



MEETING YOUR WORLD CLASS STANDARD

Global solutions for the railway industry

Established in 1857

Your experience only



WORKING TOGETHER TO CREATE WORLDCLASS RAILWAY PRODUCTS

KONI develops, manufactures and sells worldwide specialty high quality hydraulic shock absorbers and systems for street and racing cars, busses, trucks, trailers, railway rolling stock, defense and industrial applications.

In railway technology the demands for even higher standards for safety, durability, performance and passenger-comfort are universal. That is why we strive to be the leading solution provider for the global rail industry. Operating on all continents, KONI dampers are supplied to the world markets through a vast number of local distributors. Providing added value to you means that we are connected to your markets and therefore your needs. We deliver anywhere, anytime, worldwide.



As a market leader, we are committed to offering an unmatched service for railway solutions. If we want to exceed your expectations, we need to connect to your business. So we focus on your demands and requirements, whereby working together as a team is the key.

We truly believe teamwork and sharing knowledge supports your business and, therefore, ours.

KONI IS AN ITT COMPANY

ITT is a focused multi-industrial company that designs and manufactures highly engineered critical components and customized technology solutions. Our customers in the energy, transportation and industrial markets depend on us to solve their most critical problems, and we focus on partnering with them to find solutions to their unique challenges. Founded in 1920, ITT is headquartered in White Plains, N.Y., with employees in more than 35 countries. The company has sales in approximately 125 countries and generated 2013 revenues of \$2.5 billion.

For more information, visit www.itt.com.





THE ENERGY ABSORPTION SPECIALIST

A WEALTH OF EXPERTISE AND EXPERIENCE

The history of KONI began in 1857 with the supply of high quality leather harnesses and seals to the industrializing Netherlands. KONI expanded its product lines to vibration control in 1932 with the manufacture of friction dampers, quickly followed with the breakthrough introduction of adjustable hydraulic dampers.

Continuous research and further development of the Energy Absorption segment has made KONI the leading manufacturer of hydraulic dampers for rolling stock and automotive applications. This requires not only a high degree of engineering advancement, but also makes KONI with its long, successful history a trusted partner and specialist.

Our engineers have compiled a huge database of the ideal damping characteristics for every application and are consistently working on new damping concepts. Contemporary computer supported design technologies, highly trained and motivated personnel and the availability of extended measuring and testing facilities lead to well researched and thoroughly developed new solutions. Naturally all new developments in materials are closely followed and evaluated for product use.

Our organization is committed to Total Quality Management. We are operating in compliance with the quality standard ISO 9001: 2008 and the environmental code ISO 14001. Moreover, we are International Railways Industry Standard (IRIS) certified.

RELIABLE

ARCTIC CONDITIONS

In our ever faster-moving world we want to work with reliable products. Starting with the right solution is extremely important to ensure your train survives the harshest conditions. Riding through a frozen and icy arctic landscape, where temperatures can drop as low as -50 degrees Celsius (-58 F), you want your products to perform.

Our ARCTIC PACK is specifically designed to be the most reliable when winter conditions call for it. Our engineers have tested these special dampers under extremely low temperatures. The dampers will work properly even under the most challenging arctic conditions.

In order to achieve this extraordinary performance, several components have been redesigned and adjusted. For instance, the dampers are equipped with special seals suitable to withstand the low temperatures. Also we use special arctic oil with a relatively low viscosity at low temperatures to avoid blockage. Furthermore we have applied special silent blocks with suitable metals and rubber compounds, and an additional rubber snow cover is added as well on the outside of the damper.

With our ARCTIC PACK we make even the most remote areas accessible.





ARCTIC PACK

Damper



CHARACTERISTICS

Suitable for extremely low temperatures thanks to:
Special oil and materials
Snow and ice protection





DESERT PACK

Damper



CHARACTERISTICS

Suitable for extremely harsh environments thanks to:

- Robust construction
- Sand and dust protection





RELIABLE

DESERT PROOF

Crossing the desert is never an easy job. Extremely high temperatures, dust and sand create the most challenging conditions known on our planet. The wrath of the sand is apparent everywhere. Especially for modern, high-tech railway systems these circumstances can be dangerous. Due to the impact of the sand, it will tend to wear on the bogies and suspension dampers.

And that's something KONI needs to avoid. With our DESERT PACK we protect your products from the wear and tear of the desert. To be able to operate successfully, our equipment requires adaptation to the environment and to the limitations these climates impose. The dampers are modified in such a way that they match the performance and endurance you may expect from us.

That is why we have enlarged the metal dust cover, which offers extra protection against the larger sand particles. Additional rubber dust protection outside the damper prevents fine sand and dust from entering the damper. Also we have fitted an enhanced dirt scraper ring inside the damper for extra protection against dirt damaging the internal damper seal. To shield the dampers against sand blasting the material is covered in a double heavy-duty paint layer.

With our DESERT PACK you can be sure your train is prepared for a storm-prone area.



