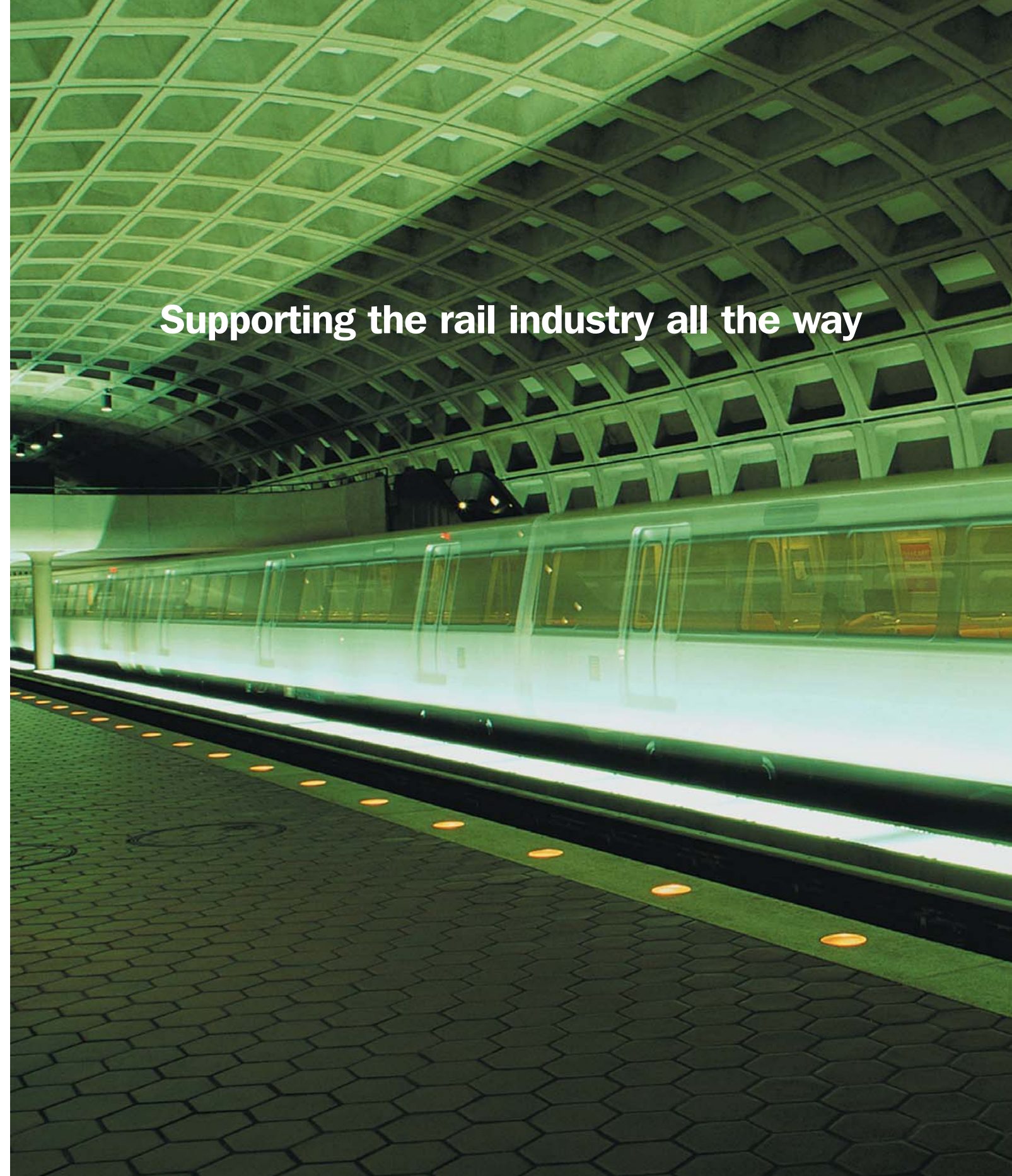


Supporting the rail industry all the way



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THE EXPERIENCE TO LEAD

Quality, reliability and safety are of paramount importance in the railway industry. This is why, for any organisation involved in the design, specification and manufacture of rail transport systems, there is no substitute for experience.

In the highly specialised field of antivibration mountings and suspension components, few companies have greater experience or expertise than **Trelleborg Industrial AVS**.

Trelleborg manufactures and markets the Metalastik® range of products. Metalastik® is one of the most globally successful product brands in the industry - a brand with a pioneering heritage of design innovation and engineering excellence that spans almost 60 years. A brand that has become synonymous with safety, longevity and reliability.

Today, Trelleborg provides advanced vibration control and suspension solutions for locomotives, high-speed passenger trains, underground trains, freight wagons, trams and light rail systems throughout the world.

We have an unrivalled track record of success. Our past achievements are not the only measure of true leadership. Trelleborg has remained, however, at the forefront of the industry by embracing the challenges of the journey ahead and shaping the future of antivibration and suspension technology.

