

# MEETING YOUR WORLD CLASS STANDARD

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Professional Damping Solutions for  
the Global Railway Industry





# WHO WE ARE

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## **Working Together to Create World Class Railway Products**

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

The ever-growing demands for even higher standards in railway technology for safety, durability, performance and passenger-comfort are a given fact for our organization. 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 all kinds of international railway clients through a vast number of offices, partners and distributors. Being close to the international market means that we are also connected to your markets and your needs. This enables us to deliver anywhere, anytime, worldwide.

As a world-class innovative manufacturer and supplier, we are committed to offering an unmatched level of service for railway solutions. What sets us apart are our continuous efforts to understand our clients and the challenges they face in the ever changing railway landscape. With our vast experience and strong background in engineering and hydraulic damping, we strive for the highest standards. Exceeding our customers' expectations is just one of them, as is focusing on technical requirements and partnering with our customers. KONI truly believes that through teamwork and by sharing knowledge, both our clients' operations as well as our own business will be

supported and ultimately, we will excel as partners. KONI is the shock absorber specialist. For more than a century we have created products that excel in the toughest and the smoothest of conditions. Each KONI shock absorber and ride system is aimed to enrich the user experience; therefore we like to think that our products have a personality of their own. In a way, diversification is our specialization. Cars or bridges, trains or ferris wheels, desert racers or army vehicles for the freezing poles: we see opportunities in everything that moves, regardless of the circumstances.

### **KONI has also Proven its Expertise by Providing Dampers for:**

- Passenger cars
- Classic cars
- Racing cars
- 4x4 vehicles and SUVs
- Recreational vehicles
- Other heavy duty vehicles and industrial applications



# AN ITT COMPANY

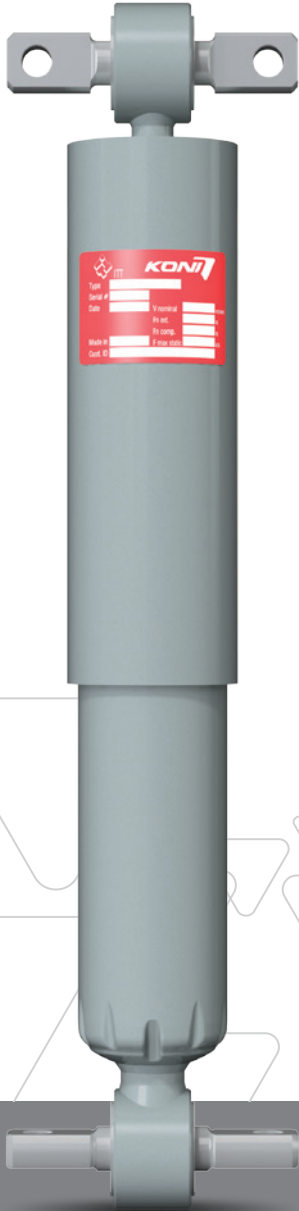
## KONI is an ITT Company

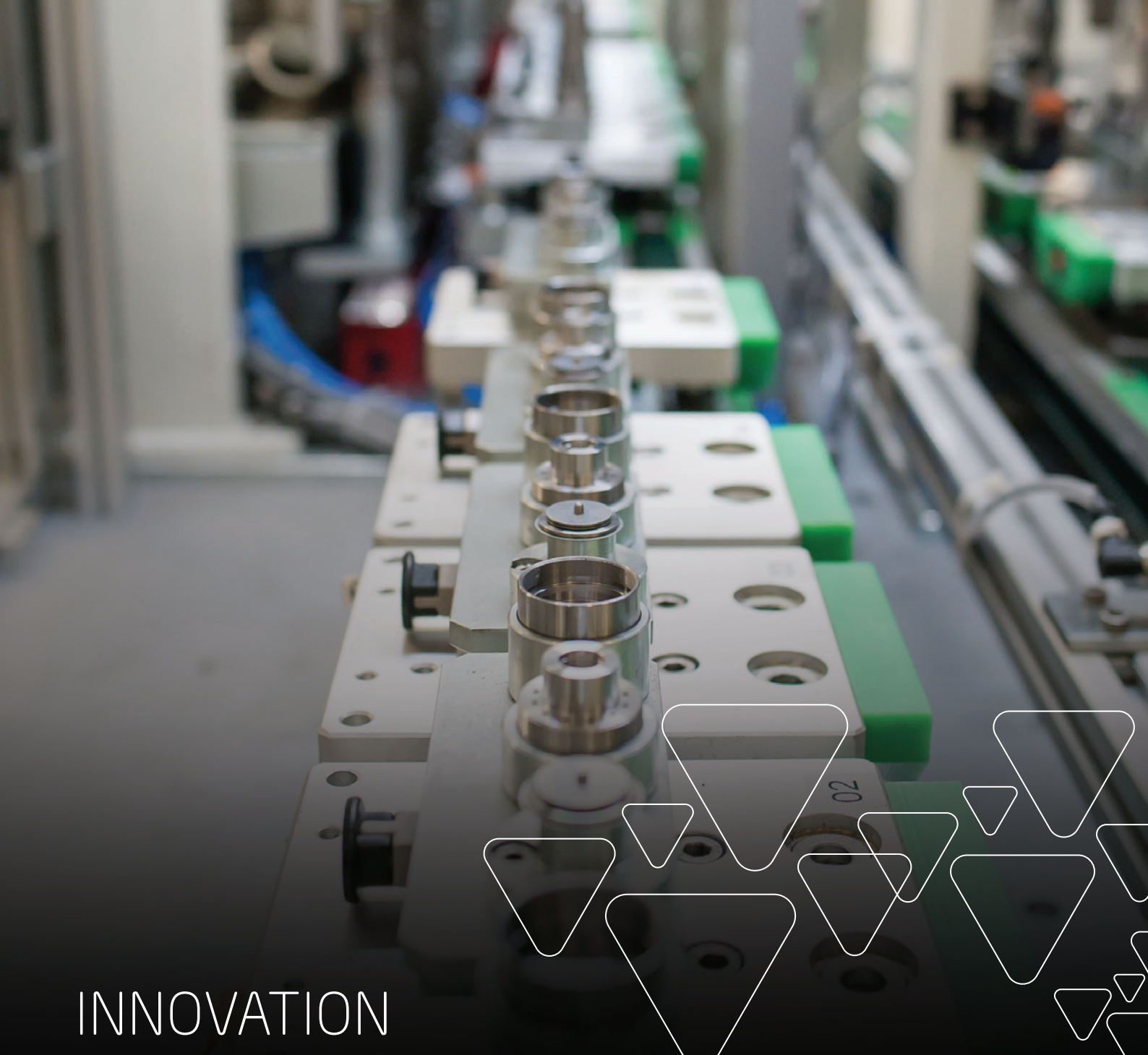
ITT is a focused multi-industrial company that designs and manufactures highly engineered critical components and customized technology solutions. Our customers in the energy, transportation and industrial markets depend on us to solve their most critical problems, and we focus on partnering with them 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. KONI is part of ITT since 1972.

