



*Single tube design/ McPherson strut*

# **MOTORSPORT**

**Owner's Manual**



ADVANCED SUSPENSION TECHNOLOGY

# INTRODUCTION



## **Öhlins Racing AB - The story**

*It was the 1970's, a young man named Kenth Öhlin spent most of his spare time pursuing his favourite sport: motocross.*

*As a careful observer, Kenth's attention was continually drawn to one specific detail - motocross bikes had more engine power than their suspension could handle. It was not long before Kenth realised that better performance could be achieved by improved wheel suspension.*

*Öhlins Racing was established in 1976, and just two years later the company won its first World Championship title. Despite being in the business for 30 years, the search for perfection and new functions is still the main focus of the company.*

*Congratulations! You are now the owner of an Öhlins Shock Absorber. More than two hundred World Championships and other major world titles are definitive proof that Öhlins shock absorbers offer outstanding performance and reliability.*

*Every product has gone through rigorous testing and engineers have spent thousands of hours, doing their very best to use every possible experience from our 30 years within the racing sport.*

*The product that you now have in your possession is pure racing breed that is built to withstand.*

*By installing this shock absorber on your vehicle you have made a clear statement... you are a serious rider with a focus on getting the maximal handling ability and outstanding feedback from your vehicle. Along comes the fact that your shock absorber will be a long lasting friend, delivering the very best of comfort and performance every time you go for a ride. Go explore!*

# SAFETY PRECAUTIONS

## General warnings

### **Note!**

*The shock absorber/front fork/steering damper is an important part of the vehicle and will affect the stability.*

### **Note!**

*Read and ensure you understand the information in this manual and other technical documents provided by Öhlins, before using the product.*

### **Note!**

*Öhlins Racing AB can not be held responsible for any damage to the shock absorber/front fork/steering damper, vehicle, other property or injury to persons, if the instructions for mounting, usage and maintenance are not followed exactly.*

### **Warning!**

*After installing the Öhlins product, take a test ride at low speed to ensure your vehicle has maintained stability.*

### **Warning!**

*If the suspension makes an abnormal noise, or the function is irregular, or if you notice any leakage from the product, stop the vehicle immediately and return the product to an Öhlins dealer.*

### **Warning!**

*The product warranty shall only apply if the product has been operated and maintained in accordance with recommendations in this manual. If you have any questions regarding usage, service, inspection and/or maintenance please contact Öhlins.*

### **Note!**

*When working with the Öhlins product, always read the Vehicle Service Manual.*

### **Note!**

*This Manual shall be considered a part of the product and shall therefore accompany the product throughout its life cycle.*

## SAFETY SYMBOLS

In this manual, mounting instructions and other technical documents, important information concerning safety is distinguished by the following symbols:



*The Safety Alert Symbol means: Warning! Your safety is involved.*

### **Warning!**

*The Warning Symbol means: Failure to follow warning instructions can result in severe or fatal injury to anyone working with, inspecting or using the shock absorber, or to bystanders.*

### **Caution!**

*The Caution Symbol means: Special precautions must be taken to avoid damage to the shock absorber.*

### **Note!**

*The Note Symbol indicates information that is important regarding procedures.*

## Product specific warnings

### **Warning!**

*This product was developed and designed exclusively for a specific vehicle model and shall only be installed on the intended vehicle model in its original condition as delivered from the vehicle manufacturer.*

### **Warning!**

*This product contains pressurized nitrogen gas (N<sub>2</sub>). Do not open, service or modify this product without proper education (authorized Öhlins dealer) and proper tools.*



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## Models

Most of Öhlins suspensions are high pressure monotube type. The fluid is under gas pressure and the gas/fluid are kept apart by a separating piston. The piston is usually fitted in an external reservoir, connected by a hose (Fig. 1) or fixed directly on top of the shock absorber (Fig 2). In some models everything is fitted inside the main shock absorber (Fig 3). A few shock absorbers are of emulsion type, oil and gas mixed inside the shock absorber (Fig 4). In some models an internal gas reservoir is separated from the tube by a base plate (Fig. 5). The oil flow is controlled by the base plate before it reaches the separating piston.

