



Öhlins Front Fork Cartridge Kit

FKS 200-Series

Owner's Manual



Öhlins Headquarters Upplands Väsby, Sweden

Öhlins Racing AB - The Story

It was the 1970's, a young man named Kenth Öhlins 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 and 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 racing history.

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.

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.

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 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.



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1 FRONT FORK CARTRIDGE KIT



Introduction

The product in your hand is an artwork, prepared by our dedicated craftsmen at our facility in Upplands Väsby, Sweden. Its predecessors have battled their way on numerous race tracks in World Superbike, Supersport, Superstock and AMA and the legacy continues in your front fork. Thousands of hours have been spent together with some of the best teams in the world to find the optimal design and functionality to give you as much performance, comfort and confidence as possible. You will feel the difference...be sure.

Design

The DNA of this new 22 mm front fork cartridge kit originates in the most prestigious race series in the world and the front fork cartridge kit is weight optimized as a result of that fact. We have used exclusive racing components

from our R&D department to increase the performance of the front fork cartridge kit. Our engineers that work on a daily basis with the top riders in the world often hear the word "feeling" and "control" when they debrief after tests and races.

We wanted to pour as much of these important factors into your front fork cartridge kit and, as a result, the new 22 mm front fork cartridge kit gives you improved "brake support" and "tire feel" when riding. For all of you that have your mind set on doing some serious racing we have some really good news.

Of course we have improved the design so that you easily can have it properly maintained and every kit is individually tested with an optimum setting and spring recommendation. The new top-cap design will send a signal to all curious spectators when you pull over next to your favourite café or local race track.



2 DESIGN AND FUNCTION

The front fork cartridge kit is divided into one compression cartridge and one rebound cartridge. The compression cartridge is installed in the left front fork leg and the rebound cartridge in the right front fork leg. Marked at the top cap is "COMP" for compression adjustment and "REB" for rebound adjustment (Fig. 1).

The compression and rebound cartridges are both of the same design but work opposite each other. To achieve rebound damping force instead of compression damping force, the cylinder tubes and the pistons are turned opposite each other between the compression and the rebound cartridges (Fig. 2).

When the front fork moves, the fluid inside is forced to flow through the pistons. At a compression movement the fluid is forced through the compression shim stack and at the same time through the rebound check valve. And opposite, at a rebound movement the fluid is forced through the rebound shim stack and through the compression check valve.

The fluid displaced by the piston shafts are directed either into or out of the cylinder tubes through the holes. (Fig. 2)

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

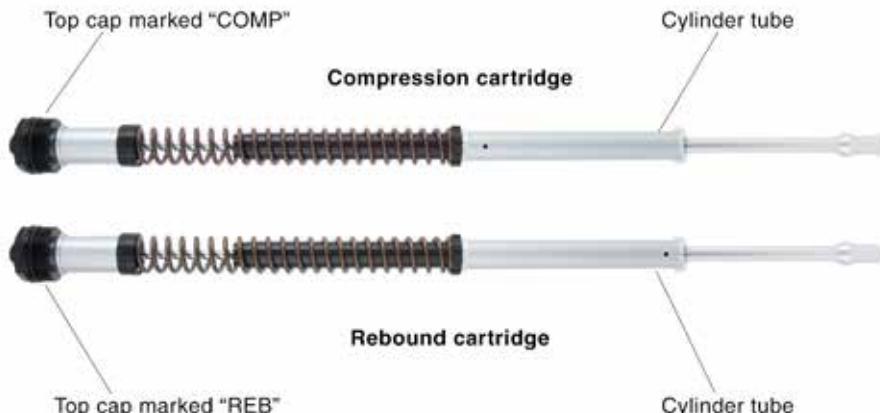
1. Bleed valve (Fig. 3 centre gray arrows). Small orifice that creates a flow restriction simply by being small.
2. Shim valve (Fig. 3 outer black arrows). Fluid pressure has to deflect thin steel washers (shims) to open up an orifice and allow fluid to flow through it.
3. Check valve (Fig. 3 outer white arrows). A spring preloaded shim that opens easily, for return flow of fluid when the direction of movement of the front fork changes.

