



*Shock Absorber for MC Road & Track*

**TTX**

**Owner's Manual**



*Öhlins Headquarters Upplands Väsby, Sweden*

### **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.

Being a careful observer, Kenth's attention was continuously 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 35 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 product. More than two hundred World Championships and other major world titles are definitive proof that Öhlins products 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 35 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 product on your vehicle you have made a clear statement... you are a serious rider or driver with a focus on getting the maximal handling ability and outstanding feedback from your vehicle. Along comes the fact that your Öhlins product 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 as a part of the product and shall 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.*

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# 1 DESIGN

*Congratulations on choosing the Öhlins TTX Road & Track shock absorber - the most unique and powerful racing shock absorber available today. The TTX shock absorber design is the culmination of two decades of Öhlins successful participation in World Championship events.*

This shock absorber draws on all the expertise developed by Öhlins while winning more than one hundred World Championship titles. The TTX shock absorber is designed to handle the demanding damping characteristics needed for all types of tracks, from winding TT road race course to pure GP Road Racing tracks.

The Öhlins TTX features a patented concept with a unique concentric twin tube design, together with a solid main piston, that allows for the gas pressure to always back-up the low-pressure side of the main piston. This design creates positive pressure build up on both compression and rebound stroke. As a result the TTX has a more direct damping response, less risk for cavitation and works with lower gas pressure.

Compared to a regular piggy back single tube

shock absorber, that has positive pressure build up only on rebound stroke and relies on compression valve resistance together with gas pressure to avoid cavitation on compression stroke, the TTX design is superior.

Also the twin tube design with separate channels connecting the compression valve to the compression side of the main piston and the rebound valve to the rebound side of the main piston, gives the possibility to have completely separated adjusters for compression and rebound damping.

The whole system is pressurized by nitrogen gas behind a floating piston to ensure separation of the gas and fluid. A top out spring is fitted in the TTX for optimum performance during hard braking.

The Öhlins shim system offers infinite combinations of shim stacks with a wide spectrum of different character. Also different bleed valves are available. The Öhlins TTX shock absorber is a user friendly shock absorber with hydraulic main spring preload adjustment, length adjustment, easy to set up, dial in and rebuild. Support is always available from the Öhlins dealers worldwide.

# 1 DESIGN

When the shock absorber moves, the fluid inside is forced to flow through either the compression valve or rebound valve first (depending on direction of movement); followed by going through either the rebound check valve or compression check valve and on to the other side of the main piston (Fig. 2 and 3). The fluid displaced by the piston rod is directed either into or out of the reservoir.

The reservoir is connected to the system so, regardless of direction of movement, it will be in contact with the low pressure side of the main piston.

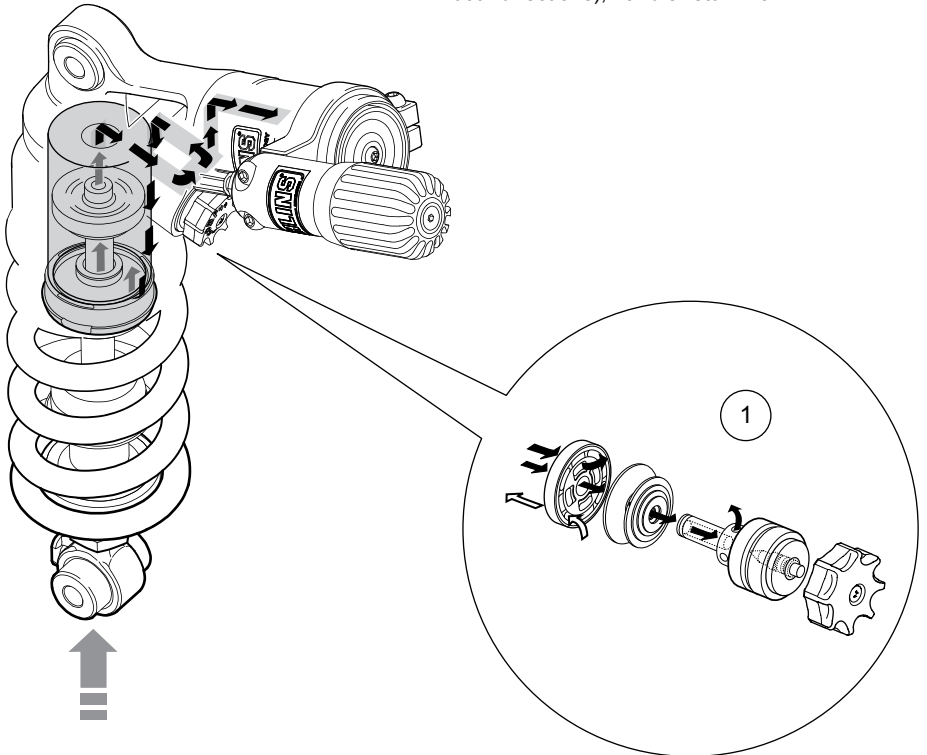
The compression and the rebound valves are both of the same design. The valves have three flow paths for the fluid;