As of 2017, KONI and Axtone are part of the railway growth platform within ITT. Axtone is an expert in impact energy absorption technology for all types of rail vehicles. Axtone's customers include companies from all over the world, representing both the passenger and freight sector. As the expert in the field of impact energy absorption and metal springs, Axtone offers its clients products using various technologies. The biggest operators and manufacturers of railway vehicles in the world trust both KONI and Axtone.

For more information, visit [www.itt.com](http://www.itt.com)

# AXTONE





# INNOVATION

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KONI invests heavily in innovation. It is one of our core qualities required to continue to produce highly qualified shock absorbers. 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 bus, truck, and trailer, or recreational and specialty solutions.

Our engineers, located in different parts of the world, have over the years gained a wealth of both scientific as well as practical experiences of all types of hydraulic rail dampers. This is based on the fact that every damper type we design and produce has its own damping characteristics that has been carefully engineered based on specific requirement.

Supported by the latest bespoke computer software programs and design technologies, highly trained and motivated personnel and the availability of modern measuring and testing facilities, we continue to provide well researched and thoroughly developed new solutions to our clients. Naturally all new developments in materials, production methods and railway specifications on top of customer requirements, are closely monitored and evaluated before implementation. Our organization is committed to Total Quality Management, as we operate in compliance with the quality standard ISO 9001: 2008 and the environmental code ISO 14001. Moreover, we are International Railways Industry Standard (IRIS) certified.



# ADDING VALUE TO YOUR BUSINESS

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## Testing Makes Perfect

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

## Growing Numbers

Capable of pulling up to 18 train cars at a maximum speed of 200 km/h (125 m/ph) 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 34,300 km (21,300 miles) serving around 500 cities in North America. Its ridership continues to grow, with the company transporting around 30 million passengers per year.

## Close Collaboration

KONI is very proud to be the damper supplier for these 70 new locomotives. The main advantages offered to Siemens are symmetrical damping characteristics and a longer service life. This particular locomotive for Amtrak was tested for ride quality prior to Amtrak accepting delivery: Siemens was very pleased to confirm 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, be operated more efficiently and provide improved performance.

# CONTINUITY

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## Market Leading Dampers

Since 1932, KONI has developed and produced dampers, originally in Oud Beijerland in the Netherlands. Today our dampers can be found in all types of vehicles around the world, often with a lifetime easily lasting well over 1,000,000 km. Aided by the availability of spare parts, dedicated tools and overhaul kits, the lifetime of maintainable railway dampers can almost be extended indefinitely, resulting in the absolute lowest cost per km.

Our engineers benefit from KONI's many years of know-how and experience in supplying Original Equipment Manufacturers (OEM). Also, our close involvement in non-railway damper activities related to passenger cars, rallies, buses, trucks and trailers all enhance the development of railway dampers. Production is mainly carried out in modern fully owned production facilities throughout the world.

All KONI railway shock absorbers, in total over 10,000 unique complete products, are specifically developed for their specific usage and function. We never develop a general railway damper, as each of our dampers is completely tailor made to the exact specifications, user conditions and types as defined by our customers. As such, damping forces and individual characteristics are precisely determined and, together with the specific dimensions and other variables, make up an individual damper. So each KONI is a tailor-made design, ensuring to provide the highest comfort and safety performance possible.



