

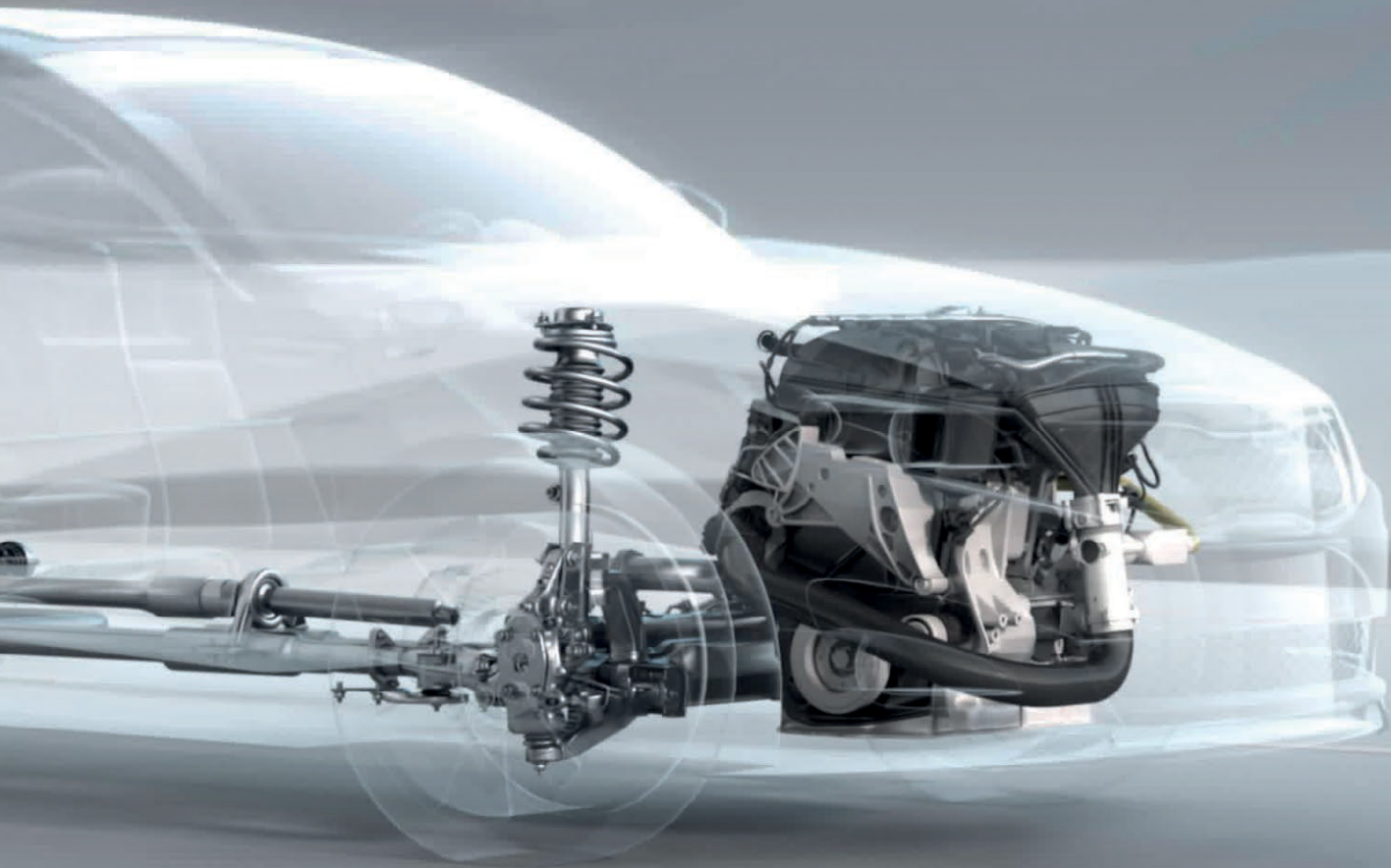
AMORIM TECH SEAL

Sealing



Reinventing sealing technology

Automotive & heavy duty
sealing solutions



AMORIM CORK SOLUTIONS

Cork, an exceptional raw material

Cork is the outer bark of the cork oak tree (*Quercus suber* L.), the 100% natural plant tissue covering the trunk and branches.

