

APPLICATIONS

The latest generation of Diesel engines from Volkswagen with Therban® torsional vibration dampers

NOTE

Camshaft absorbers: For longer toothed belt life and perfect engine management.

Cleaner, more efficient, stronger,
more dynamic.

The advance of the TDI*.

...is the success story of a VW engine: Since its launch in the early 1990s, the 1.9/2.0-liter diesel engine with direct fuel injection has proved its worth many times over. Volkswagen has set itself ambitious goals for the further development of this four-cylinder TDI engine. Above all, the aim is to optimize fuel consumption and exhaust gas behavior while, at the same time, maximizing performance. The road to success has been unprecedented. Injection pump and nozzle technology is unique to Volkswagen.

*TDI: **T**urbo-diesel **D**irect **I**njection



Whether your pump-nozzle engine is fitted with a single or double camshaft, only one camshaft absorber is needed to achieve optimum vibration damping.

The injection pump and nozzle principle.

Instead of relying on a central pump to compress the diesel fuel and inject it into the cylinders, the engineers at Volkswagen have given each cylinder its own compression pump. Because the pressure is now produced within a more confined space, the injection pump and nozzle unit injects the fuel into the combustion chamber at a higher pressure.

For the first time in the history of diesel engines, an injection pressure above 2,000 bar can be achieved – some 30% higher than with conventional technology. The fuel is sprayed more finely and burns more efficiently. The result: lower exhaust emissions and improved performance.



Volkswagen uses the TDI assembly with the vibration-damping component in several models. For example, in the Golf and Touran.

Paguag: Stress-optimized Therban® components.

A crucial highlight:
Stability at maximum temperatures.

Sustained success for high-tech elastomer.

The torsional vibration damper on Volkswagen's injection pump/nozzle TDI is current confirmation of the claims to technological excellence made by Paguag GmbH, Düsseldorf, in the



The colors indicate the performance capabilities of Therban® at high temperatures, which are excellent up to + 165 °C. Specific grades that perform at prolonged high temperatures are also available.

design, production and sale of high-performance elastomer components for the automotive industry. Paguag supplies this exceptionally demanding part, its overall concept having won over Volkswagen. It is Therban®, the high-performance elastomer, that plays a central role in the blend patented for Paguag. A perfect solution – technically and economically!

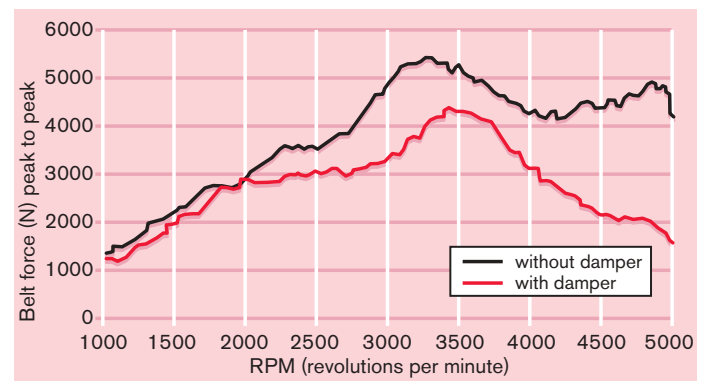
Therban® – Ideal for selective fine tuning.

From the Paguag engineers' perspective there was no elastomeric alternative to Therban®, used in the vibration absorber. Key deciding factors included the outstanding damping properties typical of rubber, resistance to oil and lubricants, excellent dynamic strength, constant torsional modulus, and, above all, outstanding thermal stability – the absorber is located in direct proximity to the hot engine components which can reach temperatures of up to 150°C when the engine is running. So it's reassuring to know that Therban® is designed to cope with long-term temperatures of up to +165°C. And TDI practice shows that even temperature peaks of +180°C can be safely withstood.