# SERVICE & DISTRIBUTORS

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## The Importance of Quality Service and Support for Our Customers

Working in close partnerships with our clients is not something that is limited to the design and production stages, but is also extended till after the delivery phases. Our fully owned engineering and production facilities in Europe and in China, as well as our eight sales offices spread across the globe are the foundation of our close customer relationship. We are never far away from our clients, a collection of all major manufacturers of rolling stock (EMUs, metros, locomotives, trams), an obvious but crucial prerequisite for an intimate partnership.

In those countries where KONI is not directly represented, we operate with a combination of carefully selected distributors and agents who support us with all those activities that would normally be done by ourselves. This includes all the activities from design and production, as well as sales, after sales, training and support.

A KONI distributor is basically an extension of the professional KONI organization and offers not only local presence to a number of clients, often both OEMs as well as Railway Operators, but also expert knowledge. These distributors are selected because of their intimate relationship with the client, their understanding of local cultures as well as their technical capabilities to ensure that they provide the same level of professional support as our own organization. Distributors take full responsibility of their activities, which is also reflected in the fact that they act as independent suppliers for our dampers, taking full ownership of our dampers before supplying these to our final customers.

Besides distributors, KONI also works with agents in many countries. Agents are also carefully selected by KONI for representations in countries not covered by our own organization or distributors. They are experts in their local market and are renowned for their understanding of the railway market as well as their excellent relationship with relevant customers, including again both OEM's as well as Railway Operators. Unlike a distributor, an agent does not take full ownership of the dampers before they are delivered, instead they receive a fixed percentage for their services and support.

Whether you are dealing with KONI directly or through one of our distributors or agents, our sole aim is to ensure that the highest standards of service and support are upheld at all times. This covers everything from the sale and supply of new dampers, both maintainable as well as non-maintainable, to the supply of dedicated damper training, special tooling, spare parts and test machines. KONI guarantees that irrespectively if you are dealing with us directly, or indirectly, we will do whatever is required to ensure that the highest possible standards are maintained.

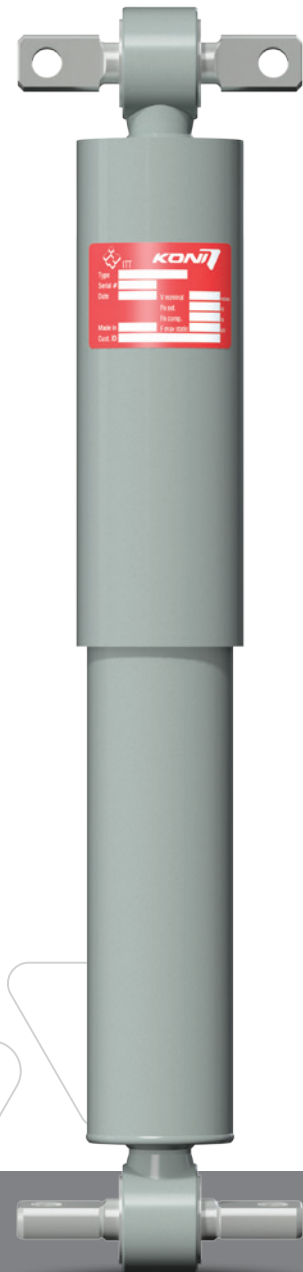


# KONI 96 TYPE DAMPERS

Our Endurance Line dampers are designed for at least 25 years of operation. These extremely robust products wear at a very slow rate and can easily be adjusted and reconditioned to new conditions; giving the dampers an extended lifetime. The circulating oil principle guarantees unmatched symmetrical damping forces and provides for an excellent heat transfer

between damper and 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.

96 Type		Specifications	
<b>GENERAL</b>			
Maintainability	Maintainable		
Durability	1,2 million km per service interval		
Adjustability	Adjustable		
Attachment Types	Eye with silentbloc and/or stem with rubber pad		
Unique Features	<ul style="list-style-type: none"> <li>- Secured service life</li> <li>- Symmetrical force</li> <li>- Fully customizable characteristic (Force rate &amp; Blow-off)</li> <li>- Low-noise</li> <li>- Maintainable</li> </ul>		
Temperature Range in Celsius	-40°C	+60°C	
Available Options	Arctic Pack (-50°C)	Desert Pack	
<b>PRIMARY VERTICAL DAMPER</b>			
Max. Damping Force	6 kN @ 0.1 m/s	10 kN @ 0.5 m/s	
Max. Damping Rate	60 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY VERTICAL DAMPER</b>			
Max. Damping Force	6 kN @ 0.1 m/s	10 kN @ 0.3 m/s	
Max. Damping Rate	60 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY HORIZONTAL DAMPER</b>			
Max. Damping Force	6 kN @ 0.1 m/s	10 kN @ 0.3 m/s	
Max. Damping Rate	60 [kNs/m]		
Minimum Angle to Horizontal	3°		
<b>MAXIMUM STATIC TENSILE LOAD</b>			
With Mechanical Rebound	50 [kN]		
<b>MAIN DIMENSIONS</b>			
Diameter of Dust Cover	Ø 80 mm		
Diameter of Reservoir Tube	Ø 70 mm		