Continuous investment in the development of our products and their applications will ensure that we are ideally placed to meet the changing needs of rail transport manufacturers and operators for many more years to come.



CUSTOMISED SOLUTIONS

1.



In the railway industry Trelleborg Industrial AVS is best known as supplier of primary and secondary suspension systems, centre control mountings, centre pivot bearings, control links and drive couplings for every type of application from trams and light rail to heavy freight locomotives. For secondary suspension, the company offers a variety of products including all-rubber hourglass bearer springs and airspring systems.

For a wide variety of vibration control and suspension needs, a standard Metalastik® product will meet and often exceed the required performance criteria. However, for many individual and technologically challenging applications, only a custom-designed solution can achieve the level of specification demanded by the customer. We call it purpose-driven design, and it's an area of expertise in which Trelleborg excels.



2.



3.

- 1. EMU Regina, Sweden*
- 2. EMU Contessa, Denmark - Sweden*
- 3. EMU Regina, Sweden*

Partnership ethos

We believe in working closely with our customers' technical teams from the outset, pooling our respective skills and experience in pursuit of the optimum solution. Through our Rail Application Team, you will gain access to Trelleborg's unrivalled technical expertise and vast global knowledge base.

The team we assign to a project will begin by making a thorough assessment of the application and the demands that will be placed on the product. In close collaboration with our customers, design proposals will be submitted, developed, refined and tested. Throughout this process, work at Trelleborg will be co-ordinated and driven forward by an experienced Project Manager to ensure that all the required performance objectives are achieved and deadlines are met.

World-class resources

Trelleborg Industrial AVS has all the resources you would expect from a global market-leader. Our Leicester head office in the UK encompasses a research and development centre as well as a purpose-built, state-of-the-art manufacturing facility. Trelleborg also has production facilities in Sweden. Materials and product development is carried out in our own laboratories equipped with the very latest compound formulation, modelling and simulation technologies. We also have our own advanced mixing facility that prepares compound on site under clean and rigorously controlled conditions.

Technical expertise

Our technical people are the best in the industry. They are the key to our success – past, present and future. It is their skills and expertise, their experience and commitment, that enable us to deliver quality solutions that add substantial value to our customers' products and services. This is why we invest in our people at all levels and in all functions of our business through a programme of continuous personal development.

With Trelleborg specialists in design, engineering and product development working alongside you, your project is in very safe hands. Therefore, you can be certain that your investment will yield outstanding performance benefits.

QUALITY AND INNOVATION



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Environmental improvement

At Trelleborg Industrial AVS, we take our environmental responsibilities very seriously indeed. We are constantly reviewing our manufacturing processes in the drive for year-on-year environmental improvement. Our strategy includes the continued elimination of solvent, significantly reducing emissions into the atmosphere, water purification and reduced notifiable waste.

We are leading the way in our industry in the increased use of aqueous metal degreasing methodology, water-based bonding agents and protective finishes.

Our mission is to exceed the requirements of current and future environmental legislation and set a standard for others to follow.

The Metalastik® range is synonymous with quality. Exhaustive testing regimes, 'right first time' manufacturing, outstanding performance, an exemplary safety record and long service life have established Metalastik® as the world's leading brand in the antivibration and suspension systems market.

Our commitment to quality is not limited to products alone. It drives everything we do. Our standards provide a benchmark of excellence in research and development, customer service, the efficiency of our manufacturing processes, the scope of our technical support and in our initiatives for environmental improvement.

Trelleborg Industrial AVS is approved to ISO 9001 and a wide variety of industry and OEM international quality and safety standards.

Research and Development

Rail transportation is a dynamic and fast-moving market. Just like the railway industry itself, we can never afford to stand still, nor are we content simply to track the pace of change. Instead, we aim to drive performance improvement by embracing new technological challenges and developing new, innovative solutions.

We invest continuously in the development of our products and the materials we use. We have developed a wide range of rubber compounds specifically for use in railway suspension systems. Based on the highest quality polymers, our products combine high strength and resilience with excellent fatigue resistance and low creep properties. We insist on optimised cure times and temperatures to ensure durability and long service life. In pursuit of even greater longevity, we are constantly exploring the potential of new and alternative materials such as composites and special metals.

Extensive testing facilities

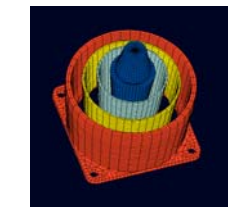
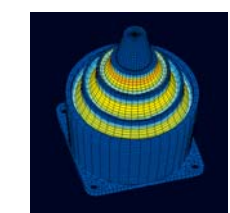
Trelleborg's testing facilities are quite simply, world-class. We operate a comprehensive programme of static, dynamic and fatigue testing in state-of-the-art laboratories within the technical centre of our Leicester headquarters.

We use advanced simulation techniques such as Finite Element Analysis (FEA) and multi body vibration analysis software to simulate the loads that products would be required to withstand over their full service life. FEA has proved to be extremely effective for the prediction of stiffness characteristics and the evaluation of stress distribution.