## Pressure

The fluid is pressurized by nitrogen ( $N_2$ ). The pressurisation prevents cavitation of the fluid and the shock absorbing action is therefore more even. The external reservoir also contributes to better cooling of the fluid, giving longer service life for the fluid as well as the components.

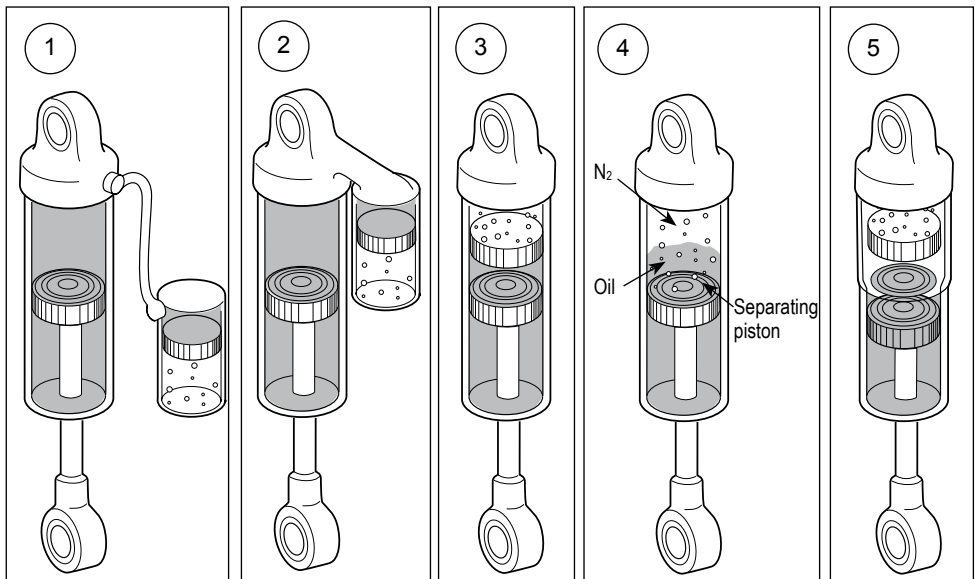
Öhlins shock absorbers with external rebound adjustment have an integrated temperature compensation.

As the temperature increases and the fluid flows more easily, the flow is controlled accordingly. The shock absorbing effect is therefore independent of the temperature.

## Adjustments

The more advanced models permit individual adjustment of compression and rebound damping. All of the shock absorbers with springs have adjustable spring preload.

Öhlins shock absorbers provide adjustment possibilities, making them adaptable to most vehicles, drivers and ranges of use.



# INSIDE THE SHOCK ABSORBER

## On a smooth surface

When you are driving on a smooth surface and the shock absorbers are compressed slowly (low shaft speed), the damping oil is forced only through the adjuster valve in the piston shaft, (Fig. 1, flow 3). The oil displaced by the piston shaft is forced through the independent compression damping adjuster out into the external reservoir, (Fig. 2, flow 3).

The floating piston in the reservoir is forced to move, compressing the gas behind it further. When the shock absorber extends, the pressure behind the floating piston will force the oil through a one-way valve, and back into the shock absorber body, (Fig. 4, flow 1 and 2). The oil beneath the piston returns through the adjuster valve in the piston shaft, (Fig. 3, flow 3).