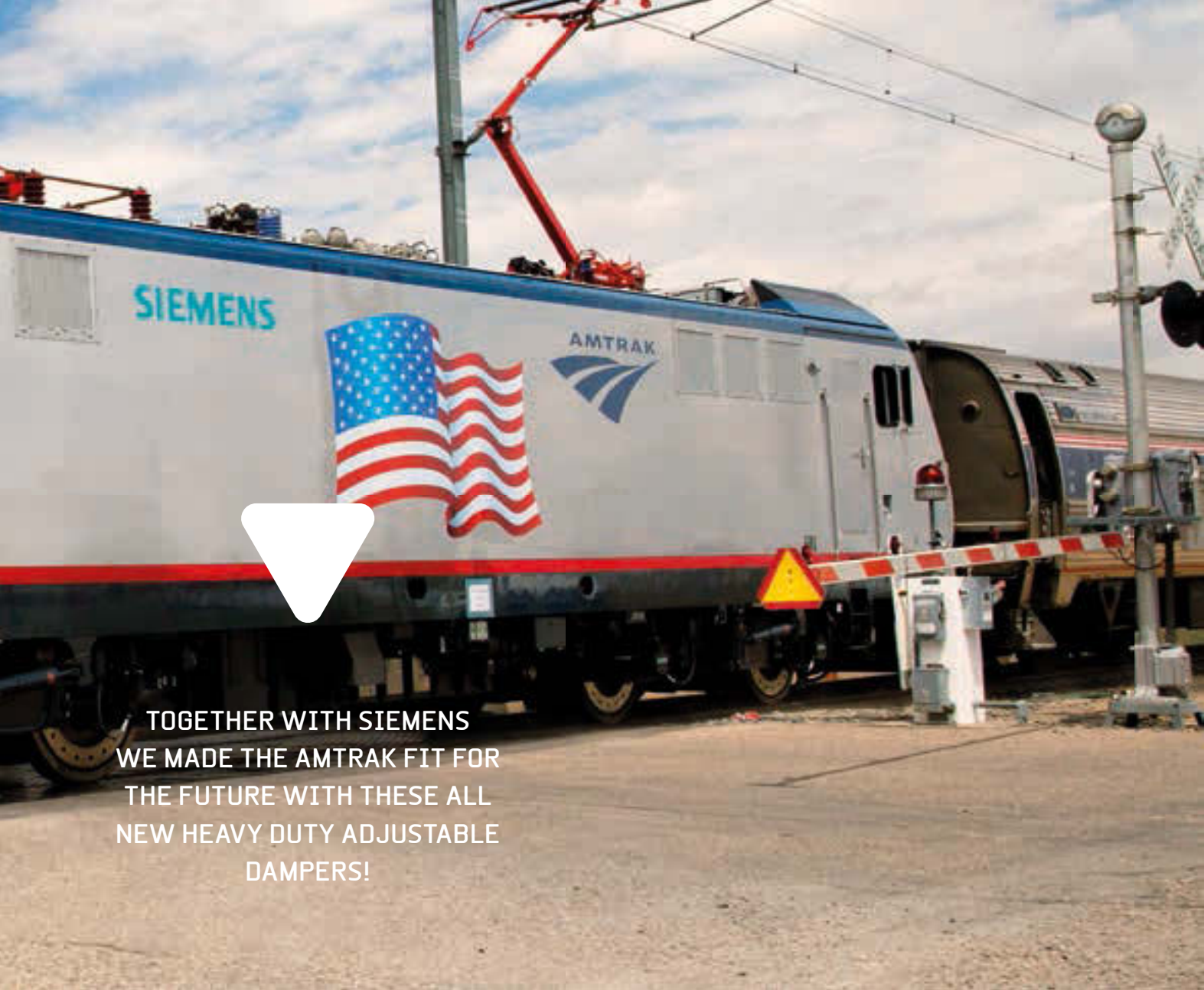
ADDING VALUE TO YOUR BUSINESS

TESTING MAKES PERFECT

Amtrak awarded Siemens a contract to deliver 70 electric locomotives. For Siemens, this order marked the company's entry into the American locomotive market. The locomotives are manufactured in the Sacramento plant, California.

GROWING NUMBERS

Capable of pulling 18 train cars at a maximum speed of 200 km/h (125 mph) these new Amtrak locomotives will safely and efficiently power commuters along the heavily traveled Northeast corridor between Washington, New York and Boston. Amtrak operates more than 300 intercity trains daily on a railroad network of almost



**TOGETHER WITH SIEMENS
WE MADE THE AMTRAK FIT FOR
THE FUTURE WITH THESE ALL
NEW HEAVY DUTY ADJUSTABLE
DAMPERS!**

34,300 km (21,300 miles) that serves 500 cities in North America. Its ridership continues to grow, with the company transporting 31.6 million passengers in 2013, an all-time annual record, and the 10th such record in 11 years.

CLOSE COLLABORATION

KONI is very proud to be the damper supplier for equipping the 70 new locomotives. The main advantage that we offer Siemens is symmetrical damping characteristics and longer service life. This particular locomotive for Amtrak was tested for ride quality prior to Amtrak accepting delivery, and Siemens was very pleased to advise us that the ride quality was significantly better than the specification required.

ADVANCED TECHNOLOGY

As a result the new type of locomotives can be maintained easier, operate more energy efficiently and provide improved performance.

MEETING RISING EXPECTATIONS AND REQUIREMENTS

The recognized KONI rail product is considered the most homologated brand. Hence, it is applied basically everywhere in the world. All over EMEA, the America's and the APAC operators experience the pleasure of using our durable and reliable products with the highest RAMS factor.

We owe this global position in homologation to developments in the 1970s, a period in which our company experienced rapid growth. Major parties like SNCF, Deutsche Bahn, the former British Rail and the Dutch Railways invested huge amounts of money, mainly via funds, in new railway infrastructure.

This also resulted in major progress for our company. The investments provided powerful momentum to the development of new products and enabled further innovation of our hydraulic dampers. It gave us the opportunity to raise standards on a global level, something we still maintain in the present day.

The strong innovative character of KONI has led to economic, technical and sustainability-driven product enhancements. We specifically mention:

- improved RAMS through standardisation and modularity;
- performance improvements through enhanced design;
- development of low cost disposable types;
- significant weight reductions.

From an economical point of view our two available product families, the low cost Performance Line and the fully maintainable and easily adjustable Endurance Line, provide a customized mixture of disposable and maintainable products presented as a bogie set. This offers the user the optimum economic solution for its specific business configuration. In this way, our continuous innovated designs provide the best possible value for money in terms of reliability and performance.

A fine example of this development can be found at SNCF. The entire range of commuter trains produced by Bombardier for the SNCF, from TER, via AGC and NAT to the most sophisticated R2N are equipped with KONI products. As such, the TER type bogies were fully equipped with dampers that could be overhauled. To reduce initial cost and maintenance cost the dampers have now partly migrated to disposable types in the consecutive platforms. Through a gradual development over years we have achieved a specific solution, where the number of different dampers on the bogie is fully balanced with the needs of this client.

This form of close cooperation and customised solution helped us evolve into one of the biggest players in the international railway industry.

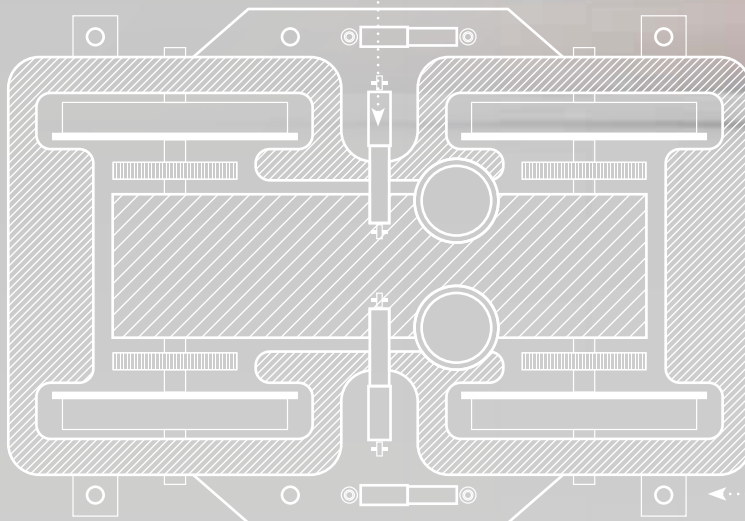
PROBLEM SOLVERS FOR ALL YOUR CHALLENGES

To help you reach stringent comfort and safety requirements, we offer a full range of solutions that can be engineered to create the desired characteristics. These tailor made products provide you with the extra control needed to bring your vehicle designs to the required high levels of comfort, safety and suitability. With our Technology Line you are best equipped to ever changing circumstances.



DAMPER-SPRING COMBINATION

External adjustable integrated damper-spring combinations with separate endrange damper. A tailor-made solution for limited space situations.