Bleed valve: (Fig. 1 centre black arrows) small orifice that creates a flow restriction simply by being small.

Shim valve: (Fig. 1 outer black arrows) fluid pressure has to deflect thin steel washers (shims) to open up an orifice and allow fluid to flow through it.

Check valve: a spring preloaded shim that opens easily, for return flow of fluid when the direction of movement of the shock absorber changes (Fig. 1 outer white arrows).

The bleed valve and shim valve are used to build up damping force. At slow stroke speeds the percentage going through the bleed valve is higher and at fast strokes the shim valve takes care of most of the flow. The check valve, together with the bleed valve (since it can flow both directions), handle return flow.



# 1 DESIGN

To control damping force the bleed valve can be changed in size by the external adjuster, compression and rebound.

By altering the stiffness of the shim stack (number, thickness, diameter and shape) on the shim valve the characteristics of the damping action can be changed.

This should only be done by an authorized Öhlins service workshop.

## Compression Damping

When movement of the motorcycle causes compression of the shock absorber, (Fig. 2) the fluid above the main piston is pressurized (more than the set gas pressure) and goes through the:

- compression adjuster bleed valve
  - compression adjuster shim valve
  - channel connected to the reservoir
  - rebound adjuster check valve
- and between the outer and inner tube to the other side of the main piston.

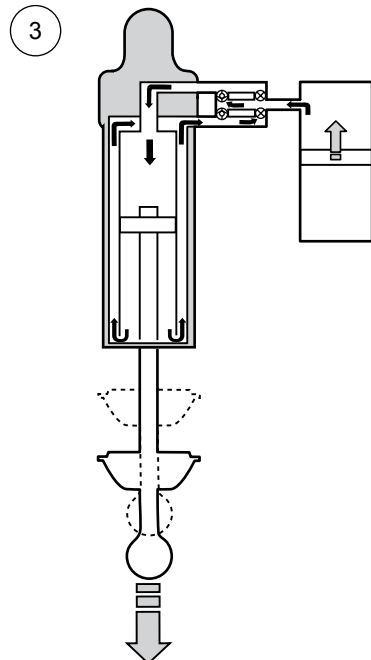
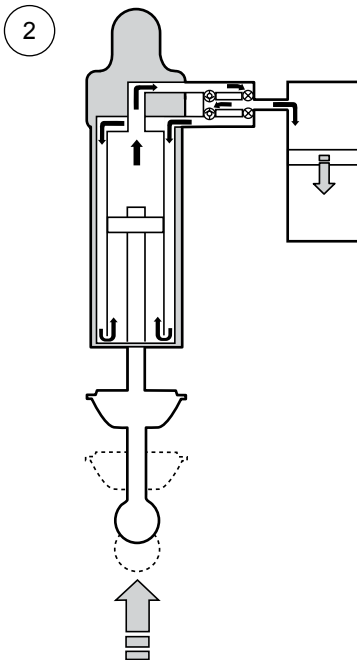
During compression stroke, the piston rod enters the main body and the correspondingly displaced volume of damper fluid has to flow into the reservoir; the separating piston moves accordingly.

## Rebound Damping

When the spring forces the shock absorber to extend again (Fig. 3), the fluid below the piston is pressurized (more than the set gas pressure) and has to move. In a similar pattern the flow goes through the:

- rebound adjuster bleed valve
  - rebound adjuster shim valve
  - channel connected to the reservoir
  - compression adjuster check valve
- and into the inner tube to the upper side of the main piston.

The fluid that was displaced into the reservoir during compression stroke, is now pushed back into the main body by the pressure of the gas; the separating piston moves accordingly.