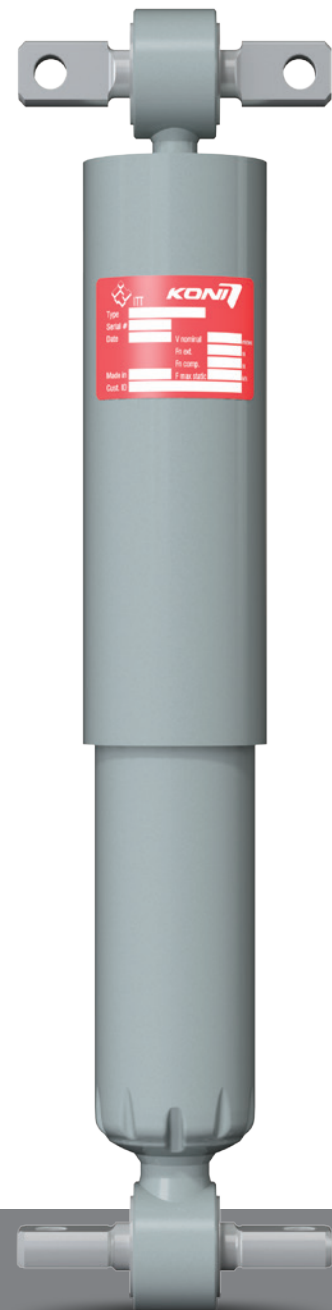
# KONI 97 TYPE DAMPERS

In order to provide a quality product for a competitive rail marketplace where serviceability had less of an emphasis than initial cost, KONI developed the Performance Line damper.

that meets the basic overhaul duty cycles for bogies. These dampers are factory maintainable; in other words, they can be maintained at KONI certified workshops.

These dampers are optimized to achieve the lowest possible initial cost without compromising on quality. It is a product

97 Type		Specifications	
<b>GENERAL</b>			
Maintainability	Factory Maintainable		
Durability	1.2 million km		
Adjustability	Not Adjustable		
Attachment Types	Eye with rubber bloc and/or stem with rubber pad		
Unique Features	<ul style="list-style-type: none"> <li>- Secured service life</li> <li>- Symmetrical force</li> <li>- Fully customizable characteristic (Force rate &amp; Blow-off)</li> <li>- Low-noise</li> <li>- Disposable</li> </ul>		
Temperature Range in Celsius	-40°C	+60°C	
Available Options	Arctic Pack (-50°C)	Desert Pack	
<b>PRIMARY VERTICAL DAMPER</b>			
Max. Damping Force	8 kN @ 0.1 m/s	12 kN @ 0.5 m/s	
Max. Damping Rate	100 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY VERTICAL DAMPER</b>			
Max. Damping Force	8 kN @ 0.1 m/s	12 kN @ 0.3 m/s	
Max. Damping Rate	100 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY HORIZONTAL DAMPER</b>			
Max. Damping Force	8 kN @ 0.1 m/s	12 kN @ 0.3 m/s	
Max. Damping Rate	100 [kNs/m]		
Minimum Angle to Horizontal	5°		
<b>MAXIMUM STATIC TENSILE LOAD</b>			
With Mechanical Rebound	85 [kN]		
<b>MAIN DIMENSIONS</b>			
Diameter of Dust Cover	Ø 80 mm		
Diameter of Reservoir Tube	Ø 70 mm		



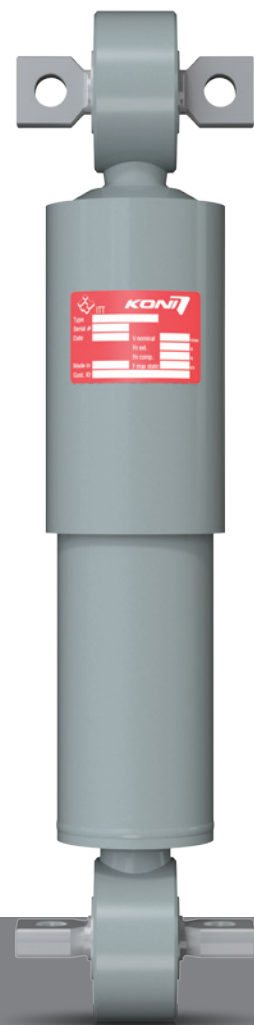


# KONI 02 TYPE DAMPERS

Our Endurance Line dampers are designed for at least 25 years of operation. These extremely robust products wear at a very slow rate and can easily be adjusted and reconditioned to new conditions; giving the dampers an extended lifetime. The circulating oil principle guarantees unmatched symmetrical

damping forces and provides for an excellent heat transfer between damper and 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.