Newly developed components also undergo rigorous and extensive field trials. These are designed to mirror the climatic conditions and operating environments in which the products will be required to perform.



5.



6.

1. EMU Signatur and Agenda, Norway*
2. Product testing at the Technical Centre, Leicester, UK
3. EMU Class 323, UK*
4. C20, Stockholm, Sweden*
5. Combino LRV, Siemens Transportation Systems
6. Metalastik® type Metacone™ Spring undergoing FEA Analysis

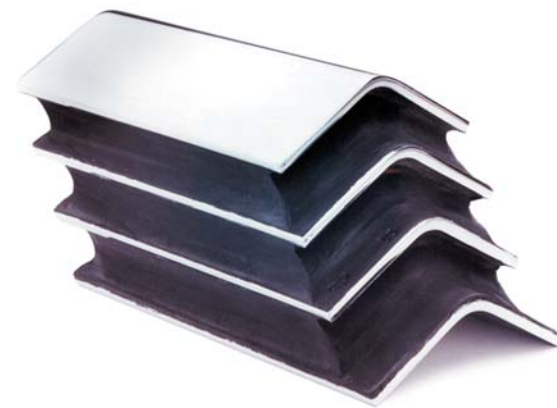
PRODUCTS

FROM TRELLEBORG INDUSTRIAL AVS



Metacone™ Springs

An easily fitted and compact conical section suspension unit in which the rubber is loaded in combined shear and compression. Particularly suitable for primary suspension of light rail vehicles.



Chevron

Provide three modes with dissimilar rates of flexibility for axlebox primary suspensions. Pairs of springs fitted in vee formation achieve this through shear and compression compliance within the rubber elements.



Bearer Springs

Large capacity springs designed to allow bogie rotation and lateral displacement. In a revised geometry some designs can also be used as traction centres. Robust and simple to fit.



Vee Mountings

This high load capacity mounting with relatively large rubber volume provides a high degree of vibration and noise isolation. It is ideally suited for suspending engines installed in 'under floor' engine installations.



Hour Glass Springs

A patented design suitable for both primary and secondary suspension of heavy vehicles. These springs provide large horizontal deflections for bogie rotation, and lateral displacement. Additionally, a rising rate stiffness for almost constant periodicity in the vertical axis. A half unit can be used with an airspring assembly for excellent vertical and horizontal stiffness characteristics in normal and emergency conditions.



Air Spring Assembly

The optimum secondary suspension for all types of passenger vehicles. These springs provide a low frequency suspension but a constant ride height.



Offset Shear Springs

This type of spring may be used for primary or secondary suspensions on rail vehicles. Offset Shear Springs are normally used in pairs, fitted at an angle to the vertical axis, thereby loading the rubber in shear and compression and providing three linear modes of flexibility.



Spherilastik™ Bearings and Control Links

Typical uses for Spherilastik™ Bearings include traction and torque reaction rods for rail and off-road vehicles, hydraulic damper fixings and other applications where a high radial load bearing, with low rotational stiffness is required. Control links are suitable for all types of heavy vehicle, offering excellent axle location under braking and traction forces. Available in varying lengths and fitted with ultra duty, inner sleeve bushes or Spherilastik™ Bearings.

SUPPORTING YOU ALL THE WAY

Trelleborg Industrial AVS is a new global force in antivibration with the steady influence to provide a safer, more comfortable ride on the world's railways.

The Metalastik® brand name represents an unrivalled product portfolio, well known for its excellent antivibration track record, alongside our ability to deliver superior service, system design and applications consulting.

There is no company better placed to produce customer specific antivibration and suspension systems fine-tuned to your railway application. Today, Trelleborg provides advanced vibration control and suspension solutions for locomotives, high-speed passenger trains, underground trains, freight wagons, trams and light rail systems throughout the world.

Exhaustive testing regimes, 'right first time' manufacturing, outstanding performance, an exemplary safety record and long service life have established Metalastik® as the world's leading brand in the antivibration and suspension systems market.

With Trelleborg specialists in design, engineering and product development working alongside you, be confident that your project is in very safe hands.

Trelleborg is a global industrial group. Operations are based on spearhead competence within polymer materials and a high level of industrial know-how, combined with functional solutions and systems designed to meet the needs of our customers. The Trelleborg Group has annual sales of approximately SEK 19 billion, with about 16,000 employees in 40 countries. Trelleborg consists of 4 business areas: Trelleborg Automotive, Trelleborg Wheel Systems, Trelleborg Engineered Systems and Trelleborg Building Systems.

Trelleborg Industrial AVS is part of the Automotive business area.

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'Trelleborg Industrial AVS operates a policy of continuous improvement and development. We reserve the right to change design and specification of our products without prior notification or alteration of literature. We will not be held responsible for any danger or damage incurred through improper use or installation.'

*Photography kindly supplied by Bombardier Transportation.
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