

PERFORMANCE

ÖHLINS ADVANCED SUSPENSION TECHNOLOGY - NR. 1 2006



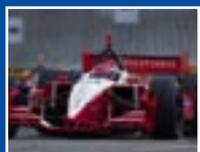
TTX

The future is now!



Driving the technology - TTX 40

Product Manager Peter Kärr tells us about the technology behind the advanced shock absorber.



TTX 40 - The winning racing shock absorber

What PKV GM and Champ car series winners Jimmy Vasser and Christiano Da Matta have to say about the TTX40.

Plus: Kenth Öhlin & Performance, The roadwork to TTX40, Why the TTX 40 damper is for you



EDITORIAL
Kenth Öhlin

Performance at your door

Welcome to our first issue of Performance. While we at Öhlins strive to achieve safety, quality and performance in all our advanced suspension systems, we also want to you to understand how our products function as well as how they were designed to help you succeed. By giving you this information, we know that we can help you, whether driving or selling the product, to perform.

In this leaflet, you will get information on our latest concept called the TTX suspension system. This lighter, easy adjustable and performance-enhanced product is set to revolutionise racing as it is today. Read further articles in this newsletter to find out more about the product, its development and the people who are using it today.

TTX fits into Öhlins' business strategies & visions by proving that we are once again in the forefront with new and specialised technology. This technique can be used in so many applications, not only shock absorbers or dampers for cars and motorcycles, but soon in the front

” Bring on the competition because development in itself is a race, and we are in the pole position.

fork on an MC. We have over 150 applications in vehicles ranging from private automobiles to snowmobiles. But we are

not stopping here. It is most likely that the next generation of TTX might even be combined with our electronic system.

We intend to highlight our TTX suspension system along with many of our technologies when we turn 30-years-old next year. But what's important is that our goal has been and will continue to be that we develop a quality product that is affordable and wins races. We will still concentrate on being in the forefront using the strength of our experienced, dedicated, and large R&D staff. We will also continue to be a reliable distributor to the world's top motorcycle and car industries selling advanced technological suspension products. That is our commitment. In short, we are specialists in advanced suspension and intend on staying that way.

Kenth Öhlin, Managing Director, Öhlins Racing

Kenth Öhlin & Performance

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As of 2004, race cars with the TTX40 installed have had ten wins both in Champ Car series in the United States and at the Bathurst 1000, V8 Supercars in Australia.

The roadwork to TTX 40

Nils Göran Nygren, Öhlins Project Manager, R&D Department, talks about the development of the TTX40. An engineer with the company for close to 15 years, he is firmly dedicated to getting out the best product. Let's hear more about how the product was developed.

You have been the person running the development team behind TTX40 all the way up to its inception in 2003 and of course are continuously improving it. How did the project start?

My colleague Christer Lööv and I were brainstorming in April, 2003 about what kind of requirements was needed for a state-of-the-art damper. So, we went back to 1990 starting with the original model DR1, and followed Öhlins' 13 year-product development map. Reviewing all the different models through time and together with the statistics from all of the different grids and race tracks, we were finally confident enough to make a first drawing and advanced technical layout of TTX40.

Was there a need for the TTX40?

The market was looking for a multi-adjustable easy-to-use damper. The plan was to let this new damper replace the TT44/TT40 as a general available damper for formula racing. Those two models have been very successful. However, in keeping with Öhlins vision to always be at the forefront of technology, we knew it was time for something new.

Has the development road been bumpy or smooth?

Pretty smooth I would say. When the layout was done, we ordered some prototypes. After some testing in our laboratory and fine tuning of the hardware, we began testing with a Champ car team in March, 2004. We got good results right away. Then, the first batch was made for our American dealer MSI to be used on Champ and IRL cars. With short notice, we also made some longer prototypes for a touring car team in the V8 Supercar series in Australia. Based on the positive test results we received, we decided to offer some longer dampers to the market for touring cars. Finally, we finished the work on the Valving Reference Program and the TTX40 manual. The TTX40 was introduced to all our markets at the 2004 PRI show in December.