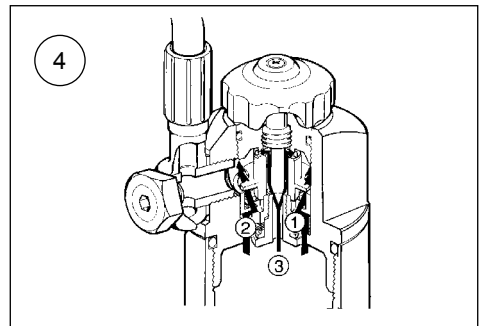
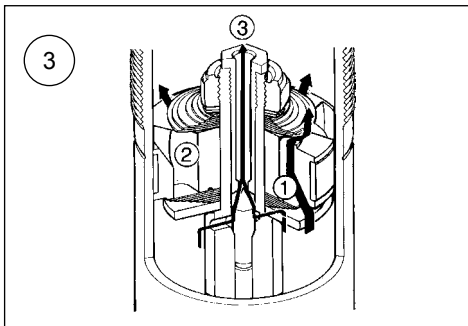
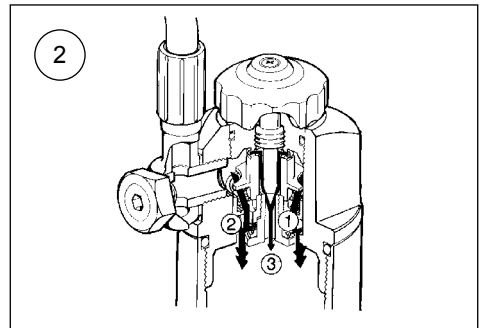
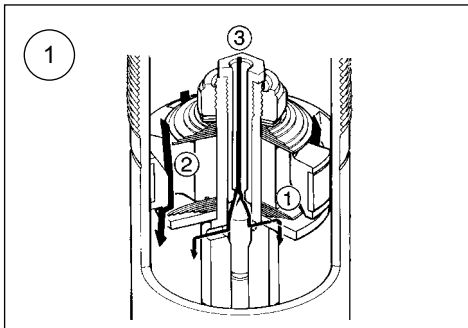
## Hitting a bump

When hitting a bump, the shock absorbers are compressed faster (high shaft speed). The oil can not be forced "fast enough" through just the

valve in the piston shaft. The pressure on the compression side increases and opens the shim stack covering the compression orifices in the piston, (Fig. 1, flow 2).

Also, oil displaced by the piston shaft can not be forced "fast enough" through just the valve in the reservoir. The pressure increases and a shim stack, parallel to the valve, opens, (Fig. 2, flow 1 and 2). The floating piston is forced to move, compressing the gas by the displacement of the piston shaft.

When the shock absorber extends the floating piston forces the oil through the one-way valve back into the shock absorber body, (Fig. 3, flow 1 and 2). The pressure difference over the piston is still high and the flow can not be forced "fast enough" through just the valve in the piston shaft. The shim stack covering the rebound orifices in the piston opens and the oil returns, (Fig. 4, flow 1).



**⚠ Warning!**

*Before driving your vehicle, make sure that the basic settings made by Öhlins are intact.*

**Recommended setting**

The shock absorbers in your kit are adjusted to the Öhlins recommended setting for your vehicle, (see the Mounting instructions or contact an Öhlins dealer), we advice to start with this setting.

**Setting up your vehicle**

Installing new shock absorbers may alter ride height, wheel angles etc. on your vehicle. Therefore, it is wise to do a complete resetting of the vehicle after you have installed the Öhlins shock absorber.

Perform the following steps and take notes to keep track of the changes you make;

1. Check ride height, front and rear. Adjust if necessary.
2. Check corner weight, front and rear, if scales are available. Adjust if necessary.
3. Check all wheel angles, front and rear. Adjust if necessary.

If your shock absorber is equipped with adjusters, learn how they work by trial and error. Always begin with a test ride, with all adjustments at their basic setting. Choose a short run with varying character, long and sharp bends, hard and soft bumps. Stay on the same run and adjust only one setting at a time.

**Compression and rebound damping**

Compression damping controls the energy absorption when the shock absorber is being compressed, thus controls how easy the shock absorber compresses when you hit a bump.

Rebound damping controls the energy absorption when the shock absorber is being extended and controls how fast the shock absorber returns to its normal position after being compressed.

**Compression damping adjuster**

Low speed compression is mainly used to control chassis movements and response but it also affects the traction. It affects how the car behaves during breaking, turn in and acceleration. Less low speed compression gives more chassis movement but in many cases it can improve traction and grip. Therefore it is possible to balance the car by adjusting the low speed compression.

High speed compression mainly affects how the car absorbs bumps and jumps. During rough conditions or with a lot of jumps more high speed damping is often necessary to control big chassis movements.

**Rebound damping adjuster**

Rebound adjuster affects chassis movement in a similar way as the compression but has even more influence on traction. Use this adjuster to control chassis movements over crests or after jumps. More rebound gives less movement and better stability but too much will cause a loss of traction. It is therefore a powerful balance tool together with the low compression adjuster.

For slippery conditions when grip levels are low, a softer set up on both rebound and low speed compression is a way to gain more traction.