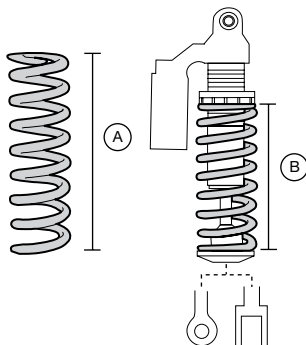
## 2 SPRING PRELOAD

When adjusting the spring preload you move the spring seat. This will decrease or increase the initial spring force, which will lower or raise the motorcycle rear ride height.

The spring preload is fundamental for the function of the suspension. If the preload is incorrectly set, any other adjustments will not help to get the intended performance from the suspension.

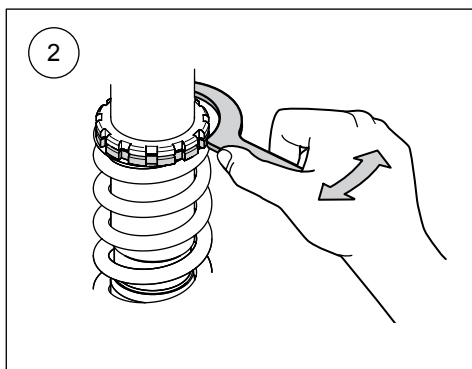
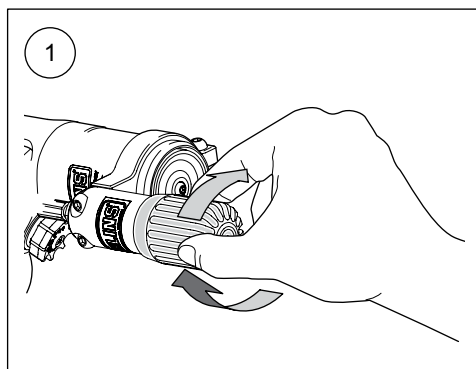
### Set Spring Preload

1. Turn the Hydraulic Adjuster knob to set the spring preload. Turn clockwise to increase the preload and turn counter clockwise to decrease.
2. If your shock absorber is not equipped with a Hydraulic Adjuster: Use a C-spanner and move the spring platform (2A) to the desired position .



- A Free spring length  
B Installed spring length  
*Shock absorber fully extended*  
 $A - B = \text{Spring Preload}$

Spring Preload is the difference between the measures A and B.

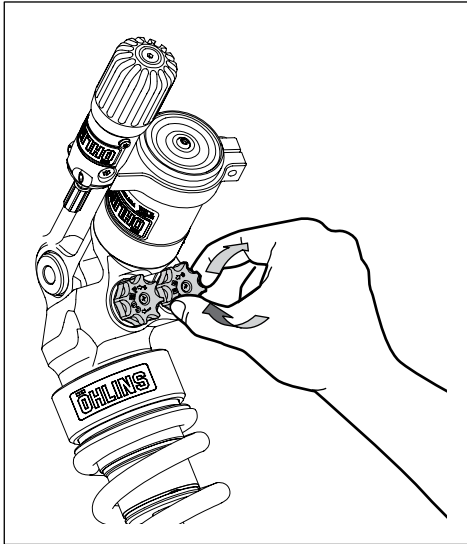




# 3 COMPRESSION AND REBOUND

*Compression damping controls the energy absorption when the shock absorber is being compressed, thus controls how easy the shock absorber compresses when the rear wheel is being loaded or hits 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.*



Adjust compression and rebound damping by turning the knobs on top of the reservoir. The adjusters have a normal right hand thread.

## **Compression Damping Adjuster**

Adjust by turning the golden coloured knob labelled "COMP" on the cylinder head. Turn clockwise to increase damping, turn counter clockwise to decrease.

## **Rebound Damping Adjuster**

Adjust by turning the black coloured knob labelled "REB" on the cylinder head. Turn clockwise to increase damping, turn counter clockwise to decrease.

## **Reset the Adjuster**

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 Setup data in the Mounting Instructions for the shock absorber.