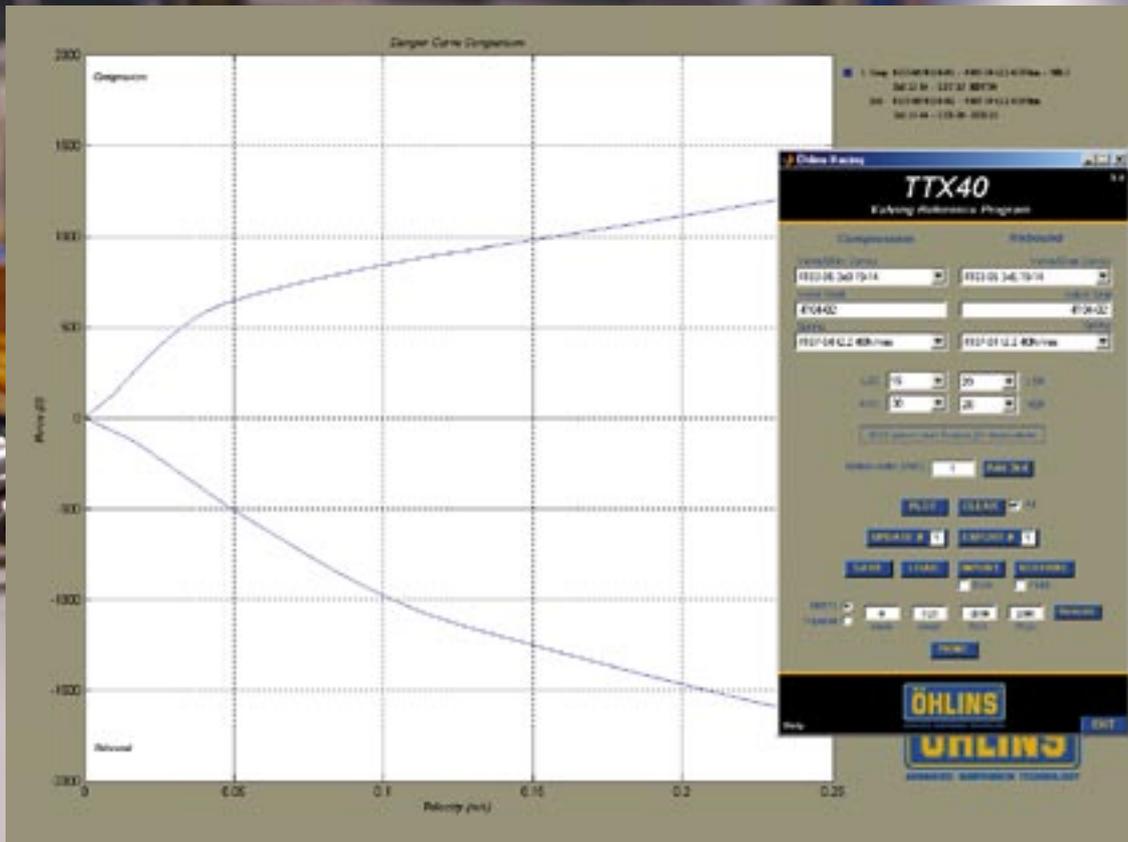
Where do you see the product going from here?

On the R&D side, we always have to be a step ahead. Exactly what the next new product that will replace the existing TTX40 would look like, we don't know today. But the TTX40 will continue to



” When our customers use shock absorbers, they are looking for more than just extensive adjustability. They want products that are easy to use and easy to understand so that the team can make full use of all the properties and concentrate on finding the optimal setting for each individual situation.

– Nils Göran Nygren



◀ The curve is showing the damping force at a specific velocity. When adjustments are made with the compression and rebound, the damping curve will change value and look different. Once the Valving Reference Program is downloaded, it will be easier to understand and test.

▶ develop, that is for sure. I also believe the TTX concept will be used in many other Öhlins products in the future.

When will TTX be available for motorcycles?

TTX has already been tested on motorcycles and with good results. It will start as a product for contracted race teams first; then, a limited production will be offered to the aftermarket motorcycle industry during the 2007 season.

Was Öhlins the first company to come up with the idea?

This concept of building up damping force is not new, but this in combination with some other features of the TTX40, is unique.

How is TTX40 different than your competitors' products?

Most competitors offer a conventional type of damper, where the damping force isn't caused mainly by a pressure rise like in the TTX, but by a pressure drop increasing the risk of cavitation. Also, all damping here comes from restricting the main piston flow, not the piston rod displacement, mini-

mizing the flex in the damper. Plus, TTX40 has unique features such as the possibility to check the gas pressure and the separating piston position without opening the damper.