CVD DAMPER

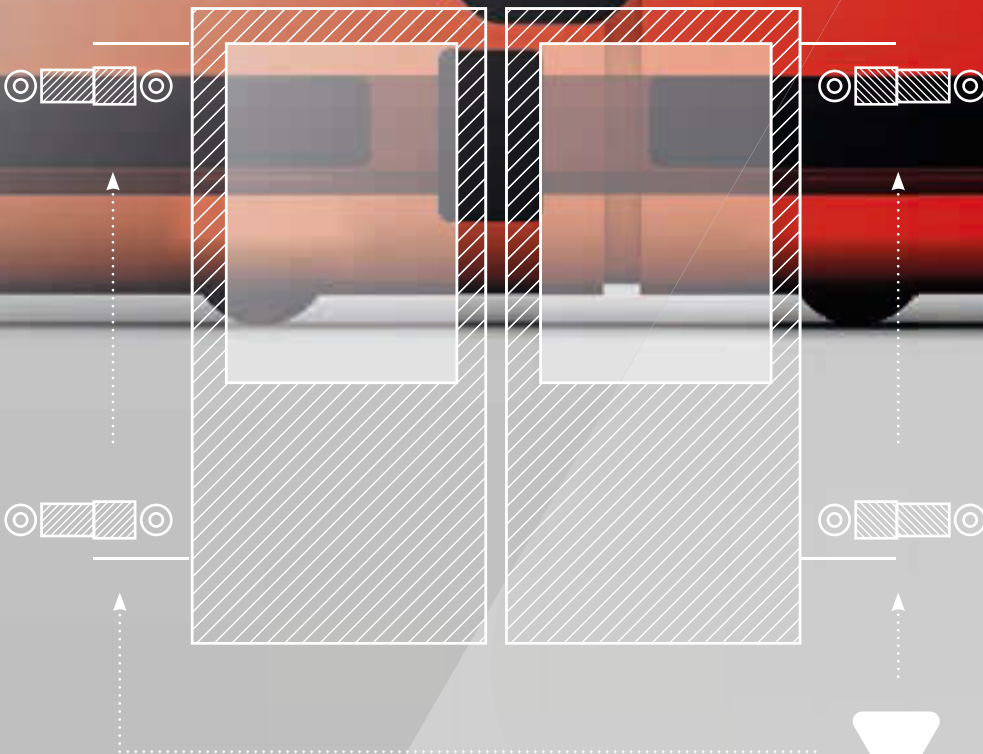
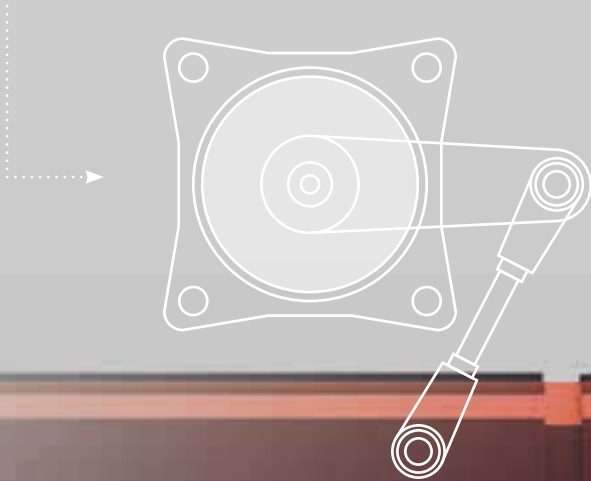
The Continuously Variable Damping System dampens the complete spectrum of vibration by continuously adjusting the forces to the exact level of damping required.



ROTARY DAMPER

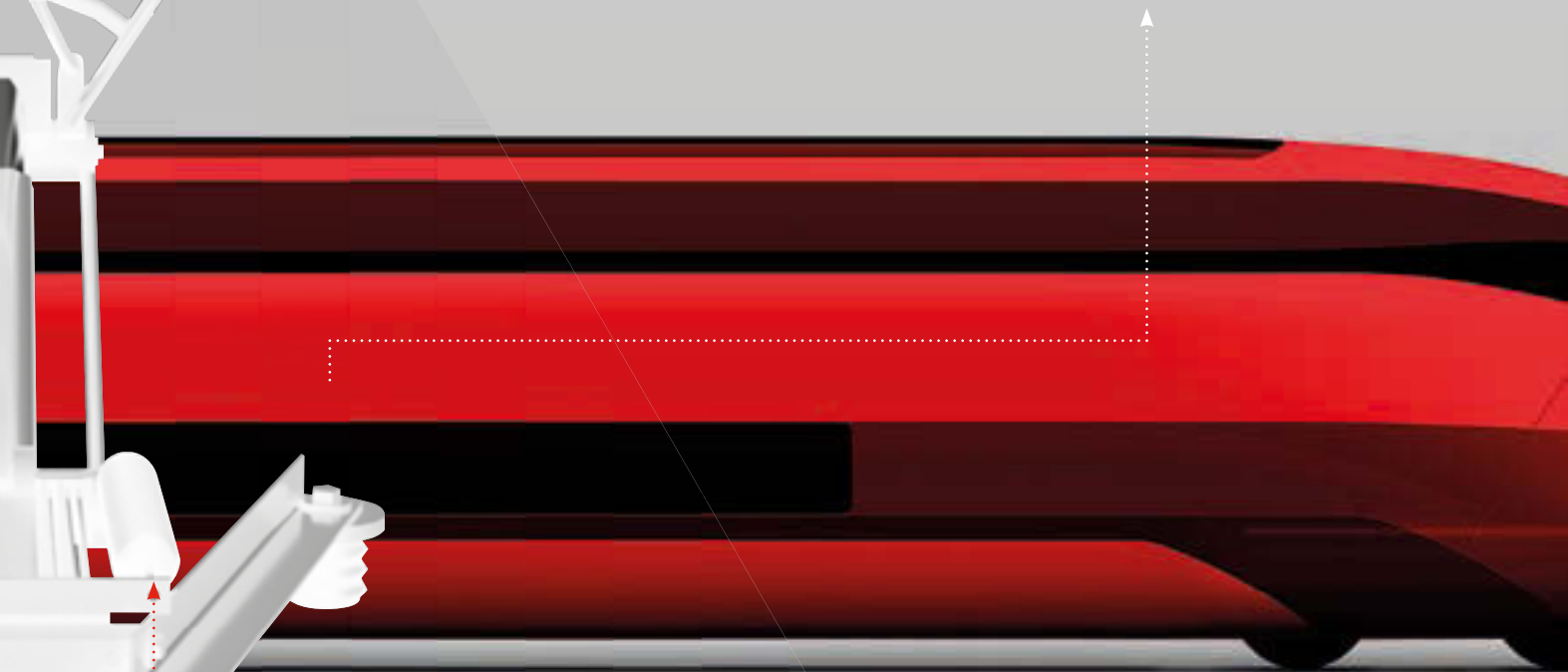
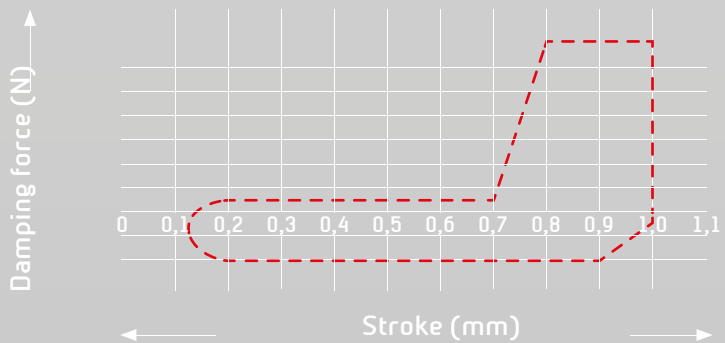
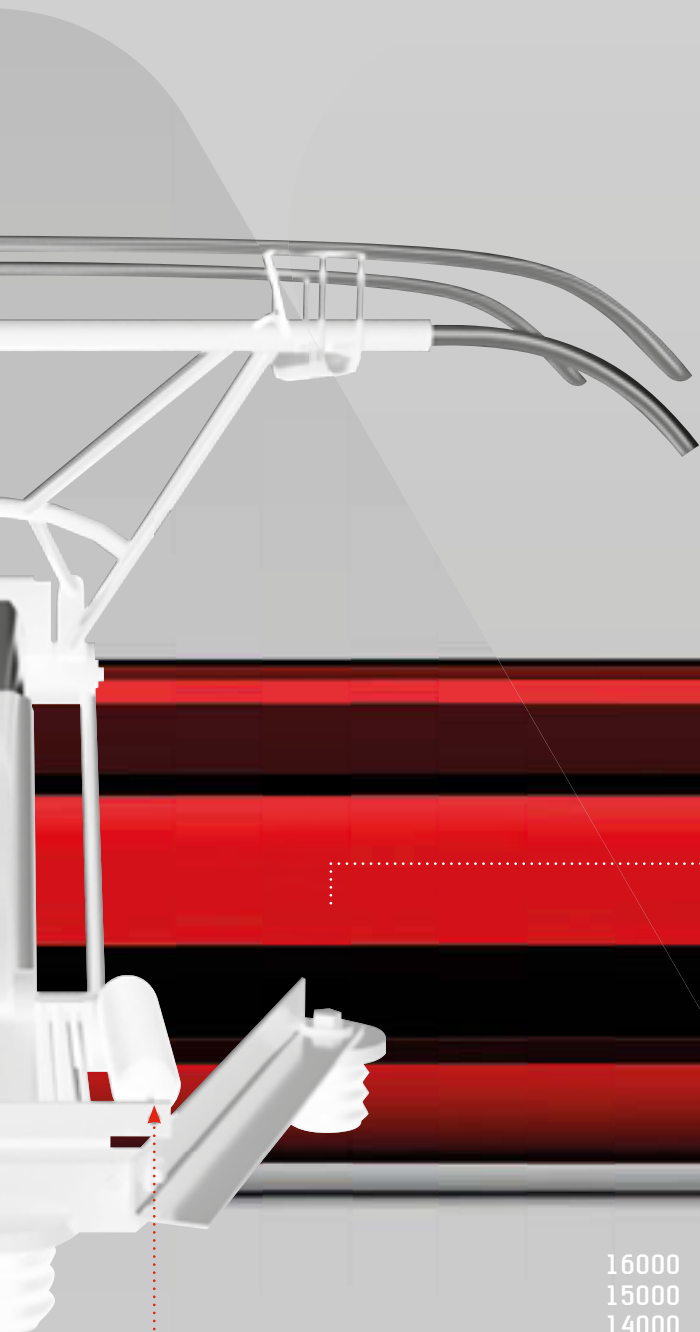
The uniquely constructed rotary damper is a vane-type damper which can be used in applications where space limitation is a concern.