## **⚠ Caution!**

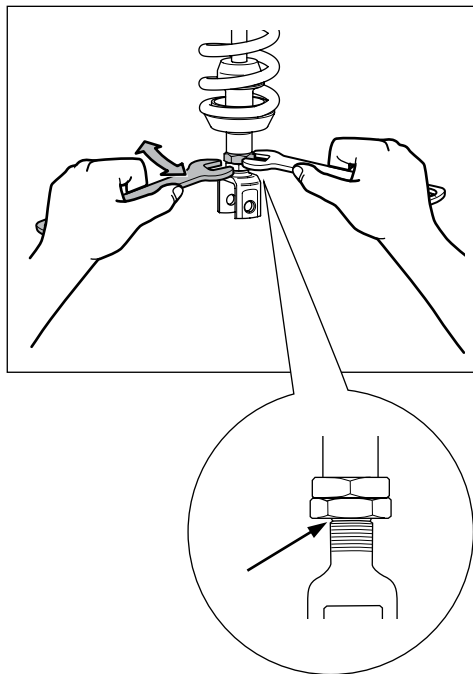
*Do not use force, delicate sealing surfaces can be damaged.*

# 4 LENGTH

*By adjusting the length of the shock absorber the steering geometry as well as the chain force can be changed.*

A shorter shock absorber will result in a lower motorcycle. The fork angle as well as the trail will increase, and normally the chain force will be reduced with less anti-squat as a result. A slight change of centre of gravity is another result of changing the length of the shock absorber.

A longer shock absorber will result in a higher motorcycle. The fork angle and trail will decrease and normally the chain force will increase with more anti-squat as a result. A slight change of centre of gravity is another result of changing the length of the shock absorber.



## **Note!**

*On modern Hyper sport and race bikes all length adjustment should be moderate. Also very small adjustments can make a big difference.*

## **Adjust Length**

We advise to remove the shock absorber from the vehicle before adjusting the length. Use two 24 mm wrenches. Hold the upper nut with one hand and at the same time loosen the lock nut (lower nut). Turn the end eye/bracket to the desired length. One [1] turn is 1 mm of shock absorber length. Please make sure to measure the ride height before and after adjusting the length (see page 9).

Tightening torque: 40 Nm

## **Warning!**

*Remember to lock the lock nut after adjusting the length.*

## **Warning!**

*The adjustable end eye/bracket must not be threaded out more than that the groove is fully visible beneath the lock nut. This is maximum length. After adjusting, make sure that the lock nut is tightened.*

# 5 ADJUSTMENT AND SETUP

## **⚠ Warning!**

*Before riding, always ensure that the basic settings made by Öhlins are intact. Take notes, adjust in small steps and make only one adjustment at a time.*

## **Step 1**

### **Spring Preload - Free Sag - Ride Height**

Spring preload is a crucial part of setting your motorcycle since it affects the height of the motorcycle and the fork angle.

1. Work on a flat surface. Put the motorcycle on a work stand so that both wheels are off the ground and the suspension is unloaded.
2. Mark, for example with a piece of tape, a point immediately above the rear wheel axle.
3. Measure the distance from the marked point to a fixed point, for example the wheel axle (R1).
4. Measure the distance from the bottom of the upper triple clamp to a fixed point, for example the front wheel axle (F1).
5. Put the motorcycle on the ground so that the front and the rear suspensions are slightly compressed. Repeat the measuring procedures (R2 and F2).
6. Sit on the motorcycle in normal riding position, properly outfitted in your riding gear. Repeat the measuring procedure (R3 and F3).

## **Recommended Measures**

If no other recommendations are given in the Mounting Instructions follow the measures below:

### **Free sag (R1-R2), (F1-F2)**

Rear	5-15 mm
Front	20-30 mm

### **Ride height (R1-R3), (F1-F3)**

Rear	25-35 mm
Front	30-40 mm

## **👁 Note!**

*Always check on the Öhlins web site [www.ohlins.com](http://www.ohlins.com) or contact an Öhlins dealer for the latest information.*

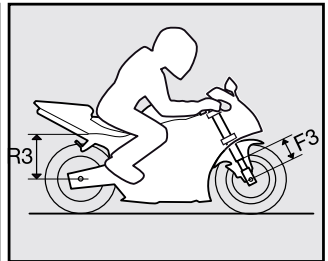
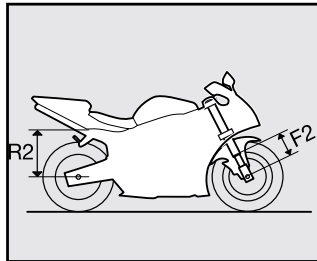
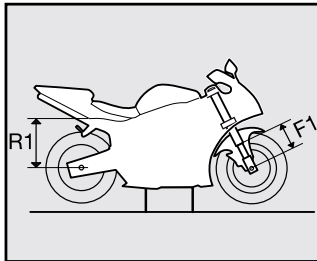
## **Step 2**

### **Adjust Spring Preload**

1. If your measures differ significantly from the recommendations in the Mounting Instructions or the table above, adjust the spring preload. (See section Spring Preload in this manual).
2. If the ride height still differs from the recommendations, you may need to change to softer/harder spring. Contact an Öhlins dealer for advice.