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 flows.

To control damping force the bleed valve can be adjusted externally from the top cap on both compression and rebound.

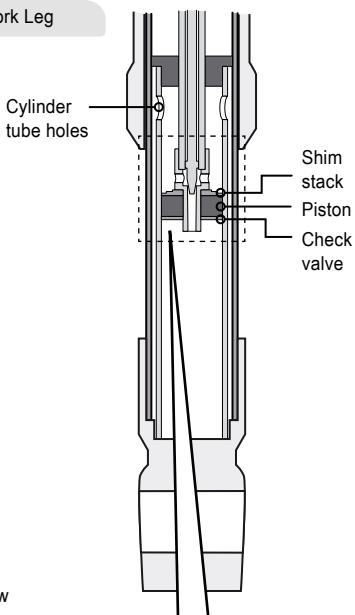
By altering the stiffness of the shim stack (number, thickness, diameter and shape) on the shim valve the characteristics of the damping action can be changed. This should only be done by an authorized Öhlins service workshop.



2 DESIGN AND FUNCTION

Fig. 2 - Schematic View

Compression Front Fork Leg



Rebound Front Fork Leg

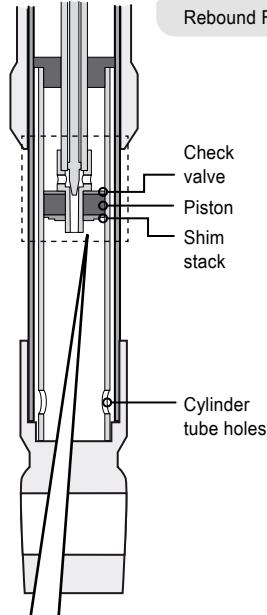
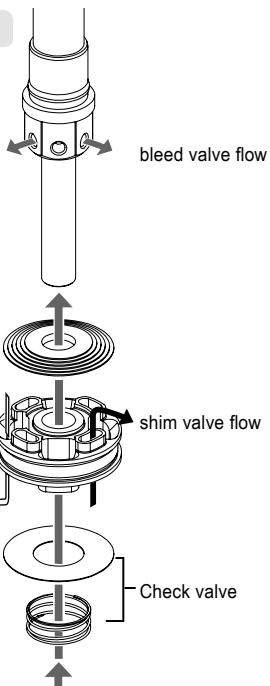
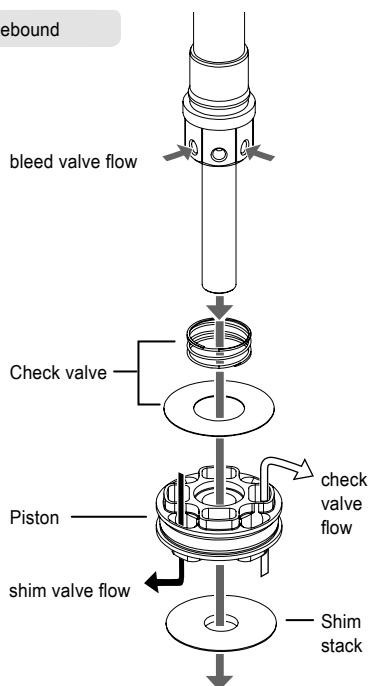


Fig. 3 - Piston Oil Flow

Compression



Rebound



2 DESIGN AND FUNCTION

Compression damping

Compression front fork leg

When movement of the motorcycle causes compression of the front fork (Fig. 4 compression movement), the fluid below the compression piston is pressurized and goes through:

- Compression shim valve
- Compression bleed valve

Rebound front fork leg

The pressure difference between the inside of the front fork leg and above the rebound piston causes the fluid to go through:

- Rebound check valve
- Rebound bleed valve (Small and insignificant flow compared to the check valve)

Displaced fluid

During compression movement, the piston shafts enter the cylinder tubes and the correspondingly displaced volume of fluid has to flow out of the cylinder tubes through the holes.