It consists of a honeycomb-like structure of microscopic cells filled with an air-like gas and coated mainly with suberin and lignin. One cubic centimeter of cork contains about 40 million cells.

Cork is also known as "nature's foam" due to its alveolar cellular structure. It has a closed-cell structure making it lightweight, airtight and watertight, resistant to acids, fuels and oils, and impervious to rot.

It is sustainably harvested by specialized professionals without damaging the trunk, thus enabling the tree to grow another layer of outer bark that, in time, will be re-harvested. Over the course of the cork oak tree's life, that lasts 200 years on average, the cork may be harvested around 17 times. This means that cork is not only a natural raw material, it is also renewable and recyclable.



Cork cell microscopic view.

Thermal resistance



Controlled side flow - less extrusion, good conformability



Elasticity - good load transfer



Impermeable to gases



Impermeable to liquids



Chemical resistance



Performance



Sustainable

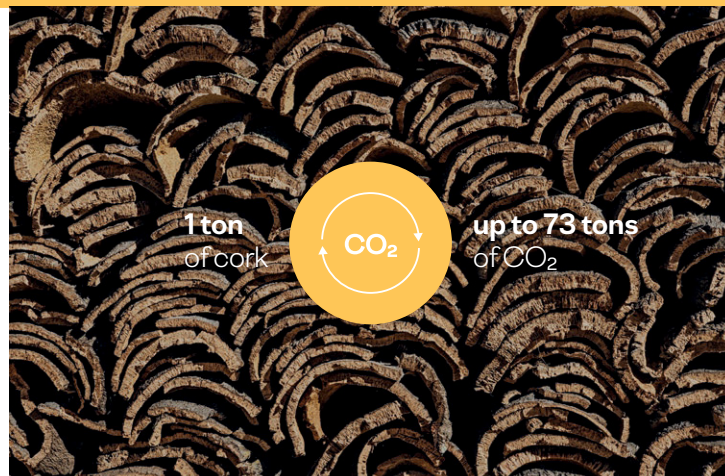


Cork, sustainable by nature

Cork forests are important natural carbon sinks. It is estimated that for each ton of cork produced, the cork oak forest sequesters up to 73 tons of CO₂*.

These forests, which have a recognized protection status, contribute to climate regulation, are the driving force of sustainable development and play a central role in the ecological balance of the planet. In this way, cork is a naturally sustainable raw material, like no other.