**👁 Note!**

*Make sure that the springs are properly preloaded before you make any other adjustments. A simple rule; Increased spring preload should be followed by an increase of rebound damping.*

**Stability**

All vehicles are designed with a suspension geometry including wheel movement and angles. Changing components will affect this, therefore it is essential that the rear and the front end match each other. Changing to Öhlins suspension gives the best performance only if the front and the rear suspensions interact properly. Read this manual carefully and contact an Öhlins dealer if you have any questions regarding your Öhlins suspension.

# ADJUSTMENTS

## Spring action

Incorrect spring action can affect the vehicle stability negatively. It can lead to over- or understeering, and consequently affect the stability of the vehicle. It is important to use the correct spring for the shock absorber. If you have any questions regarding the spring on your shock absorber, please contact an Öhlins dealer.

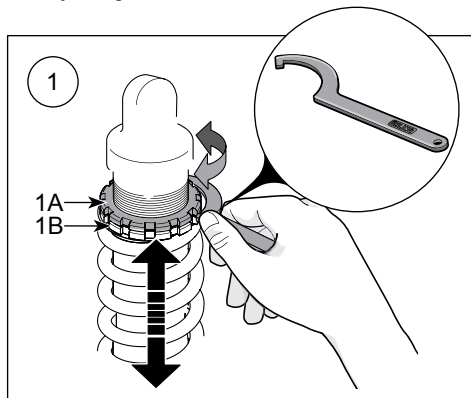
The adjustment possibilities on the Öhlins shock absorbers enable fine tuning so that you can optimize the shock absorber for your vehicle's weight and equipment, your individual way of driving and the road condition.

## Spring preload

When adjusting the spring preload you move the spring seat. This will lower or raise the vehicle ride height, which is an important criteria for the vehicle behaviour.

## How to set the spring preload

(Figure 1). Use a C-spanner. Loosen the lock nut (1A). Move the lower spring platform (1B) to the desired position. Turn clockwise to increase the preload, turn counter clockwise to decrease. After adjusting, remember to lock the lock nut.



## Compression and rebound damping

Adjust compression and rebound damping by turning the adjusters (see next page). The adjusters have a normal right hand thread.

### **Caution!**

*Turn gently not to damage delicate sealing surfaces.*

## To set

Turn the adjuster clockwise to fully closed position (position zero [0]). Then, turn counter clockwise to open, and count the clicks until you reach the recommended number of clicks. See recommended Set-up data in the Mounting Instructions or contact an Öhlins dealer.

### **Note!**

*If you cannot feel the "click" on the rebound knob, it may be due to low gas pressure or lack of oil, the shock absorber must be inspected Öhlins.*

## Useful adjustment range

The useful adjustment range depends on which setting is used. If a too large adjustment range of the compression valve is used, the damper performance is decreased due to incorrect pressure balance in the damper. If the compression valve is too hard (low clicks) there will be high pressure and flex in the damper often experienced as a hard and harsh suspension.

If the compression valve is too soft (high clicks) there will be cavitation in the damper often experienced as fading. If a large change in compression clicks compared to the recommended is used and you experience the appearances mentioned above contact an Öhlins dealer for changing the shim setting in the damper.

## When making adjustments

1. Make the adjustments in small steps (2-3 at a time) and not outside the usable range. Take notes while adjusting.
2. When you think you have made an improvement, go back to what you started with and double check to be sure.

Pay attention to changes in conditions like tires or temperatures, etc. In general, compression damping changes should be used to influence the vehicle's stability and response, while rebound damping changes should be used to influence comfort and traction.

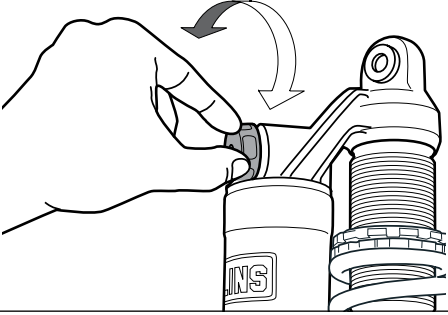
When you need more damping force, you should mainly try to increase compression damping and use as little rebound damping as possible. This usually means that you gain comfort and handling performance.