Rebound damping

Rebound front fork leg

When the spring forces the front fork to extend again (Fig. 5 rebound movement), the fluid above the rebound piston is pressurized and in a similar pattern as compression movement, goes through:

- Rebound shim valve
- Rebound bleed valve

Compression front fork leg

As similar the rebound front fork leg at a compression movement, the pressure difference between the inside of the front fork leg and below the compression piston causes the fluid to go through:

- Compression check valve
- Compression bleed valve (Small and insignificant flow compared to the check valve)

Displaced fluid

The fluid that was displaced by the piston shafts is now pushed back into the cylinder tubes by the pressure difference between the inside of the front fork legs and above and below the pistons.

2 DESIGN AND FUNCTION

Fig. 4 - Front Fork Oil Flow Compression Movement

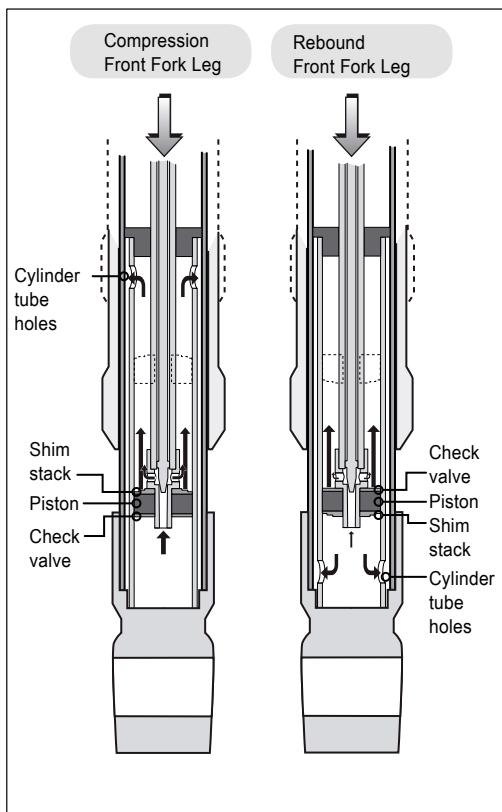
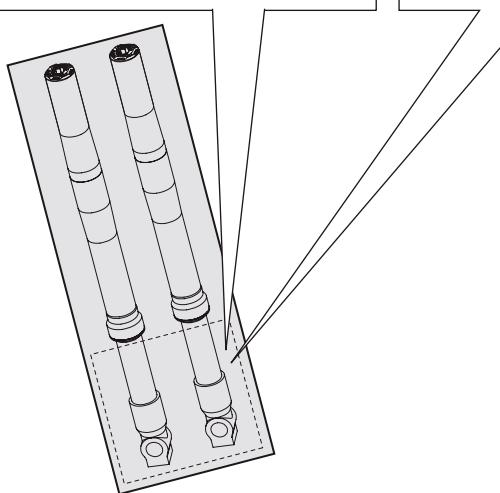
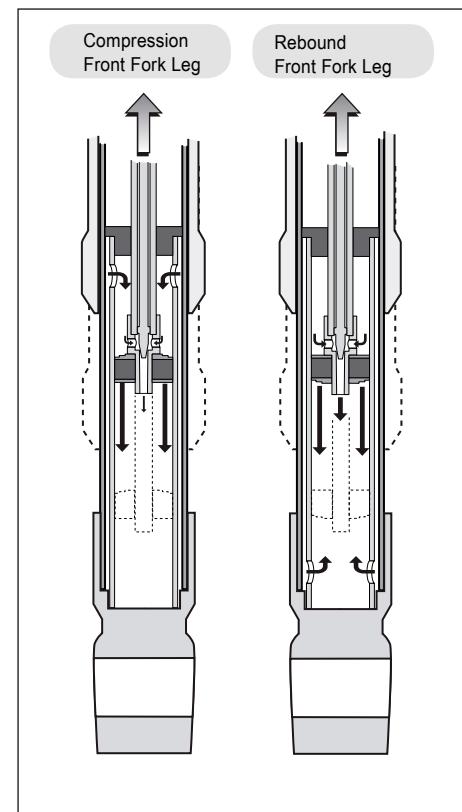


