GO FOR EXCELLENCE

Suspension Expertise for Rail Transport

Air Spring Systems

Continental CONTITECH

More than ever, mobility is crucial to modern society. Top safety performance and maximum ride comfort are a must, also at high speeds. ContiTech Railway Engineering contributes significantly to fulfilling these requirements.

Comfort and safety in rail vehicles – **for a good trip**

ContiTech PHOENIX

Our innovative suspension concepts for controlling vibrations, isolating sound and improving comfort have become standard features of rail vehicles everywhere. They can be found in inter-city, mass transit and high-speed trains – in Europe and America as well as in Eastern Asia and Australia. We are no. 1 worldwide in the rail vehicle industry.

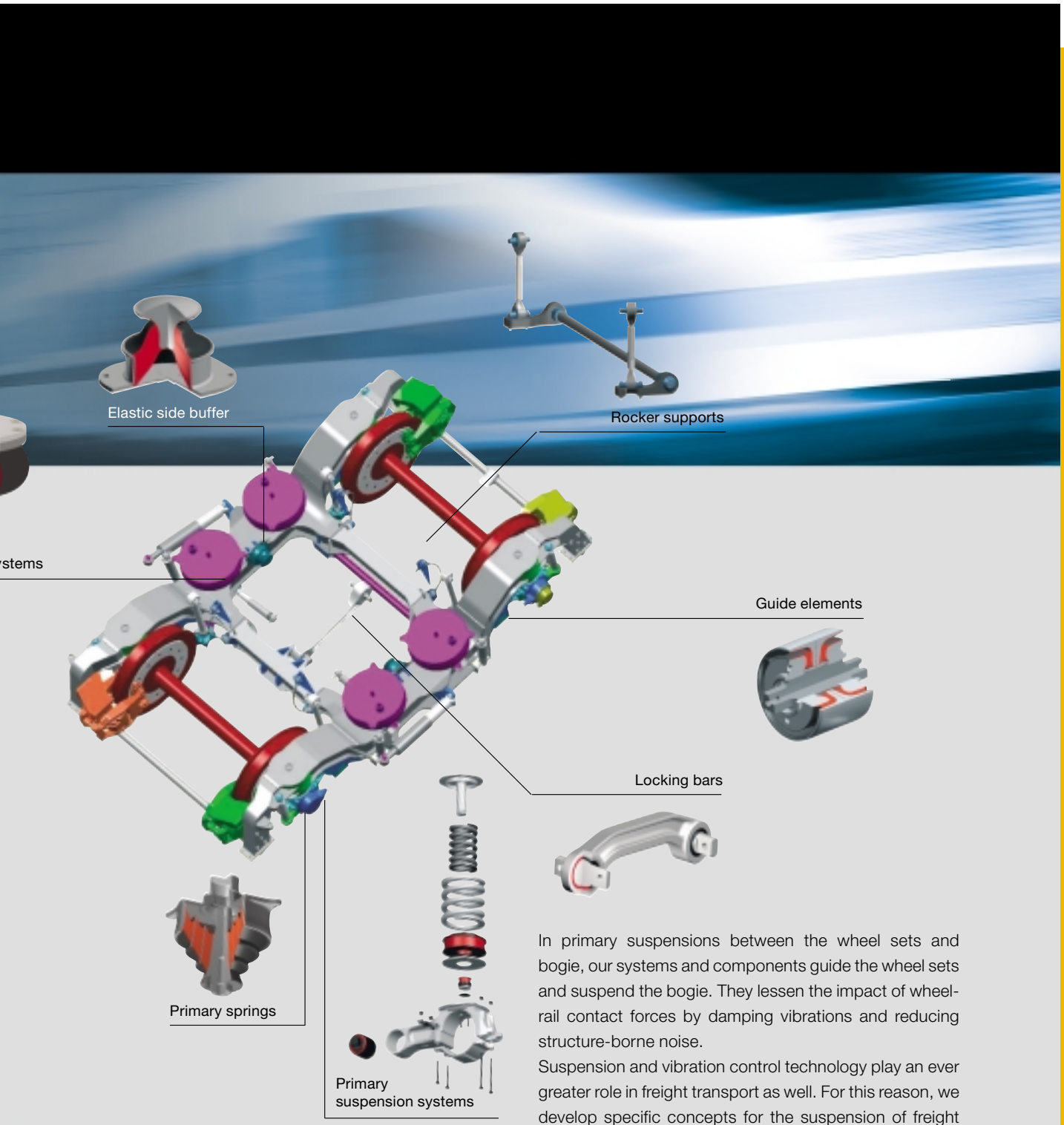
As development partner and original equipment manufacturer, we have comprehensive solutions based upon the highly-flexible material rubber. With the merging of ContiTech and Phoenix, we have expanded our technological potential even further, in particular in the field of elastic suspension elements for bogies.

