



*Automotive Shock Absorbers*

# **TTX46CS/TTX36**

**Owner's Manual**





## 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.*

*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 driver with a focus on getting the maximum 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 drive. Go explore!*

## **Note!**


The shock absorber is a very important part of the vehicle and will affect the stability.


 Read and make sure that you understand the information in this manual and the mounting instructions before you use this product. If you have any questions regarding installation or maintenance please contact your nearest Öhlins dealer.


 Öhlins Racing AB can not be held responsible for any damage to the shock absorber, vehicle, other property or injury to persons, if the instructions for installing and maintenance are not followed exactly.


## **Warning!**

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

 The specifications for the particular shock absorber are results from tests run on a factory equipped vehicle. If wheel dimensions, springs and/or other chassis parts have been changed or modified, the clearances and vehicle stability can be affected.

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

 After installing this product, take a test drive at low speed to make sure that your vehicle has maintained its stability.

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

## **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.

## **Note!**

When working on this product, also read the Vehicle Service Manual.

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

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# Contents

Introduction	1
Safety Precautions	2
Contents	3
Design and Functioning	4
Spring Preload	8
Changing the Spring - TTX46CS	9
Compression and Rebound	10
Adjustment and Set-up	11
Inspection and Maintenance	13



# Design and Functioning

*Congratulations on choosing the Öhlins TTX 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 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 buildup 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.

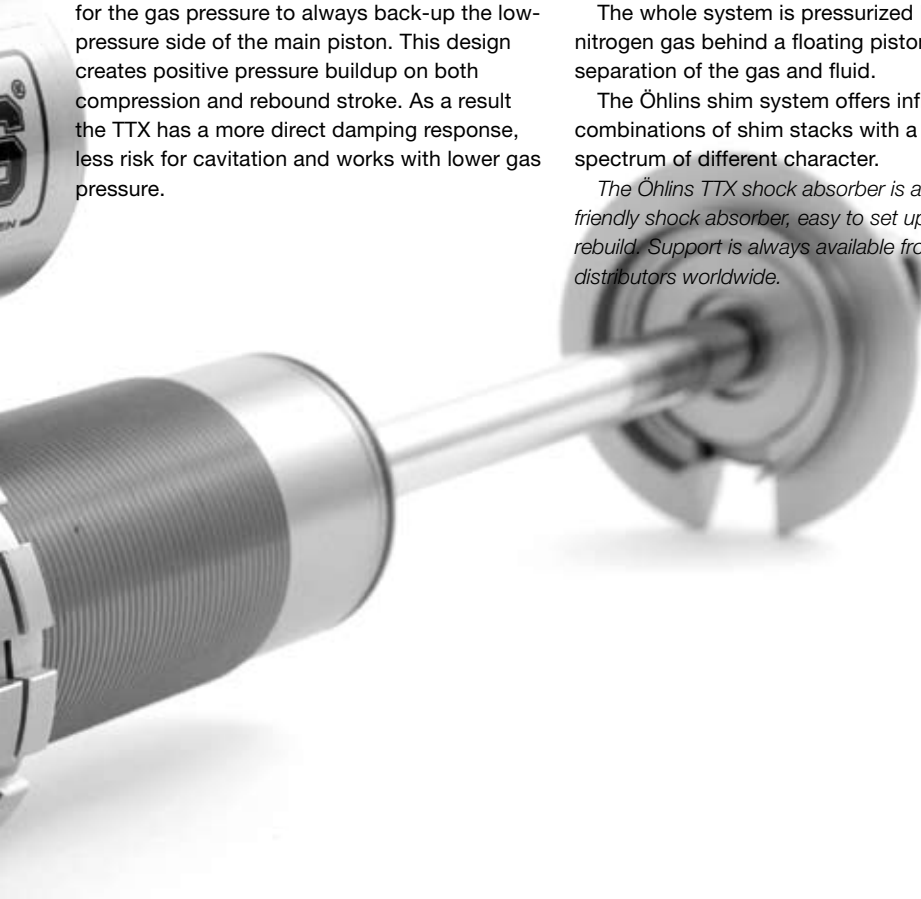
Compared to a regular piggy back single tube shock absorber, that has positive pressure buildup only on rebound stroke and relies on compression valve resistance together with gas pressure to avoid cavitation on compression stroke, the TTX design is superior.