# ADJUSTMENTS

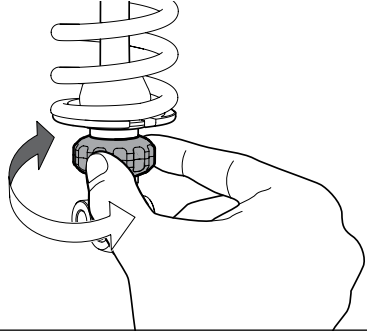
## COMPRESSION

One way compression  
Range 22 clicks



## REBOUND

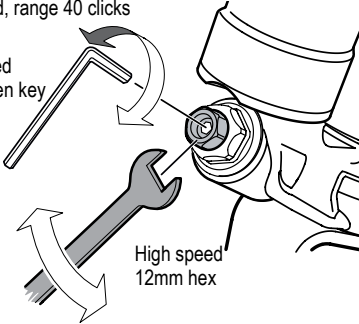
Rebound; No end stop  
Range 60 clicks



## COMPRESSION

Two way compression  
High speed, range 50 clicks  
Low speed, range 40 clicks

Low speed  
3 mm Allen key

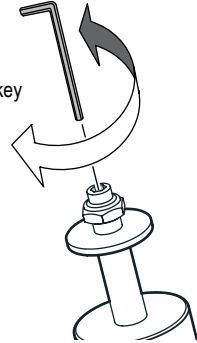


High speed  
12mm hex

## REBOUND

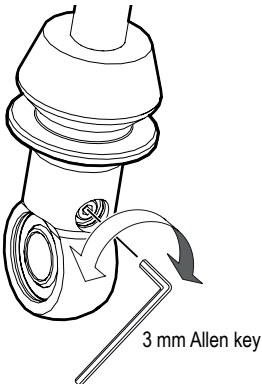
Rebound; No end stop  
Range 40 clicks

3 mm Allen key



## REBOUND

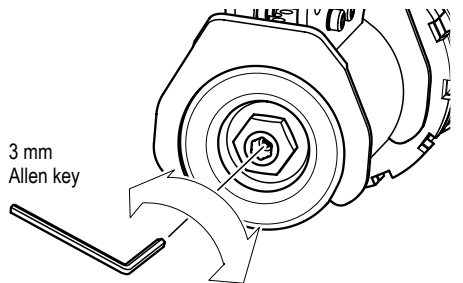
Range 50 clicks



3 mm Allen key

## REBOUND

Range 40 clicks  
Warning! No end stop. If you exceed the range of 40 clicks, the adjuster may be unscrewed.



3 mm  
Allen key

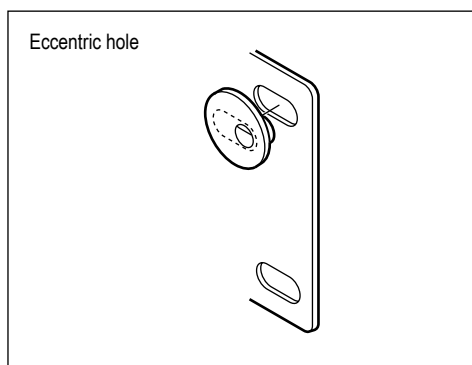
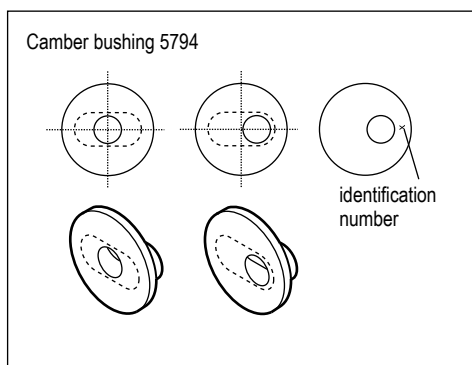
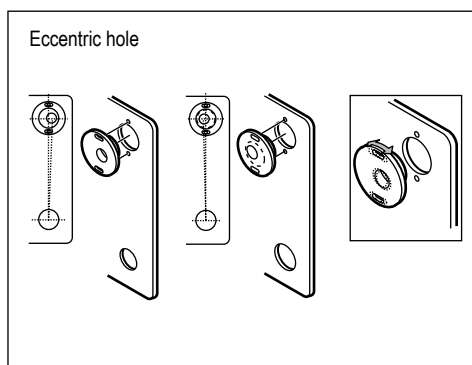
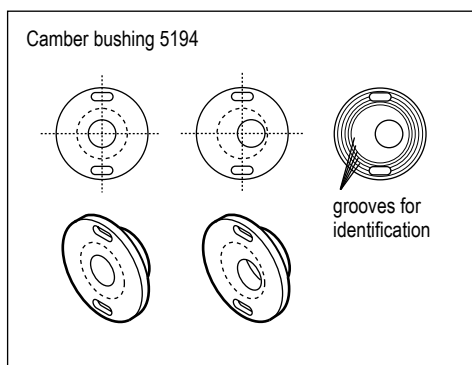
# CAMBER BUSHINGS