With our know-how, we create complete suspension concepts for primary and secondary functions at the cutting-edge of technology – reliable, long-lived, absolutely maintenance-free and environmentally friendly. Our activities for comfort and safety in rail vehicles are grouped together in the Railway Engineering market segment. We work together with rail vehicle manufacturers and rail companies throughout the world – from the development phase to the integration of the product on site.

Our suspension concepts enhance ride comfort and improve transportation performance. They are economical and go easy on the environment, thanks to the reduction in air- and structure-borne noise.

ContiTech Railway Engineering – Comprehensive suspension expertise for modern rail vehicles

Secondary suspension sy



Travelers expect just as much comfort when traveling by train as they do when flying. With our suspension solutions, we are in a position to equip both suspension stages – primary and secondary – with complete suspension concepts, designed to meet the specific technical needs of the various vehicles while ensuring that passengers and goods arrive at the destination safe and sound.
In secondary suspensions between the bogie and vehicle body, our air spring systems serve to elastically suspend the vehicle body, largely decoupling it from the irregularities of the tracks. At the same time, they allow the bogie to turn as the train negotiates bends.

In primary suspensions between the wheel sets and bogie, our systems and components guide the wheel sets and suspend the bogie. They lessen the impact of wheel-rail contact forces by damping vibrations and reducing structure-borne noise.
Suspension and vibration control technology play an ever greater role in freight transport as well. For this reason, we develop specific concepts for the suspension of freight cars, which usually have a single suspension function. The Gigabox, an entirely new type of system consisting of wheel set bearings and hydraulic spring, not only reduces noise and relieves railway track stress, but cuts costs as well.

Superb ride comfort – that is the foremost effect of our air spring systems in secondary suspensions, thanks in part to their precise configuration and the perfect interaction between all components.

The utmost in comfort –
Secondary suspension systems

ContiTech and Phoenix air spring systems play a key role in the secondary suspension. It's all a matter of the air: air springs have a low natural frequency, which minimizes the transmission of vibrations.
Another advantage is the constant leveling function which maintains the vehicle body at a consistent height – regardless whether it is full of passengers or empty. And with the pneumatic height control, the train car exits can be adapted precisely to the height of the station platform.

An outstanding feature of the system is the combination of the rubber-metal auxiliary spring integrated in the air spring.
Using this technology, we can develop system configurations for a wide variety of bogies and vehicle body models. We select a type of bellows suitable for the individual application and then tailor the auxiliary spring to match it precisely. This diverse range of design possibilities covers all conceivable applications.

Korea – TGV

England – Desiro UK

India – EMU

Picture source: Siemens

Australia – Millennium Train

Rolling lobe air spring

Double convolution air spring

Unrestricted dia-phragm air spring

Belted air spring

Guided rolling lobe air spring

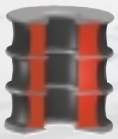
The ideal spring type for every application: Air spring systems with their components for secondary suspension

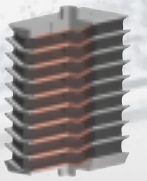
Primary suspension requires highly sophisticated systems and components to ensure smooth operation. By tailoring our suspension concepts individually to every type of bogie, we ensure that all requirements are met.