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.

The Öhlins shim system offers infinite combinations of shim stacks with a wide spectrum of different character.

*The Öhlins TTX shock absorber is a user friendly shock absorber, easy to set up, dial in and rebuild. Support is always available from the Öhlins distributors worldwide.*



# Design and Functioning

When the shock absorber moves, the fluid inside is forced to flow either through 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.

On the TTX36, the fluid displaced by the piston shaft 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 TTX46CS is a through-rod shock absorber, meaning that no fluid is displaced into or out of the reservoir when the shaft moves.

The compression valve and the rebound valve are both of the same design. The valve has three flow paths for the fluid:

1. Bleed valve; a small orifice that creates a flow restriction by its small flow area.
2. Shim valve; fluid pressure has to deflect thin steel washers (shims) to open up an orifice and allow fluid to flow through it.
3. Check valve; a spring preloaded shim that opens easily, for return flow of fluid to the other side of the piston.

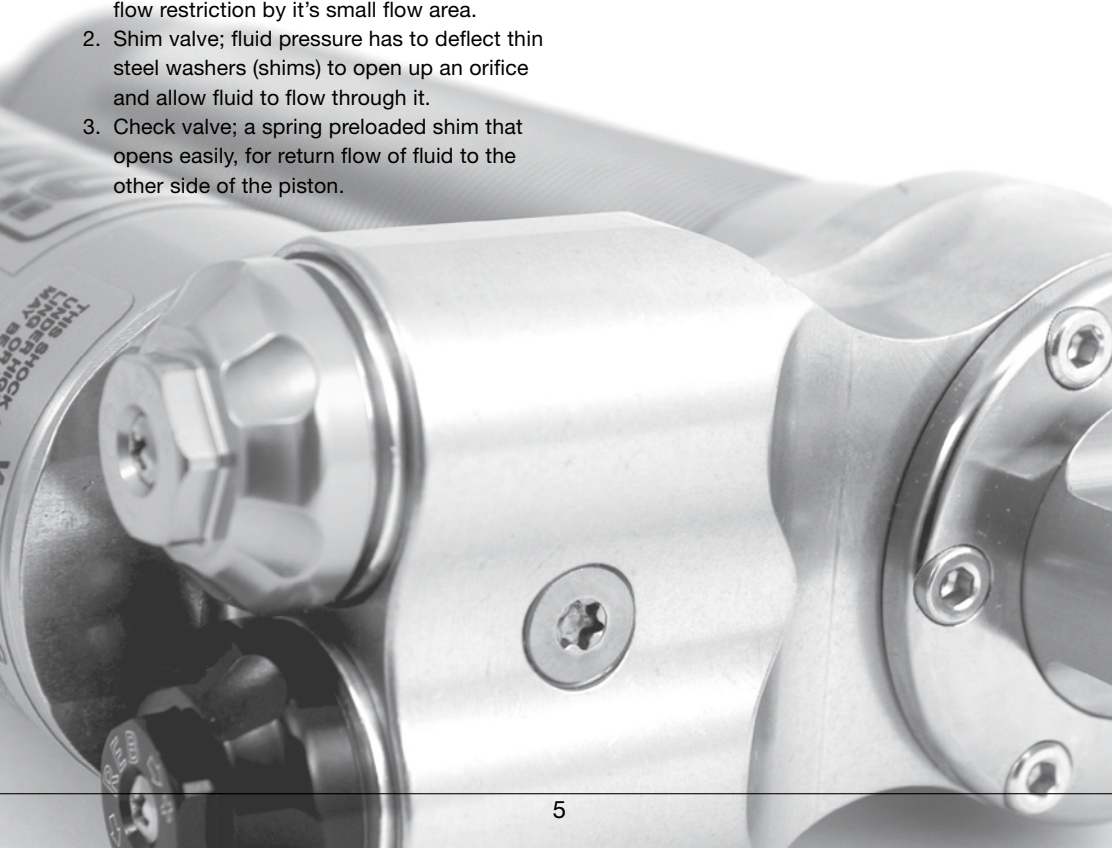
The bleed valve and shim valve are used to build up damping force. At slow stroke speeds the percentage going through the bleed valve is higher and at fast strokes the shim valve takes care of most of the flow.