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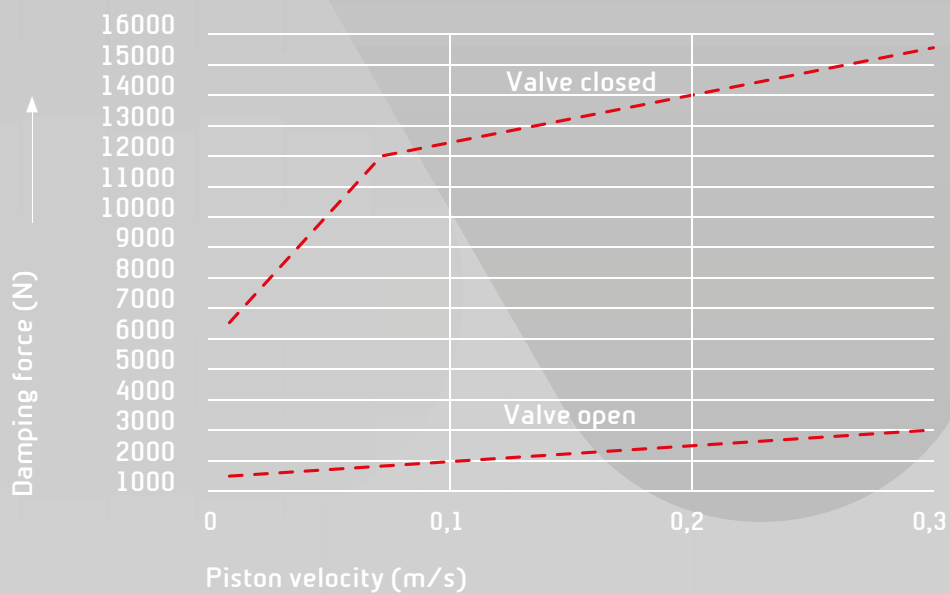
DOOR ACTUATOR DAMPER

These dampers are dedicated stroke dependent dampers, controlling door movements with exactly the correct speed to avoid slamming.



PANTOGRAPH DAMPERS

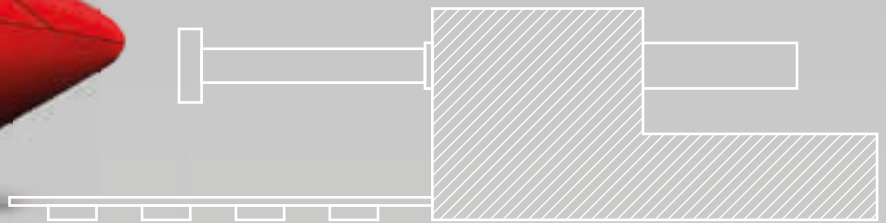
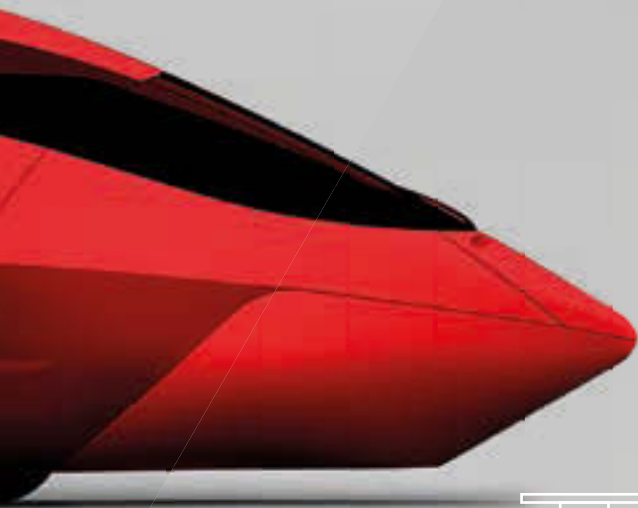
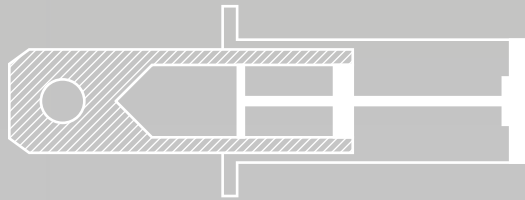
The pantograph dampers have a position dependent performance characteristic. It is customized to control the pantograph in working position in contact to the catenary as well as while lowering the pantograph to the roof.