## **⚠ Warning!**

*Incorrect spring rate may result in a front geometry that is either too steep or too flat. This can result in a tendency of under or over steering, that could seriously affect the handling characteristics of the motorcycle.*



# 5 ADJUSTMENT AND SETUP

## Stability and Traction

All motorcycles are designed with a suspension geometry that includes height and fork angle. If you change any components the suspension geometry can be affected and it is therefore essential that both the front and the rear ends match each other. Changing to Öhlins suspension gives optimum performance only when both the front fork and the rear suspension interact properly. It is very important that the front and the rear loaded heights are within the specified values.

## Front Fork Springs

To optimize the stability and traction of your motorcycle the front fork must match the rear suspension. Öhlins Racing has a variety of front fork springs available for a large number of motorcycle models.

The springs in combination with the Öhlins shock absorbers contribute to superior stability and traction. See the Öhlins Recommendation List by contacting your nearest Öhlins dealer or using our web site.

## **⚠ Warning!**

*If there are no matching springs for your motorcycle model, use the original springs, however, they must be in good condition and not fatigued.*

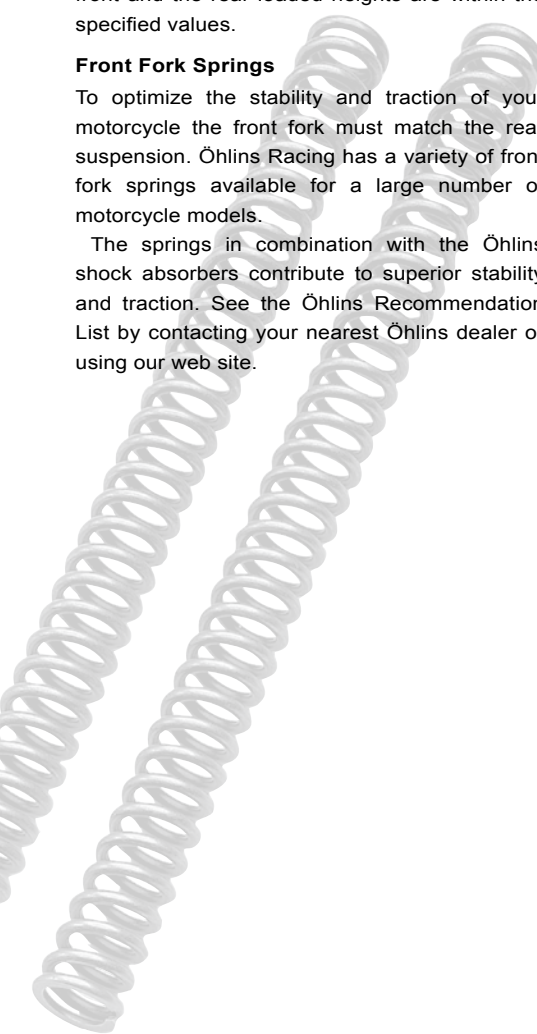
## FGK kits and Piston kits

Öhlins Racing also produces complete Racing Cartridge Systems, for front forks, as well as piston kits to upgrade your front fork to a higher performance level.

## Prepare the Settings

By adjusting the shock absorber and testing by trial and error you can learn how the different settings affect your motorcycle.

Always begin your setting by taking a test ride with all adjustments at their recommended basic setting. Choose a short run of varying character, for example with long as well as sharp bends, hard as well as soft bumps. Stay on the same run and adjust only one setting at a time.



# 5 ADJUSTMENT AND SETUP

## Recommended Adjustment Range

Rebound and compression damping:  
±5 clicks from original (basic) setting.

When you setup your bike you need to do it together with the front fork and on all types of tracks that you want to optimize, there are no setups that will be 100% perfect on all tracks, you will need to compromise.