The check valve, together with the bleed valve (since it can flow in both directions), handle return flow.

To control damping force the bleed valve orifice 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 of the shims) on the shim valve the characteristics of the damping action can be changed.

*This should only be done by an authorized Öhlins Service Centre.*

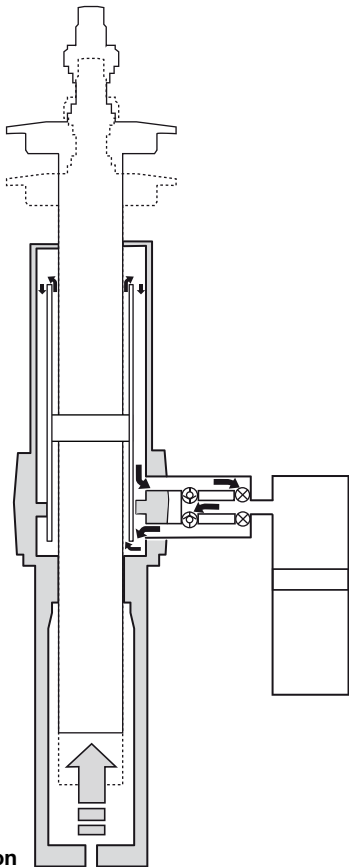


## Compression Damping - TTX46CS

When movement of the vehicle causes compression of the shock absorber 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
- ...to the underside of the main piston.

The through-rod design causes no flow to the reservoir.



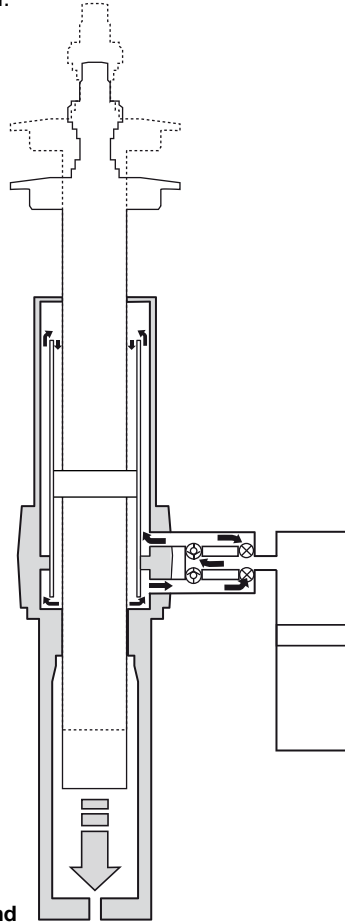
Compression

## Rebound Damping - TTX46CS

When the spring forces the shock absorber to extend again, 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
- ...to the upper side of the main piston.

The through-rod design causes no flow to the reservoir.



Rebound

## Compression Damping - TTX36

When movement of the vehicle causes compression of the shock absorber 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
- ...to the underside of the main piston.