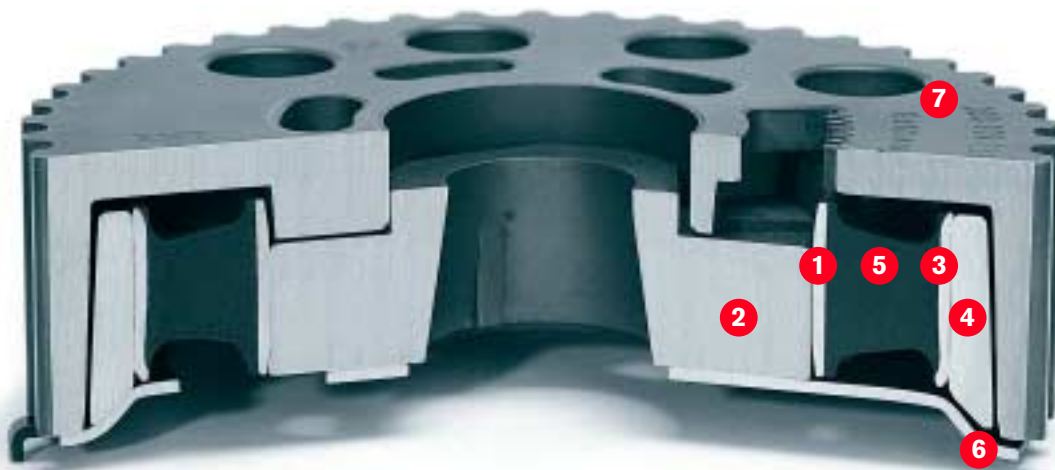
The mass damper – a component with a 138 mm external diameter - with its centerpiece, the Therban® rubber ring.

Effect of the torsional vibration damper.



The toothed belt in the TDI engine: Another Therban® component, designed with the specific functional requirements of the injection pump and nozzle unit in mind.

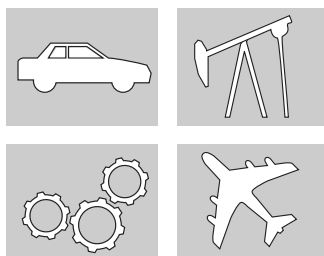
A cross-section of the torsional vibration damper.



Seven precision components.

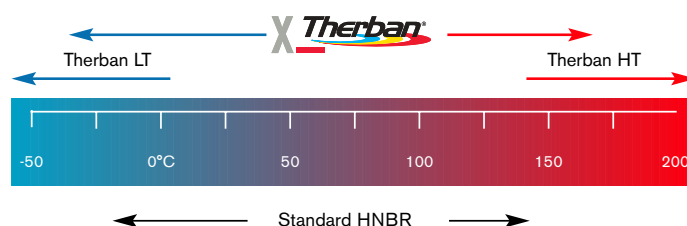
Fitted into the inner metal ring (1) is the hub (2), which provides the link to the camshaft. The flywheel (4) is pressed on to the external ring (3). The two metal rings are joined via a bonded ring of Therban® rubber (5), the central damping element and the heart of the vibration damper. The transmitting disk (6) emits pulses to control the engine management system, the toothed sprocket (7) provides the link to the driving timing belt system.

Therban® HNBR – has been developed for the automotive and oil industries, for aeronautics and space travel and for engineering. The high-performance, special-purpose elastomer is proving its worth in more and more new areas of application. See for yourself!



For your tailor-made solution.

In the rubber field, LANXESS is a supplier of both general purpose and specialty grades. It can provide products for standard applications and offer optimum solutions when it comes to special requirements.



Therban® – made to measure for every task! Even for applications beyond normal temperature limits. Talk to us about your application, about consultation and other services. LANXESS is the innovative partner that will help find a solution for your individual problem!

Therban® is a registered trademark of Bayer AG

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Wanted: a vibration-damping element.

The secret of the high pressure direct injection system lies in the ability of the camshaft-driven pump to develop high fuel pressure of over 2,000 bar. Equally high reaction forces are transmitted via the camshaft through the camdrive to the driving timing belt system. Such a dynamic system develops a vibration resonance at about 3,300 rpm. If these vibrations were allowed to be transmitted back to the belt drive it would lead to premature failure.