Unshakable precision –
Primary suspension systems

Spain – Talgo 350

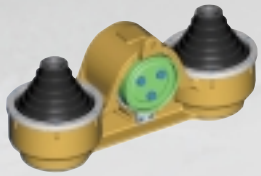

Guide elements


Leaf springs


Axle springs


Conical springs


Axle springs


Gigabox

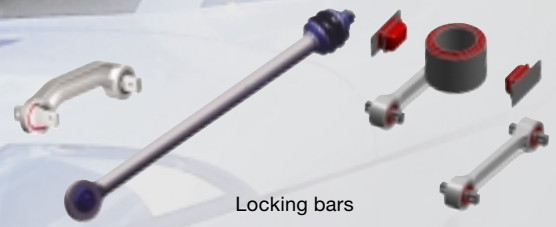
Suspension in all directions: Air spring systems with their components for primary suspension.

Singapore – Metro

MEGI® and SCHWINGMETALL® are registered trademarks for suspension components of bonded metal and rubber.

The primary suspension system is the most technically demanding feature in the bogie. Vibrations must be dampened and stiffness values harmonized precisely. There are a multitude of suspension engineering challenges to be mastered: MEGI® primary spring systems, as well as hydraulic springs, axle springs (Chevron), leaf springs and compact conical springs guide the wheel sets and suspend the bogie. Auxiliary steering systems, such as steering rods, transmit power as resilient components between the bogie and the vehicle body in addition to steering the wheel set. The SCHWINGMETALL® coupling articulation, for instance, functions as a connecting element between the two vehicle bodies. But there is more to it than that. Guide elements, transverse bumpers, auxiliary springs and leaf springs carry out other suspension and vibration control functions that ensure a comfortable ride in the vehicle and keep noise pollution down. The innovative Gigabox improves the running smoothness significantly in freight transport. The primary spring, however, also helps cut costs by reducing wheel wear and thus lengthening the service life.

Rocker support



Locking bars

Customized solutions for complex tasks: Auxiliary systems for power transmission, and for sound and vibration isolation.