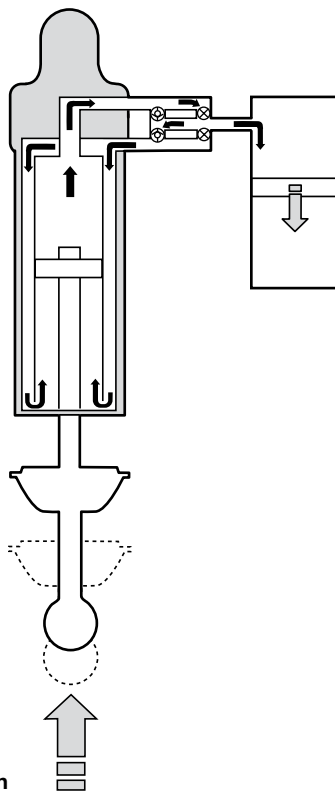
During compression stroke, the piston shaft is entering the main body and the correspondingly displaced volume of damper fluid has to flow into the reservoir; the separating piston moves accordingly.

## Rebound Damping - TTX36

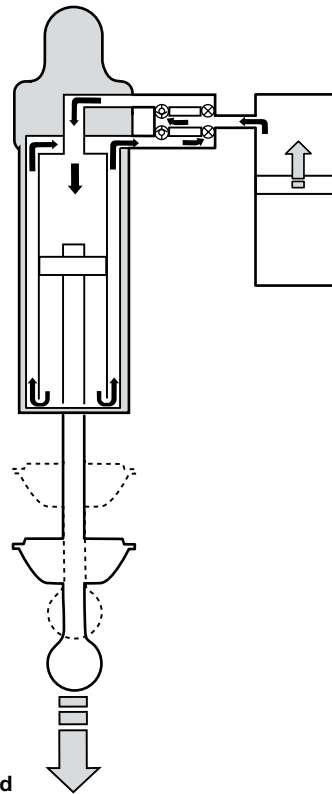
When the spring forces the shock absorber to extend again, the fluid below the piston is pressurized (more than the set gas pressure) and has to move. In a similar pattern the flow goes through the:

- rebound adjuster bleed valve
- rebound adjuster shim valve
- channel connected to the reservoir
- compression adjuster check valve
- ...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.



Compression



Rebound

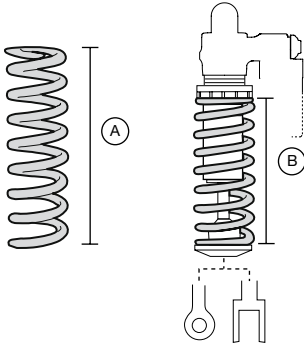


# Spring Preload

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 vehicle.

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.

The spring preload affects the height of the vehicle and the wheel angles. By changing the preload the stability of the vehicle can be changed.

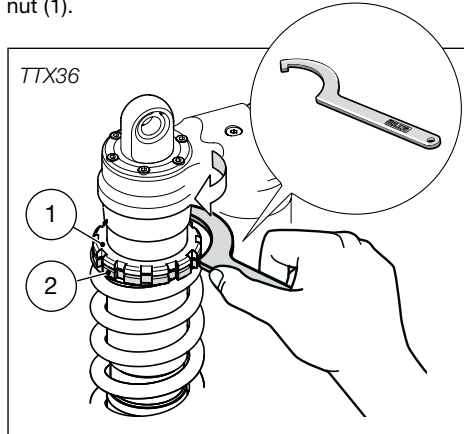


- A Free spring length
  - B Installed spring length  
*Shock absorber fully extended*
- $A - B = \text{Spring Preload}$   
*Spring Preload is the difference between the measures A and B.*