02 Type		Specifications	
<b>GENERAL</b>			
Maintainability	Maintainable		
Durability	1,2 million km per service interval		
Adjustability	Adjustable		
Attachment Types	Eye with silentbloc and/or stem with rubber pad		
Unique Features	<ul style="list-style-type: none"> <li>- Secured service life</li> <li>- Symmetrical force</li> <li>- Fully customizable characteristic (Force rate &amp; Blow-off)</li> <li>- Low-noise</li> </ul>		
Temperature Range in Celsius	-40°C	+60°C	
Available Options	Arctic Pack (-50°C)	Desert Pack	
<b>PRIMARY VERTICAL DAMPER</b>			
Max. Damping Force	12 kN @ 0.1 m/s	15 kN @ 0.5 m/s	
Max. Damping Rate	600 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY VERTICAL DAMPER</b>			
Max. Damping Force	12 kN @ 0.1 m/s	15 kN @ 0.3 m/s	
Max. Damping Rate	600 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY HORIZONTAL DAMPER + YAW DAMPER</b>			
Max. Damping Force	12 kN @ 0.1 m/s	15 kN @ 0.3 m/s	
Max. Damping Rate	600 [kNs/m]		
Minimum Angle to Horizontal	1°		
<b>MAXIMUM STATIC TENSILE LOAD</b>			
With Mechanical Rebound	50 [kN]		
<b>MAIN DIMENSIONS</b>			
Diameter of Dust Cover	Ø 102 mm		
Diameter of Reservoir Tube	Ø 89 mm		



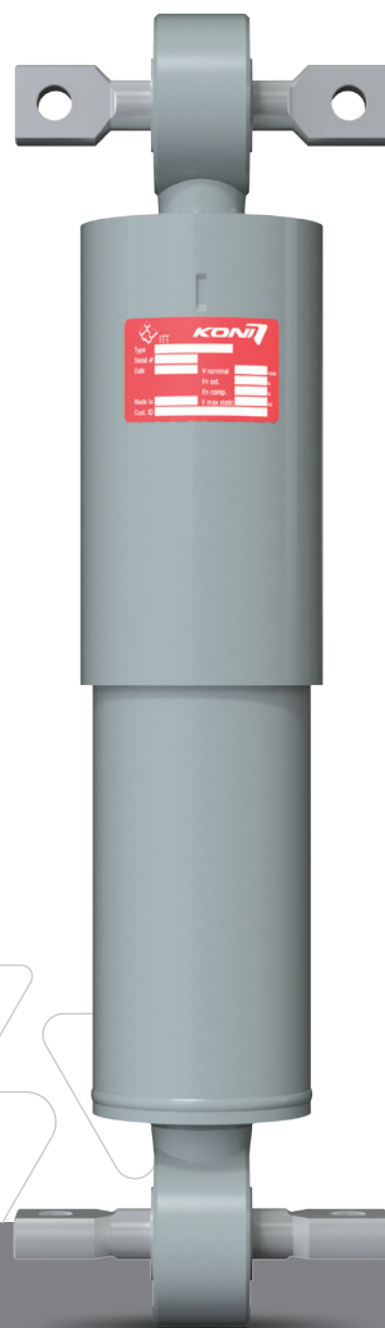


# KONI 04 TYPE DAMPERS

Our Endurance Line dampers are designed for at least 25 years of operation. These extremely robust products wear at a very slow rate and can easily be adjusted and reconditioned to new conditions; giving the dampers an extended lifetime. The circulating oil principle guarantees unmatched symmetrical damping forces and provides for an excellent heat transfer

between damper and 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.

04 Type	Specifications	
<b>GENERAL</b>		
Maintainability	Maintainable	
Durability	1,2 million km per service interval	
Adjustability	Adjustable	
Attachment Types	Eye with silentbloc	
Unique Features	<ul style="list-style-type: none"> <li>- Secured service life</li> <li>- Symmetrical force</li> <li>- Fully customizable characteristic (Force rate &amp; Blow-off)</li> <li>- Low-noise</li> </ul>	
Temperature Range in Celsius	-40°C	+60°C
Available Options	Arctic Pack (-50°C)	Desert Pack
<b>PRIMARY VERTICAL DAMPER</b>		
Max. Damping Force	17 kN @ 0.1 m/s	25 kN @ 0.5 m/s
Max. Damping Rate	1000 [kNs/m]	
Maximum Angle to Vertical	45°	
<b>SECONDARY VERTICAL DAMPER</b>		
Max. Damping Force	17 kN @ 0.1 m/s	25 kN @ 0.3 m/s
Max. Damping Rate	1000 [kNs/m]	
Maximum Angle to Vertical	45°	
<b>SECONDARY HORIZONTAL DAMPER + YAW DAMPER</b>		
Max. Damping Force	17 kN @ 0.01 m/s	25 kN @ 0.1 m/s
Max. Damping Rate	1000 [kNs/m]	
Minimum Angle to Horizontal	1°	
<b>MAXIMUM STATIC TENSILE LOAD</b>		
With Mechanical Rebound	50 [kN]	
<b>MAIN DIMENSIONS</b>		
Diameter of Dust Cover	Ø 120 mm	
Diameter of Reservoir Tube	Ø 108 mm	



# KONI 05 TYPE DAMPERS

Our Technology Line contains the high-tech dampers in which our innovative power is displayed. Our 05 – 06 series dampers utilize a two-directional oil flow principle through the piston.