Germany – Railcar

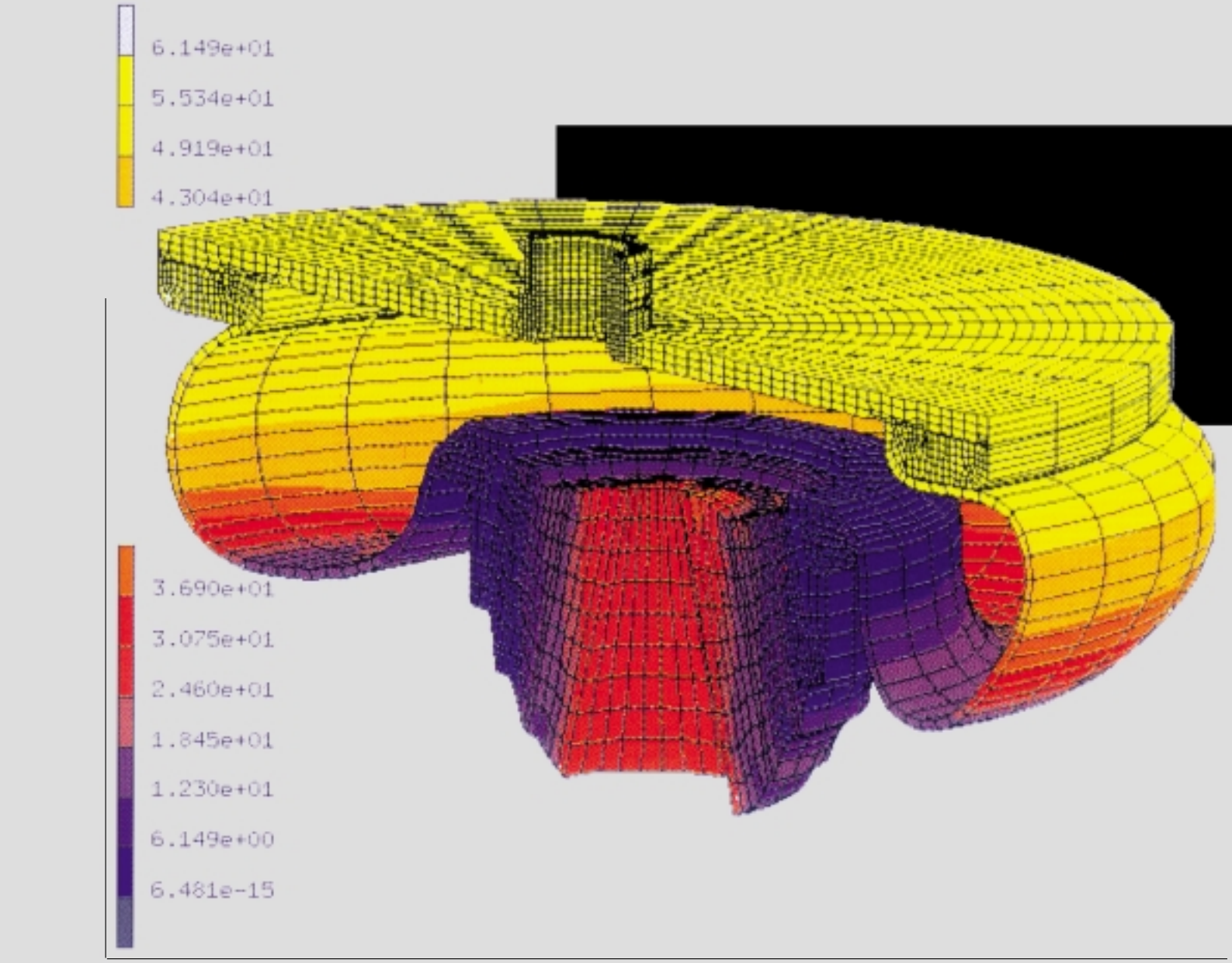
France – Regional express

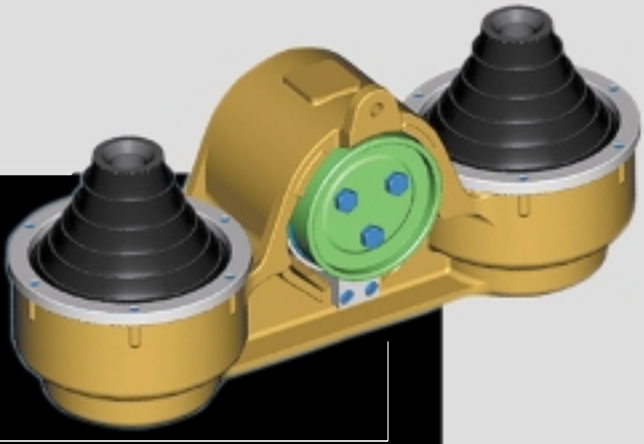
Smooth running freight transport: the innovative Gigabox system

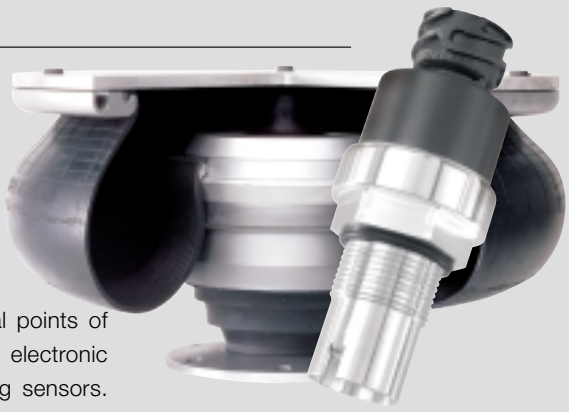
The entire development process of our products is supported by extensive performance testing. Under real-life conditions, we test whether the required in-service characteristics are met.

Simulating the real world – Test center sets the pace for modern air suspension technology

Gigabox – We assume responsibility for each system as a whole. For instance, together with the Swedish roller bearing manufacturer SKF, we developed the Gigabox, an entirely new kind of system consisting of wheel set bearings and hydraulic spring. It ensures smooth running properties, reduces structure-borne noise and requires no maintenance for up to one million kilometers.







Sensor system
One of the focal points of our research is electronic intelligence using sensors. They ensure that a constant height level is adjusted at the interface to the vehicle body.