The forces created by the resonance in the driving timing belt system need to be reduced to a negligible level and the dynamic loading on the belt drastically cut – to ensure an optimal service life. And there's another aspect to bear in mind.

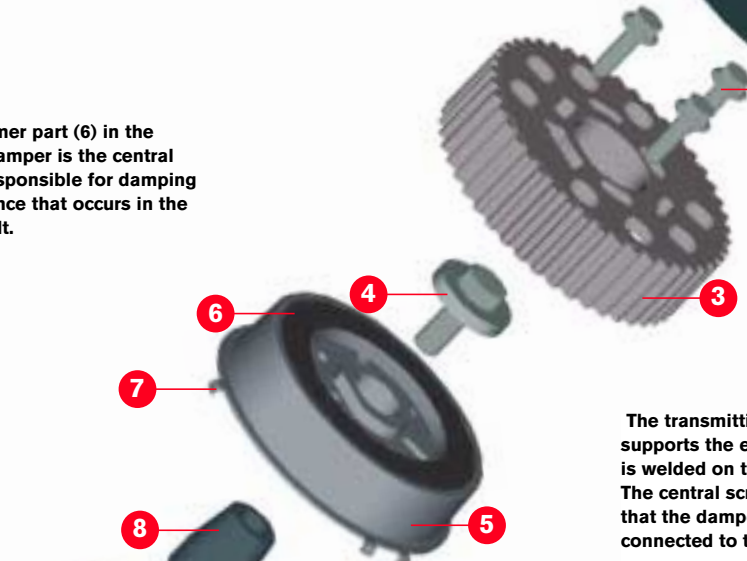
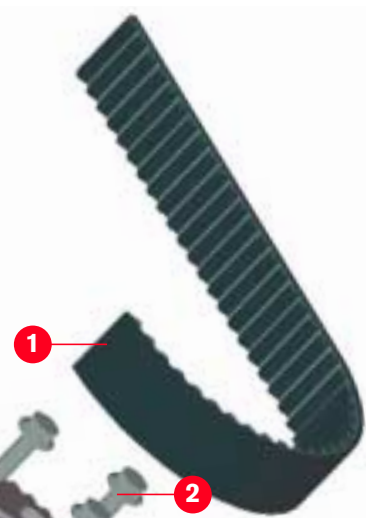
The camshaft has to function absolutely free of any toothed belt vibrations. A torsional vibration damper, fitted to the camshaft in the form of a single mass damper system, will help here.

The vibration damper makes a critical contribution to the reliability and precision of the entire engine management system.

Camshaft ↔ toothed belt

The toothed belt (1) functions as the driving force of the injection/ nozzle engine. Due to the high dynamic loading on this component, the structure of the toothed belt and the tooth profile had to be modified and customized for this specific task. The teeth of the driving gear mesh with the toothed sprocket (3), which is attached to the torsional vibration damper (5) with screws (2).

The elastomer part (6) in the vibration damper is the central element responsible for damping the resonance that occurs in the toothed belt.



The transmitting disk (7), which supports the engine management is welded on to the damper. The central screw joint (4) ensures that the damper is securely connected to the camshaft (8).

Success through partnership



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Paguag has made a worldwide name for itself as an expert in producing high-quality elastomeric articles of all kinds. But its reputation is especially good in the area of complex molded parts and vibration-damping rubber/metal products for the automotive industry. Today, Paguag is a company with the strength of the Italian C.F. Gomma Group behind it.

LANXESS – a new, globally-active chemicals company with decades of experience. LANXESS is building on the enormous performance potential which helped Bayer set benchmarks in such areas as rubbers and rubber chemicals. As a global player, LANXESS is a reliable partner at the cutting edge of technology.

LANXESS – the name today embodies the commitment to innovation that characterized the inventors of synthetic rubber and the specialists who developed a range of rubber products into today's highly diverse portfolio – a portfolio that extends from commodity products to customized high-tech systems. But LANXESS also stands above all for a new and dynamic commitment. Ensuring that business partners worldwide can achieve sustainable success.

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