

## 690 Enduro R

Art. no. 3206323en



**KTM**





Read this repair manual carefully and thoroughly before beginning work.

The vehicle will only be able to meet the demands placed on it if the specified service work is performed regularly and properly.

This repair manual was written to correspond to the latest state of this model series. We reserve the right to make changes in the interest of technical advancement without updating this repair manual at the same time. We shall not provide a description of general workshop methods. Likewise, safety rules that apply in a workshop are not specified here. It is assumed that the repair work will be performed by a fully trained mechanic.

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This document is valid for the following models:

690 Enduro R EU (F9703R8)

690 Enduro R US (F9775R8)



3206323en

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## 1.1 Symbols used

The meaning of specific symbols is described below.

---

|   |  |
|---|--|
|    | Indicates an expected reaction (e.g. of a work step or a function).              |
|    | Indicates an unexpected reaction (e.g. of a work step or a function).            |
|    | Indicates a page reference (more information is provided on the specified page). |
|    | Indicates information with more details or tips.                                 |
|    | Indicates the result of a testing step.  |
|    | Indicates a voltage measurement.   |
|    | Indicates a current measurement.   |
|  | Indicates a resistance measurement.  |
|  | Indicates the end of an activity including potential rework.                     |

---

## 1.2 Formats used

The typographical formats used in this document are explained below.

---

|                                |   |
|--------------------------------|---|
| <b>Proprietary name</b>        | Indicates a proprietary name.   |
| <b>Name®</b>                   | Indicates a protected name.   |
| <b>Brand™</b>                  | Indicates a brand available on the open market.   |
| <b><u>Underlined terms</u></b> | Refer to technical details of the vehicle or indicate technical terms, which are explained in the glossary. |

---

### 2.1 Repair Manual

Read this Repair Manual carefully and thoroughly before beginning work. It contains useful information and tips that will help you repair and maintain your vehicle.

This manual assumes that the necessary special KTM tools and KTM workplace and workshop equipment are available.

### 2.2 Safety advice

A number of safety instructions need to be followed to operate the model described safely. Therefore read this instruction and all further instructions included carefully. The safety instructions are highlighted in the text and are referred to at the relevant passages.



#### Info

Various information and warning labels are attached in prominent locations on the model described. Do not remove any information or warning labels. If they are missing, you or others may not recognize dangers and may therefore be injured.

### 2.3 Degrees of risk and symbols



#### Danger

Indicates a danger that will immediately and invariably lead to fatal or serious permanent injury if the appropriate measures are not taken.



#### Warning

Indicates a danger that is likely to lead to fatal or serious injury if the appropriate measures are not taken.



#### Caution

Indicates a danger that may lead to minor injuries if the appropriate measures are not taken.

#### Note

Indicates a danger that will lead to considerable machine and material damage if the appropriate measures are not taken.



#### Warning

Indicates a danger that will lead to environmental damage if the appropriate measures are not taken.

### 2.4 Work rules

Special tools are necessary for certain tasks. The tools are not a component of the vehicle, but can be ordered using the number in parentheses. Example: bearing puller (15112017000)

During assembly, use new parts to replace parts which cannot be reused (e.g. self-locking screws and nuts, seals, sealing rings, O-rings, pins, and lock washers).

In the case of certain screws, a thread locker (e.g. **Loctite**<sup>®</sup>) is required. Apply according to the manufacturer's instructions.

After disassembly, clean the parts that are to be reused and check them for damage and wear. Change damaged or worn parts.

After completing a repair or service work, check the operating safety of the vehicle.



**3.1 Manufacturer and implied warranty**

The work specified in the service schedule may only be performed in an authorized KTM workshop and must be recorded in both the Service & Warranty Booklet and in **KTM Dealer.net**, otherwise any warranty coverage will become void. Damage or secondary damage caused by tampering with and/or conversions on the vehicle are not covered by the warranty.

Additional information on the manufacturer or implied warranty and the procedures involved can be found in the Service & Warranty Booklet.

**3.2 Operating and auxiliary substances**



**Warning**

**Environmental hazard** Improper handling of fuel is a danger to the environment.

- Do not allow fuel to enter the groundwater, the soil, or the sewage system.

Use the operating and auxiliary substances (such as fuel and lubricants) as specified in the manual.

**3.3 Spare parts, accessories**

Only use spare parts and accessories approved and/or recommended by KTM. KTM accepts no liability for other products and any resulting damage or loss.

The current **KTM PowerParts** for your vehicle can be found on the KTM website.

International KTM Website: <http://www.ktm.com>

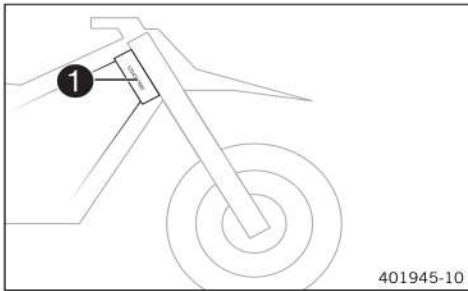
**3.4 Figures**

The figures contained in the manual may depict special equipment.

In the interest of clarity, some components may be shown disassembled or may not be shown at all. It is not always necessary to disassemble the component to perform the activity in question. Please follow the instructions in the text.

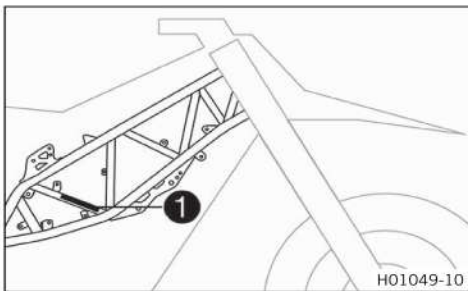
# 4 SERIAL NUMBERS

## 4.1 Chassis number



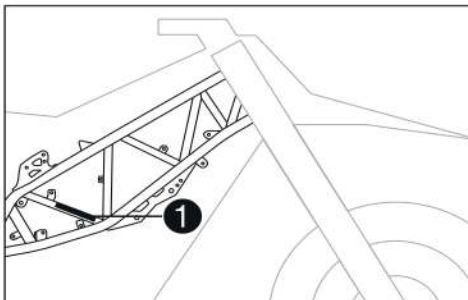
The chassis number ❶ is stamped on the steering head on the right.

## 4.2 Type label



### (690 Enduro R EU)

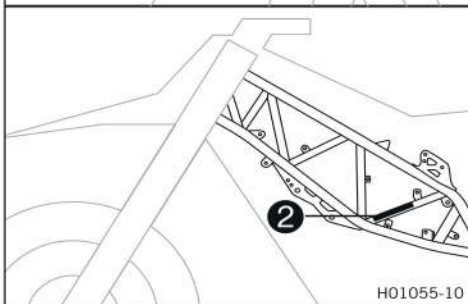
The type label ❶ is located on the right side of the frame.



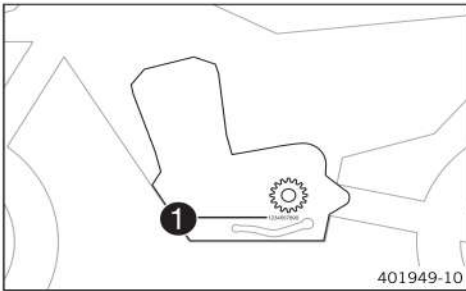
### (690 Enduro R US)

The type label USA ❶ is located on the right side of the frame.

The type label Canada ❷ is located on the left side of the frame.



## 4.3 Engine number



The engine number **1** is stamped on the left side of the engine under the engine sprocket.

## 4.4 Key number



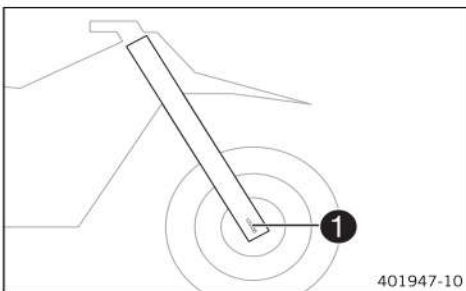
The key number **1** can be found on the **KEYCODECARD**.



### Info

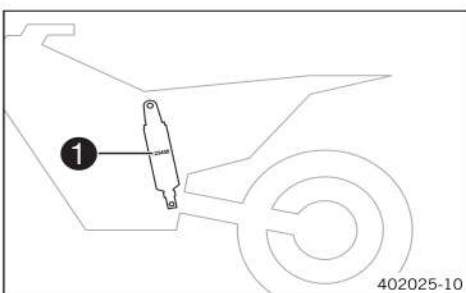
You need the key number to order a spare key. Keep the **KEYCODECARD** in a safe place.

## 4.5 Fork part number



The fork part number **1** is stamped on the inner side of the fork stub.

## 4.6 Shock absorber article number



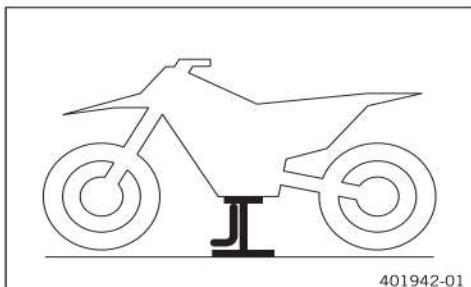
The shock absorber article number **1** is on the left side of the shock absorber.

## 5.1 Raising the motorcycle with a lift stand

### Note

**Danger of damage** The parked vehicle can roll away or fall over.

- Park the vehicle on a firm and level surface.



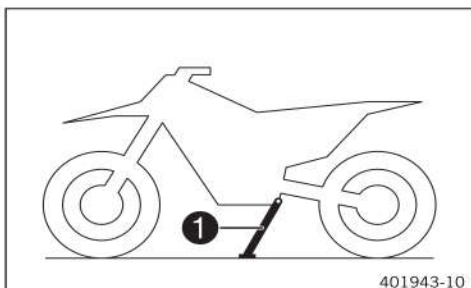
- Use the underride guard underneath the engine to raise the vehicle.
- ✓ Neither wheel is in contact with the ground.
- Secure the motorcycle against falling over.

## 5.2 Removing the motorcycle from the lift stand

### Note

**Danger of damage** The parked vehicle can roll away or fall over.

- Park the vehicle on a firm and level surface.



- Remove the motorcycle from the lift stand and rest it on side stand ①.
- Remove the lift stand.

## 5.3 Raising the motorcycle with the work stand

### Note

**Danger of damage** The parked vehicle can roll away or fall over.

- Park the vehicle on a firm and level surface.



- Mount special tool on the footrests.

Work stand attachments (75029036000) (📄 p. 289)



- Position the motorcycle upright, align the special tool, and raise the motorcycle.

Work stand (62529055100) (図 p. 287)

## 5.4 Removing the motorcycle from the work stand

### Note

**Danger of damage** The parked vehicle can roll away or fall over.

- Park the vehicle on a firm and level surface.



- Secure the motorcycle against falling over.
- Remove the work stand and lean the vehicle on the side stand.



- Remove the special tool.

## 5.5 Starting the vehicle



### Danger

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.



### Caution

**Danger of accidents** Electronic components and safety devices will be damaged if the battery is discharged or missing.

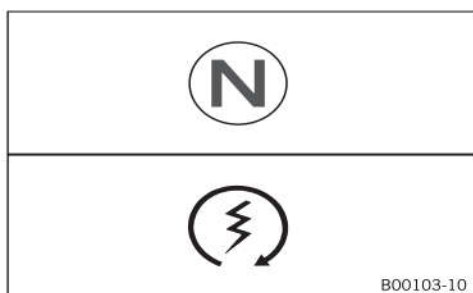
- Never operate the vehicle with a discharged battery or without a battery.




### Note

**Engine damage** High revving speed with a cold engine negatively impacts the lifespan of the engine.

- Always run the engine warm at a low speed.





- Turn the emergency OFF switch to the position .
- Switch on the ignition by turning the ignition key to position **ON** .
  - ✓ After you switch on the ignition, you can hear the fuel pump working for about two seconds. The function check of the combination instrument is run at the same time.
  - ✓ The **ABS** warning lamp lights up and goes back out after starting off.
- Shift gear to neutral.
  - ✓ The green idle indicator lamp **N** lights up.
- Press the electric starter button .

### **Info**


Do not press the electric starter button until the combination instrument function check is finished. When starting, **DO NOT** open the throttle. If you open the throttle during the starting procedure, fuel is not injected by the engine management system and the engine cannot start. Press the starter for a maximum of 5 seconds. Wait for a least 5 seconds before trying again. This motorcycle is equipped with a safety starting system. You can only start the engine if the transmission is in neutral or if the clutch lever is pulled when a gear is engaged. If the side stand is folded out and you shift into gear and release the clutch, the engine stops.

- Take the weight off the side stand and swing it back up with your foot as far as it will go.

### **Switching off ABS**

KTM recommends riding with ABS at all times. However, situations may arise in which ABS is not advantageous.

#### **Condition**

- Vehicle stationary, engine running.
- Press button  for 3 – 5 seconds.
    - ✓ The **ABS** warning lamp starts flashing; ABS is deactivated.



## 5.6 Starting the motorcycle to check the function



### **Danger**

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

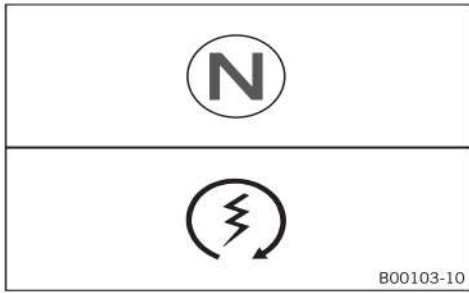
- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.



### **Info**

Press the starter for a maximum of 5 seconds. Wait for a least 5 seconds before trying again.

#### **Condition**



- Turn the emergency OFF switch to the position ⓐ.
- Shift gear to neutral.
- Switch on the ignition.
- Press the electric starter button Ⓢ.

**Info**

Do not open the throttle.

## 6.1 Adjusting the compression damping of the fork

**i Info**  
The hydraulic compression damping determines the fork suspension behavior.



- Turn the white adjusting screw ① all the way clockwise.

**i Info**  
Adjusting screw ① is located at the upper end of the left fork leg.  
The compression damping is located in the left fork leg **COMP** (white adjusting screw). The rebound damping is located in the right fork leg **REB** (red adjusting screw).

- Turn counterclockwise by the number of clicks corresponding to the fork type.

Guideline

| Compression damping |           |
|---------------------|-----------|
| Comfort             | 20 clicks |
| Standard            | 15 clicks |
| Sport               | 10 clicks |
| Full payload        | 10 clicks |

**i Info**  
Turn clockwise to increase damping; turn counterclockwise to reduce damping.

## 6.2 Adjusting the rebound damping of the fork

**i Info**  
The hydraulic rebound damping determines the fork rebound behavior.



- Turn the red adjusting screw ① all the way clockwise.

**i Info**  
Adjusting screw ① is located at the upper end of the right fork leg.  
The rebound damping is located in the right fork leg **REB** (red adjusting screw). The compression damping is located in the left fork leg **COMP** (white adjusting screw).

- Turn counterclockwise by the number of clicks corresponding to the fork type.



## Guideline

| Rebound damping |           |
|-----------------|-----------|
| Comfort         | 20 clicks |
| Standard        | 15 clicks |
| Sport           | 10 clicks |
| Full payload    | 10 clicks |



### Info

Turn clockwise to increase damping; turn counterclockwise to reduce damping.



## 6.3 Bleeding the fork legs



### Preparatory work

- Lean the motorcycle on the side stand.

### Main work

- Loosen bleeder screws ①.
- ✓ Any excess pressure escapes from the interior of the fork.
- Tighten the bleeder screws.



### Info

Carry out this action on both fork legs.



## 6.4 Cleaning the dust boots of the fork legs



### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)
- Loosen the fork protection. (📖 p. 18)

### Main work

- Push dust boots ① of both fork legs downward.



### Info

The dust boots remove dust and coarse dirt particles from the inside fork tubes. Over time, dirt can penetrate behind the dust boots. If this dirt is not removed, the oil seals behind the dust boots can start to leak.



### Warning

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.

- Clean and oil the dust boots and inner fork tube of both fork legs.

Universal oil spray (📖 p. 281)

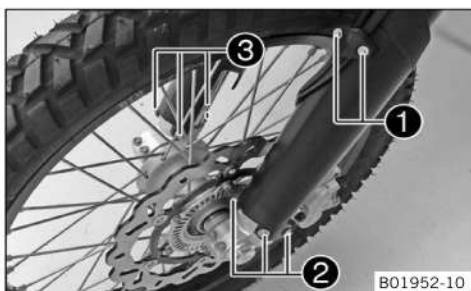
## 6 FORK, TRIPLE CLAMP

- Press the dust boots back into their normal position.
- Remove excess oil.

### Finishing work

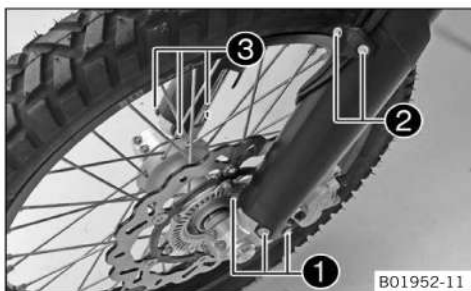
- Position the fork protector. (📖 p. 18)
- Remove the motorcycle from the lift stand. (📖 p. 12)

### 6.5 Loosening the fork protection



- Remove screws ① and take off clamp.
- Remove screws ② on left fork leg. Push the fork protection downwards.
- Remove screws ③ on the right fork leg. Push the fork protector downward.

### 6.6 Positioning the fork protector



- Position the fork protector on the left fork leg. Mount and tighten screws ①.

#### Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|

- Position the brake line, wiring harness, and clamp. Mount and tighten screws ②.
- Position the fork protector on the right fork leg. Mount and tighten screws ③.

#### Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|

### 6.7 Removing the fork legs



#### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)
- Clamp down the rear of the vehicle.

#### Main work

- Remove screws ①.
- Remove the cable tie(s).
- Press back the brake linings with a light lateral tilting of the brake caliper on the brake disc. Carefully pull the brake caliper backward from the brake disc.



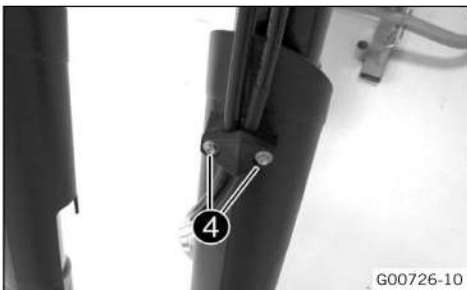
**i Info**  
 Make sure that you do not press the brake caliper against the spokes when pushing back the brake pistons.  
 Do not operate the hand brake lever when the brake caliper is removed.

- Loosen screw 2 by several rotations.
- Loosen screws 3.
- Press on screw 2 to push the wheel spindle out of the axle clamp.
- Remove screw 2.

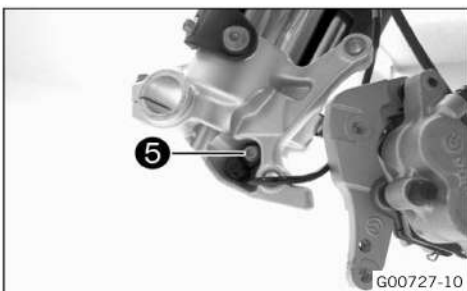
**! Warning**  
**Danger of accidents** Reduced braking effect caused by damaged brake discs.  
 - Always lay the wheel down in such a way that the brake discs are not damaged.

- Holding the front wheel, withdraw the wheel spindle. Take the front wheel out of the fork.

**i Info**  
 Do not pull the hand brake lever when the front wheel is removed.  
 Always lay the wheel down in such a way that the brake disc is not damaged.

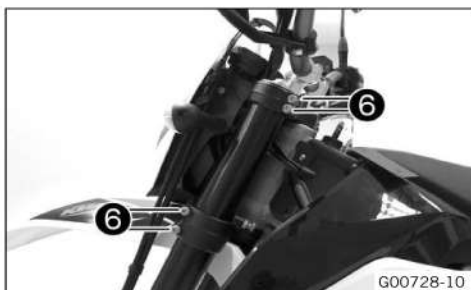


- Remove screws 4. Take the brake line and wiring harness out of the clamp.

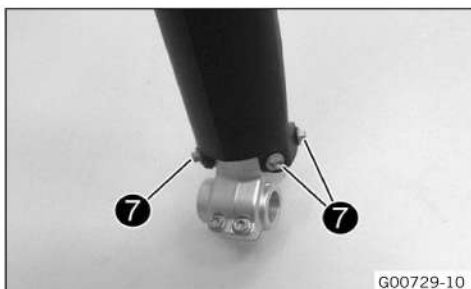


- Remove the screw 5 of the wheel speed sensor. Hang the wheel speed sensor to the side.

## 6 FORK, TRIPLE CLAMP

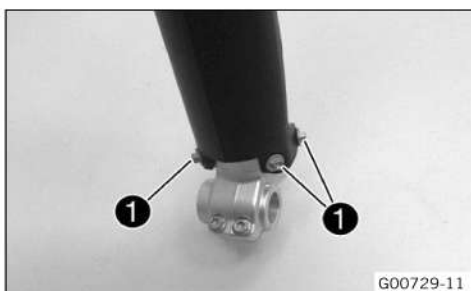


- Loosen screws **6** of the triple clamp on both sides. Remove the fork legs from the bottom.



- Remove screws **7**. Take off the fork protector from above.

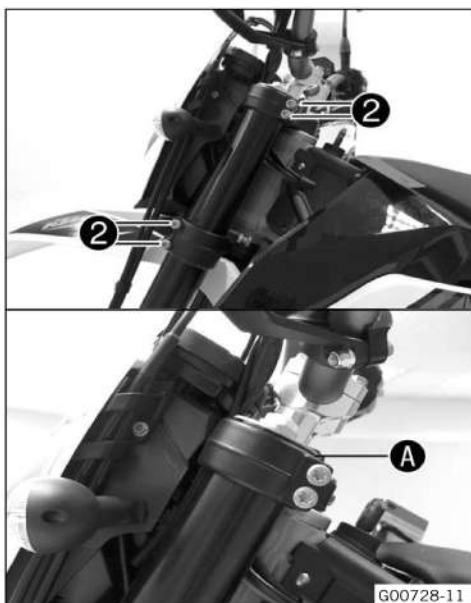
### 6.8 Installing the fork legs



- Slide on the fork protector from above and position it. Mount and tighten screws **1**.

#### Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|



- Slide the fork legs into the triple clamps on both sides.

#### **i** Info

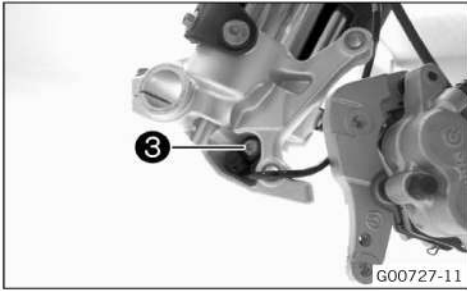
The bleeder screws must face forwards.  
The second groove **A** of the fork leg must be flush with the upper edge of the upper triple clamp.  
The upper fork overhang must be the same on both sides.

- Tighten screws **2** on both sides.

#### Guideline

|                            |    |                     |
|----------------------------|----|---------------------|
| Screw, top triple clamp    | M8 | 17 Nm (12.5 lbf ft) |
| Screw, bottom triple clamp | M8 | 12 Nm (8.9 lbf ft)  |

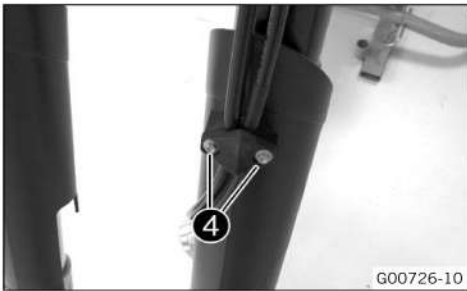




- Position the wheel speed sensor. Mount and tighten screws **3**.

Guideline

|                           |    |                   |
|---------------------------|----|-------------------|
| Screw, wheel speed sensor | M6 | 6 Nm (4.4 lbf ft) |
|---------------------------|----|-------------------|



- Position the brake line, wiring harness, and clamp.
- Mount and tighten screws **4**.



**Warning**

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.

- Clean screw **5** and the wheel spindle.
- Jack up the front wheel into the fork, position it, and insert the wheel spindle.
- Mount and tighten screw **5**.

Guideline

|                            |         |                     |
|----------------------------|---------|---------------------|
| Screw, front wheel spindle | M24x1.5 | 45 Nm (33.2 lbf ft) |
|----------------------------|---------|---------------------|



- Position the brake caliper and check that the brake linings are seated correctly.
- Mount and tighten screws **6**.

Guideline

|                            |    |  |
|----------------------------|----|--|
| Screw, front brake caliper | M8 | 25 Nm (18.4 lbf ft)<br><b>Loctite®243™</b> |
|----------------------------|----|--|

- Secure the line with the cable tie.
- Remove the load from the rear of the vehicle.
- Remove the motorcycle from the lift stand. (📖 p. 12)

## 6 FORK, TRIPLE CLAMP



- Operate the front brake and compress the fork a few times firmly.  
✓ The fork legs straighten.
- Tighten screws 7.

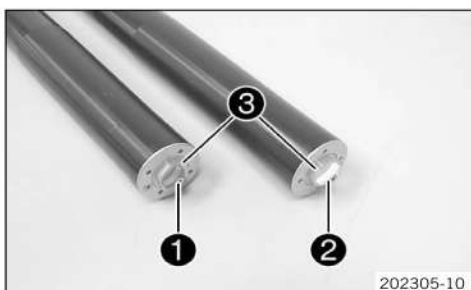
Guideline

|                  |    |                     |
|------------------|----|---------------------|
| Screw, fork stub | M8 | 15 Nm (11.1 lbf ft) |
|------------------|----|---------------------|

### 6.9 Disassembling the fork legs

#### **i** Info

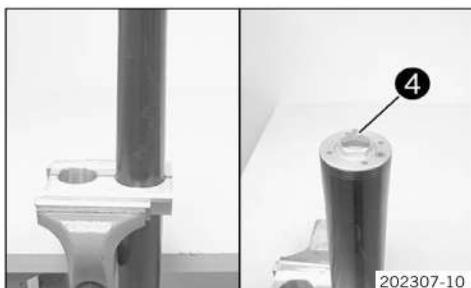
The operations are the same on both fork legs.



#### **Condition**

The fork legs have been removed.

- Make a note of the present state of rebound 1 and compression damping 2.
- Note down the current state of the spring preload 3.
- Completely open the adjusters of the rebound damping, compression damping, and spring preload.



- Clamp the fork leg in the area of the lower triple clamp.

|                                  |
|----------------------------------|
| Clamping stand (T1403S) (p. 299) |
|----------------------------------|

- Remove adjuster 4.



- Loosen the Preload adjuster 5.

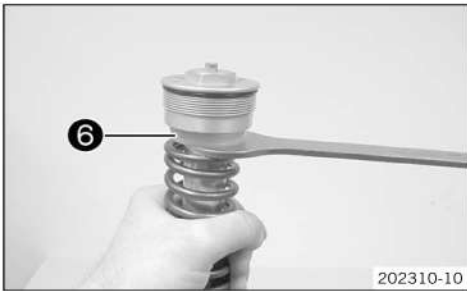
|                            |
|----------------------------|
| Pin wrench (T103) (p. 296) |
|----------------------------|

#### **i** Info

The Preload adjuster cannot be removed yet.



- Unclamp the fork leg.
- Drain the fork oil.



- Unclamp the fork leg with the axle clamp.

**i Info**  
Use soft jaws.

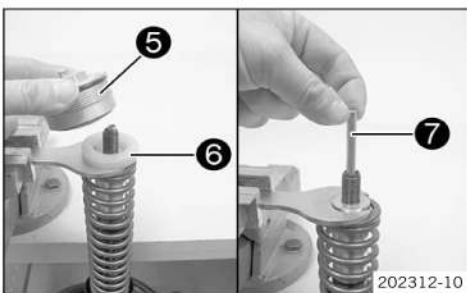
- Slide the outer tube down.
- Pull the spring downward. Mount the special tool on the hexagonal part.

Open end wrench (T14032) (📖 p. 299)

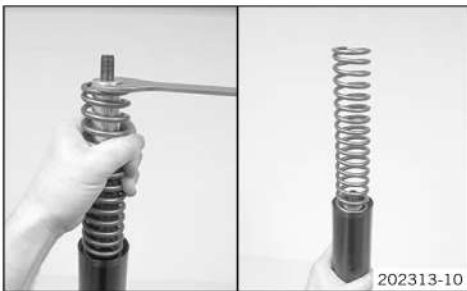
**i Info**  
Preload spacers **6** should be above the special tool.



- Clamp the special tool in the vise. Loosen the Preload adjuster **5**.

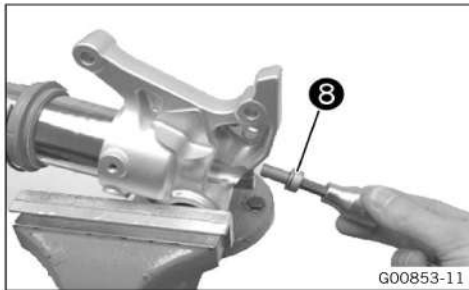


- Remove the Preload adjuster **5** with preload spacers **6**.
- Remove adjusting tube **7**.



- Pull the spring downward. Remove the special tool.
- Remove the spring.

## 6 FORK, TRIPLE CLAMP



- Clamp the fork leg with the axle clamp.

Guideline

Use soft jaws.

- Remove screw 8 of the cartridge.

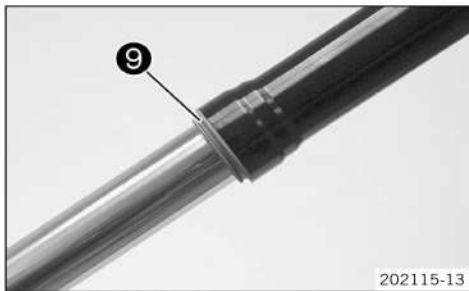


### Info

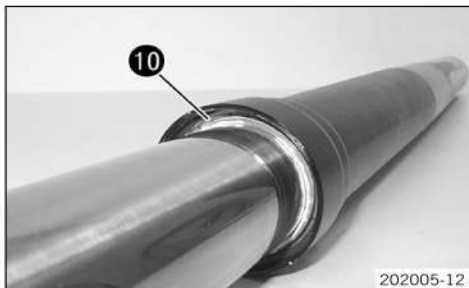
Place a container underneath as oil will run out in most cases.



- Remove the cartridge.



- Remove dust boot 9.

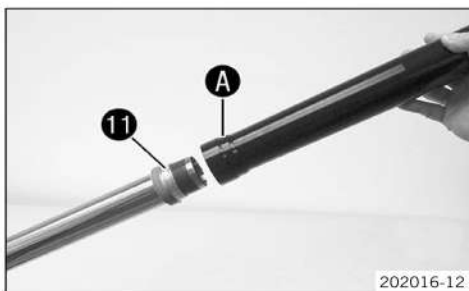


- Remove lock ring 10.



### Info

The lock ring has a beveled end where a screwdriver can be applied.



- Warm up the outer tube in area A of the lower sliding bushing.

Guideline

50 °C (122 °F)

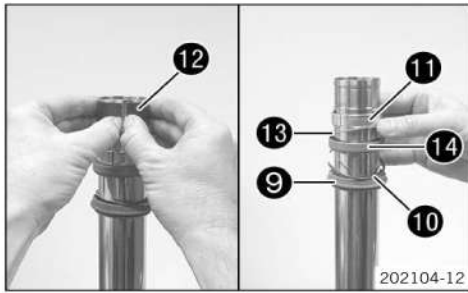
- Pull the outer tube from the inner tube with a jerk.



### Info

Lower sliding bushing 11 must be pulled from its bearing seat.





- Remove upper sliding bushing 12.



**Info**

Without using a tool, pull the stack slightly apart by hand.

- Take off lower sliding bushing 11.
- Take off support ring 13.
- Take off seal ring 14.
- Take off lock ring 10.
- Take off dust boot 9.
- Unclamp the fork leg.

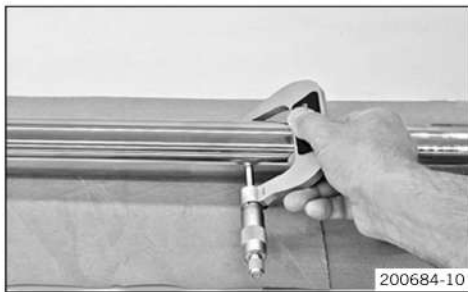
## 6.10 Checking the fork legs

**Condition**

Fork disassembled.



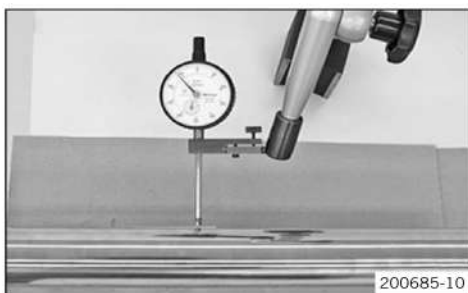
- Check the inner tube and axle clamp for damage.
  - » If there is damage:
    - Change the inner tube.



- Measure the outside diameter at several locations on the inner tube.

|                                |  |
|--------------------------------|--|
| Outside diameter of inner tube | 47.975 ... 48.005 mm<br>(1.88878 ... 1.88996 in) |
|--------------------------------|--|

- » If the measured value is less than the specified value:
  - Change the inner tube.

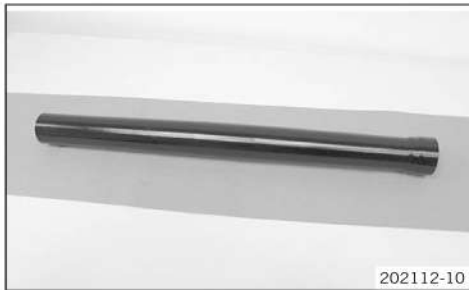


- Measure the run-out of the inner tube.

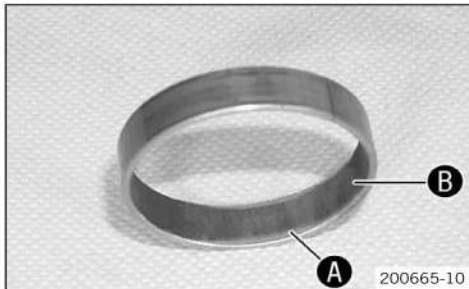
|                       |                         |
|-----------------------|-------------------------|
| Run-out of inner tube | ≤ 0.20 mm (≤ 0.0079 in) |
|-----------------------|-------------------------|

- » If the measured value is greater than the specified value:
  - Change the inner tube.

## 6 FORK, TRIPLE CLAMP



- Check the outer tube for damage.
  - » If there is damage:
    - Change the outer tube.



- Check the surface of the sliding bushings.
  - » If the bronze-colored layer **A** under the sliding layer **B** is visible:
    - Replace the sliding bushings.



- Check the spring length.

Guideline

|                                      |                   |
|--------------------------------------|-------------------|
| Spring length with preload spacer(s) | 465 mm (18.31 in) |
|--------------------------------------|-------------------|

- » If the measured value is greater than the specified value:
  - Reduce the thickness of the preload spacers.
- » If the measured value is less than the specified value:
  - Increase the thickness of the preload spacers.

### 6.11 Assembling the fork legs

#### **i** Info

The operations are the same on both fork legs.



#### Preparatory work

- Check the fork legs. (📖 p. 25)

#### Main work

- Clamp the inner tube using the axle clamp.
- Mount the special tool.

|                                      |
|--------------------------------------|
| Protecting sleeve (T1401) (📖 p. 298) |
|--------------------------------------|

- Grease and push on dust boot **1**.

|                               |
|-------------------------------|
| Lubricant (T14034) (📖 p. 280) |
|-------------------------------|

#### **i** Info

Always replace the dust boot, lock ring, seal ring, and support ring.

Mount the dust boot with the sealing lip and spring expander facing downward.

- Push on lock ring **2**.

- Grease and push on seal ring ③.

Lubricant (T14034) (📖 p. 280)



**Info**

Sealing lip downward, open side upward.

- Push on support ring ④.
- Remove the special tool.
- Sand the edges of the sliding bushings with 600 grit sandpaper; then clean and grease the bushings.

Fork oil (SAE 4) (48601166S1) (📖 p. 279)

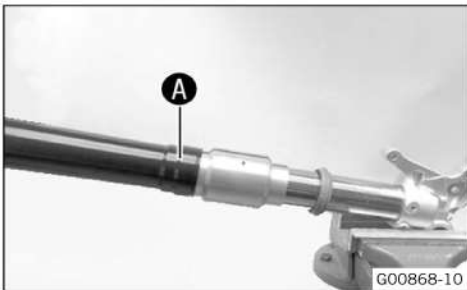


- Push on lower sliding bushing ⑤.
- Mount upper sliding bushing ⑥.



**Info**

Without using a tool, pull the stack slightly apart by hand.



- Warm up the outer tube in area A of the lower sliding bushing.

Guideline

50 °C (122 °F)

- Slide the outer tube onto the inner tube.
- Hold the lower sliding bushing with the longer side of the special tool.

Mounting tool (T14040S) (📖 p. 299)

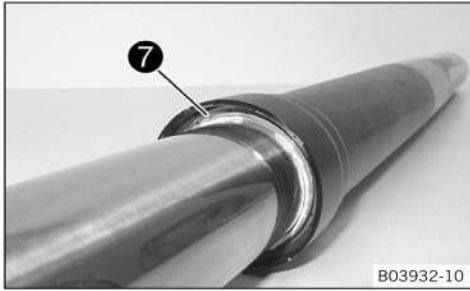
- Press the sliding bushing all the way into the outer tube.
- Position the support ring.
- Hold the seal ring with the shorter side of the special tool.

Mounting tool (T14040S) (📖 p. 299)

- Press the seal ring and support ring all the way into the outer tube.



## 6 FORK, TRIPLE CLAMP

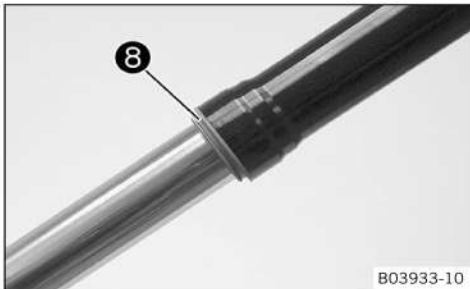


- Mount lock ring **7**.

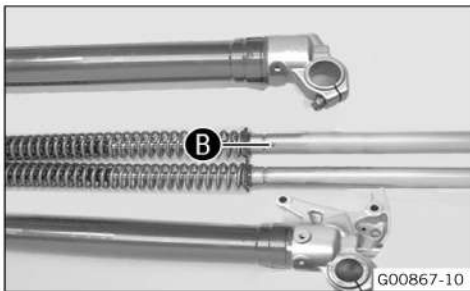


### Info

The lock ring must engage audibly.



- Mount dust boot **8**.



- Assemble the individual components that belong together.

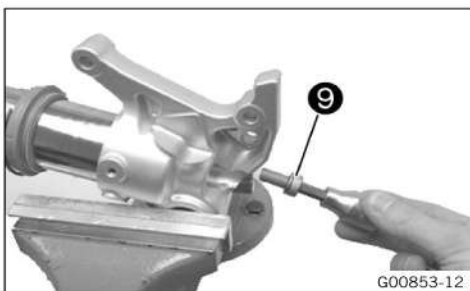


### Info

Compression damping side: cartridge with additional oil holes **B**, white adjuster, axle clamp marked **L**.  
Rebound damping side: cartridge without additional oil holes, red adjuster, axle clamp marked **R**.



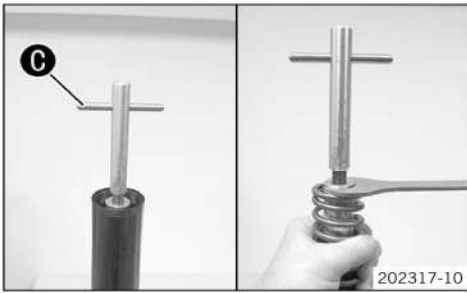
- Mount cartridge.



- Mount and tighten screw **9** of the cartridge.

### Guideline

|                  |       |                     |
|------------------|-------|---------------------|
| Screw, cartridge | M12x1 | 25 Nm (18.4 lbf ft) |
|------------------|-------|---------------------|



- Mount special tool on the cartridge; remove pin **C** of the special tool.

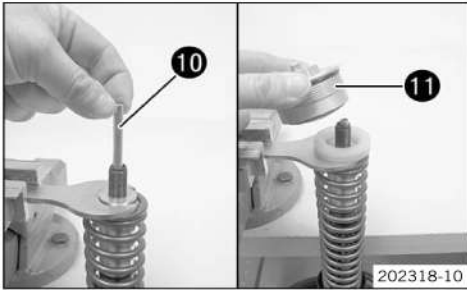
Support tool (T14026S1) (📖 p. 298)

- Pull out the piston rod. Mount the spring. Mount the pin again.
- Pull up cartridge with special tool. Pull the spring downward and slide the special tool onto the hexagonal piece.

Open end wrench (T14032) (📖 p. 299)

- Remove the special tool.

Support tool (T14026S1) (📖 p. 298)



- Clamp the special tool in the vise.

- Mount adjusting tube **10**.

- ✓ The adjusting tube protrudes 5 mm (0.197 in) from the cartridge and can be pressed in against the resistance of the spring.
- ✗ The adjusting tube protrudes more than 7 mm (0.275 in) from the cartridge and cannot be pressed in against the spring force.

- Lubricate the thread of the piston rod.

Lubricant (T159) (📖 p. 280)

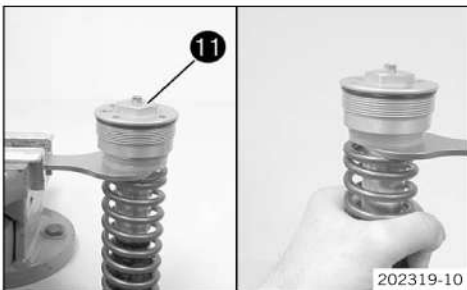
- Lubricate the upper edge of the piston rod.

Lubricant (T158) (📖 p. 280)

- Screw the preload adjuster **11** with the preload spacers onto the piston rod.

### **i** Info

The **Preload Adjuster** must reach the stop before the piston rod begins turning as well. If the thread on the piston rod is tight, it must be held to keep it from turning. If **Preload Adjuster** is not screwed in all the way, the rebound damping adjustment will not function properly.



- Tighten preload adjuster **11**.

#### Guideline

|                                |       |                     |
|--------------------------------|-------|---------------------|
| Nut, piston rod on screw cover | M12x1 | 25 Nm (18.4 lbf ft) |
|--------------------------------|-------|---------------------|

- Release the special tool. Pull the spring downward. Remove the special tool.

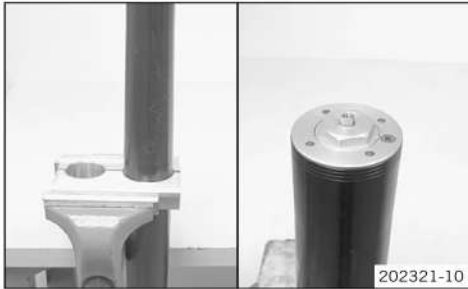


## 6 FORK, TRIPLE CLAMP



- Clamp the fork vertically.
- Fill with fork oil.

|                       |                           |  |
|-----------------------|---------------------------|--|
| Fork oil per fork leg | 635 ml<br>(21.47 fl. oz.) | Fork oil (SAE 4)<br>(48601166S1)<br>(p. 279) |
|-----------------------|---------------------------|--|



- Push the outer tube upward.
- Clamp the fork in the area of the lower triple clamp.

Clamping stand (T1403S) (p. 299)

- Lubricate O-ring of the preload adjuster.

Lubricant (T14034) (p. 280)

- Screw on and tighten the preload adjuster.

Guideline

|                           |         |                     |
|---------------------------|---------|---------------------|
| Screw cover on outer tube | M47x1.5 | 40 Nm (29.5 lbf ft) |
|---------------------------|---------|---------------------|

Pin wrench (T103) (p. 296)



- Mount adjuster **12**; mount and tighten the screw.

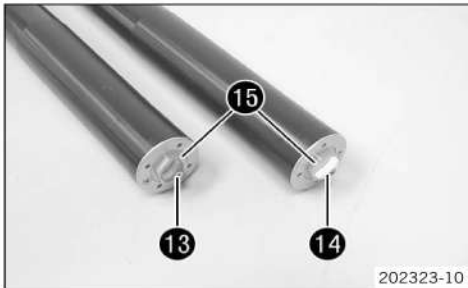
Guideline

|         |        |                         |
|---------|--------|-------------------------|
| Adapter | M4x0.5 | 1.5 Nm<br>(1.11 lbf ft) |
|---------|--------|-------------------------|

### **i** Info

Compression damping side: white adjuster, axle clamp marked **L**.

Rebound damping side: red adjuster, axle clamp marked **R**.



### Alternative 1

- Turn the adjusting screw of rebound **13** and the adjusting screw of compression damping **14** clockwise as far as possible.
- Turn counterclockwise by the number of clicks corresponding to the fork leg type.

Guideline

| Rebound damping     |           |
|---------------------|-----------|
| Comfort             | 20 clicks |
| Standard            | 15 clicks |
| Sport               | 10 clicks |
| Full payload        | 10 clicks |
| Compression damping |           |
| Comfort             | 20 clicks |
| Standard            | 15 clicks |
| Sport               | 10 clicks |
| Full payload        | 10 clicks |

- Turn spring pretension **15** clockwise all the way.

- Turn counterclockwise by the number of turns corresponding to the fork leg type.

Guideline

| Spring preload - <b>Preload Adjuster</b> |         |
|--|---------|
| Comfort                                  | 2 turns |
| Standard                                 | 5 turns |
| Sport                                    | 5 turns |
| Full payload                             | 8 turns |

### Alternative 2



#### Warning

**Danger of accident** Modifications to the suspension setting may seriously alter the handling characteristic.

Extreme modifications to the suspension setting may cause a serious deterioration in the handling characteristic and overload components.

- Only make adjustments within the recommended range.
- Ride slowly to start with after making adjustments to get the feel of the new handling characteristic.

- Turn the adjusting screws to the position they were in before dismantling.



## 6.12 Checking the play of the steering head bearing



#### Warning

**Danger of accidents** Incorrect steering head bearing play impairs the handling characteristic and damages components.

- Correct incorrect steering head bearing play immediately.



#### Info

If the vehicle is operated for a lengthy period with play in the steering head bearing, the bearings and the bearing seats in the frame can become damaged over time.

#### Preparatory work

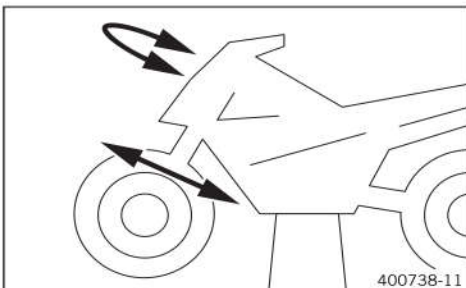
- Raise the motorcycle with a lift stand. (📖 p. 12)

#### Main work

- Move the handlebar to the straight-ahead position. Move the fork legs to and fro in the direction of travel.

Play should not be detectable on the steering head bearing.

- » If there is detectable play:
  - Adjust the steering head bearing play. (📖 p. 32)
- Move the handlebar to and fro over the entire steering range.



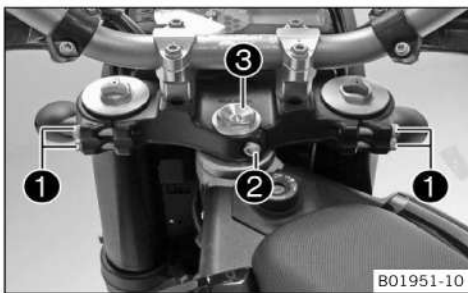
It must be possible to move the handlebar easily over the entire steering range. There should be no detectable detent positions.

- » If detent positions are detected:
  - Adjust the steering head bearing play. (📖 p. 32)
  - Check the steering head bearing and adjust if necessary.

### Finishing work

- Remove the motorcycle from the lift stand. (📖 p. 12)

## 6.13 Adjusting the steering head bearing play



### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)

### Main work

- Loosen screws ❶. Loosen screw ❷.
- Loosen and retighten screw ❸.

#### Guideline

|                          |         |                    |
|--------------------------|---------|--------------------|
| Screw, top steering head | M20x1.5 | 12 Nm (8.9 lbf ft) |
|--------------------------|---------|--------------------|

- Using a plastic hammer, tap lightly on the upper triple clamp to avoid stresses.

- Tighten screws ❶.

#### Guideline

|                         |    |                     |
|-------------------------|----|---------------------|
| Screw, top triple clamp | M8 | 17 Nm (12.5 lbf ft) |
|-------------------------|----|---------------------|

- Tighten screw ❷.

#### Guideline

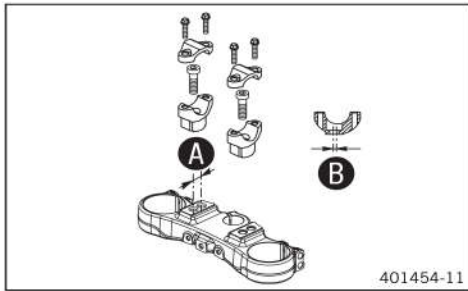
|                      |    |                     |
|----------------------|----|---------------------|
| Screw, steering stem | M8 | 20 Nm (14.8 lbf ft) |
|----------------------|----|---------------------|

### Finishing work

- Check the play of the steering head bearing. (📖 p. 31)
- Remove the motorcycle from the lift stand. (📖 p. 12)



## 7.1 Handlebar position



On the upper triple clamp, there are two holes at a distance of **A** to each other.

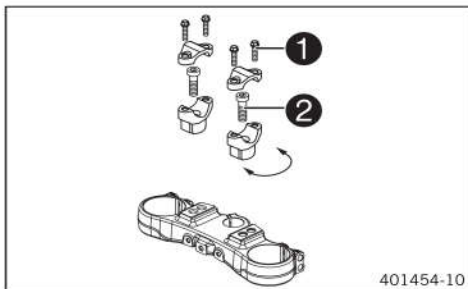
|                        |                 |
|------------------------|-----------------|
| Hole distance <b>A</b> | 15 mm (0.59 in) |
|------------------------|-----------------|

The holes on the handlebar support are placed at a distance of **B** from the center.

|                        |                   |
|------------------------|-------------------|
| Hole distance <b>B</b> | 3.5 mm (0.138 in) |
|------------------------|-------------------|

The handlebar can be mounted in 4 different positions. In this way, the handlebar can be mounted in the most comfortable position for the rider.

## 7.2 Adjusting handlebar position



- Remove screws **1**. Take off the handlebar clamps. Remove the handlebar and lay it to one side.

**i Info**  
Cover the components to protect them against damage. Do not bend the cables and lines.

- Remove screws **2**. Remove the handlebar support.
- Place the handlebar support in the required position. Mount and tighten screws **2**.

Guideline

|                          |     |  |
|--------------------------|-----|--|
| Screw, handlebar support | M10 | 40 Nm (29.5 lbf ft)<br><b>Loctite®243™</b> |
|--------------------------|-----|--|

**i Info**  
Position the left and right handlebar supports evenly.

- Position the handlebar.

**i Info**  
Make sure the cables and wiring are positioned correctly.

- Position the handlebar clamps. Mount screws **1** and tighten evenly.

Guideline

|                        |    |                     |
|------------------------|----|---------------------|
| Screw, handlebar clamp | M8 | 20 Nm (14.8 lbf ft) |
|------------------------|----|---------------------|

## 7.3 Changing the throttle grip

### Preparatory work

- Remove the headlight mask with the headlight. (📖 p. 128)
- Remove the seat. (📖 p. 73)

### Main work

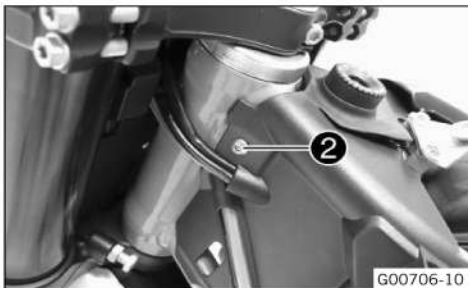
- Remove the cable tie(s).



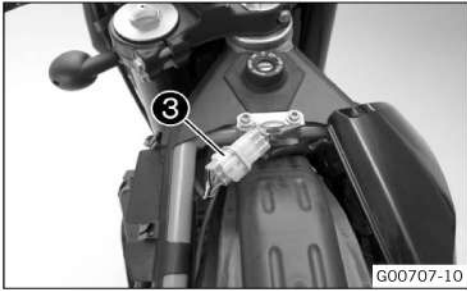
- Remove screws ❶. Take off the side cover.



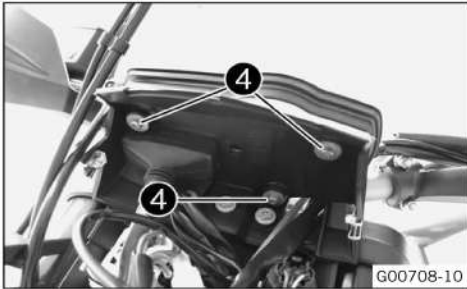
- Remove the cable tie(s).



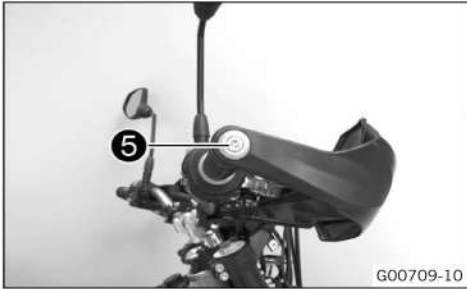
- Remove screw ❷.
- Push the trim aside.



- Expose the cable of the accelerator position sensor.
- Disconnect plug-in connector **3**.



- Remove screws **4**.
- Remove the combination instrument upwards out of the holder and hang to the side.



- Loosen screw **5**.

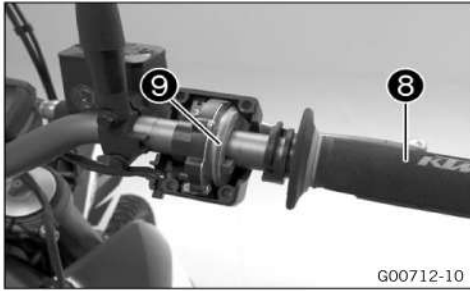


- Remove screws **6**.
- Take off hand guard.

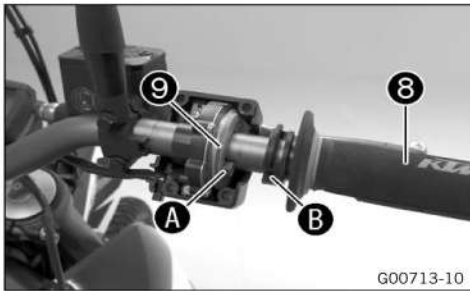


- Remove screws **7**.

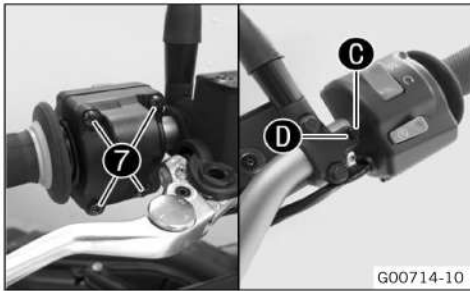
# 7 HANDLEBAR, CONTROLS



- Pull throttle grip **8** and accelerator position sensor **9** from the handlebar.



- Position throttle grip **8** and accelerator position sensor **9** on the handlebar.
- ✓ Catch **A** engages in driver **B**.



- Mount and tighten screws **7**.

Guideline

|                      |    |                         |
|----------------------|----|-------------------------|
| Screw, throttle grip | M5 | 3.5 Nm<br>(2.58 lbf ft) |
|----------------------|----|-------------------------|

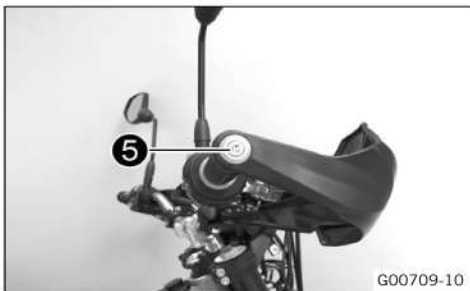
- ✓ Catch **C** engages in recess **D**.



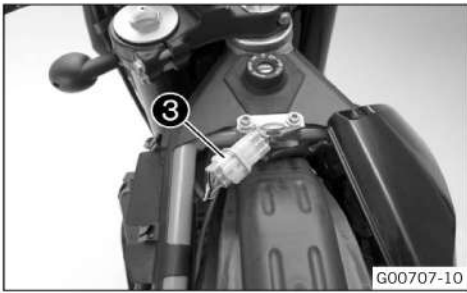
- Position hand guard.
- Mount and tighten screws **6**.

Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|



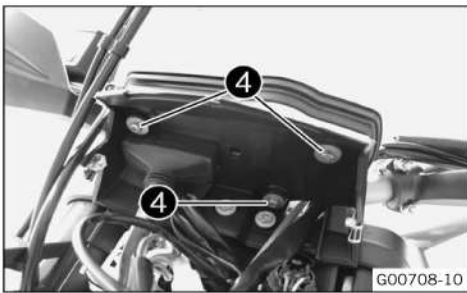
- Tighten screw **5**.



- Join plug-in connector ③.
- Route the wiring harness of the accelerator position sensor without tension.



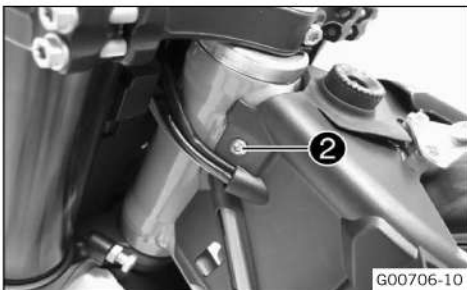
- Mount the cable tie(s).



- Position the combination instrument in the holder.
- Mount and tighten screws ④.

Guideline

|                           |    |                 |
|---------------------------|----|-----------------|
| Remaining screws, chassis | M4 | 4 Nm (3 lbf ft) |
|---------------------------|----|-----------------|



- Mount and tighten screw ②.

Guideline

|                           |    |                 |
|---------------------------|----|-----------------|
| Remaining screws, chassis | M4 | 4 Nm (3 lbf ft) |
|---------------------------|----|-----------------|



- Position the side cover.
- Mount and tighten screws ①.

Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|





- Secure the cables with the cable ties.

### Finishing work

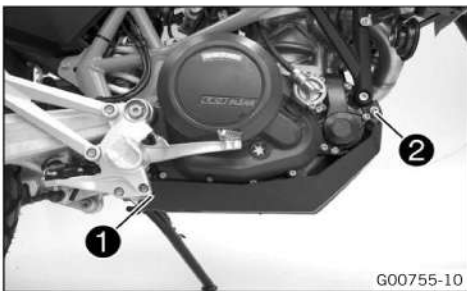
- Install the headlight mask with the headlight. (📖 p. 129)
- Check the headlight setting. (📖 p. 127)
- Reset the engine electronics control unit. (📖 p. 236)
- Program the gear position sensor. (📖 p. 217)
- Mount the seat. (📖 p. 73)

**8.1 Removing the engine guard**



- Remove screws **1** on the left and right.
- Pull the engine guard forward out of the holders and remove it.

**8.2 Installing the engine guard**



- Slide the engine guard into holders **1** at the rear.
- Position the engine guard. Mount and tighten screws **2**.

Guideline

|                              |    |                    |
|------------------------------|----|--------------------|
| Remaining screws,<br>chassis | M6 | 10 Nm (7.4 lbf ft) |
|------------------------------|----|--------------------|

## 9.1 Adjusting the high-speed compression damping of the shock absorber



### Caution

**Risk of injury** Parts of the shock absorber will move around if the shock absorber is detached incorrectly. The shock absorber is filled with highly compressed nitrogen.

- Please follow the description provided.



### Info

The effect of the high-speed setting can be seen in fast compression of the shock absorber.



- Turn adjusting screw **1** all the way clockwise with a socket wrench.



### Info

Do not loosen fitting **2**!

- Turn counterclockwise by the number of turns corresponding to the shock absorber type.

### Guideline

| Compression damping, high-speed |           |
|---------------------------------|-----------|
| Comfort                         | 2 turns   |
| Standard                        | 1.5 turns |
| Sport                           | 1 turn    |
| Full payload                    | 1 turn    |



### Info

Turn clockwise to increase damping; turn counterclockwise to reduce damping.

## 9.2 Adjusting the low-speed compression damping of the shock absorber



### Caution

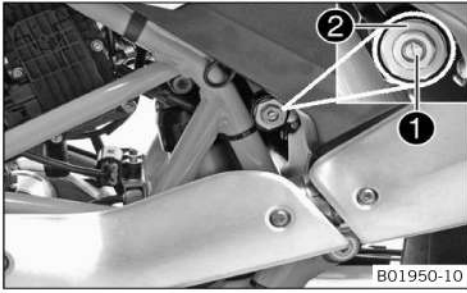
**Risk of injury** Parts of the shock absorber will move around if the shock absorber is detached incorrectly. The shock absorber is filled with highly compressed nitrogen.

- Please follow the description provided.



### Info

The effect of the low-speed setting can be seen in slow to normal compression of the shock absorber.



- Turn adjusting screw ❶ clockwise with a screwdriver up to the last perceptible click.

**i Info**  
Do not loosen fitting ❷!

- Turn counterclockwise by the number of clicks corresponding to the shock absorber type.

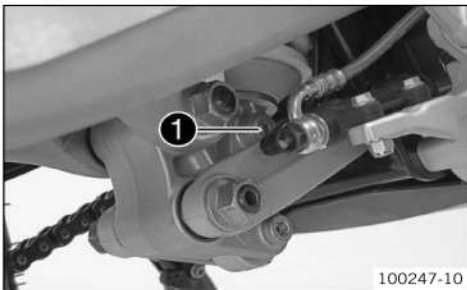
**Guideline**

| Compression damping, low-speed |           |
|--------------------------------|-----------|
| Comfort                        | 20 clicks |
| Standard                       | 15 clicks |
| Sport                          | 10 clicks |
| Full payload                   | 10 clicks |

**i Info**  
Turn clockwise to increase damping; turn counterclockwise to reduce damping.

## 9.3 Adjusting the rebound damping of the shock absorber

**⚠ Caution**  
**Risk of injury** Parts of the shock absorber will move around if the shock absorber is detached incorrectly. The shock absorber is filled with highly compressed nitrogen.  
- Please follow the description provided.



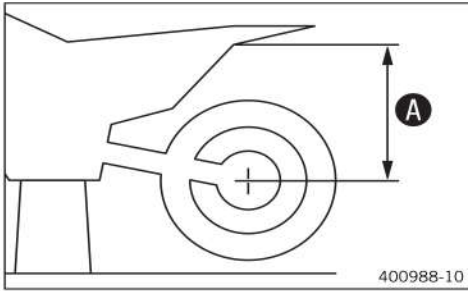
- Turn adjusting screw ❶ clockwise up to the last perceptible click.
- Turn counterclockwise by the number of clicks corresponding to the shock absorber type.

**Guideline**

| Rebound damping |           |
|-----------------|-----------|
| Comfort         | 20 clicks |
| Standard        | 15 clicks |
| Sport           | 10 clicks |
| Full payload    | 10 clicks |

**i Info**  
Turn clockwise to increase damping; turn counterclockwise to reduce damping.

## 9.4 Measuring the unloaded rear wheel sag



### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)

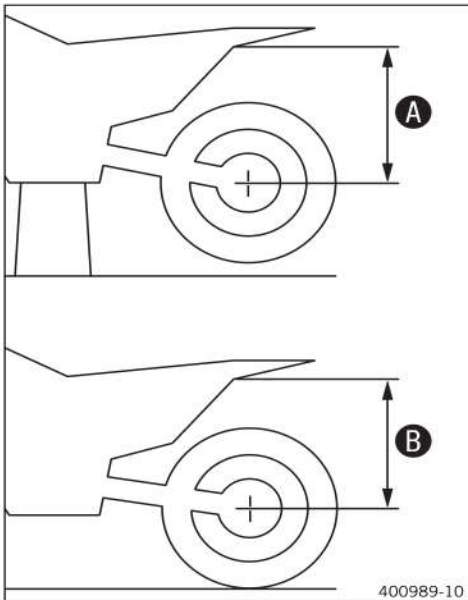
### Main work

- Measure the distance – as vertical as possible – between the rear axle and a fixed point, for example, a mark on the rear fairing.
- Note down the value as dimension **A**.

### Finishing work

- Remove the motorcycle from the lift stand. (📖 p. 12)

## 9.5 Checking the static sag of the shock absorber



- Measure distance **A** of rear wheel unloaded. (📖 p. 42)
- Hold the motorcycle upright with the aid of an assistant.
- Measure the distance between the rear axle and the fixed point again.
- Note down the value as dimension **B**.



### Info

The static sag is the difference between measurements **A** and **B**.

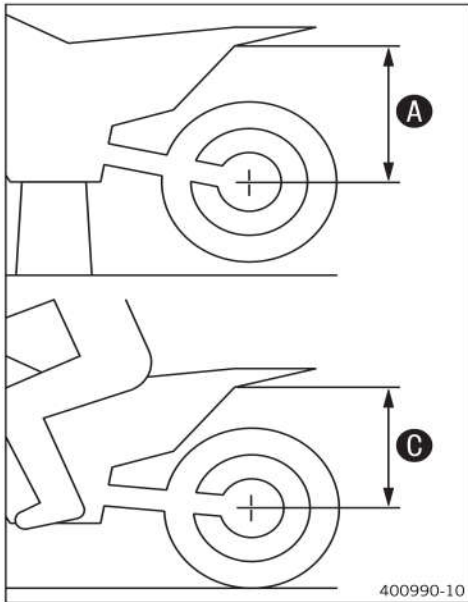
- Check the static sag.

|            |                 |
|------------|-----------------|
| Static sag | 18 mm (0.71 in) |
|------------|-----------------|

- » If the static sag is less or more than the specified value:
  - Adjust the spring preload of the shock absorber. (📖 p. 43)



## 9.6 Checking the riding sag of the shock absorber



- Measure distance **A** of rear wheel unloaded. (📖 p. 42)
- With another person holding the motorcycle, the rider, wearing full protective clothing, sits on the seat in a normal sitting position (feet on footrests) and bounces up and down a few times.
  - ✓ The rear wheel suspension levels out.
- Another person now measures the distance between the rear axle and a fixed point.
- Note down the value as dimension **C**.



### Info

The riding sag is the difference between measurements **A** and **C**.

- Check the riding sag.

|            |                                 |
|------------|---------------------------------|
| Riding sag | 70 ... 80 mm (2.76 ... 3.15 in) |
|------------|---------------------------------|

- » If the riding sag differs from the specified measurement:
  - Adjust the riding sag. (📖 p. 44)

## 9.7 Adjusting the spring preload of the shock absorber



### Caution

**Risk of injury** Parts of the shock absorber will move around if the shock absorber is detached incorrectly. The shock absorber is filled with highly compressed nitrogen.

- Please follow the description provided.



### Info

Before changing the spring preload, make a note of the present setting, e.g., by measuring the length of the spring.

### Preparatory work

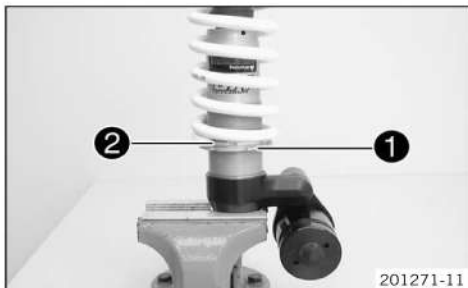
- Raise the motorcycle with the work stand. (📖 p. 12)
- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)
- Remove the shock absorber. (📖 p. 45)
- After removing the shock absorber, clean it thoroughly.

### Main work

- Release retaining ring **1**.
- Turn adjusting ring **2** until the spring is fully relaxed.

|                                |
|--------------------------------|
| Hook wrench (T106S) (📖 p. 296) |
|--------------------------------|

- Measure the overall spring length without a load.
- Tighten the spring by turning adjusting ring **2** to the specified measurement.



## Guideline

|                |                 |
|----------------|-----------------|
| Spring preload | 20 mm (0.79 in) |
|----------------|-----------------|

### **i** Info

Depending on the static sag and/or the riding sag, it may be necessary to increase or decrease the spring preload.

- Tighten retaining ring ①.

### Finishing work

- Install the shock absorber. (📖 p. 46)
- Mount the side cover. (📖 p. 74)
- Mount the seat. (📖 p. 73)
- Remove the motorcycle from the work stand. (📖 p. 13)

## 9.8 Adjusting the riding sag

### Preparatory work

- Raise the motorcycle with the work stand. (📖 p. 12)
- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)
- Remove the shock absorber. (📖 p. 45)
- After removing the shock absorber, clean it thoroughly.

### Main work

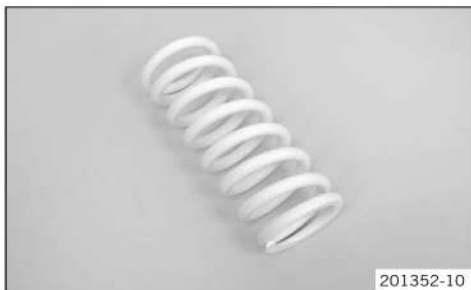
- Choose and mount a suitable spring.

## Guideline

|                   |                     |
|-------------------|---------------------|
| Spring rate       |                     |
| Medium (standard) | 80 N/mm (457 lb/in) |
| Hard              | 85 N/mm (485 lb/in) |

### **i** Info

The spring rate is shown on the outside of the spring.