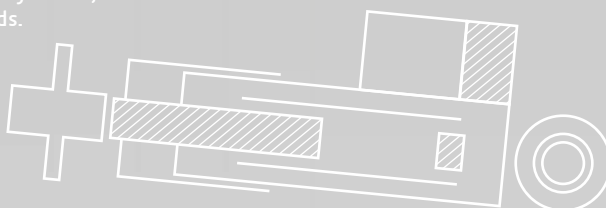
SILICON FLUID SHOCK ABSORBERS

These high capacity shock absorbers combine the energy absorption and return spring functions in a single unit, without the need for an additional gas or mechanical spring stroke return mechanism.



ELECTRONICALLY CONTROLLED YAW DAMPER

The electronically controlled yaw damper can be switched off and on, resulting in a smooth ride at low speeds on curvy tracks, and safe and steady ride at high speeds.



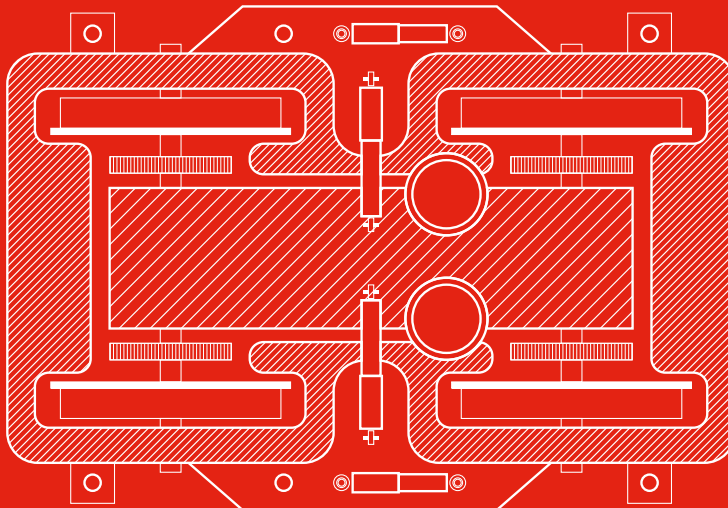
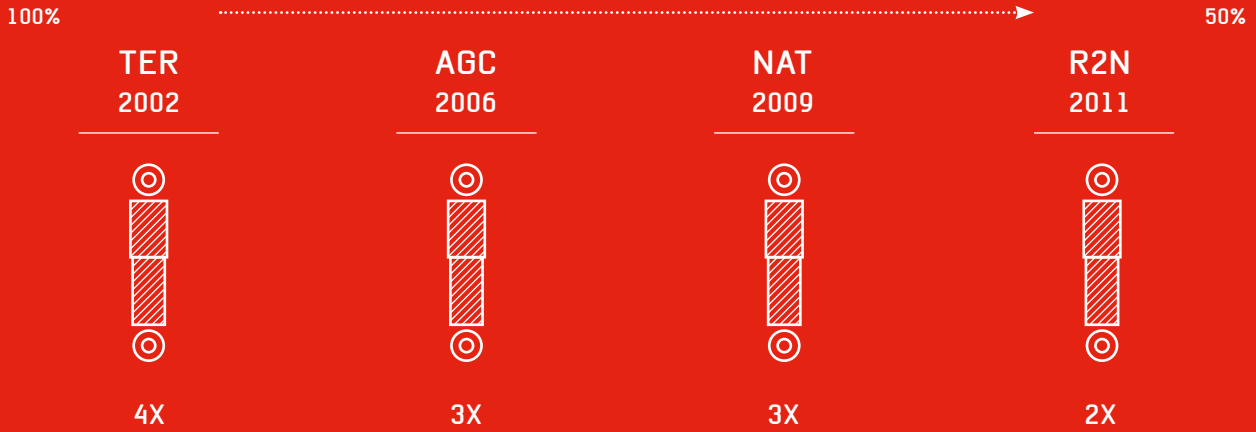
GAS / HYDRAULIC SHOCK ABSORBERS

These large-bore, high-capacity buffers have been individually designed to decelerate moving loads under a wide range of conditions.



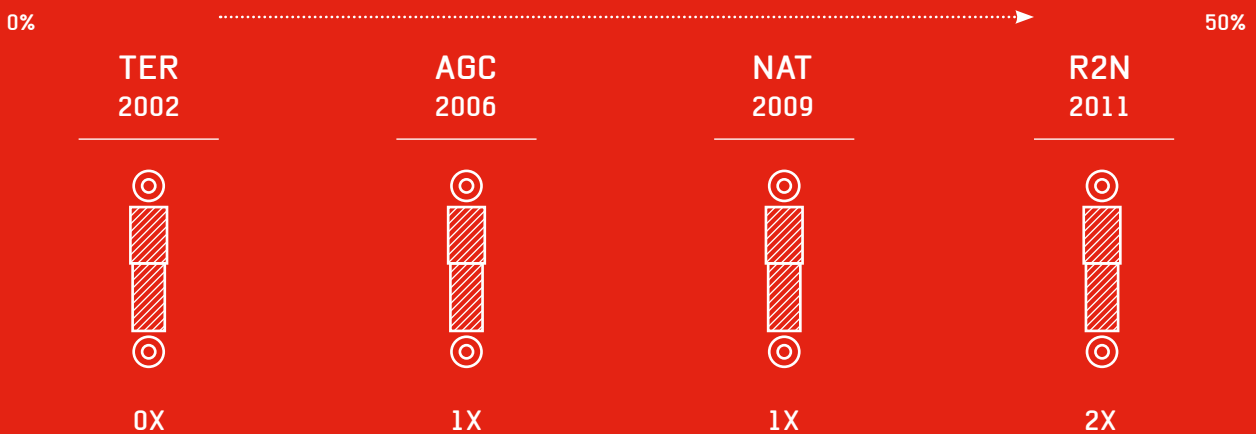
MAINTAINABLE

Dampers



DISPOSABLE

Dampers



The background features three large, overlapping shapes filled with a red hatched pattern. One shape is a semi-circle on the left, another is a heart shape in the center, and the third is an inverted heart shape at the bottom. The text is overlaid on these shapes.

**INNO-
VATION
IS
KEY**

KONI invests heavily in innovation. It is one of our core qualities required to continue to produce highly qualified shock absorbers – particularly including the railway market. In KONI’s vision innovation is the ultimate way to keep improving the world through technology and maintain being a market leader when it comes to railway solutions. The 05/06 dampers are an example of KONI’s innovative capacity, as well as the FSD technique – Frequency Selective Damping – which can be fitted on the 05/06 dampers.

MARKET TRENDS

The 05/06 dampers provide an answer to a clear market trend. Due to the higher base speed of trains, yaw dampers are required to give an improved performance at a short stroke. This improved performance can be achieved through a higher stiffness of the dampers. In addition, one is always looking for weight savings and methods to reduce the wear on train wheels and tracks.

SOLUTION

The design of 05/06 dampers features several improvements compared to traditional dampers. Due to the increased working area in the cylinder tube the dampers have an enhanced damper stiffness. This makes them perfectly suitable for yaw damper applications. A significant weight reduction has been realized by reducing the internal working pressures, allowing smaller piston diameter and thinner cylinder walls. The 05/06 dampers can be very easily fitted with FSD technology, Frequency Selective Damping. FSD automatically adjusts the damping force to the frequency of the movement. In practice, this contributes to less wear on rails and wheels.