## How to Set the Spring Preload

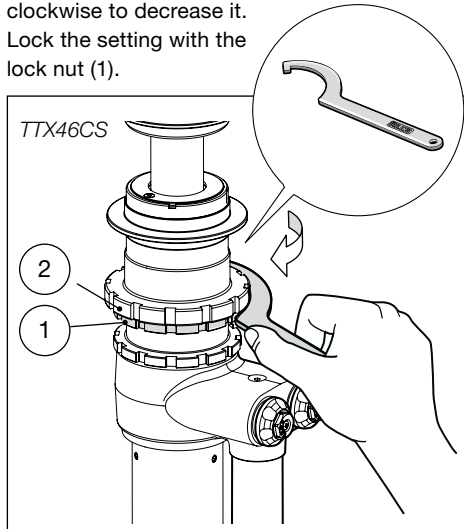
### TTX36

Use a C-spanner. Unlock the lock nut (1). Turn the adjustment ring (2) clockwise to increase the spring preload. Turn counter clockwise to decrease it. Lock the setting with the lock nut (1).



### TTX46CS

Use a C-spanner. Unlock the lock nut (1). Turn the adjustment ring (2) counter clockwise to increase the spring preload. Turn clockwise to decrease it. Lock the setting with the lock nut (1).



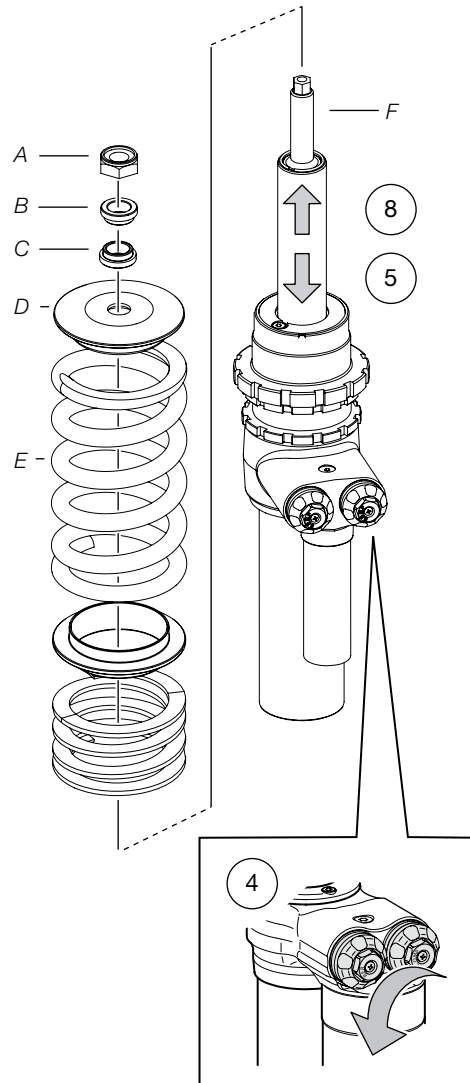
# Changing the Spring - TTX46CS

One advantage with the through-rod design is that there is no gas force pushing the shaft out. This enables changing the spring without taking the shock absorber off of the car, in turn saving time.

## ⓘ Note!

To make the following procedure easier, we recommend you to perform the following steps on **both sides** at the same time.

- 1**  
Raise the vehicle and put it on jack stands.
- 2**  
Remove the wheel.
- 3**  
Remove the top nut (A) and the top bearing spacer (B).
- 4**  
Open the adjusters fully.
- 5**  
Push the shaft down fully.
- 6**  
Remove the lower bearing spacer (C), the spring seat (D) and the main spring (E).
- 7**  
Change the spring.
- 8**  
Pull the shaft up.
- 9**  
Reassemble the spring seat (D) and the lower bearing spacer (C).
- 10**  
Guide the top pin (F) through the top mount bearing.
- 11**  
Reassemble the top bearing spacer (B) and the top nut (A).



# Compression and Rebound

Compression damping controls the energy absorption when the shock absorber is being compressed, thus controls how easily the shock absorber compresses when the 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

Turn the gold knob labelled "COMP" on the cylinder head/valve housing (1). Or, use a 14 mm socket T-bar and turn the hexagon nut on the adjuster knob (2). Turn clockwise to increase damping, turn counter clockwise to decrease.