The smart damper design features several improvements compared to traditional dampers. Due to the increased working area in the cylinder tube the dampers have an enhanced damper stiffness making 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.

Another further significant benefit of this damper series is the possibility to include our patented FSD valves in the piston without making any adjustment to the design.

05 Type		Specifications	
<b>GENERAL</b>			
Maintainability	Maintainable		
Durability	1.2 million km per service interval		
Adjustability	Not adjustable		
Attachment Types	Eye with silentbloc		
Unique Features	<ul style="list-style-type: none"> <li>- Secured service life</li> <li>- Symmetrical force</li> <li>- Fully customizable characteristic (Force rate &amp; Blow-off)</li> <li>- Low-noise</li> </ul>		
Temperature Range in Celsius	-40°C	+60°C	
Available Options	Arctic Pack (-50°C)	Desert Pack	
<b>PRIMARY VERTICAL DAMPER</b>			
Max. Damping Force	-		
Max. Damping Rate	-		
Maximum Angle to Vertical	-		
<b>SECONDARY VERTICAL DAMPER</b>			
Max. Damping Force	10 kN @ 0.1 m/s	15 kN @ 0.3 m/s	
Max. Damping Rate	600 [kNs/m]		
Maximum Angle to Vertical	45°		
<b>SECONDARY HORIZONTAL DAMPER + YAW DAMPER</b>			
Max. Damping Force	10 kN @ 0.01 m/s	15 kN @ 0.1 m/s	
Max. Damping Rate	600 [kNs/m]		
Minimum Angle to Horizontal	1°		
<b>MAXIMUM STATIC TENSILE LOAD</b>			
With Mechanical Rebound	50 [kN]		
<b>MAIN DIMENSIONS</b>			
Diameter of Dust Cover	Ø 102 mm		
Diameter of Reservoir Tube	Ø 90 mm		





# KONI 06 TYPE DAMPERS

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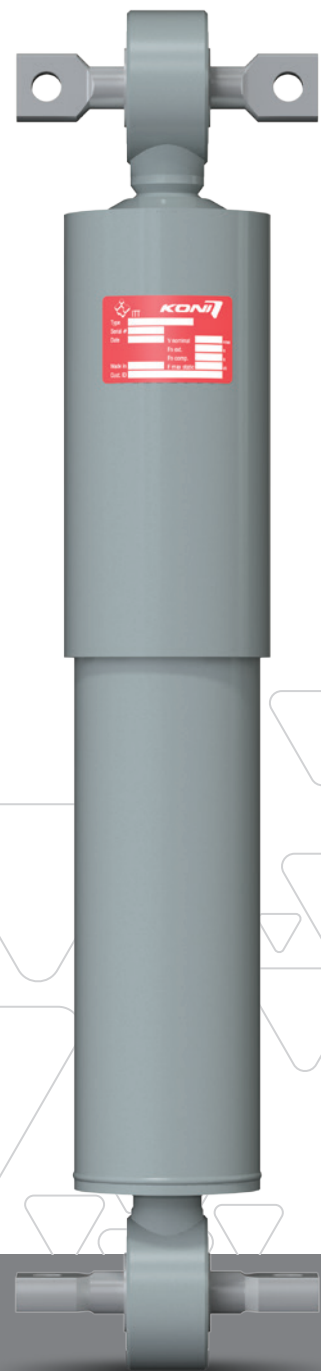
Our Technology Line contains the high-tech dampers in which our innovative power is displayed. Our 05 – 06 series dampers utilize a two-directional oil flow principle through the piston.

The smart damper design features several improvements compared to traditional dampers. Due to the increased working area in the cylinder tube, the dampers have an enhanced damper stiffness making 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.

Another further significant benefit of this damper series is the possibility to include our patented FSD valves in the piston without making any adjustment to the design.



06 Type	Specifications	
<b>GENERAL</b>		
Maintainability	Maintainable	
Durability	1,2 million km per service interval	
Adjustability	Not adjustable	
Attachment Types	Eye with silentbloc	
Unique Features	<ul style="list-style-type: none"> <li>- Secured service life</li> <li>- Symmetrical force</li> <li>- Fully customizable characteristic (Force rate &amp; Blow-off)</li> <li>- Low-noise</li> </ul>	
Temperature Range in Celsius	-40°C	+60°C
Available Options	Arctic Pack (-50°C)	Desert Pack
<b>PRIMARY VERTICAL DAMPER</b>		
Max. Damping Force	-	-
Max. Damping Rate	-	-
Maximum Angle to Vertical	-	-
<b>SECONDARY VERTICAL DAMPER</b>		
Max. Damping Force	-	-
Max. Damping Rate	-	-
Maximum Angle to Vertical	-	-
<b>SECONDARY HORIZONTAL DAMPER + YAW DAMPER</b>		
Max. Damping Force	17 kN @ 0.01 m/s	25 kN @ 0.1 m/s
Max. Damping Rate	1000 [kNs/m]	
Minimum Angle to Horizontal	1°	
<b>MAXIMUM STATIC TENSILE LOAD</b>		
With Mechanical Rebound	50 [kN]	
<b>MAIN DIMENSIONS</b>		
Diameter of Dust Cover	Ø 120 mm	
Diameter of Reservoir Tube	Ø 108 mm	



