibration (as much as 25% less on poor road surfaces).

**Performance:** Better manoeuvrability.

**Reduced cost:** Nowadays, on average, only one suspension bearing is replaced for every three shock absorbers. However, more and more dealers and garages refuse to guarantee the shock absorber if the entire suspension assembly is not replaced too.

When replacing the shock absorbers, take advantage of the opportunity to replace all of the suspension components.

Doing so during MacPherson strut replacement requires no additional time and guarantees the level of security and optimum comfort for your customer.

## When should the suspension bearing and the top mount be replaced?

**Suspension system components are becoming more and more reliable, but they do have a limited service life due to hardening of the rubber, weathered suspension bearing, etc. NTN Europe recommends replacement:**

- ↳ Whenever a shock absorber is replaced: between 75,000 and 100,000 km and in pairs
- ↳ When suspension bearings or surrounding parts show signs of wear
- ↳ When steering becomes stiff or noisy

## When should the suspension arms be replaced?

- ↳ When the seal, plug or metal cap deteriorates
- ↳ When metallic noises can be heard upon riding over a bump
- ↳ When there is play in the rear axle



# Focus on the SNR product range

With more than 350 products, NTN Europe offers one of the most complete product ranges on the market today.

- MACPHERSON STRUT SUSPENSION BEARINGS
- SUSPENSION BEARING KITS
- SUSPENSION ARM KITS
- REAR SUSPENSION KITS

## FRONT SUSPENSION

### Suspension bearings (M2\*)

OEM leader, NTN Europe makes all of its product development experience available to the aftermarket and guarantees you original quality, high performance products (bearings and components).

Suspension components perform a highly demanding function in a very exposed environment. That's why all SNR products are:

- ↳ Designed, analysed and optimised with respect to rigidity and sealing
- ↳ Validated for each vehicle application
- ↳ Tested on NTN Europe test benches and on manufacturers' test vehicles



### Suspension bearing kits (KB6\*)

NTN Europe includes all of the upper suspension parts in their kits (bearings, screws, bolts, insulating parts). Each component is tested and validated by our quality teams (life cycle testing, material hardness testing, steel composition analysis).

- ↳ Insulator
- ↳ Suspension bearing
- ↳ Fasteners

## REAR SUSPENSION

### Radius arm suspension kits (KS\*)

The radius arm suspension kits for the aftermarket include all of the parts required to complete a quick and efficient repair: bearings, seals, nuts, shields, spacers, etc.



### Rear suspension kits (KB9\*)

The rear suspension kit consists of a top mount which absorbs vibrations and ensures the efficiency and safety of the suspension.

The unusual feature of this kit is that it does not include a bearing. The bearing is easy to remove (no special tools required) and to replace since it is removed at the same time as the shock absorber. For that reason, NTN Europe recommends replacing it each time the shock absorber is replaced.

## SERVICES

**IN ORDER TO RESPOND EVEN BETTER TO YOUR NEEDS, NTN EUROPE AFTERMARKET PROVIDES:**

- UA CATALOGUE DEDICATED TO THE SUSPENSION PRODUCT RANGE
- AN ONLINE CATALOGUE
- AN INTERNET SITE
- TECHINFO TECHNICAL INFORMATION SHEETS WITH INSTALLATION TIPS
- YOUTUBE CHANNEL: SNR AUTOMOTIVE AFTERMARKET DEDICATED TO REPAIRERS:

<https://www.youtube.com/channel/UCtlos-IIHJ-I-6bh9OmtFww/featured>

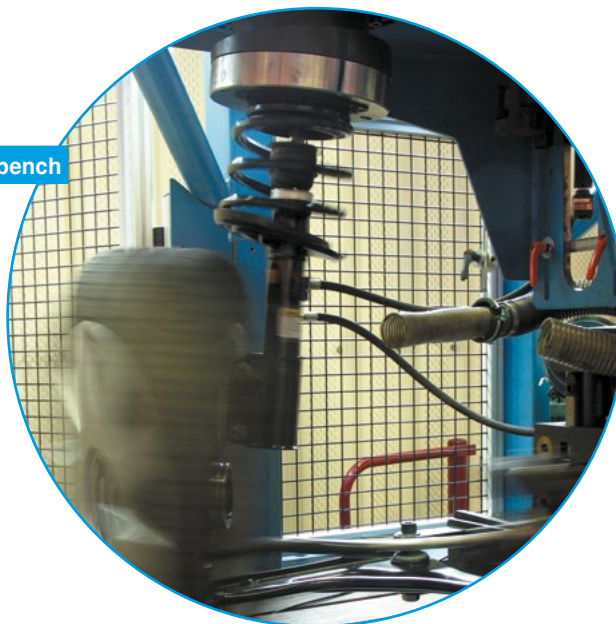
## Why choose SNR products?