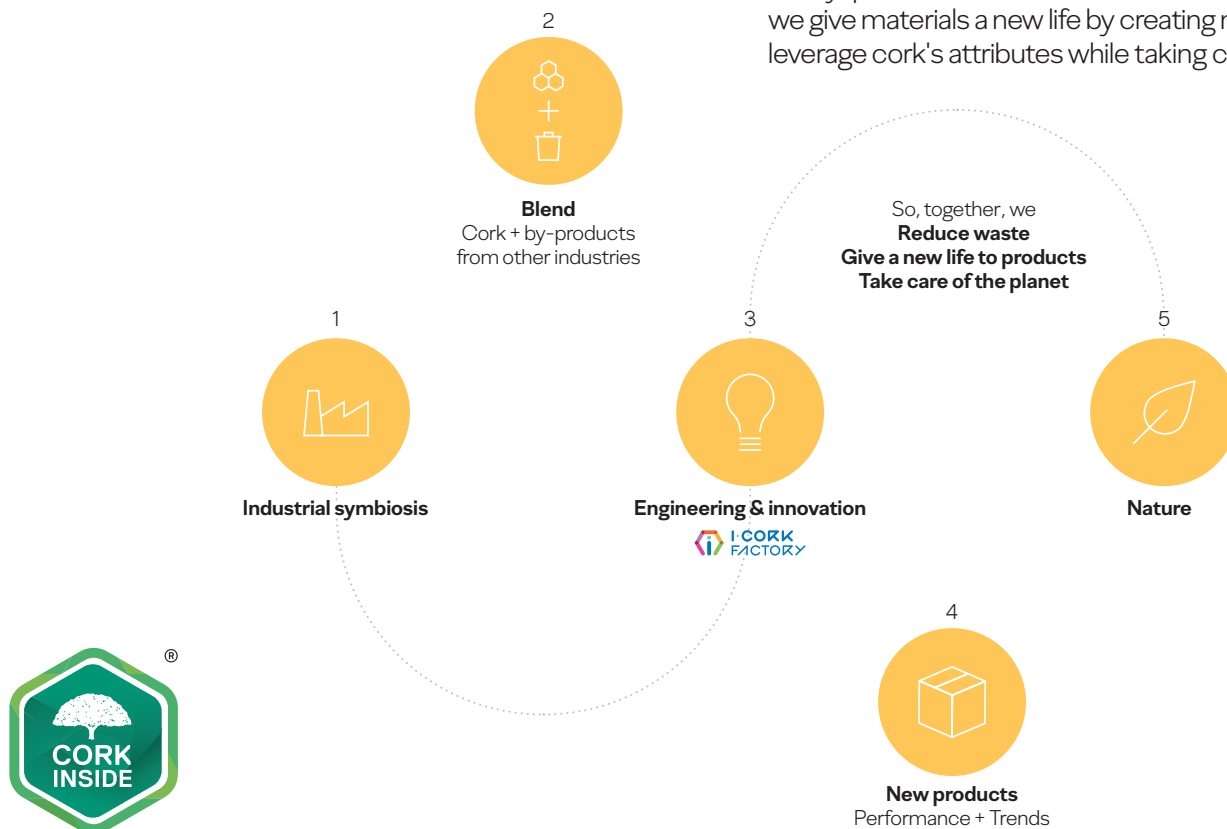
* Source: Instituto Superior de Agronomia (ISA), 2016



The circular economy at the heart of innovation

At i.cork factory, our innovation hub, we achieve the perfect match between performance and sustainability. New, innovative and high performance products from the circular economy are being created.

With cork at the core, blended with other materials, that are by-products from other industries (industrial symbiosis), we give materials a new life by creating new products that leverage cork's attributes while taking care of the planet.



When cork isn't so visible, the Cork Inside seal guarantees that the product contains cork in its formulation, a 100% natural and recyclable material with unique technical properties. Cork Inside formulations combine cork with other materials and are developed and rigorously tested by Amorim Cork Solutions' innovation and engineering teams. Cork Inside responds to stringent requirements and guarantees the performance required for the application.

Sealing industry

High thermal, chemical and mechanical resistance are essential characteristics of a good sealant. Cork is used in high-performance industries, whose applications are subjected to heat and pressure resistance tests.

Amorim Cork Solutions has many years of experience in providing sealing solutions to high-performance industries, supplying engineering support during product development, giving a global advantage when it comes to designing sealing systems.

Amorim Tech Seal is a range of engineered sealing materials based on soft gasket technology, specifically designed and tested to withstand application in several environments while providing cost-effective final product customization and manufacturing options.

We use cork and rubber solutions to produce materials for sealing, ensuring the prevention of fluids, leaks and the entrance of external elements into the sealing systems.

Industries & applications

Automotive & Heavy duty

OEMs Powertrain, aftermarket seals and gasket kits suppliers.