Has TTX40 been used in any races?

Yes, absolutely, both running and winning. As of 2004, race cars with the TTX40 installed have had ten wins both in Champ Car series in the United States and at the Bathurst 1000, V8 Supercars in Australia.

What are your customers' reaction to TTX40?

I have heard many positive reactions about working with this damper. Our customers find it very simple to use and service. I believe the adjustment range together with the Valving Reference Program (VRP) have been the most appreciated features. The VRP allows you to research the damping forces without dynamometer testing as you virtually build your damper in the computer.

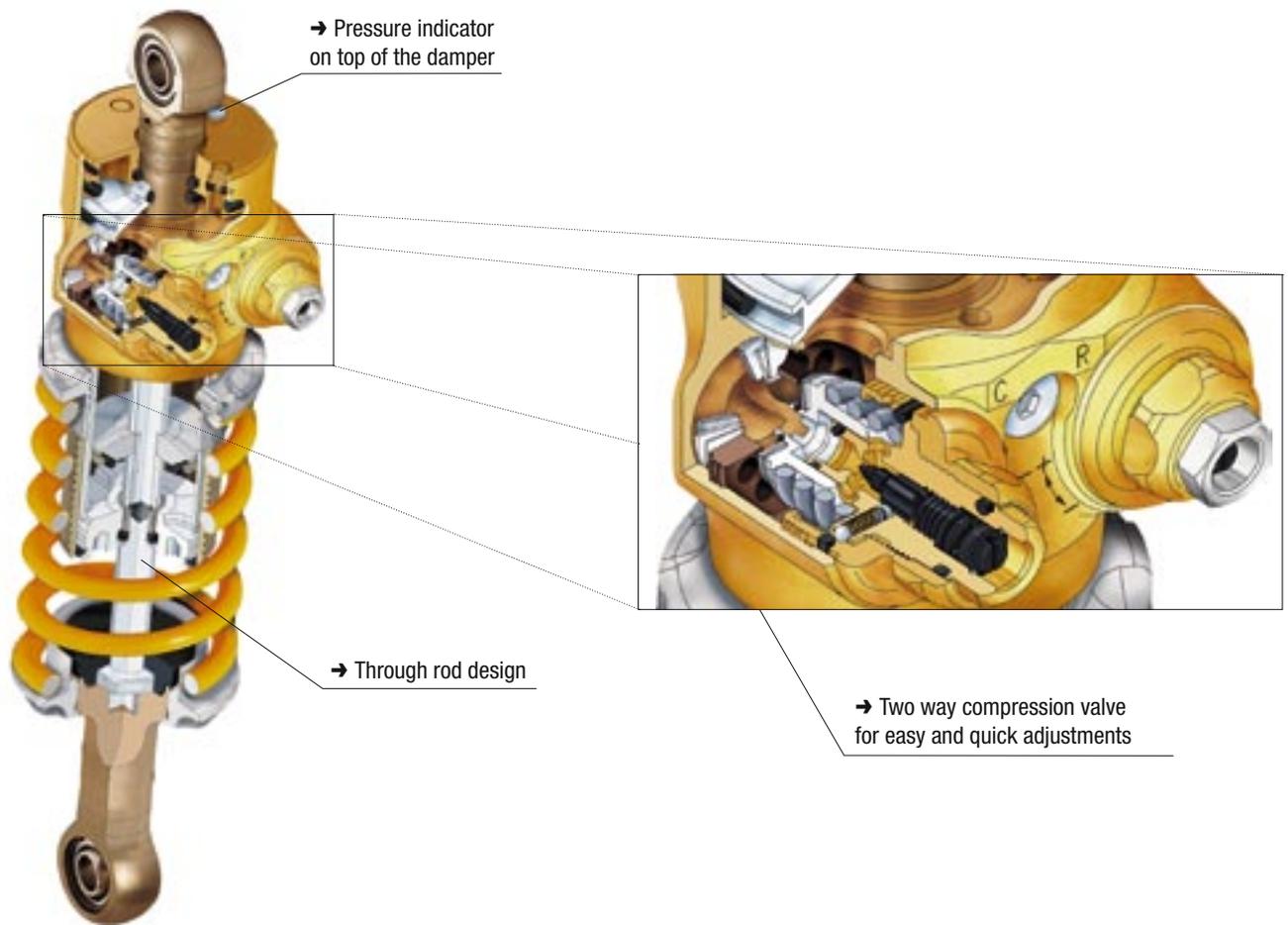
The Öhlins TTX40 damper was originally developed for formula racing. Yet it is designed to handle all types of tracks,

from street courses to super speedways. How can one shock absorber work well on different surfaces?