Keep priority at:

- safe feeling
- stability
- comfort

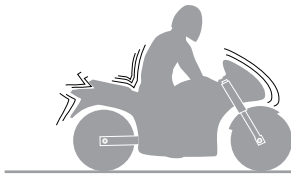
This will allow you to ride safer and use less energy.

## Rebound Damping

If you have got a good feeling for the bike with spring, preload and the ride height feels OK but the bike runs low and packs down under acceleration bumps, with lost line and/or lost comfort and traction, open the rebound adjuster two [2] clicks.

If the bike is nervous and moving a lot or has a high feeling entering corners, close the rebound adjuster two [2] clicks. Fine tune one [1] click at the time.

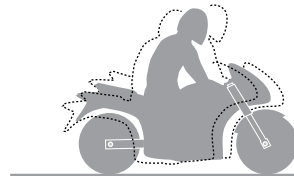
Test run and make the necessary adjustments. For original rebound setting see the Mounting Instructions for your shock absorber.



If the vehicle feels

- unstable
- loose
- bouncy

...increase rebound damping



If the vehicle feels

- hard
- bumpy

...decrease rebound damping

# 5 ADJUSTMENT AND SETUP

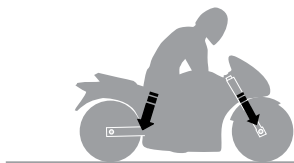
## Compression Damping

If the bike feels soft, unstable, is using too much wheel travel and you have the perfect spring for you; close the compression adjuster two [2] clicks. This will control the wheel during acceleration more, plus, it will help ride height and falling through the stroke too quickly.

If the bike feels high, has bad grip at throttle opening and feels uneven over small or medium bumps during acceleration; open the compression adjuster two [2] clicks. Test run and make necessary corrections.

When you have sufficient feel of the motorcycle you can make further fine adjustments. It is feeling and experience that counts.

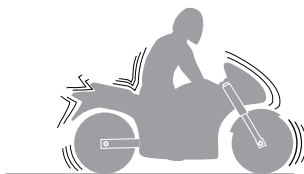
When you feel that you have achieved an improvement, go back to where you started and check once more. Note other relevant factors such as tires, temperature etc. Test run to make sure whether further fine adjustments should be made.



If the vehicle

- feels unstable
- feels soft
- feels low
- is bottoming

...increase compression damping



If the vehicle feels

- harsh
- hard
- has bad grip

...decrease compression damping

# 6 INSPECTION AND MAINTENANCE

*Preventive maintenance and regular inspection reduces the risk of poor performance. If there is any need for additional service, please contact an Authorized Specialized Service Center.*

## Cleaning

Clean the shock absorber externally with a soft detergent. Use compressed air. Be careful 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

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.

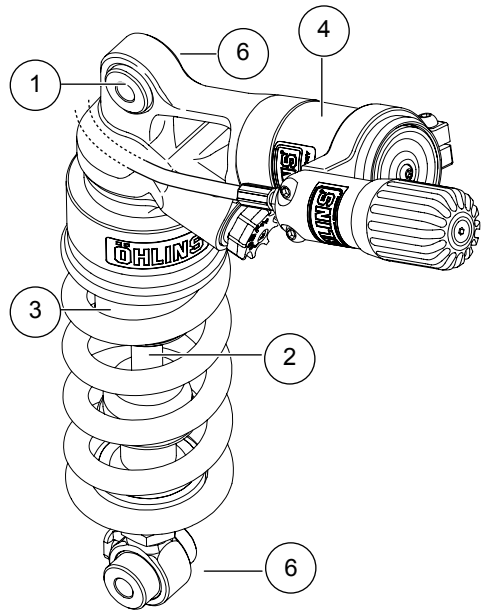
## Recommended Service Intervals

Racing: Every 10 hours of operation.  
Maximum 20 hours of operation  
without service and oil change.

Regular street use: Every 30 000 km

## Disposal

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



## 👁 Note!

*The Öhlins shock absorber should only be filled with 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 is required.*

Your Öhlins retailer:

Öhlins Racing AB  
Box 722  
SE-194 27, Upplands Väsby  
Sweden

Phone: +46 (0)8 590 025 00  
Fax: +46 (0)8 590 025 80  
[www.ohlins.com](http://www.ohlins.com)