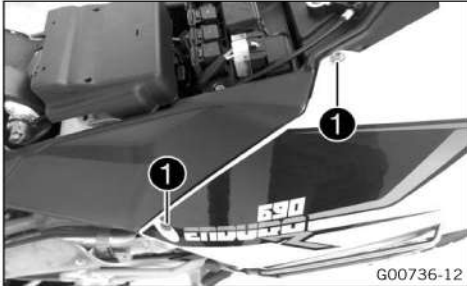
### Finishing work

- Install the shock absorber. (📖 p. 46)
- Mount the side cover. (📖 p. 74)
- Mount the seat. (📖 p. 73)
- Remove the motorcycle from the work stand. (📖 p. 13)
- Check the static sag of the shock absorber. (📖 p. 42)
- Adjust the rebound damping of the shock absorber. (📖 p. 41)

## 9.9 Removing the shock absorber

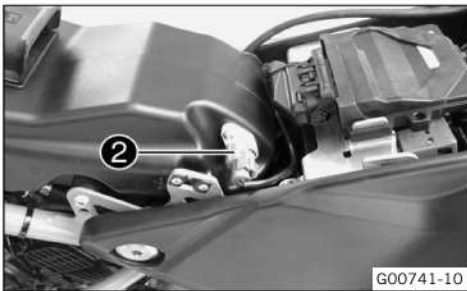
### Preparatory work

- Raise the motorcycle with the work stand. (📖 p. 12)
- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)

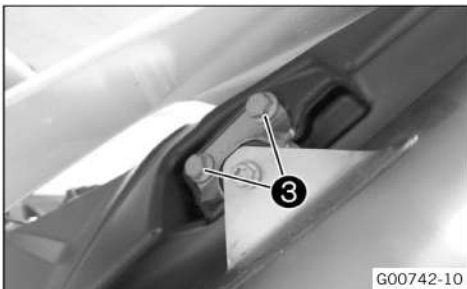


### Main work

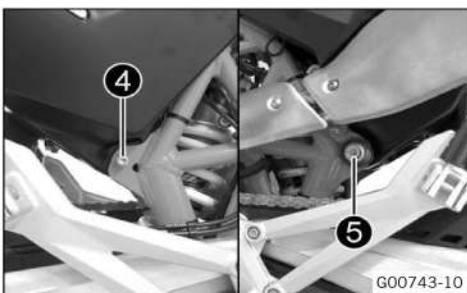
- Remove screws ①.



- Remove the battery cover.
- Detach connector ②.

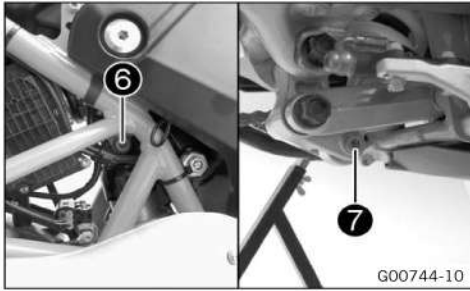


- Lift the rear fairing.
- Remove screws ③.

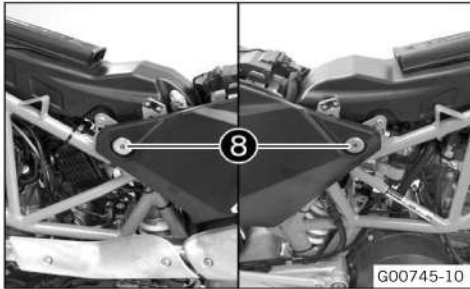


- Remove screw ④.
- Remove screw ⑤.

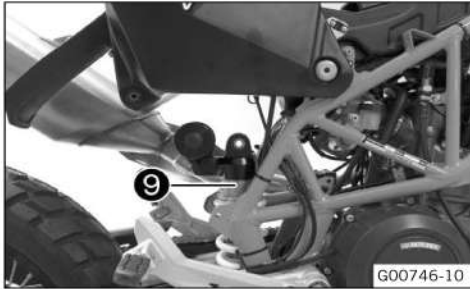
# 9 SHOCK ABSORBER, SWINGARM



- Loosen screw 6.
- Remove screw 7.
- Remove screw 6.

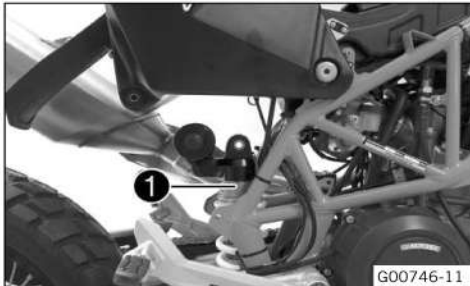


- Loosen screws 8.



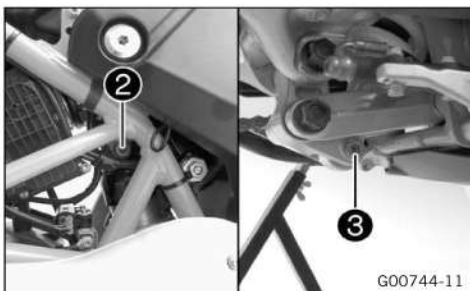
- Swing the rear end upwards.
- Lift off the shock absorber 9.

## 9.10 Installing the shock absorber



### Main work

- Insert shock absorber 1 from above.
- Lower the rear.



- Mount screw 2 but do not tighten yet.

### Guideline

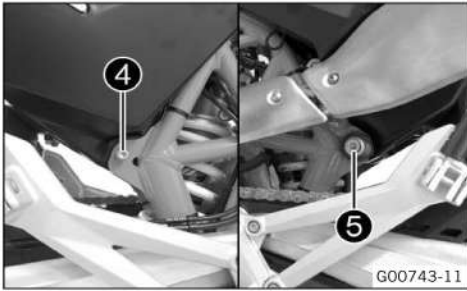
|                           |     |  |
|---------------------------|-----|--|
| Screw, top shock absorber | M10 | 45 Nm (33.2 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------|-----|--|

- Mount and tighten screw 3.

### Guideline

|                              |     |  |
|------------------------------|-----|--|
| Screw, bottom shock absorber | M10 | 45 Nm (33.2 lbf ft)<br><b>Loctite®243™</b> |
|------------------------------|-----|--|

- Tighten screw 2.



- Mount and tighten screw 4.

Guideline

|                           |     |  |
|---------------------------|-----|--|
| Screw, top shock absorber | M10 | 45 Nm (33.2 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------|-----|--|

- Mount and tighten screw 5.

Guideline

|                          |    |  |
|--------------------------|----|--|
| Screw, fuel tank, bottom | M8 | 25 Nm (18.4 lbf ft)<br><b>Loctite®243™</b> |
|--------------------------|----|--|



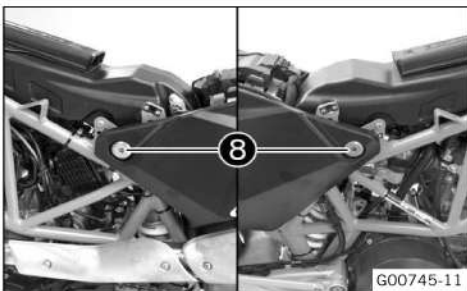
- Lift the rear fairing.
- Mount and tighten screws 6.

Guideline

|  |    |                     |
|--|----|---------------------|
| Screw, main silencer holder on fuel tank | M8 | 25 Nm (18.4 lbf ft) |
|--|----|---------------------|



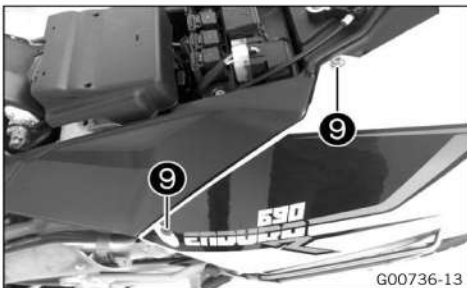
- Plug in connector 7.
- Mount the battery cover.



- Tighten screws 8.

Guideline

|                       |    |  |
|-----------------------|----|--|
| Screw, fuel tank, top | M8 | 25 Nm (18.4 lbf ft)<br><b>Loctite®243™</b> |
|-----------------------|----|--|



- Mount and tighten screws 9.

Guideline

|                   |    |                   |
|-------------------|----|-------------------|
| Screw, side cover | M6 | 5 Nm (3.7 lbf ft) |
|-------------------|----|-------------------|



## Finishing work

- Mount the side cover. (📖 p. 74)
- Mount the seat. (📖 p. 73)
- Remove the motorcycle from the work stand. (📖 p. 13)

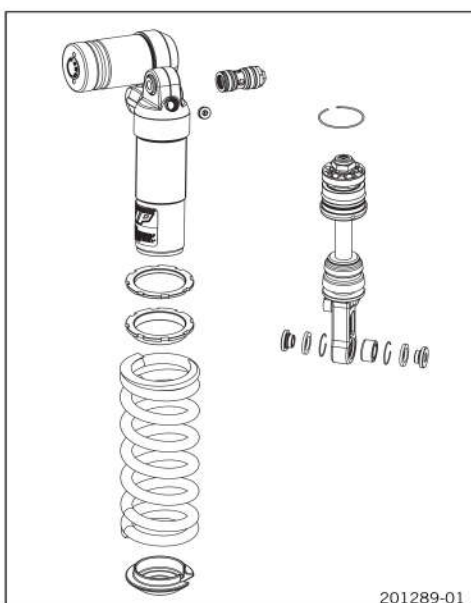
## 9.11 Servicing the shock absorber



### Caution

**Risk of injury** Parts of the shock absorber will move around if the shock absorber is detached incorrectly. The shock absorber is filled with highly compressed nitrogen.

- Please follow the description provided.



### Condition

The shock absorber has been removed.

- Remove the spring. (📖 p. 48)
- Dismantle the damper. (📖 p. 49)
- Disassemble the piston rod. (📖 p. 50)
- Check the damper. (📖 p. 51)
- Remove the heim joint. (📖 p. 52)
- Install the heim joint. (📖 p. 53)
- Assemble the piston rod. (📖 p. 54)
- Assemble the damper. (📖 p. 55)
- Install the spring. (📖 p. 62)

## 9.12 Removing the spring



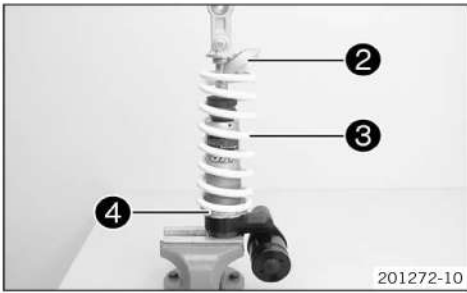
### Condition

The shock absorber has been removed.

- Clamp the shock absorber in the vise using soft jaws for protection.
- Measure and note spring length in preloaded state.
- Loosen retaining ring **1** and the adjusting ring with the special tool.

Hook wrench (T106S) (📖 p. 296)

- Turn the retaining ring and adjusting ring until the spring is fully relieved of tension.

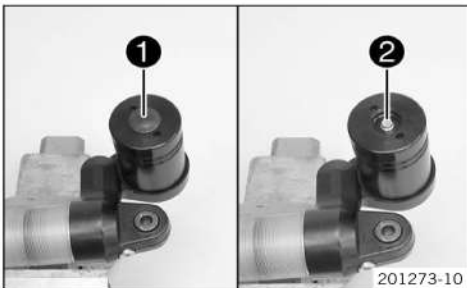


- Remove spring retainer ②.
- Take off spring ③ with the retaining ring and adjusting ring ④.

## 9.13 Dismantling the damper

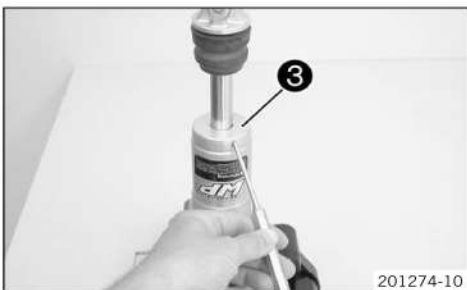
### Preparatory work

- Remove the spring. (📖 p. 48)



### Main work

- Establish and note the current state of the rebound damping and compression damping.
- Completely open the adjusters of the rebound and compression damping.
- Remove rubber cap ① of the reservoir.
- Open screw ② slowly.
  - ✓ The pressurized nitrogen escapes.

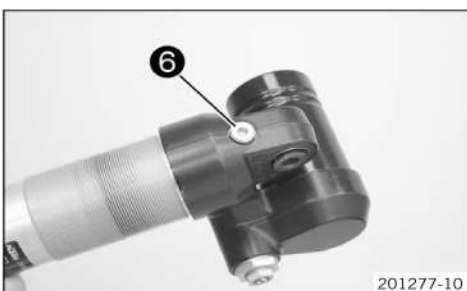


- Clamp the damper in the vise using soft jaws.
- Remove locking cap ③.



- Press in seal ring retainer ④. Remove lock ring ⑤.

**i Info**  
Do not scratch the inner surface.



- Remove screw ⑥. Drain the oil.

## 9 SHOCK ABSORBER, SWINGARM



- Remove the piston rod. Drain the remaining oil.



- Remove compression adjuster 7. Remove the spring, sleeve, and piston.



### 9.14 Disassembling the piston rod

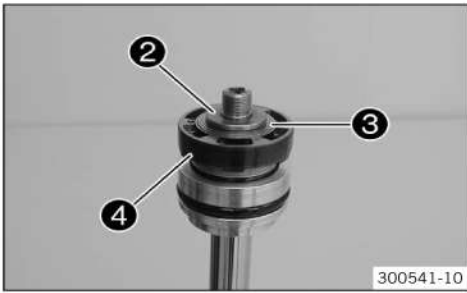
#### Preparatory work

- Remove the spring. (📖 p. 48)
- Dismantle the damper. (📖 p. 49)

#### Main work

- Clamp the piston rod with the heim joint in a vise.
- Remove nut 1.





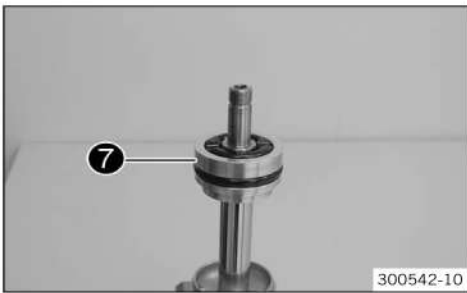
- Remove supporting plate 2 and rebound shim stack 3 together with piston 4.

**i Info**  
Thread the rebound shim set on a screwdriver and set the parts down together.



- Remove compression shim stack 6 with supporting plate 5.

**i Info**  
Thread the compression shim stack on a screwdriver and set the parts down together.



- Remove seal ring retainer 7.



- Remove locking cap 8 and rubber buffer 9.

## 9.15 Checking the damper

### Condition

The damper has been disassembled.

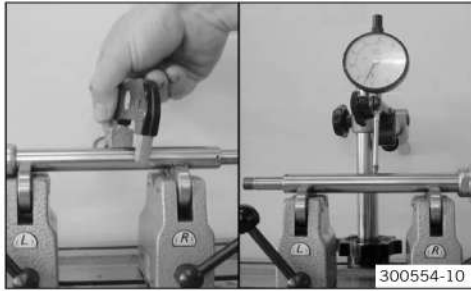
- Measure the inside diameter at both ends and in the center of the damper cartridge.

| Damper cartridge |                     |
|------------------|---------------------|
| Diameter         | 46.10 mm (1.815 in) |

- » If the measured value is greater than the specified value:
  - Change the damper cartridge.
- Check the damper cartridge for damage and wear.
  - » If there is damage or wear:
    - Change the damper cartridge.



## 9 SHOCK ABSORBER, SWINGARM



- Measure the diameter of the piston rod.

|            |                          |
|------------|--------------------------|
| Piston rod |                          |
| Diameter   | ≥ 17.95 mm (≥ 0.7067 in) |

- » If the specification is not reached:

- Change the piston rod.

- Measure the run-out of the piston rod.

|            |                         |
|------------|-------------------------|
| Piston rod |                         |
| Run-out    | ≤ 0.03 mm (≤ 0.0012 in) |

- » If the measured value is greater than the specified value:

- Change the piston rod.

- Check the piston rod for damage and wear.

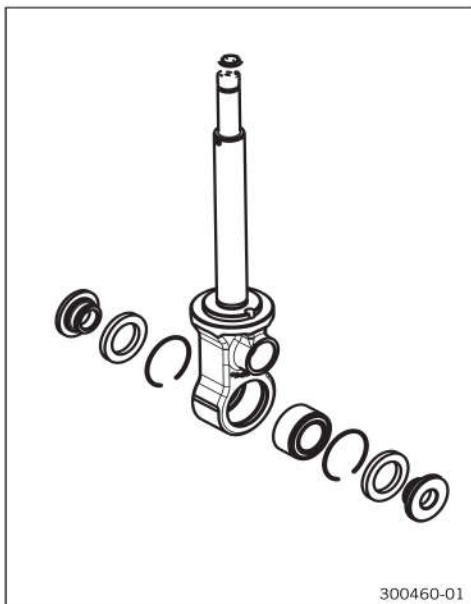
- » If there is damage or wear:

- Change the piston rod.

- Check the heim joint for damage and wear.

- » If there is damage or wear:

- Change the heim joint.



### 9.16 Removing the heim joint

#### Condition

The shock absorber has been removed.

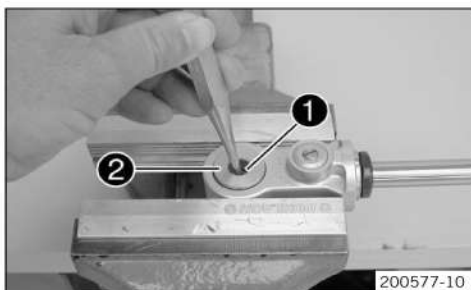
- Clamp the shock absorber into the vise with soft jaws.

- Remove collar bushing **1** of the heim joint.

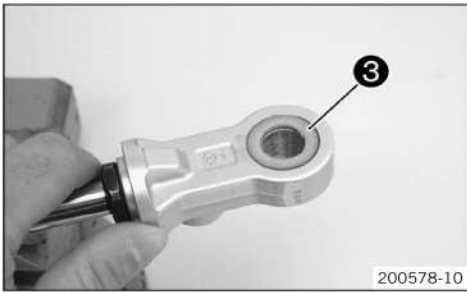
|                         |
|-------------------------|
| Drift (T120) (📄 p. 297) |
|-------------------------|

- Turn around the shock absorber and remove collar bushing **2** of the heim joint.

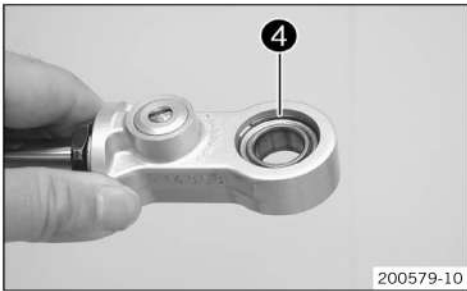
|                         |
|-------------------------|
| Drift (T120) (📄 p. 297) |
|-------------------------|



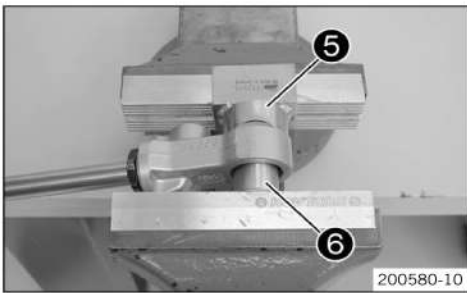




- Remove seal **3** on both sides.



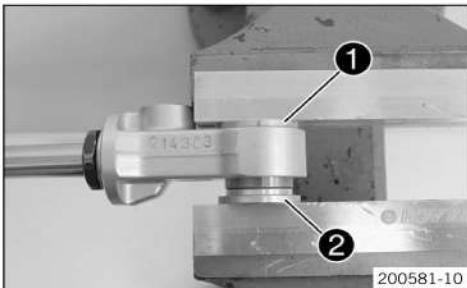
- Remove lock ring **4** on both sides.



- Place special tool **5** underneath and press out the heim joint with special tool **6**.

Pressing tool (T1207S) (📖 p. 297)

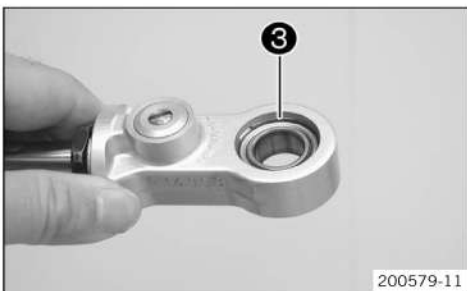
## 9.17 Installing the heim joint



- Place special tool **1** underneath and push the heim joint to the middle using special tool **2**.

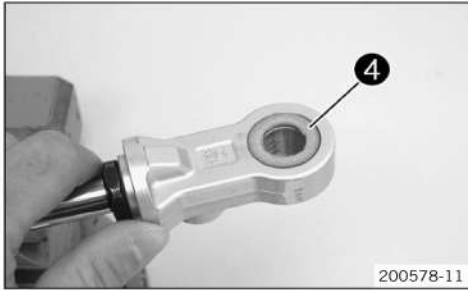
Pressing tool (T1206) (📖 p. 297)

Pressing tool (T129) (📖 p. 298)



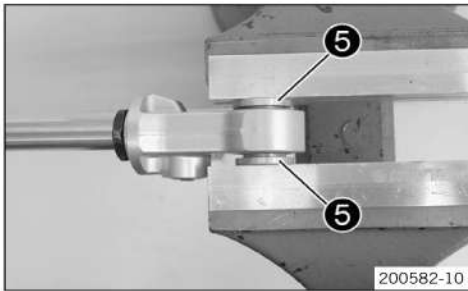
- Mount lock ring **3** on both sides.

## 9 SHOCK ABSORBER, SWINGARM



- Mount and grease seal ring **4** on both sides.

Lubricant (T158) (📖 p. 280)



- Press in both collar bushings **5** of the heim joint.

### 9.18 Assembling the piston rod

#### Preparatory work

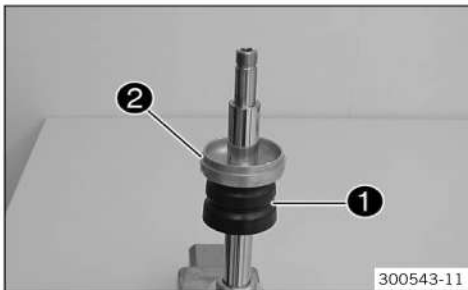
- Check the damper. (📖 p. 51)

#### Main work

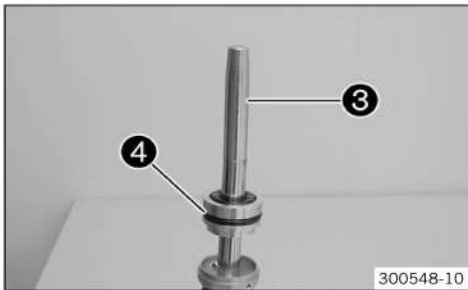
- Clamp the piston rod with the heim joint in a vise.

#### Guideline

Use soft jaws.



- Mount rubber buffer **1** and locking cap **2**.



- Position special tool **3** on the piston rod.

Mounting sleeve (T1515) (📖 p. 299)

- Grease the seal ring and push seal ring retainer **4** on to the piston rod.

Lubricant (T625) (📖 p. 280)

- Remove the special tool.



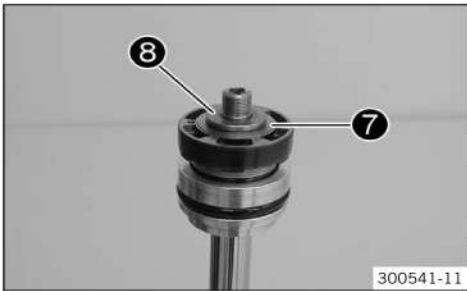
- Mount supporting plate **5** with the rounded side facing downward.
- Mount the compression shim stack **6** with the smaller shims facing downward.



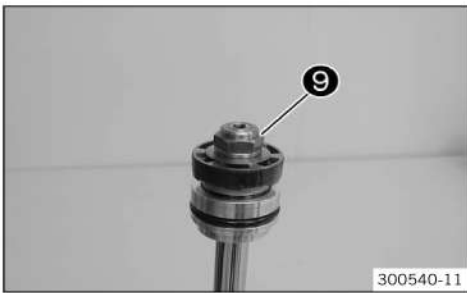
- Sand both sides of the piston on a surface plate using 1200-grit sandpaper.
- Clean the piston.
- Assemble the piston.

Guideline

|               |                   |
|---------------|-------------------|
| View <b>A</b> | Piston from above |
| View <b>B</b> | Piston from below |



- Mount the rebound shim stack **7** with the smaller shims facing upward.
- Install supporting plate **8**.



- Mount and tighten nut **9**.

Guideline

|                |       |                     |
|----------------|-------|---------------------|
| Piston rod nut | M12x1 | 40 Nm (29.5 lbf ft) |
|----------------|-------|---------------------|

## 9.19 Assembling the damper

### Preparatory work

- Check the damper. (📖 p. 51)
- Assemble the piston rod. (📖 p. 54)

## 9 SHOCK ABSORBER, SWINGARM



201279-11

### Main work

- Push the spring and sleeve onto the compression adjuster. Mount the piston.
- Mount and tighten compression adjuster **1**.

#### Guideline

|                      |       |                     |
|----------------------|-------|---------------------|
| Compression adjuster | M26x1 | 30 Nm (22.1 lbf ft) |
|----------------------|-------|---------------------|



201277-11

- Mount and tighten screw **2**.

#### Guideline

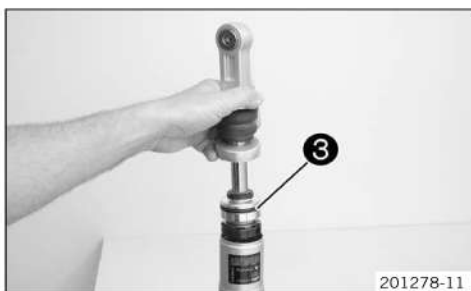
|                    |       |                     |
|--------------------|-------|---------------------|
| Filling port screw | M10x1 | 14 Nm (10.3 lbf ft) |
|--------------------|-------|---------------------|



201288-10

- Clamp the damper in the vise using soft jaws.
- Fill the damper cartridge about half full.

|  |
|--|
| Shock absorber fluid (SAE 2.5) (50180751S1) (📖 p. 279) |
|--|



201278-11

- Grease O-ring **3** of the seal ring retainer.

|                             |
|-----------------------------|
| Lubricant (T158) (📖 p. 280) |
|-----------------------------|

- Mount the piston rod carefully.



- Install the seal ring bearer **4** and push it under the ring groove.
- Mount lock ring **5**.



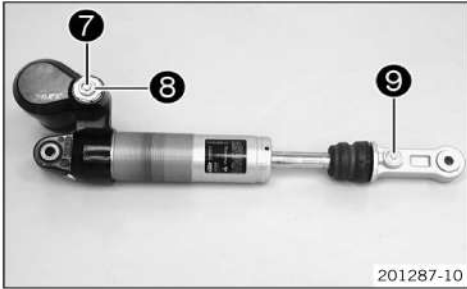
### Info

Do not scratch the inner surface.

- Pull out the piston rod so that the seal ring retainer rests against the lock ring.



- Mount locking cap **6** of the damper cartridge.
- Bleed and fill the damper. (📖 p. 58)
- Fill the damper with nitrogen. (📖 p. 61)



### Alternative 1

- Turn adjusting screw **7** clockwise with a screwdriver up to the last perceptible click.
- Turn counterclockwise by the number of clicks corresponding to the shock absorber type.

#### Guideline

| Compression damping, low-speed |           |
|--------------------------------|-----------|
| Comfort                        | 20 clicks |
| Standard                       | 15 clicks |
| Sport                          | 10 clicks |
| Full payload                   | 10 clicks |

- Turn adjusting screw **8** all the way clockwise using a socket wrench.
- Turn counterclockwise by the number of turns corresponding to the shock absorber type.

#### Guideline

| Compression damping, high-speed |           |
|---------------------------------|-----------|
| Comfort                         | 2 turns   |
| Standard                        | 1.5 turns |
| Sport                           | 1 turn    |
| Full payload                    | 1 turn    |

- Turn adjusting screw **9** clockwise up to the last perceptible click.
- Turn counterclockwise by the number of clicks corresponding to the shock absorber type.

## Guideline

| Rebound damping |           |
|-----------------|-----------|
| Comfort         | 20 clicks |
| Standard        | 15 clicks |
| Sport           | 10 clicks |
| Full payload    | 10 clicks |

## Alternative 2



### Warning

**Danger of accident** Modifications to the suspension setting may seriously alter the handling characteristic.

Extreme modifications to the suspension setting may cause a serious deterioration in the handling characteristic and overload components.

- Only make adjustments within the recommended range.
- Ride slowly to start with after making adjustments to get the feel of the new handling characteristic.

- Turn adjusting screws **7**, **8** and **9** to the position determined during disassembly.

### Finishing work

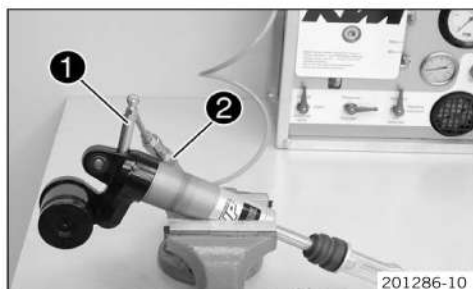
- Install the spring. (📖 p. 62)

## 9.20 Bleeding and filling the damper



### Info

Before working with the vacuum pump, be sure to read the operating instructions carefully. Completely open the adjusters of the rebound and compression damping.



- Remove the screw of the filling port.
- Install adapter **1** on the damper.



### Info

Tighten only hand-tight, without the use of tools.

- Connect the adapter **1** to connector **2** of the vacuum pump.

Vacuum pump (T1240S) (📖 p. 298)

- Clamp the damper with soft jaws or hold it as shown in the photo.



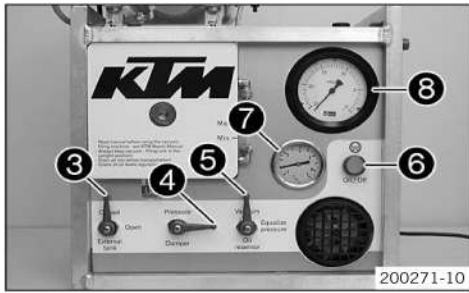
### Info

Clamp the damper only lightly.

The filling port must be at the highest point.

The piston rod slides in and out during filling - do not hold it tight with your hand!





- Place the control lever as shown in the photo.
  - ✓ The **External tank** **3** control lever is on **Closed**, **Damper** **4** on **Vacuum**, and **Oil reservoir** **5** on **Vacuum**.

- Operate the **On/Off** switch **6**.

- ✓ The vacuum pump process starts.
- ✓ Pressure gauge **7** falls to the specified value.

< 0 bar

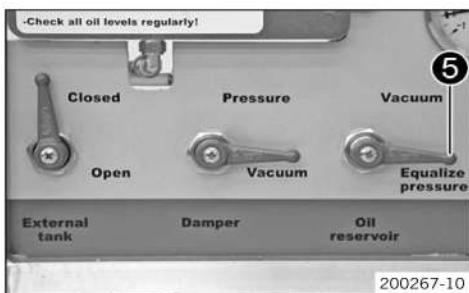
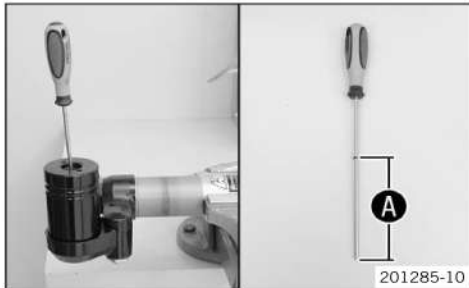
- ✓ The vacuum gauge **8** falls to the specified value.

4 mbar

- Measure distance **A** between the floating piston and reservoir hole with the special tool.

Depth micrometer (T107S) (p. 297)

- ✓ The floating piston is positioned all the way at the bottom.



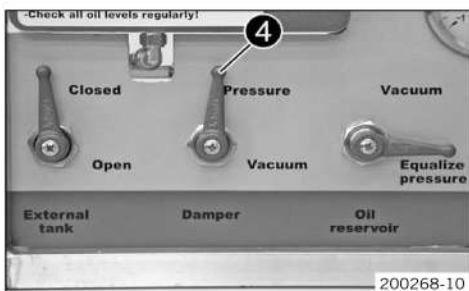
- When the vacuum pressure gauge reaches the specified value, turn the **Oil reservoir** control lever **5** to **Equalize pressure**.

Guideline

4 mbar

- ✓ The pressure gauge rises to the specified value.

0 bar



- When the pressure gauge reaches the specified value, turn the **Damper** control lever **4** to **Pressure**.

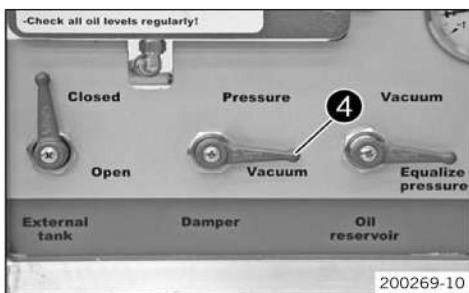
Guideline

0 bar

- ✓ Oil is pumped into the damper.

- ✓ The pressure gauge rises to the specified value.

3 bar



- When the pressure gauge reaches the specified value, turn the **Damper** **4** control lever to **Vacuum**.

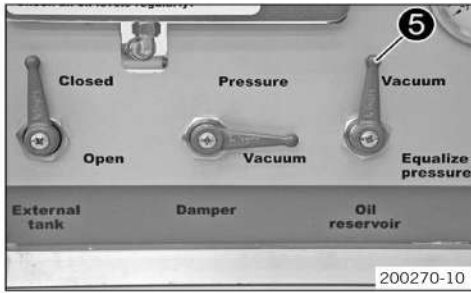
Guideline

3 bar

- ✓ The pressure gauge falls to the specified value.

0 bar

# 9 SHOCK ABSORBER, SWINGARM



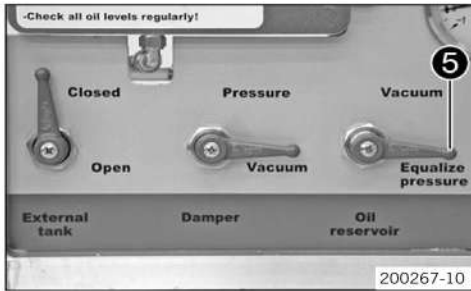
- When the pressure gauge reaches the specified value, turn the **Oil reservoir 5** control lever to **Vacuum**.

Guideline

0 bar

- ✓ The vacuum gauge falls to the specified value.

4 mbar



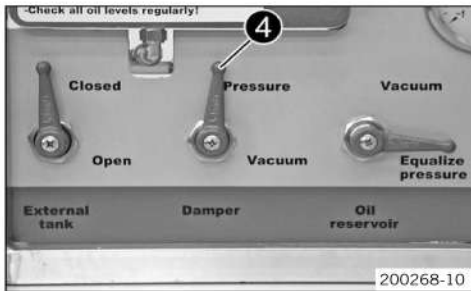
- When the vacuum pressure gauge reaches the specified value, turn the **Oil reservoir control lever 5** to **Equalize Pressure**.

Guideline

4 mbar

- ✓ The pressure gauge falls to the specified value.

0 bar



- When the pressure gauge reaches the specified value, turn the **Damper control lever 4** to **Pressure**.

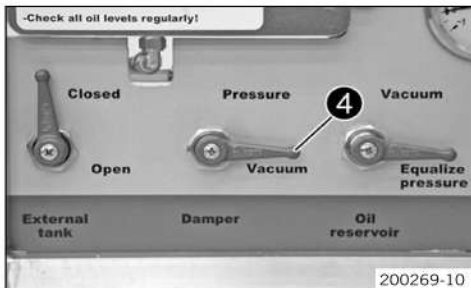
Guideline

0 bar

- ✓ Oil is pumped into the damper.

- ✓ The pressure gauge rises to the specified value.

3 bar



- When the pressure gauge reaches the specified value, turn the **Damper 4** control lever to **Vacuum**.

Guideline

3 bar

- ✓ The pressure gauge falls to the specified value.

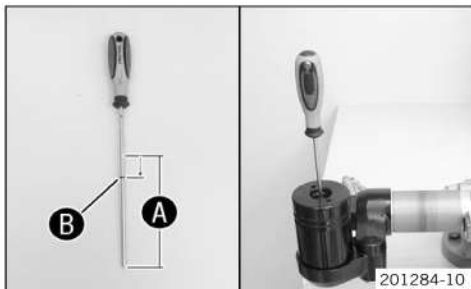
0 bar

- When the pressure gauge reaches the specified value, operate the **On/Off** switch.

Guideline

0 bar

- ✓ The vacuum pump is switched off.



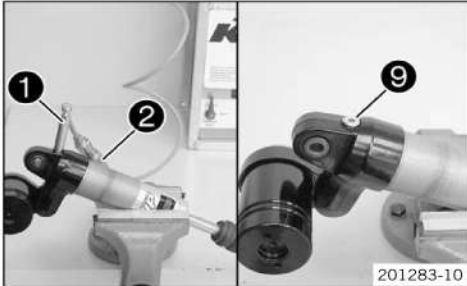
- Slide O-ring **B** to the end of the special tool by the specified value (distance **A** minus specified value).

Guideline

10 mm

Depth micrometer (T107S) (p. 297)

- Slide the floating piston into the reservoir to the shortened position using the special tool.



**i Info**  
The floating piston must be positioned at exactly this point when the rod is fully extended; otherwise, damage will occur during compression of the shock absorber.

- Remove the special tool.
- Remove adapter ① from connection ② of the vacuum pump.

**i Info**  
Hold the damper so that the filling port is at the highest point.

- Remove the adapter.
- Mount and tighten screw ⑨.

Guideline

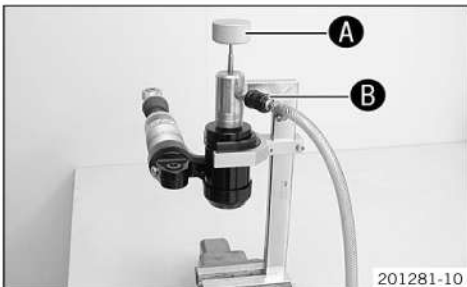
|                    |       |                     |
|--------------------|-------|---------------------|
| Filling port screw | M10x1 | 14 Nm (10.3 lbf ft) |
|--------------------|-------|---------------------|

## 9.21 Filling the damper with nitrogen



- Screw in screw ① by approx. 2 rotations but do not tighten.

**i Info**  
The piston rod is fully extended.



- Clamp special tool in the vise.

Filling tool (T170S1) (p. 300)

- Connect the special tool to the pressure regulator of the filling cylinder.

Filling gas - nitrogen

- Adjust pressure regulator.

Guideline

|              |                  |
|--------------|------------------|
| Gas pressure | 10 bar (145 psi) |
|--------------|------------------|

- Position the damper in the special tool.

✓ The hexagonal part of the tap handle **A** engages in the hexagon socket of the filling port screw.

- Open filler tap **B**.
- Fill the damper for at least 15 seconds.

Guideline

|              |                  |
|--------------|------------------|
| Gas pressure | 10 bar (145 psi) |
|--------------|------------------|



### Info

Watch the pressure regulator dial.  
Make sure that the damper is filled to the specified pressure.

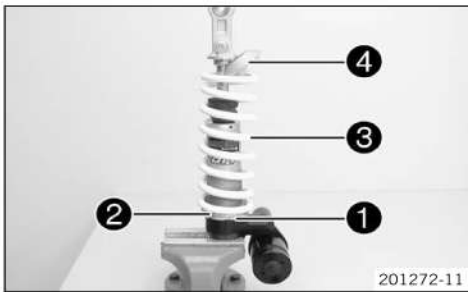
- Close the filling port screw using tap handle **A**.
- Close spigot **B** and take the damper out of the special tool.
- Tighten the filling port screw.

### Guideline

|                               |    |                   |
|-------------------------------|----|-------------------|
| Screw, reservoir filling port | M5 | 3 Nm (2.2 lbf ft) |
|-------------------------------|----|-------------------|

- Mount the rubber cap of the reservoir.

## 9.22 Installing the spring



- Clamp the damper into the vise with soft jaws.
- Mount retaining ring **1** and turn it down as far as possible.
  - ✓ The collar points to the adjusting ring.
- Mount adjusting ring **2** and turn it all the way down.
  - ✓ The collar faces the spring.
- Measure the overall spring length while the spring is not under tension.
- Mount spring **3**.

### Guideline

|                   |                     |
|-------------------|---------------------|
| Spring rate       |                     |
| Medium (standard) | 80 N/mm (457 lb/in) |
| Hard              | 85 N/mm (485 lb/in) |

- Mount spring retainer **4**.
  - ✓ The open end is opposite the spring end.

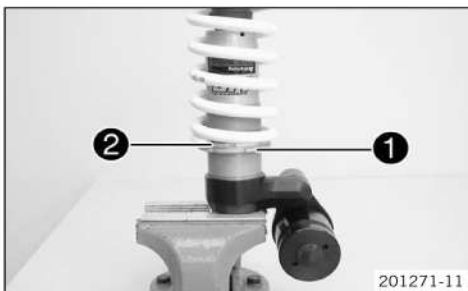
### Alternative 1

- Tighten the spring by turning adjusting ring **2** to the specified measurement.

### Guideline

|                |                 |
|----------------|-----------------|
| Spring preload | 20 mm (0.79 in) |
|----------------|-----------------|

|                                |
|--------------------------------|
| Hook wrench (T106S) (📖 p. 296) |
|--------------------------------|



## Alternative 2

**Warning**

**Danger of accident** Modifications to the suspension setting may seriously alter the handling characteristic.

Extreme modifications to the suspension setting may cause a serious deterioration in the handling characteristic and overload components.

- Only make adjustments within the recommended range.
- Ride slowly to start with after making adjustments to get the feel of the new handling characteristic.

- Adjust the spring to the value determined when it was removed by turning adjusting ring ②.

Hook wrench (T106S) (📖 p. 296)

- Tighten lock nut ① and the adjusting ring.





## 10.1 Removing the manifold



### Warning

**Danger of burns** The exhaust system gets very hot when the vehicle is driven.

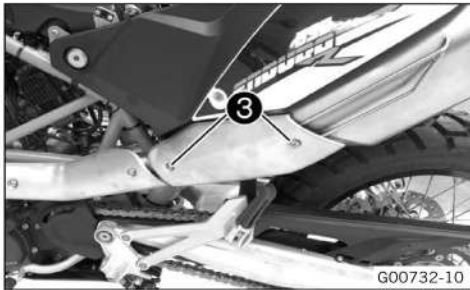
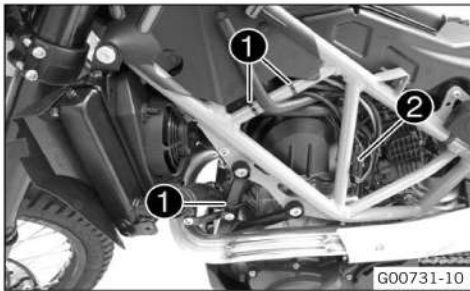
- Allow the exhaust system to cool down before performing any work on the vehicle.

### Preparatory work

- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)

### Main work

- Remove cable ties **1**.
- Push the cable to the right. Disconnect plug-in connector **2** of the lambda sensor.
- Feed out the cable of the lambda sensor.



- Remove screws **3**.
- Remove the exhaust heat shield.



- Remove nuts **4** of the manifold.



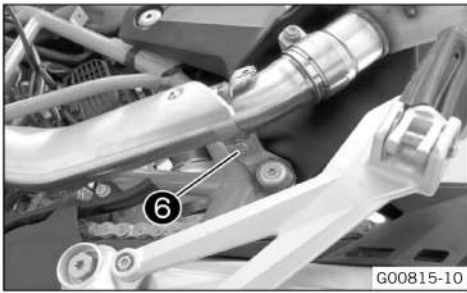
### Info

Do not misplace the spacer.



- Loosen screw **5**.





- Remove screw 6.
- Take off the manifold.

## 10.2 Installing the manifold

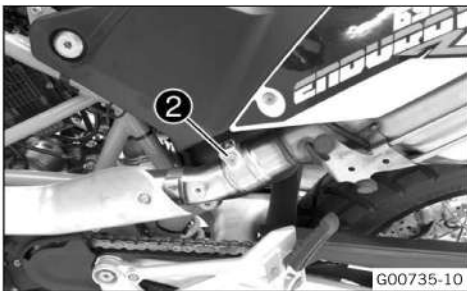


### Main work

- Position the manifold with the seals.
- Position the spacer.
- Mount and tighten nuts 1.

#### Guideline

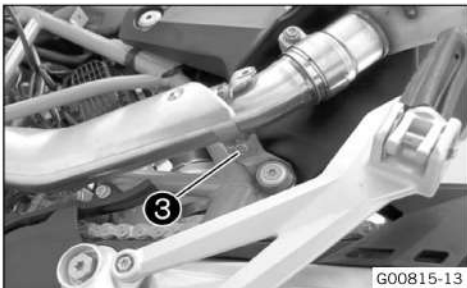
|                                |    |                                     |
|--------------------------------|----|-------------------------------------|
| Nut, manifold on cylinder head | M8 | 20 Nm (14.8 lbf ft)<br>Copper paste |
|--------------------------------|----|-------------------------------------|



- Position the exhaust clamp.
- Tighten screw 2.

#### Guideline

|                            |    |                                    |
|----------------------------|----|------------------------------------|
| Screw, main silencer clamp | M8 | 12 Nm (8.9 lbf ft)<br>Copper paste |
|----------------------------|----|------------------------------------|



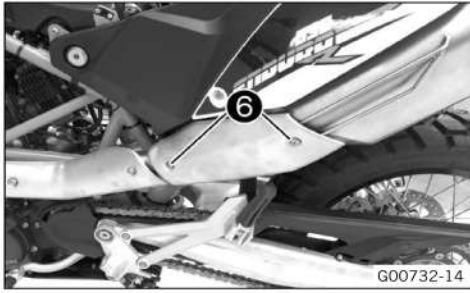
- Position the exhaust clamp.
- Mount and tighten screw 3.

#### Guideline

|                      |    |                                    |
|----------------------|----|------------------------------------|
| Screw, exhaust clamp | M8 | 12 Nm (8.9 lbf ft)<br>Copper paste |
|----------------------|----|------------------------------------|



- Connect plug-in connector 4 of the lambda sensor.
- Route the cable without tension and secure with cable ties 5.



- Position the exhaust heat guard.
- Mount and tighten screws ⑥.

Guideline

|                            |    |  |
|----------------------------|----|--|
| Screw, exhaust heat shield | M5 | 8 Nm (5.9 lbf ft)<br><b>Loctite®243™</b> |
|----------------------------|----|--|

### Finishing work

- Mount the side cover. (📖 p. 74)
- Mount the seat. (📖 p. 73)

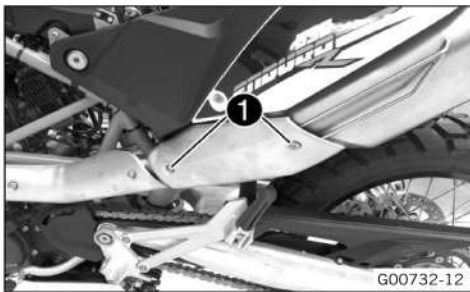
## 10.3 Removing the main silencer



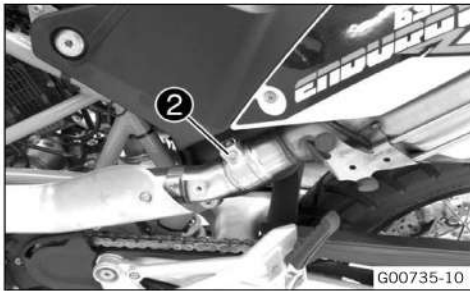
### Warning

**Danger of burns** The exhaust system gets very hot when the vehicle is driven.

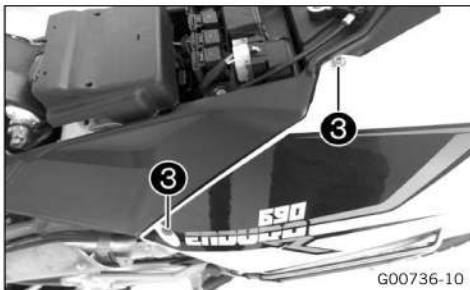
- Allow the exhaust system to cool down before performing any work on the vehicle.



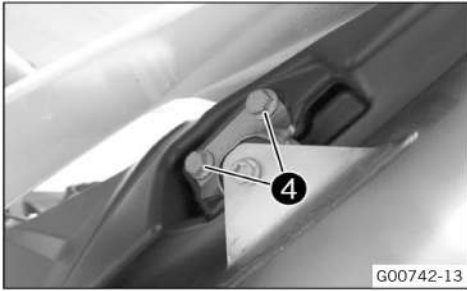
- Remove screws ①.
- Take off the exhaust heat shield.



- Loosen screw ②.



- Remove screws ③.
- Lift the rear fairing.



- Remove screws ④.
- Remove the main silencer.

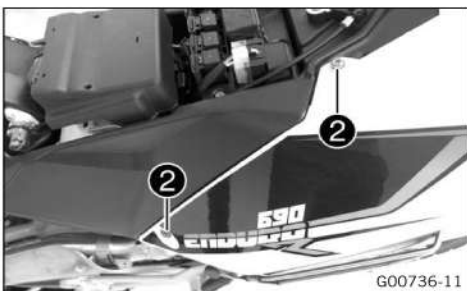
## 10.4 Installing the main silencer



- Position the main silencer.
- Mount and tighten screws ①.

Guideline

|                             |    |                     |
|-----------------------------|----|---------------------|
| Screw, main silencer holder | M8 | 25 Nm (18.4 lbf ft) |
|-----------------------------|----|---------------------|



- Mount and tighten screws ②.

Guideline

|                    |    |                   |
|--------------------|----|-------------------|
| Rear fairing screw | M6 | 5 Nm (3.7 lbf ft) |
|--------------------|----|-------------------|



- Position the exhaust clamp.
- Tighten screw ③.

Guideline

|                            |    |                                    |
|----------------------------|----|------------------------------------|
| Screw, main silencer clamp | M8 | 12 Nm (8.9 lbf ft)<br>Copper paste |
|----------------------------|----|------------------------------------|

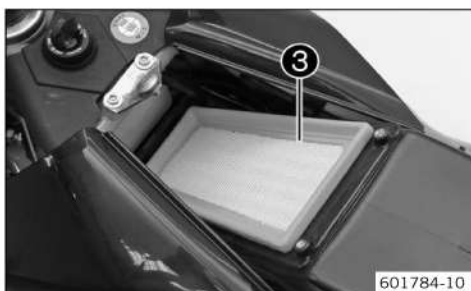
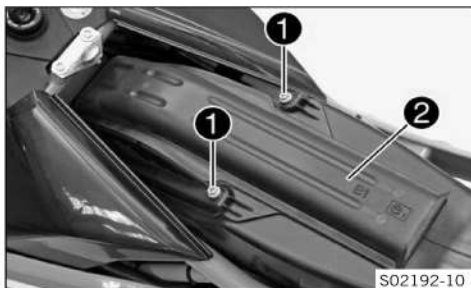


- Position the exhaust heat guard.
- Mount and tighten screws ④.

Guideline

|                            |    |  |
|----------------------------|----|--|
| Screw, exhaust heat shield | M5 | 8 Nm (5.9 lbf ft)<br><b>Loctite®243™</b> |
|----------------------------|----|--|

## 11.1 Removing the air filter



### Preparatory work

- Remove the seat. (📖 p. 73)

### Main work

- Remove screws ①.
- Remove the upper part of the air filter box ②.

### Note

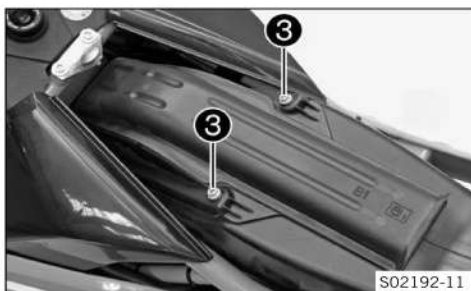
**Engine damage** Unfiltered intake air has a negative effect on the service life of the engine.

Dust and dirt will enter the engine without an air filter.

- Never start to use the vehicle without an air filter.

- Remove air filter ③.

## 11.2 Installing the air filter



### Main work

- Clean the air filter box.
- Mount air filter ①.

### Info

The air filter must lie flush against the air filter box along the entire sealing surface A.

If the air filter is not mounted correctly, dust and dirt may enter the engine and result in damage.

- Hook air filter box top ② into the front of the air filter box and swing down.
- Mount and tighten screws ③.

### Guideline

|                           |    |                   |
|---------------------------|----|-------------------|
| Screw, air filter box top | M6 | 2 Nm (1.5 lbf ft) |
|---------------------------|----|-------------------|

### Finishing work

- Mount the seat. (📖 p. 73)



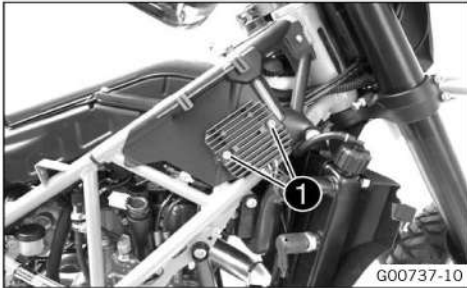
11.3 Removing the air filter box

**Preparatory work**

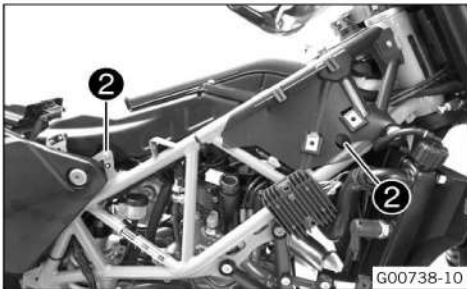
- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)

**Main work**

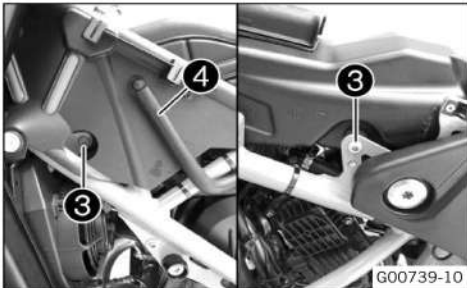
- Remove screws ①.
- Take off the voltage regulator and hang it to the side in a de-energized state.



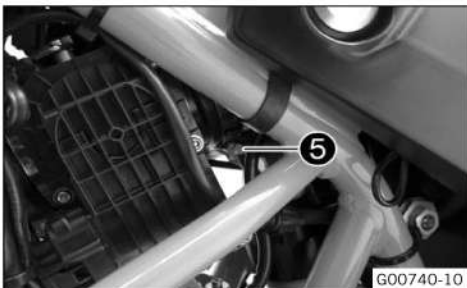
- Remove screws ②.



- Remove screws ③.
- Detach vent hose ④.



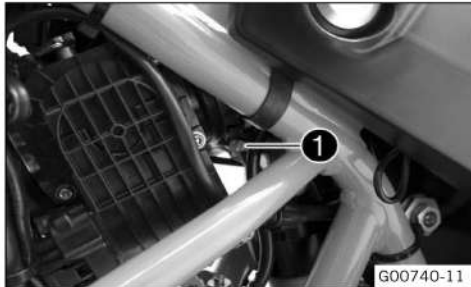
- Loosen hose clip ⑤.
- Raise the air filter box at the rear.





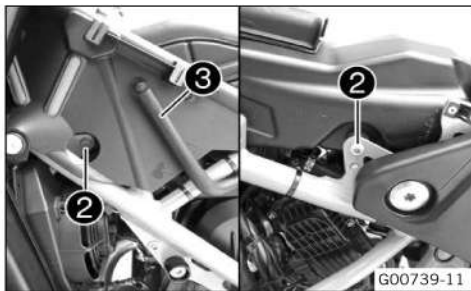
- Disconnect connector **6**.
- Raise the air filter box at the rear.
- Take off the air filter box.

## 11.4 Installing the air filter box



### Main work

- Position the air filter box.
- Mount and tighten hose clip **1**.

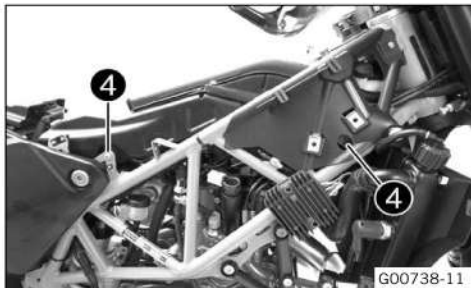


- Mount and tighten screws **2**.

### Guideline

|                                 |    |                   |
|---------------------------------|----|-------------------|
| Screw, air filter box, on frame | M6 | 6 Nm (4.4 lbf ft) |
|---------------------------------|----|-------------------|

- Route vent hose **3** without bends and mount.



- Mount and tighten screws **4**.

### Guideline

|                                 |    |                   |
|---------------------------------|----|-------------------|
| Screw, air filter box, on frame | M6 | 6 Nm (4.4 lbf ft) |
|---------------------------------|----|-------------------|



- Position the voltage regulator.
- Mount and tighten screws **5**.

### Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|





- Plug in connector 6.

**Finishing work**

- Mount the side cover. (📖 p. 74)
- Mount the seat. (📖 p. 73)



## 12.1 Opening the filler cap



### Danger

**Fire hazard** Fuel is highly flammable.

The fuel in the fuel tank expands when warm and can escape if overfilled.

- Do not refuel the vehicle in the vicinity of open flames or lit cigarettes.
- Switch off the engine for refueling.
- Make sure that no fuel is spilled; particularly not on hot parts of the vehicle.
- If any fuel is spilled, wipe it off immediately.
- Observe the specifications for refueling.



### Warning

**Danger of poisoning** Fuel is poisonous and a health hazard.

- Avoid skin, eye and clothing contact with fuel.
- Immediately consult a doctor if you swallow fuel.
- Do not inhale fuel vapors.
- In case of skin contact, rinse the affected area with plenty of water.
- Rinse the eyes thoroughly with water, and consult a doctor in case of fuel contact with the eyes.
- Change your clothing in case of fuel spills on them.
- Keep fuels correctly in a suitable canister, and out of the reach of children.



### Warning

**Environmental hazard** Improper handling of fuel is a danger to the environment.

- Do not allow fuel to enter the groundwater, the soil, or the sewage system.



- Lift cover **1** of filler cap and insert the ignition key.
- Turn the ignition key 90° counterclockwise and remove the filler cap.



### Info

The filler cap has a fuel tank breather.

## 12.2 Closing filler cap



- Put the filler cap back on and turn the ignition key 90° clockwise.
- Remove the ignition key and fold down the cover.

### 12.3 Removing the seat



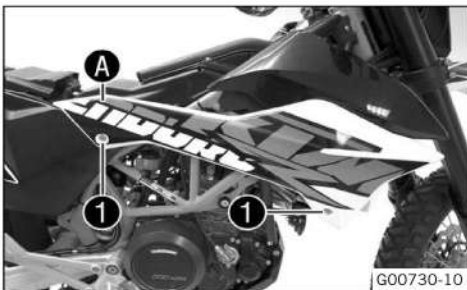
- Pull on strap **1** and raise the rear of the seat at the same time.
- Pull back the seat and lift it off.

### 12.4 Mounting the seat



- Hook slot **1** of the seat onto screw **2**, press the rear downward and at the same time push it forward.
- Push locking pin **3** into lock housing **4** and push the back of the seat down until the locking pin locks in place with an audible click.
- Check, finally, that the seat is correctly mounted.

### 12.5 Taking off the side cover



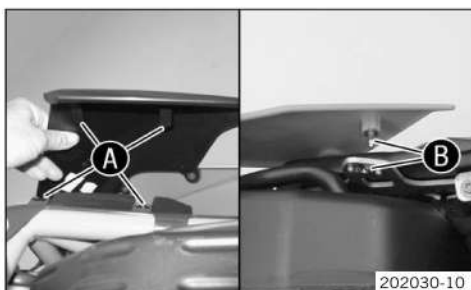
**Preparatory work**

- Remove the seat. (p. 73)

**Main work**

- Remove screws **1**.
- Pull off the side cover in area **A** and take off from above.
- Repeat the operation on the opposite side.

## 12.6 Mounting the side cover



### Main work

- Attach the side cover in area **A** and engage it in area **B**.



- Mount and tighten screws **1**.

### Guideline

|                   |    |                   |
|-------------------|----|-------------------|
| Screw, side cover | M6 | 5 Nm (3.7 lbf ft) |
|-------------------|----|-------------------|

- Repeat the operations on the opposite side.

### Finishing work

- Mount the seat. (📖 p. 73)

## 12.7 Checking the fuel pressure



### Danger

**Fire hazard** Fuel is highly flammable.

The fuel in the fuel tank expands when warm and can escape if overfilled.

- Do not refuel the vehicle in the vicinity of open flames or lit cigarettes.
- Switch off the engine for refueling.
- Make sure that no fuel is spilled; particularly not on hot parts of the vehicle.
- If any fuel is spilled, wipe it off immediately.
- Observe the specifications for refueling.



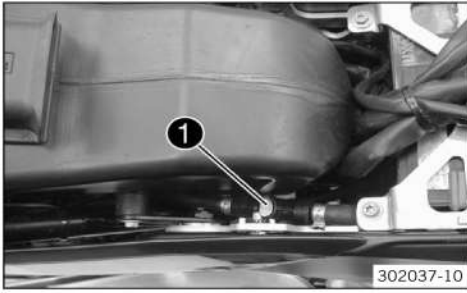
### Warning

**Danger of poisoning** Fuel is poisonous and a health hazard.

- Avoid skin, eye and clothing contact with fuel.
- Immediately consult a doctor if you swallow fuel.
- Do not inhale fuel vapors.
- In case of skin contact, rinse the affected area with plenty of water.
- Rinse the eyes thoroughly with water, and consult a doctor in case of fuel contact with the eyes.
- Change your clothing in case of fuel spills on them.
- Keep fuels correctly in a suitable canister, and out of the reach of children.

### Condition

The fuel tank is completely full.  
 Ensure that the battery voltage does not drop below 12.5 V.  
 The ignition is on.  
 The diagnostics tool is connected.

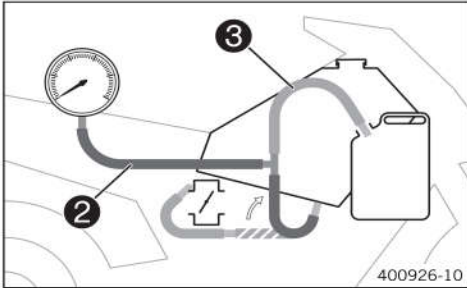


- Thoroughly clean the plug-in connection of the fuel line using compressed air.

**i Info**  
Under no circumstances should dirt enter into the fuel line. Dirt in the fuel line clogs the injection valve!

- Press on the small metal plate and disconnect fuel hose connection **1**.

**i Info**  
Remaining fuel may flow out of the fuel hose.



- Mount special tool **2**.

|  |
|--|
| Pressure testing tool (61029094000) (📄 p. 287) |
|--|

- Mount special tool **3** with nozzle code **0,60**.

|                                       |
|---------------------------------------|
| Testing hose (61029093000) (📄 p. 287) |
|---------------------------------------|

- Position the hose end in a fuel can.

Guideline

|                        |                   |
|------------------------|-------------------|
| Minimum size, fuel can | 10 l (2.6 US gal) |
|------------------------|-------------------|

- Execute "**Actuator Test**" > "**Function test of fuel pump control**".

Guideline

|                                       |       |
|---------------------------------------|-------|
| Maximum duration of the actuator test | 3 min |
|---------------------------------------|-------|

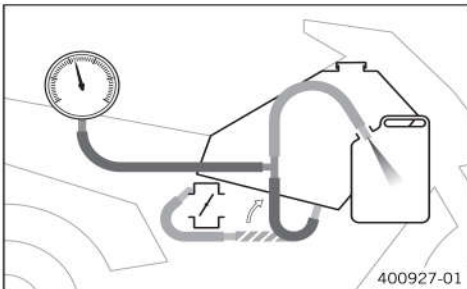
- Check the fuel pressure with the filler cap closed.

Fuel pressure

|                              |                                 |
|------------------------------|---------------------------------|
| When the fuel pump is active | 3.3 ... 3.7 bar (48 ... 54 psi) |
|------------------------------|---------------------------------|

» If the specification is not reached:

- Open the filler cap. (📄 p. 72)
- Check the fuel tank breather.



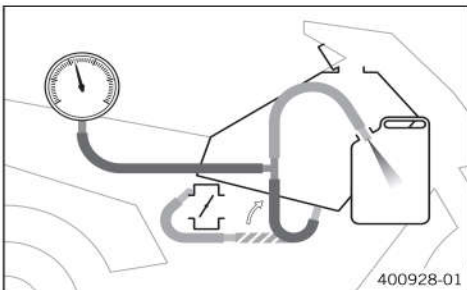
- Check the fuel pressure with the filler cap open.

Fuel pressure

|                              |                                 |
|------------------------------|---------------------------------|
| When the fuel pump is active | 3.3 ... 3.7 bar (48 ... 54 psi) |
|------------------------------|---------------------------------|

» If the specification is not reached:

- Check that the fuel line is clear.
- Change the fuel filter. (📄 p. 77)
- Change the fuel pump. (📄 p. 81)



- Stop the "**Function test of fuel pump control**" actuator test by pressing the "**Quit**" button.

- Remove the special tools.

- Join the fuel hose connection.





## 12.8 Changing the fuel screen



### Danger

**Fire hazard** Fuel is highly flammable.

The fuel in the fuel tank expands when warm and can escape if overfilled.

- Do not refuel the vehicle in the vicinity of open flames or lit cigarettes.
- Switch off the engine for refueling.
- Make sure that no fuel is spilled; particularly not on hot parts of the vehicle.
- If any fuel is spilled, wipe it off immediately.
- Observe the specifications for refueling.



### Warning

**Danger of poisoning** Fuel is poisonous and a health hazard.

- Avoid skin, eye and clothing contact with fuel.
- Immediately consult a doctor if you swallow fuel.
- Do not inhale fuel vapors.
- In case of skin contact, rinse the affected area with plenty of water.
- Rinse the eyes thoroughly with water, and consult a doctor in case of fuel contact with the eyes.
- Change your clothing in case of fuel spills on them.



### Warning

**Environmental hazard** Improper handling of fuel is a danger to the environment.

- Do not allow fuel to enter the groundwater, the soil, or the sewage system.

### Preparatory work

- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)
- Remove the air filter box. (📖 p. 69)

### Main work

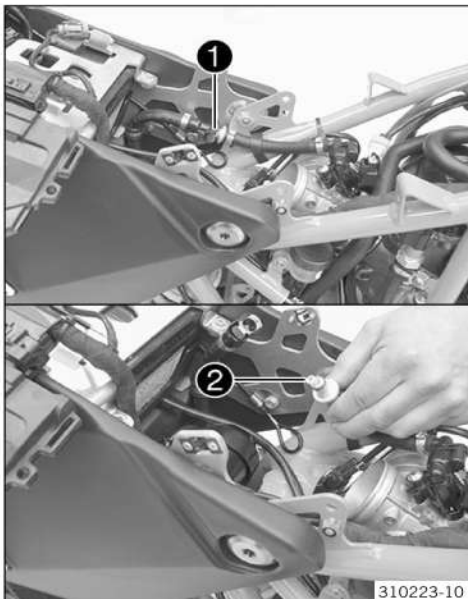
- Clean the plug-in connection **1** of the fuel line thoroughly with compressed air.



### Info

Under no circumstances should dirt enter into the fuel line. Dirt in the fuel line clogs the injection valve.

- Disconnect the plug-in connection of the fuel line.
- Pull fuel screen **2** out of the connecting piece.
- Insert the new fuel screen all the way into the connecting piece.
- Lubricate the O-ring and connect plug-in connection of the fuel line.







**Danger**

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

- Start the engine and check the response.

**Finishing work**

- Install the air filter box. (🔧 p. 70)
- Mount the side cover. (🔧 p. 74)
- Mount the seat. (🔧 p. 73)



**12.9 Changing the fuel filter**



**Danger**

**Fire hazard** Fuel is highly flammable.

The fuel in the fuel tank expands when warm and can escape if overfilled.

- Do not refuel the vehicle in the vicinity of open flames or lit cigarettes.
- Switch off the engine for refueling.
- Make sure that no fuel is spilled; particularly not on hot parts of the vehicle.
- If any fuel is spilled, wipe it off immediately.
- Observe the specifications for refueling.



**Warning**

**Danger of poisoning** Fuel is poisonous and a health hazard.

- Avoid skin, eye and clothing contact with fuel.
- Immediately consult a doctor if you swallow fuel.
- Do not inhale fuel vapors.
- In case of skin contact, rinse the affected area with plenty of water.
- Rinse the eyes thoroughly with water, and consult a doctor in case of fuel contact with the eyes.
- Change your clothing in case of fuel spills on them.
- Keep fuels correctly in a suitable canister, and out of the reach of children.



**Warning**

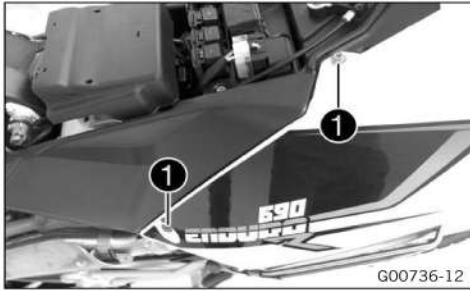
**Environmental hazard** Improper handling of fuel is a danger to the environment.

- Do not allow fuel to enter the groundwater, the soil, or the sewage system.

**Preparatory work**

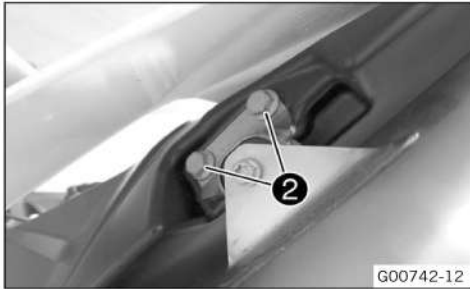
- Switch off the ignition by turning the ignition key to position **OFF** 🔌.
- Remove the seat. (🔧 p. 73)
- Disconnect the battery. (🔧 p. 101)
- Drain the fuel from the fuel tank into a suitable container.

## 12 FUEL TANK, SEAT, TRIM

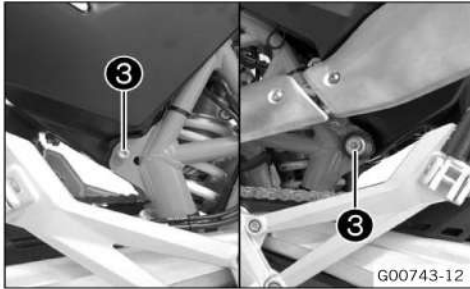


### Main work

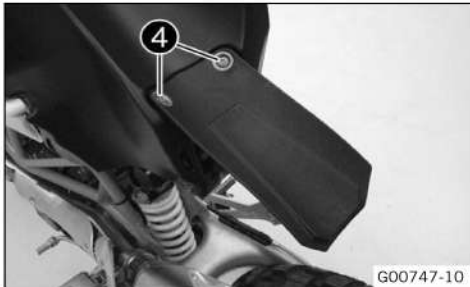
- Remove screws ①.