INNOVATION PROCESS

Innovation is developed according to a value-based product development process, leading to an approved and efficiently produced product by following a structured methodology of a new idea.

The first phase consists of generating concepts, simulations, calculations and fundamental research. Only then follow testing the life cycle, manufacturability and production processes. After each phase an evaluation is performed on the feasibility of desired product performance.

05/06 DAMPERS

OPERATING PRINCIPLE

A 05/06 damper contains a two-direction oil flow through the piston. The foot valve supplies the relative small volume difference due to the piston rod volume without significant damping. The damping force is symmetrical during extension and compression stroke.

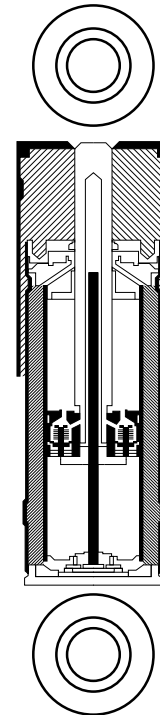
The damping force is generated by an equal amount of valve assemblies for each direction.

The 05 damper type is provided with 6 valve assemblies; 3 for each side. The 06 damper is provided with 8 valve assemblies.

One valve in each direction provides the damping rate and the remaining valves secure the required blow off forces. These valve assemblies are accurately adjusted before mounting and give the damper the desired characteristic.

During the compression stroke the damping is performed by the upper valve assemblies, in this direction the oil displaced by the piston rod volume, flows through a return tube back in the reservoir tube.

During the extension stroke the damping is performed by the lower valve assemblies, in this direction the oil volume flows back from the reservoir tube through the foot valve into the cylinder tube.



CHARACTERISTICS

Type 05

Max. damping force	15kN
Max. damping rate	600 kNs/m
Dust cover/ reservoir tube	Ø102 mm/Ø89 mm

Type 06

Max. damping force	25kN
Max. damping rate	1000 kNs/m
Dust cover/ reservoir tube	Ø120 mm/Ø108 mm

Features 05/06

- New developed range of damper with excellent performance characteristics
- Smart damper design, which features several improvements compared to traditional dampers
- Enhanced stiffness
- Significant weight reduction
- Possibility to include FSD valves
- Pre-set setting module inserts

Weight reduction

- A significant weight reduction could be realized due to:
- reduced internal working pressures allowed the use of a smaller piston rod diameter;
 - reduced wall thickness of the cylinder and dust cover tubes.

FREQUENCY SELECTIVE DAMPING

OPERATING PRINCIPLE

In addition to the regular valves, the 05/06 damper has in this case two FSD valves, one for each direction. During high frequencies the regular valves will generate the required damping; the FSD valves remain closed. At low frequencies, the FSD valves will open after a pre-designed time, this results in a lower damping characteristic as shown in the graph below.

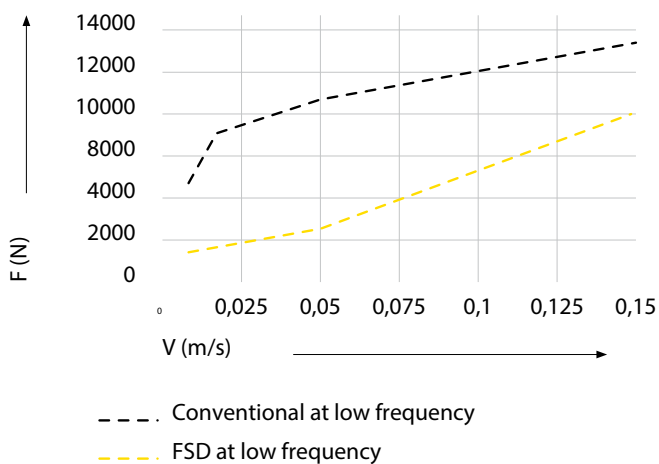
The opening of the FSD valve is achieved by emptying the oil from a chamber through a small hole. After the chamber is emptied, an oil channel is released allowing the oil to bypass the regular damper setting. If the damper changes direction the FSD valve closes automatically. This process is repeated with every damper stroke.



Benefits FSD

- Tough and comfortable damping in one single system.
- Less wear to the wheels and rails due to the lower damping force at bends and on bills.
- No electronics, fully mechanical operation.
- Easy to apply to 05/06 dampers.

Forces conventional damping vs. FSD damping



The reduced forces at low frequency during curving improves the ride quality and also reduces wear and fatigue problems caused by the counter track forces. The normal damping forces at high frequencies secure the safety during speeding over a straight track.



05/06 Dampers

The 05/06 dampers contain pre-set setting module inserts. The standard valves can be easily replaced by the special FSD valves.

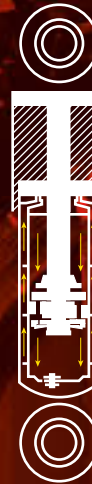
PERFORMANCE LINE

OPERATING PRINCIPLE

Our Performance Line dampers operate according to a two-directional oil flow through the piston. The construction of the damper is such that the damping forces are symmetrical during the extension and compression stroke. During the extension stroke the damping is performed by a valve stack below the piston, while during the compression stroke the valve stack on top of the piston creates the desired damping forces.

The characteristic of a Performance Line damper can be customized to suit the requirements in the linear (normal) operation area as well as in the blow-off area at high damper speeds.