The TTX40 damping curves can be reshaped to fit very different needs. It doesn't matter if it is ovals or street circuits; the damper velocity is still relatively low. The TTX40 damper is designed for racing where you see piston rod velocities below 1.5 m/s (60 inch/sec).

If a customer asked you why he should buy the TTX40 over another competitor's, what would your answer be?

You should buy the TTX40 because it is one of the most competitive dampers on the market. As you know, in this business, only performance counts. When you buy an Öhlins product you not only get a top level performance product, you also get the very best opportunity to educate yourself about dampers. No other manufacturer has the amount of information Öhlins has with its 123-page printed TTX40 manual which is also available on CD. This, together with support from Öhlins dealers and distributors worldwide, is a sound investment for the future. ■



Driving the technology –TTX40

Four fully independent adjustments--two compression and two rebound--are just part of the features of the new through-rod damper TTX 40. It is easy and quick to do adjustments and valve changes right at the race track. Best of all, it performs better than other competitors.

The TTX40 is a through rod damper loaded with new concepts that are designed to give better performance on the track. Features include adjustments that are controlled externally and are all placed in a single location. The adjustment units feature clear indications as to how they affect damping. Another new function of the racing shock absorber is its four-way adjustability incorporating compression adjustment of low and high-speed as well as rebound adjustment of low-and high-speed. All four are fully independent of each other.

This twin tube damper has a 40 mm piston and a through rod shaft without any external gas reservoir. Due to the powerful external adjusters, the need for rebuilding dampers is small. If still needed, you simply unscrew the valve end caps and make the needed hardware change. In fact,

says product manager Peter Kärr of Öhlins, valve changes can sometimes be made without taking the damper off the car. The top eye can easily be re-locked without opening the damper.

Adjustments made simple

The number of click positions is about 40 on the low-speed adjusters and about 50 on the high-speed adjusters on both compression and rebound. This amounts to four million different settings.

“And what’s more,” says Kärr, “the oil level can also easily be checked without dismantling. It is easy to adjust the oil level and to add oil without taking apart the damper. You can even ensure that the damper is pressurized just by pushing in the indicators on top of the damper.”



” In fact, says product manager Peter Kärr of Öhlins, valve changes can sometimes be made without taking the damper off the car. The top eye can easily be re-locked without opening the damper.



Tough test for Öhlins
TTX40 in the Brazilian Stockcar 2005

► Due to TTX40s new design, the weight has been reduced compared to previous models. The weight, excluding the end eye and spring platforms with 56 mm of stroke, is only 880 grams. The new TTX40 is easier to install on a vehicle because it takes up less space. The lack of an external gas reservoir makes it easier to fit to a vehicle. The adjustment of the clocking of the damper, which is very easy for the customers to do themselves, is only used to install the dampers with the adjusters facing the best way.

Here's how it works

The compression damping forces of the TTX are not, as in a conventional damper, caused by a pressure drop on the rebound side, but by increased pressure on the compression side. This reduces the risk of cavitation and makes a reservoir valve unnecessary. In essence, no balancing reservoir damping to main piston damping is necessary. The low amount of hysteresis results in excellent short stroke/high force performance. Consequently, a very low gas pressure can be used without any loss of damping performance.

New manual and software program

Along with the damper comes a unique Valving Reference Program or (VRP) making adjustments easier for mechanics and engineers in the racing business. This computer model of the damper allows users to find damping curves without using a dynamometer. The VRP also makes it easier to adjust the various parameters of the shock absorbers and see immediately how these adjustments will affect the damping curve. "It allows exact

damper adjustments out in the pit lane," says Kär.rr.

"There is also an extensive manual in CD format that comes with the damper, basically covering everything you wanted to know about the TTX but were afraid to ask," says Kär.rr. The manual is also available in print from any Öhlins' distributor. Together, using the VRP program engineer and technician are able to use the same language eliminating misinterpretation and loss of time.