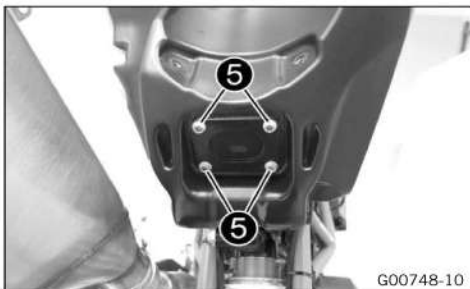
- Lift the rear fairing.
- Remove screws ②.



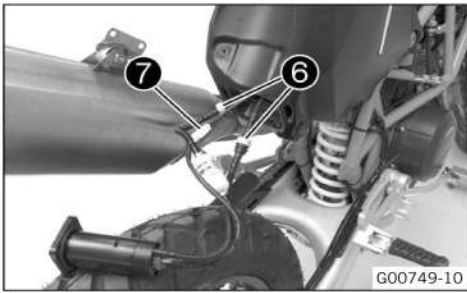
- Remove screws ③ on both sides.
- Swing the rear end upward and secure it.



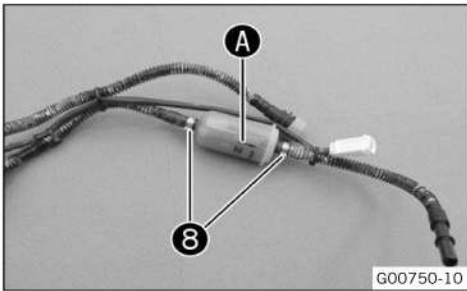
- Remove screws ④ and take off the splash protector.



- Remove screws ⑤.
- Pull out the fuel pump.

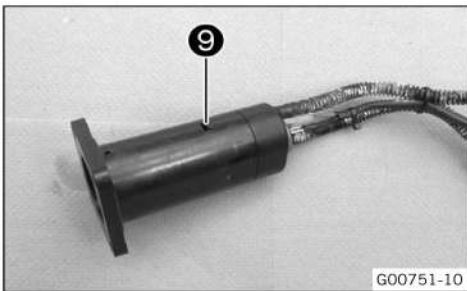


- Disconnect both fuel hose connections ⑥.
- Disconnect plug-in connector ⑦. Remove fuel pump.

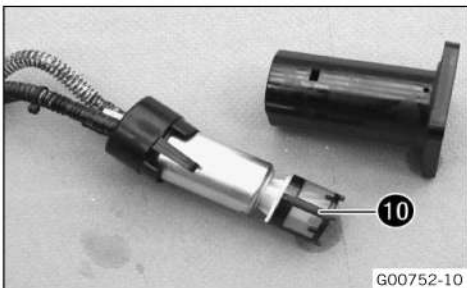


- Remove hose clamps ⑧.
- Remove fuel filter.
- Mount the new fuel filter.
- ✓ Arrow A points away from the fuel pump.
- Mount hose clamps ⑧.

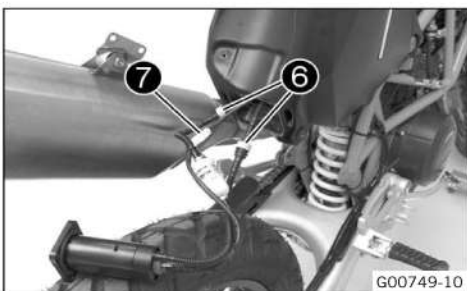
Hose clamp plier (60029057000) (📖 p. 286)



- Press locking mechanism ⑨ on both sides.
- Pull off the fuel pump housing.

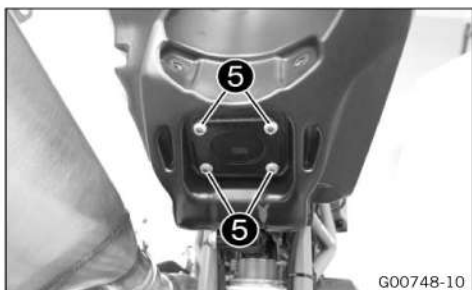


- Change fuel screen ⑩.
- Mount the fuel pump housing.



- Connect both fuel hose connections ⑥.
- Join plug-in connector ⑦.

## 12 FUEL TANK, SEAT, TRIM



- Position the fuel pump.
- Mount and tighten screws **5**.

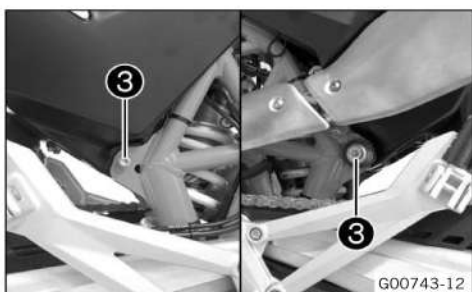
Guideline

|                  |    |                 |
|------------------|----|-----------------|
| Screw, fuel pump | M5 | 4 Nm (3 lbf ft) |
|------------------|----|-----------------|



- Position the splash protector. Mount and tighten screws **4**.
- Guideline

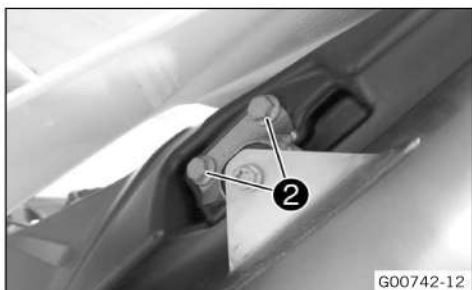
|                           |    |                 |
|---------------------------|----|-----------------|
| Remaining screws, chassis | M5 | 4 Nm (3 lbf ft) |
|---------------------------|----|-----------------|



- Position the rear end.
- Mount and tighten screws **3** on both sides.

Guideline

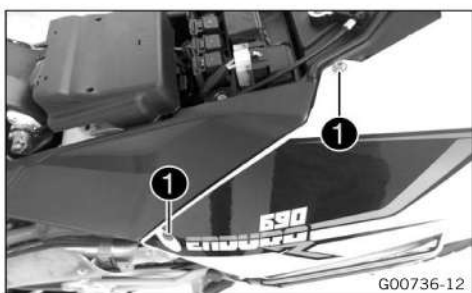
|                          |    |  |
|--------------------------|----|--|
| Screw, fuel tank, bottom | M8 | 25 Nm (18.4 lbf ft)<br><b>Loctite®243™</b> |
|--------------------------|----|--|



- Lift the rear fairing.
- Mount and tighten screws **2**.

Guideline

|  |    |                     |
|--|----|---------------------|
| Screw, main silencer holder on fuel tank | M8 | 25 Nm (18.4 lbf ft) |
|--|----|---------------------|



- Mount and tighten screws **1**.
- Guideline

|                   |    |                   |
|-------------------|----|-------------------|
| Screw, side cover | M6 | 5 Nm (3.7 lbf ft) |
|-------------------|----|-------------------|

### Finishing work

- Disconnect the battery. (📖 p. 101)
- Mount the seat. (📖 p. 73)
- Set the clock. (📖 p. 125)

12.10 Changing the fuel pump



**Danger**

**Fire hazard** Fuel is highly flammable.

The fuel in the fuel tank expands when warm and can escape if overfilled.

- Do not refuel the vehicle in the vicinity of open flames or lit cigarettes.
- Switch off the engine for refueling.
- Make sure that no fuel is spilled; particularly not on hot parts of the vehicle.
- If any fuel is spilled, wipe it off immediately.
- Observe the specifications for refueling.



**Warning**

**Danger of poisoning** Fuel is poisonous and a health hazard.

- Avoid skin, eye and clothing contact with fuel.
- Immediately consult a doctor if you swallow fuel.
- Do not inhale fuel vapors.
- In case of skin contact, rinse the affected area with plenty of water.
- Rinse the eyes thoroughly with water, and consult a doctor in case of fuel contact with the eyes.
- Change your clothing in case of fuel spills on them.
- Keep fuels correctly in a suitable canister, and out of the reach of children.



**Warning**

**Environmental hazard** Improper handling of fuel is a danger to the environment.

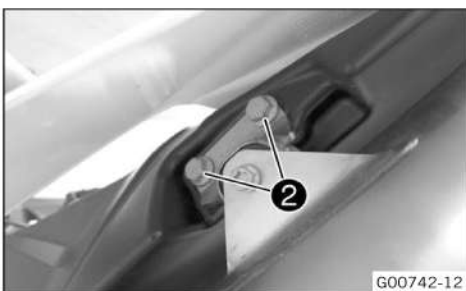
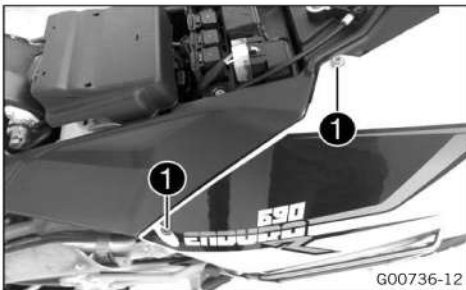
- Do not allow fuel to enter the groundwater, the soil, or the sewage system.

**Preparatory work**

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (📖 p. 73)
- Disconnect the battery. (📖 p. 101)
- Drain the fuel from the fuel tank into a suitable container.

**Main work**

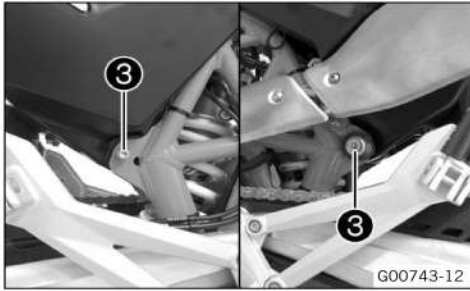
- Remove screws ①.



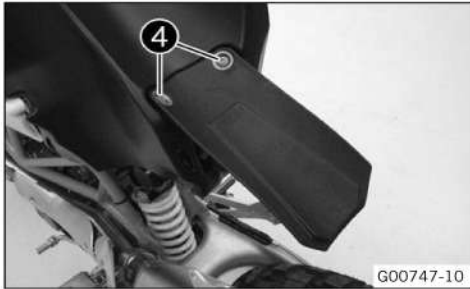
- Lift the rear fairing.
- Remove screws ②.



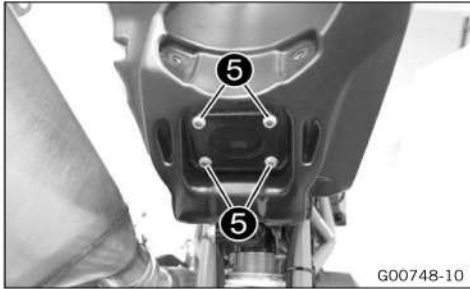
## 12 FUEL TANK, SEAT, TRIM



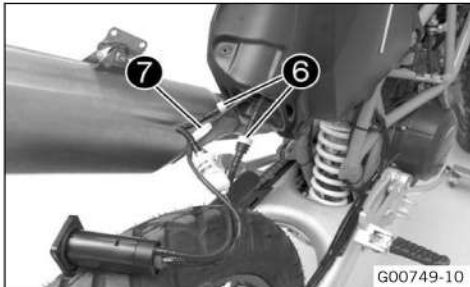
- Remove screws **3** on both sides.
- Swing the rear end upward and secure it.



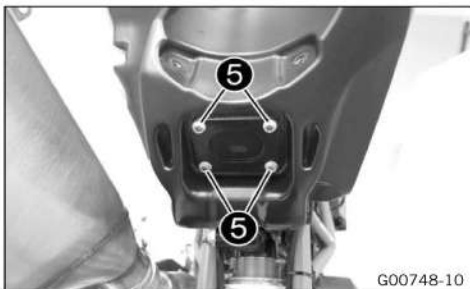
- Remove screws **4** and take off the splash protector.



- Remove screws **5**.
- Pull out the fuel pump.



- Disconnect both fuel hose connections **6**.
- Unplug connector **7**. Remove fuel pump.
- Connect new fuel pump, connecting both fuel hose connections **6**.
- Plug in connector **7**.

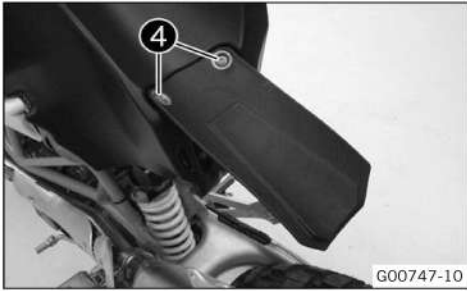


- Position the fuel pump.
- Mount and tighten screws **5**.

### Guideline

|                  |    |                 |
|------------------|----|-----------------|
| Screw, fuel pump | M5 | 4 Nm (3 lbf ft) |
|------------------|----|-----------------|

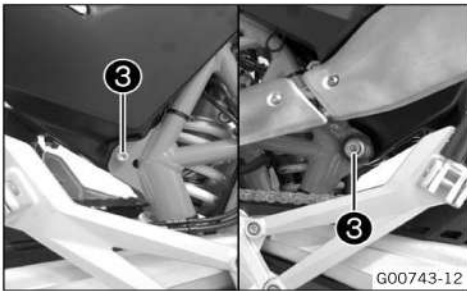




- Position the splash protector. Mount and tighten screws ④.

Guideline

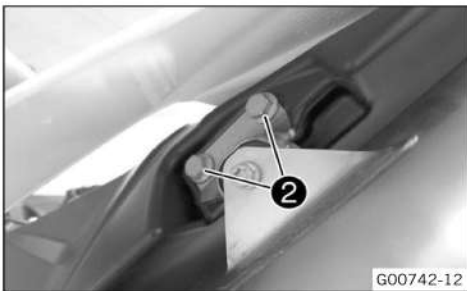
|                           |    |                 |
|---------------------------|----|-----------------|
| Remaining screws, chassis | M5 | 4 Nm (3 lbf ft) |
|---------------------------|----|-----------------|



- Position the rear end.
- Mount and tighten screws ③ on both sides.

Guideline

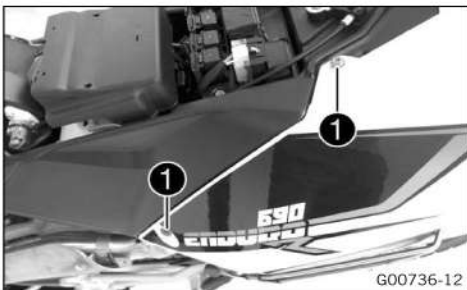
|                          |    |  |
|--------------------------|----|--|
| Screw, fuel tank, bottom | M8 | 25 Nm (18.4 lbf ft)<br><b>Loctite®243™</b> |
|--------------------------|----|--|



- Lift the rear fairing.
- Mount and tighten screws ②.

Guideline

|  |    |                     |
|--|----|---------------------|
| Screw, main silencer holder on fuel tank | M8 | 25 Nm (18.4 lbf ft) |
|--|----|---------------------|



- Mount and tighten screws ①.

Guideline

|                   |    |                   |
|-------------------|----|-------------------|
| Screw, side cover | M6 | 5 Nm (3.7 lbf ft) |
|-------------------|----|-------------------|

### Finishing work

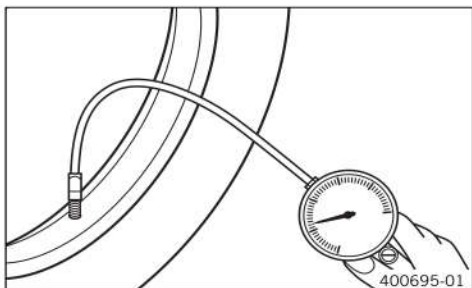
- Disconnect the battery. (📖 p. 101)
- Mount the seat. (📖 p. 73)
- Set the clock. (📖 p. 125)

## 13.1 Checking the tire air pressure



### Info

Low tire air pressure leads to abnormal wear and overheating of the tire. Correct tire air pressure ensures optimal riding comfort and maximum tire service life.



- Remove the protection cap.
- Check the tire air pressure when the tires are cold.

| Tire air pressure, offroad, single rider |                  |
|--|------------------|
| front                                    | 1.5 bar (22 psi) |
| rear                                     | 1.5 bar (22 psi) |

| Tire air pressure, road, solo |                  |
|-------------------------------|------------------|
| front                         | 1.8 bar (26 psi) |
| rear                          | 1.8 bar (26 psi) |

| Tire air pressure with passenger / fully loaded |                  |
|---|------------------|
| front   | 2.2 bar (32 psi) |
| rear  | 2.2 bar (32 psi) |

- » If the tire pressure does not meet specifications:
  - Correct the tire pressure.
- Mount the protection cover.

## 13.2 Checking the tire condition



### Warning

**Danger of accidents** If a tire bursts while riding, the vehicle becomes uncontrollable.

- Ensure that damaged or worn tires are replaced immediately.



### Warning

**Danger of crashing** Different tire tread patterns on the front and rear wheel impair the handling characteristic.

Different tire tread patterns can make the vehicle significantly more difficult to control.

- Make sure that only tires with a similar tire tread pattern are fitted to the front and rear wheel.



### Warning

**Danger of accidents** Non-approved or non-recommended tires and wheels impact the handling characteristic.

- Only use tires/wheels approved by KTM with the corresponding speed index.



### Warning

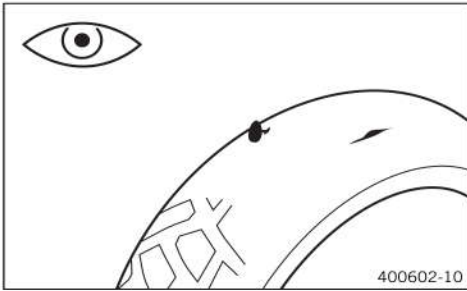
**Danger of accidents** New tires have reduced road grip.

The contact surface on new tires is not yet roughened.

- Run in new tires with moderate riding at alternating angles.
  - Running-in phase 200 km (124 mi)

**i Info**

The type, condition, and air pressure of the tires all have a major impact on the handling of the motorcycle. Worn tires have a negative effect on handling characteristics, especially on wet surfaces.



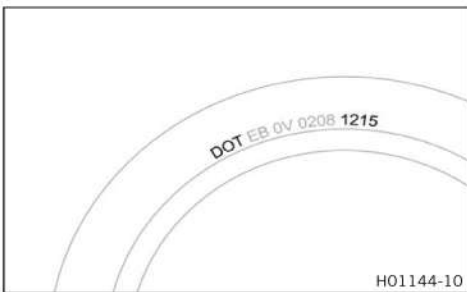
- Check the front and rear tires for cuts, run-in objects, and other damage.
  - » If the tires have cuts, run-in objects, or other damage:
    - Change the tires.
- Check the tread depth.

**i Info**

Adhere to the legally required minimum tread depth.

|                     |                    |
|---------------------|--------------------|
| Minimum tread depth | ≥ 2 mm (≥ 0.08 in) |
|---------------------|--------------------|

- » If the tread depth is less than the minimum tread depth:
  - Change the tires.
- Check the tire age.



**i Info**

The tire date of manufacture is usually contained in the tire label and is indicated by the last four digits of the DOT number. The first two digits indicate the week of manufacture and the last two digits the year of manufacture. KTM recommends that the tires be changed after 5 years at the latest, regardless of the actual state of wear.

- » If the tires are more than 5 years old:
  - Change the tires.

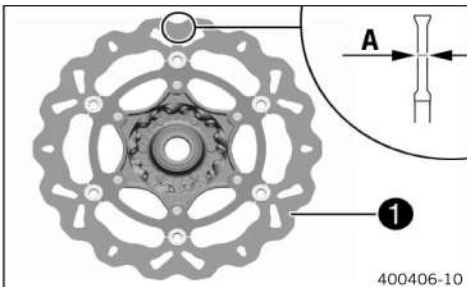
**13.3 Checking the brake discs**



**Warning**

**Danger of accidents** Worn-out brake discs reduce the braking effect.

- Make sure that worn-out brake discs are replaced immediately.



- Check the front and rear brake disc thickness at multiple points for the dimension **A**.

**i Info**

Wear will reduce the thickness of the brake disc at contact surface **1** of the brake linings.

| Brake discs - wear limit |                   |
|--------------------------|-------------------|
| front                    | 4.5 mm (0.177 in) |
| rear                     | 4.5 mm (0.177 in) |

- » If the brake disc thickness is less than the specified value.
  - Change the brake disc.

- Check the front and rear brake discs for damage, cracking, and deformation.
  - » If the brake disc exhibits damage, cracking, or deformation:
    - Change the brake disc.

## 13.4 Checking the spoke tension



### Warning

**Danger of accidents** Incorrectly tensioned spokes impair the handling characteristic and result in secondary damage.

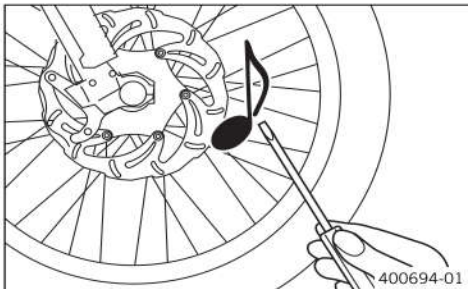
The spokes break due to being overloaded if they are too tightly tensioned. If the tension in the spokes is too low, then lateral and radial run-out will form in the wheel. Other spokes will become looser as a result.

- Check spoke tension regularly, and in particular on a new vehicle.



### Info

A loose spoke causes wheel imbalance and rapidly leads to more loose spokes. If the spokes are too tight, they can break due to local overload. Check the spoke tension regularly, especially on a new motorcycle.



- Briefly strike each spoke with a screwdriver blade.



### Info

The frequency of the tone is a function of the spoke length and spoke diameter. If you hear different tone frequencies from individual spokes of the same length and thickness, this is an indication of different spoke tensions.

You should hear a high note.

- » If the spoke tensions differ:
  - Correct the spoke tension.

## 13.5 Checking the rim run-out



### Warning

**Danger of accidents** Incorrectly tensioned spokes impair the handling characteristic and result in secondary damage.

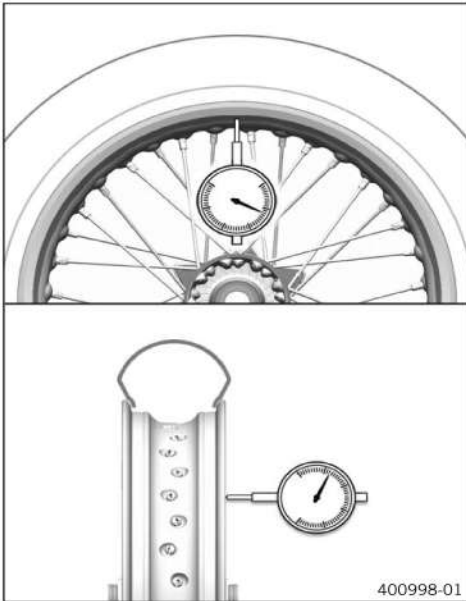
The spokes break due to being overloaded if they are too tightly tensioned. If the tension in the spokes is too low, then lateral and radial run-out will form in the wheel. Other spokes will become looser as a result.

- Check spoke tension regularly, and in particular on a new vehicle.



**i Info**

A loose spoke can cause wheel imbalance, which leads to more loose spokes in a short time. If the spokes are too tight, they can break due to local overload. Check the spoke tension regularly, especially on a new motorcycle.



- Check the axial run-out and radial run-out of the rim.

| Axial run-out            |                       |
|--------------------------|-----------------------|
| outside of the rim joint | < 1.8 mm (< 0.071 in) |

| Radial run-out           |                       |
|--------------------------|-----------------------|
| outside of the rim joint | < 1.8 mm (< 0.071 in) |

- » If the measured value is greater than the specified value:
  - Center the rim.

**i Info**

Center the rim by tightening the spoke nipple on the opposite side of the rim run-out. Change the rim if it is excessively deformed.

- Correct the spoke tension.

## 13.6 Front wheel

### 13.6.1 Removing the front wheel

**Preparatory work**

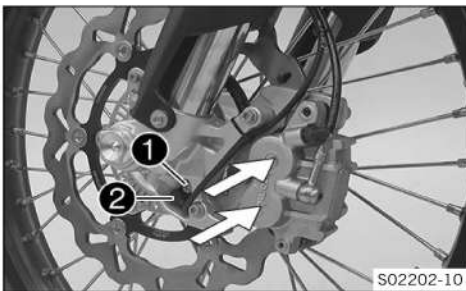
- Raise the motorcycle with a lift stand. (p. 12)

**Main work**

- Press the brake caliper onto the brake disc by hand in order to push back the brake pistons.

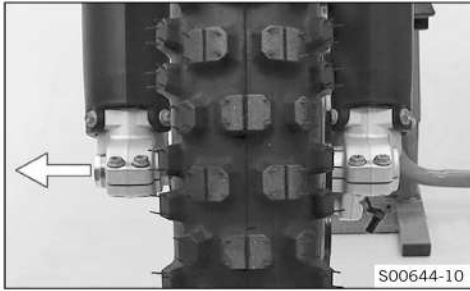
**i Info**

Make sure when pushing back the brake pistons that you do not press the brake caliper against the spokes.



- Remove screw **1** and pull wheel speed sensor **2** out of the hole.
- Loosen screw **3** by several rotations.
- Loosen screws **4**.
- Press on screw **3** to push the wheel spindle out of the axle clamp.
- Remove screw **3**.





### Warning

**Danger of accidents** Damaged brake discs reduce the braking effect.

- Always lay the wheel down in such a way that the brake disc is not damaged.

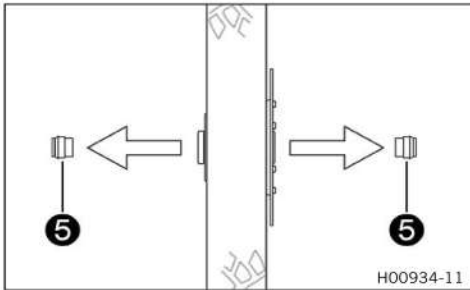
- Holding the front wheel, withdraw the wheel spindle. Take the front wheel out of the fork.



### Info

Do not pull the hand brake lever when the front wheel is removed.

- Remove spacers ⑤.



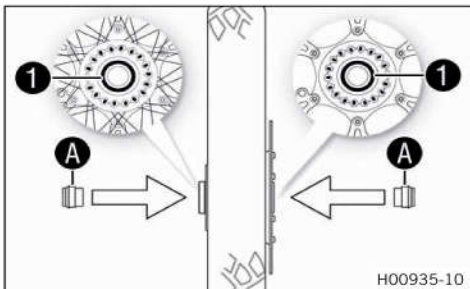
## 13.6.2 Installing the front wheel



### Warning

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

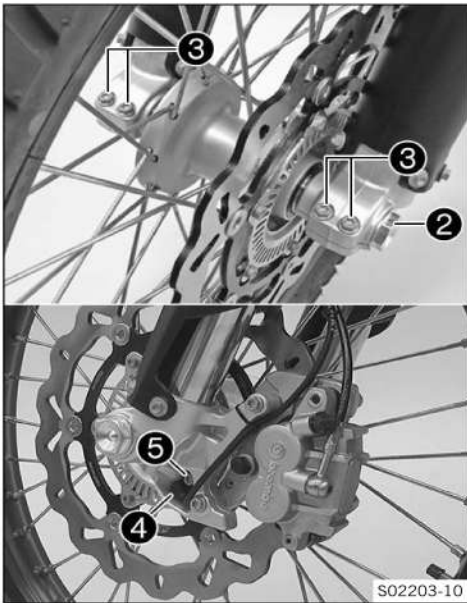
- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.



- Check the wheel bearing for damage and wear.
  - » If the wheel bearing is damaged or worn:
    - Replace the wheel bearing.
- Clean and grease shaft seal rings ① and contact surface A of the spacers.

Long-life grease (📖 p. 280)

- Insert the spacers.



- Clean and grease the wheel spindle.

Long-life grease (📖 p. 280)

- Jack up the front wheel into the fork, position it, and insert the wheel spindle.
  - ✓ The brake linings are correctly positioned.
- Mount and tighten screw 2.

Guideline

|                            |         |                     |
|----------------------------|---------|---------------------|
| Screw, front wheel spindle | M24x1.5 | 45 Nm (33.2 lbf ft) |
|----------------------------|---------|---------------------|

- Operate the hand brake lever several times until the brake linings are seated correctly against the brake disc.
- Remove the motorcycle from the lift stand. (📖 p. 12)
- Operate the front brake and compress the fork a few times firmly.
  - ✓ The fork legs straighten.
- Tighten screws 3.

Guideline

|                  |    |                     |
|------------------|----|---------------------|
| Screw, fork stub | M8 | 15 Nm (11.1 lbf ft) |
|------------------|----|---------------------|

- Position wheel speed sensor 4 in the drill hole. Mount and tighten screw 5.

Guideline

|                           |    |                   |
|---------------------------|----|-------------------|
| Screw, wheel speed sensor | M6 | 6 Nm (4.4 lbf ft) |
|---------------------------|----|-------------------|

### 13.6.3 Changing the front brake disc

**i** Info

If the brake discs are changed, the brake linings must also be changed.

**Preparatory work**

- Raise the motorcycle with a lift stand. (📖 p. 12)
- Remove the front wheel. (📖 p. 87)

**Main work**

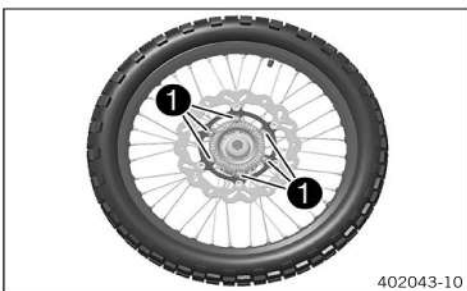
- Remove screws 1. Take off the brake disc with the ABS sensor wheel.
- Clean the contact surface of the brake disc.
- Position the new brake disc with the label facing outward.
- Position the ABS sensor wheel.
  - ✓ The lettering on the ABS sensor wheel is located on the outside.
- Mount and tighten screws 1.

Guideline

|                         |    |  |
|-------------------------|----|--|
| Screw, front brake disc | M6 | 14 Nm (10.3 lbf ft)<br><b>Loctite®243™</b> |
|-------------------------|----|--|

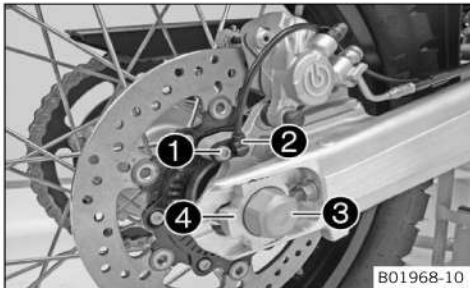
**Finishing work**

- Install the front wheel. (📖 p. 88)



## 13.7 Rear wheel

### 13.7.1 Removing the rear wheel



#### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)

#### Main work

- Remove screw ❶ and pull wheel speed sensor ❷ out of the hole.
- Press the brake caliper onto the brake disc by hand in order to push back the brake piston.
- Remove nut ❸. Remove chain adjuster ❹.

#### Info

Cover the components to protect them against damage.

- Holding the rear wheel, withdraw wheel spindle ❺.

- Push the rear wheel forward as far as possible and take the chain off the rear sprocket.



#### Warning

**Danger of accidents** Damaged brake discs reduce the braking effect.

- Always lay the wheel down in such a way that the brake disc is not damaged.

- Take the rear wheel out of the swingarm.

#### Info

Do not operate the foot brake when the rear wheel is removed.

### 13.7.2 Installing the rear wheel



#### Warning

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

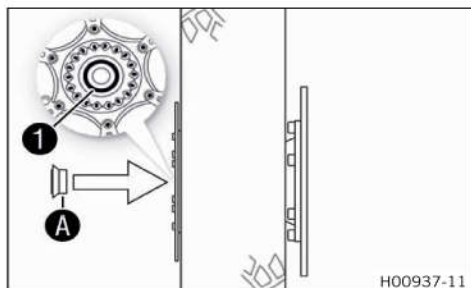
- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.



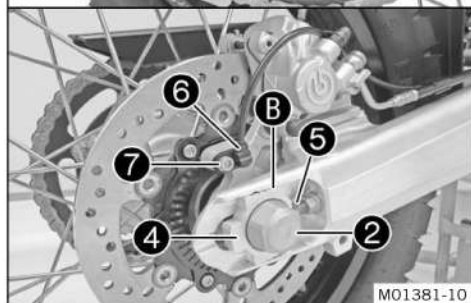
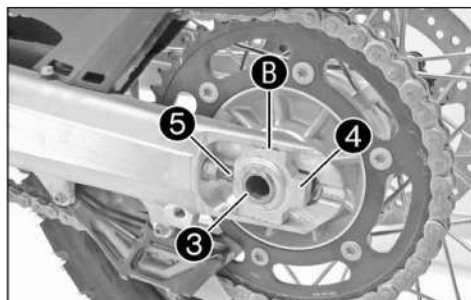
### Warning

**Danger of accidents** There is no braking effect to start with at the rear brake after installing the rear wheel.

- Actuate the foot brake several times before going on a ride until you can feel a firm pressure point.



H00937-11



M01381-10

### Main work

- Check the rear hub rubber dampers. (📖 p. 97)
- Check the wheel bearing for damage and wear.
  - » If the wheel bearing is damaged or worn:
    - Replace the wheel bearing.
- Remove spacer.
- Clean and grease shaft seal ring **1** and contact surface **A** of the spacer.

|                             |
|-----------------------------|
| Long-life grease (📖 p. 280) |
|-----------------------------|

- Insert the spacer.
- Clean and grease the thread of the wheel spindle and nut **2**.

|                             |
|-----------------------------|
| Long-life grease (📖 p. 280) |
|-----------------------------|

- Clean and grease the wheel spindle.

|                             |
|-----------------------------|
| Long-life grease (📖 p. 280) |
|-----------------------------|

- Mount the rubber damper and rear sprocket carrier in the rear wheel.
- Position the rear wheel.
  - ✓ The brake linings are correctly positioned.
- Push the rear wheel forward as far as possible and lay the chain on the rear sprocket.
- Mount wheel spindle **3** and chain adjuster **4**. Mount nut **2**, but do not tighten it yet.
- Make sure that chain adjusters **4** are fitted correctly on adjusting screws **5**.
- Make sure that the markings on the left and right chain adjusters are in the same position relative to reference marks **B**. The rear wheel is then correctly aligned.
- Tighten nut **2**.

#### Guideline

|                         |         |                     |
|-------------------------|---------|---------------------|
| Nut, rear wheel spindle | M25x1.5 | 90 Nm (66.4 lbf ft) |
|-------------------------|---------|---------------------|

- Position wheel speed sensor **6** in the drill hole. Mount and tighten screw **7**.

#### Guideline

|                           |    |                   |
|---------------------------|----|-------------------|
| Screw, wheel speed sensor | M6 | 6 Nm (4.4 lbf ft) |
|---------------------------|----|-------------------|

- Operate the foot brake lever repeatedly until the brake linings are in contact with the brake disc and there is a pressure point.

### Finishing work

- Remove the motorcycle from the lift stand. (📖 p. 12)



- Check the chain tension. (📖 p. 92)

## 13.7.3 Changing the rear brake disc



### Info

If the brake discs are changed, the brake linings must also be changed.



402045-10

### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)
- Remove the rear wheel. (📖 p. 90)

### Main work

- Remove screws **1**. Take off the brake disc with the ABS sensor wheel.
- Clean the contact surface of the brake disc.
- Position the new brake disc with the label facing outward.
- Position the ABS sensor wheel.
  - ✓ The lettering on the ABS sensor wheel is located on the outside.
- Mount and tighten screws **1**.

### Guideline

|                        |    |  |
|------------------------|----|--|
| Screw, rear brake disc | M6 | 14 Nm (10.3 lbf ft)<br><b>Loctite®243™</b> |
|------------------------|----|--|

### Finishing work

- Install the rear wheel. (📖 p. 90)
- Remove the motorcycle from the lift stand. (📖 p. 12)
- Check the chain tension. (📖 p. 92)

## 13.7.4 Checking the chain tension



### Warning

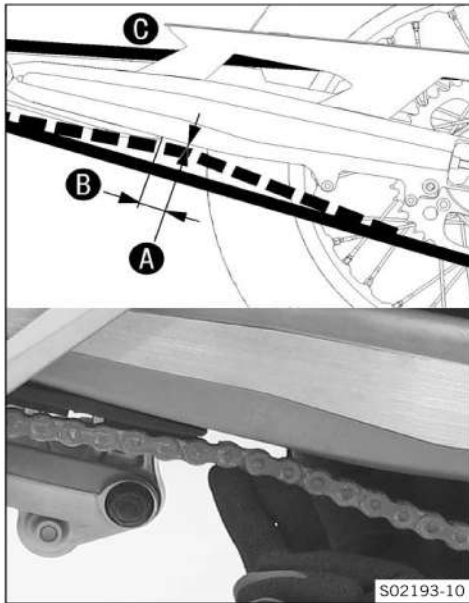
**Danger of accidents** Incorrect chain tension damages components and results in accidents.

If the chain is tensioned too much, the chain, engine sprocket, rear sprocket, transmission and rear wheel bearings wear more quickly. Some components may break if overloaded.

If the chain is too loose, the chain may fall off the engine sprocket or the rear sprocket. As a result, the rear wheel locks or the engine will be damaged.

- Check the chain tension regularly.
- Set the chain tension in accordance with the specification.





- Lean the motorcycle on the side stand.
- Shift gear to neutral.
- Push the chain upward at a distance **B** from the chain sliding guard and determine the chain tension **A**.

**i Info**  
 The upper chain section **C** must be taut.  
 Chain wear is not always even. Repeat this measurement at different chain positions.

|               |               |
|---------------|---------------|
| Chain tension | 5 mm (0.2 in) |
|---------------|---------------|

|                                 |                 |
|---------------------------------|-----------------|
| Distance to chain sliding guard | 30 mm (1.18 in) |
|---------------------------------|-----------------|

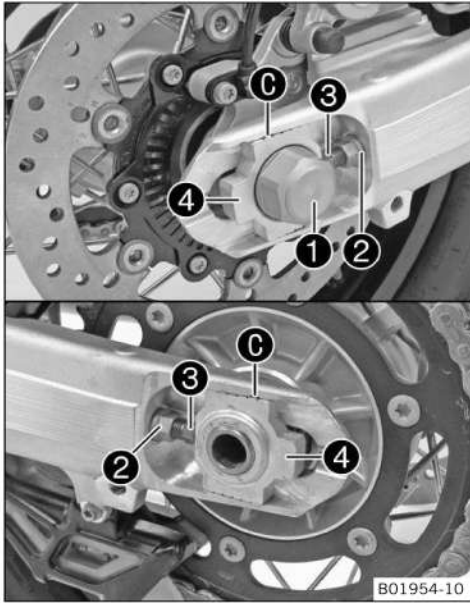
- » If the chain tension does not meet specifications:
  - Adjust the chain tension. (🔧 p. 93)

### 13.7.5 Adjusting the chain tension

**⚠ Warning**  
**Danger of accidents** Incorrect chain tension damages components and results in accidents.  
 If the chain is tensioned too much, the chain, engine sprocket, rear sprocket, transmission and rear wheel bearings wear more quickly. Some components may break if overloaded.  
 If the chain is too loose, the chain may fall off the engine sprocket or the rear sprocket. As a result, the rear wheel locks or the engine will be damaged.

- Check the chain tension regularly.
- Set the chain tension in accordance with the specification.

- Preparatory work**
- Check the chain tension. (🔧 p. 92)



### Main work

- Loosen nut ①.
- Loosen nuts ②.
- Adjust the chain tension by turning adjusting screws ③ on the left and right.

### Guideline

|  |               |
|--|---------------|
| Chain tension  | 5 mm (0.2 in) |
| Turn adjusting screws ③ on the left and right so that the markings on the left and right chain adjusters ④ are in the same position relative to reference marks ①. The rear wheel is then correctly aligned. |               |

### Info

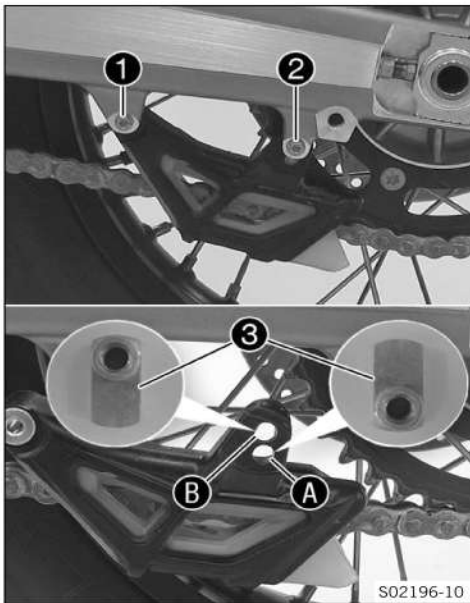
The upper chain section must be taut. Chain wear is not always even. Repeat this measurement at different chain positions.

- Tighten nuts ②.
- Make sure that the chain adjusters ④ are installed correctly on adjusting screws ③.

### Guideline

|                         |         |                     |
|-------------------------|---------|---------------------|
| Nut, rear wheel spindle | M25x1.5 | 90 Nm (66.4 lbf ft) |
|-------------------------|---------|---------------------|

## 13.7.6 Adjusting chain guide



- Remove screws ① and ②. Take off the chain guide.

### Condition

Number of teeth: ≤ 44 teeth

- Insert nut ③ in hole ①. Position the chain guide.
- Mount and tighten screws ① and ②.

### Guideline

|                    |    |                   |
|--------------------|----|-------------------|
| Screw, chain guide | M6 | 8 Nm (5.9 lbf ft) |
|--------------------|----|-------------------|

### Condition

Number of teeth: ≥ 45 teeth

- Insert nut ③ in hole ②. Position the chain guide.
- Mount and tighten screws ① and ②.

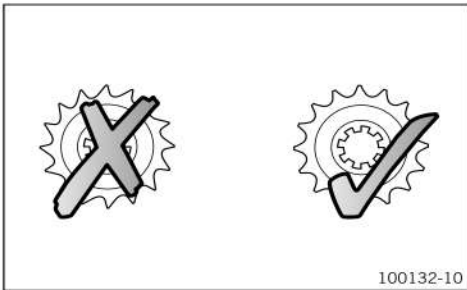
### Guideline

|                    |    |                   |
|--------------------|----|-------------------|
| Screw, chain guide | M6 | 8 Nm (5.9 lbf ft) |
|--------------------|----|-------------------|

## 13.7.7 Checking the chain, rear sprocket, engine sprocket, and chain guide

### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)

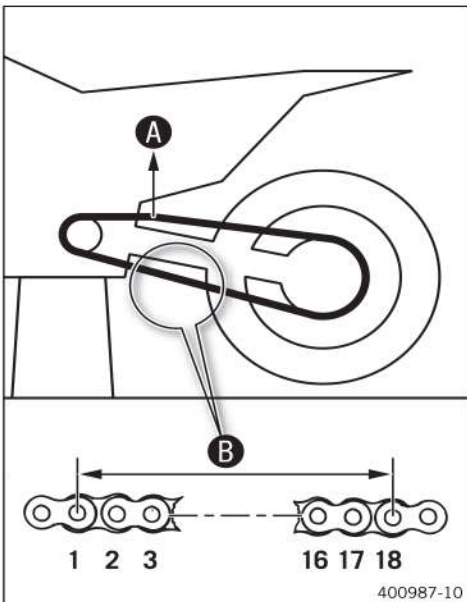


### Main work

- Shift the transmission to idle.
- Check the rear sprocket and engine sprocket for wear.
  - » If the rear sprocket or engine sprocket is worn:
    - Change the power set.

### **i** Info

The engine sprocket, rear sprocket, and chain should always be replaced together.



- Pull at the top part of the chain with the specified weight **A**.  
Guideline

|                                  |                |
|----------------------------------|----------------|
| Weight of chain wear measurement | 15 kg (33 lb.) |
|----------------------------------|----------------|

- Measure distance **B** of 18 chain rollers in the lower chain section.

### **i** Info

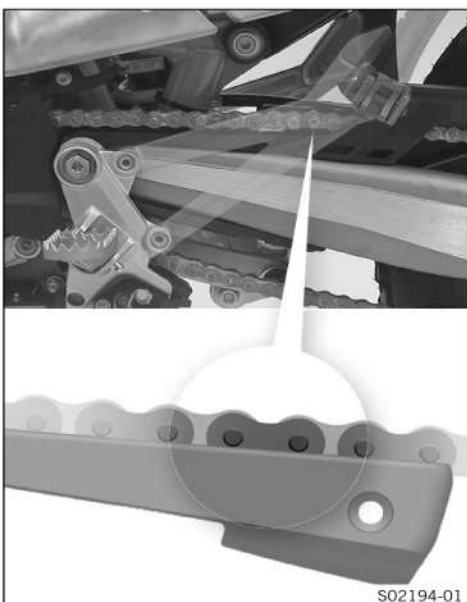
Chain wear is not always even, so you should repeat this measurement at different chain positions.

|  |                   |
|--|-------------------|
| Maximum distance <b>B</b> at the longest chain section | 272 mm (10.71 in) |
|--|-------------------|

- » If the distance **B** is greater than the specified measurement:
  - Change the power set.

### **i** Info

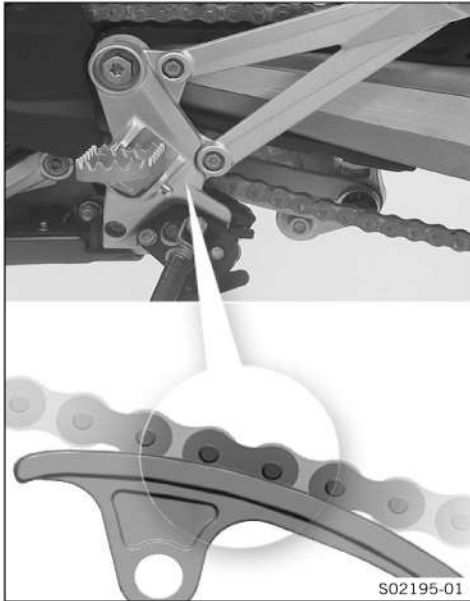
When the chain is replaced, the rear sprocket and engine sprocket should also be changed. New chains wear out faster on an old, worn rear sprocket or engine sprocket.



- Check the chain sliding guard for wear.
  - » If the lower edge of the chain pins is in line with or below the chain sliding guard:
    - Replace the chain sliding guard.
- Check that the chain sliding guard is firmly seated.
  - » If the chain sliding guard is loose:
    - Tighten the screws on the chain sliding guard.

### Guideline

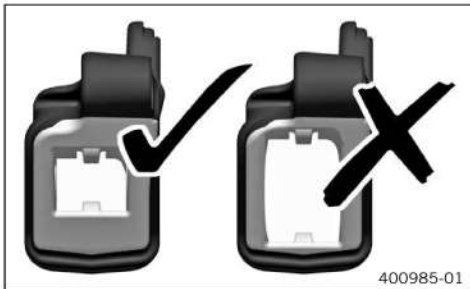
|                            |    |  |
|----------------------------|----|--|
| Screw, chain sliding guard | M6 | 8 Nm (5.9 lbf ft)<br><b>Loctite®243™</b> |
|----------------------------|----|--|



- Check the chain sliding piece for wear.
  - » If the lower edge of the chain pins is in line with or below the chain sliding piece:
    - Change the chain sliding piece.
- Check that the chain sliding piece is firmly seated.
  - » If the chain sliding piece is loose:
    - Tighten the screw on the chain sliding piece.

**Guideline**

|                            |    |                        |
|----------------------------|----|------------------------|
| Screw, chain sliding piece | M8 | 15 Nm<br>(11.1 lbf ft) |
|----------------------------|----|------------------------|



- Check the chain guide for wear.

**i Info**

Wear can be seen on the front of the chain guide.

- » If the light part of the chain guide is worn:
  - Change the chain guide.



- Check that the chain guide is firmly seated.
  - » If the chain guide is loose:
    - Tighten the screws on the chain guide.

**Guideline**

|                           |    |                       |
|---------------------------|----|-----------------------|
| Remaining screws, chassis | M6 | 10 Nm<br>(7.4 lbf ft) |
|---------------------------|----|-----------------------|

**Finishing work**

- Remove the motorcycle from the lift stand. (📖 p. 12)

## 13.7.8 Cleaning the chain



**Warning**

**Danger of accidents** Oil or grease on the tires reduces the road grip.

- Remove the lubricant from the tires using a suitable cleaning agent.





## Warning

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.



## Warning

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.



## Info

The service life of the chain depends largely on its maintenance.



### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)

### Main work

- Rinse off loose dirt with a soft jet of water.
- Remove old grease residue with chain cleaner.

Chain cleaner (📖 p. 280)

- After drying, apply chain spray.

Off-road chain spray (📖 p. 280)

### Finishing work

- Remove the motorcycle from the lift stand. (📖 p. 12)



## 13.7.9 Checking the rear hub rubber dampers



## Info

The engine power is transmitted from the rear sprocket to the rear wheel via 6 rubber dampers. They eventually wear out during operation. If the rubber dampers are not changed in time, the rear sprocket carrier and the rear hub become damaged.

### Preparatory work

- Raise the motorcycle with a lift stand. (📖 p. 12)
- Remove the rear wheel. (📖 p. 90)

### Main work

- Check bearing ①.
  - » If the bearing is damaged or worn:
    - Replace the bearings.
- Check rubber dampers ② of the rear hub for damage and wear.
  - » If the rubber dampers of the rear hub are damaged or worn:
    - Change all rubber dampers in the rear hub.







- Lay the rear wheel on a workbench with the rear sprocket facing upwards and insert the wheel spindle in the hub.
- To check play **A**, hold the rear wheel tight and try to turn the rear sprocket with your hand.

**Info**

Measure the play on the outside of the rear sprocket.

|                                    |                   |
|------------------------------------|-------------------|
| Play in rubber dampers, rear wheel | ≤ 5 mm (≤ 0.2 in) |
|------------------------------------|-------------------|

- » If clearance **A** larger than the specified value:
  - Change all rubber dampers in the rear hub.

**Finishing work**

- Install the rear wheel. (📖 p. 90)
- Remove the motorcycle from the lift stand. (📖 p. 12)
- Check the chain tension. (📖 p. 92)



## 14.1 Removing the battery

**Warning**

**Risk of injury** Battery acid and battery gases cause serious chemical burns.

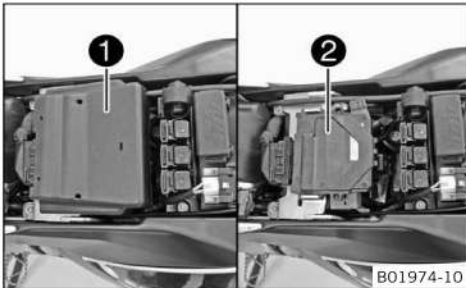
- Keep batteries out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Avoid contact with battery acid and battery gases.
- Keep sparks or open flames away from the battery.
- Only charge batteries in well-ventilated rooms.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes with water for at least 15 minutes and consult a doctor immediately if battery acid and battery gases get into the eyes.

**Preparatory work**

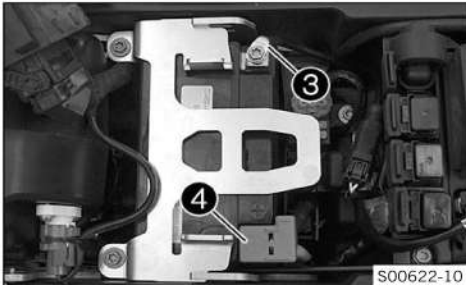
- Switch off the ignition by turning the ignition key to position **OFF** .
- Remove the seat. ( p. 73)

**Main work**

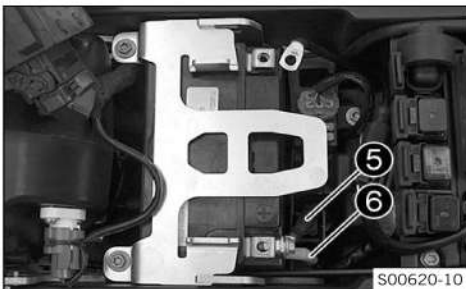
- Remove battery cover **1**.
- Pull engine electronics control unit **2** off of the holder and set it to one side.

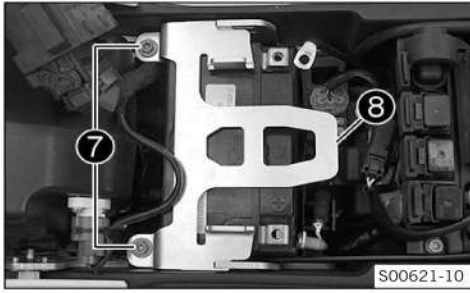


- Disconnect negative cable **3** from the battery.
- Take off positive terminal cover **4**.



- Disconnect ABS connection cable **5** and positive cable **6** from the battery.





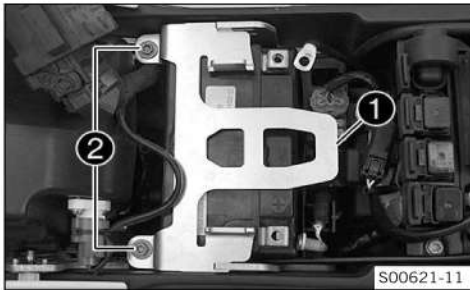
- Remove screws 7.
- Pull retaining bracket 8 of the battery forward and remove it.
- Lift the battery up and out.



**Info**

Never operate the motorcycle with a discharged battery or without a battery. In both cases, electrical components and safety devices can be damaged. The vehicle will therefore no longer be roadworthy.

## 14.2 Installing the battery



**Main work**

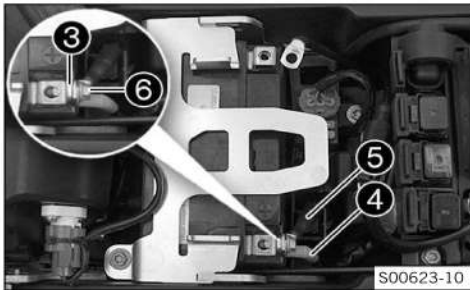
- Insert the battery into the battery compartment with the terminals facing rearward.

Battery (YTZ10S) (p. 243)

- Position retaining bracket 1 and mount and tighten screws 2.

**Guideline**

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|

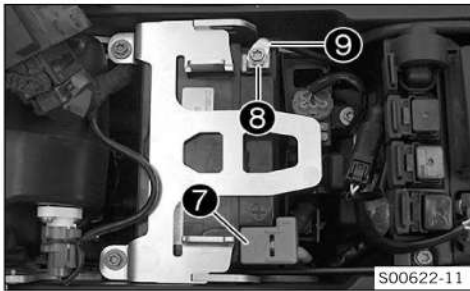


- Position washer 3, positive cable 4, and ABS connection cable 5.

- Mount and tighten screw 6.

**Guideline**

|                         |    |                      |
|-------------------------|----|----------------------|
| Screw, battery terminal | M6 | 4.5 Nm (3.32 lbf ft) |
|-------------------------|----|----------------------|

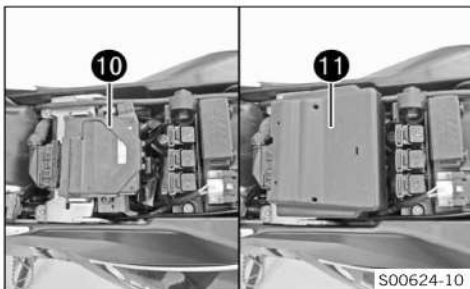


- Position positive terminal cover 7.

- Position washer 8 and negative cable 9, and mount and tighten the screw.

**Guideline**

|                         |    |                      |
|-------------------------|----|----------------------|
| Screw, battery terminal | M6 | 4.5 Nm (3.32 lbf ft) |
|-------------------------|----|----------------------|



- Position the engine electronics control unit 10.

- Mount battery cover 11.

### Finishing work

- Mount the seat. (📖 p. 73)
- Set the clock. (📖 p. 125)



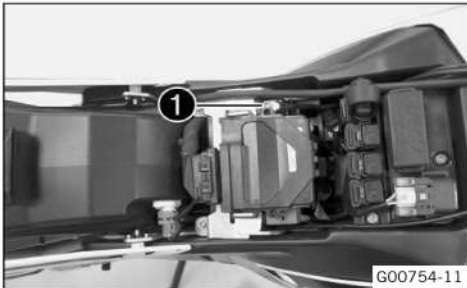
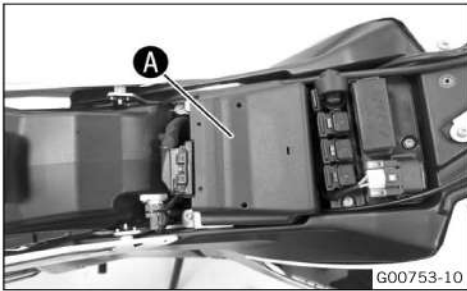
## 14.3 Disconnecting the battery

### Preparatory work

- Switch off the ignition by turning the ignition key to position **OFF** 🔓.
- Remove the seat. (📖 p. 73)

### Main work

- Remove battery cover **A**.



- Disconnect negative cable **1** of the battery.

### **i** Info

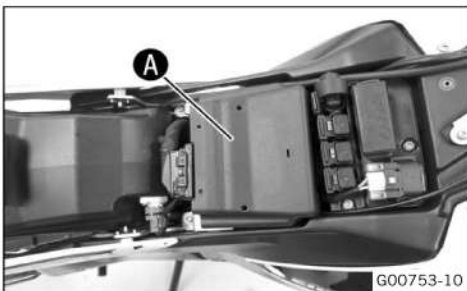
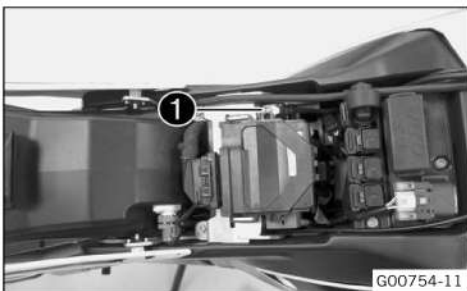
Never operate the motorcycle with a discharged battery or without a battery. In both cases, electrical components and safety devices can be damaged. The vehicle will therefore no longer be roadworthy.



## 14.4 Connecting the battery

### Main work

- Reconnect minus cable **1**.



- Position battery cover **A**.



## Finishing work

- Mount the seat. (📖 p. 73)
- Set the clock. (📖 p. 125)

## 14.5 Recharging the battery



### Warning

**Risk of injury** Battery acid and battery gases cause serious chemical burns.

- Keep batteries out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Avoid contact with battery acid and battery gases.
- Keep sparks or open flames away from the battery.
- Only charge batteries in well-ventilated rooms.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes with water for at least 15 minutes and consult a doctor immediately if battery acid and battery gases get into the eyes.



### Warning

**Environmental hazard** Batteries contain environmentally-hazardous materials.

- Do not dispose of batteries as household waste.
- Dispose of batteries at a collection point for used batteries.



### Warning

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.



### Info

Even when there is no load on the battery, it discharges steadily.

The charging level and the method of charging are very important for the service life of the battery.

Rapid recharging with a high charging current shortens the service life of the battery.

If the charging current, charging voltage, and charging time are exceeded, the battery will be destroyed.

If the battery is depleted from starting the vehicle repeatedly, the battery must be charged immediately.

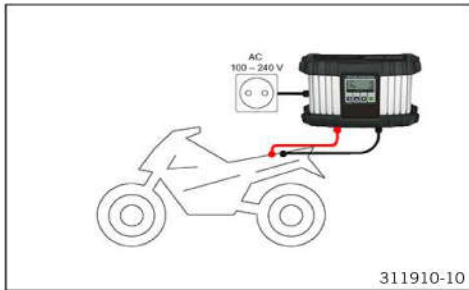
If the battery is left in a discharged state for an extended period, it will become over-discharged and sulfated, destroying the battery.

The battery is maintenance-free, i.e., the acid level does not have to be checked.

## Preparatory work

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (📖 p. 73)
- Disconnect the battery. (📖 p. 101)





### Main work

- Connect the battery charger to the battery. Switch on the battery charger.

EU battery charger **XCharge-professional** (00029095050) (📖 p. 282)

### Alternative 1

US battery charger **XCharge-professional** (00029095051) (📖 p. 283)

### Alternative 2

UK battery charger **XCharge-professional** (00029095052) (📖 p. 283)

### Alternative 3

CH battery charger **XCharge-professional** (00029095053) (📖 p. 283)



### Info

Follow the charger's instructions exactly.

- Disconnect the battery charger after charging the battery.

### Guideline

The charging current, charging voltage, and charging time must not be exceeded.

|  |          |
|--|----------|
| Charge the battery regularly when the motorcycle is not in use | 3 months |
|--|----------|

### Finishing work

- Disconnect the battery. (📖 p. 101)
- Mount the seat. (📖 p. 73)
- Set the clock. (📖 p. 125)

## 14.6 Checking the charging voltage

### Condition

The battery must be fully functional and completely charged.

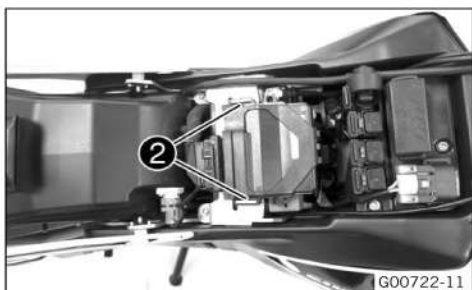
### Preparatory work

- Remove the seat. (📖 p. 73)

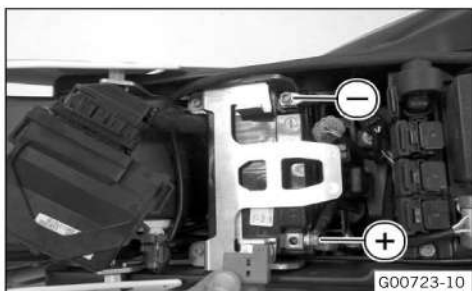
### Main work

- Remove battery cover ❶.





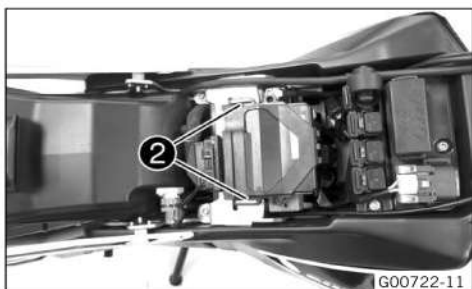
- Pull off the engine electronics control unit in area ② and hang it to one side.
- Take off the terminal cover.
- Start the motorcycle to check the function. (📖 p. 14)



- **V** Measure the voltage between the specified points.  
Measuring point **Plus (+)** – Measuring point **Ground (-)**

| Charging voltage |                 |
|------------------|-----------------|
| 5,000 rpm        | 13.5 ... 15.0 V |

- » If the displayed value is less than the specified value:
  - Check the plug-in connections from the alternator to the voltage regulator.
  - Check the plug-in connections from the voltage regulator to the wiring harness.
  - Check the stator winding of the alternator. (📖 p. 232)
- » If the displayed value is greater than the specified value:
  - Change the voltage regulator.



- Position the terminal cover.
- Mount the engine electronics control unit in area ②.



- Mount battery cover ①.

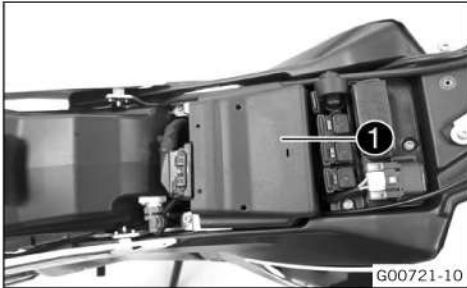
### Finishing work

- Mount the seat. (📖 p. 73)

## 14.7 Checking the open-circuit current

### Preparatory work

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (📖 p. 73)



### Main work

- Remove cover ①.



- Disconnect the negative cable of the battery.
- Measure the current between battery ground (-) and the negative cable.



### Info

The value of the open-circuit current only applies to vehicles in their original state without additional power consumers.

|                              |          |
|------------------------------|----------|
| Maximum open-circuit current | < 1.0 mA |
|------------------------------|----------|

- » If the measured value is greater than the specified value:
  - Disconnect the voltage regulator from the wiring harness and perform the measurement again.



- Mount cover ①.

### Finishing work

- Mount the seat. (📖 p. 73)

## 14.8 Changing the main fuse



### Warning

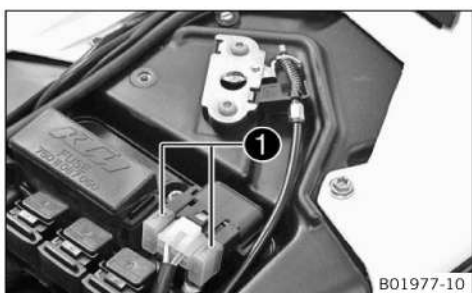
**Fire hazard** Incorrect fuses overload the electrical system.

- Only use fuses with the required ampere value.
- Do not bypass or repair fuses.

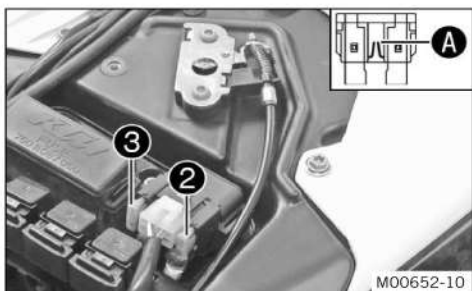


### Info

The main fuse protects all power consumers of the vehicle. It is in the housing of the starter relay next to the battery.



B01977-10



M00652-10

### Preparatory work

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (📖 p. 73)

### Main work

- Take off protection caps ❶.

- Remove a defective main fuse ❷ with needle nose pliers.



### Info

A defective fuse is indicated by a burned-out fuse wire **A**.

A spare fuse **3** is located in the starter relay.

- Install a new main fuse.

Fuse (58011109130) (📖 p. 243)



### Info

Insert a new spare fuse into the starter relay to have it available when needed.

- Check that the electrical equipment is functioning properly.
- Mount the protection caps.

### Finishing work

- Mount the seat. (📖 p. 73)
- Set the clock. (📖 p. 125)

## 14.9 Changing the fuses of individual power consumers

### **i** Info

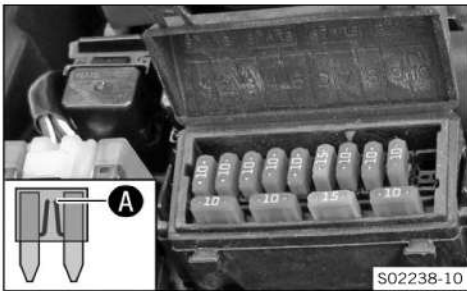
The fuse box containing the fuses of individual power consumers is located under the seat.

### Preparatory work

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (📖 p. 73)

### Main work

- Open fuse box cover **1**.



- Remove the faulty fuse.

### Guideline

|   |
|---|
| Fuse <b>1</b> - 10 A - ignition   |
| Fuse <b>2</b> - 10 A - ignition, combination instrument, engine electronics control unit, lambda sensor |
| Fuse <b>3</b> - 10 A - fuel pump  |
| Fuse <b>4</b> - 10 A - radiator fan   |
| Fuse <b>5</b> - 10 A - horn, brake light, turn signal   |
| Fuse <b>6</b> - 15 A - high beam, low beam, parking light, tail light, license plate lamp               |
| Fuse <b>7</b> - 10 A - for auxiliary equipment (permanent positive)                                     |
| Fuse <b>8</b> - 10 A - for auxiliary equipment (accessories connected with ignition switch)             |
| Fuse <b>9</b> - 10 A - ABS  |
| Fuse <b>10</b> - not assigned   |
| Fuse <b>SPARE</b> - 10 A/15 A - spare fuses   |

### **i** Info

You can recognize a faulty fuse by a burned-out fuse wire **A**.



### Warning

**Fire hazard** Incorrect fuses overload the electrical system.

- Only use fuses with the required ampere value.
- Do not bypass or repair fuses.

- Use spare fuses with the correct rating only.

Fuse (75011088010) (📖 p. 243)



Fuse (75011088015) (📖 p. 243)



### Tip

Replace the spare fuse in the fuse box so that it is available if needed.

- Check that the power consumer is functioning properly.
- Close the fuse box cover.

### Finishing work

- Mount the seat. (📖 p. 73)

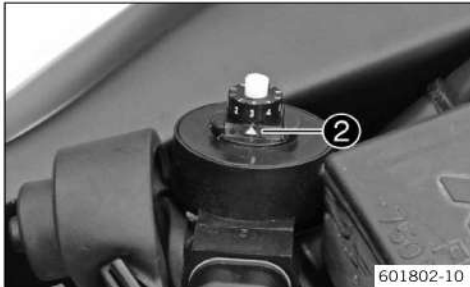
## 14.10 Adjusting the engine characteristic

### Preparatory work

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (📖 p. 73)

### Main work

- Pull the **Map-Select** switch and holder ❶ upward off of the retaining bracket.
- Pull the **Map-Select** switch out of the holder.



- Turn the adjusting wheel until the desired digit is next to marking ❷.

### Set the Map-Select switch to Soft.

- Set the adjusting wheel to position 1.
  - ✓ Soft – reduced homologated peak performance for better driveability.

### Set the Map-Select switch to Advanced.

- Set the adjusting wheel to position 2.
  - ✓ Advanced – homologated performance with extremely direct responsiveness.

### Set the Map-Select switch to Standard.

- Set the adjusting wheel to position 3, 4, 5, 6, 7, 8 or 9.
  - ✓ Standard – homologated performance with balanced responsiveness.

### Set the Map-Select switch to poor fuel quality.

- Set the adjusting wheel to position 0.
  - ✓ Poor fuel quality – homologated performance is reduced in accordance with the fuel quality, use for no more than 1 tank of fuel

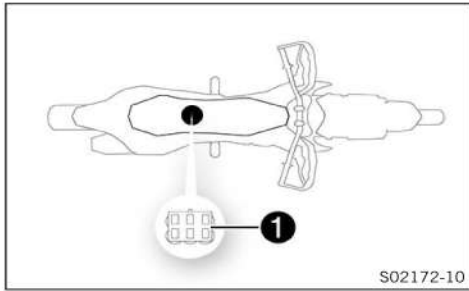
- Position the **Map-Select** switch in the holder.
- Slide the **Map-Select** switch with the holder downward onto the retaining bracket.

### Finishing work

- Mount the seat. (📖 p. 73)

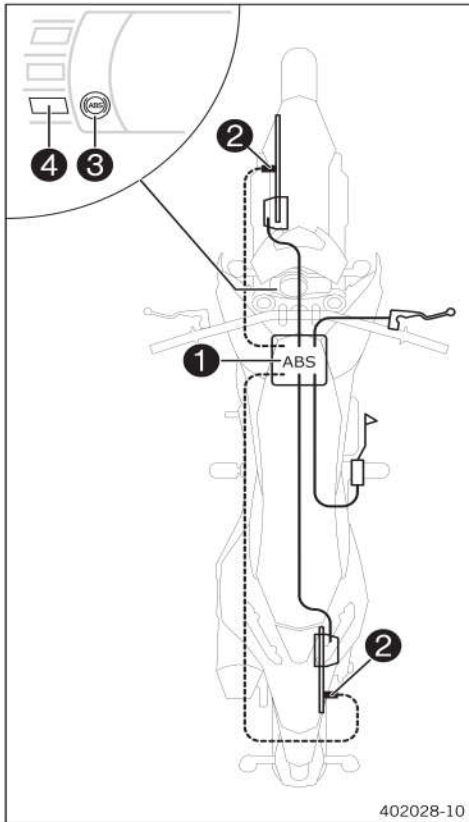


### 14.11 Diagnostics connector



Diagnostics connector **1** is located under the engine control unit.