PERFORMANCE Damper



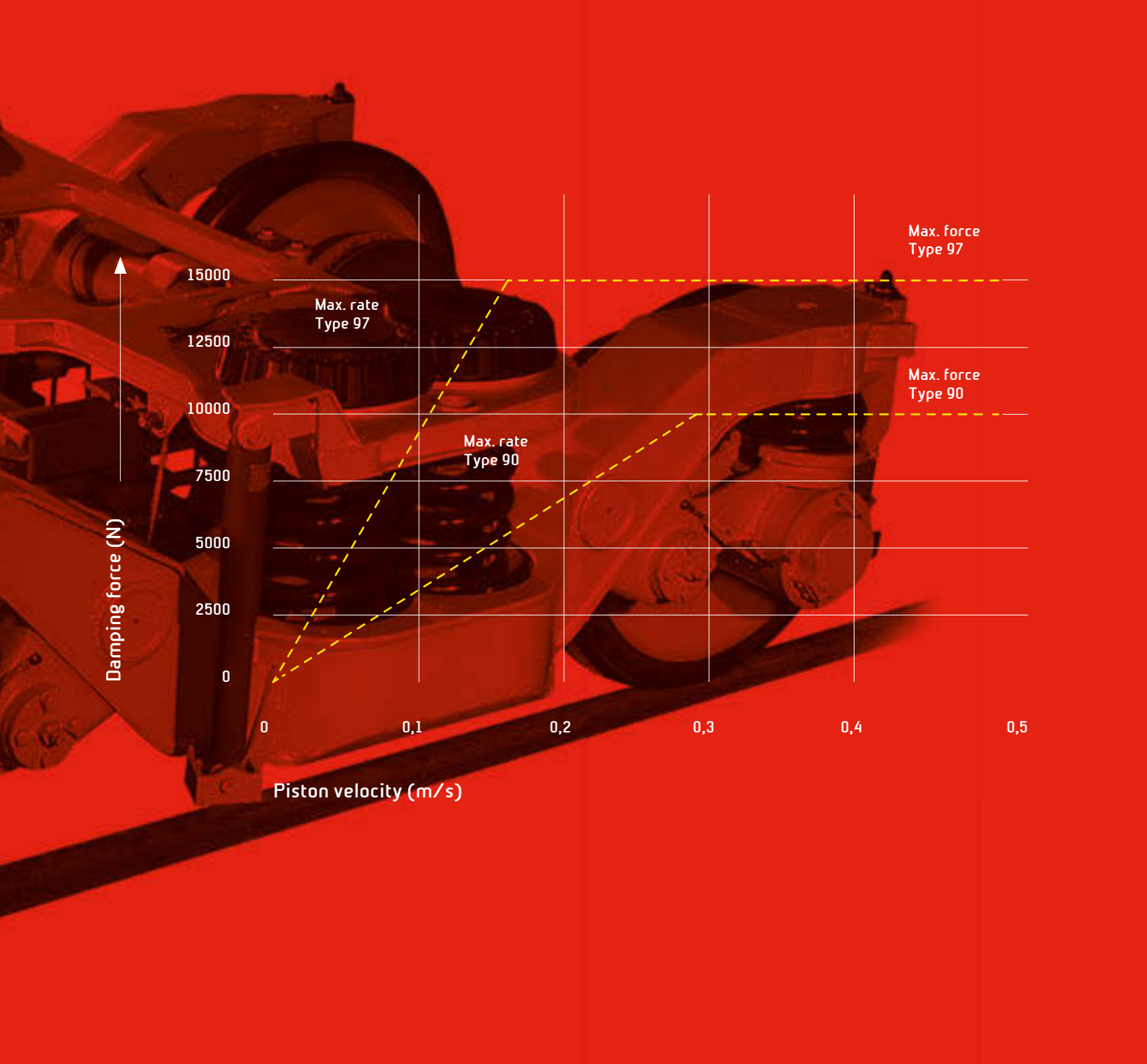
MAINTENANCE FREE

The Performance Line products provide maintenance-free superb operation until the next planned major overhaul of the bogies. After this time, and depending on the configuration, the product can be replaced by a new damper, or can be overhauled in a specialized workshop. Due to the smart damper design and the efficient manufacturing process, we are able to offer these dampers at very attractive price levels. These dampers are optimized to achieve the lowest possible initial purchase price without compromising the quality of the product.

UNIQUE FEATURES

The dampers are provided with the following specific railway features:

- Robust construction resulting in a long service life
- Symmetrical force in extension and compression
- Linear force rate up to a freely defined blow-off point
- The special synthetic rings around the piston and the guide result in the absence of any metal-to-metal contact
- High quality silent blocks
- Low-noise valve systems



ADDED VALUE FOR YOUR INVESTMENT

Our Performance Line dampers offer excellent value for your money and are among the latest damper innovations. They are suitable for the primary vertical, secondary vertical and secondary horizontal bogie applications.

SPECIFICATIONS

Type 90

Max. damping force 10 kN
 Max. damping rate 35 kNs/m
 Dust cover / reservoir tube Ø 80 mm / Ø 70 mm

Type 97

Max. damping force 15 kN
 Max. damping rate 100 kNs/m
 Dust cover/reservoir tube Ø 80 mm / Ø 70 mm

ENDURANCE LINE

OPERATING PRINCIPLE

All Endurance Line dampers operate in accordance with the circulating oil principle. This means that the oil is directed through the same valve systems in the guide, during both the compression and extension stroke. On the extension stroke the non-return valve in the piston is closed and the oil above the piston is forced through the damping valves in the guide. At the same time, because of the increased volume below the piston, oil is forced through the non-return foot valve.

During the compression stroke the non-return foot valve is closed and because the piston is forced down in the cylinder, oil flows through the now open non-return valve in the piston. The oil displaced by the piston rod is forced through the damping valves. Due to the unique valve system of the Endurance Line dampers, nearly every required characteristic can be provided within an unmatched narrow tolerance band.



ENDURANCE Damper



AVAILABILITY

For the following applications:

- Primary vertical
- Secondary vertical
- Secondary horizontal
- Yaw
- Inter-car
- Anti-roll

MULTIPLE LIFETIME

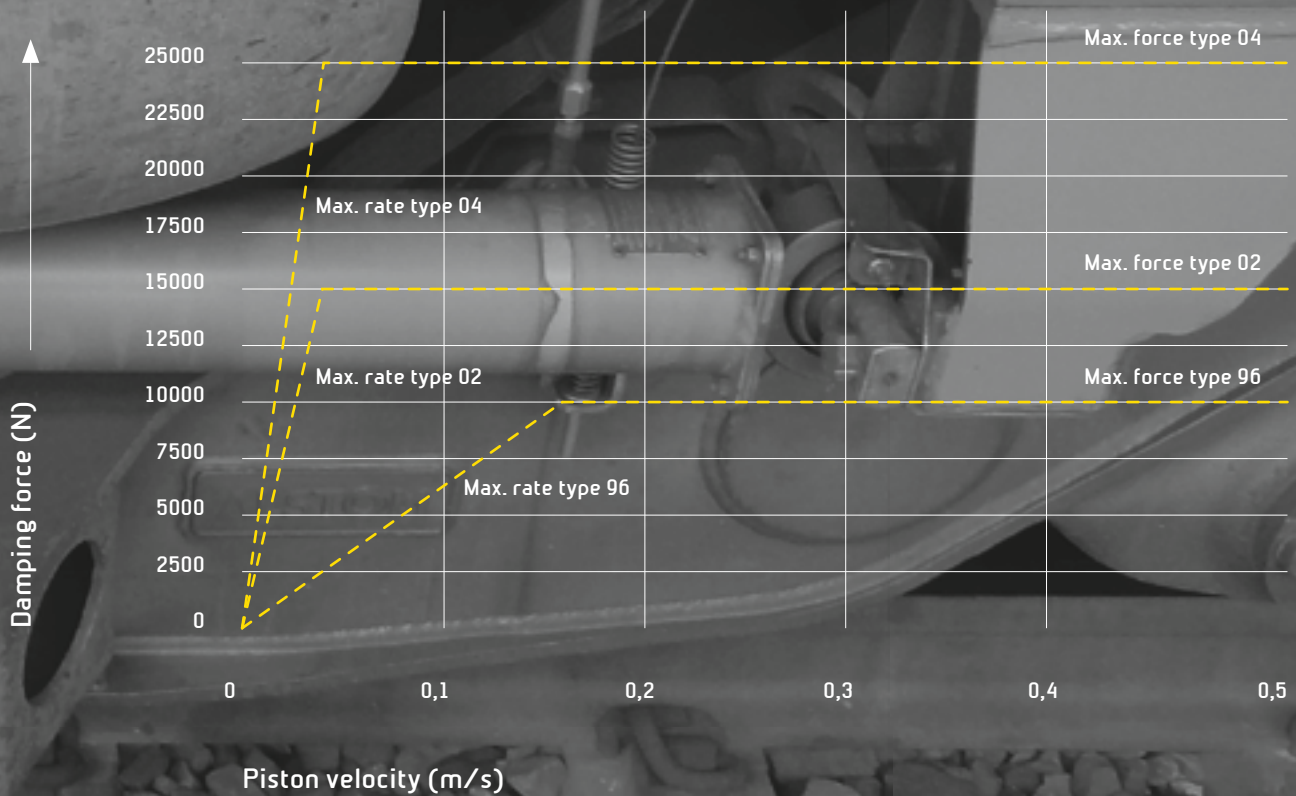
The Endurance Line products are extremely robust products that wear at a very slow rate and can easily be adjusted and reconditioned to new conditions, giving the dampers multiple life times.