## Camber bushings

Unlike most standard McPherson struts, most Öhlins struts feature camber bushings that enable you to alter the wheel camber.

Bushing type	Identification marking
5194	grooves
5794	id number

You will obtain different camber angles depending on how you mount the bushings, with the eccentric hole facing the wheel or away from the wheel.



# INSPECTION AND MAINTENANCE

*Preventive maintenance and regular inspection reduces the risk of functional disturbance. If there is any need for additional service, please contact an Öhlins dealer.*

## Cleaning

Clean the shock absorber externally, use soft detergent and compressed air. Ensure that all dirt is removed. Lift the bump rubber and clean the area below. Keep the shock absorber clean and spray it with oil (WD40, CRC 5-56 or equivalent) after washing. Wipe off excessive oil with a cloth.

## ⚠ Caution!

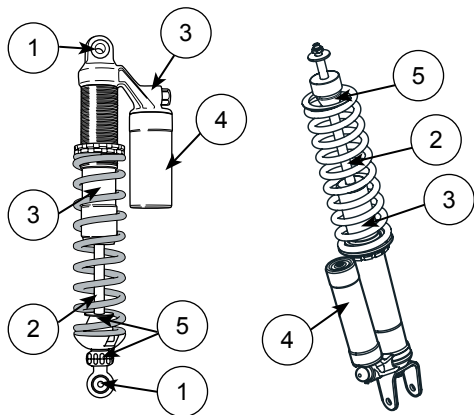
*Never spray water directly into the adjuster knobs and/or the ball joints.*

## Inspection points

1. Check ball joints for possible excessive play or stiction.
2. Check the piston shaft for leakage and damage.
3. Check the shock absorber body for external damage.
4. Check the reservoir for external damage that can restrict the floating piston from moving freely.
5. Check for excessive wear of rubber components.
6. Check the attachment points of the shock absorber to the vehicle.

## Inspection intervals

300 - 400 km



## McPherson

1. Remove the strut casing
2. Clean the seal and bushings. Check them for wear. Replace if necessary.
3. Lubricate the inner tube and the scraper with a layer of Öhlins red grease (00146-01/02).  
The space between the bushings in the outer tube should be filled with a layer of Öhlins red grease up to the bushing surface.
4. Assemble the strut.  
Tighten the piston shaft 35Nm  
Tighten the nut, use Loctite 648 60Nm

## ⚠ Caution!

*When tightening; hold the shaft with an allen key, otherwise the shaft pre-load will be reduced and there is a risk of the nut coming loose.*

## Maintenance

Service your dampers at an Öhlins Service Centre.

Smooth gravel 800 - 1200 km

Tarmac 1000 - 1400 km

*For rougher conditions; maintenance is required more frequently.*

## Disposal

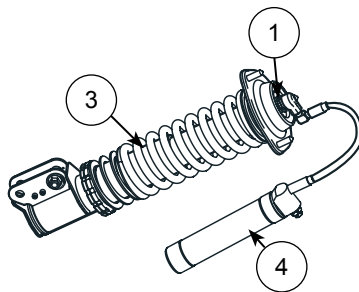
Discarded Öhlins products should be handed over to an Öhlins dealer for proper disposal.

## 👁 Note!

*The Öhlins shock absorber shall only be filled with the Öhlins High Performance Shock Absorber Fluid. Contact an Öhlins dealer for advice.*

## ⚠ Warning!

*Never alter the gas pressure. Special purpose charging equipment and access to nitrogen required.*





Your Öhlins retailer:

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