Focus on durability –
Efficient tools for calculating and design

Finite Element Method

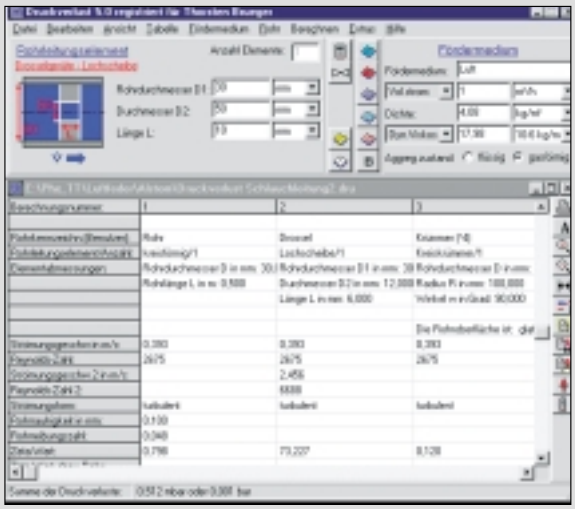
In state-of-the-art processes, we develop products to last as long as possible. We analyze product characteristics by simulating various operating conditions, using the results to create the best product design. This reduces the number of prototypes, thus cutting development costs and times.

When designing air spring systems, we use the finite element method. Already in the conceptual phase, we utilize this simulation technology to determine the mechanical loads and the resulting local strain and deterioration that occur in actual applications. Based upon these findings, we design the strength of the individual system components – efficiently using materials and optimizing component weight while maximizing the service life.

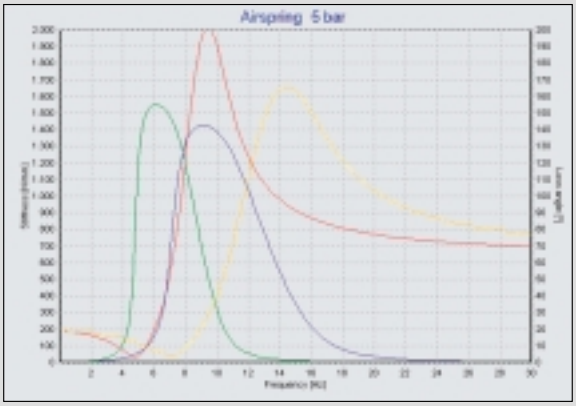
Service Life Estimates

A vital tool for evaluating elastomer and air spring systems is the service life estimation, which we do using a special process. With this calculation, it is possible to determine areas where the product is subjected to the greatest stress or where deterioration occurs. Taking this information, we then optimize the component already in the design phase, providing it with the longest possible service life.

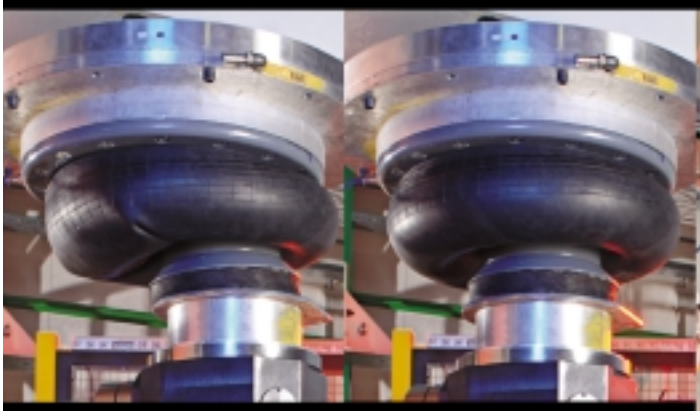
Determination of damping property of an air spring system



Determination of performance parameters



Impact of line length to the auxiliary reservoir on the stiffness and the loss angle