## 15.1 Antilock brake system (ABS)



The **ABS** unit **1**, which consists of a hydraulic unit, ABS control unit, and return pump, is installed under the seat. One wheel speed sensor **2** is located in each case on the front and the rear wheel.



### Warning

**Danger of accidents** Changes to the vehicle impair the function of the ABS.

- Only allow the rear wheel to spin with the front brake applied away from public road traffic if the ABS is switched off.
- Do not make any changes to the suspension travel.
- Only use spare parts on the brake system which have been approved and recommended by KTM.
- Only use tires/wheels approved by KTM with the corresponding speed index.
- Maintain the specified tire air pressure.
- Service work and repairs must be performed professionally.

The **ABS** is a safety system that prevents locking of the wheels when driving straight ahead without the influence of lateral forces.



### Warning

**Danger of accidents** Driving aids can only prevent a rollover within the physical limitations.

It is not always possible to compensate for extreme riding situations, for example with luggage loaded with a high center of gravity, varying road surfaces, steep descents or full braking without disengaging the gear.

- Adapt your riding style to the road conditions and your driving ability.

The **ABS** operates with two independent brake circuits (front and rear brakes). During normal operation, the brake system operates like a conventional brake system without ABS. When the ABS control unit detects a locking tendency in a wheel, ABS begins regulating the brake pressure. The regulating process causes a slight pulsing of the hand and foot brake levers.

The ABS warning lamp **3** must light up after the ignition is switched on and go out after starting off. If it does not go out after starting off or if it lights up while riding, this indicates a fault in the ABS system. In this case, the ABS is no longer enabled and the wheels may lock during braking. The brake system itself stays functional; only ABS control is not available.

The ABS warning lamp may also light up if the rotating speeds of the front and rear wheels differ greatly under extreme riding conditions, for example when making "wheelies" or if the rear wheel spins. This causes the ABS to switch off.

To reactivate the ABS, the vehicle must be stopped and the ignition switched off. The ABS is reactivated when the vehicle is

switched on again. The ABS warning lamp goes out when you start off.

The button ④ can be used to switch ABS off manually (see Starting).

## 15.2 Checking the front brake linings



### Warning

**Danger of accidents** Worn-out brake linings reduce the braking effect.

- Ensure that worn-out brake linings are replaced immediately.

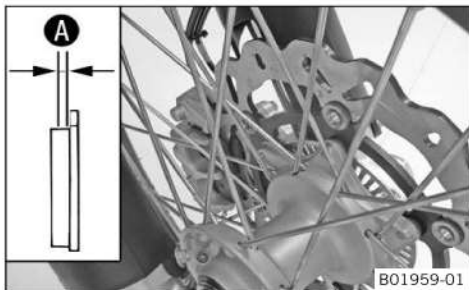


### Warning

**Danger of accidents** Damaged brake discs reduce the braking effect.

If the brake linings are not changed in time, the brake lining carriers grind against the brake disc. As a consequence, the braking effect is greatly reduced and the brake discs are destroyed.

- Check the brake linings regularly.



- Check the brake linings for minimum thickness ①.

|                     |                    |
|---------------------|--------------------|
| Minimum thickness ① | ≥ 1 mm (≥ 0.04 in) |
|---------------------|--------------------|

- » If the minimum thickness is less than specified:
  - Change the front brake linings. (📖 p. 111)
- Check the brake linings for damage and cracking.
  - » If there is wear or tearing:
    - Change the front brake linings. (📖 p. 111)

## 15.3 Changing the front brake linings



### Warning

**Danger of accidents** Incorrect maintenance will cause the brake system to fail.

- Ensure that service work and repairs are performed professionally.



### Warning

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



### Warning

**Danger of accidents** Old brake fluid reduces the braking effect.

- Make sure that brake fluid for the front and rear brake is changed in accordance with the service schedule.





## Warning

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.



## Warning

**Danger of accidents** Brake linings which have not been approved alter the braking efficiency.

Not all brake linings are tested and approved for KTM motorcycles. The structure and friction coefficient of the brake linings, and thus their brake power, may vary greatly from that of original brake linings. If brake linings are used that differ from the original equipment, compliance with the original homologation is not guaranteed. In this case, the vehicle no longer corresponds to its condition at delivery and the warranty shall be void.

- Only use brake linings approved and recommended by KTM.



## Warning

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

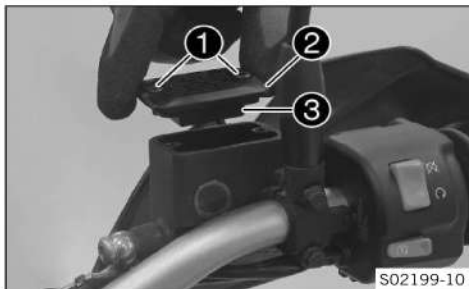


## Info

Never use DOT 5 brake fluid! It is silicone-based and purple in color. Oil seals and brake lines are not designed for DOT 5 brake fluid.

Avoid contact between brake fluid and painted parts. Brake fluid attacks paint!

Use only clean brake fluid from a sealed container.



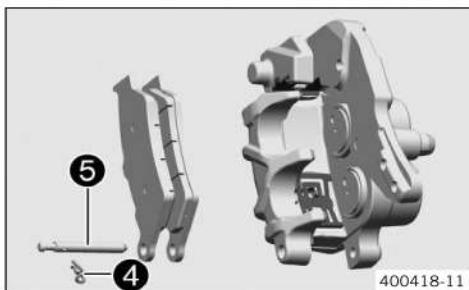
S02199-10

- Move the brake fluid reservoir mounted on the handlebar to a horizontal position.
- Remove screws ①.
- Remove cover ② with membrane ③.
- Press the brake caliper by hand onto the brake disc in order to retract the brake pistons. Ensure that brake fluid does not flow out of the brake fluid reservoir, extracting it by suction if it does.



## Info

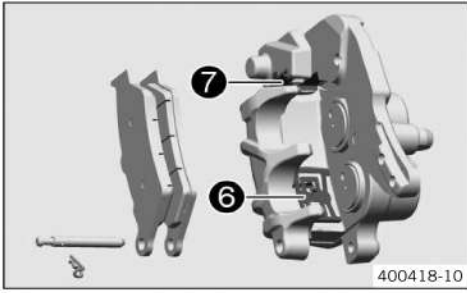
Make sure when pushing back the brake pistons that you do not press the brake caliper against the spokes.



400418-11

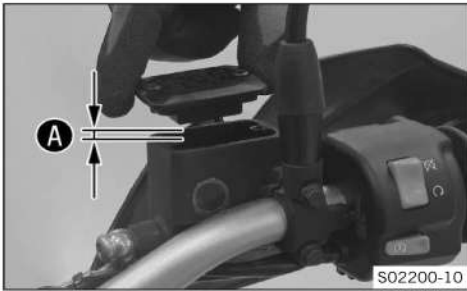
- Remove cotter pin ④, remove pin ⑤ toward the right by striking it, and remove the brake linings.
- Clean brake caliper and brake caliper support.





- Check that leaf spring **6** in the brake caliper and sliding plate **7** in the brake caliper support are seated correctly.
- Insert the new brake linings, insert the pin, and mount the cotter pin.

**i Info**  
Always change the brake linings in pairs.



- Operate the hand brake lever repeatedly until the brake linings are in contact with the brake disc and there is a pressure point.
- Adjust the brake fluid level to level **A**.

Guideline

|  |               |
|--|---------------|
| Measurement <b>A</b>                   | 5 mm (0.2 in) |
| Brake fluid DOT 4 / DOT 5.1 (📖 p. 278) |               |

- Position the cover with the membrane. Mount and tighten the screws.

**i Info**  
Clean up overflowed or spilt brake fluid immediately with water.

### 15.4 Checking the free travel of the hand brake lever



**Warning**

**Danger of accidents** The brake system fails in the event of overheating. If there is no free travel on the hand brake lever, pressure builds up on the front brake circuit.

- Set the free travel on the hand brake lever in accordance with the specification.



- Push the hand brake to the handlebar and check free travel **A**.

|                                 |                    |
|---------------------------------|--------------------|
| Free travel of hand brake lever | ≥ 3 mm (≥ 0.12 in) |
|---------------------------------|--------------------|

- » If the free travel does not meet specifications:
  - Adjust the free travel of the hand brake lever. (📖 p. 114)

## 15.5 Adjusting the free travel of the hand brake lever



- Check the free travel of the hand brake lever. (📖 p. 113)
- Adjust the free travel of the hand brake lever with adjusting screw ①.

### **i** Info

Turn the adjusting screw clockwise to reduce free travel. The pressure point moves away from the handlebar.  
 Turn the adjusting screw counterclockwise to increase free travel. The pressure point moves towards the handlebar.  
 The range of adjustment is limited.  
 Turn the adjusting screw by hand only, and do not apply any force.  
 Do not make adjustments while riding.

## 15.6 Checking brake fluid level of front brake



### **Warning**

**Danger of accidents** An insufficient brake fluid level will cause the brake system to fail.  
 If the brake fluid level drops below the specified marking or the specified value, the brake system is leaking or the brake linings are worn down.

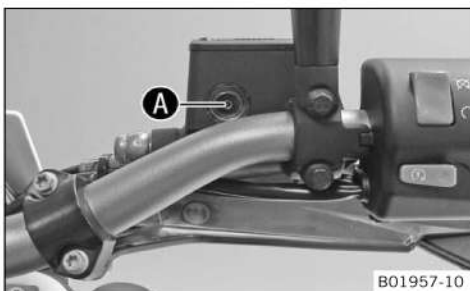
- Check the brake system and do not continue riding until the problem is eliminated.



### **Warning**

**Danger of accidents** Old brake fluid reduces the braking effect.

- Make sure that brake fluid for the front and rear brake is changed in accordance with the service schedule.



- Move the brake fluid reservoir mounted on the handlebar to a horizontal position.
- Check the brake fluid level in the viewer.
  - » If the brake fluid has dropped below marking ①:
    - Top up the brake fluid of the front brake. (📖 p. 115)

## 15.7 Topping up brake fluid of front brake.



### Warning

**Danger of accidents** An insufficient brake fluid level will cause the brake system to fail.

If the brake fluid level drops below the specified marking or the specified value, the brake system is leaking or the brake linings are worn down.

- Check the brake system and do not continue riding until the problem is eliminated.



### Warning

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



### Warning

**Danger of accidents** Old brake fluid reduces the braking effect.

- Make sure that brake fluid for the front and rear brake is changed in accordance with the service schedule.



### Warning

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

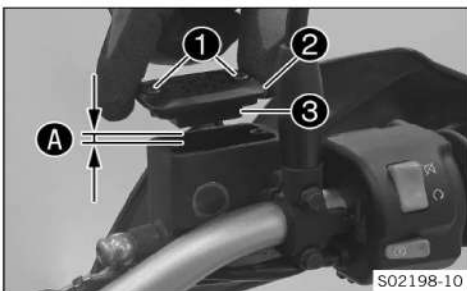


### Info

Never use DOT 5 brake fluid! This is based on silicone oil and is colored purple. Oil seals and brake lines are not designed for DOT 5 brake fluid.

Avoid contact between brake fluid and painted parts. Brake fluid attacks paint!

Use only clean brake fluid from a sealed container.



### Preparatory work

- Check the front brake linings. (📖 p. 111)

### Main work

- Move the brake fluid reservoir mounted on the handlebar to a horizontal position.
- Remove screws ①.
- Remove cover ② with membrane ③.
- Add brake fluid to level A.

### Guideline

|   |               |
|---|---------------|
| Level A (brake fluid level below container rim) | 5 mm (0.2 in) |
|---|---------------|

Brake fluid DOT 4 / DOT 5.1 (📖 p. 278)

- Position the cover with the membrane. Mount and tighten screws.



### Info

Clean up overflowed or spilt brake fluid immediately with water.

## 15.8 Changing the front brake fluid



### Warning

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



### Warning

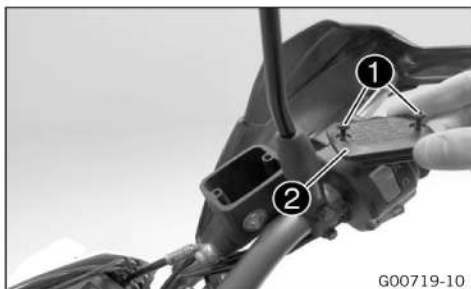
**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.



### Info

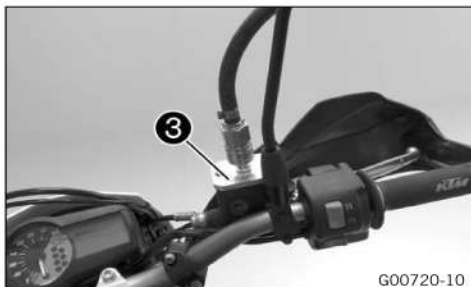
Avoid contact between brake fluid and painted parts. Brake fluid attacks paint!  
Use only clean brake fluid from a sealed container.



- Move the brake fluid reservoir mounted on the handlebar to a horizontal position.
- Cover painted parts.
- Remove screws ①.
- Take off cover ② with the membrane.
- Draw the old brake fluid out of the brake fluid reservoir using a syringe and fill with fresh brake fluid.

|                                  |
|----------------------------------|
| Syringe (50329050000) (📖 p. 284) |
|----------------------------------|

|  |
|--|
| Brake fluid DOT 4 / DOT 5.1 (📖 p. 278) |
|--|



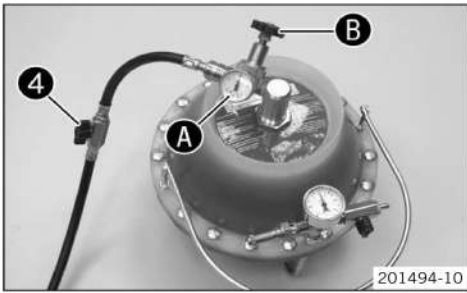
- Mount bleeder cover ③.

|  |
|--|
| Bleeder cover (00029013015) (📖 p. 282) |
|--|

- Connect the bleeding device.

|  |
|--|
| Bleeding device (00029013100) (📖 p. 282) |
|--|





- Open shut-off valve 4.

**i Info**  
Follow the instructions in the Owner's Manual of the bleeding device.

- Ensure that the filling pressure is set on pressure gauge A. Correct the filling pressure on pressure regulator B if necessary.

**Guideline**

|                  |                               |
|------------------|-------------------------------|
| Filling pressure | 2 ... 2.5 bar (29 ... 36 psi) |
|------------------|-------------------------------|

- Pull off protection cap 5 of the brake caliper bleeder screw. Connect the bleeder bottle hose.

|  |
|--|
| Bleeding device (00029013100) (p. 282) |
|--|

- Open bleeder screw 6 by approx. one half turn.

**i Info**  
Drain until fresh brake fluid emerges in the bleeder bottle hose without bubbles.

- Tighten the bleeder screw.
- Close shut-off valve 4.
- Open the bleeder screw again until brake fluid stops emerging.

**i Info**  
Overfilling of the brake fluid reservoir is prevented.

- Tighten the bleeder screw. Remove the bleeder bottle hose. Attach the protection cap.
- Disconnect the bleeding device. Remove the bleeder cover.
- Correct the brake fluid level.

**Guideline**

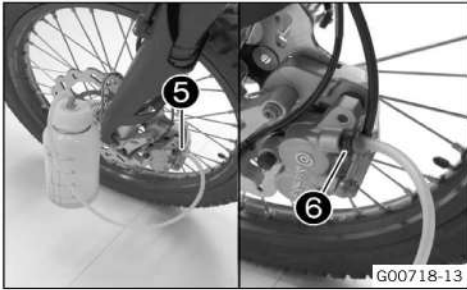
|                             |               |
|-----------------------------|---------------|
| Add brake fluid to level C. | 5 mm (0.2 in) |
|-----------------------------|---------------|

|                                      |
|--------------------------------------|
| Brake fluid DOT 4 / DOT 5.1 (p. 278) |
|--------------------------------------|

- Position the cover with the membrane. Mount and tighten the screws.

**i Info**  
Clean up overflowed or spilled brake fluid immediately with water.

- Check the hand brake lever for a firm pressure point.





## 15.9 Checking the rear brake linings



### Warning

**Danger of accidents** Worn-out brake linings reduce the braking effect.

- Ensure that worn-out brake linings are replaced immediately.

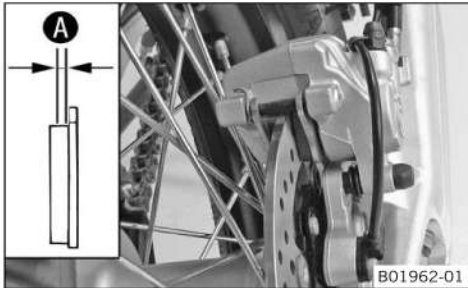


### Warning

**Danger of accidents** Damaged brake discs reduce the braking effect.

If the brake linings are not changed in time, the brake lining carriers grind against the brake disc. As a consequence, the braking effect is greatly reduced and the brake discs are destroyed.

- Check the brake linings regularly.



- Check the brake linings for minimum thickness **A**.

|                            |   |
|----------------------------|---|
| Minimum thickness <b>A</b> | $\geq 1 \text{ mm } (\geq 0.04 \text{ in})$ |
|----------------------------|---|

- » If the minimum thickness is less than specified:
  - Change the rear brake linings. (📄 p. 118)
- Check the brake linings for damage and cracking.
  - » If there is wear or tearing:
    - Change the rear brake linings. (📄 p. 118)

## 15.10 Changing the rear brake linings



### Warning

**Danger of accidents** Incorrect maintenance will cause the brake system to fail.

- Ensure that service work and repairs are performed professionally.



### Warning

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



### Warning

**Danger of accidents** Old brake fluid reduces the braking effect.

- Make sure that brake fluid for the front and rear brake is changed in accordance with the service schedule.



### Warning

**Danger of accidents** Oil or grease on the brake discs reduces the braking effect.

- Always keep the brake discs free of oil and grease.
- Clean the brake discs with brake cleaner when necessary.

**Warning**

**Danger of accidents** Brake linings which have not been approved alter the braking efficiency.

Not all brake linings are tested and approved for KTM motorcycles. The structure and friction coefficient of the brake linings, and thus their brake power, may vary greatly from that of original brake linings. If brake linings are used that differ from the original equipment, compliance with the original homologation is not guaranteed. In this case, the vehicle no longer corresponds to its condition at delivery and the warranty shall be void.

- Only use brake linings approved and recommended by KTM.

**Warning**

**Environmental hazard** Hazardous substances cause environmental damage.

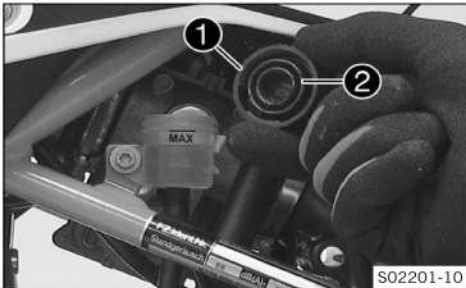
- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

**Info**

Never use DOT 5 brake fluid! It is silicone-based and purple in color. Oil seals and brake lines are not designed for DOT 5 brake fluid.

Avoid contact between brake fluid and painted parts. Brake fluid attacks paint!

Use only clean brake fluid from a sealed container.



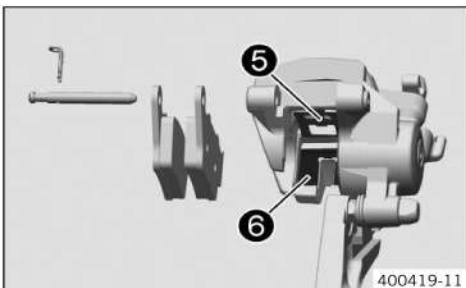
- Stand the vehicle upright.
- Remove screw cap ① with membrane ②.
- Press the brake caliper by hand onto the brake disc in order to retract the brake piston. Ensure that brake fluid does not flow out of the brake fluid reservoir, extracting it by suction if it does.

**Info**

Make sure when pushing back the brake piston that you do not press the brake caliper against the spokes.



- Remove cotter pin ③, remove pin ④ toward the left by striking it, and remove the brake linings.
- Clean brake caliper and brake caliper support.



- Check that leaf spring ⑤ in the brake caliper and sliding plate ⑥ in the brake caliper support are seated correctly.
- Insert the new brake linings, insert the pin, and mount the cotter pin.

**Info**

Always change the brake linings in pairs.

- Operate the foot brake lever repeatedly until the brake linings are in contact with the brake disc and there is a pressure point.

- Adjust the brake fluid level to the **MAX** mark.

|  |
|--|
| Brake fluid DOT 4 / DOT 5.1 (📖 p. 278) |
|--|

- Mount the screw cap with the membrane.



### Info

Clean up overflowed or spilt brake fluid immediately with water.

## 15.11 Checking the free travel of foot brake lever

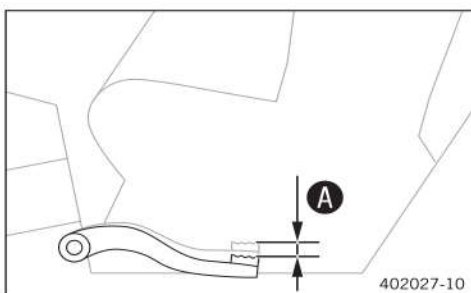


### Warning

**Danger of accidents** The brake system fails in the event of overheating.

If there is no free travel on the foot brake lever, pressure builds up in the brake system on the rear brake.

- Set the free travel on the foot brake lever in accordance with the specification.



- Move the foot brake lever back and forth between the end stop and the contact to the foot brake cylinder piston and check free travel **A**.

### Guideline

|                                 |                              |
|---------------------------------|------------------------------|
| Free travel at foot brake lever | 3 ... 5 mm (0.12 ... 0.2 in) |
|---------------------------------|------------------------------|



### Info

You will know that contact has been made with the foot brake cylinder piston when there is increased resistance when you activate the foot brake lever.

- » If the free travel does not meet specifications:
  - Adjust the basic position of the foot brake lever. (📖 p. 120)

## 15.12 Adjusting the basic position of the foot brake lever



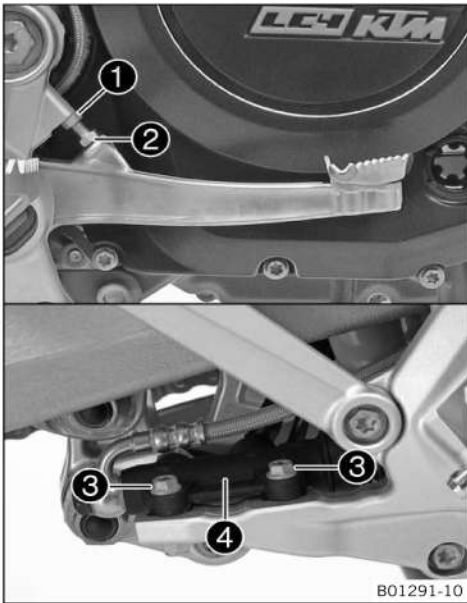
### Warning

**Danger of accidents** The brake system fails in the event of overheating.

If there is no free travel on the foot brake lever, pressure builds up in the brake system on the rear brake.

- Set the free travel on the foot brake lever in accordance with the specification.





- Loosen fittings ③ on foot brake cylinder ④.
- To adjust the basic position of the foot brake lever individually, loosen nut ① and turn screw ② accordingly.

**i Info**  
The range of adjustment is limited. The screw must be screwed into the footrest bracket by at least four turns.

- Position foot brake cylinder ④ so that the foot brake lever has the necessary free travel.
- Mount and tighten fittings ③.

**Guideline**

|                                       |    |                    |
|---------------------------------------|----|--------------------|
| Screw connection, foot brake cylinder | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------------------|----|--------------------|

- Check the free travel of the foot brake lever. (📖 p. 120)
- Tighten nut ①.

**15.13 Checking rear brake fluid level**

**⚠ Warning**  
**Danger of accidents** An insufficient brake fluid level will cause the brake system to fail. If the brake fluid level drops below the **MIN** marking, the brake system is leaking or the brake linings are worn down.

- Check the brake system and do not continue riding until the problem is eliminated.

**⚠ Warning**  
**Danger of accidents** Old brake fluid reduces the braking effect.

- Make sure that brake fluid for the front and rear brake is changed in accordance with the service schedule.



- Stand the vehicle upright.
- Check the brake fluid level in the brake fluid reservoir.
  - » If the fluid level reaches the **MIN** marking ①:
    - Add rear brake fluid. (📖 p. 122)

## 15.14 Adding rear brake fluid



### Warning

**Danger of accidents** An insufficient brake fluid level will cause the brake system to fail.

If the brake fluid level drops below the **MIN** marking, the brake system is leaking or the brake linings are worn down.

- Check the brake system and do not continue riding until the problem is eliminated.



### Warning

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



### Warning

**Danger of accidents** Old brake fluid reduces the braking effect.

- Make sure that brake fluid for the front and rear brake is changed in accordance with the service schedule.



### Warning

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

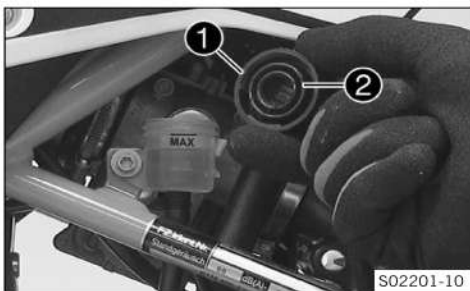


### Info

Never use DOT 5 brake fluid! It is silicone-based and purple in color. Oil seals and brake lines are not designed for DOT 5 brake fluid.

Avoid contact between brake fluid and painted parts. Brake fluid attacks paint!

Use only clean brake fluid from a sealed container.



### Preparatory work

- Check the rear brake linings. (📖 p. 118)

### Main work

- Stand the vehicle upright.
- Remove screw cap ① with the washer and membrane ②.
- Add brake fluid to the **MAX** mark.

Brake fluid DOT 4 / DOT 5.1 (📖 p. 278)

- Mount the screw cap with the washer and membrane.



### Info

Clean up overflowed or spilt brake fluid immediately with water.



## 15.15 Changing the rear brake fluid

**Warning****Skin irritation** Brake fluid causes skin irritation.

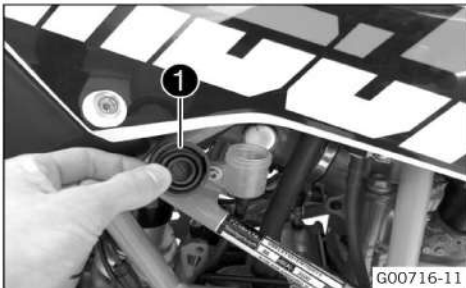
- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.

**Warning****Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

**Info**

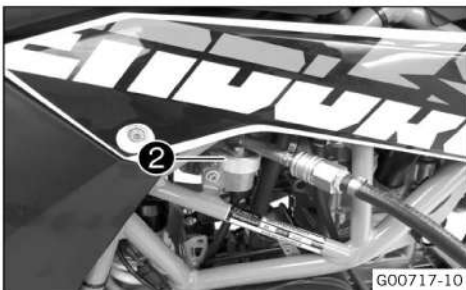
Avoid contact between brake fluid and painted parts. Brake fluid attacks paint!  
Use only clean brake fluid from a sealed container.



- Cover painted parts.
- Take off screw cap ① with membrane.
- Draw the old brake fluid out of the brake fluid reservoir using a syringe and fill with fresh brake fluid.

|                                  |
|----------------------------------|
| Syringe (50329050000) (📖 p. 284) |
|----------------------------------|

|  |
|--|
| Brake fluid DOT 4 / DOT 5.1 (📖 p. 278) |
|--|

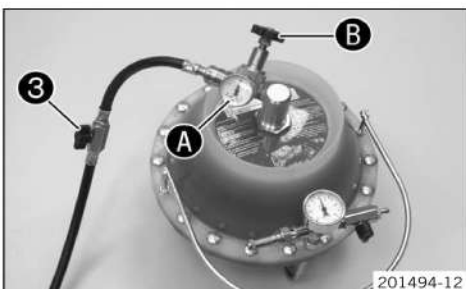


- Mount bleeder cover ②.

|  |
|--|
| Bleeder cover (00029013004) (📖 p. 282) |
|--|

- Connect the bleeding device.

|  |
|--|
| Bleeding device (00029013100) (📖 p. 282) |
|--|

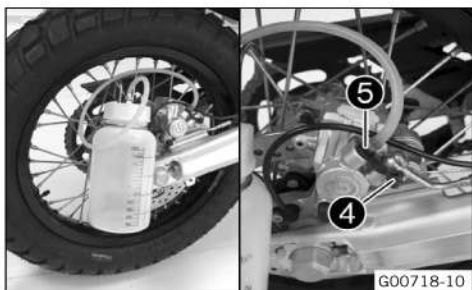


- Open shut-off valve ③.

**Info**

Follow the instructions in the Owner's Manual of the bleeding device.

- Ensure that the filling pressure is set on pressure gauge A. Correct the filling pressure on pressure regulator B if necessary.



## Guideline

|                  |                               |
|------------------|-------------------------------|
| Filling pressure | 2 ... 2.5 bar (29 ... 36 psi) |
|------------------|-------------------------------|

- Pull off protection cap **4** of the bleeder screw. Connect the bleeder bottle hose.

|  |
|--|
| Bleeding device (00029013100) (📖 p. 282) |
|--|

- Open bleeder screw **5** by approx. one half turn.

**i Info**  
Drain until fresh brake fluid emerges in the bleeder bottle hose without bubbles.

- Tighten the bleeder screw.
- Close shut-off valve **3**.
- Open the bleeder screw again until brake fluid stops emerging.

**i Info**  
Overfilling of the brake fluid reservoir is prevented.

- Tighten the bleeder screw. Remove the bleeder bottle hose. Attach the protection cap.
- Disconnect the bleeding device. Remove the bleeder cover.
- Add brake fluid up to **MAX** marking **C**.

|  |
|--|
| Brake fluid DOT 4 / DOT 5.1 (📖 p. 278) |
|--|

- Mount screw cap with membrane.

**i Info**  
Clean up overflowed or spilled brake fluid immediately with water.



**16.1 Combination instrument**

**16.1.1 Setting the kilometers or miles**



**Info**

If the unit is changed, the value is retained and converted accordingly. Make the setting according to the country.



**Condition**

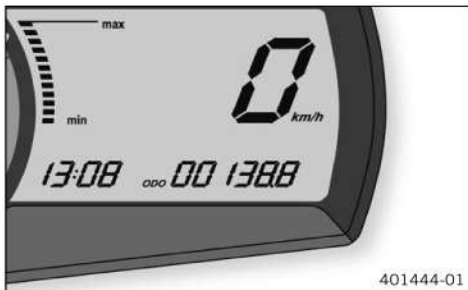
The motorcycle is stationary.

- Switch on the ignition by turning the ignition key to position **ON** .
- Press the **MODE** button repeatedly until the **ODO** display mode is active.
- Keep the **MODE** button pressed until the display mode changes from **km/h** to **mph** or from **mph** to **km/h**.

Guideline

|   |      |
|---|------|
| Activation duration of <b>MODE</b> button | 10 s |
|---|------|

**16.1.2 Setting the clock**



**Condition**

The motorcycle is stationary.

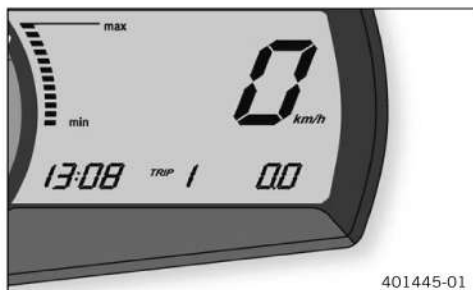
- Switch on the ignition by turning the ignition key to position **ON** .
- Press the **MODE** button repeatedly until the **ODO** mode is active.
- Keep the **MODE** button and the **SET** button pressed simultaneously.
  - ✓ The time display begins to flash.
- Press the **MODE** button to set the hour.
- Press the **SET** button to set the minute.
- Keep the **MODE** button and the **SET** button pressed simultaneously.
  - ✓ The time is set.


**16.1.3 Setting/resetting display TRIP 1**



**Info**

The **TRIP 1** trip counter runs constantly and counts up to **999.9**. The trip counter can be used to measure the distance covered during trips or between two refueling stops. After the value **999.9** is reached, the trip counter starts at **0.0** again.



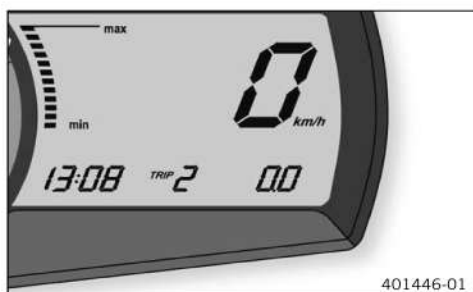
- Switch on the ignition by turning the ignition key to position **ON** .
- Press the **MODE** button repeatedly until the **TRIP 1** mode is active.
- Keep the **SET** button pressed.
  - ✓ The **TRIP 1** display is set to **0.0**.


## 16.1.4 Setting/resetting display TRIP 2



### Info

The **TRIP 2** trip counter runs constantly and counts up to **999.9**. The trip counter can be used to measure the distance covered during trips or between two refueling stops. After the value **999.9** is reached, the trip counter starts at **0.0** again.



- Switch on the ignition by turning the ignition key to position **ON** .
- Press the **MODE** button repeatedly until the **TRIP 2** mode is active.
- Keep the **SET** button pressed.
  - ✓ The **TRIP 2** display is set to **0.0**.

## 16.1.5 Setting the wheel circumference



### Danger

**Voiding of the government approval for road use and the insurance coverage** The vehicle is only authorized for operation on public roads in the homologated version.

- If the vehicle is modified in any way, it may only be used on designated tracks away from public roads. Advise the vehicle owner and rider of this.
- If you undertake any modifications, please insist on receiving a signed workshop order from your customer in which you inform the customer in writing that these modifications are performed at the customer's own risk and that the vehicle will no longer be approved for use on public roads once modified.

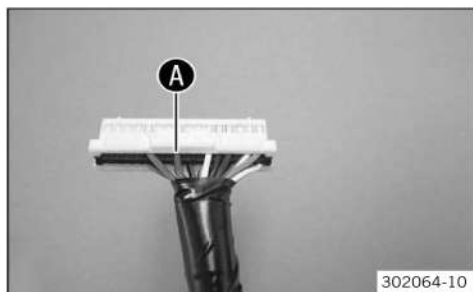
### Condition

The motorcycle is stationary.

### Preparatory work

- Remove the headlight mask with the headlight. ( p. 128)





302064-10



202058-10

**Main work**

- Unplug connector **ED** from the combination instrument.
- Unlock pin **18** **A** and remove it from connector **ED**.
- Plug connector **ED** into the combination instrument.
- Switch on the ignition by turning the ignition key to position **ON**  $\odot$ .
- Press the **MODE** button repeatedly until the **TRIP 1** display mode is active.
- Press and hold the **MODE** button for 10 seconds.
  - ✓ The wheel circumference is displayed in millimeters.

**Increasing the wheel circumference**

- Press the **MODE** button **1**.

**Reducing the wheel circumference**

- Press the **SET** button **2**.

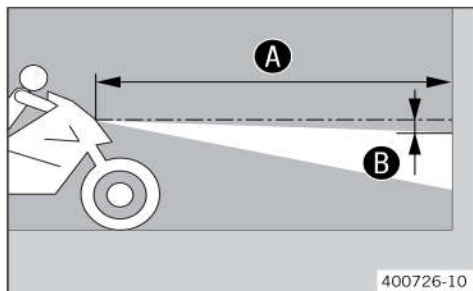
- Keep the **MODE** button and the **SET** button pressed simultaneously.
  - ✓ The settings are saved and the Setup menu is closed.
- Switch off the ignition by turning the ignition key to position **OFF**  $\otimes$ .
- Unplug connector **ED** from the combination instrument.
- Connect pin **18** to connector **ED**.
- Plug connector **ED** into the combination instrument.

**Finishing work**

- Install the headlight mask with the headlight. (📖 p. 129)
- Check the headlight setting. (📖 p. 127)



**16.2 Checking the headlight setting**



400726-10

- Position the vehicle upright on a horizontal surface in front of a light wall and make a mark at the height of the center of the low beam headlight.
- Make another mark at a distance **B** under the first mark.

Guideline

|                   |             |
|-------------------|-------------|
| Distance <b>B</b> | 5 cm (2 in) |
|-------------------|-------------|

- Position the vehicle vertically at a distance **A** away from the wall.

Guideline

|                   |             |
|-------------------|-------------|
| Distance <b>A</b> | 5 m (16 ft) |
|-------------------|-------------|

- The rider, with luggage and passenger if applicable, now mounts the motorcycle.
- Switch on the low beam.
- Check the headlight setting.

The light-dark boundary must lie exactly on the lower mark when the motorcycle is ready to operate with the rider mounted along with any luggage and a passenger if applicable.

- » If the boundary between light and dark does not meet specifications:



- Adjust the headlight range. (📖 p. 128)

## 16.3 Adjusting the headlight range

### Preparatory work

- Check the headlight setting. (📖 p. 127)

### Main work

- Turn adjusting screw **1** to adjust the headlight range.

#### Guideline

The boundary between light and dark must be exactly on the lower mark for a motorcycle with rider (instructions on how to apply the mark: Checking the headlight setting).



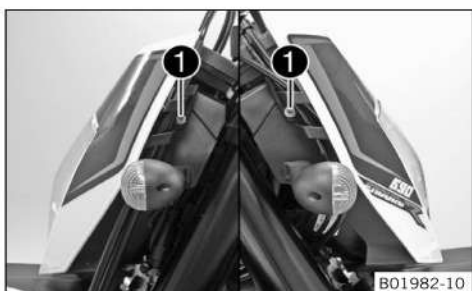
601796-10

### **i** Info

Turn clockwise to increase the headlight range; turn counterclockwise to reduce the headlight range. If you have a payload, you may have to correct the headlight range.

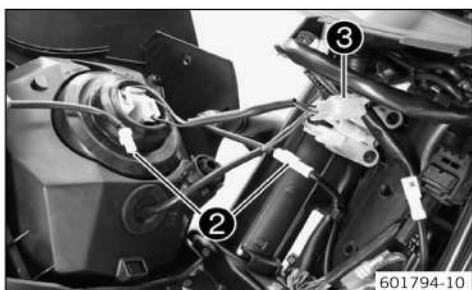
## 16.4 Removing the headlight mask with the headlight

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Cover the fender with a cloth to protect it from damage.
- Remove screws **1** on both sides.
- Tip the headlight mask forward.



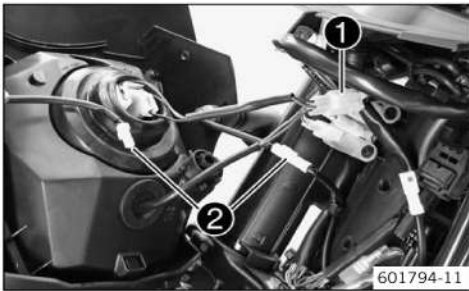
B01982-10

- Disconnect plug-in connectors **2** for the turn signals and **3** for the headlight.
- Take off the headlight mask.



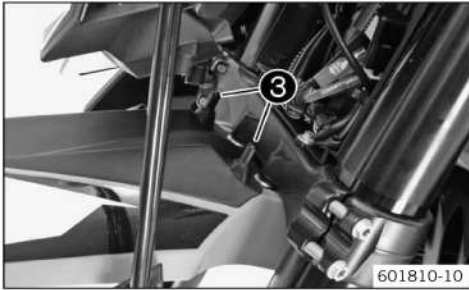
601794-10

**16.5 Installing the headlight mask with the headlight**

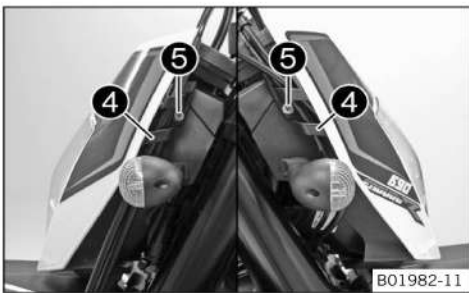


**Main work**

- Connect plug-in connectors ① of the headlight and ② of the turn signals.
- Check that the lighting is functioning properly.



- Remove the cloth from the fender and position the headlight mask.
  - ✓ Holding lugs ③ reach into the headlight mask.



- Position line guides ④. Mount and tighten screws ⑤.

**Guideline**

|                       |    |                   |
|-----------------------|----|-------------------|
| Screw, headlight mask | M5 | 5 Nm (3.7 lbf ft) |
|-----------------------|----|-------------------|

**Finishing work**

- Check the headlight setting. (📖 p. 127)

**16.6 Changing the parking light bulb**

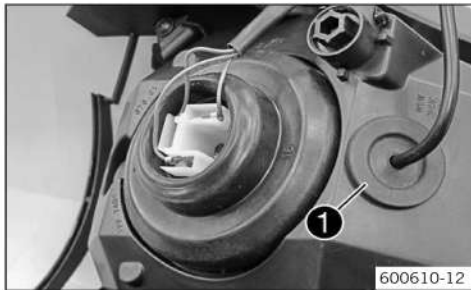
**Note**

**Damage to reflector** Grease on the reflector reduces the brightness. Grease on the bulb will evaporate due to the heat and be deposited on the reflector.

- Clean and degrease the bulbs before mounting.
- Do not touch the bulbs with your bare hands.

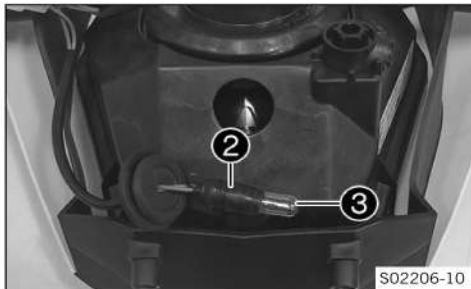
**Preparatory work**

- Remove the headlight mask with the headlight. (📖 p. 128)



### Main work

- Remove protection cap 1.



- Pull bulb socket 2 out of the reflector.
- Pull parking light bulb 3 out of the bulb socket.
- Insert a new parking light bulb in the bulb socket.

Parking light (W5W / socket W2.1x9.5d) (📖 p. 243)

- Insert the bulb socket in the reflector.
- Insert the protection cap.

### Finishing work

- Install the headlight mask with the headlight. (📖 p. 129)
- Check the headlight setting. (📖 p. 127)

## 16.7 Changing the headlight bulb

### Note

**Damage to reflector** Grease on the reflector reduces the brightness.

Grease on the bulb will evaporate due to the heat and be deposited on the reflector.

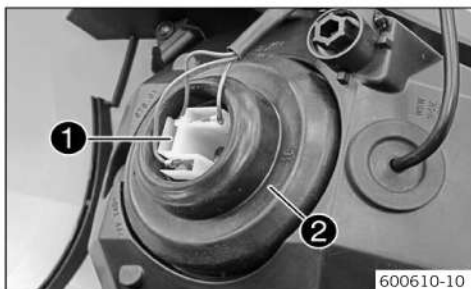
- Clean and degrease the bulbs before mounting.
- Do not touch the bulbs with your bare hands.

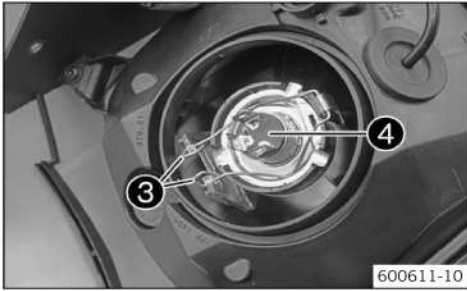
### Preparatory work

- Remove the headlight mask with the headlight. (📖 p. 128)

### Main work

- Unplug connector 1.
- Take off protection cap 2 of the headlight bulb.





- Detach spring bar ③.
- Remove headlight bulb ④.
- Insert a new headlight bulb into the headlight housing.

Headlight (H4 / socket P43t) (📖 p. 243)

- Fix the headlight bulb in the headlight using the spring bar.
- Mount the protection cap. Plug in the connector.

### Finishing work

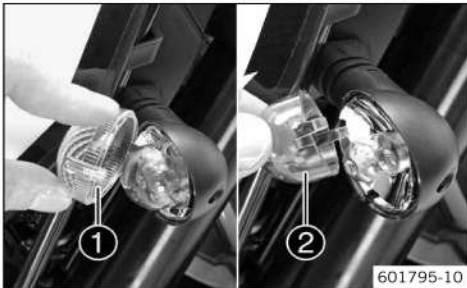
- Install the headlight mask with the headlight. (📖 p. 129)
- Check the headlight setting. (📖 p. 127)

## 16.8 Changing the turn signal bulb

### Note

**Damage to reflector** Grease on the reflector reduces the brightness.  
Grease on the bulb will evaporate due to the heat and be deposited on the reflector.

- Clean and degrease the bulbs before mounting.
- Do not touch the bulbs with your bare hands.



### Main work

#### (690 Enduro R EU)

- Remove the screw on the rear of the turn signal housing.
- Tilt headlamp diffuser ① forward carefully and take it off.
- Lightly squeeze orange cap ② in the area of the holding lugs and take it off.
- Press the turn signal bulb lightly into the socket, turn it counterclockwise by about 30°, and take it out of the socket.



### Info

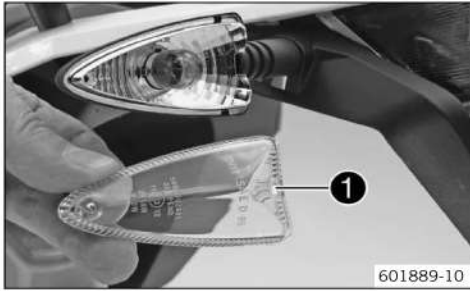
Do not touch the reflector with your fingers, and keep it free from grease.

- Press the new turn signal bulb carefully into the socket and turn it clockwise until it stops.

Turn signal (R10W / socket BA15s) (📖 p. 243)

- Mount the orange cap.
- Position the diffuser.
- Insert the screw and first turn counterclockwise until it engages in the thread with a small jerk. Tighten the screw lightly.





## (690 Enduro R US)

- Remove the screw on the rear of the turn signal housing.
- Tilt headlamp diffuser **1** forward carefully and take it off.
- Press the turn signal bulb lightly into the socket, turn it counterclockwise by about 30°, and take it out of the socket.

---

### **i** Info

Do not touch the reflector with your fingers, and keep it free from grease.

- 
- Press the new turn signal bulb carefully into the socket and turn it clockwise until it stops.

Turn signal (RY10W / socket BAU15s) (📖 p. 243)

- Position the diffuser.
- Insert the screw and first turn counterclockwise until it engages in the thread with a small jerk. Tighten the screw lightly.

### **Finishing work**

- Check that the turn signal system is functioning properly.



## 17.1 Removing the engine

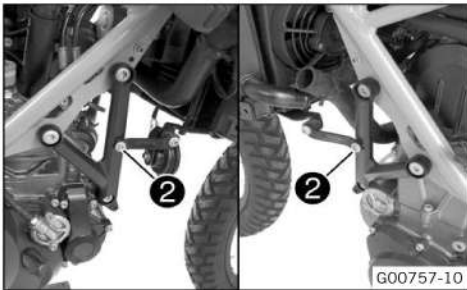
**Preparatory work**

- Switch off the ignition by turning the ignition key to position **OFF** ☒.
- Remove the seat. (☞ p. 73)
- Disconnect the battery. (☞ p. 101)
- Raise the motorcycle with the work stand. (☞ p. 12)
- Take off the side cover. (☞ p. 73)
- Remove the air filter box. (☞ p. 69)
- Remove the manifold. (☞ p. 64)
- Remove the engine guard. (☞ p. 39)
- Drain the coolant. (☞ p. 218)

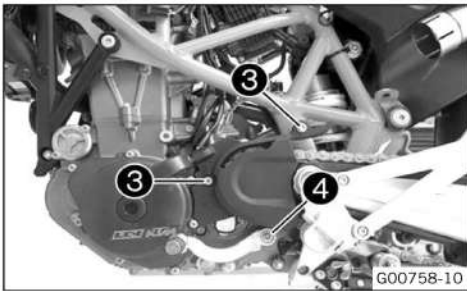
**Main work**

- Loosen hose clips **1** using the special tool. Pull off the radiator hoses.

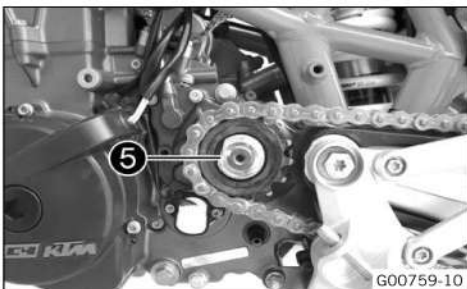
|   |
|---|
| Hose clamp plier (60029057000) (☞ p. 286) |
|---|



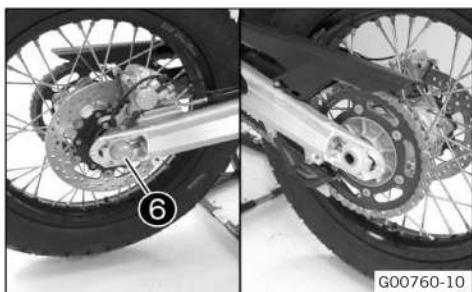
- Remove screws **2**.



- Remove screws **3**.
- Take off the engine sprocket cover.
- Remove screw **4**.
- Take off the shift lever.



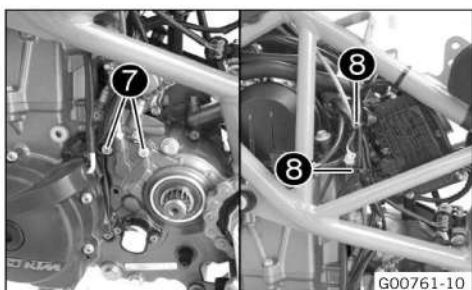
- Bend up lock washer **5**.
- Have an assistant operate the rear brake.
- Remove the nut of the engine sprocket with the lock washer.



- Remove nut **6**. Remove the chain adjuster.
- Pull out wheel spindle far enough to allow the rear wheel to be pushed forward.
- Push the rear wheel forward as far as possible and take the chain off the rear sprocket.

**i Info**

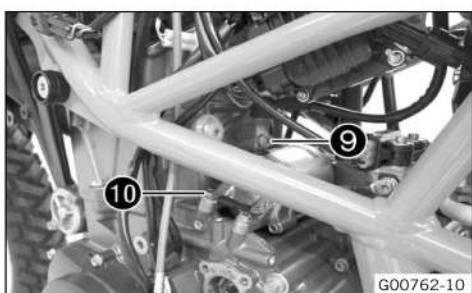
The rear wheel must not be fully removed.



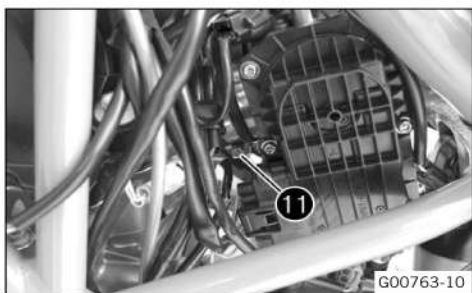
- Take off the engine sprocket.
- Remove screws **7**.
- Remove cable ties **8**.
- Take off the clutch slave cylinder with the gasket and hang it to the side.

**i Info**

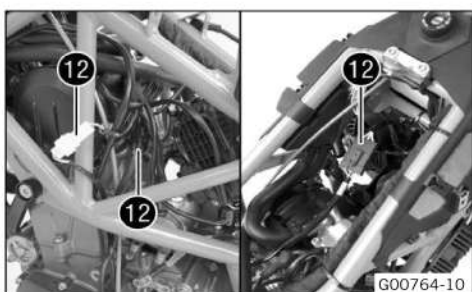
Do not kink the clutch line.  
Do not activate the clutch lever while the slave cylinder of the clutch is removed.



- Take off the clutch push rod.
- Pull back the protection cap. Remove screw **9**.
- Remove screw **10**.



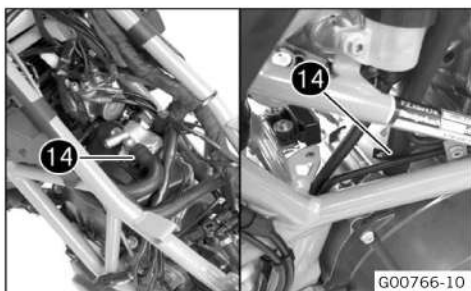
- Loosen hose clip **11**.
- Pull off the throttle valve body to the rear.



- Disconnect plug-in connectors **12** of the gear position sensor, crankshaft position sensor, and alternator.



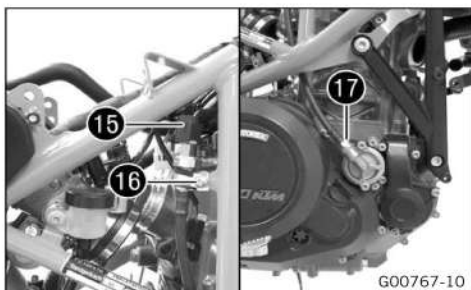
- Disconnect both plugs of the ignition coils.
- Disconnect engine coolant temperature sensor connector 13.



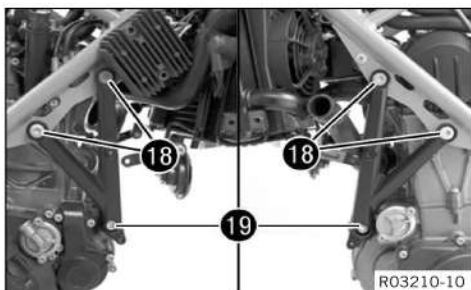
- Loosen the spring band clamps 14 using the special tool.

Spring band clamps plier (60029057100) (p. 286)

- Pull off the hoses.



- Unplug connector 15 from the oil pressure sensor. Remove screw 16.
- Release connection 17. Take off the line with the oil pressure sensor.

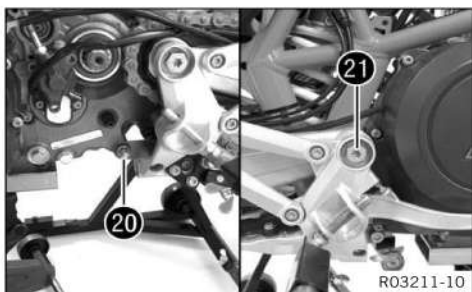


- Remove screws 18.
- Remove fitting 19.
- Take off the engine bearer on the left and right.



- Position the floor jack under the engine and secure using the special tool.

Floor jack attachment (75029055000) (p. 292)



- Remove fitting 20 of the lower engine bracket.
- Remove screw 21 of the swingarm pivot.
- Pull the swingarm pivot out far enough to release the engine.



- Lower the engine.

**i Info**  
The help of an assistant is useful in this step. Make sure that the engine is sufficiently secured against falling over. Protect the frame and attachments against damage.

## 17.2 Installing the engine

### Preparatory work

- Lift the engine onto the special tool and secure it.

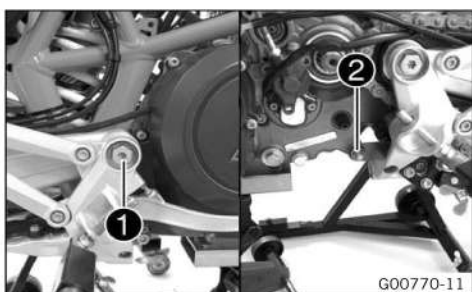
Floor jack attachment (75029055000) (p. 292)



### Main work

- Position the engine in the frame.

**i Info**  
The help of an assistant is useful in this step. Make sure that the engine is sufficiently secured against falling over. Protect the frame and attachments against damage.

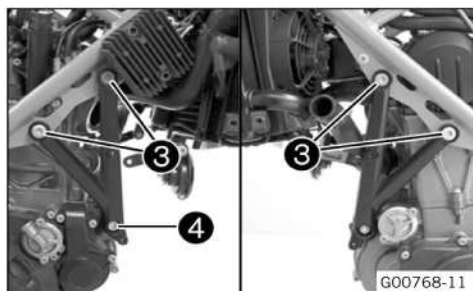


- Mount the swingarm pivot.
- Mount the screw 1 of the swingarm pivot but do not tighten yet.
- Mount fitting 2 of the lower engine attachment but do not tighten yet.



- Remove the floor jack with the special tool.

|  |
|--|
| Floor jack attachment (75029055000) (📖 p. 292) |
|--|



- Position the engine bearer.
- Mount and tighten screws **3**.

Guideline

|                               |     |                     |
|-------------------------------|-----|---------------------|
| Screw, engine bearer on frame | M10 | 45 Nm (33.2 lbf ft) |
|-------------------------------|-----|---------------------|

- Mount and tighten fitting **4**.

Guideline

|                       |     |  |
|-----------------------|-----|--|
| Engine carrying screw | M10 | 45 Nm (33.2 lbf ft)<br><b>Loctite®243™</b> |
|-----------------------|-----|--|

- Tighten the swingarm pivot.

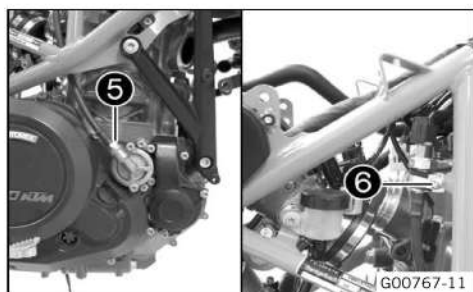
Guideline

|                       |     |                   |
|-----------------------|-----|-------------------|
| Screw, swingarm pivot | M12 | 80 Nm (59 lbf ft) |
|-----------------------|-----|-------------------|

- Tighten the lower engine bracket.

Guideline

|                       |     |  |
|-----------------------|-----|--|
| Engine carrying screw | M10 | 45 Nm (33.2 lbf ft)<br><b>Loctite®243™</b> |
|-----------------------|-----|--|



- Position the line with the oil pressure sensor. Mount and tighten connection **5**.

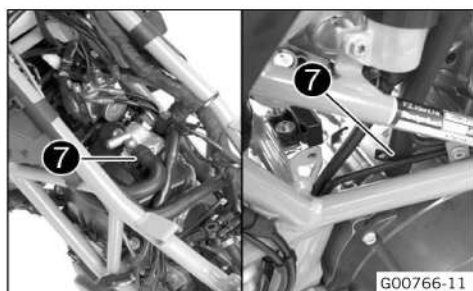
Guideline

|                          |       |                    |
|--------------------------|-------|--------------------|
| Oil pressure sensor line | M10x1 | 10 Nm (7.4 lbf ft) |
|--------------------------|-------|--------------------|

- Position the clamp of the oil line. Mount and tighten screw **6**. Plug in the connector.

Guideline

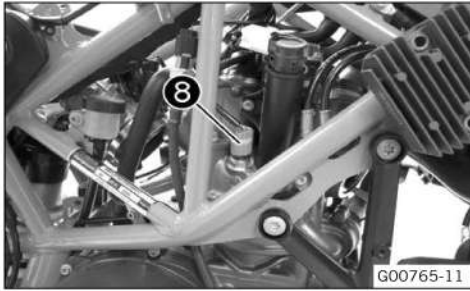
|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|



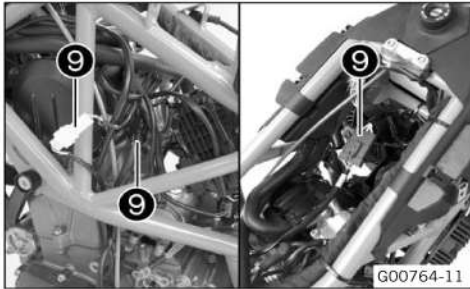
- Position the hoses of the engine breather, the SAS, and the oil return line. Mount spring band clamp **7** using the special tool.

|   |
|---|
| Spring band clamps plier (60029057100) (📖 p. 286) |
|---|

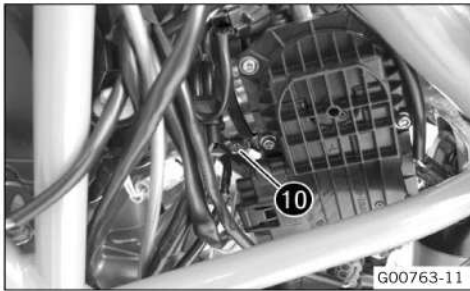




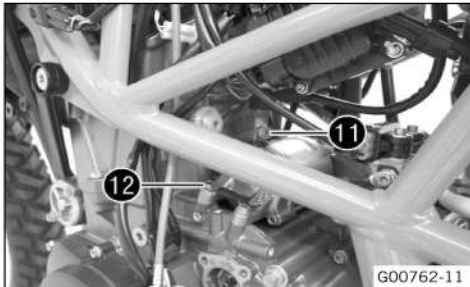
- Plug in both plugs of the ignition coils.
  - ✓ The cable with the white marking is connected to the outer ignition coil.
- Plug in the connector of the engine coolant temperature sensor **8**.



- Connect plug-in connectors **9** of the gear position sensor, crankshaft position sensor, and alternator.



- Position the throttle valve body.
- Position and tighten hose clip **10**.



- Position the electrical connection on the starter motor. Mount and tighten screw **11**. Mount the protection cap.

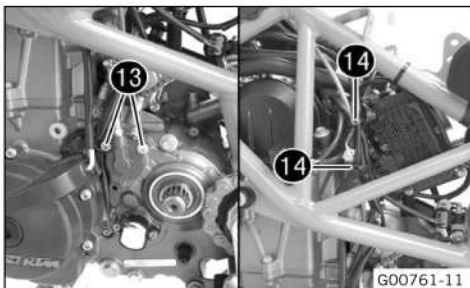
Guideline

|                               |    |                   |
|-------------------------------|----|-------------------|
| Screw, cable on starter motor | M5 | 3 Nm (2.2 lbf ft) |
|-------------------------------|----|-------------------|

- Position the ground wire on the starter motor. Mount and tighten screw **12**.

Guideline

|                      |    |   |
|----------------------|----|---|
| Screw, starter motor | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|----------------------|----|---|

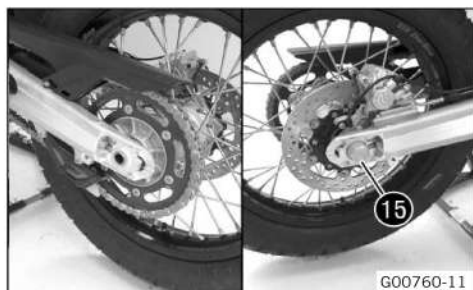


- Insert the clutch push rod.
- Position the clutch slave cylinder with the gasket.
- Mount and tighten screws **13**.

Guideline

|                              |       |   |
|------------------------------|-------|---|
| Screw, clutch slave cylinder | M6x20 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
| Screw, clutch slave cylinder | M6x35 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |

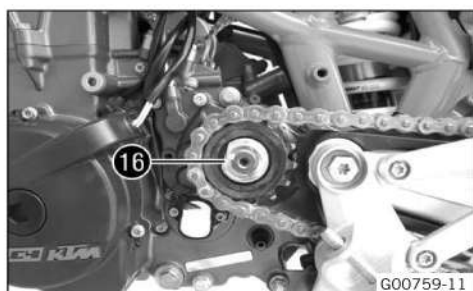
- Secure the cable with the cable ties **14**.



- Mount the engine sprocket with the chain.
- Position the new lock washer and mount nut but do not tighten yet.
- Position the rear wheel.
- Mount the chain adjuster and nut.
- Push the rear wheel forward so that the chain adjusters rest against the tensioning screws, and tighten nut **15**.

Guideline

|                         |         |                     |
|-------------------------|---------|---------------------|
| Nut, rear wheel spindle | M25x1.5 | 90 Nm (66.4 lbf ft) |
|-------------------------|---------|---------------------|

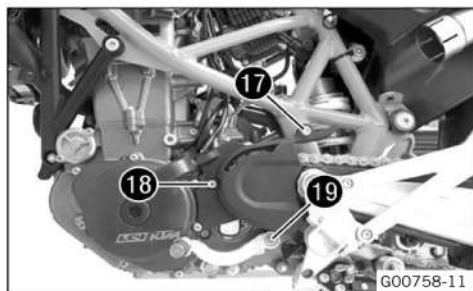


- Have an assistant operate the rear brake.
- Tighten the engine sprocket nut.

Guideline

|                      |         |  |
|----------------------|---------|--|
| Nut, engine sprocket | M20x1.5 | 80 Nm (59 lbf ft)<br><b>Loctite®243™</b> |
|----------------------|---------|--|

- Secure the nut with lock washer **16**.



- Position the engine sprocket cover.
- Mount and tighten screw **17**.

Guideline

|                           |    |                     |
|---------------------------|----|---------------------|
| Remaining screws, chassis | M8 | 25 Nm (18.4 lbf ft) |
|---------------------------|----|---------------------|

- Mount and tighten screw **18**.

Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|

- Position the shift lever.
- Mount and tighten screw **19**.

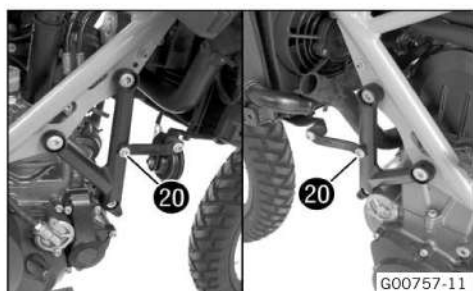
Guideline

|                    |    |  |
|--------------------|----|--|
| Screw, shift lever | M6 | 14 Nm (10.3 lbf ft)<br><b>Loctite®243™</b> |
|--------------------|----|--|

- Mount and tighten screws **20**.

Guideline

|                               |    |                    |
|-------------------------------|----|--------------------|
| Screw, upper radiator bracket | M6 | 10 Nm (7.4 lbf ft) |
|-------------------------------|----|--------------------|

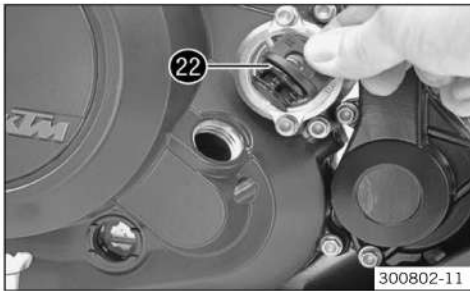




- Position the radiator hoses. Mount hose clips **21**.

|   |
|---|
| Hose clamp plier (60029057000) (📖 p. 286) |
|---|

- Install the manifold. (📖 p. 65)
- Install the air filter box. (📖 p. 70)
- Disconnect the battery. (📖 p. 101)



- Remove the oil filler plug with O-ring **22** from the clutch cover and fill up with engine oil.

|                                      |                     |   |
|--------------------------------------|---------------------|---|
| Engine oil                           | 1.70 l<br>(1.8 qt.) | Engine oil<br>(SAE 10W/60)<br>(00062010035)<br>(📖 p. 278) |
| Engine oil<br>Alternative engine oil |                     | Engine oil<br>(SAE 10W/50)<br>(📖 p. 279)                  |

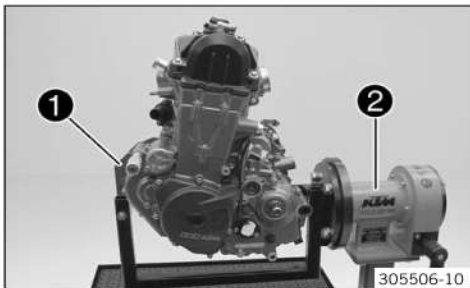
- Mount and tighten the filler plug with O-ring **22**.

### Finishing work

- Fill/bleed the cooling system. (📖 p. 218)
- Remove the motorcycle from the work stand. (📖 p. 13)
- Perform the initialization run. (📖 p. 236)
- Go for a short test ride.
- Read out the fault memory using the KTM diagnostics tool.
- Check the engine for leak tightness.
- Check the engine oil level. (📖 p. 225)
- Check the coolant level. (📖 p. 221)
- Mount the seat. (📖 p. 73)

## 17.3 Engine disassembly

### 17.3.1 Clamping the engine into the engine assembly stand



- Mount special tool **1** on engine assembly stand **2**.

|  |
|--|
| Engine work stand (61229001000) (📖 p. 287) |
|--|

|   |
|---|
| Fitting for work stand (75012001060) (📖 p. 288) |
|---|

|  |
|--|
| Holder for engine motor stand (75012001070) (📖 p. 288) |
|--|

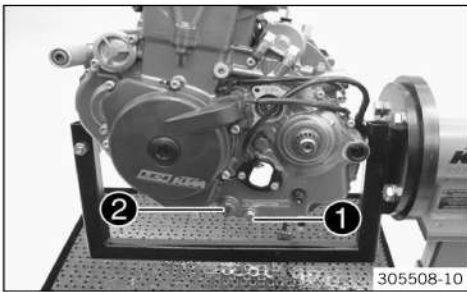
- Mount the engine on special tool **1**.



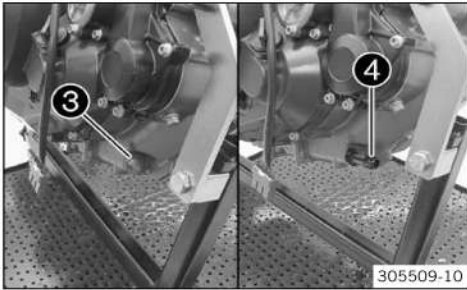
### Info

Have an assistant help you or use a crane.

## 17.3.2 Draining the engine oil



- Remove the oil drain plug **1** with the magnet and seal ring.
- Remove plug **2** with oil screen and the O-rings.



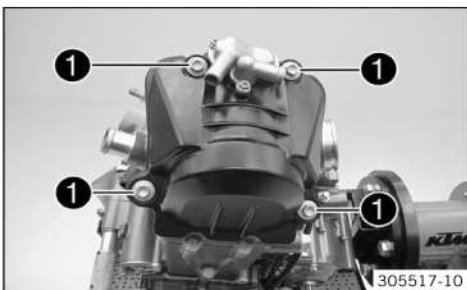
- Remove plug **3** with oil screen **4** and the O-rings.
- Completely drain the engine oil.