The circulating oil principle guarantees unmatched symmetrical damping forces and provides for an excellent heat transfer between the damper and the surrounding air, allowing them to operate in the most extreme conditions. The design is optimized to achieve the highest possible dependability while allowing the longest time between consecutive overhauls.

UNIQUE FEATURES

This robust construction of the Endurance Line dampers is reflected in:

- Large diameter of the piston rod limiting the surface pressure due to side loads. The direct result is reduced friction and a long life time.
- High quality silent blocks
- Low friction multiple seal system
- The special synthetic rings around the piston and the guide result in the absence of any metal-to-metal contact
- Low-noise valve systems
- Screwed dust cover; no welding required
- Internal or external dust bellows, protecting the piston rod against small abrasive particles



YAW DAMPERS

A special example of an Endurance Line damper is the yaw damper. This damper is specially designed to control small-amplitude sinusoidal bogie rotational movements and thereby to enable trains to be operated at speeds above those previously possible. The same technology is also used in our inter-car dampers.

LEADING TO SUSTAINABLE SOLUTIONS

After many years of trouble free operation, the Endurance Line dampers, due to their extremely robust construction, can be maintained and recalibrated to the level of a new damper, with limited cost. Since the damping forces can be adjusted by turning the adjustment screw with a screwdriver, normally, there is no need to dismantle the damper or to replace internal parts.

SPECIFICATIONS

Type 96

Max. damping force 10 kN
 Max. damping rate 60 kNs/m
 Dust cover/reservoir tube \varnothing 80 mm / \varnothing 70 mm

Type 02

Max. damping force 15 kN
 Max. damping rate 600 kNs/m
 Dust cover/reservoir tube \varnothing 102 mm / \varnothing 89 mm

Type 04

Max. damping force 25 kN
 Max. damping rate 1,000 kNs/m
 Dust cover / reservoir tube \varnothing 120 mm / \varnothing 108 mm

CONTACT AND SUPPORT

WORKING WITH KONI

KONI, an ITT Company, is one of the world-leading providers of shock absorption technology and services. KONI helps thousands of companies and people to improve their street and racing cars, busses, trucks, trailers, railway rolling stock, defense and industrial applications. To find out more about our solutions, please contact us at +31 186 635 500.

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KONI B.V.

Oud-Beijerland / The Netherlands

Sales / R&D / Application Engineering / Production

ITT Holdings Czech Republic s.r.o.

Ostrava / Czech Republic

Customer Service / Production

AMERICA

KONI North America

Hebron, KY / USA

Customer Service / Repair facilities

ITT Enidine Inc.

Orchard Park, NY / USA

Sales / Application Engineering

ASIA

ITT High Precision Manufactured Products Co. Ltd.

Wuxi / China

Customer Service / Production

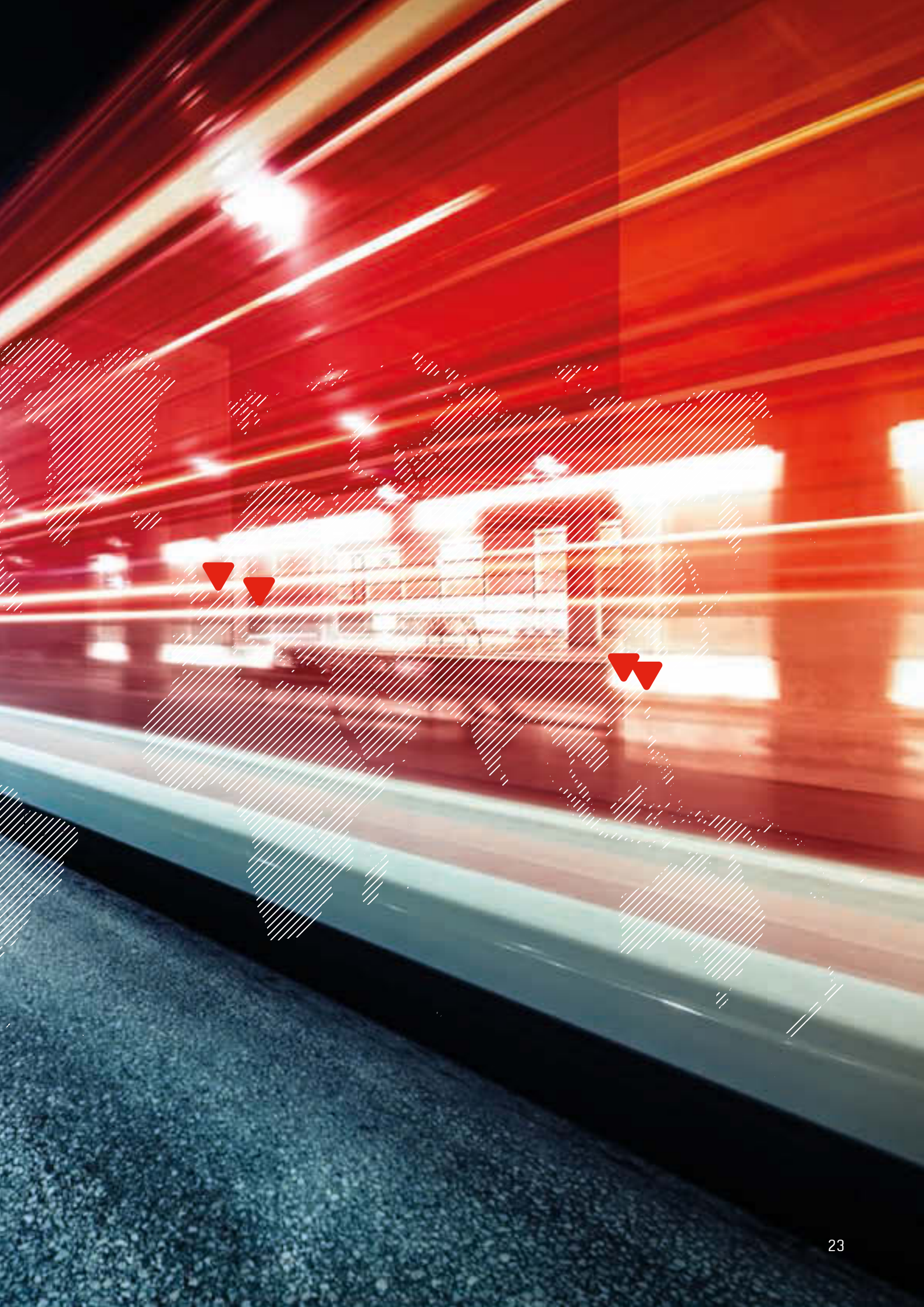
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Your experience only