## Rebound Damping Adjuster

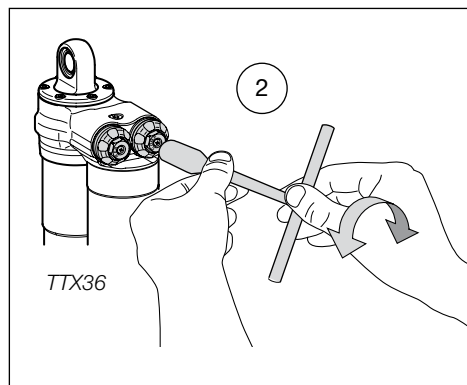
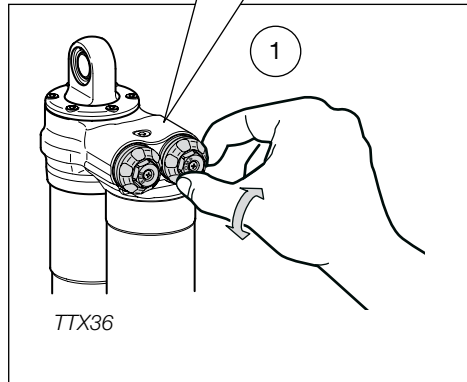
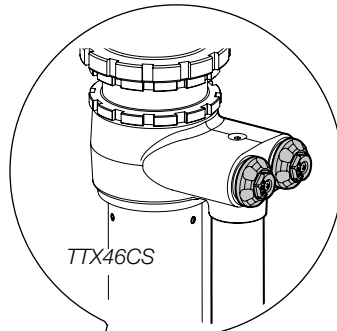
Turn the black knob labelled "REB" on the cylinder head/valve housing (1). Or, use a 14 mm socket T-bar and turn the hexagon nut on the adjuster knob (2). Turn clockwise to increase damping, turn counter clockwise to decrease.

## 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 Set-up data in the Mounting Instructions for the shock absorber.

## Caution!

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



*Installing new shock absorbers may alter ride height, wheel angles etc. on your vehicle.*

*Therefore, it is wise to do a complete set-up check of the vehicle after you have installed the Öhlins shock absorber.*

Perform the following steps and always take notes before using the shock absorber;

- Check ride height, front and rear. Adjust if necessary.
- If scales are available check corner weights, front and rear. Adjust if necessary.

#### **Note!**

*Always consult your Öhlins dealer if you have any questions regarding settings of the shock absorber.*

By using the adjustments available on this product, and testing by trial and error, you can learn how the adjustments affect your vehicle.

Always begin by taking your vehicle for a test drive with all adjustments at their basic settings. If possible, choose a short run of varying character with long and sharp bends, hard and soft bumps. Stay to the same run and adjust only one setting at a time.

#### **Warning!**

*Before driving, always ensure that the basic settings made by Öhlins have not been changed during delivery. When adjusting, always make notes, adjust in small steps and make only one adjustment at a time. Do not adjust more than four [4] clicks at a time.*

## **Making adjustments**

Suspension settings are dependent on your vehicle's weight, your driving style, road or track conditions, etc. If you are not happy with our recommended settings, here are a few guidelines and ground rules how to make adjustments.

To make improvements, it is important to understand the function of the shock absorbers and through testing learn how they affect the handling of your vehicle.

### **Adjust rebound damping first**

If the vehicle feels unstable, has excessive chassis movements or seems to be bouncing on the springs; increase rebound damping.

First, turn the adjuster knob four [4] clicks clockwise. Take a test drive; if the vehicle feels harsh and has low grip, adjust two [2] clicks back.

If the vehicle feels harsh and has low grip, especially over a series of bumps, decrease rebound damping. Turn the adjuster knob four [4] clicks counter clockwise. Take a test drive; if the vehicle feels unstable, has excessive chassis movements or seems to be bouncing on the springs, adjust two clicks back.