Fig. 5 - Front Fork Oil Flow Rebound Movement

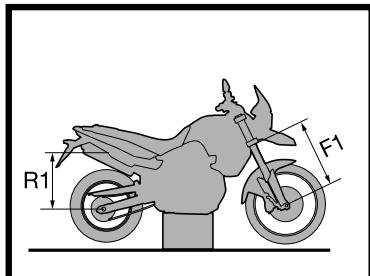


3 SETTING UP YOUR FRONT FORK

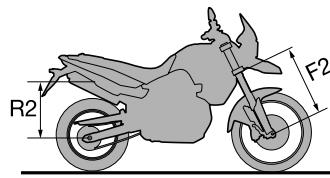
Measure sag

Spring preload - Free sag - Ride height
The spring preload directly affects the front fork angle and the motorcycle height. Therefore, when you setup your motorcycle the spring preload should be one of the first things to check.

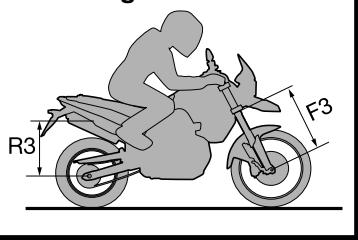
1. Perform this procedure on a flat surface.
2. Place the motorcycle on a work stand so that both wheels are off the ground and the suspension is unloaded.
3. Use a piece of tape and mark a point immediately above the rear wheel axle.
4. Measure the distance from the marked point to a fixed point, for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



Free sag



Ride height



Note measures

R1		F1	
R2		F2	
R3		F3	

Recommended measures

If no other recommendations are given in the Mounting instructions for your product, see the table below for recommended measures.

Sag pos.	Formula	Rec.
Free sag	$\frac{(F1-F2)}{\text{wheel travel}} \times 100$	~15-30 %
Ride height	$\frac{(F1-F3)}{\text{wheel travel}} \times 100$	~20-40 %

If the measures differ significantly you may need to adjust the spring preload or change the springs. Please see the Mounting Instructions for your kit to find out more or contact an authorized Öhlins service center for advice.

⚠ Warning!

An incorrect spring rate can give a faulty front geometry leading to under or over steering and seriously affect the ground clearance and vehicle handling.

4 ADJUSTMENTS

4.1 - Adjusters

• Spring preload adjuster

Use a 14 mm wrench to turn the upper adjustment screw. Maximum adjustment range is 15 mm. One turn of the adjustment screw will cause 1 mm change in spring preload.

• Compression damping adjuster

Left front fork leg.

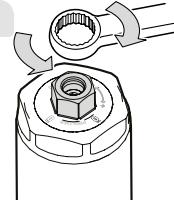
• Rebound damping adjuster

Right front fork leg.

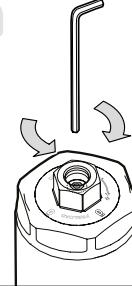
Adjust Compression and Rebound;

Use a 3 mm allen key. Adjustment range from fully closed valve (clockwise) to fully open valve (counter-clockwise) is about 20 "clicks". Recommended "clicks" from closed position according to your mounting instruction for your Front Fork Cartridge Kit.

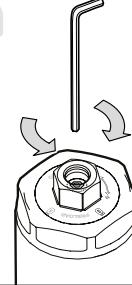
Spring preload adjuster



Compression adjuster



Rebound adjuster



4.2 - Spring

The spring recommended in the Mounting Instructions is chosen after evaluations performed on a test track according to motorcycle characteristics for your specific motorcycle model. Due to variations in ride style, track conditions, body shape etc. the spring is often a subject for additional fine-tuning.

Springs are available in 0.5 N/mm intervals but the rate can be set to 0.25 N/mm increments by using two different rates. A method used on the race track.

Example:

Using 9.5 N/mm in the right front fork leg and 10.0 N in the left front fork leg gives a combined spring rate of 9.75 N/mm.

4 ADJUSTMENTS



Oil level diagram

The diagram below shows two different types of curves of force that equal to a specific oil level. A change in the front fork oil level will not have an impact on the air spring force in the early stage of the movement but will have a greater effect in the later stage.