Fluids Compatibilities: coolants, engine and gear oil, diesel and gasoline

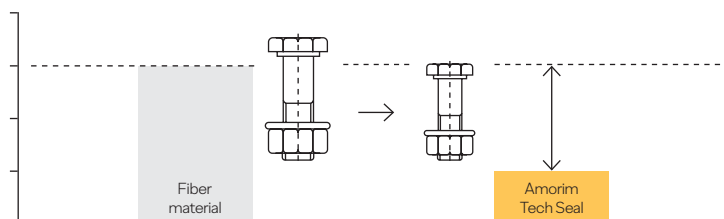


Main advantages

Load-to-seal

Lower load-to-seal delivers hardware gains, such as optimized hardware designs including lower grade or smaller size fasteners, resulting in lower torques which also benefit from lower distortion issues and safer fastener working ranges.

Load-to-seal



Controlled side flow

No allowance need to be made for side flow if a cork rubber material of the correct firmness is selected. The compressability of cork-rubber can be used instead of non-compressible molded rubber o-rings.

Controlled side flow



Compressed rubber material, with side flow



Compressed Amorim Tech Seal materials, without side flow

Conformability

Tolerance to extreme surface finish conditions and high out-of-flatness ranges. Large contact areas and sufficient compression ensures an excellent conformability even if there are surface imperfections in the flange.

Conformability to the flange



Untorqued material with flange with deformation



The Amorim Tech Seal material conforms to the flange, after being torqued

Automotive

Sustainable solutions delivering the highest performance

Amorim Cork Solutions is a supplier to the biggest vehicle manufacturers worldwide, with solid knowledge. Equipment manufacturers and end-users expect sealing

systems to operate leak-free and to maintain a long service life in their applications.

Amorim Tech Seal product range is a tailor-made approach to sealing systems, bearing in mind that gasket reliability is defined by a variety of application factors, such as gasket design, flange distortion, fastener loading, temperature and chemical resistance.

Electric Vehicles (EV) / Hybrid Electric Vehicles (HEV)

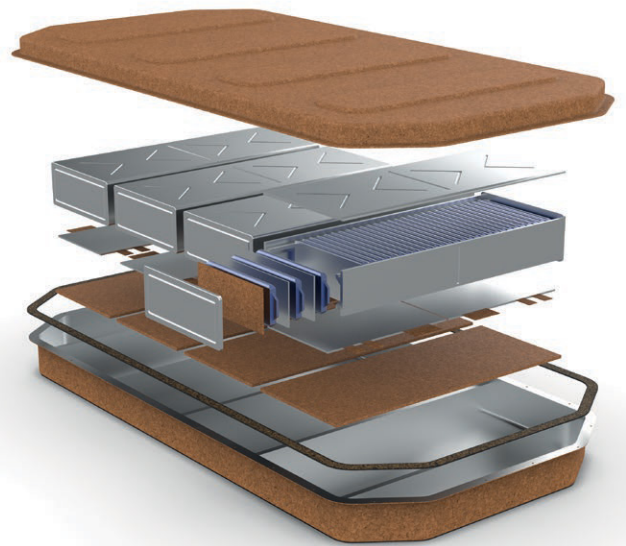
Advanced E-Mobility solutions are emerging and transforming the automotive industry, such as batteries, EVs charging, and hybrid technologies, as is the growth of our product offer.

Cork resists extreme temperatures and ensures flame retardancy, from passenger vehicles to trucks and buses.

Cork's characteristics enable us to respond to demand from emerging applications, where there is a need for environmental seals, for sensitive electronics which need to be packaged to withstand the elements and function in all environments.

Amorim Cork Solutions have a technical engineering team that can give technical support and assistance with any kind of sealing challenges.