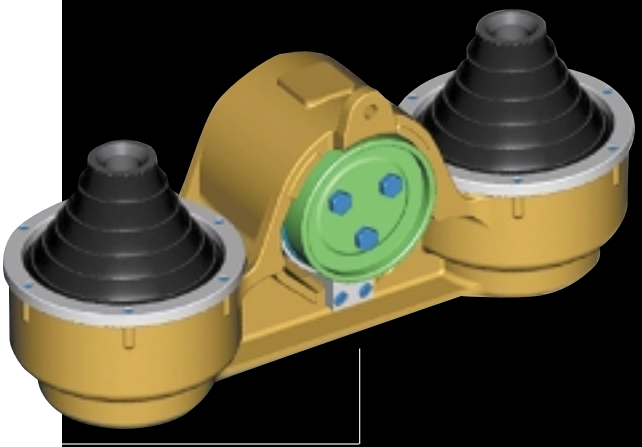
When it comes to safety in rail traffic, no compromises can be made. To make sure that our products are suitable for real-life applications, they are tested in our central Hanover test center – the world's most extensive testing facility of its kind. Testing equipment includes multi-axial test rigs, single and multi-axle test rigs, dynamics test equipment, bursting pressure test rigs and test rigs which can be adapted to individual assemblies.

We simulate and analyze all load conditions that arise during operation, not only accelerating our own product development but our customers' development processes as well.

Characteristics testing and destructive tests provide us with insight into the properties of the product.

By subjecting our products to extreme loads, including accelerated tests, we determine their service life. And in test track runs, we verify various properties such as suspension characteristics and functionality of the sensor system. This testing technology is a part of our quality responsibility. It guarantees the excellent reliability and performance of our suspension system.

AIR SPRING TECHNOLOGY CENTER



On track worldwide –
In inter-city and mass transit trains

Picture source: Bombardier Transportation

Shanghai – Pearlline (Metro)

Bangkok – Metro

Denmark – Doubledeck train

For 50 years, we have supported the technological development of inter-city and mass transit trains. During this time, we have repeatedly created innovative products that modernized – and sometimes even revolutionized - rail transportation, for instance the first air suspension system for high-speed trains.

We have expanded our product range and opened up markets on an ongoing basis. Today our suspension concepts for maximum safety and ride comfort have become permanent features in inter-city and mass transit trains as well as high-speed trains.

50 years of engineering achievements

1956 Air springs for rail buses
1962 Unrestricted air spring for bolsterless bogies
1968 Air suspension for underground trains in Munich
1975 Belted rolling lobe air spring for bogies
1981 Development of air spring systems for TGV
1985 Development of side-tilt system
1986 Development of wheel set control spring for TGV
1988 Development of a spring concept with extremely low horizontal stiffness and high lateral stability
1990 Development of an FEM calculation program to design air spring systems for rail vehicles
1994 Development of air spring systems for ICE 2
Development of coupling articulation for TGV 2 N
1995 Development of a module family of laterally stable rolling lobe air springs for low-floor concepts
1996 Development of the hydraulic spring as an axle spring
1997 Development of a primary air spring
2000 Development of a complete primary suspension level