High oil level

The air spring in the later half stage of travel is stronger which makes the front fork firmer.

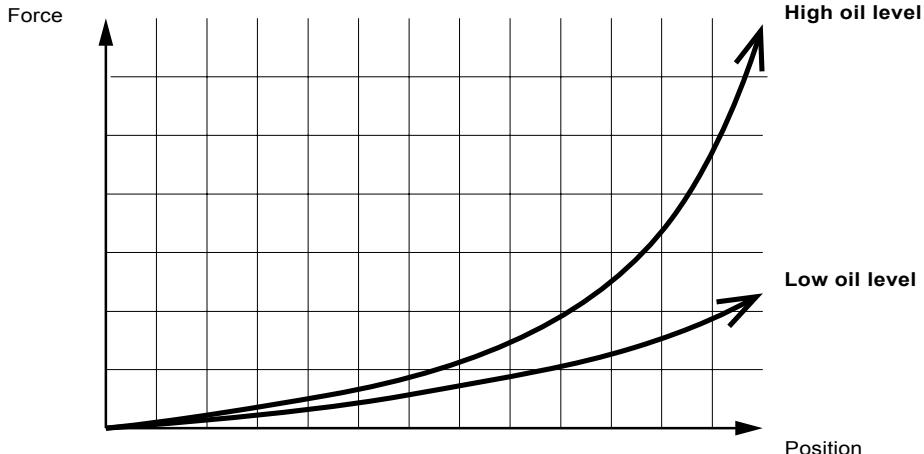
Low oil level

The air spring in the later half stage of travel is lessened which makes the front fork softer.

Adjust oil level

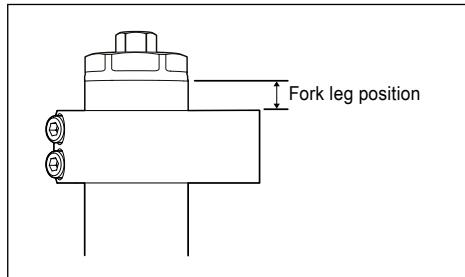
The procedure for oil level change requires special knowledge and tools. As mentioned earlier, the oil level must be handled with special care. Contact an authorized Öhlins service center to change the oil level.

Oil level diagram



4.4 - Fork leg position

The fork leg position changes the ride height at the front. To measure the fork leg position; measure the distance between the outer tube and the upper triple clamp. For recommended fork leg position, see the Mounting Instructions.



5 CHANGE MAIN SPRING AND CHECK OR CHANGE OIL LEVEL

⚠ Warning!

This procedure requires high technical knowledge and/or experience of working with front forks. If you feel any insecurity regarding this procedure, contact an Öhlins dealer for advice. See the Vehicle Service Manual.

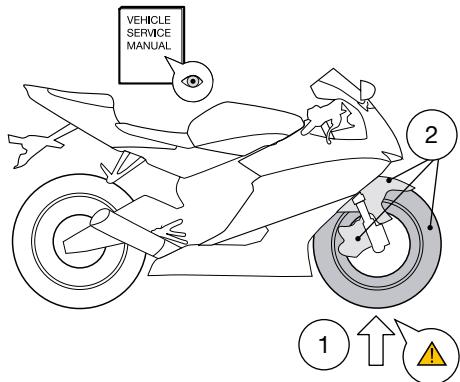
⚠ Warning!

Spring compression creates a potential danger because of the violent force that loaded springs are capable of. Beware of this when you work with the front fork.

Remove front fork from vehicle

1

Put the motorcycle on a workstand so that the front wheel barely touches the ground.



⚠ Warning!

Make sure the vehicle is securely supported so that it will not fall over.

2

Remove the front fender, brake calipers and front wheel.

3

Use a 14 mm socket to release the main spring preload by turning the adjuster counter clockwise until stop.

4

Note the fork leg position.

5

Loosen the upper triple clamp.