## 17.3.3 Removing the starter motor



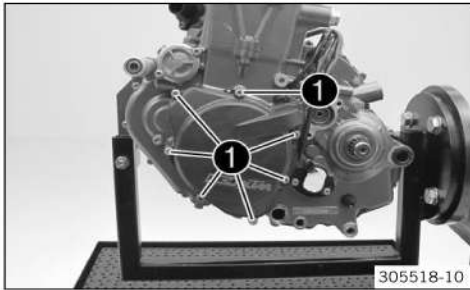
- Remove oil throttle **1**.
- Take off the starter motor.

## 17.3.4 Removing the valve cover

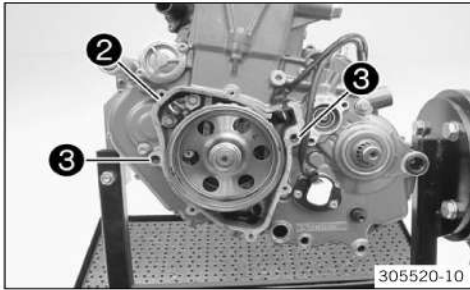


- Remove screws **1**.
- Take off the valve cover with the valve cover seal.

## 17.3.5 Removing the alternator cover

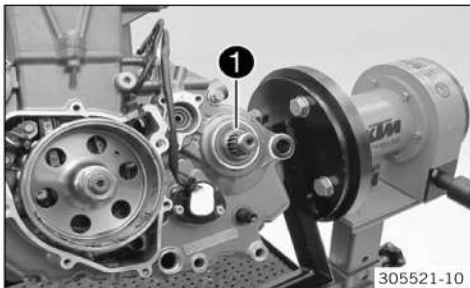


- Remove screws **1**.
- Take off the alternator cover.



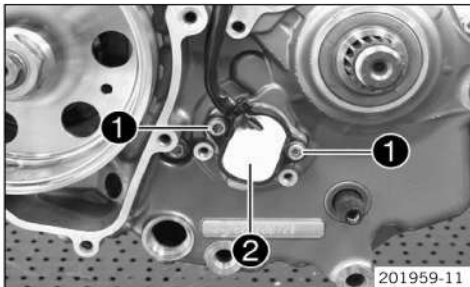
- Take off alternator cover gasket **2** and remove dowels **3**.

## 17.3.6 Removing the spacer



- Remove spacer **1**.

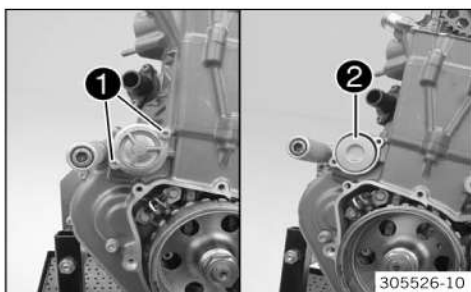
## 17.3.7 Removing the gear position sensor



- Remove screws **1** with the washers.
- Remove gear position sensor **2** with the O-ring.

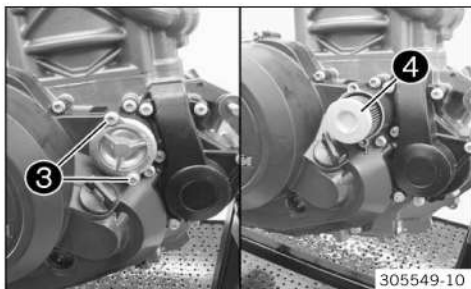


## 17.3.8 Removing the oil filter



- Remove screws ①.
- Take off the oil filter cover with the O-ring.
- Remove oil filter ②.

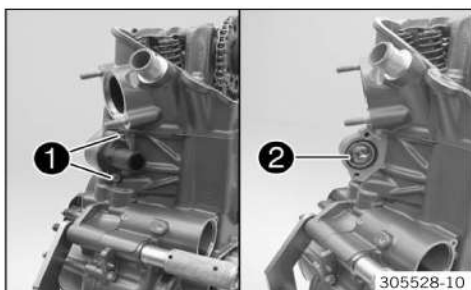
Lock ring plier (51012011000) (📖 p. 284)



- Remove screws ③.
- Take off the oil filter cover with the O-ring.
- Remove oil filter ④.

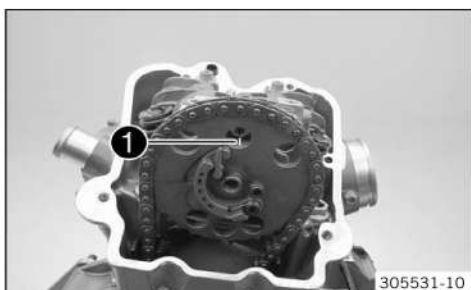
Lock ring plier (51012011000) (📖 p. 284)

## 17.3.9 Removing the thermostat

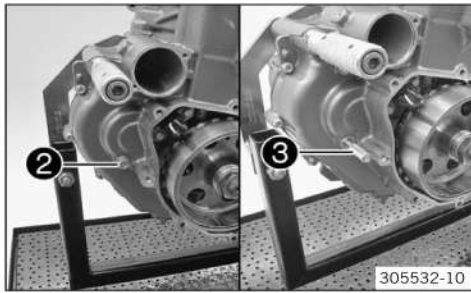


- Remove screws ①.
- Take off the thermostat case.
- Remove thermostat ②.

## 17.3.10 Setting engine to ignition top dead center



- Turn the crankshaft counterclockwise until markings ① of the camshafts are flush with the marks of the camshaft support plate.



- Remove screw **2**.

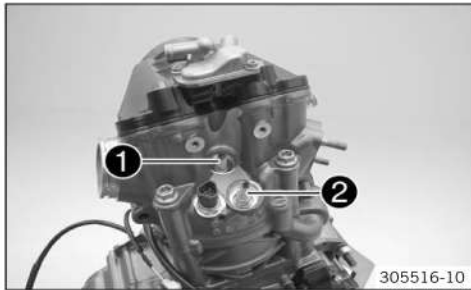
**i Info**

Look through the hole to check that the position hole of the balancer shaft is visible.

- Screw in special tool **3**.

Locking screw (77329010000) (p. 294)

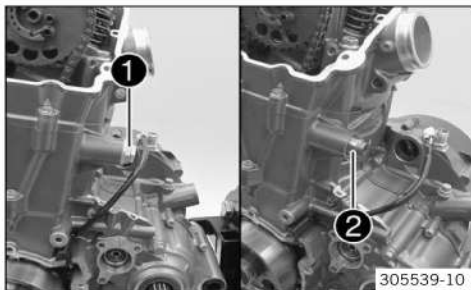
### 17.3.11 Removing the spark plugs



- Remove spark plugs **1** and **2**.

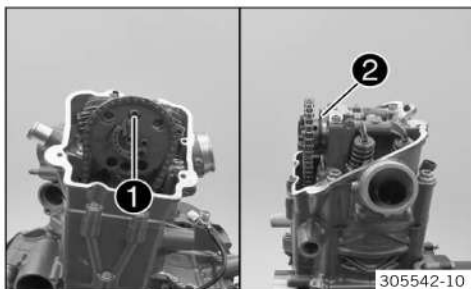
Spark plug wrench (75029172000) (p. 293)

### 17.3.12 Removing the timing chain tensioner



- Remove screw **1** with the seal ring.
- Remove timing chain tensioner **2**.

### 17.3.13 Removing the camshafts



- Remove screw **1**.
- Take off the camshaft support plate **2**.



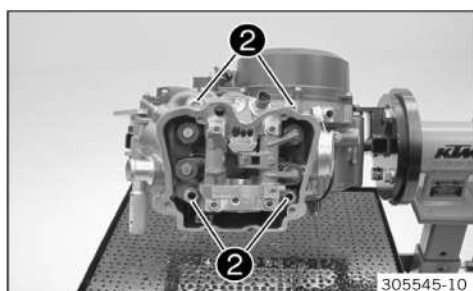
- Pull the camshaft out of the bearing seats.
- Take the timing chain off the camshaft gear.
- Remove the camshaft.



## 17.3.14 Removing the cylinder head



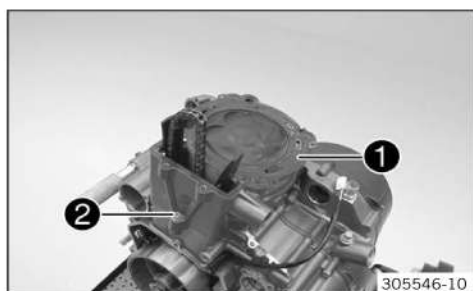
- Remove screws **1**.



- Loosen screws **2** diagonally and remove them.
- Take off the cylinder head.



## 17.3.15 Removing the piston

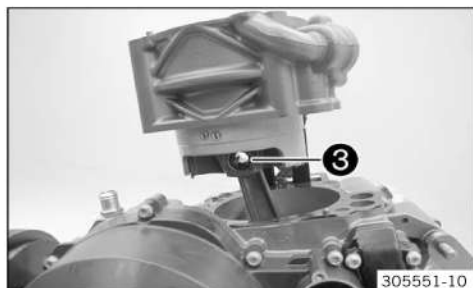


- Take off the cylinder head gasket **1**.
- Remove screw **2**.
- Push the cylinder upward.



### Info

Push the cylinder upward only far enough to allow removal of the piston pin. Ensure that the two grooved pins remain in place.

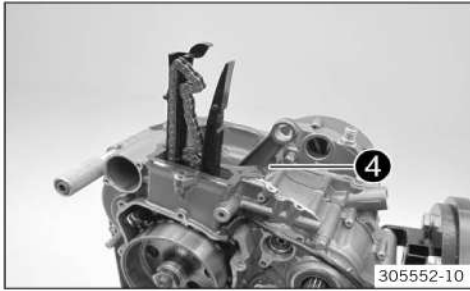


- Remove piston pin retainer **3**.
- Remove the piston pin.
- Take off the cylinder with the piston.
- Push the piston upward out of the cylinder.



### Info

If no other work is required on the cylinder and the piston, you can leave the piston in the cylinder.

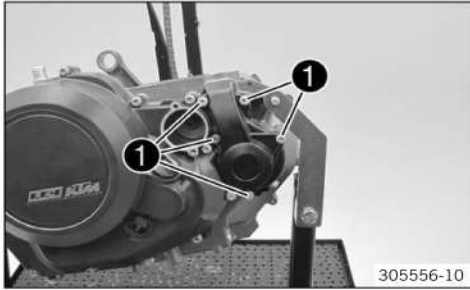


- Take off the cylinder base gasket ④.

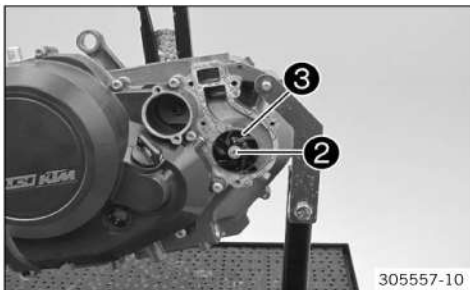
**i Info**

Ensure that the two grooved pins remain in place.

### 17.3.16 Removing the water pump impeller



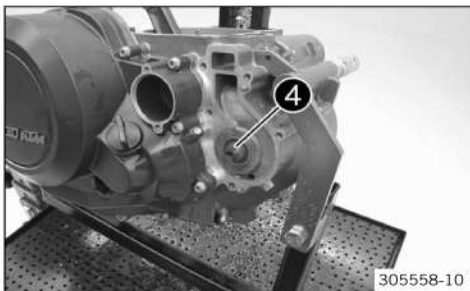
- Remove screws ①. Take off the water pump cover.



- Remove screw ②.
- Remove water pump impeller ③.
- Take off the water pump cover seal.

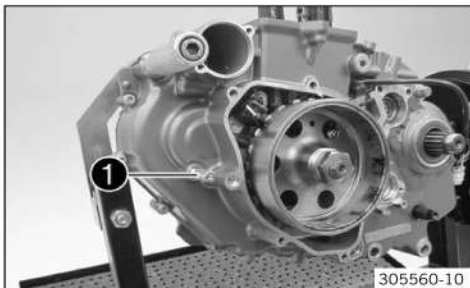
**i Info**

Ensure the locating pins remain in place.



- Remove formed washer ④.

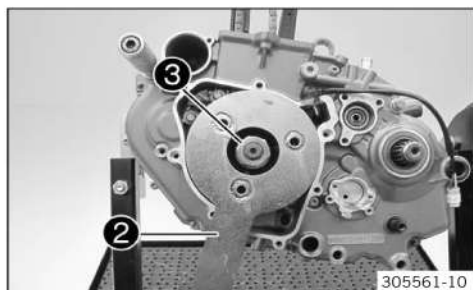
### 17.3.17 Removing the rotor



- Remove special tool ①.

Locking screw (77329010000) (📄 p. 294)





- Hold the rotor with special tool ②.

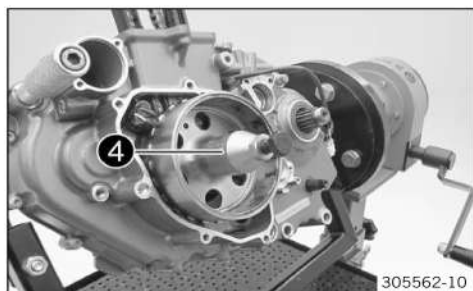
Holding wrench (75029091000) (📖 p. 293)



**Info**

Make sure that the crankshaft is not blocked.

- Remove nut ③ and the locking edge washer.

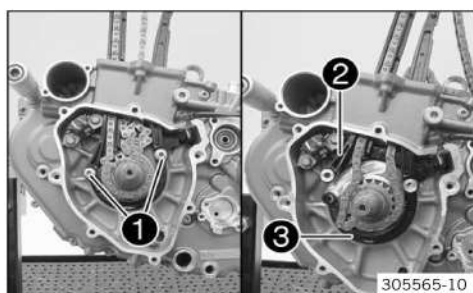


- Mount the special tool ④ on the rotor.

Puller (58429009000) (📖 p. 284)

- Hold it tight using the special tool and pull off the rotor by turning the screw in.
- Remove the special tool.

**17.3.18 Removing the timing chain rails**



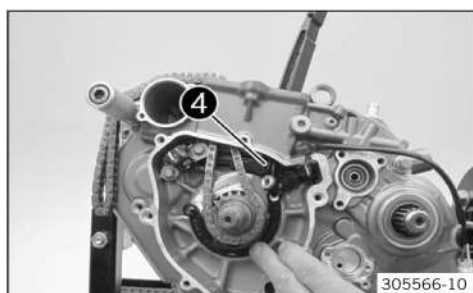
- Remove screws ①.
- Pull the timing chain guide rails ② out of the timing chain securing guide ③.



**Info**

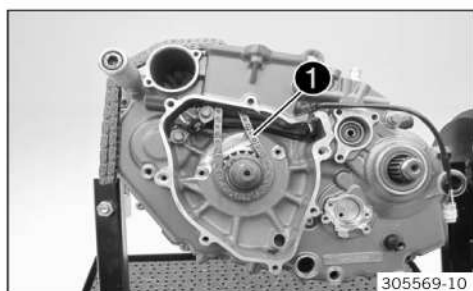
The support bushing is plugged into the timing chain securing guide through the timing chain guide rails.

- Remove the timing chain guide rails upward out of the timing chain shaft.



- Hold the timing chain securing guide tight and pull the timing chain tensioning rail ④ out of the timing chain securing guide.
- Remove the timing chain tensioning rail upward out of the timing chain shaft.
- Remove the timing chain securing guide.

**17.3.19 Removing the timing chain and timing chain sprocket**



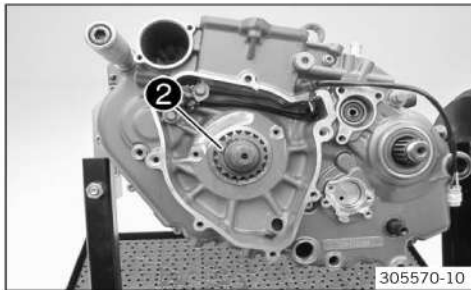
- Slip out timing chain ①.



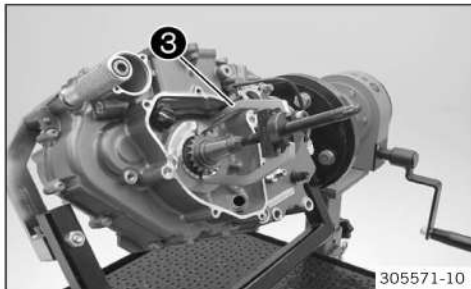
**Info**

If the timing chain will be used again, mark the direction of travel.





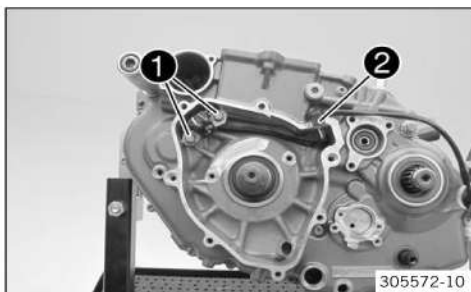
- Take off lock ring **2**.



- Pull off the timing chain sprocket with special tool **3**.

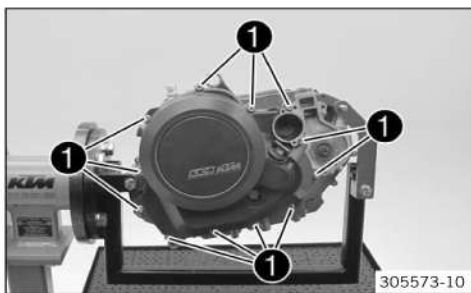
Puller (59029033000) (📖 p. 286)

### 17.3.20 Removing the ignition pulse generator

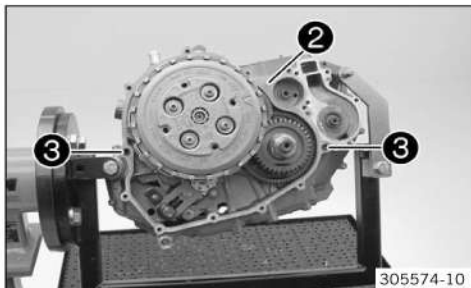


- Remove screws **1**.
- Pull cable sleeve **2** out of the engine case.
- Remove the ignition pulse generator.

### 17.3.21 Removing the clutch cover

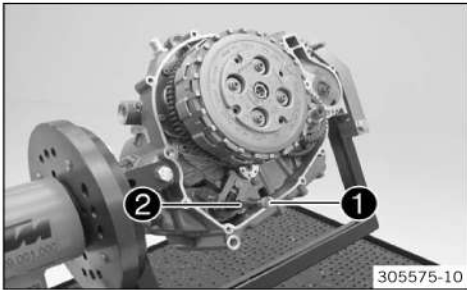


- Remove screws **1**.
- Take off the clutch cover.



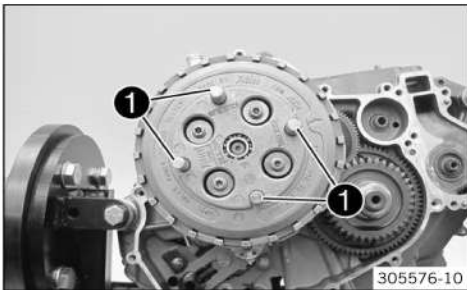
- Remove the clutch cover gasket **2**.
- Take off dowels **3**.

## 17.3.22 Removing the spacer and spring



- Remove spacer ① and spring ②.

## 17.3.23 Removing the clutch basket

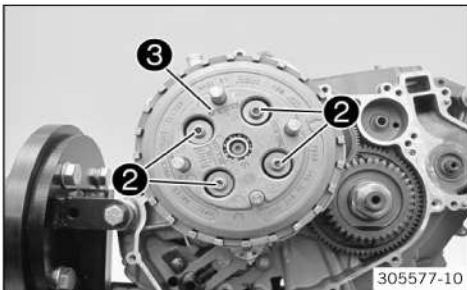


- Clamp the antihopping clutch with special tool ①.

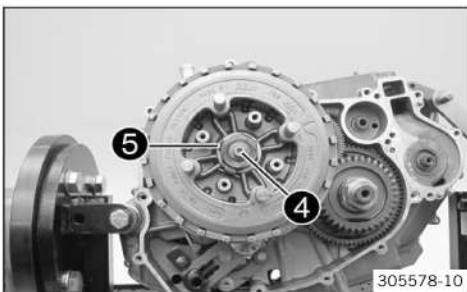
Assembly screws (75029033000) (📖 p. 289)

**i Info**

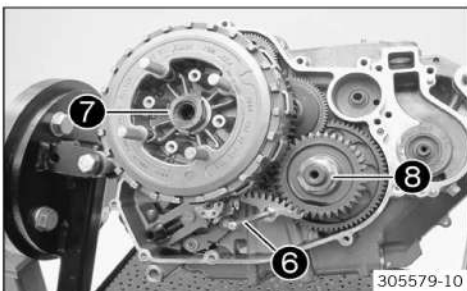
Apply the special tool by hand only; do not use another tool.



- Loosen screws ② diagonally and remove them with their spring retainers and clutch springs.
- Remove pressure cap ③.



- Remove clutch throw-out ④.
- Bend up lock washer ⑤.



- Hold the clutch basket using special tool ⑥.

Gear segment (75029081000) (📖 p. 292)

**i Info**

Make sure that the crankshaft is not locked.

- Remove nut ⑦.
- Remove the lock washer.
- Remove nut ⑧.



**Info**

LH thread!

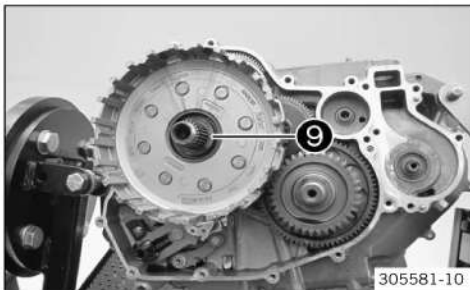
- Remove the special tool.

Gear segment (75029081000) (📖 p. 292)

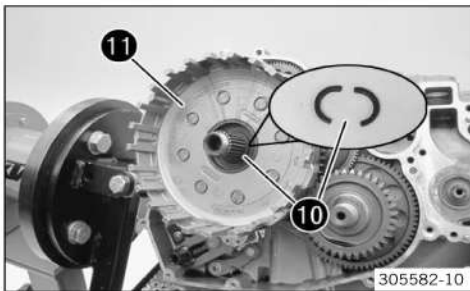
- Take out the antihopping clutch.



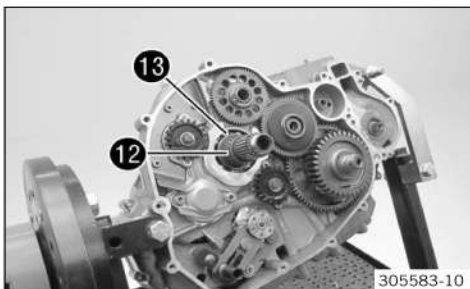
- Remove stepped washer 9.



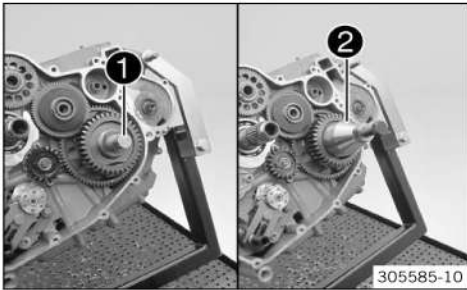
- Remove half washers 10.
- Take off clutch basket 11.



- Remove needle bearing 12 and supporting plate 13.



17.3.24 Removing the primary gear



- Position special tool ①.

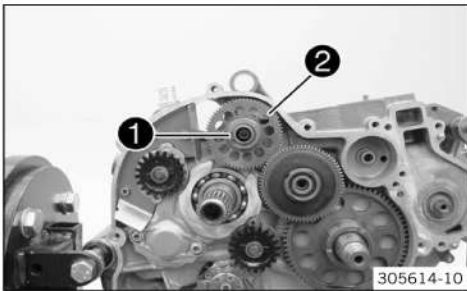
Protection cap (75029090000) (p. 293)

- Mount special tool ②.

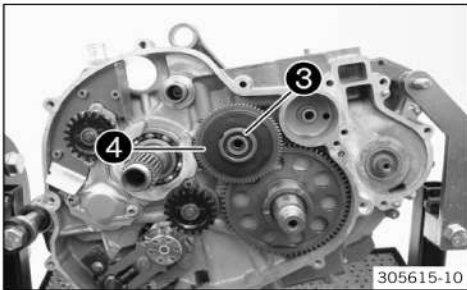
Puller (75029021000) (p. 289)

- Hold it using the special tool and pull off the primary gear by turning the screw in.
- Remove the special tools.

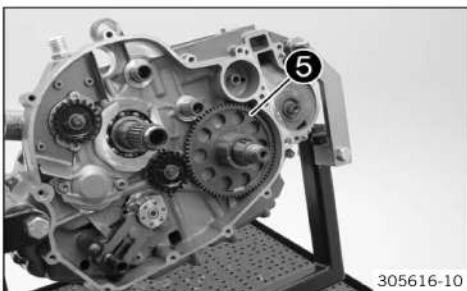
17.3.25 Removing the starter drive



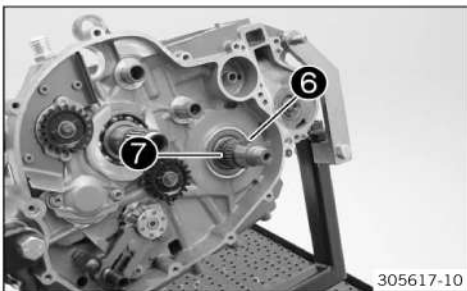
- Remove lock ring ①.
- Take off the starter idler gear ② with the washers.



- Remove lock ring ③.
- Remove torque limiter ④ with the washers and needle bearing.



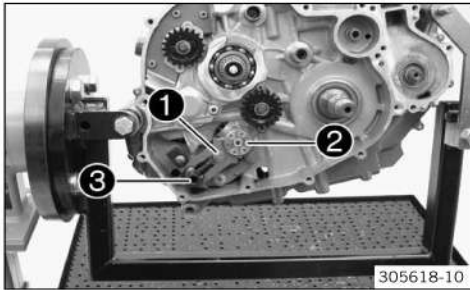
- Take off freewheel gear ⑤.



- Remove woodruff key ⑥ and both needle bearings ⑦.

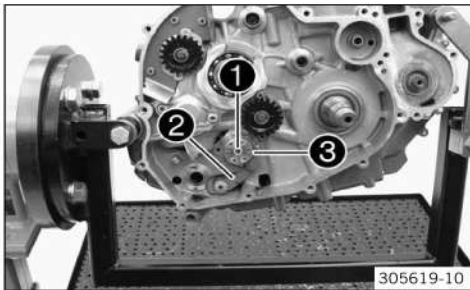


## 17.3.26 Removing shift shaft



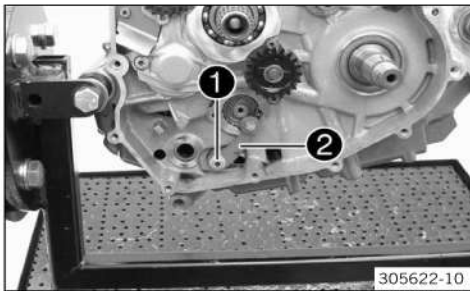
- Push sliding plate **1** away from the shift drum locating **2**.
- Remove shift shaft **3** with the washer.

## 17.3.27 Removing shift drum locating



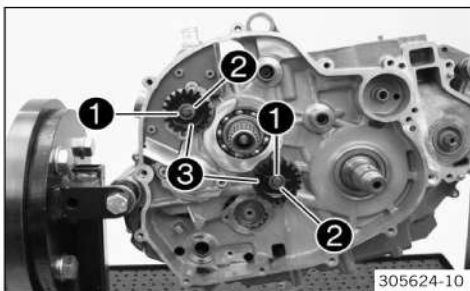
- Remove screw **1**.
- Press locking lever **2** away from shift drum locating **3** and take off the shift drum locating.
- Release the locking lever.

## 17.3.28 Removing locking lever



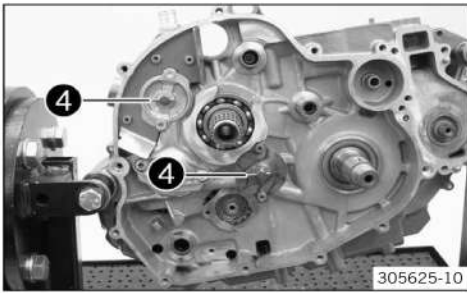
- Remove screw **1**.
- Take off locking lever **2** with the sleeve and spring.

## 17.3.29 Removing the oil pumps

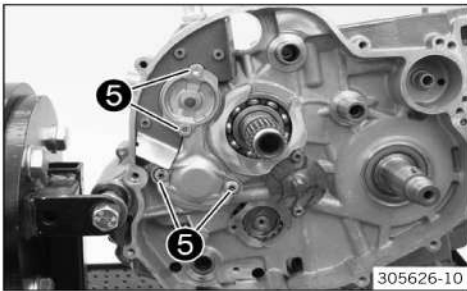


- Remove lock washers **1** and normal washers **2** from both oil pumps.
- Take off oil pump gear wheels **3**.

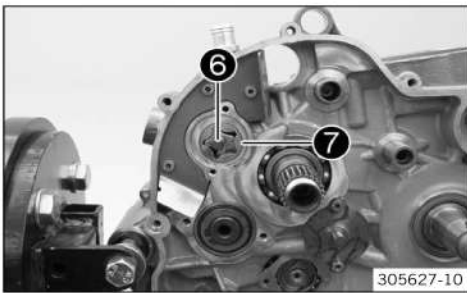




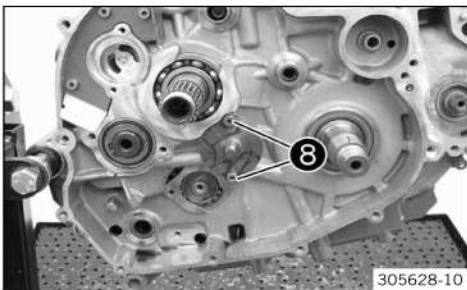
- Remove pins **4** and washers.



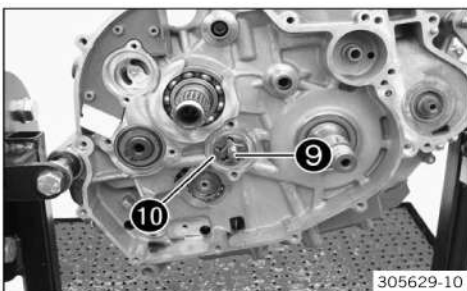
- Remove screws **5**.
- Take off the oil pump cover.



- Remove oil pump shaft **6** with the internal rotor.
- Remove external rotor **7**.

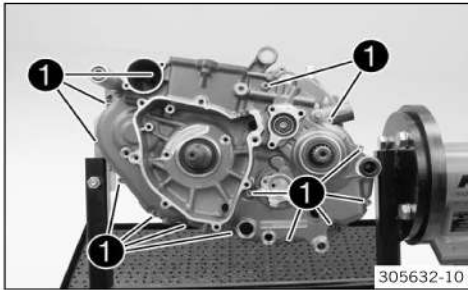


- Remove screws **8**.
- Take off the oil pump cover.

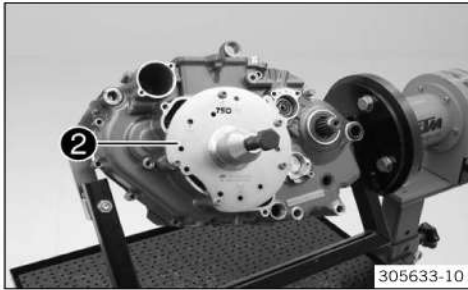


- Remove oil pump shaft **9** with the internal rotor.
- Remove external rotor **10**.

## 17.3.30 Removing the left engine case



- Remove screws **1**.
- Swing the left section of the engine case up and remove the nut or screw of the engine fixing arm.



- Mount special tool **2** with suitable screws.

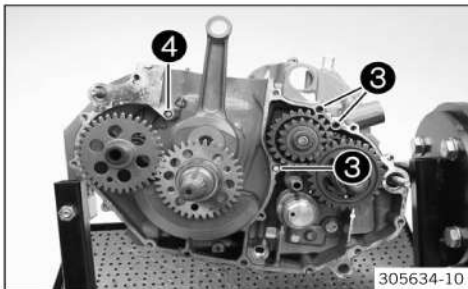
Puller (75029048100) (p. 291)

**i Info**  
Use the drill hole with marking **750**.

- Pull off the section of the engine case.

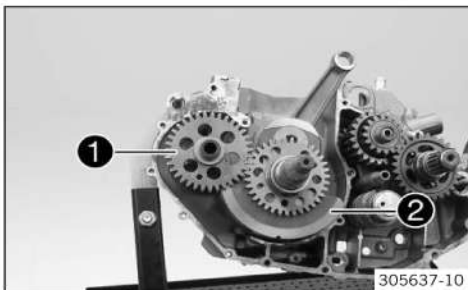
**i Info**  
Do not tension the section of the engine case.  
The balancer shaft and the main shaft have a stop disk; these usually stick to the bearing.

- Take off the left section of the engine case.
- Remove the special tool.



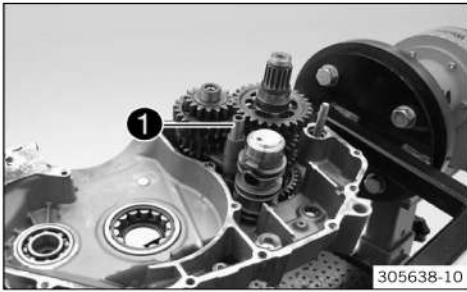
- Remove dowels **3**.
- Remove O-ring **4**.

## 17.3.31 Removing the crankshaft and balancer shaft

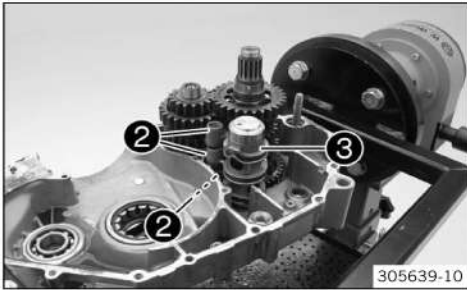


- Remove balancer shaft **1** and crankshaft **2**.

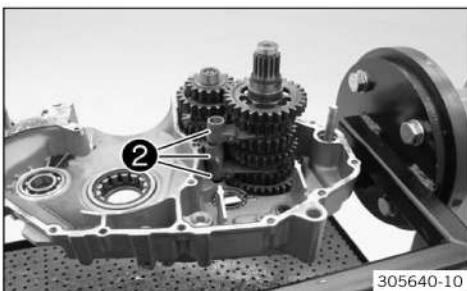
17.3.32 Removing the transmission shafts



- Remove shift rail ①.



- Swing shift forks ② to one side.
- Remove shift drum ③.

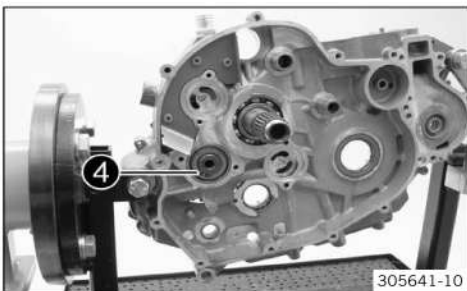


- Remove shift forks ②.

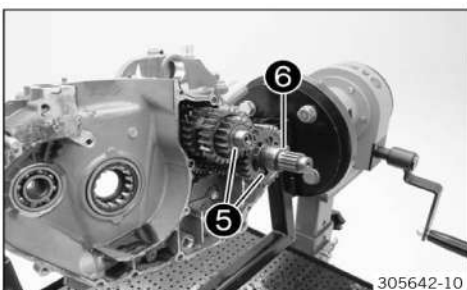
---

**i Info**  
Ensure that the pins remain in place.

---



- Remove lock ring ④ and the stop disk.



- Remove transmission shafts ⑤.

---

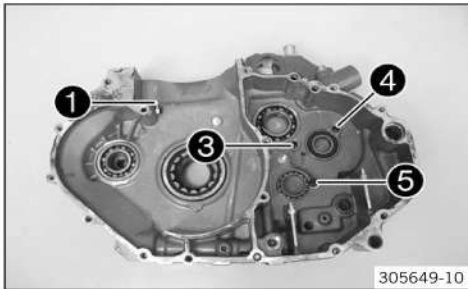
**i Info**  
The stop disk of the countershaft usually sticks to the bearing.

---

- Take off the O-ring of countershaft ⑥.

## 17.4 Working on individual parts

### 17.4.1 Working on the right section of the engine case



- Remove oil nozzle ①.
- Remove bearing retainers ③ of the main shaft bearing, ④ of the countershaft bearing and ⑤ of the shift drum bearing.
- Remove any remnants of sealing compound and clean the section of the engine case thoroughly.
- Pull the dowels out of the housing.
- Warm the section of the engine case in an oven.

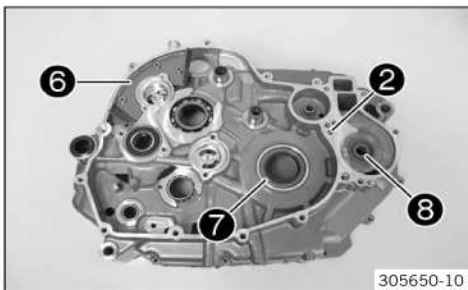
#### Guideline

150 °C (302 °F)

- Knock the section of the engine case against a level wooden board. This will cause the bearings to drop out of the bearing seats.

#### **i** Info

Any bearings that remain in the section of the engine case must be removed using a suitable tool.



- Remove oil nozzle ②.
- Remove the cover plate ⑥ for the oil return line.
- Press out shaft seal ring ⑦ of the crankshaft from the inside to the outside.
- Remove shaft seal rings ⑧ of the water pump.
- Press in the shaft seal ring ⑦ of the crankshaft from the outside to the inside with the open side facing in.

#### **i** Info

The shaft seal ring must be flush on the outside.

- Press in the shaft seal rings of the water pump with the open side facing out so that it is flush.
- Warm the section of the engine case again.

#### Guideline

150 °C (302 °F)

- Insert the new cold bearings into the bearing seats of the hot engine case section and, if necessary, use a suitable press drift to push the bearings from the inside to the outside, all the way to the stop or so it is flush.

#### **i** Info

Shift shaft bearing ⑨ must be pressed in from the outside to the inside until it is flush. When pressing in, ensure that the section of the engine case lies flat in order prevent damage. Only press the bearings in using the outer bearing race; otherwise, the bearings will be damaged when they are pressed in.





- After the section of the engine case has cooled, check that the bearings are firmly seated.

**i Info**  
If the bearings are not firmly seated after cooling, it is likely that they will rotate in the engine case when warm. In this case, the engine case must be renewed.

- Position all bearing retainers. Mount and tighten the screws.

Guideline

|                           |    |  |
|---------------------------|----|--|
| Locking screw for bearing | M5 | 6 Nm (4.4 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------|----|--|

- Mount and tighten oil nozzle ①.

Guideline

|                         |         |  |
|-------------------------|---------|--|
| Oil jet, piston cooling | M6x0.75 | 4 Nm (3 lbf ft)<br><b>Loctite®243™</b> |
|-------------------------|---------|--|

- Mount and tighten oil nozzle ②.

Guideline

|   |    |  |
|---|----|--|
| Oil nozzle for conrod bearing lubrication | M4 | 2 Nm (1.5 lbf ft)<br><b>Loctite®243™</b> |
|---|----|--|

- Blow compressed air through all oil channels and check that they are clear.

- Position cover plate ⑥. Mount and tighten the screws.

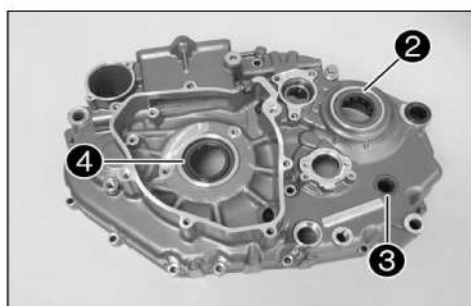
Guideline

|  |    |                   |
|--|----|-------------------|
| Screw, cover plate for oil return line | M5 | 6 Nm (4.4 lbf ft) |
|--|----|-------------------|

- Reinstall the dowels.

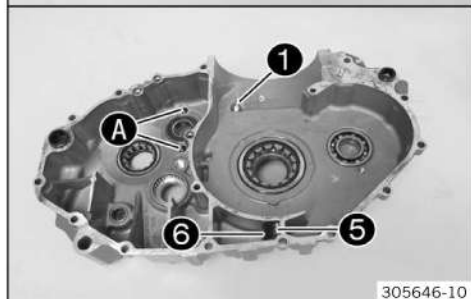


## 17.4.2 Working on the left section of the engine case



- Remove all dowels.
- Remove oil nozzle ①.
- Remove shaft seal rings of the countershaft ② and ③ of the shift shaft.

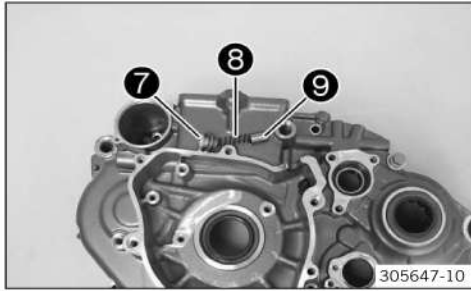
**i Info**  
Shaft seal ring ④ of the crankshaft cannot be removed before the crankshaft bearing.



- Unscrew the membrane support plate ⑤ and remove it together with membrane ⑥.
- Remove screws ① with the washer.

305646-10





- Remove screw plug **7** and take pressure spring **8** with piston valve **9** out of the drill hole.
- Remove any remnants of sealing compound and clean the section of the engine case thoroughly.
- Warm the section of the engine case in an oven.

Guideline

|                 |
|-----------------|
| 150 °C (302 °F) |
|-----------------|

- Knock the section of the engine case against a level wooden board. This will cause the bearings to drop out of the bearing seats.

**i** Info

Any bearings that remain in the section of the engine case must be removed using a suitable tool.

- Press out the crankshaft shaft seal ring from the outside toward the inside.
- Press in the crankshaft seal ring from the inside toward the outside, with the open side facing outward.

**i** Info

The shaft seal ring must be flush on the outside.

- Warm the section of the engine case again.

Guideline

|                 |
|-----------------|
| 150 °C (302 °F) |
|-----------------|

- Insert the new cold bearings in the bearing seats of the heated section of the engine case; if necessary, use a suitable press drift to push them all the way in and make them flush.

**i** Info

When pressing in, ensure that the section of the engine case lies flat in order prevent damage. Only press the bearings in using the outer bearing race; otherwise, the bearings will be damaged when they are pressed in.

- After the section of the engine case has cooled, check that the bearings are firmly seated.

**i** Info

If the bearings are not firmly seated after cooling, it is likely that they will rotate in the engine case when warm. In this case, the engine case must be renewed.

- Mount and tighten screws **A** with the washers.

Guideline

|                           |    |  |
|---------------------------|----|--|
| Locking screw for bearing | M5 | 6 Nm (4.4 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------|----|--|

- Press the shaft seal ring **2** of the countershaft and **3** of the shift shaft in flush, with the open side facing inward.
- Mount and tighten oil nozzle **1**.

Guideline

|                         |         |  |
|-------------------------|---------|--|
| Oil jet, piston cooling | M6x0.75 | 4 Nm (3 lbf ft)<br><b>Loctite®243™</b> |
|-------------------------|---------|--|

- Mount the dowels.
- Blow compressed air through all oil channels and check that they are clear.
- Measure the spring length of the oil pressure regulator valve.

|  |                      |
|--|----------------------|
| Oil pressure regulator valve - minimum spring length | 25.36 mm (0.9984 in) |
|--|----------------------|

- » If the measured value does not meet specifications:
  - Change the spring.
- Check the piston valve for damage and wear.
  - » If there is damage or wear:
    - Replace the piston valve.
- Lubricate piston valve ⑨ and mount it with pressure spring ⑧. Mount and tighten screw plug ⑦ with a new seal ring.

Guideline

|                                   |         |                     |
|-----------------------------------|---------|---------------------|
| Oil pressure regulator valve plug | M12x1.5 | 20 Nm (14.8 lbf ft) |
|-----------------------------------|---------|---------------------|

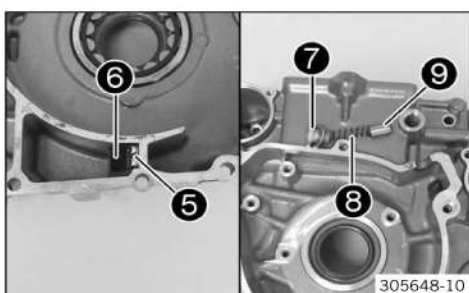
- Position membrane support plate ⑤ with membrane ⑥. Mount and tighten the screws.

Guideline

|                          |    |  |
|--------------------------|----|--|
| Screw, membrane fixation | M3 | 2 Nm (1.5 lbf ft)<br><b>Loctite®243™</b> |
|--------------------------|----|--|

**i** Info

The membrane support plate is curved and must point away from the membrane. An incorrectly installed membrane support plate results in loss of performance and increased oil consumption or leaks. Do not apply thread locker between the membrane and the membrane support plate since this would impair their function.



17.4.3 Work on the clutch cover



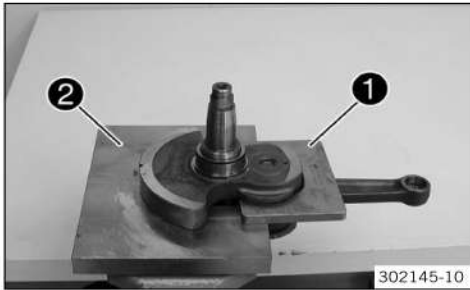
- Remove the shaft seal ring ① of the crankshaft.
- Press in a new shaft seal ring with the open side facing inward until it stops.

**i** Info

Support the clutch cover sufficiently when pressing in.

- Blow compressed air through the oil channel and check that it is clear.

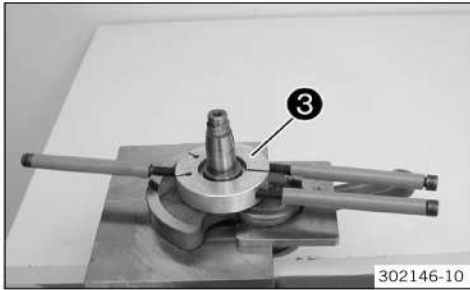
## 17.4.4 Removing crankshaft bearing inner ring



- Fix the crankshaft with special tools ① and ② in the vise.

Separator plate, upper part (75029047050) (📖 p. 290)

Separator plate, base (75029047051) (📖 p. 291)



- Heat the special tool ③.

Guideline

150 °C (302 °F)

Puller (58429037043) (📖 p. 285)

- Push the heated special tool ③ on to the inner bearing race, press them hard together, and pull them together off the crankshaft.
- Take off the compensation shim.
- Repeat the operation on the opposite side.

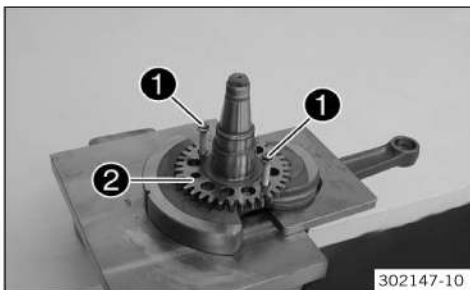
## 17.4.5 Removing the drive wheel of the balancer shaft

### Preparatory work

- Remove the crankshaft bearing inner ring. (📖 p. 160)

### Main work

- Screw suitable screws ① into the thread. Tighten the two screws evenly to pull drive wheel ② off the crankshaft.



## 17.4.6 Changing the connecting rod, conrod bearing, and crank pin

### Preparatory work

- Remove the crankshaft bearing inner ring. (📖 p. 160)
- Remove the drive wheel of the balancer shaft. (📖 p. 160)

### Main work

- Position the crankshaft with special tool ① in the press.

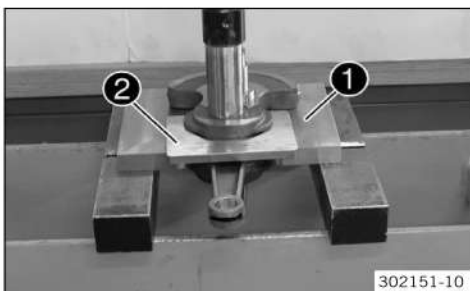
Separator plate, base (75029047051) (📖 p. 291)

- Position special tool ② between the crankwebs.

Separator plate, upper part (75029047050) (📖 p. 290)

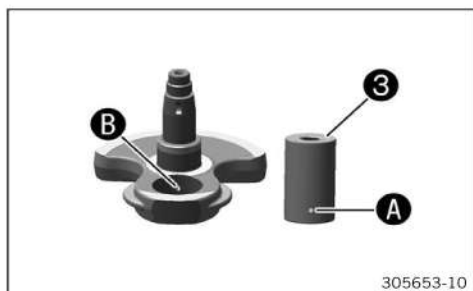
- Press the crank pin out of the upper crankweb with the push-out drift of the special tool.

Crankshaft pressing tool (75029047000) (📖 p. 290)



**i Info**  
Hold the lower crankweb.

- Take off the connecting rod and bearing.
- Press the crank pin out of the crankweb.



- Press in the new crank pin ③ as far as possible.

**i Info**  
The crank pin must be pressed in so that oil channel A is aligned with oil channel B. If the oil channels are not correctly aligned, the conrod bearing will not be supplied with oil.

- Blow compressed air through the oil channel to check that it is clear.
- Mount bearing ④ and connecting rod ⑤.

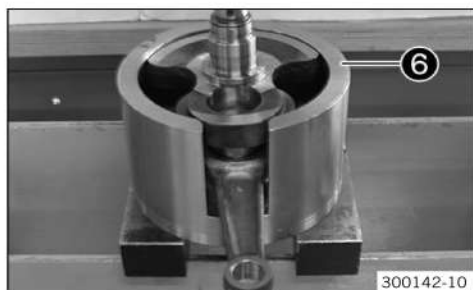


**i Info**  
Thoroughly lubricate the bearing.

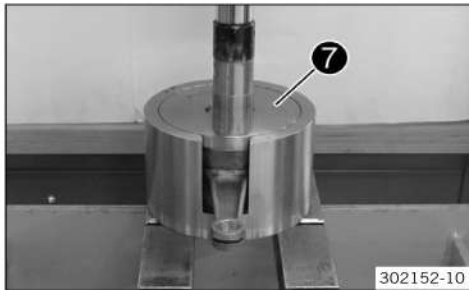
- Position special tool ⑥ on the press.

Crankshaft pressing tool (75029047000) ( p. 290)

- Place the crankweb in with the connecting rod and the bearing. Position the second crankweb.







- Position special tool **7** with the heel at the bottom.

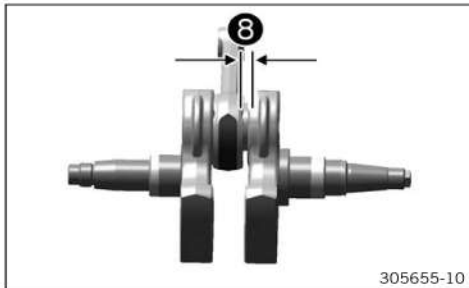
|   |
|---|
| Crankshaft pressing tool (75029047000) (p. 290) |
|---|

- Press the upper crankweb in as far as possible.

**i Info**

The press mandrel must be applied above the crank pin.

- Take the crankshaft out of the special tool, and check the connecting rod for freedom of movement.



- Measure axial play **8** between the connecting rod and the crankwebs using the special tool.

|                                     |
|-------------------------------------|
| Feeler gauge (59029041100) (p. 286) |
|-------------------------------------|

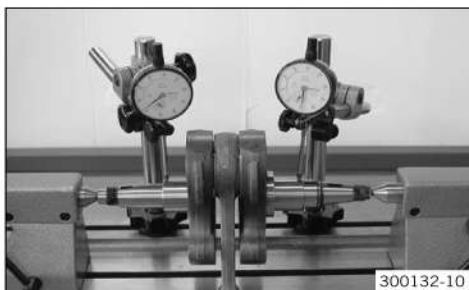
|  |   |
|--|---|
| Connecting rod - axial clearance of lower conrod bearing | 0.30 ... 0.60 mm (0.0118 ... 0.0236 in) |
|--|---|

- » If the specification is not reached:
  - Correct until it complies with the specified value.

**Finishing work**

- Check the crankshaft run-out at the bearing pin. (p. 162)
- Install the drive wheel of the balancer shaft. (p. 162)
- Install the crankshaft bearing inner ring. (p. 163)
- Measure the axial clearance of the crankshaft and the balancer shaft. (p. 164)

### 17.4.7 Checking crankshaft run-out at bearing pin

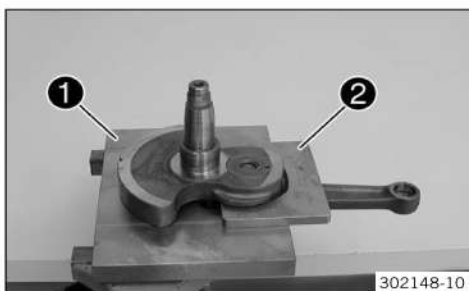


- Position the crankshaft on a roller block.
- Rotate the crankshaft slowly.
- Check the crankshaft run-out at both bearing pins.

|                                   |                         |
|-----------------------------------|-------------------------|
| Crankshaft run-out at bearing pin | ≤ 0.10 mm (≤ 0.0039 in) |
|-----------------------------------|-------------------------|

- » If the crankshaft run-out at the bearing pin is greater than the specified value:
  - Align the crankshaft.

### 17.4.8 Installing balancer shaft drive wheel



**Main work**

- Fix the crankshaft with special tools **1** and **2** in the vise.

|  |
|--|
| Separator plate, upper part (75029047050) (p. 290) |
|--|

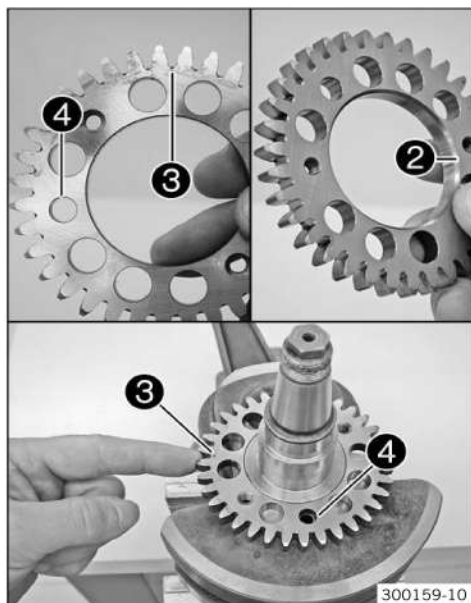
|  |
|--|
| Separator plate, base (75029047051) (p. 291) |
|--|

- Warm the drive wheel.

**Guideline**

|                 |
|-----------------|
| 100 °C (212 °F) |
|-----------------|





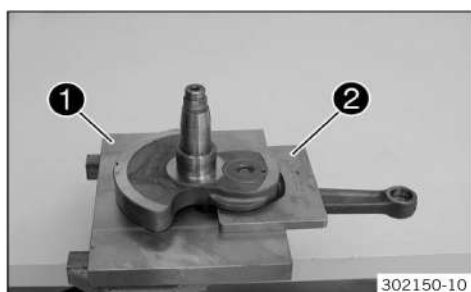
- Place the drive wheel on the crankshaft.
  - ✓ The dowel of the crankshaft must fit in the drill hole ④.
  - ✓ The side of the drive wheel with the punch mark ③ must be visible after assembly, and the side with the bevel ② must be in contact with the crankweb.

#### Finishing work

- Install the crankshaft bearing inner ring. (📖 p. 163)
- Measure the axial clearance of the crankshaft and the balancer shaft. (📖 p. 164)



### 17.4.9 Installing crankshaft bearing inner ring



#### Main work

- Fix the crankshaft with special tools ① and ② in the vise.

|  |
|--|
| Separator plate, upper part (75029047050) (📖 p. 290) |
|--|

|  |
|--|
| Separator plate, base (75029047051) (📖 p. 291) |
|--|

- Push on the compensation shim.
- Heat the special tool. Install the inner bearing race.

#### Guideline

|                 |
|-----------------|
| 120 °C (248 °F) |
|-----------------|

- Repeat the operation on the opposite side.
- Make sure that the new inner bearing race is installed flush.

#### **i** Info

After changing the crankshaft bearing and the conrod bearing, measure the axial play of the crankshaft.

#### Finishing work

- Measure the axial clearance of the crankshaft and the balancer shaft. (📖 p. 164)



## 17.4.10 Measuring axial clearance of crankshaft and balancer shaft



- Insert the crankshaft and balancer shaft in the right engine casing.



### Info

Do not forget the dowels.

- Mount the left engine casing.
- Mount and tighten the screws.

#### Guideline

|                    |    |                    |
|--------------------|----|--------------------|
| Screw, engine case | M6 | 10 Nm (7.4 lbf ft) |
|--------------------|----|--------------------|

- Mount the dial gauge support on the engine case and measure and note the axial clearance of the crankshaft.

#### Guideline

|                              |   |
|------------------------------|---|
| Crankshaft - axial clearance | 0.15 ... 0.25 mm (0.0059 ... 0.0098 in) |
|------------------------------|---|

- » If the measured value does not equal the specified value:
  - Remove the crankshaft.
  - Remove the crankshaft bearing inner ring. (📖 p. 160)
  - Calculate the thickness of the compensation shims.
  - Add or remove compensation shims equally on both sides.



### Info

If the axial clearance is too small, remove compensation shims.  
If the axial clearance is too large, add compensation shims.

- Install the crankshaft bearing inner ring. (📖 p. 163)

- Mount the dial gauge support on the engine case and measure and note the axial clearance of the balancer shaft.

#### Guideline

|                                |  |
|--------------------------------|--|
| Balancer shaft axial clearance | 0.05 ... 0.20 mm (0.002 ... 0.0079 in) |
|--------------------------------|--|

- » If the measured value does not equal the specified value:
  - Remove the balancer shaft.
  - Calculate the thickness of the compensation shims.
  - Add compensation shims to the ignition side only.



### Info

If the axial clearance is too small, remove compensation shims.  
If the axial clearance is too large, add compensation shims.



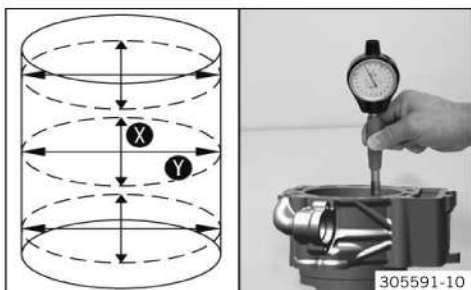
17.4.11 Cylinder - Nikasil® coating



**Nikasil®** is a surface protection layer for a coating procedure developed by Mahle. The name is derived from the two materials used in this procedure - a layer of nickel into which is embedded the particularly hard silicone carbide.

The most important advantages of the **Nikasil®** coating are very good heat conductivity, resulting in much improved performance, low wear, and a lightweight cylinder.

17.4.12 Checking/measuring the cylinder



- Check the O-ring of the chain adjuster for damage and wear.
  - » If there is damage or wear:
    - Change the O-ring.
- Check the cylinder bearing surface for damage.
  - » If the cylinder bearing surface is damaged:
    - Change the cylinder and piston.
- Measure the cylinder diameter at several locations on the **X** and **Y** axes using a micrometer to identify oval wear.

Guideline

| Cylinder - bore diameter |  |
|--------------------------|--|
| Size I                   | 102.000 ... 102.012 mm<br>(4.01574 ... 4.01621 in) |
| Size II                  | 102.013 ... 102.025 mm<br>(4.01625 ... 4.01672 in) |

- The cylinder size **1** is marked on the side of the cylinder.



- Using a straightedge and the special tool, check the sealing surface of the cylinder head for distortion.

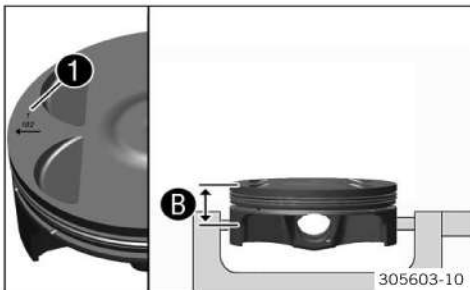
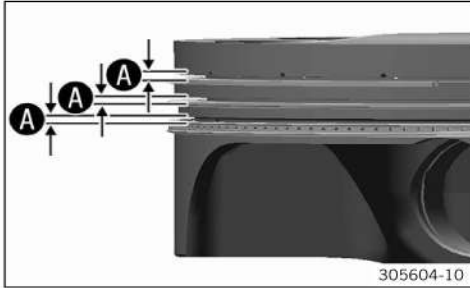
|                                     |
|-------------------------------------|
| Feeler gauge (59029041100) (p. 286) |
|-------------------------------------|

|  |                         |
|--|-------------------------|
| Cylinder/cylinder head - sealing area distortion | ≤ 0.10 mm (≤ 0.0039 in) |
|--|-------------------------|

- » If the measured value does not meet specifications:
  - Change the cylinder.



## 17.4.13 Checking/measuring the piston



- Use the special tool to measure play **A** of the piston rings in the piston ring groove.

### Guideline

|                                |                         |
|--------------------------------|-------------------------|
| Piston ring - groove clearance | ≤ 0.08 mm (≤ 0.0031 in) |
|--------------------------------|-------------------------|

Feeler gauge (59029041100) (📖 p. 286)

- » If play **A** is greater than the specified value:
  - Change the piston and piston rings.
  - Check/measure the cylinder. (📖 p. 165)
- Check the piston bearing surface for damage.
  - » If the piston bearing surface is damaged:
    - Change the piston and, if necessary, the cylinder.
- Check that the piston rings can move easily in the piston ring grooves.

- » If the piston ring is stiff:

- Clean the piston ring groove.



### Tip

Use an old piston ring to clean the piston ring groove.

- Check the piston rings for damage.

- » If the piston ring is damaged:

- Change the piston ring.



### Info

Mount the piston ring with the marking facing upward.

- Check the piston pin for discoloration or signs of wear.

- » If the piston pin has strong discoloration/signs of wear:

- Change the piston pin.

- Insert the piston pin into the connecting rod and check the bearing for play.

- » If the piston pin bearing has too much play:

- Change the connecting rod and the piston pin.

- Measure the piston at the piston skirt, at right angles to the piston pin, at a distance **B**.

### Guideline

|                   |  |
|-------------------|--|
| Distance <b>B</b> | 31.5 mm (1.24 in)                                  |
| Piston - diameter |  |
| Size I            | 101.955 ... 101.965 mm<br>(4.01397 ... 4.01436 in) |
| Size II           | 101.965 ... 101.975 mm<br>(4.01436 ... 4.01476 in) |





**Info**

Piston size ① is marked on the piston head.

**17.4.14 Checking the piston ring end gap**



- Remove the piston ring from the piston.
- Place the piston ring in the cylinder and align with the piston.

Guideline

|                                      |                 |
|--------------------------------------|-----------------|
| Below the upper edge of the cylinder | 10 mm (0.39 in) |
|--------------------------------------|-----------------|

- Measure end gap ① with a feeler gauge.

Guideline

| Piston ring end gap |                         |
|---------------------|-------------------------|
| Compression rings   | ≤ 0.80 mm (≤ 0.0315 in) |
| Oil scraper ring    | ≤ 1.00 mm (≤ 0.0394 in) |

- » If the end gap is greater than the specified measurement:
  - Check/measure the cylinder. (🔗 p. 165)
- » If cylinder wear lies within the specified tolerance:
  - Change the piston ring.
- Mount the piston ring with the marking facing toward the piston head.

**17.4.15 Determining the piston/cylinder mounting clearance**



- Check/measure the cylinder. (🔗 p. 165)
- Check/measure the piston. (🔗 p. 166)
- The smallest piston/cylinder mounting clearance is the result of the smallest cylinder bore diameter minus the largest piston diameter. The largest piston/cylinder mounting clearance is the result of the largest cylinder bore diameter minus the smallest piston diameter.

Guideline

| Piston/cylinder - mounting clearance |  |
|--------------------------------------|--|
| New condition                        | 0.035 ... 0.060 mm<br>(0.00138 ... 0.00236 in) |
| Wear limit                           | 0.10 mm (0.0039 in)                            |

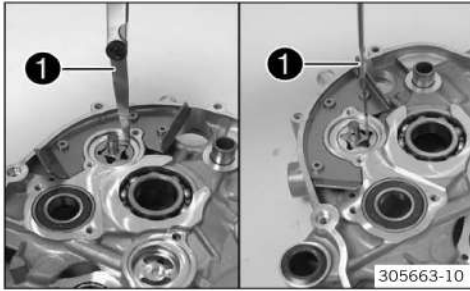
**17.4.16 Checking oil pumps for wear**



**Info**

The oil pump wear check shown here is on the suction pump but it applies to all oil pumps.

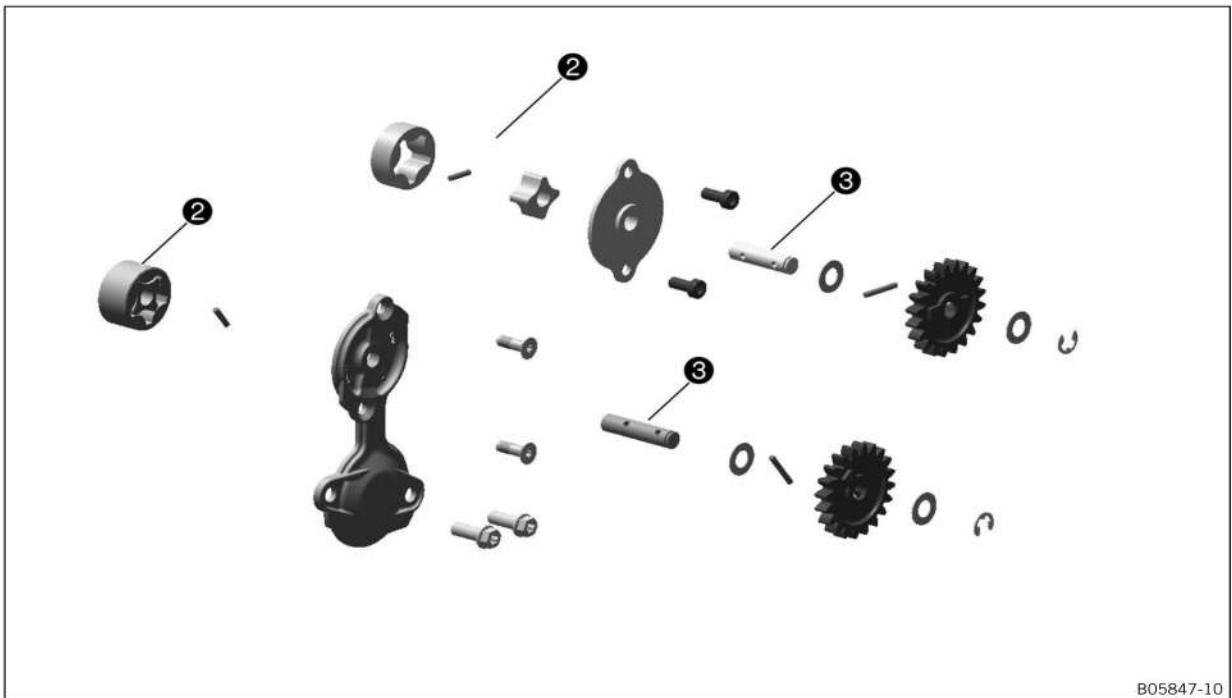




- Use a feeler gauge **1** to measure the play between the external rotor and the engine case as well as between the external rotor and the internal rotor.

| Oil pump  |   |
|---|---|
| Clearance between external rotor and engine case    | ≤ 0.20 mm (≤ 0.0079 in)                 |
| Clearance between external rotor and internal rotor | ≤ 0.20 mm (≤ 0.0079 in)                 |
| Axial clearance                                     | 0.04 ... 0.08 mm (0.0016 ... 0.0031 in) |

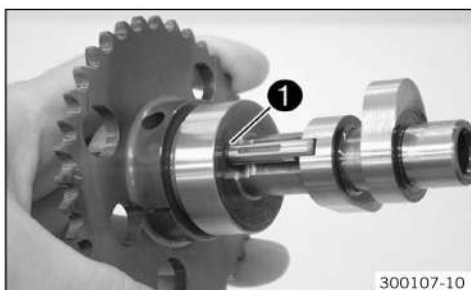
- » If the measured value does not meet specifications:
  - Change the oil pump and, if necessary, the engine case.



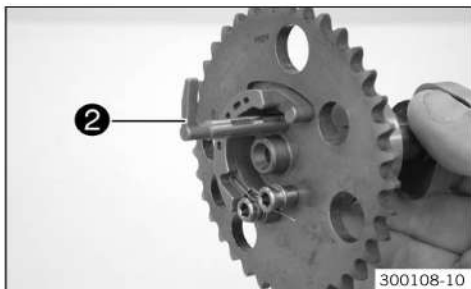
- Check the internal rotor and external rotor of oil pumps **2** for damage and wear.
  - » If there is damage or wear:
    - Change the oil pumps.
- Check oil pump shafts **3** for damage and wear.
  - » If there is damage or wear:
    - Change the oil pump shaft.
- Check both oil pump covers for damage and wear.
  - » If there is damage or wear:
    - Change the oil pump cover.

B05847-10

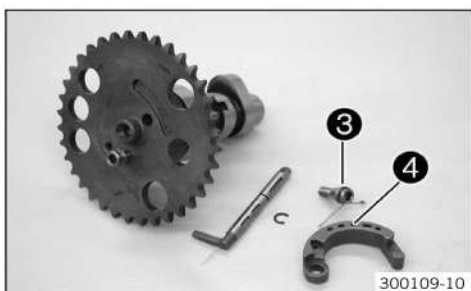
17.4.17 Replacing autodecompressor



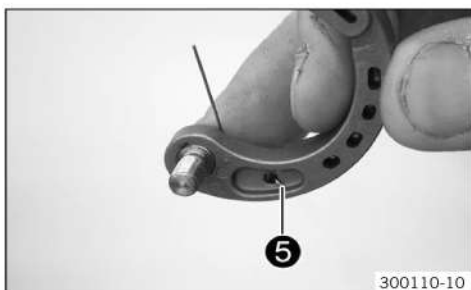
- Take the lock ring **1** off the autodecompression shaft and dispose of it.



- Pull the autodecompression shaft **2** from the camshaft.



- Disconnect the autodecompression spring. Loosen the screw **3** and remove it together with the autodecompression spring and the autodecompression weight **4**.



- When assembling, first connect the autodecompression spring and then insert the screw through the autodecompression weight.
  - ✓ The arm of the autodecompression spring **5** is long enough to pass right through the autodecompression weight.
- Position the autodecompression weight. Mount and tighten screw **3**. Reconnect the autodecompression spring.