# FREQUENCY SELECTIVE DAMPING

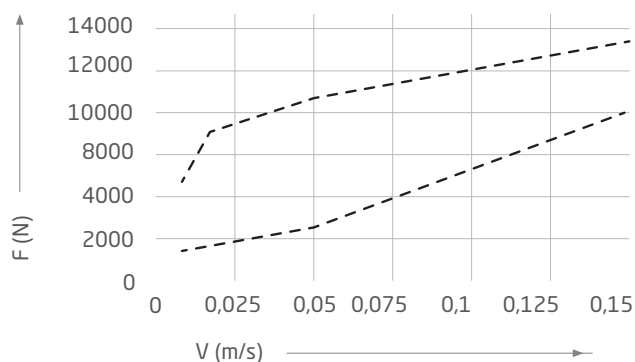
## Benefits of FSD

KONI offers optional Frequency Selective Damping on the 05/06. FSD offers a mechanical solution which offers a lot of benefits, like:

- 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



- Conventional at low frequency
- ..... FSD at low frequency

## 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.

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.



# PANTOGRAPH DAMPERS AND COILOVERS

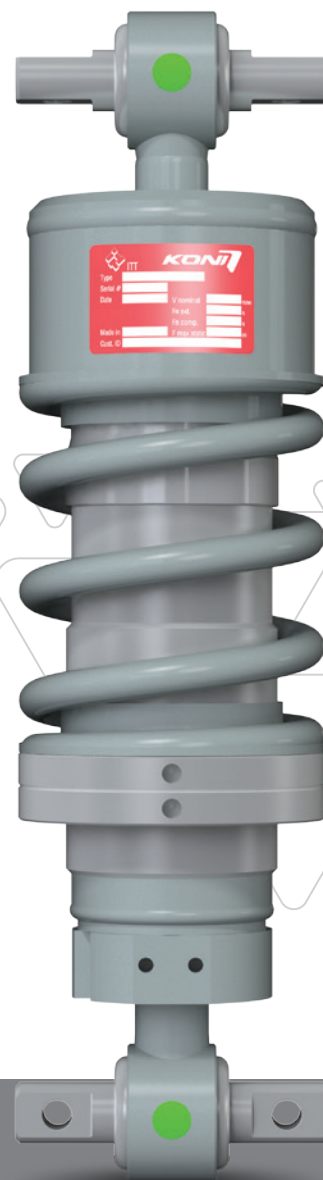
## Pantograph Dampers

The relatively small sized pantograph damper has 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.



## Damper-spring Combinations

Sometimes the available space on a bogie or wheel set is extremely limited. For those particular situations, tailor-made solutions are available to meet your requirements. KONI can deliver an external adjustable integrated damper-spring combination with separate end range damping.





# ARCTIC CONDITIONS

As if 'normal' railway conditions are not already challenging enough, there are certain conditions that are even worse and should therefore be classified as nothing less than extreme.

In order for trains to operate in the harshest conditions, our hydraulic dampers can operate in temperatures as low as - 50 degrees Celsius (-58 F) without compromising on specification, maintenance or reliability.

Specifically for those areas of the world that are notorious for extremely low temperatures, KONI has designed an ARCTIC PACK, consisting of a redesign of several key components including seals that are designed to deal with extremely low temperatures and special oil with a very low viscosity at low temperatures. Moreover, all our hydraulic dampers that are equipped with this ARCTIC PACK have special silent blocks that consist of suitable metal and rubber compounds, as well as an additional rubber cover on the outside of the damper to avoid penetration of snow, making even the most remote and cold areas accessible by train.

Dampers with our ARCTIC PACK have been tested against the most extreme low temperatures to provide exactly the same reassured performance under these challenging conditions as under normal circumstances.



## CHARACTERISTICS

Suitable for extremely low temperatures thanks to:

- Special oil and materials
- Snow and ice protection



# DESERT PROOF

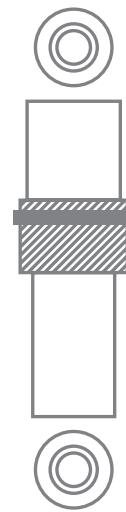
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Surviving extreme conditions in a hot desert is very demanding because the combination of extremely high temperatures caused by the blistering sun and the ever-present chance of a storm whereby small dust and sand particles find their way into the tiniest of gaps, is a real challenge.

Yet, these conditions, a real nightmare for the wear and tear of bogies, wheels and tracks, are no excuse for the proper functioning of today's high-tech railway systems. At KONI, we have used our years of damping experience for the design of a suitable answer to these extreme conditions. The result of this is our DESERT PACK.