6

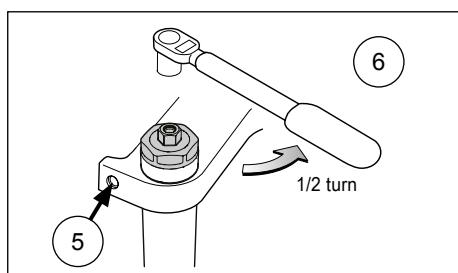
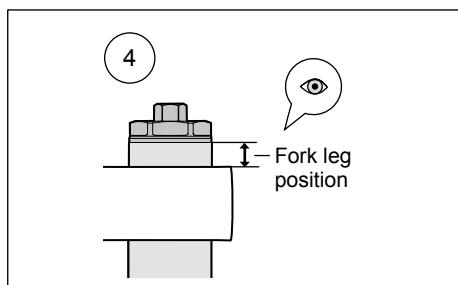
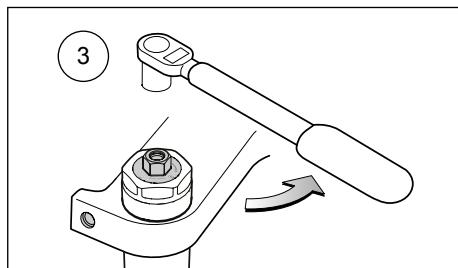
Loosen (do not remove) the top cap $\frac{1}{2}$ turn.

7

Loosen the lower triple clamp.

8

Remove the front fork legs from the triple clamps.



5 CHANGE MAIN SPRING AND CHECK OR CHANGE OIL LEVEL

Remove main spring

Caution!

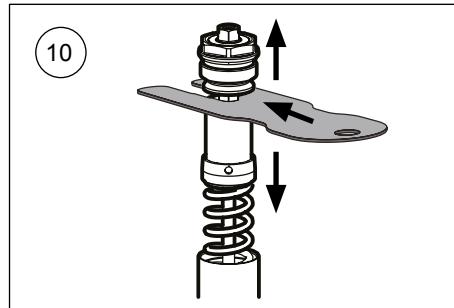
Do not mix the parts. Work with only one fork at a time. Keep the fork leg in a vertical position during the procedure.

9

Loosen the top cap from the inner tube.

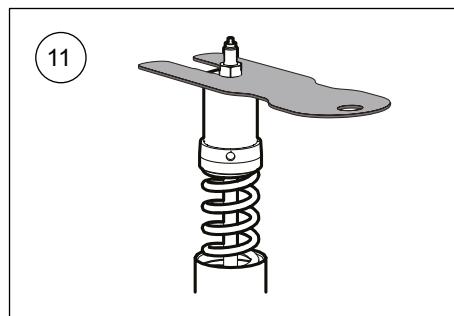
10

Push down the preload tube and at the same time pull up the top cap. Insert the stopper plate tool (02810-03) below the shaft nut.



11

Remove the top cap from the shaft. Use a 14 mm socket for the preload adjuster and a 13 mm wrench for the shaft nut to loosen the top cap.



12

Use a 13 mm wrench to adjust the shaft nut as far up as possible on the shaft. Make sure to leave enough threads on the shaft to install the pull up tool.

13

Install the pull up tool (01765-08) on the shaft. Tighten by hand.

14

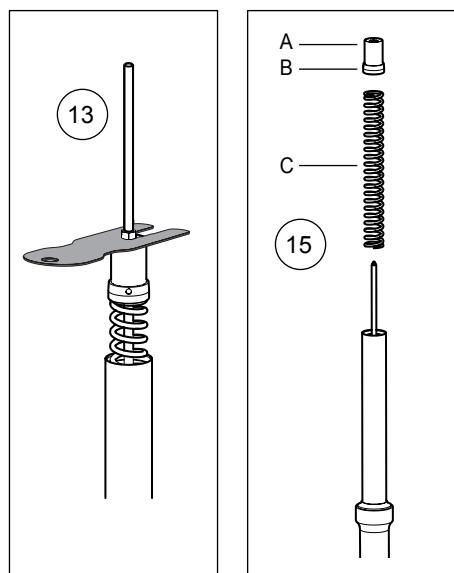
Push down the preload tube and at the same time pull up the shaft. Carefully remove the stopper plate tool.