For E-mobility sealing solutions please contact us, through our website www.amorimsolutions.com

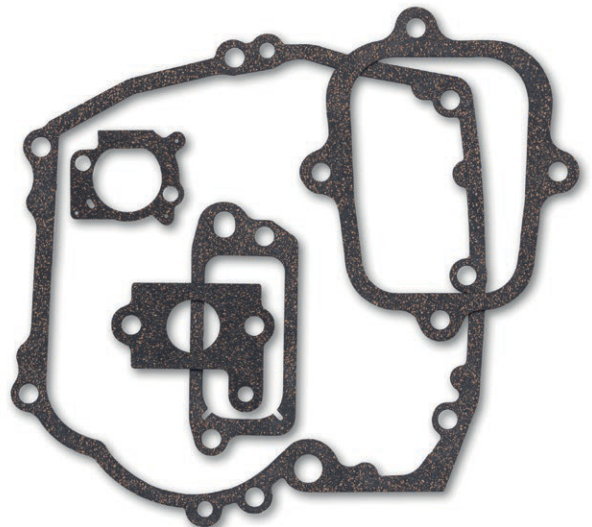


Automotive Aftermarket

Being a supplier to the biggest automotive aftermarket distributors worldwide guarantees that our products are the gold standard for aftermarket parts when it comes to safety, due to their rigorous standards and quality testing.

Car engines are subject to extreme tests of endurance, resistance, heat, and pressure. Amorim Cork Solutions develop unique blends of cork and select rubbers to produce soft gasket sealing materials.

Amorim Cork Solutions guarantees that its materials are sustainable and asbestos-free, offering reliable and attractive solutions.



Heavy duty

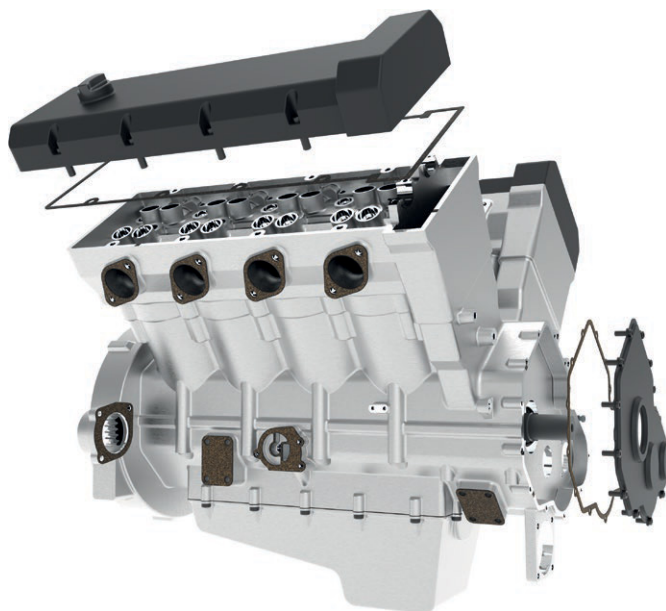
Amorim Tech Seal products are designed to withstand the application requirements for heavy duty applications, guaranteeing reduced CO₂ emissions and extended components life.

Our product range will meet the application environment, where contact with engine oil, gear oil, diesel fuel or biodiesel as well as coolants are required.

Amorim Cork Solutions has designed products specifically for:

- Lower bolt torque values
- Smaller or lower grade fasteners
- High distortion applications when steel and plastic covers are used
- Conformable to flanges with higher "out-of-flatness" values
- Stable damping values across the frequency range reduces vibration effectively

Amorim Cork Solutions has developed unique blends of cork and select rubbers to produce materials indicated for soft gasket sealing, that due to reduced side flow permit larger contact areas and higher compression ratios, which guarantee an effective sealing barrier against potential flange surface imperfections, distortions and leakage paths.



Product Range












Fluids compatibilities

Material	TS1521	TS4600 (GT46)	TS2050 (D205)	TS1400	TS7100	TS7111 (NC711)	TS7000	A099	TS7610 (NL76)	TS2030	TS7110 (711G)
Unleaded gasoline	x	x	x	✓	✓	acceptable	x	—	x	x	✓
E-85	x	x	x	✓	acceptable	acceptable	x	—	x	x	✓
B-100 Bio-diesel	x	x	x	✓	acceptable	✓	x	x	x	x	✓
Diesel (low sulfur)	x	x	x	✓	✓	✓	x	x	x	x	✓
Engine oil (15W40)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gear oil (75W90)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PEG coolant	x	x	acceptable	✓	x	✓	✓	✓	✓	✓	✓
MEG coolant	x	x	acceptable	✓	x	✓	✓	✓	✓	✓	✓
Organic Acid Technology (OAT)	—	—	—	✓	x	—	✓	✓	—	—	✓
Hydraulic fluids	—	—	—	✓	✓	—	✓	✓	—	—	✓