Guideline

|                          |    |  |
|--------------------------|----|--|
| Screw, autodecompression | M6 | 3 ... 4 Nm (2.2 ... 3 lbf ft)<br><b>Loctite®243™</b> |
|--------------------------|----|--|

- Mount the autodecompression shaft in the camshaft. Install a new lock ring.
- Check the functioning.
  - » If the autodecompression spring does not completely retract the autodecompression shaft:
    - Replace the autodecompression spring.



## 17.4.18 Preparing timing chain tensioner for installation



- Fully compress the timing chain tensioner.



### Info

This requires considerable force since the oil has to be pressed out.

- Release the timing chain tensioner.
  - ✓ Without pressure, the timing chain tensioner expands fully.



- Place two compensating disks or similar aids next to the piston of the timing chain tensioner. This should ensure that when pushed down, the piston does not fully withdraw.

### Guideline

|                                     |                                  |
|-------------------------------------|----------------------------------|
| Thickness of the compensating disks | 2 ... 2.5 mm (0.08 ... 0.098 in) |
|-------------------------------------|----------------------------------|

- Release the timing chain tensioner.
  - ✓ The latching system locks and the piston stops moving.

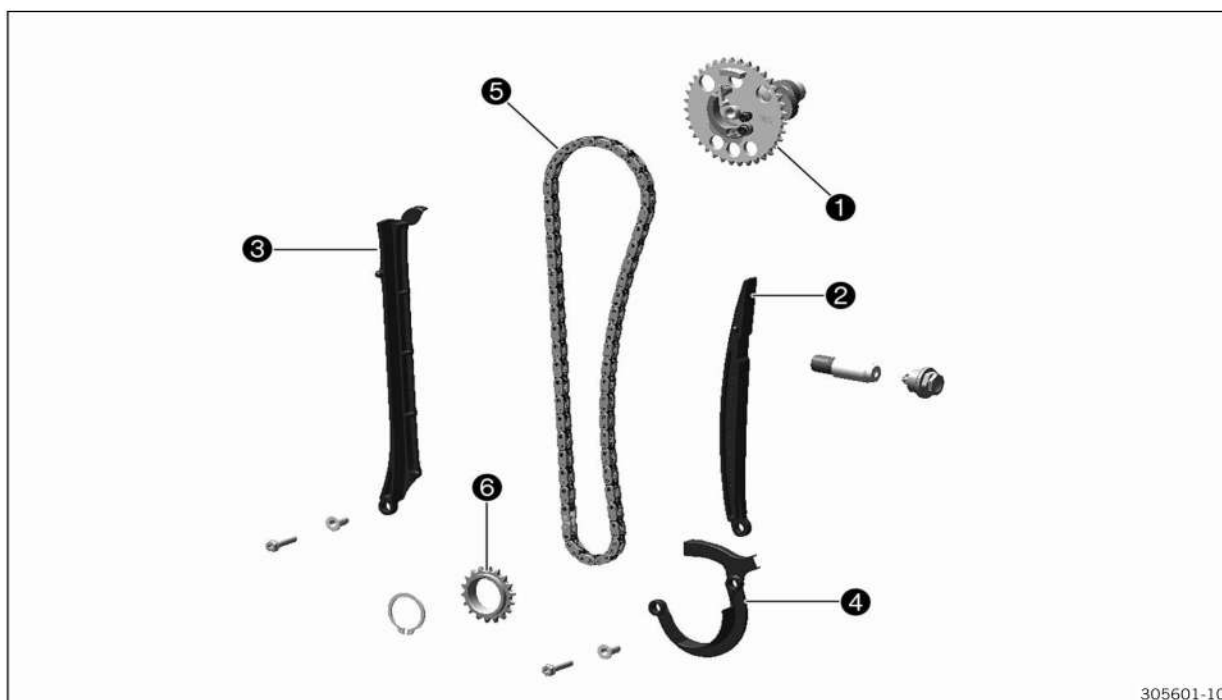
|                                       |                |
|---------------------------------------|----------------|
| End position of piston after latching | 3 mm (0.12 in) |
|---------------------------------------|----------------|



### Info

This position is necessary for installation. If the timing chain tensioner is now pressed in once more (while it is installed) and then pulled out no more than halfway (preventing it from coming out fully), the latching system locks and the timing chain tensioner can no longer be compacted; this function is necessary to ensure sufficient tension of the timing chain, even at low oil pressure.

## 17.4.19 Checking the timing assembly

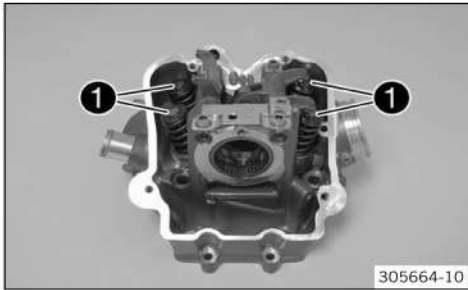


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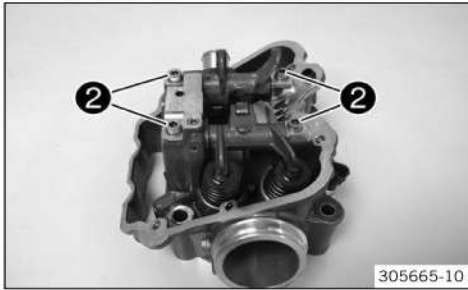
- Clean all parts well.
- Check timing chain gear **1** for damage and wear.
  - » If there is damage or wear:
    - Change the timing chain gear/timing chain sprocket.
- Check timing chain tensioning rail **2** for damage and wear.
  - » If there is damage or wear:
    - Change the timing chain tensioning rail.
- Check timing chain guide rail **3** for damage and wear.
  - » If there is damage or wear:
    - Change the timing chain guide rail.
- Check timing chain securing guide **4** for damage and wear.
  - » If there is damage or wear:
    - Change the timing chain securing guide.
- Check timing chain **5** for damage and wear.
  - » If there is damage or wear:
    - Change the timing chain.
- Check that the timing chain links move easily. Let the timing chain hang down freely.
  - » If the chain links no longer straighten out:
    - Change the timing chain.
- Check timing chain sprocket **6** for damage and wear.
  - » If there is damage or wear:
    - Change the timing chain gear/timing chain sprocket.



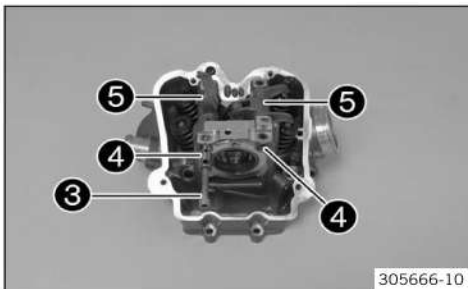
## 17.4.20 Removing the rocker arm



- Take shims **1** out of the valve spring retainers and lay them to one side according to their normal built-in position.



- Remove screws **2**.



- Screw a suitable screw **3** into the rocker arm shafts **4**. Pull out the rocker arm shafts.
- Take off rocker arm **5**.

## 17.4.21 Changing the camshaft bearing

### Preparatory work

- Remove the rocker arm. (📖 p. 172)

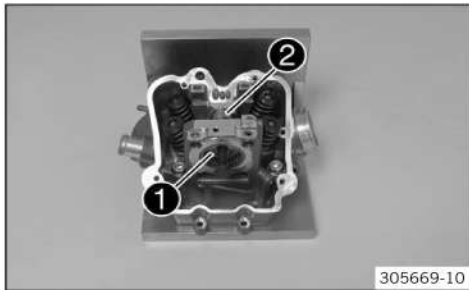
### Main work

- Mount the cylinder head on the special tool.

Clamping plate (75029050000) (📖 p. 291)







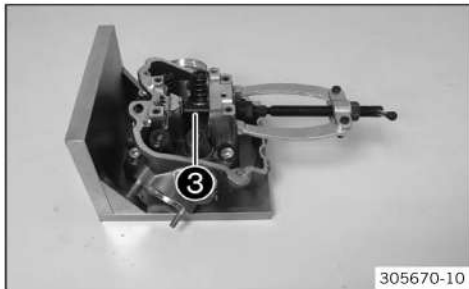
- Remove the large camshaft bearing using special tool **1**.

Pressing tool (75029051000) (📖 p. 291)



### Info

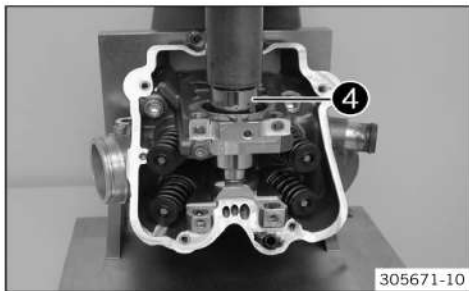
Brace the back of the special tool with a suitable tool **2**.



- Remove the small camshaft bearing using special tool **3**.

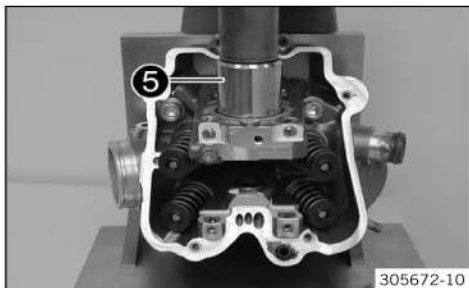
Internal bearing puller (15112018100) (📖 p. 284)

Bearing puller (15112017000) (📖 p. 283)



- Press in the small camshaft bearing as far as possible using special tool **4**.

Pressing tool (75029044020) (📖 p. 290)



- Press in the large camshaft bearing as far as possible using special tool **5**.

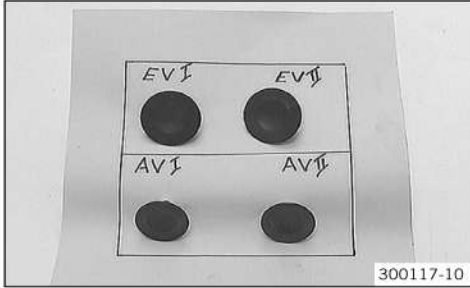
Pressing tool (75029044010) (📖 p. 290)

### Finishing work

- Install the rocker arm. (📖 p. 177)



## 17.4.22 Removing the valves



- Pretension the valve springs using the special tool.

|  |
|--|
| Valve spring mouter (59029019000) (📄 p. 285) |
|--|

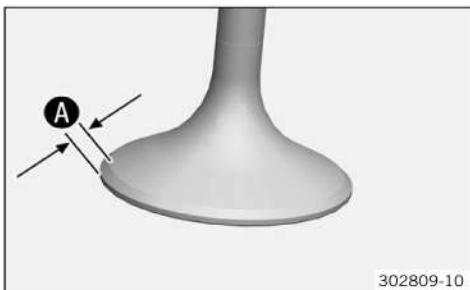
|  |
|--|
| Insert for valve spring lever (78029060000) (📄 p. 294) |
|--|

- Remove the valve keys and release the tension on the valve springs.
- Remove the spring retainer and spring.
- Pull the valve down and out of the valve guide, and remove the valve stem seal and valve spring seat.
- Mark the valves according to their normal built-in position.

### **i** Info

Place the valves into a box according to the installation position and label the box.

## 17.4.23 Checking the valves



- Check the run-out at the valve plate.

|                 |  |
|-----------------|--|
| Valve - run-out |  |
|-----------------|--|

|                    |                        |
|--------------------|------------------------|
| On the valve plate | ≤ 0.05 mm (≤ 0.002 in) |
|--------------------|------------------------|

- » If the measured value does not equal the specified value:
  - Change the valve.

- Check sealing seat **A** on the valve.

|                            |  |
|----------------------------|--|
| Valve - sealing seat width |  |
|----------------------------|--|

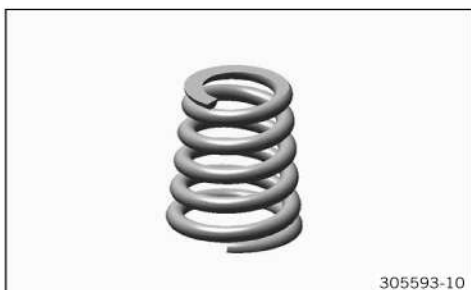
|        |                    |
|--------|--------------------|
| Intake | 1.60 mm (0.063 in) |
|--------|--------------------|

|                            |  |
|----------------------------|--|
| Valve - sealing seat width |  |
|----------------------------|--|

|         |                     |
|---------|---------------------|
| Exhaust | 2.00 mm (0.0787 in) |
|---------|---------------------|

- » If the sealing area is not in the center of the valve seat or deviates from the specified value:
  - Machine the valve seat.

17.4.24 Checking valve springs



- Check the valve springs for fractures and wear (visual check).
  - » If the valve spring is fractured or worn:
    - Change the valve spring.
- Measure the valve spring lengths.

|   |                    |
|---|--------------------|
| Valve spring                              |                    |
| Minimum length (without valve spring cap) | 42.3 mm (1.665 in) |

- » If the measured value does not equal the specified value:
  - Change the valve spring.



17.4.25 Checking valve spring retainer



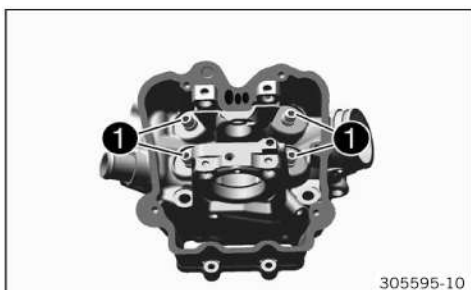
- Check the valve spring retainer for fractures and wear (visual check).
  - » If the valve spring retainer is fractured or worn:
    - Change the valve spring retainer.
- Measure the thickness of the valve spring retainer.

|                              |                                     |
|------------------------------|-------------------------------------|
| Valve spring cap - thickness | 2.4 ... 2.5 mm (0.094 ... 0.098 in) |
|------------------------------|-------------------------------------|

- » If the measured value does not equal the specified value:
  - Change the valve spring retainer.



17.4.26 Checking the cylinder head



- Check valve guides ① with the special tool.

|   |
|---|
| Limit plug gauge (59029026006) (📖 p. 285) |
|---|

- » If the special tool is easy to insert into the valve guide:
  - Change the valve guide and valve.
- Check the sealing area of the spark plug thread and the valve seats for damage and cracking.
  - » If there is damage or cracking:
    - Change the cylinder head.

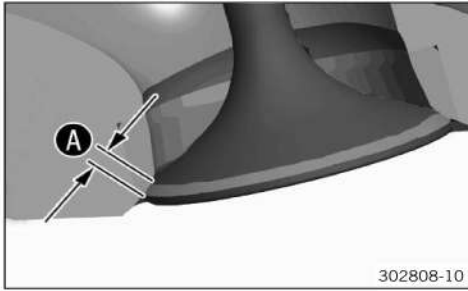


- Check the sealing area of the cylinder for distortion using a straight edge and the special tool.

|                                       |
|---------------------------------------|
| Feeler gauge (59029041100) (📖 p. 286) |
|---------------------------------------|

|  |                         |
|--|-------------------------|
| Cylinder/cylinder head - sealing area distortion | ≤ 0.10 mm (≤ 0.0039 in) |
|--|-------------------------|

- » If the measured value does not equal the specified value:
  - Change the cylinder head.



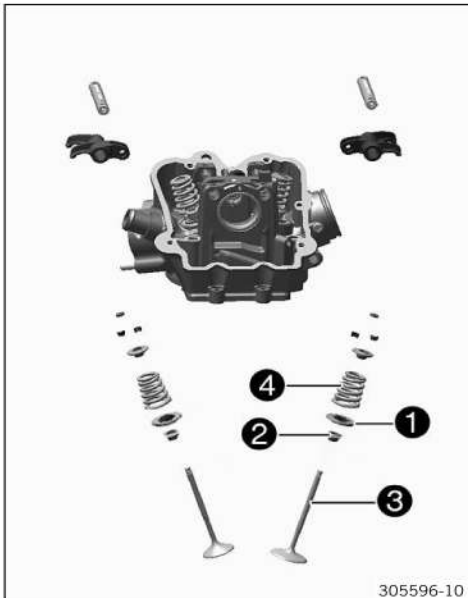
- Check sealing seat **A** of the valves.

|                            |                    |
|----------------------------|--------------------|
| Valve - sealing seat width |                    |
| Intake                     | 1.60 mm (0.063 in) |

|                            |                     |
|----------------------------|---------------------|
| Valve - sealing seat width |                     |
| Exhaust                    | 2.00 mm (0.0787 in) |

- » If the measured value does not equal the specified value:
  - Machine the valve seat.
- Blow compressed air through all oil channels and check that they are clear.

## 17.4.27 Installing the valves



- Position the valve spring seat **1**. Mount the new valve stem seals **2**.
- Mount valves **3** according to their normal built-in position.
- Mount valve springs **4** and the spring retainers.



- Pretension the valve springs using the special tool.

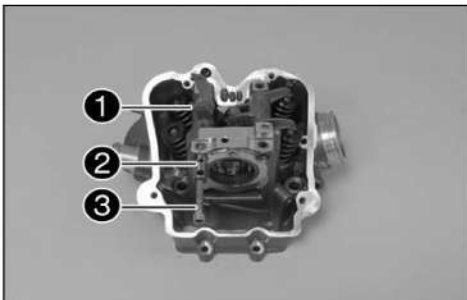
|  |
|--|
| Valve spring mounter (59029019000) (📄 p. 285)          |
| Insert for valve spring lever (78029060000) (📄 p. 294) |

- Mount the valve keys.

### **i** Info

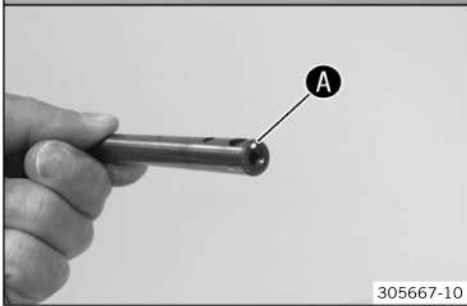
When mounting the valve keys, check that they are seated correctly; preferably, fix the valve keys to the valve with a little grease.

17.4.28 Installing the rocker arm

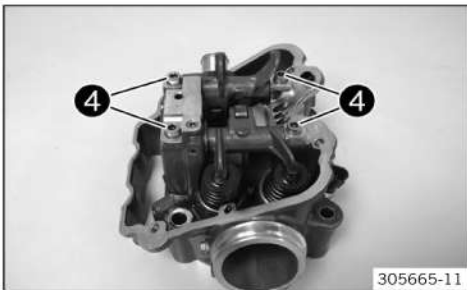


- Position rocker arm ① and push in the rocker arm shafts ②.

**i Info**  
 Make sure that the tapped hole of the rocker arm shaft is facing outward.  
 The small drill hole **A** and the flat surface must face upward.



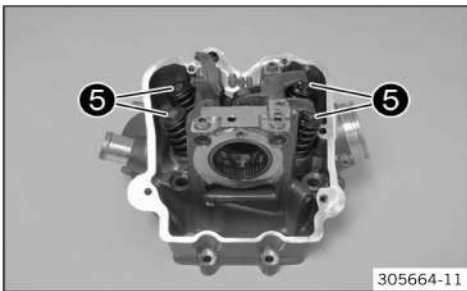
- Remove screw ③.



- Mount and tighten screws ④.

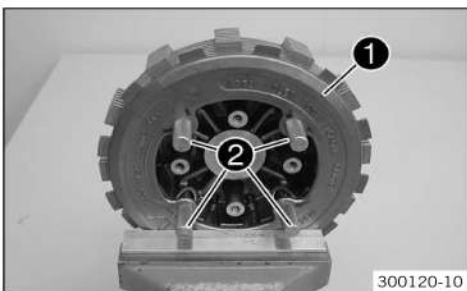
Guideline

|                         |    |                    |
|-------------------------|----|--------------------|
| Screw, rocker arm shaft | M6 | 12 Nm (8.9 lbf ft) |
|-------------------------|----|--------------------|



- Place shims ⑤ into the valve spring retainers according to their normal built-in position.

17.4.29 Disassembling the antihopping clutch

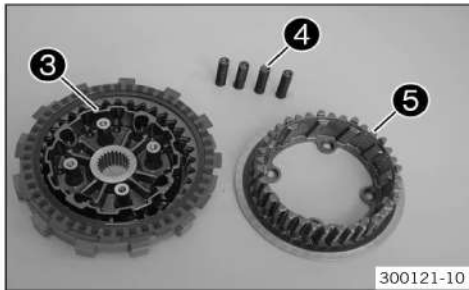


- Clamp the clutch ① in a vise.

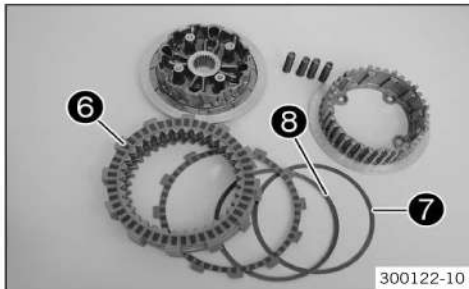
**i Info**  
 Use soft jaws.

- Carefully loosen and gradually remove the special tool ②.





- Take the clutch out of the vise and lay it on a clean workbench with the outer clutch hub 5 facing down.
- Take the inner clutch hub 3 and release springs 4 out of the outer clutch hub 5.

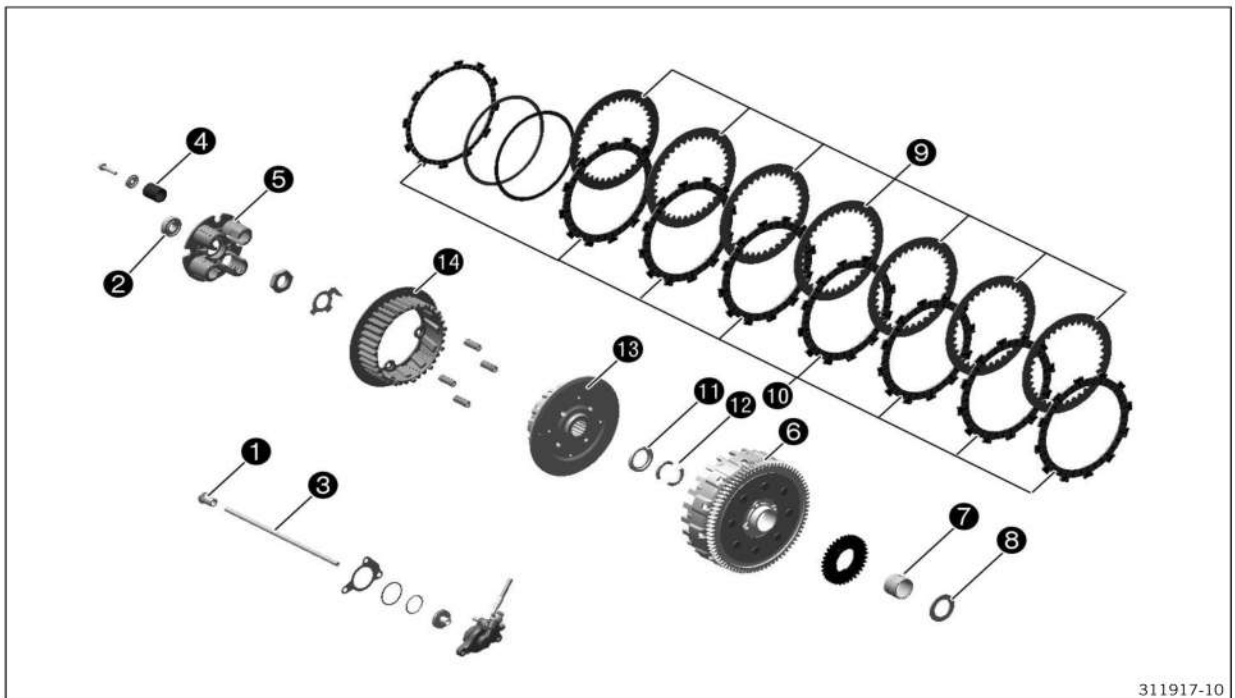


- Take off the clutch facing discs 6 from the inner clutch hub.
- Remove pretension ring 7 and support ring 8.
- Clean all parts well.
- Check the clutch. (p. 178)

### 17.4.30 Checking the clutch

#### Preparatory work

- Disassemble the antihopping clutch. (p. 177)



#### Main work

- Check clutch push rod 1 for damage and wear.
  - » If there is damage or wear:
    - Change the clutch push rod.
- Check axial bearing 2 for damage and wear.
  - » If there is damage or wear:
    - Change the axial bearing.

- Place the clutch push rod **3** on a flat surface and check for run-out.
  - » If there is run-out:
    - Change the clutch push rod.
- Check the length of clutch springs **4**.

|                        |                                      |
|------------------------|--------------------------------------|
| Clutch spring - length | 31.5 ... 33.5 mm (1.24 ... 1.319 in) |
|------------------------|--------------------------------------|

- » If the clutch spring length is shorter than specified:
  - Change all clutch springs.
- Check the contact surface of pressure cap **5** for damage and wear.
  - » If there is damage or wear:
    - Change the pressure cap.
- Check the thrust surfaces of the clutch facing discs in clutch basket **6** for wear.

|  |                      |
|--|----------------------|
| Clutch basket - contact surface of clutch facing discs | ≤ 0.5 mm (≤ 0.02 in) |
|--|----------------------|

- » If the thrust surface exhibits excessive wear:
  - Change the clutch facing discs and the clutch basket.
- Check needle bearing **7** and supporting plate **8** for damage and wear.
  - » If there is damage or wear:
    - Change the needle bearing and supporting plate.
- Check intermediate clutch discs **9** for damage and wear.
  - » If the intermediate clutch discs are not level and are pitted:
    - Change all intermediate clutch discs.
- Check clutch facing discs **10** for discoloration and scoring.
  - » If there is discoloration or scoring:
    - Change all clutch facing discs.
- Check the thickness of clutch facing discs **10**.

|                                |                       |
|--------------------------------|-----------------------|
| Clutch facing disc - thickness | ≥ 2.5 mm (≥ 0.098 in) |
|--------------------------------|-----------------------|

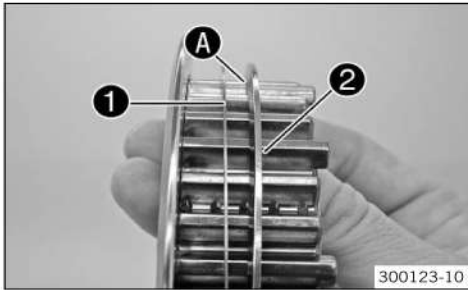
- » If the clutch facing disc does not meet specifications:
  - Change all clutch facing discs.
- Check stepped washer **11** for damage and wear.
  - » If there is damage or wear:
    - Change the stepped washer.
- Check half washers **12** for damage and wear.
  - » If there is damage or wear:
    - Change the half washers.
- Check inner clutch hub **13** for damage and wear.
  - » If there is damage or wear:
    - Change the inner clutch hub.
- Check outer clutch hub **14** for damage and wear.
  - » If there is damage or wear:
    - Change the outer clutch hub.

#### Finishing work

- Preassemble the antihopping clutch. (📖 p. 180)



## 17.4.31 Preassembling the antihopping clutch

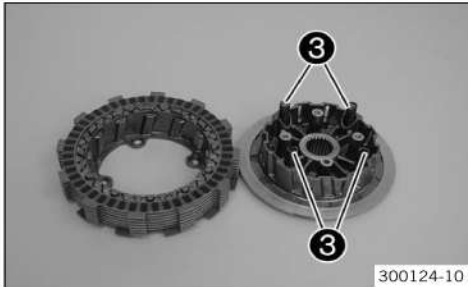


300123-10

- Thoroughly oil the clutch facing discs.
- Push the support ring **1** and the pretension ring **2** on to the outer clutch hub.

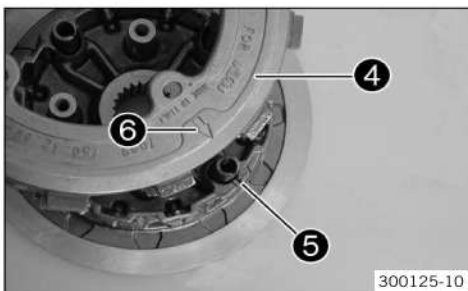
### **i** Info

The pretension ring must be installed so that it is flush with the inner edge **A** on the support ring.



300124-10

- Position the trimmed clutch facing disc with the recess for the pretension ring on the outer clutch hub.
- Beginning with the coated intermediate clutch disc, position all further clutch facing discs and intermediate clutch discs alternately.
- Position the release springs **3**.



300125-10

- Push on the outer clutch hub **4** and pay attention to the markings.
- ✓ The arrow **6** of the outer clutch hub must point to the notch **5** of the inner clutch hub.
- Push the two clutch hubs firmly together and have an assistant screw in the special tool.

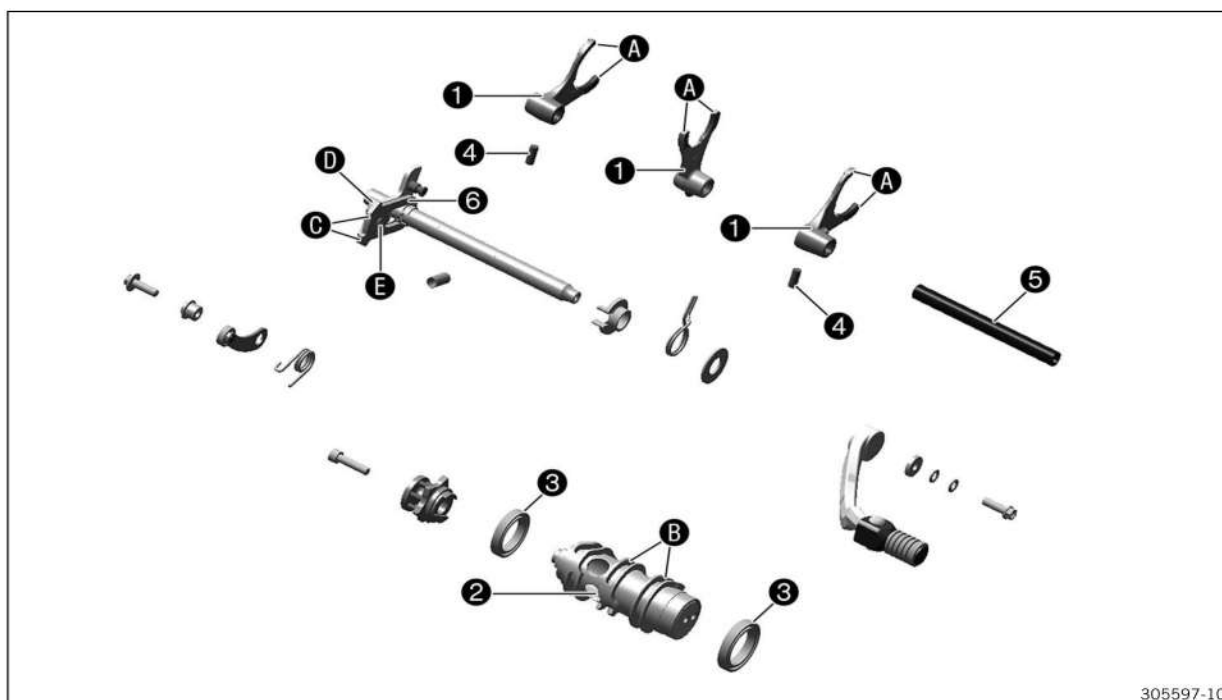
Assembly screws (75029033000) (p. 289)

### **i** Info

Apply the special tool with the hand only, do not use another tool.

Apply the special tool only firmly enough so that the clutch facing discs can still be turned against each other since they still have to be aligned for mounting in the clutch basket.

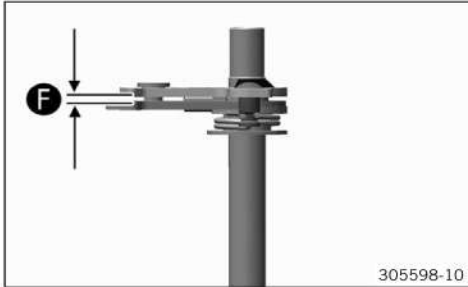
## 17.4.32 Checking the shift mechanism



305597-10

- Check shift forks **1** (see **A**) for damage and wear (visual check).
  - » If there is damage or wear:
    - Change the shift fork and gear wheel pair.
- Check shift grooves **B** of shift drum **2** for wear.
  - » If the shift groove is worn:
    - Change the shift drum.
- Check the seat of the shift drum in bearings **3**.
  - » If the shift drum is not seated correctly:
    - Change the shift drum and/or the bearing.
- Check bearing **3** for stiffness and wear.
  - » If the bearings do not move freely or are worn:
    - Change the bearings.
- Check needle bushing **4** for stiffness and wear.
  - » If the needle bushing does not move freely or is worn:
    - Change the needle bushing.
- Check shift rail **5** on a flat surface for run-out.
  - » If there is run-out:
    - Change the shift rail.
- Check the shift rail for scoring, signs of corrosion, and stiffness in the shift forks.
  - » If there is scoring or corrosion, or if the shift fork is stiff:
    - Change the shift rail.
- Check sliding plate **6** in contact areas **C** for wear.
  - » If the sliding plate is worn:
    - Change the sliding plate.
- Check return surface **D** on the sliding plate for wear.

- » If deep notches are present:
  - Change the sliding plate.
- Check guide pin **E** for looseness and wear.
  - » If the guide pin is loose and/or worn:
    - Change the sliding plate.
- Preassemble the shift shaft. (📖 p. 182)

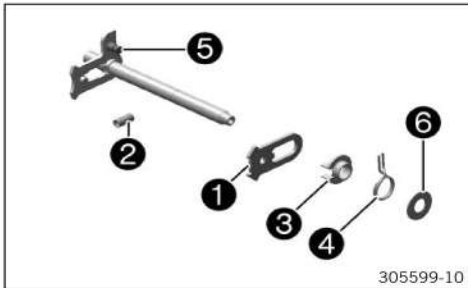


- Check play **F** between the sliding plate and the shift quadrant.

|  |   |
|--|---|
| Shift shaft - play in sliding plate/shift quadrant | 0.40 ... 0.80 mm (0.0157 ... 0.0315 in) |
|--|---|

- » If the measured value does not equal the specified value:
  - Change the sliding plate.

### 17.4.33 Preassembling the shift shaft



- Fix the short end of the shift shaft in a vise.

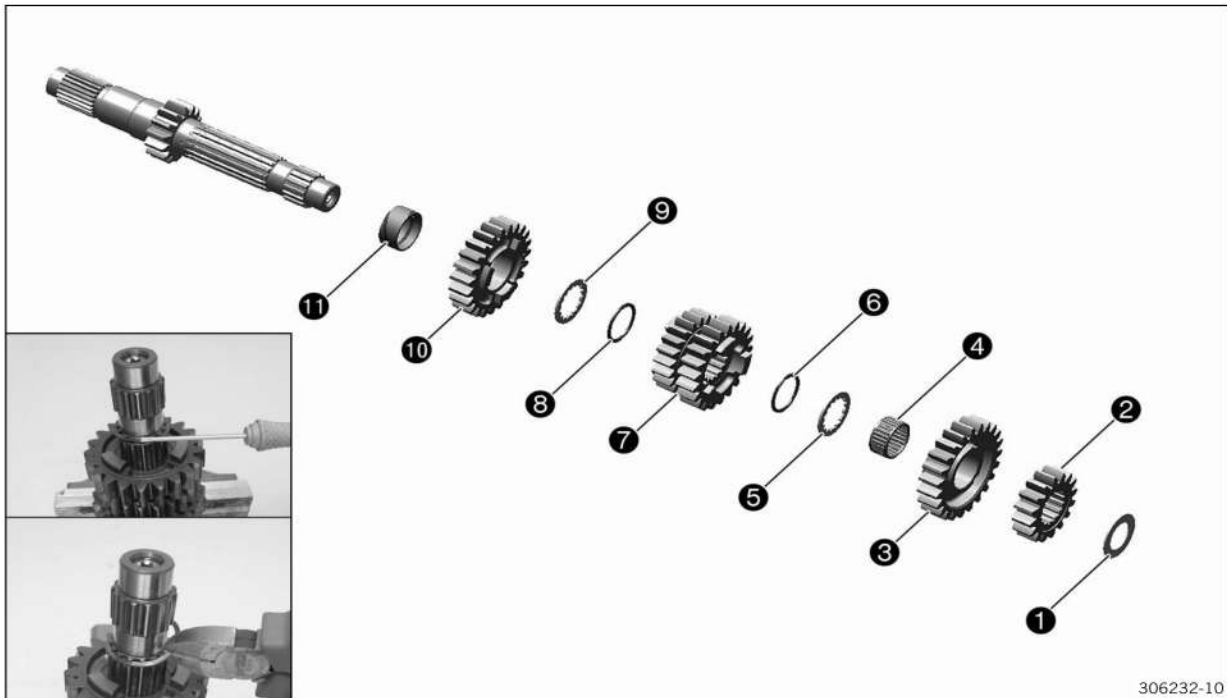
Guideline

Use soft jaws.

- Mount sliding plate **1** with the guide pin facing down and attach the guide pin to the shift quadrant.
- Mount pressure spring **2**.
- Push on spring guide **3**, push return spring **4** over the spring guide with the offset end facing upward and lift the offset end over abutment bolt **5**.
- Mount stop disk **6**.



## 17.4.34 Disassembling the main shaft



306232-10

- Fix the main shaft in the vise with the geared end facing downward.

Guideline

Use soft jaws.

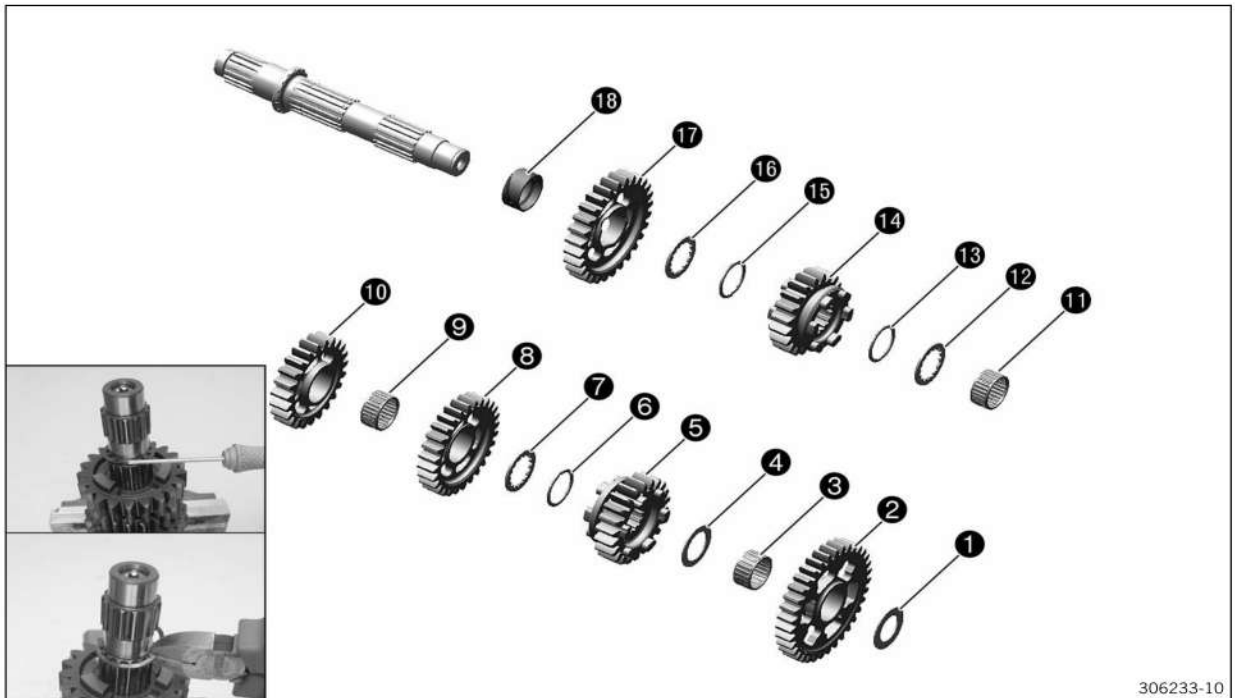
- Remove stop disk ① and second-gear fixed gear ②.
- Remove the sixth-gear idler gear ③.
- Remove the split needle bearing ④ and stop disk ⑤.
- Remove lock ring ⑥.

**Info**

Open the lock ring with a screwdriver and twist it off the transmission shaft with pliers.

- Remove the third/fourth-gear sliding gear ⑦.
- Remove lock ring ⑧.
- Remove stop disk ⑨ and fifth-gear idler gear ⑩.
- Remove bearing bush ⑪.

## 17.4.35 Disassembling the countershaft



306233-10

- Secure the countershaft in the bench vise with the toothed end facing downward.

### Guideline

Use soft jaws.

- Remove stop disk ① and first-gear idler gear ②.
- Remove needle bearing ③ and stop disk ④.
- Remove fifth-gear sliding gear ⑤ and lock ring ⑥.

### **i** Info

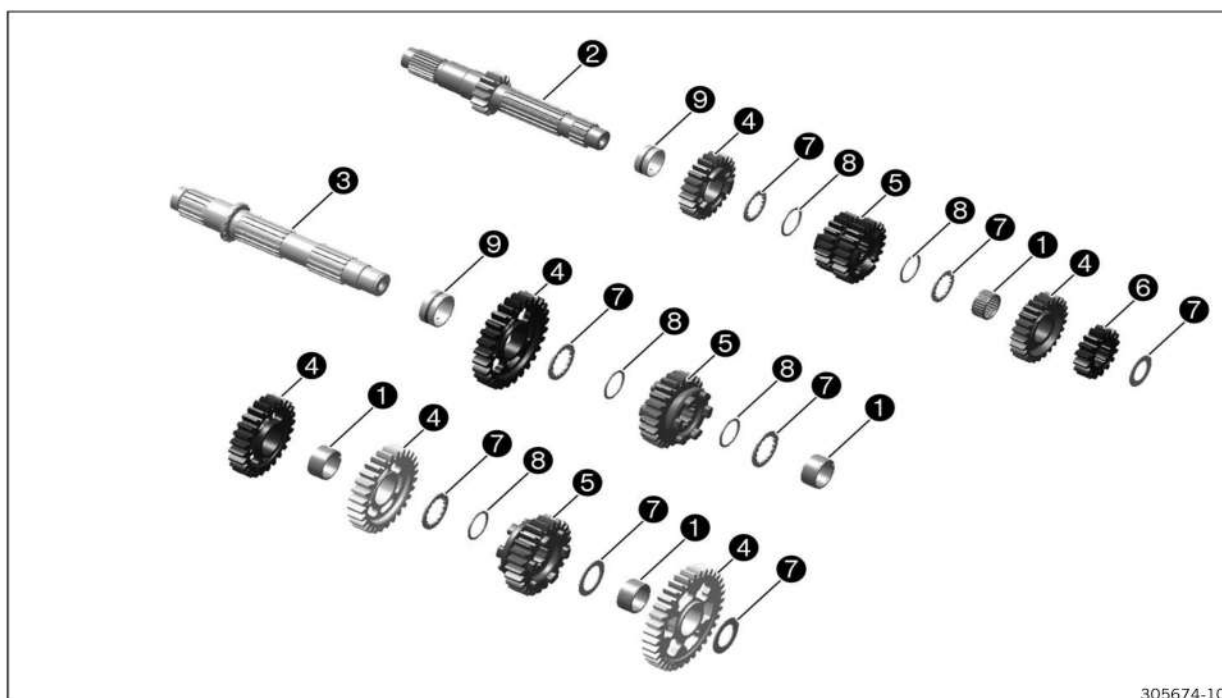
Open the lock ring with a screwdriver and twist it off the transmission shaft with pliers.

- Remove stop disk ⑦ and third-gear idler gear ⑧.
- Remove needle bearing ⑨ and fourth-gear idler gear ⑩.
- Remove needle bearing ⑪ and stop disk ⑫.
- Remove lock ring ⑬ and sixth-gear sliding gear ⑭.
- Remove lock ring ⑮ and stop disk ⑯.
- Remove the second-gear idler gear ⑰ and bearing bush ⑱.

## 17.4.36 Checking the transmission

### Condition

The transmission has been disassembled.



305674-10

- Check needle bearings **1** for damage and wear.
  - » If there is damage or wear:
    - Change the needle bearing.
- Check the pivot points of main shaft **2** and countershaft **3** for damage and wear.
  - » If there is damage or wear:
    - Change the main shaft and/or countershaft.
- Check the tooth profiles of main shaft **2** and countershaft **3** for damage and wear.
  - » If there is damage or wear:
    - Change the main shaft and/or countershaft.
- Check the pivot points of idler gears **4** for damage and wear.
  - » If there is damage or wear:
    - Change the gear wheel pair.
- Check the shift dogs of idler gears **4**, sliding gears **5**, and fixed gear **6** for damage and wear.
  - » If there is damage or wear:
    - Change the gear wheel pair.
- Check the tooth faces of idler gears **4**, sliding gears **5**, and fixed gear **6** for damage and wear.
  - » If there is damage or wear:
    - Change the gear wheel pair.
- Check the tooth profiles of sliding gears **5** for damage and wear.
  - » If there is damage or wear:
    - Change the gear wheel pair.
- Check sliding gears **5** for smooth operation in the profile of main shaft **2**.
  - » If the sliding gear does not move easily:
    - Change the sliding gear or the main shaft.
- Check sliding gears **5** for smooth operation in the profile of countershaft **3**.
  - » If the fixed gear does not move easily:
    - Change the sliding gear or the countershaft.

- Check stop disks **7** for damage and wear.
  - » If there is damage or wear:
    - Change the stop disk.
- Use new lock rings **8** in every repair job.
- Check bearing bush **9** for damage and wear.
  - » If there is damage or wear:
    - Change the bearing bush.

## 17.4.37 Assembling the main shaft

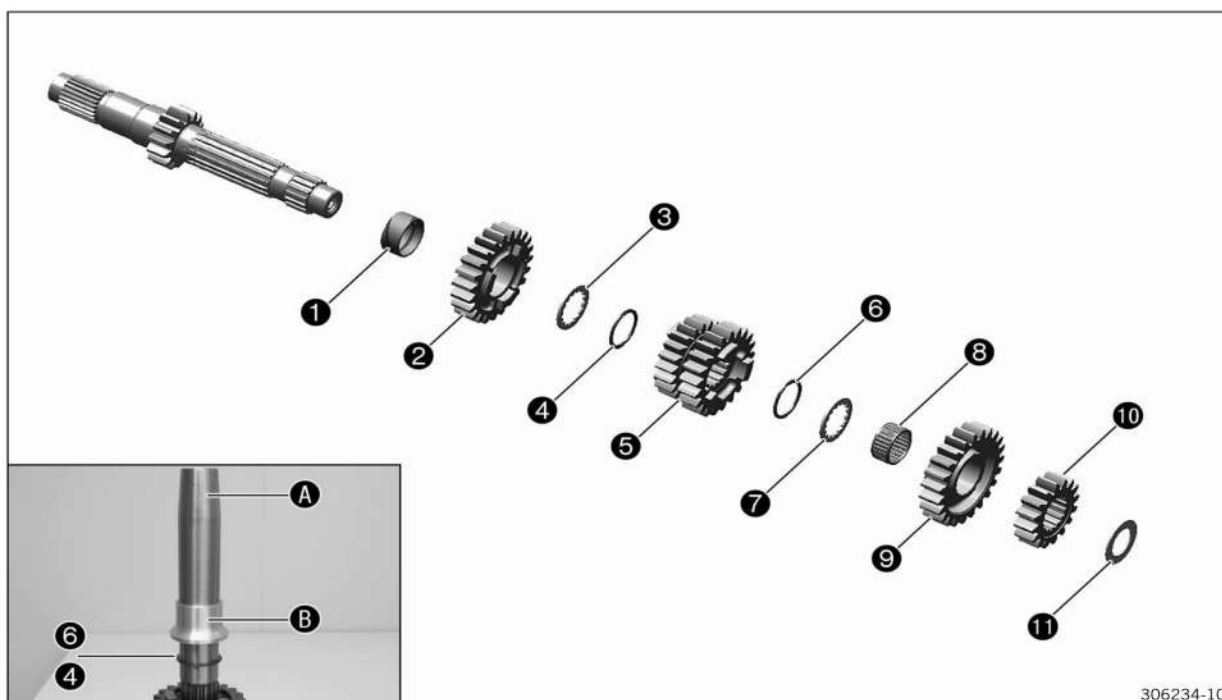


### Info

Use new lock rings with every repair.

### Preparatory work

- Lubricate all parts carefully before assembling.
- Check the transmission. (📖 p. 184)



306234-10

### Main work

- Secure the main shaft in the vise with the gear teeth facing downward.

Guideline

Use soft jaws.

- Lubricate and mount bearing bush **1**.

Long-life grease (📖 p. 280)

- Push on fifth-gear idler gear **2** with the shift dogs facing upward.
- Mount stop disk **3**.
- Position special tool **A** on the transmission shaft.

Mounting tool for lock ring (75029005000) (📖 p. 288)

- Position lock ring ④ on special tool ① and push down with sleeve ②.
- ✓ The lock ring engages in the groove of the transmission shaft.
- Push on third/fourth-gear sliding gear ⑤ with the small gear wheel facing downward.
- Position special tool ① on the transmission shaft.

Mounting tool for lock ring (75029005000) (📖 p. 288)

- Position lock ring ⑥ on special tool ① and push down with sleeve ②.
- ✓ The lock ring engages in the groove of the transmission shaft.
- Push on stop disk ⑦ and split needle bearing ⑧.
- Push on sixth-gear idler gear ⑨ with the shift dogs facing downward.
- Push on second-gear fixed gear ⑩ with the collar facing downward and attach stop disk ⑪.
- Finally, check all the gear wheels for smooth operation.

### 17.4.38 Assembling the countershaft

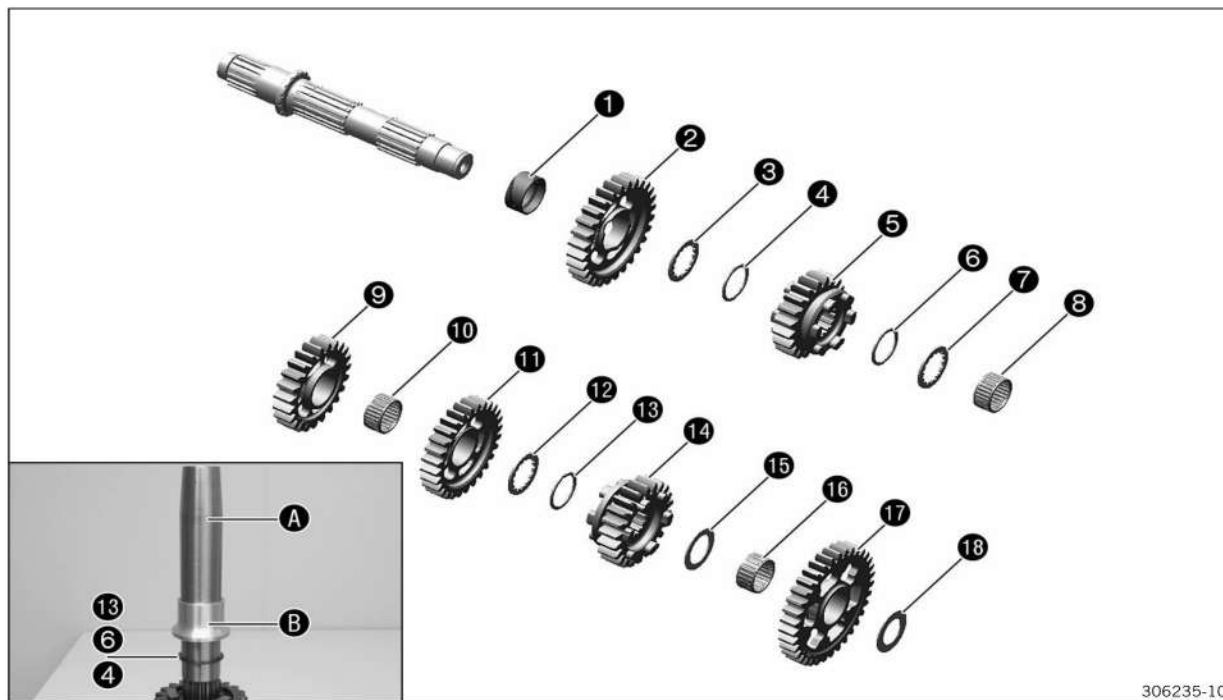


#### Info

Use new lock rings with every repair.

#### Preparatory work

- Lubricate all parts carefully before assembling.
- Check the transmission. (📖 p. 184)



306235-10

#### Main work

- Secure the countershaft in the bench vise with the toothed end facing downward.

#### Guideline

Use soft jaws.



- Mount bearing bush ① and the second-gear idler gear ② on the countershaft with the protruding collar facing downward.
- Mount stop disk ③.
- Position special tool A on the transmission shaft.

Mounting tool for lock ring (75029005000) (📖 p. 288)

- Position lock ring ④ on special tool A and push down with sleeve B.
- ✓ The lock ring engages in the groove of the transmission shaft.
- Mount sixth-gear sliding gear ⑤ with the shift groove facing upward.
- Position special tool A on the transmission shaft.

Mounting tool for lock ring (75029005000) (📖 p. 288)

- Position lock ring ⑥ on special tool A and push down with sleeve B.
- ✓ The lock ring engages in the groove of the transmission shaft.
- Mount stop disk ⑦.
- Mount needle bearing ⑧ and fourth-gear idler gear ⑨ with the collar facing upward.
- Mount needle bearing ⑩ and third-gear idler gear ⑪ with the collar facing downward.
- Mount stop disk ⑫.
- Position special tool A on the transmission shaft.

Mounting tool for lock ring (75029005000) (📖 p. 288)

- Position lock ring ⑬ on special tool A and push down with sleeve B.
- ✓ The lock ring engages in the groove of the transmission shaft.
- Mount fifth-gear sliding gear ⑭ with the shift groove facing downward and stop disk ⑮.
- Mount needle bearing ⑯, first-gear idler gear ⑰ with the recess facing downward and stop disk ⑱.
- Finally, check all the gear wheels for smooth operation.



## 17.4.39 Checking the starter drive

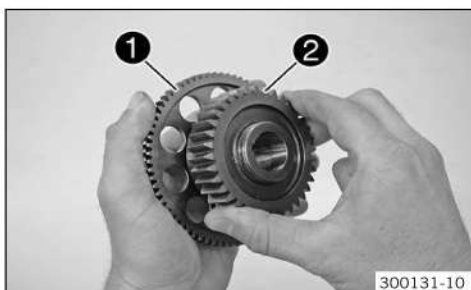


305600-10

- Check the gear mesh and bearing of starter idler gear **1** for damage and wear.
  - » If there is damage or wear:
    - Change the starter idler gear and/or needle bushing.
- Check the gear teeth and bearing of torque limiter **2** for damage and wear.
  - » If there is damage or wear:
    - Change the torque limiter and/or needle bearing.
- Check freewheel gear **3** and bearing when removed for damage and wear.
  - » If there is damage or wear:
    - Change the freewheel gear or bearing.
- Check freewheel **4** when removed for damage and wear.
  - » If there is damage or wear:
    - Change the freewheel.
- Check the gear teeth of starter motor **5** for damage and wear.
  - » If there is damage or wear:
    - Change the starter motor.
- Connect the negative cable of a 12-volt power supply to the housing of the starter motor. Connect the positive cable of the power supply briefly with the connector of the starter motor.
  - » If the starter motor does not turn when the circuit is closed:
    - Change the starter motor.
- Change O-ring **6** of the starter motor.



## 17.4.40 Checking freewheel

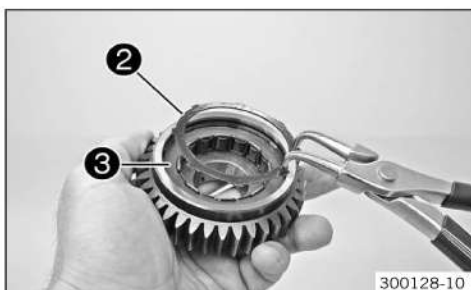


- Insert the freewheel gear **1** in the primary gear **2**, turning the primary gear clockwise; do not twist!
- Check the locking action of the freewheel gear **1**.
  - » If the primary gear does not turn clockwise or if it does not lock counterclockwise:
    - Remove the freewheel. (📖 p. 190)
    - Turn the freewheel 180°.
    - Install the freewheel. (📖 p. 190)

## 17.4.41 Removing freewheel



- Extract the lock ring **1** from the groove using suitable pliers.



- Compress the expansion ring **2** and remove it, using suitable pliers.
- Take the freewheel **3** out of the primary gear.

## 17.4.42 Installing freewheel



- Lubricate all parts thoroughly.
- Push the freewheel **1** into the primary gear.

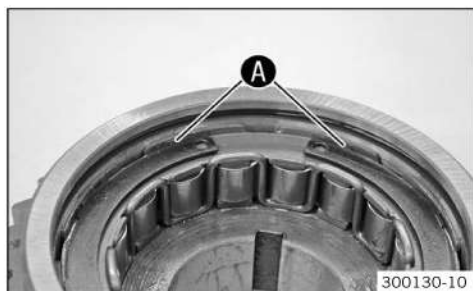
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**i Info**  
Note the direction of rotation.

---



- Install the expansion ring **2**.



- Make sure that all lugs of the expansion ring locate in the slits **A** of the freewheel.

**i Info**

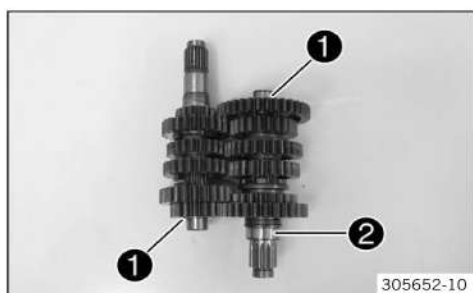
If necessary, use a screwdriver to ease them in.



- Insert the lock ring **3** into the groove with suitable pliers and check that it is seated correctly.

## 17.5 Engine assembly

### 17.5.1 Installing the transmission shafts



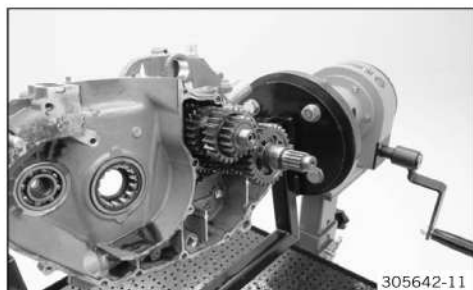
- Clamp the right section of the engine case.

|  |
|--|
| Holder for engine motor stand (75012001070) (📖 p. 288) |
|--|

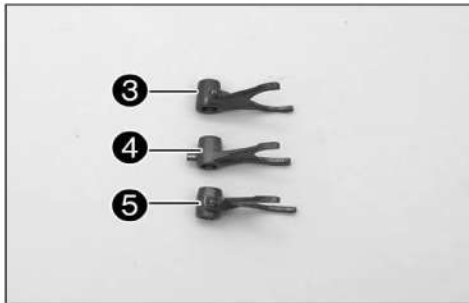
|   |
|---|
| Fitting for work stand (75012001060) (📖 p. 288) |
|---|

|  |
|--|
| Engine work stand (61229001000) (📖 p. 287) |
|--|

- Make sure that both stop disks **1** are installed.
- Mount inner bearing race **2** on the countershaft.



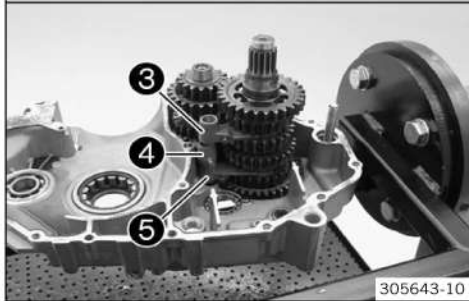
- Oil all bearings.
- Slide both transmission shafts together into the bearing seats.



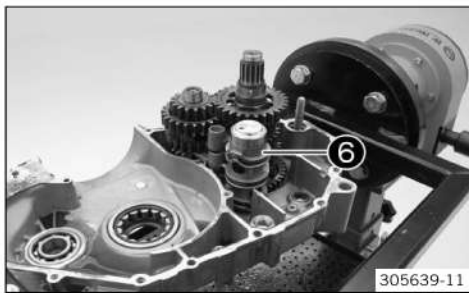
- Mount upper shift fork ③, middle shift fork ④, and lower shift fork ⑤.

**i Info**

For easier assembly of middle shift fork ④, lift the sliding gear of the third/fourth gear.



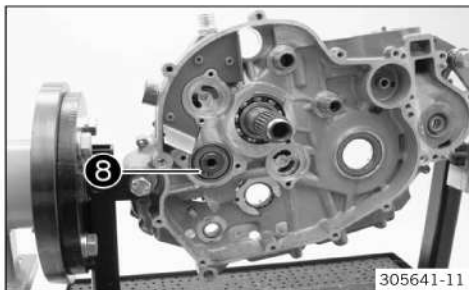
- Mount shift drum ⑥.
- Hang the shift forks into the shift drum.



- Mount shift rail ⑦.
- Check the transmission for smooth operation.

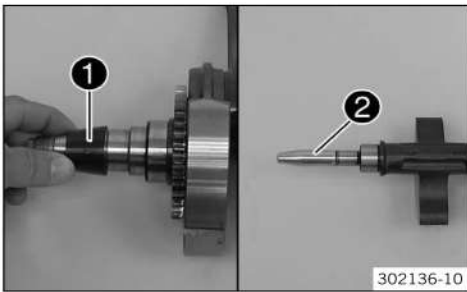


- Mount the washer and lock ring ⑧.





## 17.5.2 Installing crankshaft and balancer shaft



- Mount special tool **1** on the alternator side of the crankshaft.

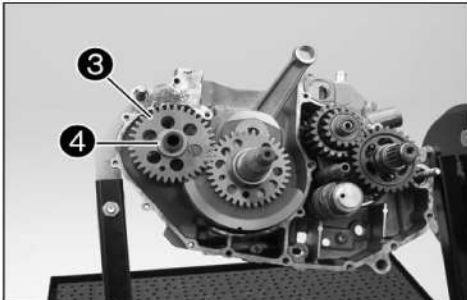
Protecting sleeve (75029080000) (📖 p. 292)

- Mount the special tool on the clutch end of the crankshaft.

Protecting sleeve (75029080050) (📖 p. 292)

- Mount special tool **2** on the balancer shaft.

Protection cap (58529005000) (📖 p. 285)



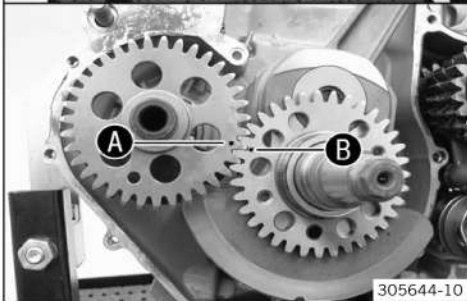
- Push the crankshaft into the bearing seat and take off the special tool.

- Grease the shaft seal rings of the balancer shaft.

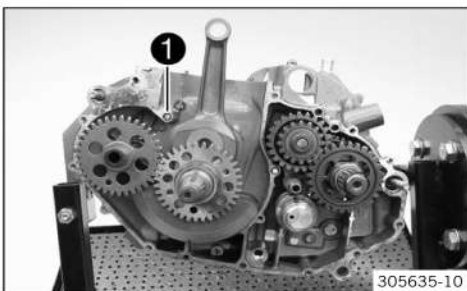
- Push balancer shaft **3** into the bearing seat and remove the special tool.

✓ Align markings **A** and **B**.

- Mount stop disk **4**.

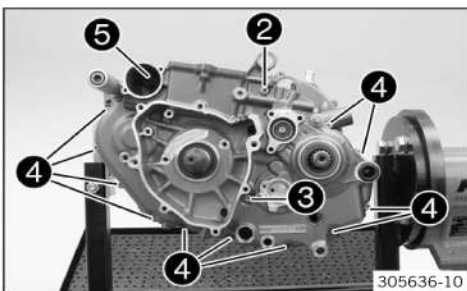


## 17.5.3 Installing the left engine case



- Mount the dowels.
- Mount O-ring **1**.
- Degrease the sealing surface. Apply sealing compound to the left section of the engine case.

Loctite® 5910



- Mount the left section of the engine case. If necessary, strike it lightly with a rubber mallet and turn the transmission shafts.

### **i** Info

Do not use the screws to pull the two sections of the engine case together.

- Take off special tool from the crankshaft.

Protecting sleeve (75029080000) (📖 p. 292)

- Mount screw **2** but do not tighten yet.

Guideline

|                    |       |                    |
|--------------------|-------|--------------------|
| Screw, engine case | M6x80 | 10 Nm (7.4 lbf ft) |
|--------------------|-------|--------------------|

- Mount screw ③ but do not tighten yet.

Guideline

|                    |       |                    |
|--------------------|-------|--------------------|
| Screw, engine case | M6x70 | 10 Nm (7.4 lbf ft) |
|--------------------|-------|--------------------|

- Mount screws ④ but do not tighten yet.

Guideline

|                    |       |                    |
|--------------------|-------|--------------------|
| Screw, engine case | M6x30 | 10 Nm (7.4 lbf ft) |
|--------------------|-------|--------------------|

- Mount screw ⑤ with the washer but do not tighten yet.

Guideline

|                    |       |                    |
|--------------------|-------|--------------------|
| Screw, engine case | M6x25 | 10 Nm (7.4 lbf ft) |
|--------------------|-------|--------------------|



**Info**

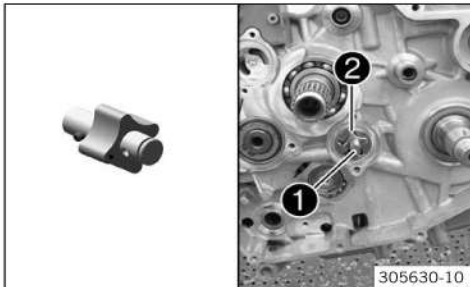
Mount the screw with a new copper washer.

- Tighten all screws in a crisscross pattern.

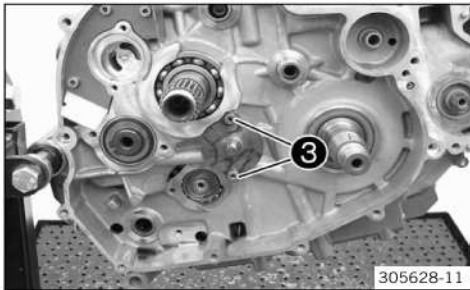
Guideline

|                    |    |                    |
|--------------------|----|--------------------|
| Screw, engine case | M6 | 10 Nm (7.4 lbf ft) |
|--------------------|----|--------------------|

## 17.5.4 Installing the oil pumps



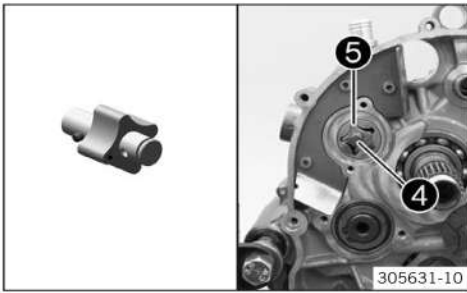
- Mount the pin and internal rotor on the oil pump shaft.
- Position the external rotor in the engine case with the bevel facing inward.
- Mount oil pump shaft ① with internal rotor ②.
- Oil the parts.



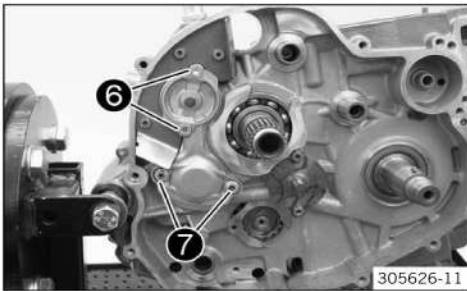
- Position the oil pump cover.
- Mount and tighten screws ③.

Guideline

|                       |    |  |
|-----------------------|----|--|
| Screw, oil pump cover | M5 | 6 Nm (4.4 lbf ft)<br><b>Loctite®243™</b> |
|-----------------------|----|--|



- Mount the pin and internal rotor on the oil pump shaft.
- Position the external rotor in the engine case with the bevel facing inward.
- Mount oil pump shaft ④ with internal rotor ⑤.
- Oil the parts.



- Position the oil pump cover.
- Mount and tighten screws ⑥.

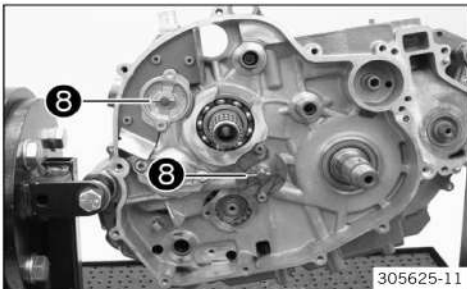
Guideline

|                            |    |  |
|----------------------------|----|--|
| Screw, oil pump cover, top | M5 | 6 Nm (4.4 lbf ft)<br><b>Loctite®243™</b> |
|----------------------------|----|--|

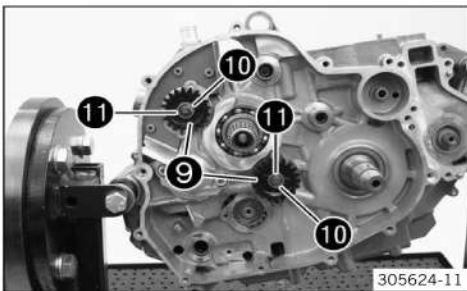
- Mount and tighten screws ⑦.

Guideline

|                               |    |   |
|-------------------------------|----|---|
| Screw, oil pump cover, bottom | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|-------------------------------|----|---|

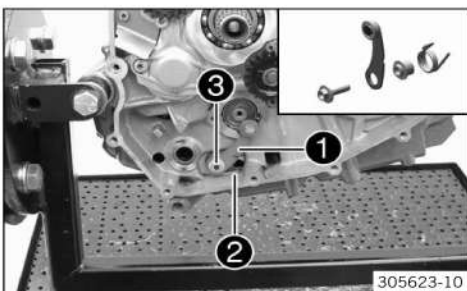


- Mount washers and pins ⑧.



- Mount oil pump gear wheels ⑨, washers ⑩ and lock washers ⑪.