15

Remove the preload tube (A), guide ring (B) and main spring (C).

Note!

The main spring removal affects the oil level and it must therefore be adjusted, see section "Check or change oil level".



5 CHANGE MAIN SPRING AND CHECK OR CHANGE OIL LEVEL

Check or change oil level

16

Make sure that the shaft, guide sleeve and inner tube are in the lowest position.

17

Measure the oil level "X" using a ruler. Compare the oil level "X" with setup data in mounting instructions for your specific cartridge kit. If the oil level is too low, pour Öhlins front fork fluid (01309-xx) in the fork leg.

18

Adjust the oil level and set it according to chapter setup data in mounting instructions for your specific cartridge kit.

Install main spring

19

Make sure that the mark on the main spring is up. Install main spring (A), guide ring (B) and preload tube (C). See main spring alternatives in chapter setup data in mounting instructions for your specific cartridge kit.

Note!

Make sure that the guide ring (B) is positioned correctly.

20

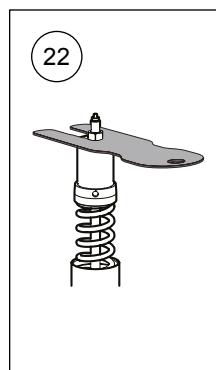
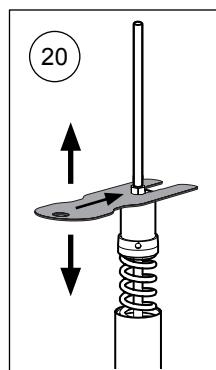
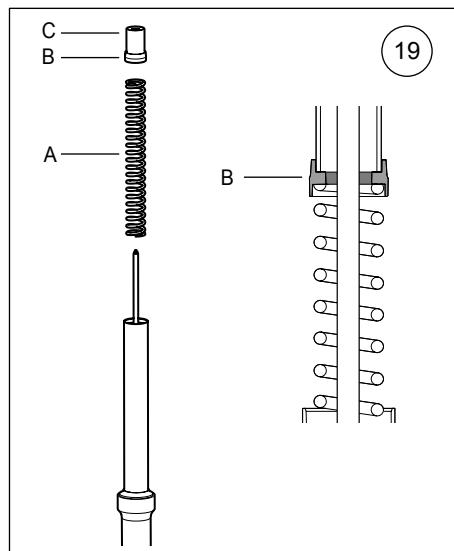
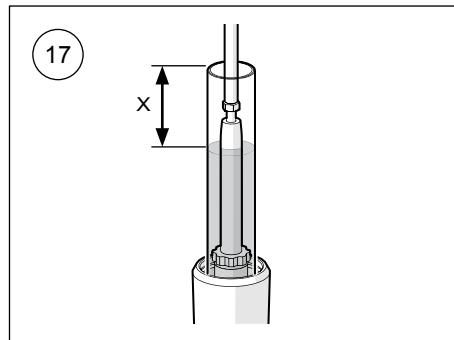
Push down the preload tube and at the same time pull up the shaft. Carefully insert the stopper plate tool below the shaft nut.

21

Remove the pull up tool from the shaft.

22

Use a 13 mm wrench to adjust the shaft nut until bottomed. Make sure that the stopper plate tool stays in place.



5 CHANGE MAIN SPRING AND CHECK OR CHANGE OIL LEVEL

⚠ Warning!

Make sure that the compression and rebound adjusters are fully open, counter clockwise, before installing the top cap.

23

Install the top cap on the shaft until stop.

⚠ Warning!

Make sure that the top cap is completely bottomed on the shaft.

24

Use a tool 14 mm socket for the preload adjuster and a 13 mm wrench to tighten the shaft nut to the top cap. Tighten the shaft nut to 12 Nm.

25

Push down the preload tube and carefully remove the stopper plate tool. Make sure that the preload tube is correctly installed in the preload socket.

26

Pull up the inner tube and at the same time push down the top cap. Use appropriate tool to tighten the top cap to the inner tube.

Tighten the top cap to 10 Nm.