✓ Suitable x Unsuitable — Not tested

Product Range

Automotive & Heavy Duty

Material	Format	Material Description	Density (kg/m ³) (lb/ft ³)	Hardness Shore A	Compressibility (%) (400 psi)	Tensile strength (MPa/psi)	Temperature range (°C/°F)
TS2050 (D205)		Cork/SBR blend. Suitable for all engine and gear oils, and coolants.	830* 52*	60-80	15-35	2* 290	-30°C to 90°C -22°F to 194°F
TS4600 (GT46)		Cork/SBR blend. Suitable for all engine and gear oils.	>640 >40	70*	25-45	>1,03* >149	-30°C to 110°C -22°F to 230°F
TS1521		Cork/SBR blend. Suitable for most lubricant fluids.	550-750 34-47	50-70	35-50	>0,8 >116	-30°C to 110°C -22°F to 254°F
TS1400		Cork/NBR blend. Suitable for fuels, bio-fuels, oils and coolants.	1100* 68*	75-90	10-22	>3,5 >507	-30°C to 125°C -22°F to 254°F
TS7100 ⁽¹⁾		Cork/NBR blend. Suitable for fuels, bio-fuels, and oils.	900* 56*	60-75	20-45	2,5* 362*	-30°C to 110°C -22°F to 230°F
TS7111 (NC711) ⁽¹⁾		Cork/NBR blend. Suitable for all engine and gear oils, and coolants.	800-960 50-60	70-85	10-25	>2 >290	-30°C to 110°C -22°F to 230°F
TS7000		Cork/Silicone blend. Suitable for coolants, and acceptable to most lubricants. Used for very high and low temperatures.	1100* 69*	65-80	10-30	>1,7 >249	-60°C to 175°C -76°F to 347°F
A099		Cork/Silicone blend for injection molding. Suitable for coolants, and acceptable to most lubricants. Used for very high and low temperatures.	Depending on the injection process**	63-73	10-30*	>3	-60°C to 175°C -76°F to 347°F
TS7610 (NL76)		Cork/Polychloroprene foamed blend. Suitable for all engine and gear oils, and coolants.	470-620 29-39	30-50	30-45 (@100psi)	>0,5 >72	-20°C to 110°C -4°F to 230°F
TS2030		Cork/Polychloroprene blend. Suitable for all engine and gear oils, and coolants.	750-850 47-53	60-80	25-40	>1,96 >284	-40°C to 110°C -40°F to 230°F
TS7110 (711G) ⁽¹⁾		Cork/Epichlorohydrin (ECO) rubber blend. Exceptionally suitable for fuels, bio-fuels, oils and coolants.	1100* 69*	70-85	15-30	4,5* 653*	-35°C / 135°C -31°F / 275°F

* Typical value  Roll  Block  Injection process

Certifications and Approvals

(1) UL157 Listed · Gaskets and Seals - requirements cover test procedures and performance criteria for the evaluation of nonmetallic gasket and seal materials for specific end products.

UL compliance

Material	TS1521	TS4600 (GT46)	TS2050 (D205)	TS1400	TS7100	TS7111 (NC711)	TS7000	A099	TS7610 (NL76)	TS2030	TS7110 (711G)
UL 157 listed	—	—	—	—	yes	yes	—	—	—	—	yes

Certifications and Approvals

UL157 Listed · Gaskets and Seals - requirements cover test procedures and performance criteria for the evaluation of nonmetallic gasket and seal materials for specific end products.