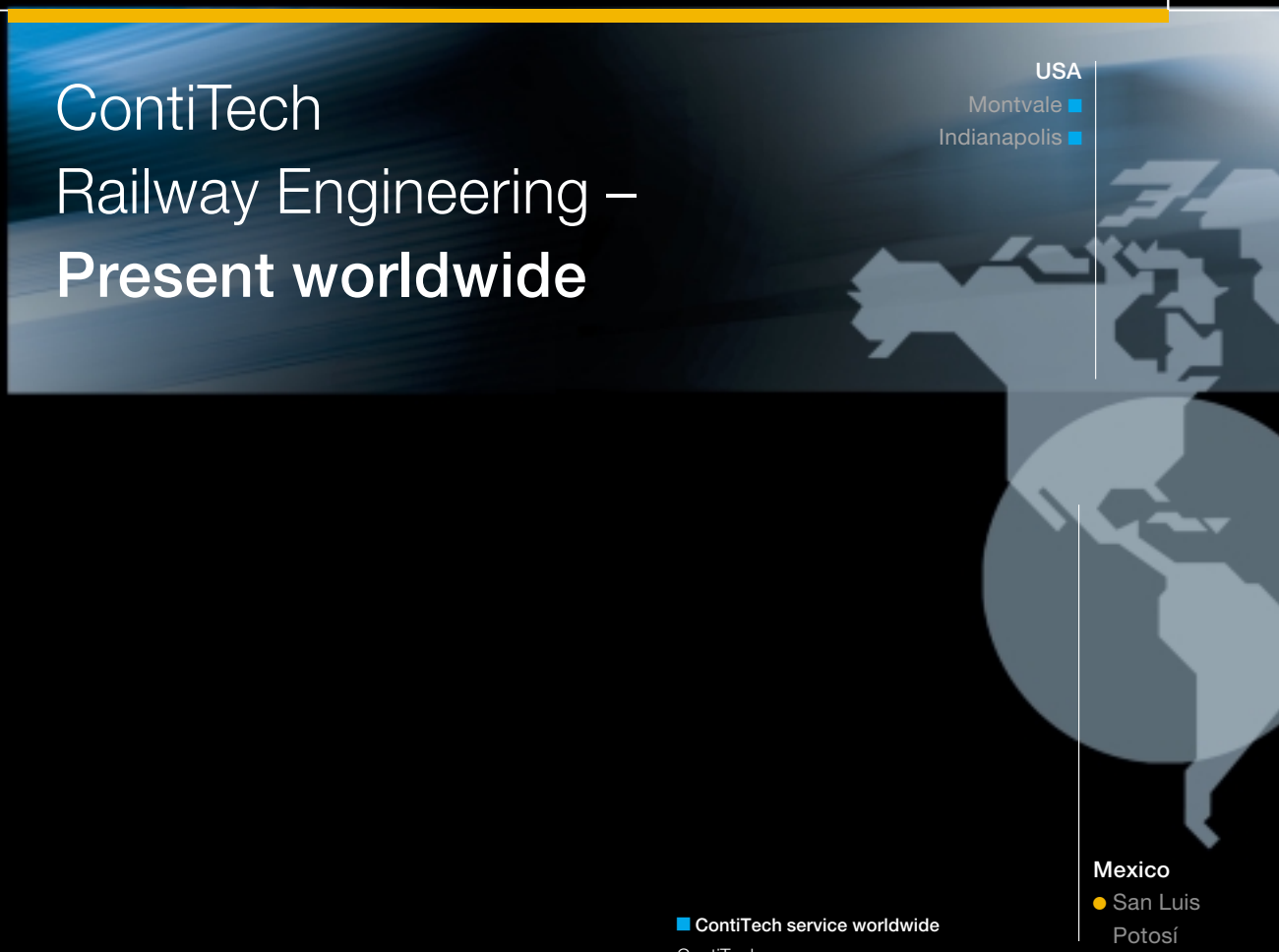
Paris/Cologne – Thalys

London/Paris – Eurostar

Examples of projects in Europe		NS	Doubledeck coaches IRM	Metro Singapore
DB	ICE 1-3, ICT	SBB	Suburban trains in Zurich	Metro Bangkok, Thailand
DB	VT 611/VT 612	CD	Doubledeck coaches	Metro Taipei, Taiwan
DB	ET 423/424/425	UK	TURBOSTAR	Metro Shanghai, PRC
DB	Talent	UK	ELECTROSTAR	Metro Toronto, Canada
DB	Doubledeck coaches	UK	London Underground	Metro Los Angeles, USA
SNCF	TGV	Trenitalia	Minuetto, TAF	Metro São Paulo, Brazil
SNCF	TER, XTER, AGC			Metro Monterrey, Mexico
RENFE	Train Pendular	**Examples of projects**		XPT, Australia
SNCB	I 11 coaches	**outside Europe**		HUNTER/OSCARS, Australia
	Channel Tunnel	Metro Seoul, Korea		Millennium Train, Australia
	Night Stock	EMU, Taiwan		American Flyer (NEC), USA
NSB	Sleeping cars	EMU, Indonesia		
DSB	Underground trains in Copenhagen	EMU, India		
		Metro Hong Kong, PRC		

With our production locations, partnership alliances and worldwide sales network, we are a partner much in demand among our customers from the rail transport industry.