27

Set the compression, rebound and main spring preload adjusters according to chapter setup data in mounting instructions for your specific cartridge kit.

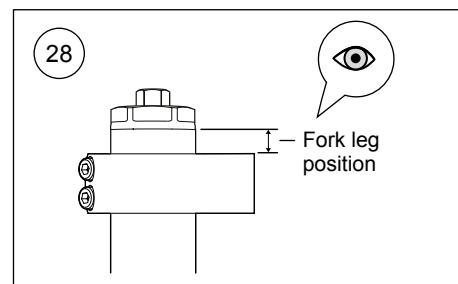
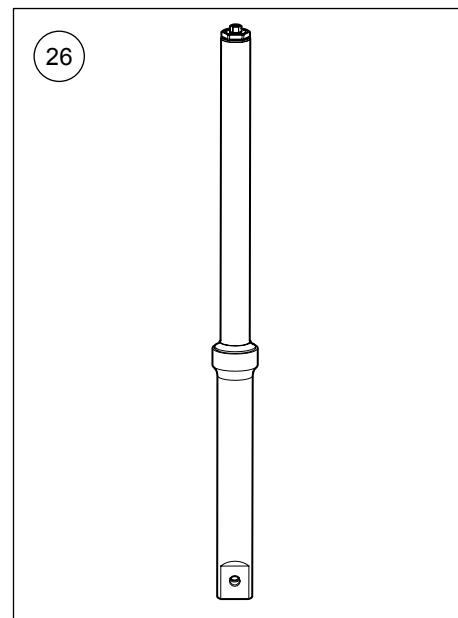
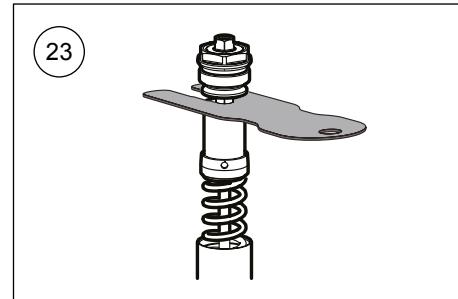
Install front fork in vehicle

28

Install the front fork in the vehicle at the fork leg position according to section 4 or according to chapter setup data in mounting instructions for your specific cartridge kit. See the vehicle service manual for instructions.

⚠ Warning!

Make sure to install all removed parts in the same positions as they were before the installation of the Öhlins cartridge kit.



6 TECHNICAL SPECIFICATIONS



Front Fork length

See specification card for your specific Front Fork Cartridge Kit.

Stroke

See specification card for your specific Front Fork Cartridge Kit.

Compression adjustment

Maximum open valve about 20 clicks.

Rebound adjustment

Maximum open valve about 20 clicks.

Spring preload adjustment

0 - 15 mm (0 - 15 turns)

Spring rate

See specification card or Mounting Instructions for your specific Front Fork Cartridge Kit.

Oil Level

Mounting Instructions for your specific Front Fork Cartridge Kit.

Caution!

Use only Öhlins high performance Front Fork Fluid (01309-01).

7 INSPECTION AND MAINTENANCE



Preventive maintenance and periodic inspection procedures help to keep the front fork in proper condition. For additional service, please contact an authorized Öhlins service center.

Caution!

Do not use strong detergents that can damage the front fork surfaces. Thinner and brake cleaner will dry out seals, increase the risk of friction, oil leakage and poor function.

Caution!

Use Öhlins High Performance Front Fork fluid 01309-xx.

Inspection points

1. Examine the fork leg for external oil leakage.
2. Examine the inner fork leg for scratches, dents or other defects that can damage the seal and/or bushing.
3. Examine the fender brackets and the brake calliper attachments.
4. Examine the front fork attachments to the vehicle.

Inspection intervals

Normal use: Once a year or every 5 000 km

Racing use: Every 10 hours

Service intervals

Normal use: Every third year or every 30 000 km

Racing use: Once a year or every 30 hours

Service at an authorized Öhlins service center.

Disposal

Hand over your discarded Öhlins products to an authorized Öhlins service center for proper disposal.

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



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