Major player and LEADER in MacPherson strut technology, producing 90,000 bearings per day. Thanks to its responsiveness, its innovation potential, its expertise and its production sites throughout the world, NTN Europe is well-positioned as a partner to the biggest vehicle manufacturers when it comes to suspension systems.

Product quality, ensuring an optimal level of performance and safety for our customers.



Life cycle test bench



## From design to testing:

**NTN EUROPE INVESTS EXTENSIVELY IN THE RESOURCES AND CAPABILITIES REQUIRED FOR PRODUCT DESIGN AND DEVELOPMENT.**

- Finite element analysis
- Calculation of axial deformation
- Parts stress analysis




**EACH PRODUCT IS THEN TESTED AT THE TEST CENTRE IN ORDER TO MEET THE TECHNICAL SPECIFICATIONS OF THE DIFFERENT MANUFACTURERS.**

- Endurance: life cycle testing under representative conditions (mud, salt, water) to verify seal integrity and corrosion resistance.
- Friction torque
- Fatigue test: conducted on the FEB bench under various loads.  
Objective: change in torque < 30%. No deterioration.



# Inspection and replacement

## Bearing failure

FAILURE	CAUSE	RESULT
<p>CORROSION</p> 	<p>Ingress of contaminants: water, salt, sand...</p>	<p>Noise on poor road surfaces or when turning. Increased torque</p>
<p>FRACTURE</p> 	<p>Poor road surface, accident</p>	<p>Noise on poor road surfaces or when manoeuvring. Increased torque</p>
<p>FALSE BRINELLING</p> 	<p>Micro-vibrations while vehicles are in motion</p>	<p>Spring noise in passenger compartment</p>

## Top mount failure

FAILURE	CAUSE	RESULT
<p>TEARING</p> 	<p>Poor road surface. Ingress of contaminants: water, salt, sand...</p>	<p>Degradation in performance of the suspension (play in the front suspension)</p>
<p>WEATHERED MATERIAL Hardened or softened rubber</p>	<p>Very high or very low temperatures Exposure to chemical pollutants</p>	<p>Reduced comfort and service life</p>



# Recommendations

Many types of failure are caused by incorrect assembly: all parts of the suspension must be installed correctly. It is important to replace all of the parts contained in the kits, such as screws, bolts, nuts, or other components.

Make sure that:

→ **The suspension bearing is installed the right way round**

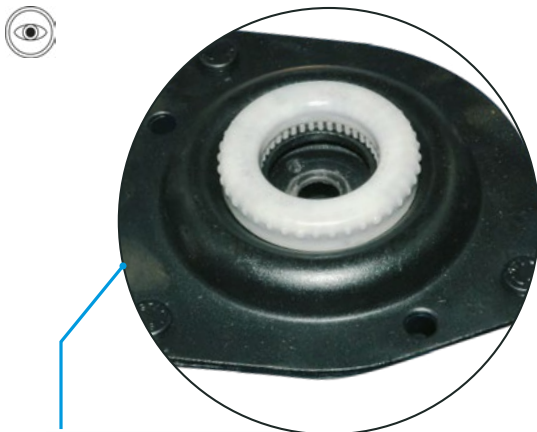
→ **All of the parts are present and installed the right way round and in the correct order:** bearing, insulator, bellows, bump stop, support, washer

→ **All of the parts are in good condition:** Do not re-install any part which has been damaged in any way, and do not re-install a bearing which has been immersed in liquid.

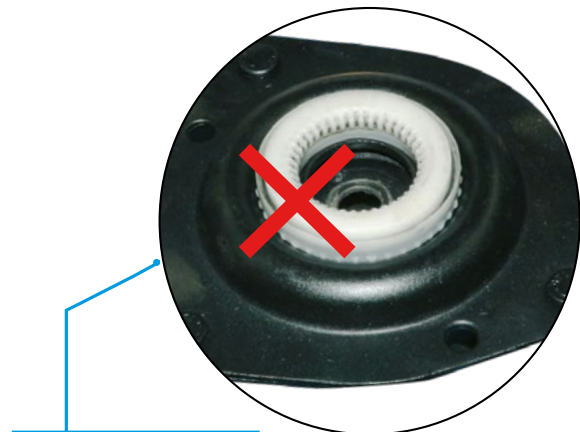
→ **The spring is of original quality:** A spring that is not of original quality will have a different elasticity and

mechanical resistance, which can lead to premature wear of all suspension components.