## 17.5.5 Installing locking lever

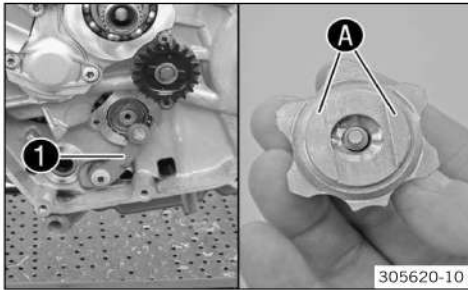


- Position locking lever ① with sleeve and spring ②.
- Mount and tighten screw ③.

Guideline

|                      |    |   |
|----------------------|----|---|
| Screw, locking lever | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|----------------------|----|---|

## 17.5.6 Installing shift drum locating

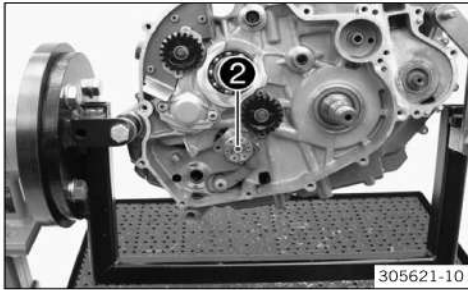


- Press locking lever **1** down and position shift drum locating.



### Info

The flat surfaces **A** of the shift drum locating are not symmetric.

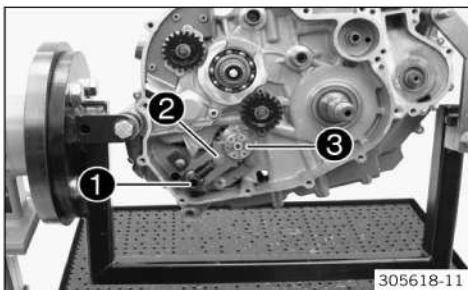


- Release the locking lever.
- Mount and tighten screw **2**.

### Guideline

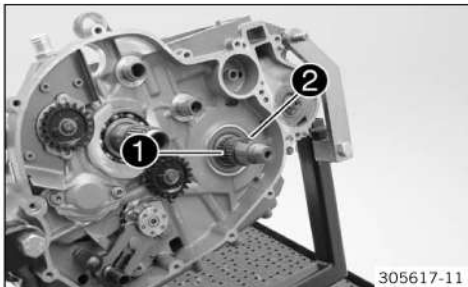
|                            |    |   |
|----------------------------|----|---|
| Screw, shift drum locating | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|----------------------------|----|---|

## 17.5.7 Installing shift shaft



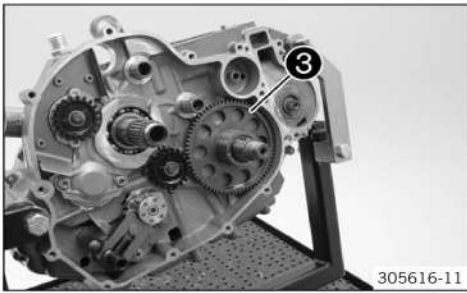
- Slide shift shaft **1** with the washer into the bearing seat.
- Push sliding plate **2** away from the shift drum locating **3**. Insert the shift shaft all the way.
- Let the sliding plate engage in the shift drum locating.
- Shift through the transmission.

## 17.5.8 Installing the starter drive

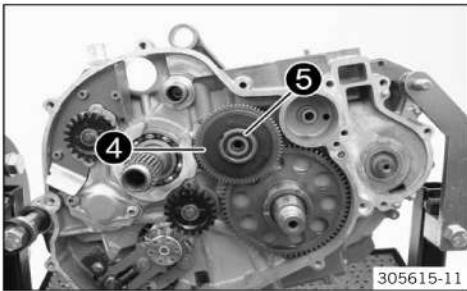


- Mount the two needle bearings **1** and the woodruff key **2**.

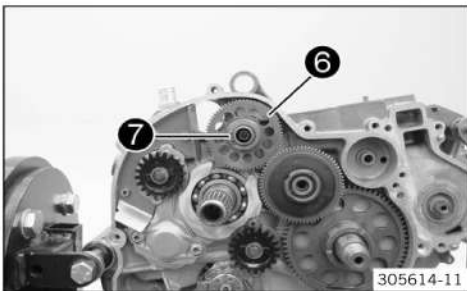




- Position freewheel gear ③.

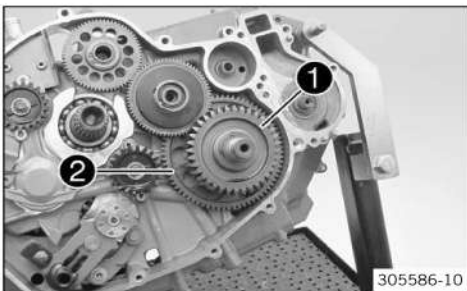


- Mount the needle bearing and torque limiter ④ with the washer.
- Mount lock ring ⑤.



- Mount the starter idler gear ⑥ with the washer.
- Mount lock ring ⑦.

## 17.5.9 Installing the primary gear



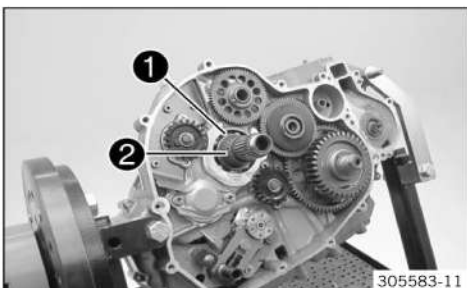
- Ensure that the woodruff key is seated properly.
- Mount primary gear ①.



### Info

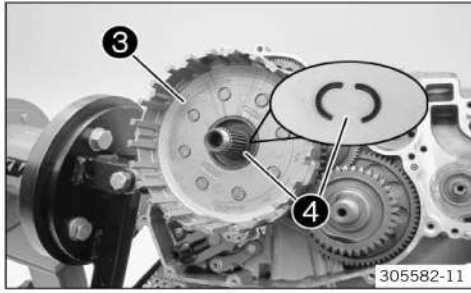
Turn freewheel gear ② backwards and forwards to ease meshing.

## 17.5.10 Installing the clutch basket



- Mount supporting plate ① and needle bearing ②.





- Mount clutch basket **3**.

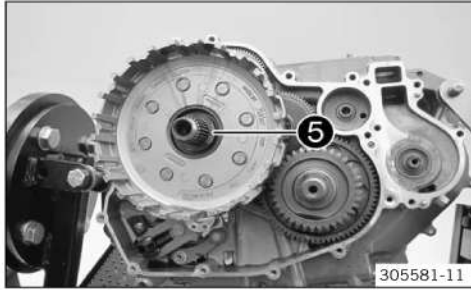
**i Info**

Turn the clutch basket and oil pump gear wheels backwards and forwards slightly to help them mesh more easily.

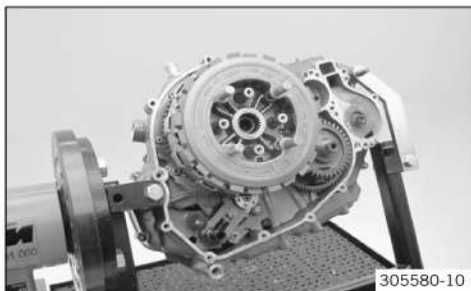
- Mount half washers **4** with the sharp edge facing outward.

**i Info**

Grease the half washers to ease assembly.



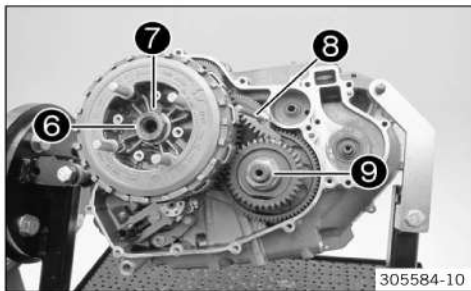
- Position stepped washer **5** with the recesses toward the half washers.



- Insert the antihopping clutch in the clutch basket.
- ✓ The uppermost clutch facing disc is offset by one tooth.

**i Info**

If necessary, turn the main shaft a little to ease access.



- Mount the new lock washer **6** with nut **7**.
- Lock the clutch basket and primary gear using special tool **8** and tighten the nut.

Guideline

|                       |         |   |
|-----------------------|---------|---|
| Nut, inner clutch hub | M20x1.5 | 100 Nm (73.8 lbf ft)<br><b>Loctite®243™</b> |
|-----------------------|---------|---|

Gear segment (75029081000) (📄 p. 292)

**i Info**

Make sure that the crankshaft is not locked.

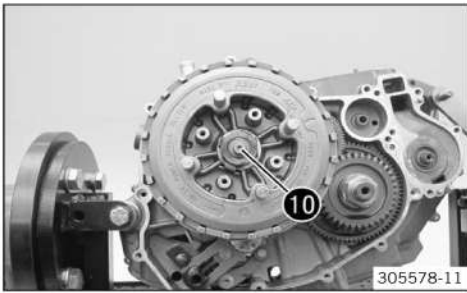
- Secure the nut with the lock washer.
- Mount and tighten nut **9**.

Guideline

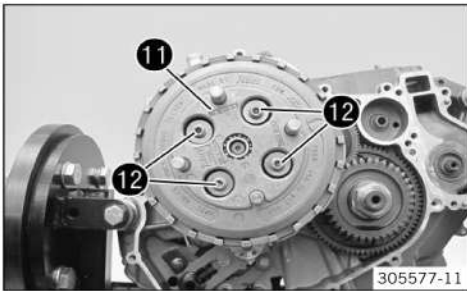
|                   |           |  |
|-------------------|-----------|--|
| Nut, primary gear | M20LHx1.5 | 90 Nm (66.4 lbf ft)<br><b>Loctite®243™</b> |
|-------------------|-----------|--|

- Remove the special tool.

Gear segment (75029081000) (📄 p. 292)



- Mount clutch throw-out **10**.

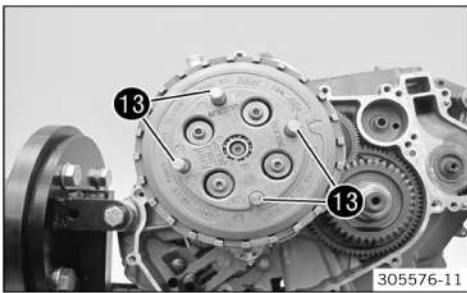


- Position pressure cap **11**.
- Install and tighten screws **12** with the spring retainers and clutch springs.

Guideline

|                      |    |                   |
|----------------------|----|-------------------|
| Screw, clutch spring | M5 | 8 Nm (5.9 lbf ft) |
|----------------------|----|-------------------|

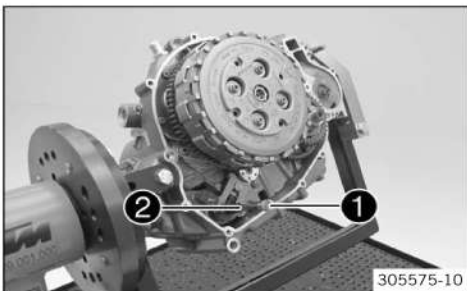
**i Info**  
Ensure that all clutch springs have a blue color coding.



- Remove special tool **13**.

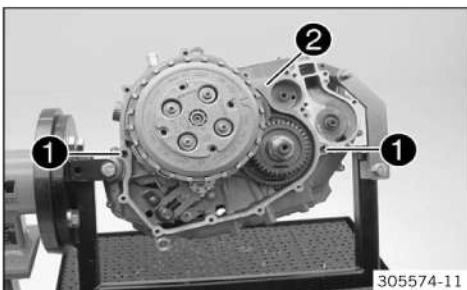
|  |
|--|
| Assembly screws (75029033000) (see p. 289) |
|--|

### 17.5.11 Installing the spacer and spring

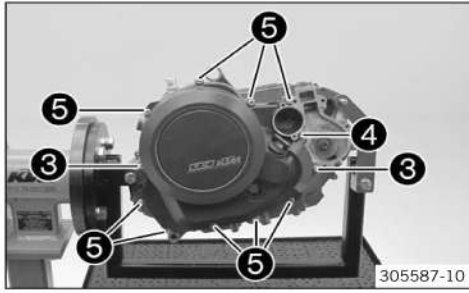


- Position spacer **1** and spring **2**.

### 17.5.12 Installing the clutch cover



- Mount dowels **1** and position the clutch cover gasket **2**.



- Position the clutch cover.
- Mount screws **3** but do not tighten yet.

Guideline

|                     |       |                    |
|---------------------|-------|--------------------|
| Screw, clutch cover | M6x30 | 10 Nm (7.4 lbf ft) |
|---------------------|-------|--------------------|

- Mount screw **4** but do not tighten it yet.

Guideline

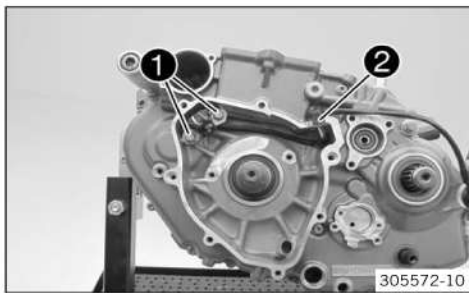
|                     |       |                    |
|---------------------|-------|--------------------|
| Screw, clutch cover | M6x35 | 10 Nm (7.4 lbf ft) |
|---------------------|-------|--------------------|

- Mount screws **5** and tighten all screws in a crisscross pattern.

Guideline

|                     |       |                    |
|---------------------|-------|--------------------|
| Screw, clutch cover | M6x25 | 10 Nm (7.4 lbf ft) |
|---------------------|-------|--------------------|

### 17.5.13 Installing the ignition pulse generator



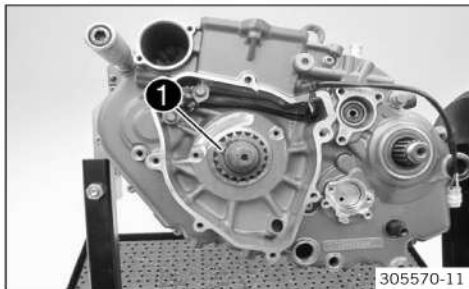
- Position the ignition pulse generator.
- Mount screws **1** but do not tighten yet.

Guideline

|                                 |    |   |
|---------------------------------|----|---|
| Screw, ignition pulse generator | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------------|----|---|

- Position the cable and position cable sleeve **2** in the engine case.

### 17.5.14 Installing timing chain and timing chain sprocket

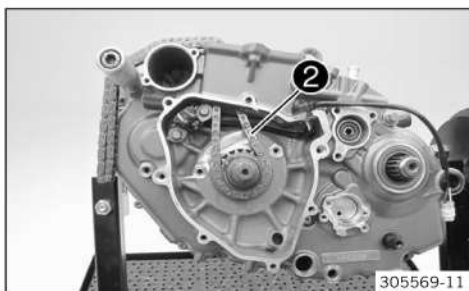


- Heat the timing chain sprocket and push it immediately on to the crankshaft.

Guideline

|                 |
|-----------------|
| 100 °C (212 °F) |
|-----------------|

- Mount lock ring **1**.



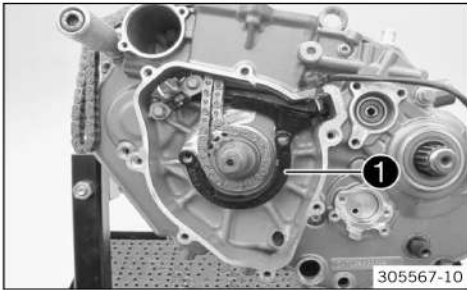
- Thread the timing chain **2** in and lay it over the timing chain sprocket.



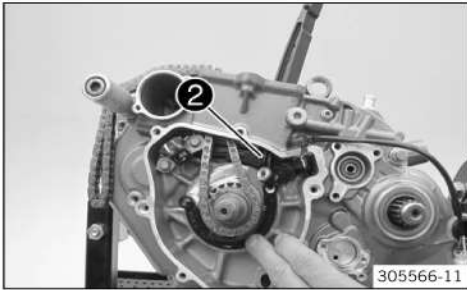
**Info**

If the timing chain is not new, pay attention to the direction of travel.

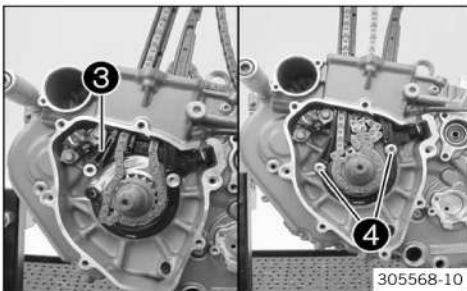
17.5.15 Installing the timing chain rails



- Position the timing chain securing guide **1**.
- ✓ The ignition pulse generator cable is routed in the cable duct of the timing chain securing guide.



- Position the timing chain tensioning rail **2** from above.
- Insert the support bushing into the timing chain securing guide.



- Position the timing chain guide rail **3** from above.
- Insert the support bushing into the timing chain securing guide.
- Mount and tighten screws **4**.

Guideline

|                                     |    |  |
|-------------------------------------|----|--|
| Screw, timing chain guide rail      | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®2701™</b> |
| Screw, timing chain tensioning rail | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®2701™</b> |

**i Info**  
Ensure that there is no thread locking material at the collar of the screw; otherwise, the timing chain tensioning rail could lock and break.

- Check both timing chain rails for freedom of movement.

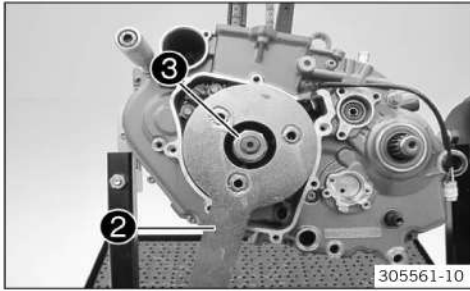
17.5.16 Installing the rotor



- Ensure that woodruff key **1** is seated properly.
- Degrease the cone of the crankshaft and rotor.
- Mount the rotor.

**i Info**  
Make sure that the crankshaft is not blocked.





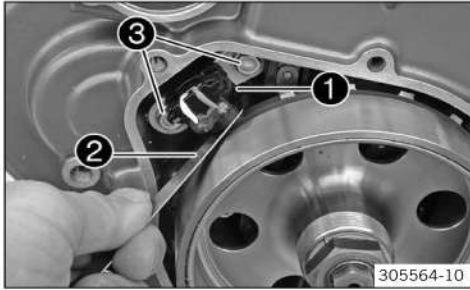
- Hold the rotor with special tool **2**.

|   |
|---|
| Holding wrench (75029091000) (📄 p. 293) |
|---|

- Mount and tighten nut **3** with the locking edge washer.  
Guideline

|           |         |                         |
|-----------|---------|-------------------------|
| Rotor nut | M18x1.5 | 100 Nm<br>(73.8 lbf ft) |
|-----------|---------|-------------------------|

## 17.5.17 Adjusting crankshaft position sensor distance



- Adjust the distance between the crankshaft position sensor **1** and the conductive element of the rotor using the special tool **2**.

Guideline

|   |                     |
|---|---------------------|
| Crankshaft position sensor/rotor - distance | 0.70 mm (0.0276 in) |
|---|---------------------|

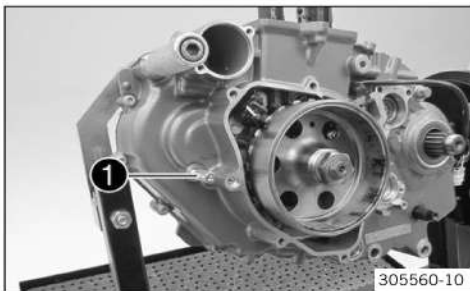
|                                       |
|---------------------------------------|
| Feeler gauge (59029041100) (📄 p. 286) |
|---------------------------------------|

- Fully tighten screws **3**.

Guideline

|                                 |    |   |
|---------------------------------|----|---|
| Screw, ignition pulse generator | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------------|----|---|

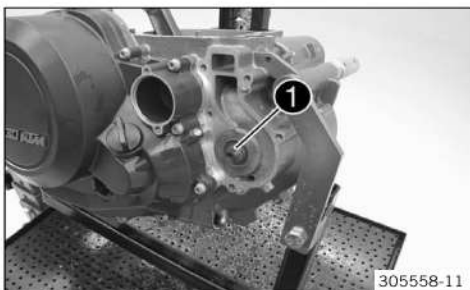
## 17.5.18 Setting engine to top dead center



- Set the crankshaft to top dead center and lock it with the special tool **1**.

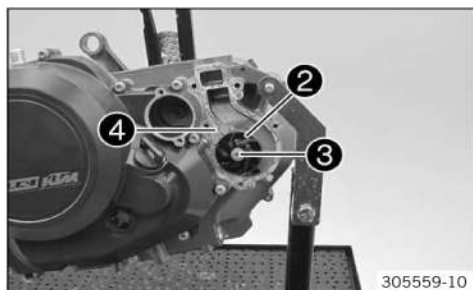
|  |
|--|
| Locking screw (77329010000) (📄 p. 294) |
|--|

## 17.5.19 Mounting the water pump cover



- Mount form washer **1**.



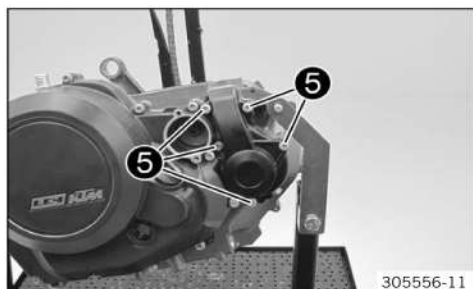


- Mount water pump impeller **2**.
- Mount and tighten screw **3**.

Guideline

|                         |    |   |
|-------------------------|----|---|
| Screw, water pump wheel | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|-------------------------|----|---|

- Lay on the water pump cover seal **4**.



- Position the water pump cover.
- Mount and tighten screws **5**.

Guideline

|                         |    |                    |
|-------------------------|----|--------------------|
| Screw, water pump cover | M6 | 10 Nm (7.4 lbf ft) |
|-------------------------|----|--------------------|

## 17.5.20 Installing piston

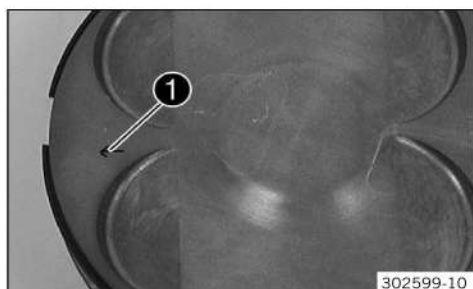


- Shift the joint of the piston rings by 120°.
- Push the oiled piston into the special tool.

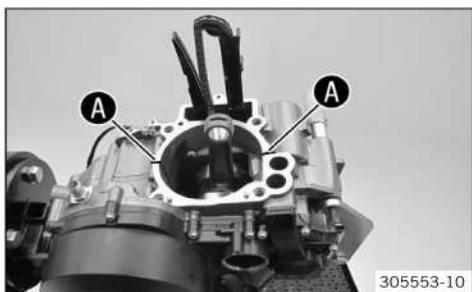
|   |
|---|
| Piston assembly ring (75029015102) (📖 p. 288) |
|---|



- Position the piston on the cylinder using the special tool.
- Push the piston carefully into the cylinder from above.
  - ✓ The piston rings should not become caught; otherwise, they may be damaged.



- Ensure that piston marking **1** faces the outfeed side.



- Apply a thin layer of sealing compound in area **A**.

**Loctite® 5910**

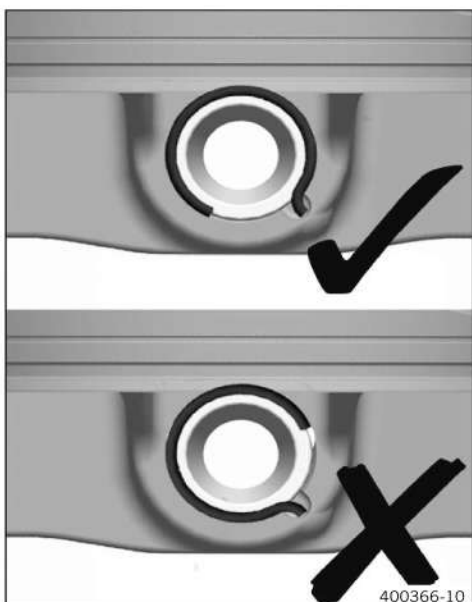
- Place the cylinder base gasket on.

**i Info**  
Make sure the grooved pins are seated correctly.



- Cover the engine case opening with a cloth. Thread the timing chain through the chain shaft. Mount the piston pin.

**i Info**  
For clarity, the following steps are illustrated using a disassembled piston.



- Position the piston pin retainer.



- Insert the special tool and firmly press it toward the piston.
- Turn the special tool counterclockwise, thereby pressing the piston pin retainer into the groove.

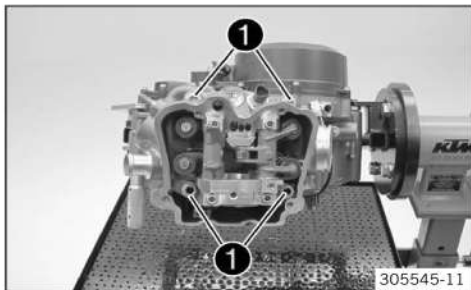
Insertion for piston ring lock (75029035000) (p. 289)

- Make sure that the piston pin retainer is seated correctly on both sides.



- Remove the cloth.
- Keep the timing chain tensioned. Push the cylinder down carefully and let the grooved pins engage.

**17.5.21 Installing the cylinder head**



- Put on the cylinder head gasket.

**i Info**  
Make sure the grooved pins are seated correctly.

- Mount the cylinder head.
- Mount and tighten screws **1** with the washers.

Guideline

|                     |     |  |
|---------------------|-----|--|
| Cylinder head screw | M10 | Tightening sequence:<br>Tighten diagonally, beginning with the rear screw on the timing chain shaft.<br>Step 1<br>15 Nm (11.1 lbf ft)<br>Step 2<br>30 Nm (22.1 lbf ft)<br>Step 3<br>45 Nm (33.2 lbf ft)<br>Step 4<br>60 Nm (44.3 lbf ft)<br>Lubricated with engine oil |
|---------------------|-----|--|

**i Info**  
Always use new cylinder head screws.

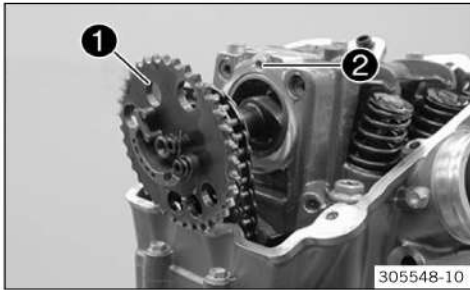


- Mount and tighten screws **2**.

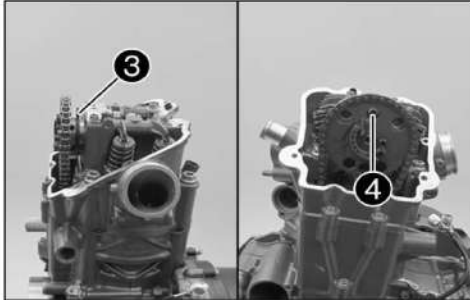
Guideline

|                      |    |   |
|----------------------|----|---|
| Screw, cylinder head | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|----------------------|----|---|

## 17.5.22 Installing camshafts



- Lay the timing chain over the camshaft. Push the camshaft into the bearing seat.
  - ✓ The crankshaft is at top dead center.
  - ✓ The middle drill hole ① of camshaft and the drill hole ② of cylinder head are aligned.

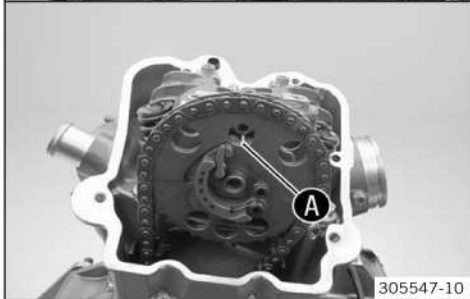


- Position the camshaft support plate ③. Mount and tighten screw ④.

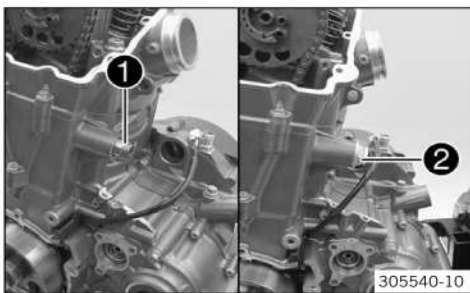
Guideline

|                               |       |   |
|-------------------------------|-------|---|
| Screw, camshaft support plate | M6x12 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|-------------------------------|-------|---|

- ✓ Marking **A** of the camshaft is aligned with the marking of the camshaft support plate.



## 17.5.23 Installing timing chain tensioner

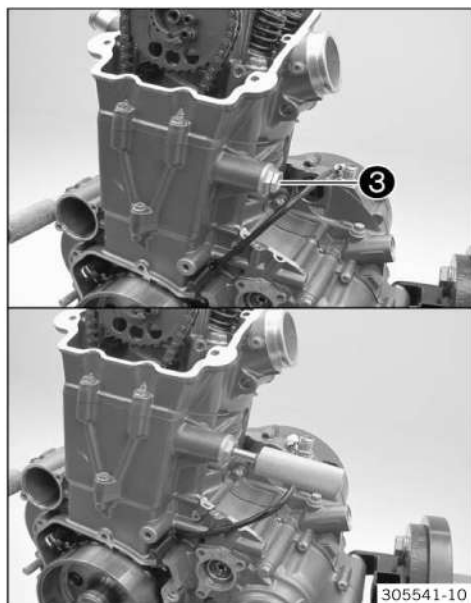


- Insert the timing chain tensioner ①.
- Mount and tighten plug ② with the new seal ring.

Guideline

|                              |         |                     |
|------------------------------|---------|---------------------|
| Plug, timing chain tensioner | M20x1.5 | 25 Nm (18.4 lbf ft) |
|------------------------------|---------|---------------------|





- Remove screw **3** and use the special tool to push the timing chain tensioner toward the timing chain.

Release device for timing chain tensioner (77329051000) (📖 p. 294)

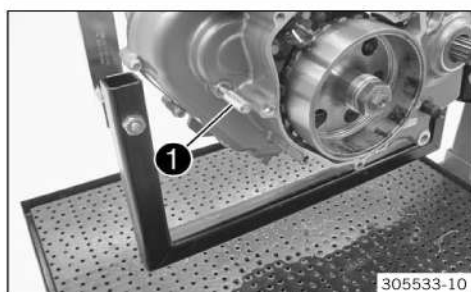
✓ The timing chain tensioner unlocks.

- Mount and tighten screw **3**.

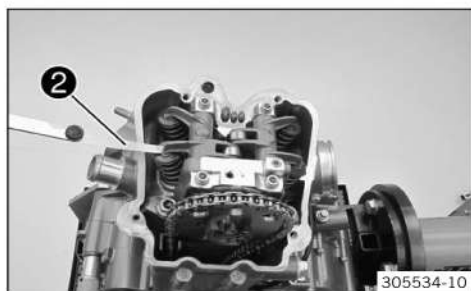
Guideline

|  |       |                    |
|--|-------|--------------------|
| Screw, unlocking of timing chain tensioner | M10x1 | 10 Nm (7.4 lbf ft) |
|--|-------|--------------------|

## 17.5.24 Checking valve clearance



- Remove special tool **1**.
- Crank the engine several times.
- Set the engine to ignition top dead center. (📖 p. 143)



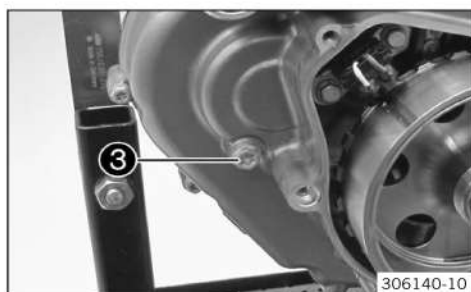
- Check the valve clearance on all valves between the valve and the rocker arm using the special tool **2**.

Guideline

|                  |   |
|------------------|---|
| Valve play, cold | 0.07 ... 0.13 mm (0.0028 ... 0.0051 in) |
|------------------|---|

Feeler gauge (59029041100) (📖 p. 286)

- » If valve clearance does not meet specifications:
  - Adjust the valve clearance. (📖 p. 208)



- Remove the special tool.

Locking screw (77329010000) (📖 p. 294)

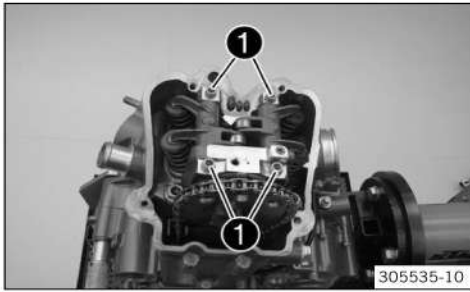
- Mount and tighten screw **3** with the washer.

Guideline

|                             |    |                     |
|-----------------------------|----|---------------------|
| Crankshaft clamp screw plug | M8 | 15 Nm (11.1 lbf ft) |
|-----------------------------|----|---------------------|



## 17.5.25 Adjusting the valve clearance

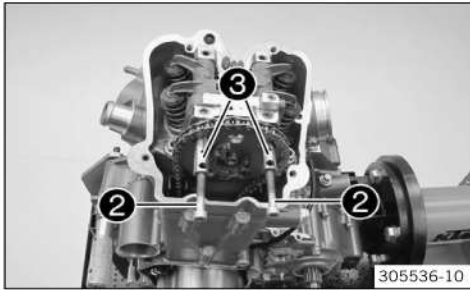


- Remove screws **1**.

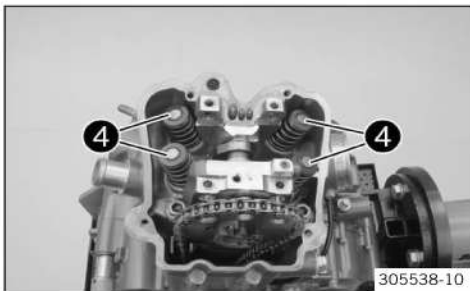


### Info

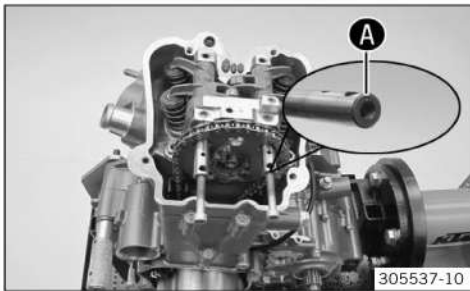
Make sure that the crankshaft is at top dead center.



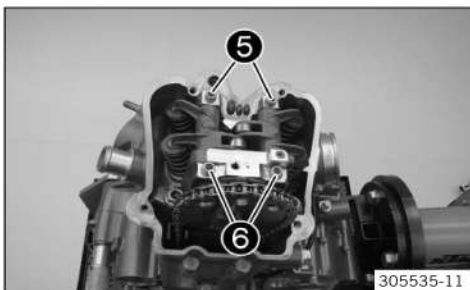
- Screw suitable screws **2** into the rocker arm shafts **3**.
- Remove the rocker arm shafts and take off the rocker arm.



- Remove shims **4** and set them down according to the installation position.
- Correct the shims as indicated by the results of the valve clearance check.
- Insert suitable shims.



- Position the rocker arms and mount the rocker arm shafts.
  - ✓ The tapped hole of the rocker arm shaft faces outward.
  - ✓ Drill hole **A** and the flat surface face upward.



- Mount and tighten screws **5**.

### Guideline

|                         |    |                    |
|-------------------------|----|--------------------|
| Screw, rocker arm shaft | M6 | 12 Nm (8.9 lbf ft) |
|-------------------------|----|--------------------|

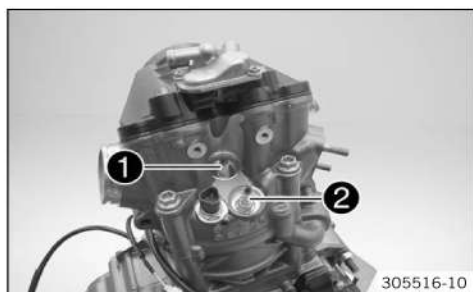
- Mount and tighten screws **6**.

### Guideline

|                         |       |                    |
|-------------------------|-------|--------------------|
| Screw, rocker arm shaft | M6x40 | 12 Nm (8.9 lbf ft) |
|-------------------------|-------|--------------------|

- Check the valve clearance. (📖 p. 207)

17.5.26 Installing the spark plugs



- Mount and tighten spark plug 1 using the special tool.

Guideline

|                   |          |                     |
|-------------------|----------|---------------------|
| Spark plug inside | M12x1.25 | 18 Nm (13.3 lbf ft) |
|-------------------|----------|---------------------|

Spark plug wrench (75029172000) (p. 293)

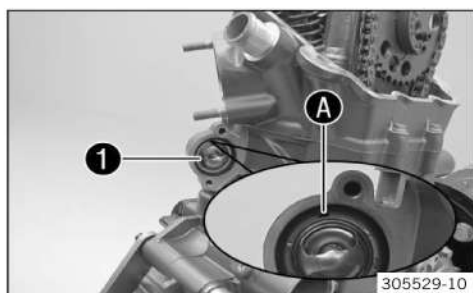
- Mount and tighten spark plug 2 using the special tool.

Guideline

|                    |       |                    |
|--------------------|-------|--------------------|
| Spark plug outside | M10x1 | 11 Nm (8.1 lbf ft) |
|--------------------|-------|--------------------|

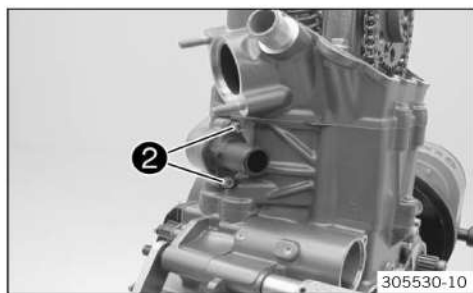
Spark plug wrench (75029172000) (p. 293)

17.5.27 Installing the thermostat



- Position thermostat 1 with the gasket.

✓ Drill hole A must face upward.



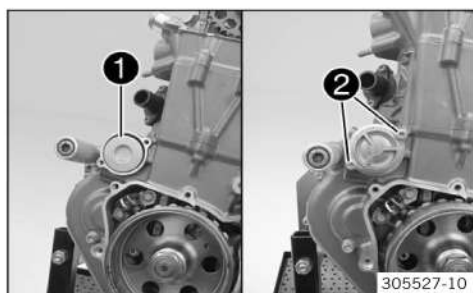
- Position the thermostat case.

- Mount and tighten screws 2.

Guideline

|                           |    |   |
|---------------------------|----|---|
| Screw, thermostat housing | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|---------------------------|----|---|

17.5.28 Installing the oil filter



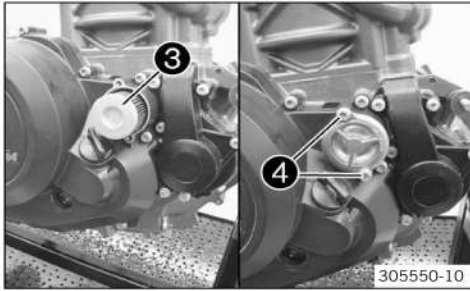
- Insert oil filter 1.

- Oil the O-ring of the oil filter cover and mount it with the oil filter cover.

- Mount and tighten screws 2.

Guideline

|                         |    |                   |
|-------------------------|----|-------------------|
| Screw, oil filter cover | M5 | 6 Nm (4.4 lbf ft) |
|-------------------------|----|-------------------|

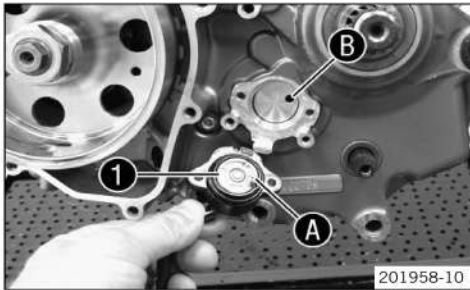


- Insert oil filter **3**.
- Oil the O-ring of the oil filter cover and mount it with the oil filter cover.
- Mount and tighten screws **4**.

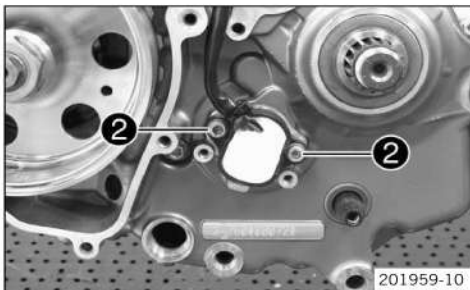
Guideline

|                         |    |                   |
|-------------------------|----|-------------------|
| Screw, oil filter cover | M5 | 6 Nm (4.4 lbf ft) |
|-------------------------|----|-------------------|

### 17.5.29 Installing the gear position sensor



- Mount gear position sensor **1** with the O-ring.
- ✓ Pin **A** engages in drill hole **B**.

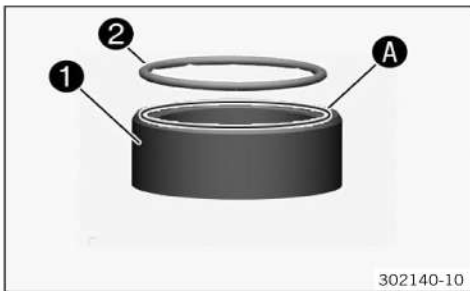


- Mount and tighten screws **2** with the washers.

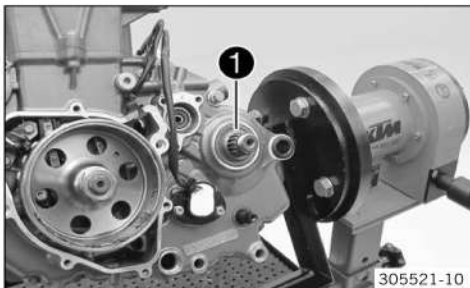
Guideline

|                    |    |  |
|--------------------|----|--|
| Screw, gear sensor | M5 | 5 Nm (3.7 lbf ft)<br><b>Loctite®243™</b> |
|--------------------|----|--|

### 17.5.30 Installing the spacer

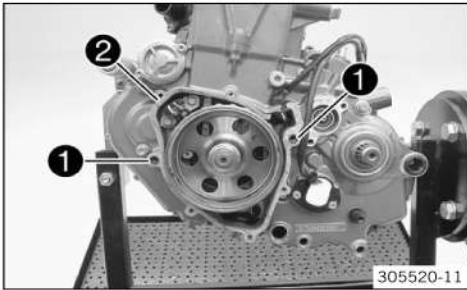


- Before mounting, grease spacer **1** in area **A** and O-ring **2**.
- |                             |
|-----------------------------|
| Long-life grease (📖 p. 280) |
|-----------------------------|
- Position the O-ring in the recess of the spacer.



- Grease the shaft seal ring.
- |                             |
|-----------------------------|
| Long-life grease (📖 p. 280) |
|-----------------------------|
- Push spacer **1** with the O-ring onto the countershaft with a twisting motion.
  - ✓ The recess with the O-ring faces inward.
  - ✓ The shaft seal ring rests against the spacer along its entire circumference.

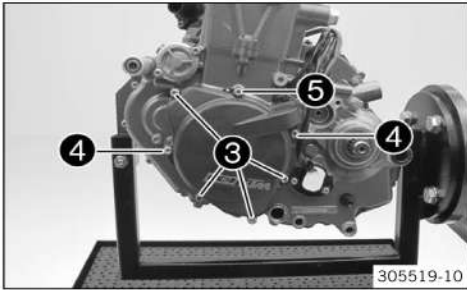
17.5.31 Installing the alternator cover



- Apply sealing compound lightly in the area of the cable sleeve.

**Loctite® 5910**

- Mount dowels **1** and put alternator cover gasket **2** in place.



- Position the alternator cover.
- Mount and tighten screws **3**.

Guideline

|                           |    |                    |
|---------------------------|----|--------------------|
| Screw in alternator cover | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|

- Mount and tighten screws **4**.

Guideline

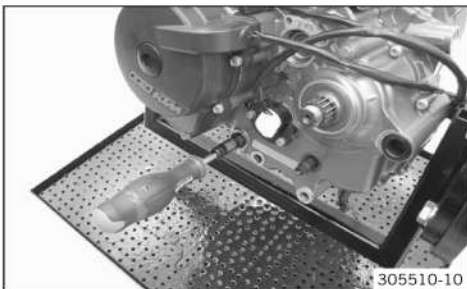
|                         |       |                    |
|-------------------------|-------|--------------------|
| Screw, alternator cover | M6x30 | 10 Nm (7.4 lbf ft) |
|-------------------------|-------|--------------------|

- Mount and tighten screw **5**.

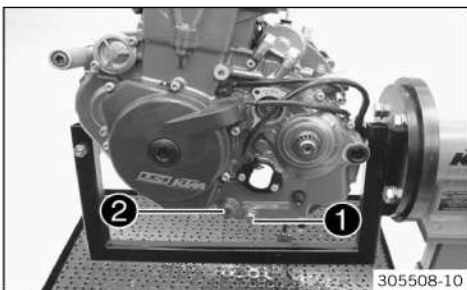
Guideline

|  |    |   |
|--|----|---|
| Screw, alternator cover (chain shaft through-hole) | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|--|----|---|

17.5.32 Installing oil screens



- Push the oil screen with O-rings on to a pin wrench. Push the pin wrench through the opening into the drill hole of the opposite engine case wall and push the oil screen as far as possible into the engine case.



- Mount the oil drain plug **1** with the magnet and a new seal ring and tighten it.

Guideline

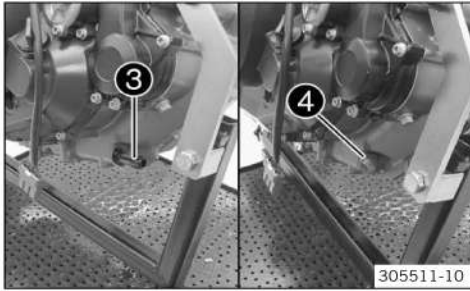
|                            |         |                     |
|----------------------------|---------|---------------------|
| Oil drain plug with magnet | M12x1.5 | 20 Nm (14.8 lbf ft) |
|----------------------------|---------|---------------------|

- Mount and tighten screw plug **2** with the O-ring.

Guideline

|                  |         |                     |
|------------------|---------|---------------------|
| Plug, oil screen | M20x1.5 | 15 Nm (11.1 lbf ft) |
|------------------|---------|---------------------|



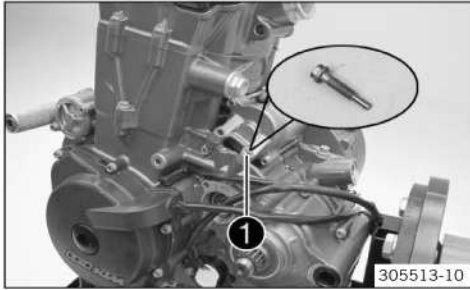


- Position the oil screen **3** with O-rings.
- Mount and tighten screw plug **4** with the O-ring.

Guideline

|                  |         |                     |
|------------------|---------|---------------------|
| Plug, oil screen | M20x1.5 | 15 Nm (11.1 lbf ft) |
|------------------|---------|---------------------|

### 17.5.33 Installing the starter motor



- Grease the O-ring and mount the starter motor.

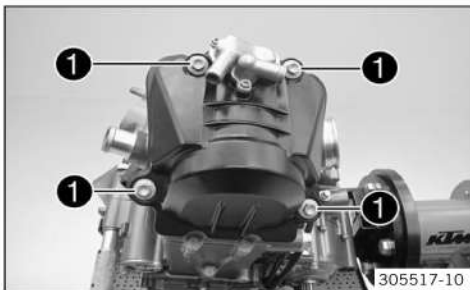
Long-life grease (see p. 280)

- Mount and tighten oil throttle **1**.

Guideline

|  |    |   |
|--|----|---|
| Screw, starter motor with oil throttle | M6 | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b> |
|--|----|---|

### 17.5.34 Installing the valve cover

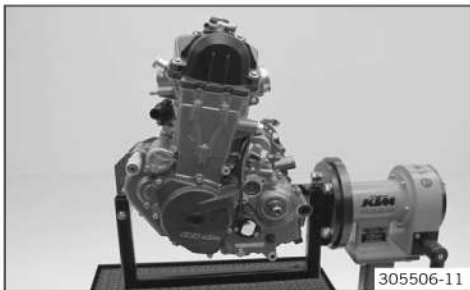


- Position the valve cover with the gasket.
- Mount and tighten screws **1**.

Guideline

|                    |    |                    |
|--------------------|----|--------------------|
| Screw, valve cover | M6 | 10 Nm (7.4 lbf ft) |
|--------------------|----|--------------------|

### 17.5.35 Removing the engine from the engine assembly stand



- Remove the engine from the engine assembly stand.



#### Info

Have an assistant help you or use a motorized hoist.



18.1 Checking/correcting the fluid level of the hydraulic clutch



**Warning**

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



**Warning**

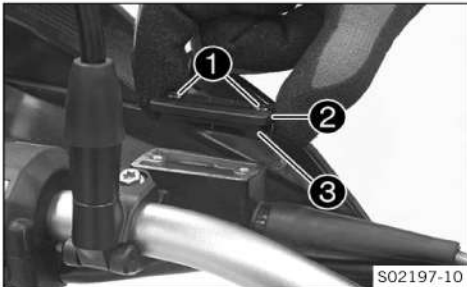
**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.



**Info**

The fluid level rises with increasing wear of the clutch facing discs. Never use DOT 5 brake fluid. It is silicone-based and purple in color. Oil seals and clutch lines are not designed for DOT 5 brake fluid. Avoid contact between brake fluid and painted parts. Brake fluid attacks paint. Only use clean brake fluid from a sealed container.



- Move the clutch fluid reservoir mounted on the handlebar to a horizontal position.
- Remove screws ①.
- Remove cover ② with membrane ③.
- Check the fluid level.

|                                 |                |
|---------------------------------|----------------|
| Fluid level below container rim | 4 mm (0.16 in) |
|---------------------------------|----------------|

- » If the fluid level does not meet specifications:
  - Correct the fluid level of the hydraulic clutch.

Brake fluid DOT 4 / DOT 5.1 (📖 p. 278)

- Position the cover with the membrane. Mount and tighten the screws.



**Info**

Clean up overflowed or spilled brake fluid immediately with water.

## 18.2 Changing the hydraulic clutch fluid



### Warning

**Skin irritation** Brake fluid causes skin irritation.

- Keep brake fluid out of the reach of children.
- Wear suitable protective clothing and safety glasses.
- Do not allow brake fluid to come into contact with the skin, the eyes or clothing.
- Consult a doctor immediately if brake fluid has been swallowed.
- Rinse the affected area with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water immediately and consult a doctor if brake fluid comes into contact with the eyes.
- If brake fluid spills on to your clothing, change the clothing.



### Warning

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

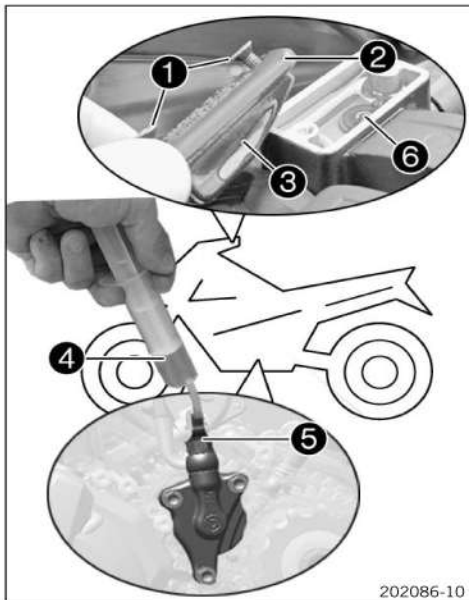


### Info

Never use DOT 5 brake fluid. It is silicone-based and purple in color. Oil seals and clutch lines are not designed for DOT 5 brake fluid.

Avoid contact between brake fluid and painted parts. Brake fluid attacks paint.

Only use clean brake fluid from a sealed container.



- Move the clutch fluid reservoir mounted on the handlebar to a horizontal position.
- Remove screws ①.
- Remove cover ② with membrane ③.
- Fill bleeding syringe ④ with the appropriate hydraulic fluid.

|                                  |
|----------------------------------|
| Syringe (50329050000) (📄 p. 284) |
|----------------------------------|

|  |
|--|
| Brake fluid DOT 4 / DOT 5.1 (📄 p. 278) |
|--|

- On the clutch slave cylinder, remove bleeder screw ⑤ and mount bleeding syringe ④.
- Inject the liquid into the system until it escapes from drill hole ⑥ of the master cylinder without bubbles.
- Drain fluid occasionally from the master cylinder reservoir, to prevent overflow.
- Remove the bleeding syringe. Mount and tighten screws bleeder screw.
- Correct the fluid level of the hydraulic clutch.

#### Guideline

|                                 |                |
|---------------------------------|----------------|
| Fluid level below container rim | 4 mm (0.16 in) |
|---------------------------------|----------------|

- Position the cover with the membrane. Mount and tighten the screws.

**Info**

Clean up overflowed or spilled brake fluid immediately with water.

---



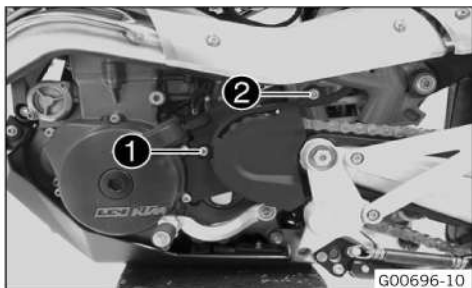
## 19.1 Changing the gear position sensor

### Preparatory work

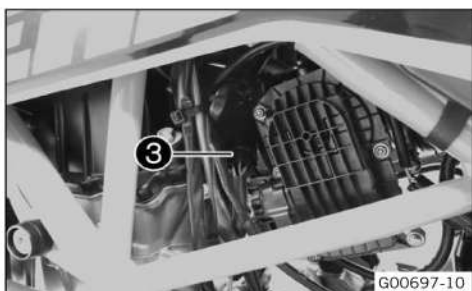
- Raise the motorcycle with a lift stand. (📖 p. 12)

### Main work

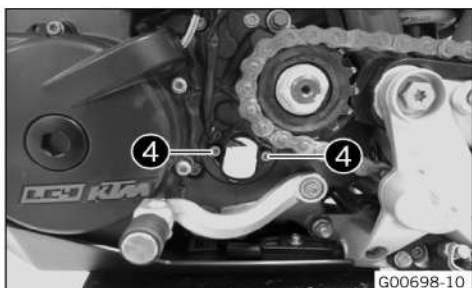
- Remove screw ①.
- Remove screw ②. Take off the engine sprocket cover.



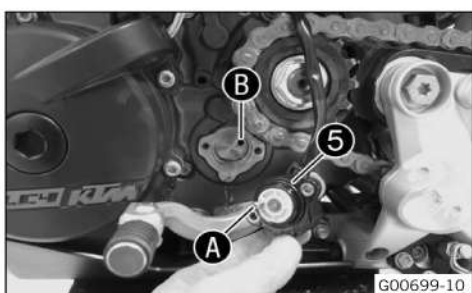
- Disconnect plug-in connector ③.
- Remove the cable tie(s).
- Expose the cable.



- Remove screws ④ with the washers.
- Take off the gear position sensor.



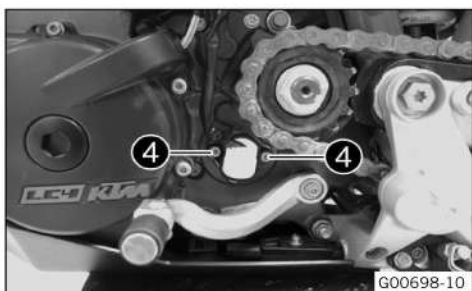
- Lubricate O-ring ⑤ of the new gear position sensor.
- Position the gear position sensor.
- ✓ Pin A engages in drill hole B.

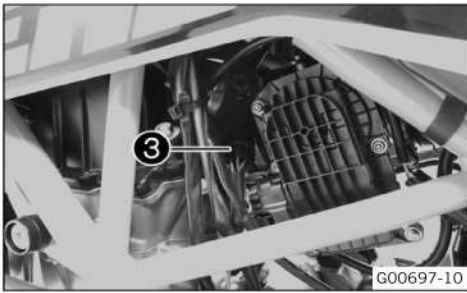


- Mount and tighten screws ④ with the washers.

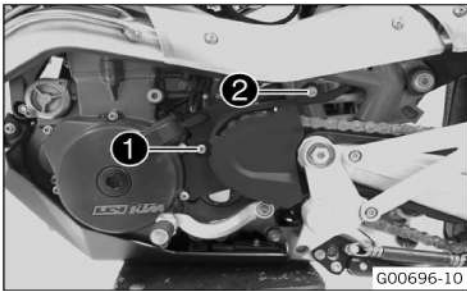
### Guideline

|                    |    |  |
|--------------------|----|--|
| Screw, gear sensor | M5 | 5 Nm (3.7 lbf ft)<br><b>Loctite®243™</b> |
|--------------------|----|--|





- Join plug-in connector ③.
- Route the cable without tension and secure with cable tie(s).



- Position the engine sprocket cover.
- Mount and tighten screw ①.

**Guideline**

|                           |    |                    |
|---------------------------|----|--------------------|
| Remaining screws, chassis | M6 | 10 Nm (7.4 lbf ft) |
|---------------------------|----|--------------------|

- Mount and tighten screw ②.

**Guideline**

|                           |    |                     |
|---------------------------|----|---------------------|
| Remaining screws, chassis | M8 | 25 Nm (18.4 lbf ft) |
|---------------------------|----|---------------------|

**Finishing work**

- Program the gear position sensor. (📖 p. 217)
- Remove the motorcycle from the lift stand. (📖 p. 12)

## 19.2 Programming the gear position sensor

**Condition**

The diagnostics tool is connected and running.

**Preparatory work**

- Reset the engine electronics control unit. (📖 p. 236)

**Main work**

- Execute **"Engine electronics" > "Functions" > "Program the gear position sensor"**.
- Switch to the main menu.
- Switch the ignition off and on again.
  - ✓ The green idling speed indicator lamp **N** lights up.





## 20.1 Draining the coolant



### Warning

**Danger of scalding** During motorcycle operation, the coolant gets very hot and is under pressure.

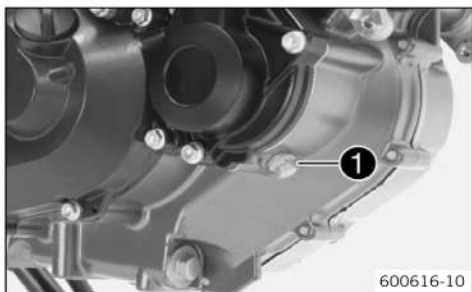
- Do not open the radiator, the radiator hoses or other cooling system components if the engine or the cooling system are at operating temperature.
- Allow the cooling system and the engine to cool down before you open the radiator, the radiator hoses or other components of the cooling system.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



### Warning

**Danger of poisoning** Coolant is toxic and a health hazard.

- Keep coolant out of the reach of children.
- Do not allow coolant to come into contact with the skin, the eyes and clothing.
- Consult a doctor immediately if coolant is swallowed.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water and consult a doctor immediately if coolant gets into the eyes.
- Change clothing if coolant spills onto your clothing.



### Preparatory work

- Remove the engine guard. (📖 p. 39)

### Main work

- Position the motorcycle upright.
- Place a suitable container under the engine.
- Remove screw ①. Remove the radiator cap.
- Completely drain the coolant.
- Mount and tighten screw ① with a new seal ring.

### Guideline

|                                |       |                     |
|--------------------------------|-------|---------------------|
| Plug, drain hole of water pump | M10x1 | 15 Nm (11.1 lbf ft) |
|--------------------------------|-------|---------------------|

### Finishing work

- Install the engine guard. (📖 p. 39)

## 20.2 Filling/bleeding the cooling system



### Warning

**Danger of poisoning** Coolant is toxic and a health hazard.

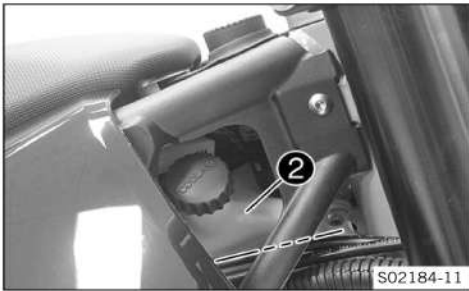
- Keep coolant out of the reach of children.
- Do not allow coolant to come into contact with the skin, the eyes and clothing.
- Consult a doctor immediately if coolant is swallowed.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water and consult a doctor immediately if coolant gets into the eyes.
- Change clothing if coolant spills onto your clothing.



- Stand the motorcycle on its side stand on a horizontal surface.
- Remove radiator cap ❶.



- Refill with coolant.
- Coolant (📖 p. 278)
- Completely fill the radiator with coolant.
  - Mount radiator cap ❶.



- Remove the cover of compensating tank ❷.
- Add coolant to the level shown in the figure.
- Mount the cover of the compensating tank.



### Danger

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

- Start the engine and run it until the 5th bar of the temperature indicator lights up.
- Stop the engine and allow it to cool down.
- Check the coolant level. (📖 p. 221)

## 20.3 Checking the antifreeze and coolant level



### Warning

**Danger of scalding** During motorcycle operation, the coolant gets very hot and is under pressure.

- Do not open the radiator, the radiator hoses or other cooling system components if the engine or the cooling system are at operating temperature.
- Allow the cooling system and the engine to cool down before you open the radiator, the radiator hoses or other components of the cooling system.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



## Warning

**Danger of poisoning** Coolant is toxic and a health hazard.

- Keep coolant out of the reach of children.
- Do not allow coolant to come into contact with the skin, the eyes and clothing.
- Consult a doctor immediately if coolant is swallowed.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water and consult a doctor immediately if coolant gets into the eyes.
- Change clothing if coolant spills onto your clothing.



S02184-10

## Condition

The engine is cold.

- Stand the motorcycle on its side stand on a horizontal surface.
- Remove the cover of compensating tank ①.
- Check the antifreeze in the coolant.

-25 ... -45 °C (-13 ... -49 °F)

- » If the antifreeze in the coolant does not match the specified value:
  - Correct the antifreeze in the coolant.

- Check the coolant level in the compensating tank.

The coolant level must be within the range shown in the figure.

- » If the coolant level does not match the specified value:
  - Correct the coolant level.

Coolant (📖 p. 278)

- Mount the cover of the compensating tank.

- Remove radiator cap ②.

- Check the antifreeze in the coolant.

-25 ... -45 °C (-13 ... -49 °F)

- » If the antifreeze in the coolant does not match the specified value:
  - Correct the antifreeze in the coolant.

- Check the coolant level in the radiator.

The radiator must be filled completely.

- » If the coolant level does not match the specified value:
  - Check the coolant level and the reason for the loss.

Coolant (📖 p. 278)

- Mount the radiator cap.



601799-10



## 20.4 Checking the coolant level



### Warning

**Danger of scalding** During motorcycle operation, the coolant gets very hot and is under pressure.

- Do not open the radiator, the radiator hoses or other cooling system components if the engine or the cooling system are at operating temperature.
- Allow the cooling system and the engine to cool down before you open the radiator, the radiator hoses or other components of the cooling system.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



### Warning

**Danger of poisoning** Coolant is toxic and a health hazard.

- Keep coolant out of the reach of children.
- Do not allow coolant to come into contact with the skin, the eyes and clothing.
- Consult a doctor immediately if coolant is swallowed.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water and consult a doctor immediately if coolant gets into the eyes.
- Change clothing if coolant spills onto your clothing.

### Condition

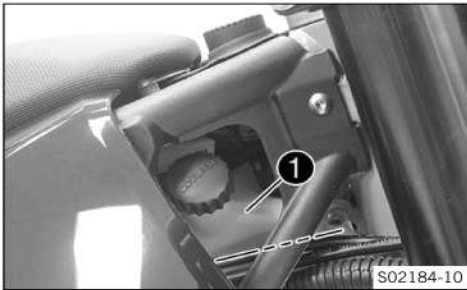
The engine is cold.

- Stand the motorcycle on its side stand on a horizontal surface.
- Check the coolant level in compensating tank **1**.

The coolant level must be within the range shown in the figure.

- » If the coolant level does not match the specified value:
  - Correct the coolant level.

Coolant (📖 p. 278)



- Remove radiator cap **2** and check the coolant level in the radiator.

The radiator must be filled completely.

- » If the coolant level does not match the specified value:
  - Check the coolant level and the reason for the loss.

Coolant (📖 p. 278)

- Mount the radiator cap.



## 20.5 Changing the coolant



### Warning

**Danger of scalding** During motorcycle operation, the coolant gets very hot and is under pressure.

- Do not open the radiator, the radiator hoses or other cooling system components if the engine or the cooling system are at operating temperature.
- Allow the cooling system and the engine to cool down before you open the radiator, the radiator hoses or other components of the cooling system.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



### Warning

**Danger of poisoning** Coolant is toxic and a health hazard.

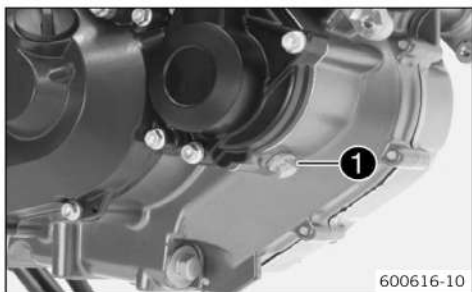
- Keep coolant out of the reach of children.
- Do not allow coolant to come into contact with the skin, the eyes and clothing.
- Consult a doctor immediately if coolant is swallowed.
- Rinse the affected area immediately with plenty of water in the event of contact with the skin.
- Rinse eyes thoroughly with water and consult a doctor immediately if coolant gets into the eyes.
- Change clothing if coolant spills onto your clothing.

### Preparatory work

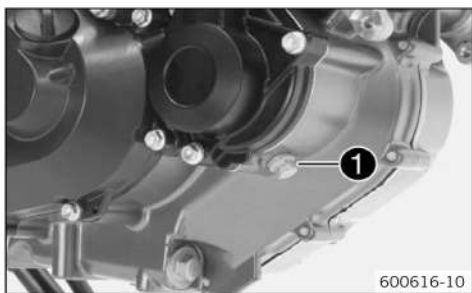
- Remove the engine guard. (📖 p. 39)

### Main work

- Position the motorcycle upright.
- Place a suitable container under the engine.
- Remove screw ❶.



- Remove radiator cap ❷.
- Completely drain the coolant.



- Mount and tighten screw ❶ with a new seal ring.

### Guideline

|                                |       |                     |
|--------------------------------|-------|---------------------|
| Plug, drain hole of water pump | M10x1 | 15 Nm (11.1 lbf ft) |
|--------------------------------|-------|---------------------|

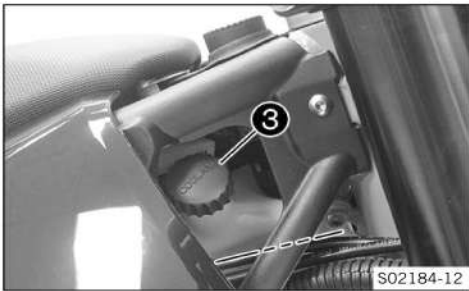




- Stand the motorcycle on its side stand on a horizontal surface.
- Refill with coolant.

|         |                      |                    |
|---------|----------------------|--------------------|
| Coolant | 1.20 l<br>(1.27 qt.) | Coolant (📖 p. 278) |
|---------|----------------------|--------------------|

- Completely fill the radiator with coolant.
- Mount radiator cap ②.



- Remove cover ③ of the compensating tank.
- Add coolant to the level shown in the figure.
- Mount cover ③ of the compensating tank.



### **Danger**

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

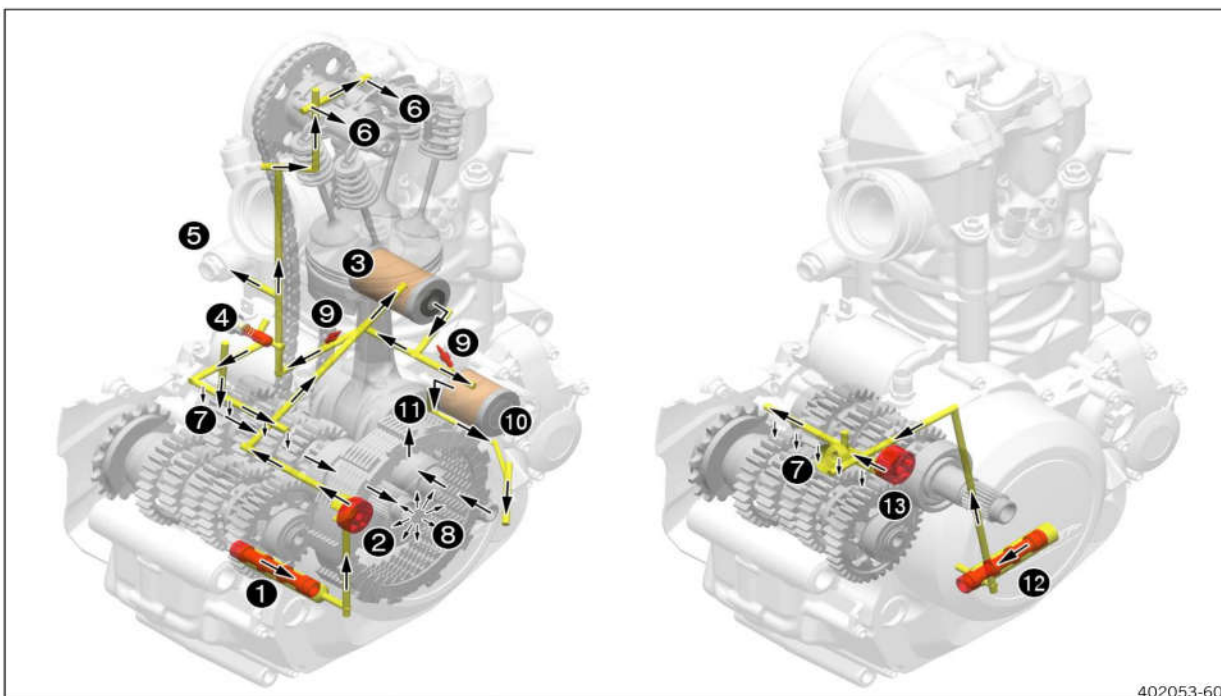
- Start the engine and run it until the 5th bar of the temperature indicator lights up.
- Stop the engine and allow it to cool down.
- Check the coolant level. (📖 p. 221)

### **Finishing work**

- Install the engine guard. (📖 p. 39)



## 21.1 Oil circuit



402053-60

### Oil circuit of force pump

- ① Oil screen
- ② Force pump
- ③ Oil filter
- ④ Oil pressure regulator valve
- ⑤ Timing chain tensioner
- ⑥ Oil nozzle for rocker arm lubrication
- ⑦ Transmission
- ⑧ Clutch
- ⑨ Oil nozzle for piston cooling
- ⑩ Oil filter
- ⑪ Oil nozzle for conrod bearing lubrication

### Oil circuit of suction pump

- ⑫ Oil screen
- ⑬ Suction pump
- ⑦ Transmission

## 21.2 Checking the engine oil level



### Info

The engine oil level must be checked when the engine is warm.