## **Adjust compression damping**

If the vehicle feels too soft, and it bottoms easily or the ride height decreases while driving; increase compression damping. Turn the adjuster four [4] clicks clockwise. Take a test drive; if the vehicle feels harsh and has too little compliance over bumps, adjust two [2] clicks back.

If the vehicle feels harsh and has too little compliance over bumps; decrease the compression damping. Turn the adjuster four [4] clicks counter clockwise. Take a test drive; if the vehicle feels too soft, and it bottoms easily or the ride height decreases while driving; adjust two [2] clicks back.

- 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 tyres 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, grip 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.

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

## Cleaning

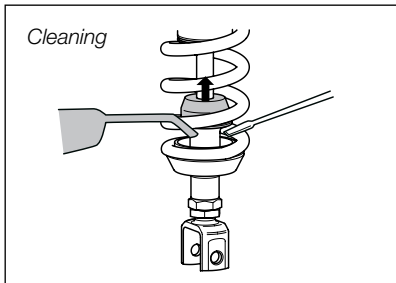
Clean the shock absorber externally with a soft detergent. Use compressed air. Be careful that all dirt is removed. Lift the bump rubber and clean the area below (TTX36). Keep the shock absorber clean and spray it with oil (WD40, CRC 5-56 or equivalent) after washing. Wipe off excess oil with a cloth.

## Caution!

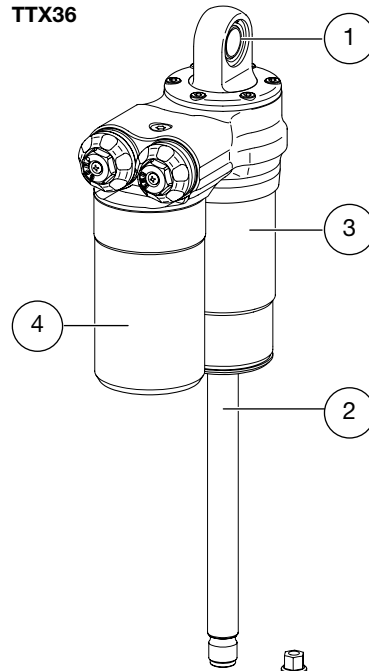
Never spray water directly into the adjuster knobs and/or the ball joints.

## Inspection

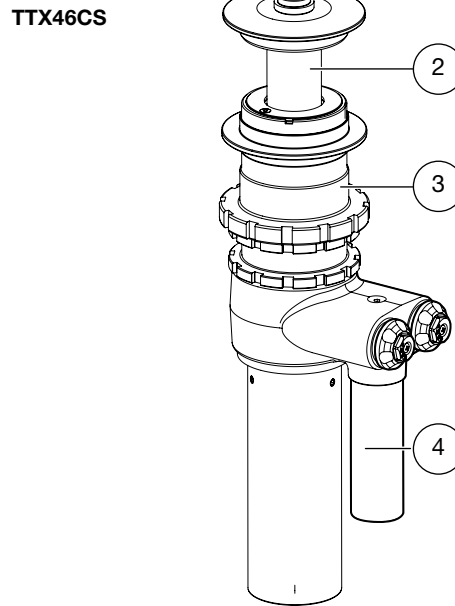
1. Check ball joints for possible excessive play or stiction.
2. Check the piston shaft for leakage and damage.
3. Check the shock absorber body for external damage.
4. Check the reservoir for external damage that can restrict the floating piston from moving freely.
5. Check for excessive wear of rubber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



TTX36



TTX46CS



## **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 authorized Öhlins workshop or distributor for proper disposal.

## **👁 Note!**

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*The Öhlins shock absorber should only be filled with Öhlins Shock Absorber Fluid. Contact an Öhlins dealer for advice.*

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## **⚠ Warning!**

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

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Öhlins Owner's Manual | Part No. 07446-01\_0 | Issued 2009-06-30 | © 2009 Öhlins Racing AB

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