→ **The parts are of good quality:** Each component in our kits is tested. SNR kits guarantee greater safety for passengers and dynamic response of the vehicle, thereby ensuring good road holding characteristics and a high level of comfort. Some products do not have the same quality. Poor quality steel, grease and plastic, and heat treatment that is inadequate or is completely lacking can have a serious negative impact on the service life of the parts.



Correct installation



Incorrect installation  
steering system rotation impaired

Damaged bellows, for example, will no longer protect all of the parts of the suspension from external contaminants (water, dust, sand...). This causes bearing corrosion and premature wear of all suspension components.



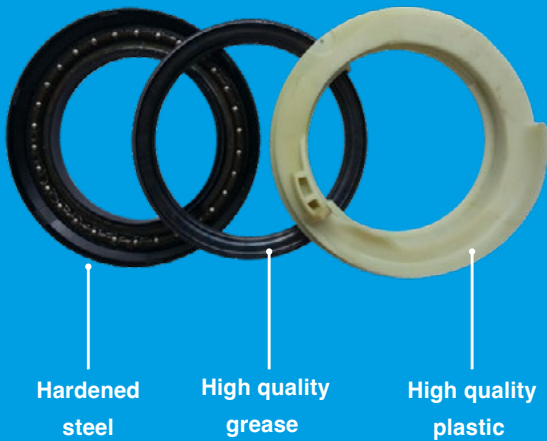
Deteriorated bellows



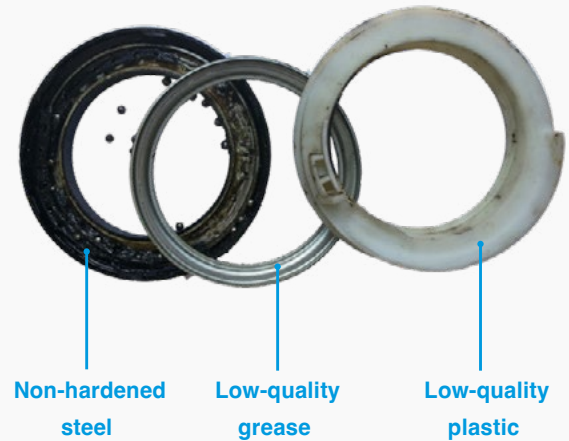
Suspension bearing corroded due  
to ingress of contaminants

## Comparison between an SNR suspension bearing and a low-quality part:

### SUSPENSION BEARING SNR



### POOR QUALITY SUSPENSION BEARING

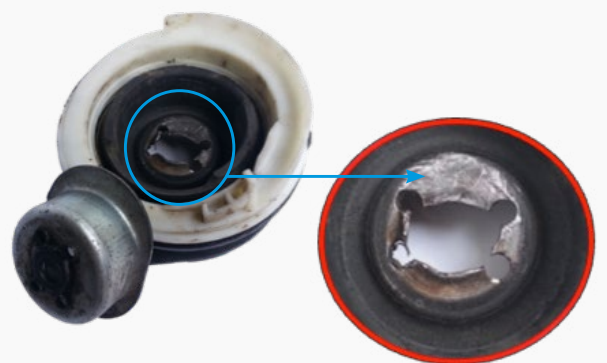


## Comparison between an SNR suspension kit and a low-quality part for the same application: :

### SNR SUSPENSION BEARING



### LOW-QUALITY TOP MOUNTS BEARINGS AND SHOCK ABSORBER SHAFTS may damage the body of the vehicle



Some brands choose to imitate the shape and colour of a part in order to create the impression that it is comparable to the original equipment part. But since the specifications of the original equipment are not maintained (heat treatment, metal reinforcements...), the use of such products may result in their puncturing the body of the vehicle in the event of impact.



Brand of NTN corporation

An aerial photograph of a winding asphalt road that curves through a dense forest. The trees are in various stages of autumn, showing shades of green, yellow, orange, and red. Several large, grey rock formations are visible on the right side of the road. Three white cars are driving along the road. A large, semi-transparent circular graphic with a blue-to-purple gradient is overlaid on the center of the image, framing the text.

Make the world  
a better road  
to drive\*

# NTN

Make the world **NAMERAKA**



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