ContiTech Railway Engineering – **Present worldwide**



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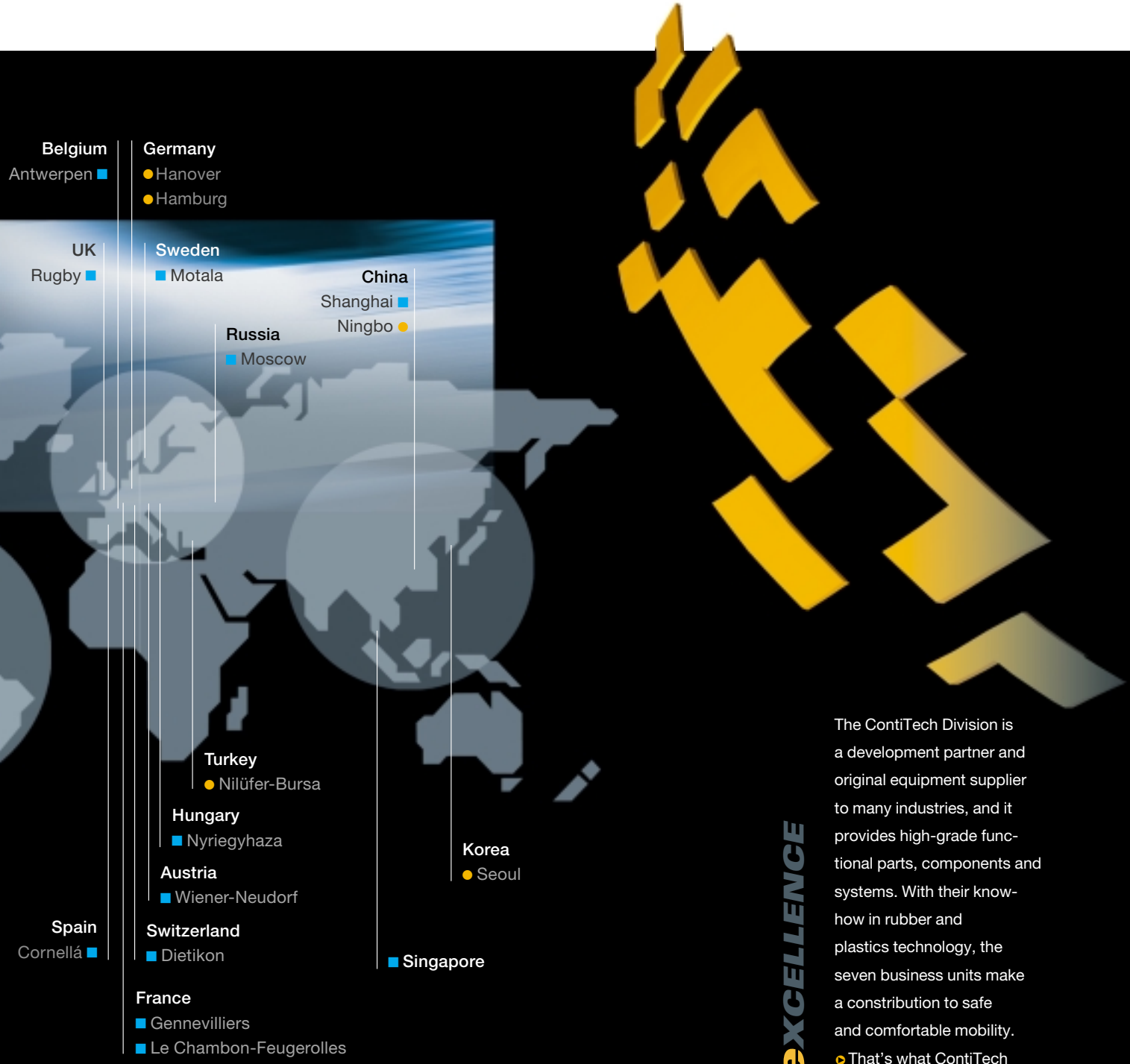
Certifications

Management system

certified by DQS
according to
DIN EN ISO 9001
FSO/TS 16949
VDA 6.1
Reg. No.:2286-QS/248

Umweltmanagementsystem
Dr. Kühnemann Institut und Partner für Umwelttechnik
Zertifiziert nach DIN EN ISO 14001
Reg.-Nr. 00-9053-05-01

EN ISO 14001



GO FOR eXCELLENCE

The ContiTech Division is a development partner and original equipment supplier to many industries, and it provides high-grade functional parts, components and systems. With their know-how in rubber and plastics technology, the seven business units make a constribution to safe and comfortable mobility. That's what ContiTech is all about.

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