With our DESERT PACK we have enlarged the metal dust cover, which offers extra protection against the larger sand particles. An additional rubber dust protection outside the damper prevents fine sand and dust from entering the damper. On top of that, we have included an enhanced dirt scraper ring inside the damper for extra protection against dirt damaging the internal damper seal. Moreover, our hydraulic dampers are covered with a heavy-duty paint layer to shield the dampers against corrosion and sand blasting.

With our DESERT PACK our customers are assured that their trains will perform and operate in the extreme conditions of the desert, as they would do under perfectly normal circumstances.



## CHARACTERISTICS

Suitable for extremely harsh environments thanks to:

- Robust construction
- Sand and dust protection



# HOMOLOGATION

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## Meeting Rising Expectations and Requirements

The recognized KONI rail product is considered the most homologated brand, hence, it is applied world-wide. All over EMEA, the Americas and 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 through funds, in new railway infrastructure. This resulted in a major progress for KONI. These investments provided a powerful momentum for the development of new products and enabled further innovation of our hydraulic dampers. It gave KONI the opportunity to raise standards on a global level, something we still maintain today.

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

- Improved RAMS through standardization and modularity
- Performance improvements through enhanced design
- Development of low cost disposable types
- Significant weight reductions

From an economical point of view, our 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 complete bogie set. This offers our clients optimum economic solutions for their specific rail configuration. In this way, our continuous innovated designs provide the best possible value for money in terms of reliability and performance. At the same time, it provides a choice between disposable and maintainable/adjustable dampers.

A fine example of this development can be found at SNCF. The entire range of commuter trains produced by Bombardier for SNCF, from TER, via AGC and NAT to the most sophisticated R2N, are all equipped with KONI hydraulic dampers. As such, it was originally decided that the TER type bogies would be equipped with dampers from our Endurance Line that can be easily overhauled and serviced. To reduce initial cost and maintenance cost, it was decided to install dampers from our Performance Line that can easily be disposed and replaced after its service life. Dampers have now partly been migrated to disposable types in the consecutive platforms. Through a gradual development over the years, our client has achieved a specific solution, whereby the type of dampers on their bogie, either of the disposable or of the fully maintainable type, is fully balanced with their specific needs. This form of close cooperation and a customized solution helps us further evolve and remain one of the most formidable players in the international railway industry.



# A GREEN LIGHT FOR GREENER RAIL

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## **ITT KONI and Bombardier Work Together to Advance Eco-Friendly Rail Platform**

Canadian transportation giant Bombardier had a vision to build a new generation of electric multiple-unit (EMU) passenger trains that would provide outstanding eco-friendliness, while maintaining maximum performance and reliability. To make the new AVENTRA train - a train that weighs significantly less, optimizes energy consumption and minimizes maintenance costs for operators, while continuing to deliver the high performance and reliability - a reality, Bombardier needed special custom-engineered dampers for its advanced FLEXX Eco bogie platform - so KONI stepped in.

### **Bombardier's Challenge**

Bombardier had to challenge the industry's conventional wisdom and solve significant engineering problems to deliver on its promise to develop the most economical and ecologically friendly rail platform. Responding to today's stringent market demands, the train's bogie needed to be lightweight and "track-friendlier" than any existing platform, in order to significantly reduce operator costs being driven by rail access charges introduced in many European countries.

KONI played a substantial role in the development process of the FLEXX Eco bogie platform. The company was tasked with developing a yaw damper and a vertical damper that would stabilize the connection between car body and bogie, dampen the train's wheel track force, reduce life-cycle cost, and increase the reliability of the dampers. Bombardier needed KONI to deliver this, all while reducing weight and without increasing the cost of components.

### **How KONI Solved It**

KONI redeveloped its bogie yaw dampers in 2010. Yaw dampers are the most sophisticated dampers on a bogie - preventing uncontrolled yaw movement and playing a vital role in both safety and ride comfort for rail passengers. The redevelopment provided a significantly higher inherent stiffness and up to 30% less weight compared to previous designs..

KONI's vertical damper sits parallel to the air spring, which is positioned between bogie and car body. With its innovative vertical and yaw dampers, KONI was able to fully meet and exceed Bombardier's expectations for its new FLEXX Eco platform, delivering two products that have outstanding economic and ecological benefits, excellent performance and a significantly reduced weight.

### **Immediate Impact**

The excellent performance and reliability of KONI's damping solutions significantly contribute to Bombardier's vision to develop a train platform with drastically reduced maintenance cost and optimized performance. Together with Bombardier's modern, economic bogie design, FLEXX Eco, KONI contributes to the unprecedented eco- and track-friendliness of the new AVENTRA train platform. A platform that is fit for the future and easily adaptable to shifting market requirements.

# WORKING WITH KONI

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KONI, an ITT company, is one of the world-leading providers of shock absorption technologies and services. KONI assists thousands of companies and people to improve their street and racing cars, buses, trucks, trailers, railway rolling stock, defense and industrial applications. To find out more about our solutions, please contact us at +31 186 635 500, or contact us using the contact form on [www.koni.com](http://www.koni.com).

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## KONI Rail Worldwide Partners

KONI works with official partners globally to ensure excellence in local service and support. To find out more, please visit [www.koni.com/en-us/railway/locator](http://www.koni.com/en-us/railway/locator).

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