Amorim Cork Solutions

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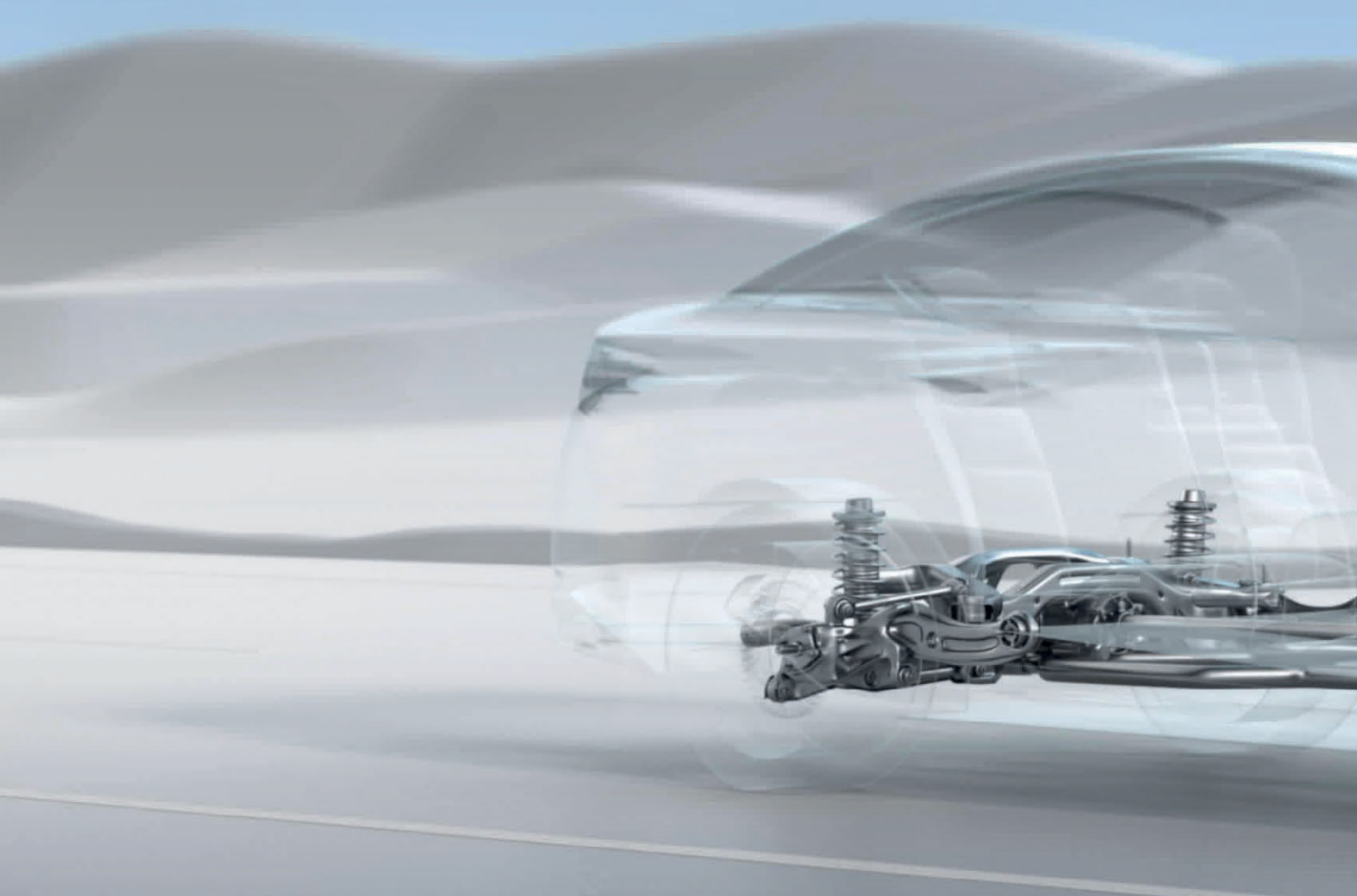
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