Easy to adjust for all tracks

The Öhlins' TTX40 damper, originally developed for single-seaters, is designed to handle the demanding damping characteristics needed for all types of tracks, from street courses to super speedways. The concept can be used in many applications such as McPherson strut for touring cars and in the future in shock absorbers and front forks for motorcycles.

The TTX40 race suspension system is the culmination of thirty years of Öhlins successful participation in world champion events such as CART, V8 Supercar in Australia, V8 Supercar in Brazil, GT and LeMans. This, in combination with a dedicated and experienced research team at Öhlins racing headquarters in Sweden, has given the unique knowledge needed to design the TTX40 damper.

As always, all dampers are carefully dyno-tested before they are delivered to the customer and are checked continuously for quality which gives added product life expectancy. Support and service for these products and others are always available from Öhlins' worldwide distributors. ■

Why the TTX 40 damper is for you

- It performs better than other competitors
- It has four fully independent adjustments, two compression and two rebound
- It is easy and quick to do adjustments and valve changes at the race track
- Less space is needed on the car because there is no external gas reservoir
- It has low weight
- It comes with an extensive Valving Reference Program (VRP)
- It has an Excel program to calculate length and produce an ordering list
- It is completely factory assembled and available in six different lengths
- The damper is dyno-tested
- No gas force pushing the shaft because of the through rod
- Minimal risk of cavitation and very low hysteresis
- Compression and rebound adjusters are identical – less need for spare parts
- The oil level can easily be checked without dismantling the damper
- There is an Indicator to show if the damper is pressurised
- Gas pressure can be very low
- The piston rod bushings are always far apart reducing friction



TTX40 – The winning racing shock absorber

Competition out on the racetrack is keen no matter how you look at it. Racing teams in the Champ Car World series know that, it's not just the tires, the chassis or engine that separates the winners from the losers. It's the shock absorber or damper that is a big part of the performance.

Just like every grid is different, every damper is different. It's the advanced technology and experience behind it that sets it apart from all the others. The Öhlins TTX40 stands for this and more. This top of the line suspension damper also stands for performance. As General Manager of PKV Racing, Jim McGee knows Öhlins' products and its excellent performance history.

"We've been using Öhlins shock absorbers for many years with the teams I had before I came to PKV. So, I made sure that we had them with us for this team as well."

McGee says he likes the improvements that have been made with the TTX40. He is especially satisfied that it has a lot of flexibility, is easy to adjust and consistently performs well.

"It takes a combination of many elements to win a race: tuning shocks and springs and contact patch on the road are all very important equations. But without having confidence in the damper, we wouldn't feel good about putting a driver in the seat. I believe the TTX40 has the capabilities of being the best product out there. In fact, our lap times and speed have gone up in 2005."

” Over the years driving champ cars, I've used several brands of shocks, but the commitment and reliability and the development that Öhlins puts into their program is far and above what I have experienced with any other shock program.



– Jimmy Vasser



◀ Both champions know that performance counts and are glad to be driving with the TTX40 shock absorber.



▶ **Winning with TTX40**

It's true. Driving with TTX40, both PKV racing drivers Christiano da Matta (2002 series champion) won Portland and 1996 series champion and veteran Jimmy Vasser was on the Pole at Milwaukee and finished third at Las Vegas. The two drivers have combined to set team records for best combined qualifying, for qualifying in the top-five twice and for qualifying in the top 10 in a team record nine races. Both champions know that performance counts and are glad to be driving with the TTX40 shock absorber.

Easy to use

The Valving Reference Program that comes with the TTX40 has made things simpler for the teams' engineers. The software program for the damper makes adjusting easier and

it can be done quickly while at the racetrack.

"Our engineers really like it," says McGee. "It gives direction and a point from which you can start and go from. You can develop a particular field, the ride, the power down, and braking qualities."

Öhlins rides into 2006 series

McGee and the PKV Racing team will continue to use Öhlins TTX40 in the 2006 Champ Car World series and will have plenty of useful data to carry over to the next year.

"We will continue to use Öhlins because we believe the product is better and the company has the most experience with advanced suspension products and racing. Plus we like working with Öhlins. They are easy to talk to and listen to our needs." ■

” It feels good to be back in the Champ Car series after racing in Formula 1. The experience and performance of Öhlins TTX40 has proved itself since I took a victory in Portland this year.



– Christiano Da Matta