### Condition

The engine is at operating temperature.

### Preparatory work

- Stand the motorcycle upright on a horizontal surface.

### Main work

- Check the engine oil level.



### Info

After switching off the engine, wait one minute before checking the level.

The engine oil must be between the lower and upper edge of the oil level viewer.

- » If the engine oil level is not at the specified level:
  - Add engine oil. (📖 p. 231)

## 21.3 Checking the engine oil pressure



### Warning

**Danger of scalding** Engine and gear oil get very hot when the motorcycle is ridden.

- Wear suitable protective clothing and safety gloves.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



### Warning

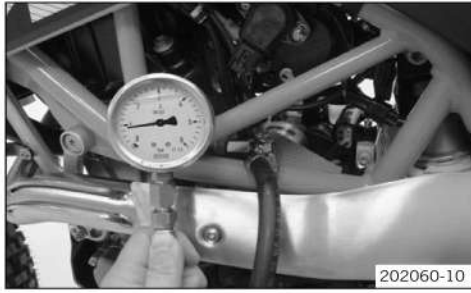
**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.



### Main work

- Remove screw ①.



202060-10

- Position the banjo bolt with the connector and sealing rings. Mount and tighten the banjo bolt.

Guideline

|            |       |                   |
|------------|-------|-------------------|
| Banjo bolt | M10x1 | 8 Nm (5.9 lbf ft) |
|------------|-------|-------------------|

|   |
|---|
| Oil pressure adapter (77329006000) (📖 p. 293) |
|---|

- Connect the pressure tester to the special tool without the T-plate.

|  |
|--|
| Pressure testing tool (61029094000) (📖 p. 287) |
|--|

- Check the engine oil level. (📖 p. 225)



**Danger**

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

- Start the engine and let it warm up.
- Check the engine oil pressure.

| Engine oil pressure  |                      |
|--|----------------------|
| Coolant temperature:<br>≥ 70 °C (≥ 158 °F)<br>Engine speed:<br>1,500 rpm | ≥ 0.4 bar (≥ 6 psi)  |
| Coolant temperature:<br>≥ 70 °C (≥ 158 °F)<br>Engine speed:<br>5,000 rpm | ≥ 1.5 bar (≥ 22 psi) |

- » If the measured value is less than the specification:
  - Change the oil filter. Check the oil pumps for wear. Check that all oil holes are clear.

- Switch off the engine.



**Warning**

**Danger of burns** Some vehicle components get very hot when the machine is driven.

- Wear appropriate protective clothing and safety gloves. In case of burns, rinse immediately with lukewarm water.

- Remove the special tools.
- Mount and tighten screw ❶.

Guideline

|  |       |                    |
|--|-------|--------------------|
| Screw, unlocking of timing chain tensioner | M10x1 | 10 Nm (7.4 lbf ft) |
|--|-------|--------------------|

**Finishing work**

- Check the engine oil level. (📖 p. 225)

**21.4 Changing the engine oil and filter, cleaning the oil screens**

- Drain the engine oil. (📖 p. 227)
- Remove the oil filter. (📖 p. 228)
- Clean the oil screens. (📖 p. 229)
- Install the oil filter. (📖 p. 229)
- Fill up with engine oil. (📖 p. 230)

**21.5 Draining the engine oil****Warning**

**Danger of scalding** Engine and gear oil get very hot when the motorcycle is ridden.

- Wear suitable protective clothing and safety gloves.
- In the event of scalding, rinse the area affected immediately with lukewarm water.

**Warning**

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

**Info**

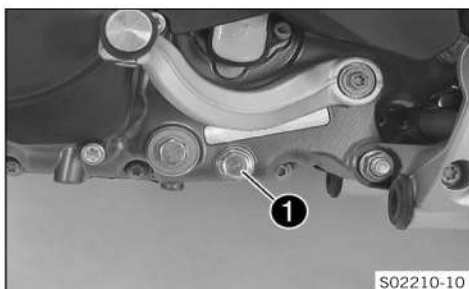
Drain the engine oil while the engine is at operating temperature.

**Preparatory work**

- Remove the engine guard. (📖 p. 39)

**Main work**

- Place a suitable container under the engine.
- Remove oil drain plug ❶ with the magnet and seal ring.
- Completely drain the engine oil.







- Thoroughly clean the oil drain plug with magnet.
- Mount the oil drain plug with the magnet and seal ring and tighten it.

**Guideline**

|                            |         |                     |
|----------------------------|---------|---------------------|
| Oil drain plug with magnet | M12x1.5 | 20 Nm (14.8 lbf ft) |
|----------------------------|---------|---------------------|

## 21.6 Removing the oil filter



**Warning**

**Danger of scalding** Engine and gear oil get very hot when the motorcycle is ridden.

- Wear suitable protective clothing and safety gloves.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



**Warning**

**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

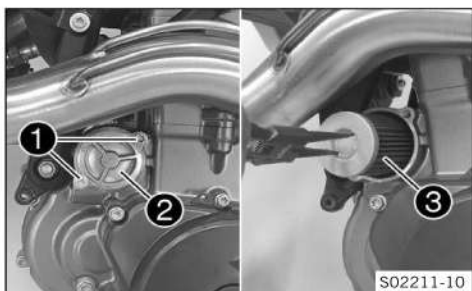
**Preparatory work**

- Place a suitable container under the engine.

**Main work**

- Remove screws **1**. Remove the oil filter cover **2** with the O-ring.
- Pull oil filter **3** out of the oil filter housing.

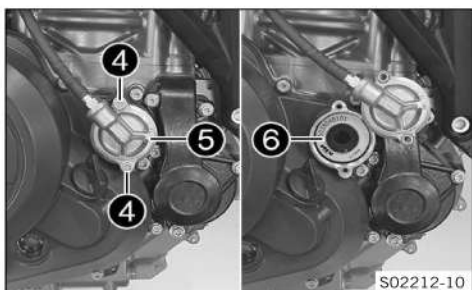
Lock ring plier (51012011000) (📖 p. 284)



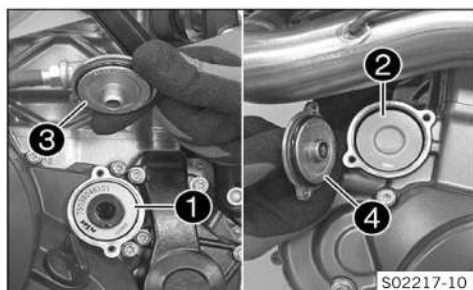
- Remove screws **4**. Remove the oil filter cover **5** with the O-ring.
- Pull oil filter **6** out of the oil filter housing.

Lock ring plier (51012011000) (📖 p. 284)

- Completely drain the engine oil.
- Thoroughly clean the parts and sealing area.



**21.7 Installing the oil filter**



- Insert oil filters ① and ②.
- Oil the O-rings of the oil filter covers. Mount oil filter covers ③ and ④.
- Mount and tighten the screws.

Guideline

|                         |    |                   |
|-------------------------|----|-------------------|
| Screw, oil filter cover | M5 | 6 Nm (4.4 lbf ft) |
|-------------------------|----|-------------------|

**21.8 Cleaning the oil screens**



**Warning**

**Danger of scalding** Engine and gear oil get very hot when the motorcycle is ridden.

- Wear suitable protective clothing and safety gloves.
- In the event of scalding, rinse the area affected immediately with lukewarm water.



**Warning**

**Environmental hazard** Hazardous substances cause environmental damage.

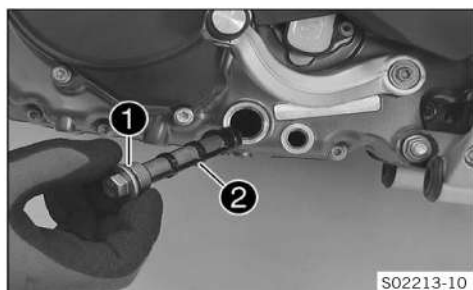
- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.

**Preparatory work**

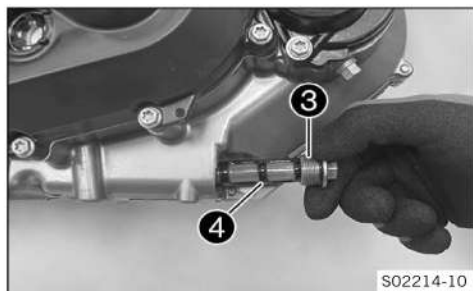
- Place a suitable container under the engine.

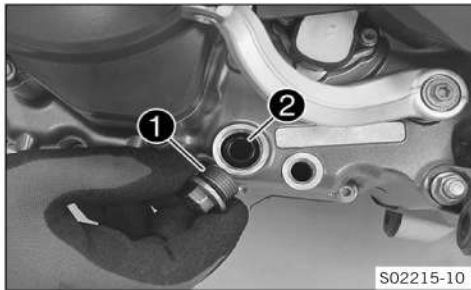
**Main work**

- Remove screw plug ① with oil screen ② and the O-rings.



- Remove screw plug ③ with oil screen ④ and the O-rings.
- Completely drain the engine oil.
- Thoroughly clean the parts and sealing surface.

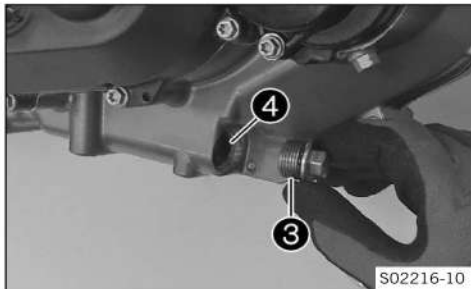




- Position oil screen ② with the O-rings.
- Mount and tighten screw plug ① with the O-ring.

Guideline

|                  |         |                     |
|------------------|---------|---------------------|
| Plug, oil screen | M20x1.5 | 15 Nm (11.1 lbf ft) |
|------------------|---------|---------------------|



- Position oil screen ④ with the O-rings.
- Mount and tighten screw plug ③ with the O-ring.

Guideline

|                  |         |                     |
|------------------|---------|---------------------|
| Plug, oil screen | M20x1.5 | 15 Nm (11.1 lbf ft) |
|------------------|---------|---------------------|

## 21.9 Filling up with engine oil

**i Info**

Too little engine oil or poor-quality engine oil results in premature wear to the engine.



**Main work**

- Remove filler plug with O-ring ① from the clutch cover and add engine oil.

|                                      |                     |   |
|--------------------------------------|---------------------|---|
| Engine oil                           | 1.70 l<br>(1.8 qt.) | Engine oil<br>(SAE 10W/60)<br>(00062010035)<br>(☞ p. 278) |
| Engine oil<br>Alternative engine oil |                     | Engine oil<br>(SAE 10W/50)<br>(☞ p. 279)                  |

- Refit plug with O-ring ① and tighten it.



**Danger**

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

- Start the engine and check that it is oil-tight.

**Finishing work**

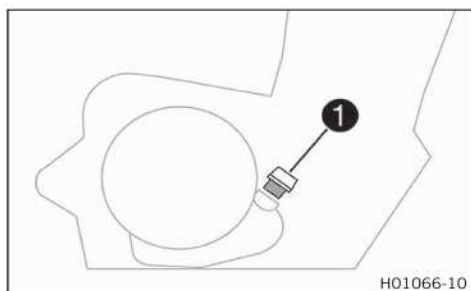
- Install the engine guard. (☞ p. 39)
- Check the engine oil level. (☞ p. 225)

## 21.10 Adding engine oil



### Info

Too little engine oil or poor-quality engine oil results in premature wear of the engine.



### Main work

- Remove filler plug **1** and the O-ring from the clutch cover, and fill up with engine oil.

|  |
|--|
| Engine oil (SAE 10W/60) (00062010035) (📖 p. 278) |
|--|

|                                    |
|------------------------------------|
| Engine oil (SAE 10W/50) (📖 p. 279) |
|------------------------------------|



### Info

In order to achieve optimal engine performance, it is not advisable to mix different engine oils. We recommended changing the engine oil when necessary.

- Mount and tighten oil filler plug **1** with the O-ring.



### Danger

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

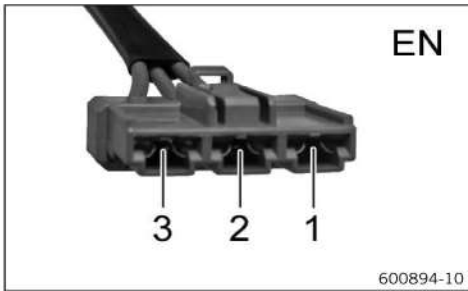
- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

- Start the engine and check that it is oil-tight.

### Finishing work

- Check the engine oil level. (📖 p. 225)

## 22.1 Alternator - checking the stator winding



### Condition

The stator is disconnected.

### Stator winding measurement I - check the resistance.

- $\Omega$  Measure the resistance between the specified points.  
Stator, connector **EN** pin **1** – Stator, connector **EN** pin **2**

|   |                        |
|---|------------------------|
| Alternator                                  |                        |
| Stator winding resistance at: 20 °C (68 °F) | 0.15 ... 0.30 $\Omega$ |

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.

### Stator winding measurement II - check the resistance.

- $\Omega$  Measure the resistance between the specified points.  
Stator, connector **EN** pin **1** – Stator, connector **EN** pin **3**

|   |                        |
|---|------------------------|
| Alternator                                  |                        |
| Stator winding resistance at: 20 °C (68 °F) | 0.15 ... 0.30 $\Omega$ |

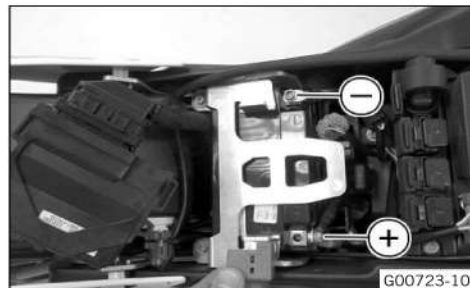
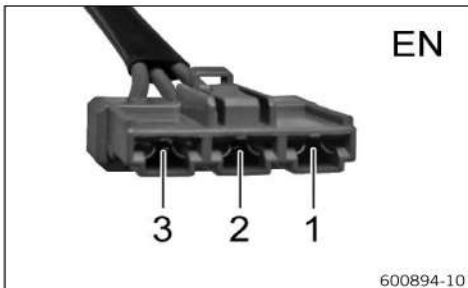
- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.

### Stator winding measurement III - check the resistance.

- $\Omega$  Measure the resistance between the specified points.  
Stator, connector **EN** pin **2** – Stator, connector **EN** pin **3**

|   |                        |
|---|------------------------|
| Alternator                                  |                        |
| Stator winding resistance at: 20 °C (68 °F) | 0.15 ... 0.30 $\Omega$ |

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.



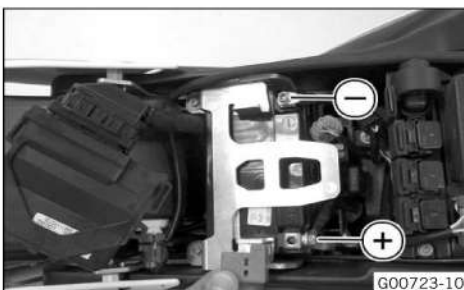
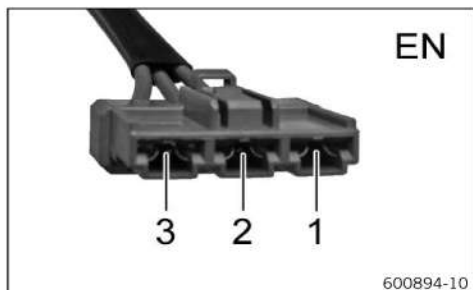
### Stator winding I - check short circuit to ground (terminal 31).

- $\Omega$  Measure the resistance between the specified points.  
Stator, connector **EN** pin **1** – Measuring point **Ground (-)**

|            |                 |
|------------|-----------------|
| Resistance | $\infty \Omega$ |
|------------|-----------------|

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.



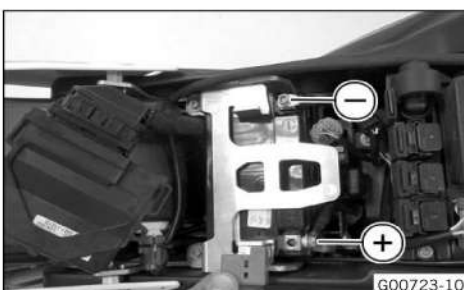
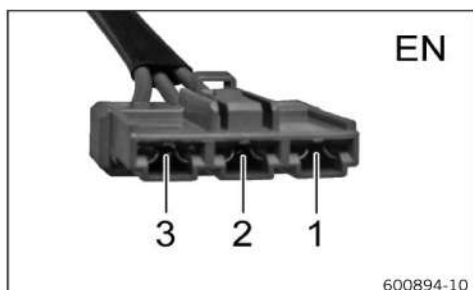


**Stator winding II - check short circuit to ground (terminal 31).**

- $\Omega$  Measure the resistance between the specified points.  
Stator, connector **EN** pin **2** – Measuring point **Ground (-)**

|            |                 |
|------------|-----------------|
| Resistance | $\infty \Omega$ |
|------------|-----------------|

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.



**Stator winding III - check short circuit to ground (terminal 31).**

- $\Omega$  Measure the resistance between the specified points.  
Stator, connector **EN** pin **3** – Measuring point **Ground (-)**

|            |                 |
|------------|-----------------|
| Resistance | $\infty \Omega$ |
|------------|-----------------|

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.



**Stator winding measurement I - check the voltage.**

- $V$  Measure the voltage between the specified points.  
Stator, connector **EN** pin **1** – Stator, connector **EN** pin **2**

**i Info**  
The results of the measurements on the individual coils must not deviate noticeably from each other.

|   |             |
|---|-------------|
| AC generator  |             |
| Alternating voltage stator winding at 4000 rpm: 20 °C (68 °F) | $\geq 50 V$ |

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.

**Stator winding measurement II - check the voltage.**

- $V$  Measure the voltage between the specified points.  
Stator, connector **EN** pin **1** – Stator, connector **EN** pin **3**

**i Info**

The results of the measurements on the individual coils must not deviate noticeably from each other.

|   |        |
|---|--------|
| AC generator  |        |
| Alternating voltage stator winding at 4000 rpm: 20 °C (68 °F) | ≥ 50 V |

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.

**Stator winding measurement III - check the voltage.**

- **V** Measure the voltage between the specified points.  
Stator, connector **EN** pin 2 – Stator, connector **EN** pin 3

**i Info**

The results of the measurements on the individual coils must not deviate noticeably from each other.

|   |        |
|---|--------|
| AC generator  |        |
| Alternating voltage stator winding at 4000 rpm: 20 °C (68 °F) | ≥ 50 V |

- » If the indicated value does not correspond to the setpoint value:
  - Change the stator.

## 22.2 Ignition coil - checking the primary winding

**Preparatory work**

- Remove the seat. (📖 p. 73)
- Take off the side cover. (📖 p. 73)

**Main work**

- Disconnect ignition coil 1 cylinder 1.

**Ignition coil cylinder 1 - check the primary winding resistance**

- **Ω** Measure the resistance between the specified points.  
Ignition coil pin 1 – Ignition coil pin 2



|   |                   |
|---|-------------------|
| Ignition coil                                   |                   |
| Resistance of primary winding at: 20 °C (68 °F) | 1.105 ... 1.495 Ω |

- » If the displayed value does not correspond to specifications:
  - Change the ignition coil.

- Disconnect ignition coil 2 cylinder 1.

**Ignition coil cylinder 1 - check the primary winding resistance**

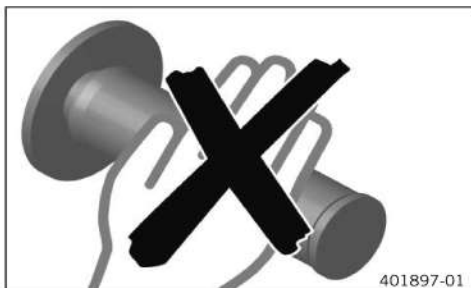
- **Ω** Measure the resistance between the specified points.  
Ignition coil pin 1 – Ignition coil pin 2

| Ignition coil                                   |                          |
|---|--------------------------|
| Resistance of primary winding at: 20 °C (68 °F) | 1.105 ... 1.495 $\Omega$ |

- » If the displayed value does not correspond to specifications:
  - Change the ignition coil.



## 23.1 Performing the initialization run



### Condition

The diagnostics tool is connected and running.

- Execute "**Engine electronics**" > "**Functions**" > "**Delete adaptation values**".
  - ✓ The adaptation values are deleted.
- Program the gear position sensor. (📖 p. 217)
- Switch off ignition.
- Disconnect the diagnostics tool.



### Danger

**Danger of poisoning** Exhaust gases are toxic and inhaling them may result in unconsciousness and death.

- Always make sure there is sufficient ventilation when running the engine.
- Use an effective exhaust extraction system when starting or running the engine in an enclosed space.

- Start the engine without activating the throttle grip.

### Guideline

|                     |                   |
|---------------------|-------------------|
| Coolant temperature | < 25 °C (< 77 °F) |
|---------------------|-------------------|

- Let the engine idle for at least 10 minutes (600 seconds).



### Info

Do not activate the throttle grip during the initialization process.

- Switch off the ignition after 10 minutes (600 seconds).



### Info

If initialization is not completed or if the initialization process was interrupted, the entire process must be restarted.

## 23.2 Resetting the engine electronics control unit

### Condition

The diagnostics tool is connected and running.

### Main work

- Execute "**Engine electronics**" > "**Functions**" > "**Delete adaptation values**".

### Finishing work

- Program the gear position sensor. (📖 p. 217)

**24.1 Engine**

|   |   |
|---|---|
| Design                                  | 1-cylinder 4-stroke engine, water-cooled  |
| Displacement                            | 690 cm <sup>3</sup> (42.11 cu in)   |
| Stroke                                  | 84.5 mm (3.327 in)  |
| Bore                                    | 102 mm (4.02 in)  |
| Compression ratio                       | 12.6:1  |
| Control                                 | OHC, 4 valves controlled via rocker arm, chain drive                              |
| Valve diameter, intake                  | 40 mm (1.57 in)   |
| Valve diameter, exhaust                 | 34 mm (1.34 in)   |
| Valve play, cold                        | 0.07 ... 0.13 mm (0.0028 ... 0.0051 in)   |
| Crankshaft bearing                      | 2 roller bearings   |
| Conrod bearing                          | Needle bearing  |
| Piston pin bearing                      | Piston pin with <b>DLC</b> coating  |
| Pistons                                 | Forged light alloy  |
| Piston rings                            | 1 L-ring, 1 tapered compression piston ring, 1 oil scraper ring                   |
| Engine lubrication                      | Semi-dry sump lubrication system with two rotor pumps                             |
| Primary transmission                    | 36:79   |
| Clutch                                  | <b>APT<sup>™</sup></b> antihopping clutch in oil bath/hydraulically operated      |
| Transmission                            | 6-gear, claw shifted  |
| Transmission ratio                      |   |
| 1st gear                                | 14:35   |
| 2nd gear                                | 16:28   |
| 3rd gear                                | 21:28   |
| 4th gear                                | 21:23   |
| 5th gear                                | 23:22   |
| 6th gear                                | 23:20   |
| Mixture preparation                     | Electronic fuel injection   |
| Ignition                                | Contactless controlled fully electronic ignition with digital ignition adjustment |
| Alternator                              | 12 V, 224 W   |
| Spark plug                              |   |
| Inside spark plug                       | NGK LKAR8BI-9   |
| Outside spark plug                      | NGK LMAR7A-9  |
| Spark plug electrode gap                | 0.9 mm (0.035 in)   |
| Cooling                                 | Water cooling, permanent circulation of coolant by water pump                     |
| Idle speed                              |   |
| Coolant temperature: ≥ 70 °C (≥ 158 °F) | 1,550 ... 1,650 rpm   |
| Starting aid                            | Electric starter, automatic decompressor  |



## 24.2 Engine tolerance, wear limits

|   |   |
|---|---|
| Camshafts - diameter, bearing pin                         |   |
| Next to exhaust cam                                       | ≥ 39.95 mm (≥ 1.5728 in)                        |
| Next to inlet cam   | ≥ 17.96 mm (≥ 0.7071 in)                        |
| Valve spring  |   |
| Minimum length (without valve spring cap)                 | 42.3 mm (1.665 in)                              |
| Valve spring cap - thickness                              | 2.4 ... 2.5 mm (0.094 ... 0.098 in)             |
| Valve - valve stem diameter                               |   |
| Exhaust   | ≥ 5.93 mm (≥ 0.2335 in)                         |
| Intake  | ≥ 5.93 mm (≥ 0.2335 in)                         |
| Valve guide - diameter                                    |   |
| New condition   | 6.004 ... 6.016 mm (0.23638 ... 0.23685 in)     |
| Wear limit  | 6.050 mm (0.23819 in)                           |
| Valve - sealing seat width                                |   |
| Intake  | 1.60 mm (0.063 in)                              |
| Exhaust   | 2.00 mm (0.0787 in)                             |
| Valve - run-out   |   |
| On the valve plate  | ≤ 0.05 mm (≤ 0.002 in)                          |
| On the valve stem   | ≤ 0.05 mm (≤ 0.002 in)                          |
| Cylinder/cylinder head - sealing area distortion          | ≤ 0.10 mm (≤ 0.0039 in)                         |
| Cylinder - bore diameter                                  |   |
| Size I  | 102.000 ... 102.012 mm (4.01574 ... 4.01621 in) |
| Size II   | 102.013 ... 102.025 mm (4.01625 ... 4.01672 in) |
| Piston - diameter   |   |
| Size I  | 101.955 ... 101.965 mm (4.01397 ... 4.01436 in) |
| Size II   | 101.965 ... 101.975 mm (4.01436 ... 4.01476 in) |
| Piston/cylinder - mounting clearance                      |   |
| New condition   | 0.035 ... 0.060 mm (0.00138 ... 0.00236 in)     |
| Wear limit  | 0.10 mm (0.0039 in)                             |
| Piston ring - groove clearance                            | ≤ 0.08 mm (≤ 0.0031 in)                         |
| Piston ring end gap                                       |   |
| Compression rings   | ≤ 0.80 mm (≤ 0.0315 in)                         |
| Oil scraper ring  | ≤ 1.00 mm (≤ 0.0394 in)                         |
| Piston - piston pin hole diameter                         | 20.010 ... 20.020 mm (0.78779 ... 0.78819 in)   |
| Piston pin - diameter                                     | 19.995 ... 20.004 mm (0.7872 ... 0.78756 in)    |
| Connecting rod - axial clearance of lower conrod bearing  | 0.30 ... 0.60 mm (0.0118 ... 0.0236 in)         |
| Connecting rod - radial clearance of lower conrod bearing | 0.05 mm (0.002 in)                              |
| Crankshaft - axial clearance                              | 0.15 ... 0.25 mm (0.0059 ... 0.0098 in)         |
| Crankshaft run-out at bearing pin                         | ≤ 0.10 mm (≤ 0.0039 in)                         |
| Balancer shaft axial clearance                            | 0.05 ... 0.20 mm (0.002 ... 0.0079 in)          |
| Clutch facing disc - thickness                            | ≥ 2.5 mm (≥ 0.098 in)                           |
| Intermediate disk - thickness                             | ≥ 1.35 mm (≥ 0.0531 in)                         |
| Clutch spring - length                                    | 31.5 ... 33.5 mm (1.24 ... 1.319 in)            |

|   |   |
|---|---|
| Clutch basket - contact surface of clutch facing discs  | ≤ 0.5 mm (≤ 0.02 in)                    |
| Oil pressure regulator valve - minimum spring length  | 25.36 mm (0.9984 in)                    |
| Oil pump  |   |
| Clearance between external rotor and engine case  | ≤ 0.20 mm (≤ 0.0079 in)                 |
| Clearance between external rotor and internal rotor   | ≤ 0.20 mm (≤ 0.0079 in)                 |
| Axial clearance   | 0.04 ... 0.08 mm (0.0016 ... 0.0031 in) |
| Engine oil pressure   |   |
| Coolant temperature: ≥ 70 °C (≥ 158 °F)<br>Engine speed: 1,500 rpm  | ≥ 0.4 bar (≥ 6 psi)                     |
| Coolant temperature: ≥ 70 °C (≥ 158 °F)<br>Engine speed: 5,000 rpm  | ≥ 1.5 bar (≥ 22 psi)                    |
| Main shaft axial clearance  | 0.10 ... 0.40 mm (0.0039 ... 0.0157 in) |
| Transmission shaft run-out  | ≤ 0.025 mm (≤ 0.00098 in)               |
| Shift shaft - play in sliding plate/shift quadrant  | 0.40 ... 0.80 mm (0.0157 ... 0.0315 in) |
| Fuel pressure   |   |
| Under every load condition  | 3.3 ... 3.7 bar (48 ... 54 psi)         |
| Engine oil consumption  |   |
| After the vehicle is run-in   | ≤ 0.7 l/1.000 km (≤ 0.7 qt./600 mi)     |
| <div style="border: 1px solid black; padding: 5px;"> <p><b>i Info</b><br/>The oil consumption depends on the riding style and on the operating conditions.</p> </div> |   |

### 24.3 Engine tightening torques

|  |    |                      |                     |
|--|----|----------------------|---------------------|
| Screw, membrane fixation                           | M3 | 2 Nm (1.5 lbf ft)    | <b>Loctite®243™</b> |
| Hose clamp, intake flange                          | M4 | 2.5 Nm (1.84 lbf ft) |                     |
| Oil nozzle for conrod bearing lubrication          | M4 | 2 Nm (1.5 lbf ft)    | <b>Loctite®243™</b> |
| Locking screw for bearing                          | M5 | 6 Nm (4.4 lbf ft)    | <b>Loctite®243™</b> |
| Remaining screws, engine                           | M5 | 6 Nm (4.4 lbf ft)    |                     |
| Screw, breather cover on valve cover               | M5 | 6 Nm (4.4 lbf ft)    | <b>Loctite®243™</b> |
| Screw, clutch spring                               | M5 | 8 Nm (5.9 lbf ft)    |                     |
| Screw, cover plate for oil return line             | M5 | 6 Nm (4.4 lbf ft)    |                     |
| Screw, gear sensor                                 | M5 | 5 Nm (3.7 lbf ft)    | <b>Loctite®243™</b> |
| Screw, oil filter cover                            | M5 | 6 Nm (4.4 lbf ft)    |                     |
| Screw, oil pump cover, top                         | M5 | 6 Nm (4.4 lbf ft)    | <b>Loctite®243™</b> |
| Plug, vacuum connection                            | M6 | 10 Nm (7.4 lbf ft)   | <b>Loctite®243™</b> |
| Remaining screws, engine                           | M6 | 10 Nm (7.4 lbf ft)   |                     |
| Screw in alternator cover                          | M6 | 10 Nm (7.4 lbf ft)   |                     |
| Screw, alternator cover (chain shaft through-hole) | M6 | 10 Nm (7.4 lbf ft)   | <b>Loctite®243™</b> |

|                                     |         |  |
|-------------------------------------|---------|--|
| Screw, autodecompression            | M6      | 3 ... 4 Nm (2.2 ... 3 lbf ft)<br><b>Loctite®243™</b> |
| Screw, axial lock of camshaft       | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, clutch cover                 | M6      | 10 Nm (7.4 lbf ft)                                   |
| Screw, clutch slave cylinder        | M6x20   | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, clutch slave cylinder        | M6x35   | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, cylinder                     | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, cylinder head                | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, engine case                  | M6      | 10 Nm (7.4 lbf ft)                                   |
| Screw, ignition coil                | M6      | 10 Nm (7.4 lbf ft)                                   |
| Screw, ignition pulse generator     | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, locking lever                | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, oil pump cover, bottom       | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, rocker arm shaft             | M6      | 12 Nm (8.9 lbf ft)                                   |
| Screw, shift drum locating          | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, shift lever                  | M6      | 14 Nm (10.3 lbf ft)<br><b>Loctite®243™</b>           |
| Screw, starter motor                | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, stator                       | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, thermostat housing           | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Screw, timing chain guide rail      | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®2701™</b>           |
| Screw, timing chain tensioning rail | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®2701™</b>           |
| Screw, valve cover                  | M6      | 10 Nm (7.4 lbf ft)                                   |
| Screw, water pump cover             | M6      | 10 Nm (7.4 lbf ft)                                   |
| Screw, water pump wheel             | M6      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |
| Oil jet, piston cooling             | M6x0.75 | 4 Nm (3 lbf ft)<br><b>Loctite®243™</b>               |
| Crankshaft clamp screw plug         | M8      | 15 Nm (11.1 lbf ft)                                  |
| Stud, exhaust flange                | M8      | 10 Nm (7.4 lbf ft)<br><b>Loctite®243™</b>            |

|   |           |  |
|---|-----------|--|
| Cylinder head screw                         | M10       | Tightening sequence:<br>Tighten diagonally, beginning with the rear screw on the timing chain shaft.<br>Step 1<br>15 Nm (11.1 lbf ft)<br>Step 2<br>30 Nm (22.1 lbf ft)<br>Step 3<br>45 Nm (33.2 lbf ft)<br>Step 4<br>60 Nm (44.3 lbf ft)<br>Lubricated with engine oil |
| Oil line for oil pressure sensor            | M10x1     | 10 Nm (7.4 lbf ft)   |
| Oil pressure sensor                         | M10x1     | 10 Nm (7.4 lbf ft)   |
| Plug, drain hole of water pump              | M10x1     | 15 Nm (11.1 lbf ft)  |
| Screw plug, oil channel                     | M10x1     | 15 Nm (11.1 lbf ft)<br><b>Loctite®243™</b>   |
| Screw plug, oil channel, for oil radiator   | M10x1     | 15 Nm (11.1 lbf ft)  |
| Screw, unlocking of timing chain tensioner  | M10x1     | 10 Nm (7.4 lbf ft)   |
| Spark plug outside                          | M10x1     | 11 Nm (8.1 lbf ft)   |
| Spark plug inside                           | M12x1.25  | 18 Nm (13.3 lbf ft)  |
| Coolant temperature sensor on cylinder head | M12x1.5   | 12 Nm (8.9 lbf ft)   |
| Oil drain plug with magnet                  | M12x1.5   | 20 Nm (14.8 lbf ft)  |
| Oil pressure regulator valve plug           | M12x1.5   | 20 Nm (14.8 lbf ft)  |
| Screw plug, oil channel                     | M14x1.5   | 15 Nm (11.1 lbf ft)<br><b>Loctite®243™</b>   |
| Engine case stud                            | M16x1.5   | 25 Nm (18.4 lbf ft)<br><b>Loctite®243™</b>   |
| Rotor nut                                   | M18x1.5   | 100 Nm (73.8 lbf ft)   |
| Nut, engine sprocket                        | M20x1.5   | 80 Nm (59 lbf ft)<br><b>Loctite®243™</b>   |
| Nut, inner clutch hub                       | M20x1.5   | 100 Nm (73.8 lbf ft)<br><b>Loctite®243™</b>  |
| Nut, primary gear                           | M20LHx1.5 | 90 Nm (66.4 lbf ft)<br><b>Loctite®243™</b>   |
| Plug, oil screen                            | M20x1.5   | 15 Nm (11.1 lbf ft)  |
| Plug, timing chain tensioner                | M20x1.5   | 25 Nm (18.4 lbf ft)  |
| Plug, oil thermostat                        | M24x1.5   | 15 Nm (11.1 lbf ft)  |
| Screw in alternator cover                   | M24x1.5   | 8 Nm (5.9 lbf ft)  |

## 24.4 Capacities

### 24.4.1 Engine oil

|                                      |                  |  |
|--------------------------------------|------------------|--|
| Engine oil                           | 1.70 l (1.8 qt.) | Engine oil (SAE 10W/60) (00062010035) (p. 278) |
| Engine oil<br>Alternative engine oil |                  | Engine oil (SAE 10W/50) (p. 279)               |

### 24.4.2 Coolant

|         |                   |                  |
|---------|-------------------|------------------|
| Coolant | 1.20 l (1.27 qt.) | Coolant (p. 278) |
|---------|-------------------|------------------|

### 24.4.3 Fuel

|                                   |                   |  |
|-----------------------------------|-------------------|--|
| Total fuel tank capacity, approx. | 12 l (3.2 US gal) | Super unleaded (ROZ 95/RON 95/PON 91) (p. 279) |
| Fuel reserve, approx.             | 2.5 l (2.6 qt.)   |  |

## 24.5 Chassis

|   |   |  |
|---|---|--|
| Frame   | Lattice frame made of chrome molybdenum steel tubing, powder-coated |  |
| Fork  | <b>WP Performance Systems</b> 4860 MXTA SPLIT                       |  |
| Shock absorber                                  | <b>WP Performance Systems</b> 4618 with <b>Pro-Lever</b> linkage    |  |
| Suspension travel                               |   |  |
| front   | 250 mm (9.84 in)  |  |
| rear  | 250 mm (9.84 in)  |  |
| Brake system                                    |   |  |
| front   | Disc brake with dual-piston brake caliper, floating                 |  |
| rear  | Disc brake with single-pot brake caliper, floating                  |  |
| Brake discs - diameter                          |   |  |
| front   | 300 mm (11.81 in)   |  |
| rear  | 240 mm (9.45 in)  |  |
| Brake discs - wear limit                        |   |  |
| front   | 4.5 mm (0.177 in)   |  |
| rear  | 4.5 mm (0.177 in)   |  |
| Tire air pressure, road, solo                   |   |  |
| front   | 1.8 bar (26 psi)  |  |
| rear  | 1.8 bar (26 psi)  |  |
| Tire air pressure with passenger / fully loaded |   |  |
| front   | 2.2 bar (32 psi)  |  |
| rear  | 2.2 bar (32 psi)  |  |
| Tire air pressure, offroad, single rider        |   |  |
| front   | 1.5 bar (22 psi)  |  |
| rear  | 1.5 bar (22 psi)  |  |
| Secondary drive ratio                           | 15:45   |  |
| Chain   | 5/8 x 1/4" X-ring   |  |
| Steering head angle                             | 63°   |  |



|                                     |                                 |
|-------------------------------------|---------------------------------|
| Wheelbase                           | 1,504 ± 15 mm (59.21 ± 0.59 in) |
| Seat height unloaded                | 910 mm (35.83 in)               |
| Ground clearance unloaded           | 280 mm (11.02 in)               |
| Weight without fuel, approx.        | 143 kg (315 lb.)                |
| Maximum permissible front axle load | 150 kg (331 lb.)                |
| Maximum permissible rear axle load  | 200 kg (441 lb.)                |
| Maximum permissible overall weight  | 350 kg (772 lb.)                |


## 24.6 Electrical system

|                                       |                        |   |
|---------------------------------------|------------------------|---|
| Battery                               | YTZ10S                 | Battery voltage: 12 V<br>Nominal capacity: 8.6 Ah<br>maintenance-free |
| Fuse                                  | 58011109115            | 15 A  |
| Fuse                                  | 58011109125            | 25 A  |
| Fuse                                  | 58011109130            | 30 A  |
| Fuse                                  | 75011088015            | 15 A  |
| Fuse                                  | 75011088010            | 10 A  |
| Headlight                             | H4 / socket P43t       | 12 V<br>60/55 W   |
| Parking light                         | W5W / socket W2.1x9.5d | 12 V<br>5 W   |
| Instrument lights and indicator lamps | LED                    |   |
| Turn signal (690 Enduro R EU)         | R10W / socket BA15s    | 12 V<br>10 W  |
| Turn signal (690 Enduro R US)         | RY10W / socket BAU15s  | 12 V<br>10 W  |
| Brake/tail light (690 Enduro R EU)    | LED                    |   |
| Brake/tail light (690 Enduro R US)    | P21/5W / socket BAY15d | 12 V<br>21/5 W  |
| License plate lamp                    | W5W / socket W2.1x9.5d | 12 V<br>5 W   |

## 24.7 Tires

| Validity  | Front tire   | Rear tire   |
|---|--|---|
| (690 Enduro R EU)   | <b>90/90 - 21 M/C 54S TT</b><br>Metzeler Enduro 3 Sahara | <b>140/80 - 18 M/C 70S TT</b><br>Metzeler Enduro 3 Sahara |
| (690 Enduro R US)   | <b>90/90 - 21 M/C 54R TT</b><br>Pirelli MT 21 RALLYCROSS | <b>140/80 - 18 M/C 70R TT</b><br>Pirelli MT 21 RALLYCROSS |
| The tires specified represent one of the possible series production tires. Additional information is available in the Service section under:<br><a href="http://www.ktm.com">http://www.ktm.com</a> |  |   |

## 24.8 Fork

|                                      |  |  |
|--------------------------------------|--|--|
| Fork part number                     | 14.18.8N.10  |  |
| Fork                                 | <b>WP Performance Systems 4860 MXTA SPLIT</b>                    |  |
| Compression damping                  |  |  |
| Comfort                              | 20 clicks  |  |
| Standard                             | 15 clicks  |  |
| Sport                                | 10 clicks  |  |
| Full payload                         | 10 clicks  |  |
| Rebound damping                      |  |  |
| Comfort                              | 20 clicks  |  |
| Standard                             | 15 clicks  |  |
| Sport                                | 10 clicks  |  |
| Full payload                         | 10 clicks  |  |
| Spring length with preload spacer(s) | 465 mm (18.31 in)  |  |
| Spring rate                          |  |  |
| Medium (standard)                    | 5.3 N/mm (30.3 lb/in)  |  |
| Air chamber length                   | 120 $\pm$ $\frac{10}{20}$ mm (4.72 $\pm$ $\frac{0.39}{0.79}$ in) |  |
| Fork length                          | 895 mm (35.24 in)  |  |
| Fork oil per fork leg                | 635 ml (21.47 fl. oz.)   | Fork oil (SAE 4) (48601166S1)<br>(  p. 279) |

## 24.9 Shock absorber

|                                 |   |  |
|---------------------------------|---|--|
| Shock absorber article number   | 15.18.7L.10   |  |
| Shock absorber                  | <b>WP Performance Systems 4618 with Pro-Lever linkage</b> |  |
| Compression damping, high-speed |   |  |
| Comfort                         | 2 turns   |  |
| Standard                        | 1.5 turns   |  |
| Sport                           | 1 turn  |  |
| Full payload                    | 1 turn  |  |
| Compression damping, low-speed  |   |  |
| Comfort                         | 20 clicks   |  |
| Standard                        | 15 clicks   |  |
| Sport                           | 10 clicks   |  |
| Full payload                    | 10 clicks   |  |
| Rebound damping                 |   |  |
| Comfort                         | 20 clicks   |  |
| Standard                        | 15 clicks   |  |
| Sport                           | 10 clicks   |  |
| Full payload                    | 10 clicks   |  |
| Spring preload                  | 20 mm (0.79 in)   |  |
| Spring rate                     |   |  |
| Medium (standard)               | 80 N/mm (457 lb/in)                                       |  |
| Hard                            | 85 N/mm (485 lb/in)                                       |  |
| Spring length                   | 220 mm (8.66 in)  |  |

|                      |  |
|----------------------|--|
| Gas pressure         | 10 bar (145 psi)                                       |
| Static sag           | 18 mm (0.71 in)  |
| Riding sag           | 70 ... 80 mm (2.76 ... 3.15 in)                        |
| Fitted length        | 395 mm (15.55 in)                                      |
| Shock absorber fluid | Shock absorber fluid (SAE 2.5) (50180751S1) (📄 p. 279) |

### 24.10 Chassis tightening torques

|  |      |                      |                     |
|--|------|----------------------|---------------------|
| Screw, chain guard                                   | EJOT | 2 Nm (1.5 lbf ft)    |                     |
| Screw, combination instrument                        | EJOT | 1 Nm (0.7 lbf ft)    |                     |
| Screw, license plate holder, bottom                  | EJOT | 3 Nm (2.2 lbf ft)    |                     |
| Screw, side cover on spoiler                         | EJOT | 1 Nm (0.7 lbf ft)    |                     |
| Screw, side stand switch                             | EJOT | 2 Nm (1.5 lbf ft)    |                     |
| Screw, SLS valve                                     | EJOT | 2 Nm (1.5 lbf ft)    |                     |
| Fitting, side stand switch                           | M4   | 2 Nm (1.5 lbf ft)    |                     |
| Spoke nipple, front wheel                            | M4.5 | 4 Nm (3 lbf ft)      |                     |
| Bolt, foot brake lever stub                          | M5   | 6 Nm (4.4 lbf ft)    | <b>Loctite®243™</b> |
| Remaining nuts, chassis                              | M5   | 4 Nm (3 lbf ft)      |                     |
| Remaining screws, chassis                            | M5   | 4 Nm (3 lbf ft)      |                     |
| Screw, brake line holder on swingarm                 | M5   | 4 Nm (3 lbf ft)      |                     |
| Screw, cable on starter motor                        | M5   | 3 Nm (2.2 lbf ft)    |                     |
| Screw, electrical holder                             | M5   | 3 Nm (2.2 lbf ft)    |                     |
| Screw, exhaust heat shield                           | M5   | 8 Nm (5.9 lbf ft)    | <b>Loctite®243™</b> |
| Screw, fuel hose clamp on fuel tank                  | M5   | 5 Nm (3.7 lbf ft)    |                     |
| Screw, fuel level sensor                             | M5   | 3 Nm (2.2 lbf ft)    |                     |
| Screw, fuel pump                                     | M5   | 4 Nm (3 lbf ft)      |                     |
| Screw, fuel tank closure flange                      | M5   | 2.5 Nm (1.84 lbf ft) |                     |
| Screw, headlight mask                                | M5   | 5 Nm (3.7 lbf ft)    |                     |
| Screw, pressure regulator                            | M5   | 4 Nm (3 lbf ft)      |                     |
| Screw, throttle grip                                 | M5   | 3.5 Nm (2.58 lbf ft) |                     |
| Spoke nipple, rear wheel                             | M5   | 4 Nm (3 lbf ft)      |                     |
| Remaining nuts, chassis                              | M6   | 10 Nm (7.4 lbf ft)   |                     |
| Remaining screws on fuel tank                        | M6   | 5 Nm (3.7 lbf ft)    |                     |
| Remaining screws, chassis                            | M6   | 10 Nm (7.4 lbf ft)   |                     |
| Screw connection, foot brake cylinder                | M6   | 10 Nm (7.4 lbf ft)   |                     |
| Screw, ABS control unit                              | M6   | 5 Nm (3.7 lbf ft)    |                     |
| Screw, air filter box top                            | M6   | 2 Nm (1.5 lbf ft)    |                     |
| Screw, ball joint of push rod on foot brake cylinder | M6   | 10 Nm (7.4 lbf ft)   | <b>Loctite®243™</b> |

|  |       |                     |                      |
|--|-------|---------------------|----------------------|
| Screw, brake fluid reservoir of rear brake | M6    | 5 Nm (3.7 lbf ft)   |                      |
| Screw, chain guard                         | M6    | 2 Nm (1.5 lbf ft)   | <b>Loctite®243™</b>  |
| Screw, chain guide                         | M6    | 8 Nm (5.9 lbf ft)   |                      |
| Screw, chain sliding guard                 | M6    | 8 Nm (5.9 lbf ft)   | <b>Loctite®243™</b>  |
| Screw, fan hood                            | M6    | 4 Nm (3 lbf ft)     |                      |
| Screw, front brake disc                    | M6    | 14 Nm (10.3 lbf ft) | <b>Loctite®243™</b>  |
| Screw, ignition lock                       | M6    | 10 Nm (7.4 lbf ft)  | <b>Loctite®243™</b>  |
| Screw, lower radiator bracket              | M6    | 8 Nm (5.9 lbf ft)   |                      |
| Screw, magnetic holder on side stand       | M6    | 6 Nm (4.4 lbf ft)   | <b>Loctite®243™</b>  |
| Screw, radiator guard                      | M6    | 8 Nm (5.9 lbf ft)   |                      |
| Screw, rear brake disc                     | M6    | 14 Nm (10.3 lbf ft) | <b>Loctite®243™</b>  |
| Screw, seat lock                           | M6    | 5 Nm (3.7 lbf ft)   |                      |
| Screw, side cover                          | M6    | 5 Nm (3.7 lbf ft)   |                      |
| Screw, upper radiator bracket              | M6    | 10 Nm (7.4 lbf ft)  |                      |
| Screw, voltage regulator                   | M6    | 8 Nm (5.9 lbf ft)   |                      |
| Screw, wheel speed sensor                  | M6    | 6 Nm (4.4 lbf ft)   |                      |
| Nut, rear sprocket screw                   | M8    | 35 Nm (25.8 lbf ft) | <b>Loctite®2701™</b> |
| Remaining nuts, chassis                    | M8    | 25 Nm (18.4 lbf ft) |                      |
| Remaining screws, chassis                  | M8    | 25 Nm (18.4 lbf ft) |                      |
| Screw, bottom triple clamp                 | M8    | 12 Nm (8.9 lbf ft)  |                      |
| Screw, chain sliding piece                 | M8    | 15 Nm (11.1 lbf ft) |                      |
| Screw, connection lever on frame           | M8    | 30 Nm (22.1 lbf ft) | <b>Loctite®243™</b>  |
| Screw, foot brake lever                    | M8    | 25 Nm (18.4 lbf ft) | <b>Loctite®243™</b>  |
| Screw, fork stub                           | M8    | 15 Nm (11.1 lbf ft) |                      |
| Screw, front brake caliper                 | M8    | 25 Nm (18.4 lbf ft) | <b>Loctite®243™</b>  |
| Screw, front footrest bracket              | M8    | 25 Nm (18.4 lbf ft) | <b>Loctite®243™</b>  |
| Screw, fuel tank bracket                   | M8    | 15 Nm (11.1 lbf ft) |                      |
| Screw, fuel tank, bottom                   | M8    | 25 Nm (18.4 lbf ft) | <b>Loctite®243™</b>  |
| Screw, fuel tank, top                      | M8    | 25 Nm (18.4 lbf ft) | <b>Loctite®243™</b>  |
| Screw, grab handle                         | M8    | 10 Nm (7.4 lbf ft)  |                      |
| Screw, handlebar clamp                     | M8    | 20 Nm (14.8 lbf ft) |                      |
| Screw, heel protector                      | M8x12 | 5 Nm (3.7 lbf ft)   | <b>Loctite®243™</b>  |
| Screw, license plate holder, top           | M8    | 20 Nm (14.8 lbf ft) |                      |

|  |          |                      |                     |
|--|----------|----------------------|---------------------|
| Screw, main silencer clamp                 | M8       | 12 Nm (8.9 lbf ft)   | Copper paste        |
| Screw, main silencer holder                | M8       | 25 Nm (18.4 lbf ft)  |                     |
| Screw, main silencer holder on fuel tank   | M8       | 25 Nm (18.4 lbf ft)  |                     |
| Screw, rear footrest bracket               | M8x16    | 25 Nm (18.4 lbf ft)  |                     |
| Screw, side stand bracket                  | M8       | 25 Nm (18.4 lbf ft)  | <b>Loctite®243™</b> |
| Screw, spring holder on side stand bracket | M8       | 25 Nm (18.4 lbf ft)  | <b>Loctite®243™</b> |
| Screw, steering stem                       | M8       | 20 Nm (14.8 lbf ft)  |                     |
| Screw, top triple clamp                    | M8       | 17 Nm (12.5 lbf ft)  |                     |
| Engine carrying screw                      | M10      | 45 Nm (33.2 lbf ft)  | <b>Loctite®243™</b> |
| Remaining nuts, chassis                    | M10      | 45 Nm (33.2 lbf ft)  |                     |
| Remaining screws, chassis                  | M10      | 45 Nm (33.2 lbf ft)  |                     |
| Screw, bottom shock absorber               | M10      | 45 Nm (33.2 lbf ft)  | <b>Loctite®243™</b> |
| Screw, engine bearer on frame              | M10      | 45 Nm (33.2 lbf ft)  |                     |
| Screw, handlebar support                   | M10      | 40 Nm (29.5 lbf ft)  | <b>Loctite®243™</b> |
| Screw, side stand                          | M10      | 35 Nm (25.8 lbf ft)  | <b>Loctite®243™</b> |
| Screw, top shock absorber                  | M10      | 45 Nm (33.2 lbf ft)  | <b>Loctite®243™</b> |
| Banjo bolt, brake line                     | M10x1    | 25 Nm (18.4 lbf ft)  |                     |
| Screw, swingarm pivot                      | M12      | 80 Nm (59 lbf ft)    |                     |
| Lambda sensor                              | M12x1.25 | 25 Nm (18.4 lbf ft)  | Copper paste        |
| Nut, linkage lever on swingarm             | M14x1.5  | 100 Nm (73.8 lbf ft) |                     |
| Nut, linkage lever to rocker arm           | M14x1.5  | 100 Nm (73.8 lbf ft) |                     |
| Screw, bottom steering head                | M20x1.5  | 60 Nm (44.3 lbf ft)  | <b>Loctite®243™</b> |
| Screw, top steering head                   | M20x1.5  | 12 Nm (8.9 lbf ft)   |                     |
| Screw, front wheel spindle                 | M24x1.5  | 45 Nm (33.2 lbf ft)  |                     |
| Nut, rear wheel spindle                    | M25x1.5  | 90 Nm (66.4 lbf ft)  |                     |



## 25.1 Cleaning the motorcycle

### Note

**Material damage** Components become damaged or destroyed if a pressure cleaner is used incorrectly. The high pressure forces water into the electrical components, connectors, throttle cables, and bearings, etc. Pressure which is too high causes malfunctions and destroys components.

- Do not direct the water jet directly on to electrical components, connectors, throttle cables or bearings.
- Maintain a minimum distance between the nozzle of the pressure cleaner and the component.  
Minimum clearance 60 cm (23.6 in)



### Warning

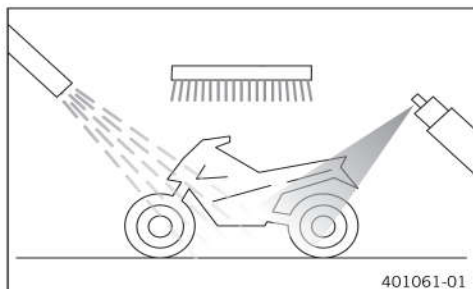
**Environmental hazard** Hazardous substances cause environmental damage.

- Dispose of oils, grease, filters, fuel, cleaning agents, brake fluid, etc., correctly and in compliance with the applicable regulations.



### Info

If you clean the motorcycle regularly, its value and appearance will be maintained over a long period. Avoid direct sunshine on the motorcycle during cleaning.



- Seal the exhaust system to keep water out.
- First remove coarse dirt particles with a gentle spray of water.
- Spray very dirty areas with a normal motorcycle cleaner and then clean with a brush.

Motorcycle cleaner (📖 p. 280)



### Info

Use warm water containing normal motorcycle cleaner and a soft sponge. Never apply motorcycle cleaner to the dry vehicle; always rinse with water first. If the vehicle was operated in road salt, clean it with cold water. Warm water enhances the corrosive effects of salt.

- After rinsing the motorcycle with a gentle spray of water, allow it to dry thoroughly.
- Remove the plug from the exhaust system.



### Warning

**Danger of accidents** Moisture and dirt impair the brake system.

- Brake carefully several times to dry out and remove dirt from the brake linings and the brake discs.

- After cleaning, ride a short distance until the engine reaches operating temperature.



### Info

The heat produced causes water at inaccessible locations in the engine and brake system to evaporate.

- Push back the protection covers of the handlebar controls to allow any water that has penetrated to evaporate.
- After the motorcycle has cooled off, lubricate all moving parts and bearings.
- Clean the chain. (📖 p. 96)
- Treat bare metal parts (except for brake discs and exhaust system) with anti-corrosion materials.

Preserving materials for paints, metal and rubber (📖 p. 281)

- Treat all painted parts with a mild paint polish.

Perfect Finish and high gloss polish for paints (📖 p. 281)



**Info**

Do not polish parts that were matte when delivered as this would strongly impair the material quality.

- Treat all plastic parts and powder-coated parts with a mild cleaning and care agent.

Special cleaner for glossy and matte paint finishes, metal and plastic surfaces (📖 p. 281)

- Lubricate the ignition/steering lock.

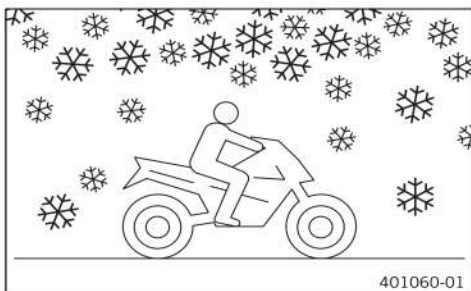
Universal oil spray (📖 p. 281)

**25.2 Checks and maintenance steps for winter operation**



**Info**

If you use the motorcycle in winter, you must expect salt on the roads. You should therefore take precautions against aggressive road salt. If the vehicle was operated in road salt, clean it with cold water after riding. Warm water would enhance the corrosive effects of salt.



- Clean the motorcycle. (📖 p. 248)
- Clean the brake system.



**Info**

After **EVERY** trip on salted roads, thoroughly wash the brake calipers and brake linings with cold water and dry carefully. This should be done after the parts are cooled down and while they are installed. After use on salted roads, clean the motorcycle thoroughly with cold water and dry it properly.

- Treat the engine, the swingarm, and all other bare or galvanized parts (except brake discs) with a wax-based anti-corrosion substance.



**Info**

To prevent serious reduction of the braking efficiency, make sure no anti-corrosion substance gets on to the brake discs.

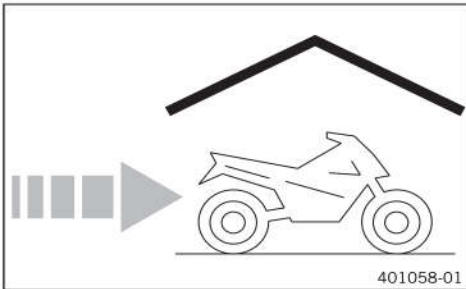
- Clean the chain. (📖 p. 96)



## 26.1 Storage

**i** Info

If you want to garage the motorcycle for a longer period, take the following actions. Before storing the motorcycle, check all parts for function and wear. If service, repairs, or replacements are necessary, you should do this during the storage period (less workshop overload). In this way, you can avoid long workshop waiting times at the start of the new season.



- When refueling for the last time before taking the motorcycle out of service, add fuel additive.

|                          |
|--------------------------|
| Fuel additive (📖 p. 280) |
|--------------------------|

- Refuel.
- Clean the motorcycle. (📖 p. 248)
- Change the engine oil and filter, clean the oil screens. (📖 p. 227)
- Check the antifreeze and coolant level. (📖 p. 219)
- Check the tire air pressure. (📖 p. 84)
- Remove the battery. (📖 p. 99)
- Recharge the battery.

## Guideline

|  |                            |
|--|----------------------------|
| Storage temperature of battery without direct sunshine | 0 ... 35 °C (32 ... 95 °F) |
|--|----------------------------|

- Store the vehicle in a dry location that is not subject to large fluctuations in temperature.

**i** Info

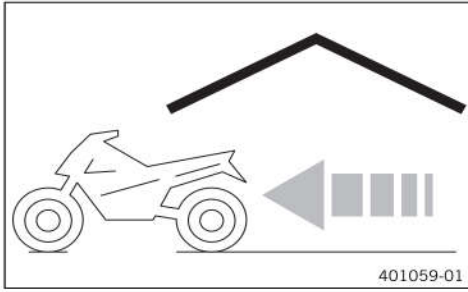
KTM recommends jacking up the motorcycle.

- Raise the motorcycle with a lift stand. (📖 p. 12)
- Cover the motorcycle with a tarp or similar cover that is permeable to air.

**i** Info

Do not use non-porous materials since they prevent humidity from escaping, thus causing corrosion. Avoid running the engine for a short time only. Since the engine cannot warm up properly, the water vapor produced during combustion condenses and causes valves and exhaust system to rust.

## 26.2 Preparing for use after storage



- Remove the motorcycle from the lift stand. (📖 p. 12)
- Recharge the battery.
- Install the battery. (📖 p. 100)
- Set the clock. (📖 p. 125)
- Perform checks and maintenance measures when preparing for use.
- Take a test ride.



**27.1 Additional information**

Any further work that results from the required work or from the recommended work must be ordered separately and can be invoiced separately.

Different service intervals may apply in your country, depending on the local operating conditions.

Individual service intervals and scopes may change in the course of technical developments. The most up-to-date service schedule can always be found on KTM Dealer.net. Your authorized KTM dealer will be happy to advise you.

**27.2 Required work**

|  | after every sporting use    |   |            |   |   |   |
|--|-----------------------------|---|------------|---|---|---|
|  | Every two years             |   | Every year |   |   |   |
|  | every 20,000 km (12,400 mi) |   |            |   |   |   |
|  | every 10,000 km (6,200 mi)  |   |            |   |   |   |
|  | after 1,000 km (620 mi)     |   |            |   |   |   |
| Read out the fault memory using the KTM diagnostics tool.  | ○                           | ● | ●          | ● | ● | ● |
| Check that the electrical system is functioning properly.  | ○                           | ● | ●          | ● | ● | ● |
| Change the engine oil and filter, clean the oil screens. (📖 p. 227)  | ○                           | ● | ●          | ● | ● | ● |
| Check the front brake linings. (📖 p. 111)  | ○                           | ● | ●          | ● | ● | ● |
| Check the rear brake linings. (📖 p. 118)   | ○                           | ● | ●          | ● | ● | ● |
| Check the brake discs. (📖 p. 85)   | ○                           | ● | ●          | ● | ● | ● |
| Check the brake lines for damage and leakage.  | ○                           | ● | ●          | ● | ● | ● |
| Change the front brake fluid. (📖 p. 116)   |                             |   |            |   |   | ● |
| Change the rear brake fluid. (📖 p. 123)  |                             |   |            |   |   | ● |
| Change the hydraulic clutch fluid. (📖 p. 214)  |                             |   |            |   |   | ● |
| Check the brake fluid level of the front brake. (📖 p. 114)   | ○                           | ● | ●          | ● |   | ● |
| Check the rear brake fluid level. (📖 p. 121)   | ○                           | ● | ●          | ● |   | ● |
| Check/correct the fluid level of the hydraulic clutch. (📖 p. 213)  |                             |   | ●          | ● | ● | ● |
| Check the free travel of the foot brake lever. (📖 p. 120)  | ○                           | ● | ●          | ● | ● | ● |
| Check the shock absorber and fork for leaks. Perform a fork service and shock absorber service as needed and depending on how the vehicle is used. | ○                           | ● | ●          | ● | ● | ● |
| Clean the dust boots of the fork legs. (📖 p. 17)   |                             | ● | ●          |   |   | ● |
| Check the play of the steering head bearing. (📖 p. 31)   | ○                           | ● | ●          | ● | ● |   |
| Check the tire condition. (📖 p. 84)  | ○                           | ● | ●          | ● | ● | ● |
| Check the tire air pressure. (📖 p. 84)   | ○                           | ● | ●          | ● | ● | ● |
| Check the spoke tension. (📖 p. 86)   | ○                           | ● | ●          | ● | ● | ● |
| Check for rim run-out. (📖 p. 86)   | ○                           | ● | ●          | ● | ● |   |
| Check the chain, rear sprocket, engine sprocket, and chain guide. (📖 p. 94)  |                             | ● | ●          | ● | ● | ● |
| Check the chain tension. (📖 p. 92)   | ○                           | ● | ●          | ● | ● | ● |
| Change fuel screen. (📖 p. 76)  | ○                           | ● | ●          | ● | ● |   |
| Change the spark plug.   |                             |   | ●          |   |   |   |
| Check the valve clearance.   |                             | ● | ●          |   |   |   |
| Check the antifreeze and coolant level. (📖 p. 219)   | ○                           | ● | ●          | ● | ● | ● |
| Check the cables for damage and for routing without kinks.   |                             | ● | ●          | ● | ● | ● |
| Change the air filter. Clean the air filter box.   |                             | ● | ●          |   |   | ● |
| Check the fuel pressure. (📖 p. 74)   |                             | ● | ●          | ● | ● |   |

|   | after every sporting use | Every two years | Every year | every 20,000 km (12,400 mi) | every 10,000 km (6,200 mi) | after 1,000 km (620 mi) |
|---|--------------------------|-----------------|------------|-----------------------------|----------------------------|-------------------------|
| Check the headlight setting. (📖 p. 127)   | ○                        | ●               | ●          |                             |                            | ●                       |
| Check that the radiator fan is functioning properly.  | ○                        | ●               | ●          | ●                           | ●                          | ●                       |
| Final check: Check the vehicle is roadworthy and take a test ride.                                    | ○                        | ●               | ●          | ●                           | ●                          | ●                       |
| Read out the fault memory using the KTM diagnostics tool after a test ride.                           | ○                        | ●               | ●          | ●                           | ●                          | ●                       |
| Check the CO adjustment using the KTM diagnostics tool.   |                          | ●               | ●          |                             |                            | ●                       |
| Make the service entry in <b>KTM Dealer.net</b> and in the Service and Manufacturer Warranty Booklet. | ○                        | ●               | ●          | ●                           | ●                          | ●                       |

- One-time interval
- Periodic interval

## 27.3 Recommended work

|   | after every sporting use | Every four years | Every year | every 30,000 km (18,600 mi) | every 10,000 km (6,200 mi) | after 1,000 km (620 mi) |
|---|--------------------------|------------------|------------|-----------------------------|----------------------------|-------------------------|
| Check the frame.  |                          |                  | ●          |                             |                            |                         |
| Check the swingarm.   |                          |                  | ●          |                             |                            |                         |
| Check the swingarm bearing for play.  |                          |                  | ●          | ●                           |                            |                         |
| Check the wheel bearing for play.   |                          |                  | ●          | ●                           |                            | ●                       |
| Grease all moving parts (e.g. side stand, hand lever, chain, etc.) and check for smooth operation.                    | ○                        | ●                | ●          | ●                           | ●                          | ●                       |
| Check all hoses (e.g. fuel, cooling, bleeder, drainage, etc.) and sleeves for cracking, leaks, and incorrect routing. |                          | ●                | ●          | ●                           | ●                          | ●                       |
| Check the screws and nuts for tightness.  | ○                        | ●                | ●          | ●                           | ●                          | ●                       |
| Change the coolant. (📖 p. 222)  |                          |                  |            |                             |                            | ●                       |

- One-time interval
- Periodic interval





**Components:**

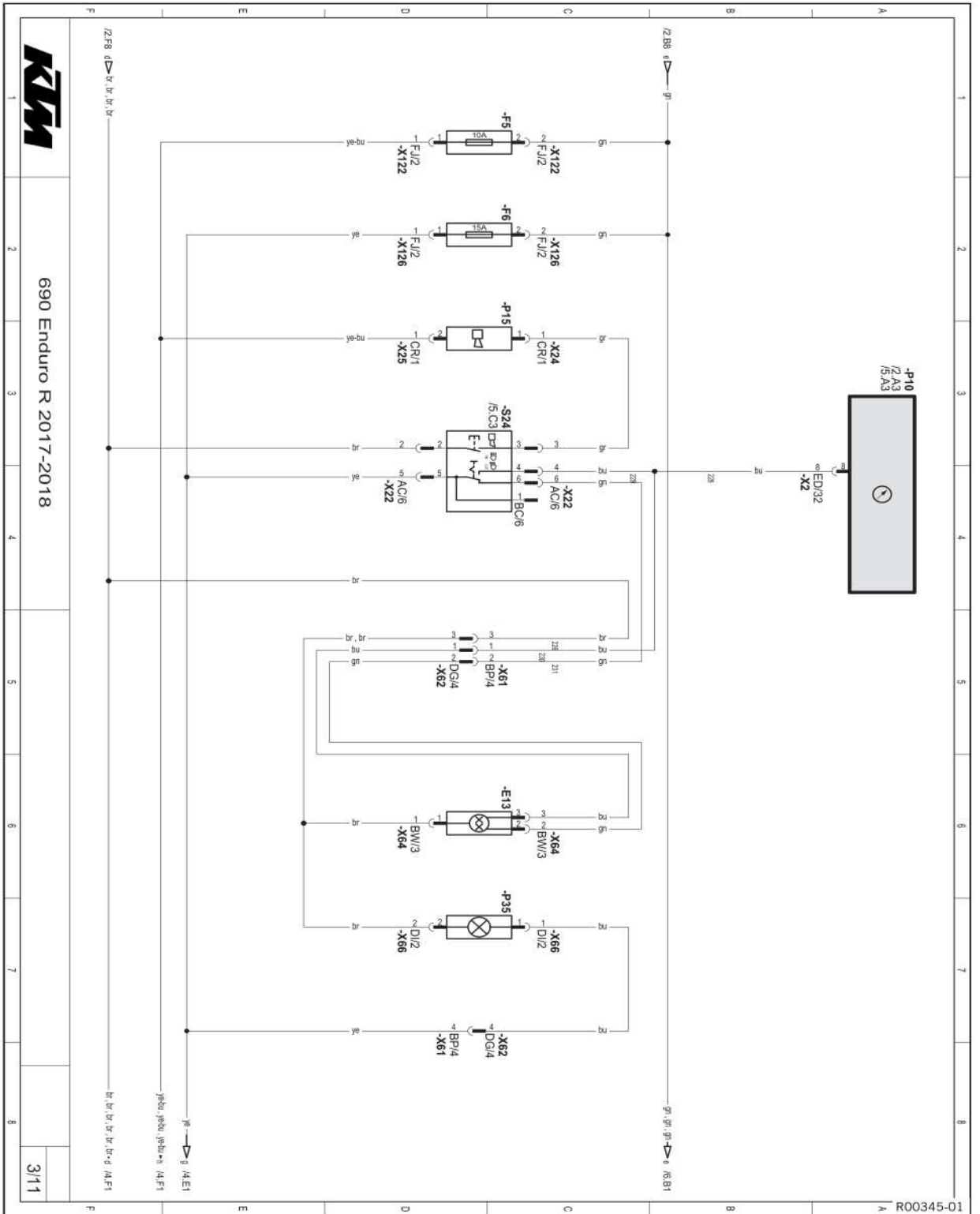
|      |  |
|------|--|
| A11  | Engine electronics control unit  |
| F7   | Fuse   |
| G10  | Battery  |
| G20  | Alternator   |
| K10  | Starter relay with main fuse   |
| K11  | Start auxiliary relay  |
| M10  | Electric starter system  |
| T20  | Voltage regulator  |
| X291 | Connector for accessory ground (terminal 31) <b>ACC 1</b> (not assigned) |
| X292 | Connector for accessory plus (terminal 30) <b>ACC 1</b> (not assigned)   |





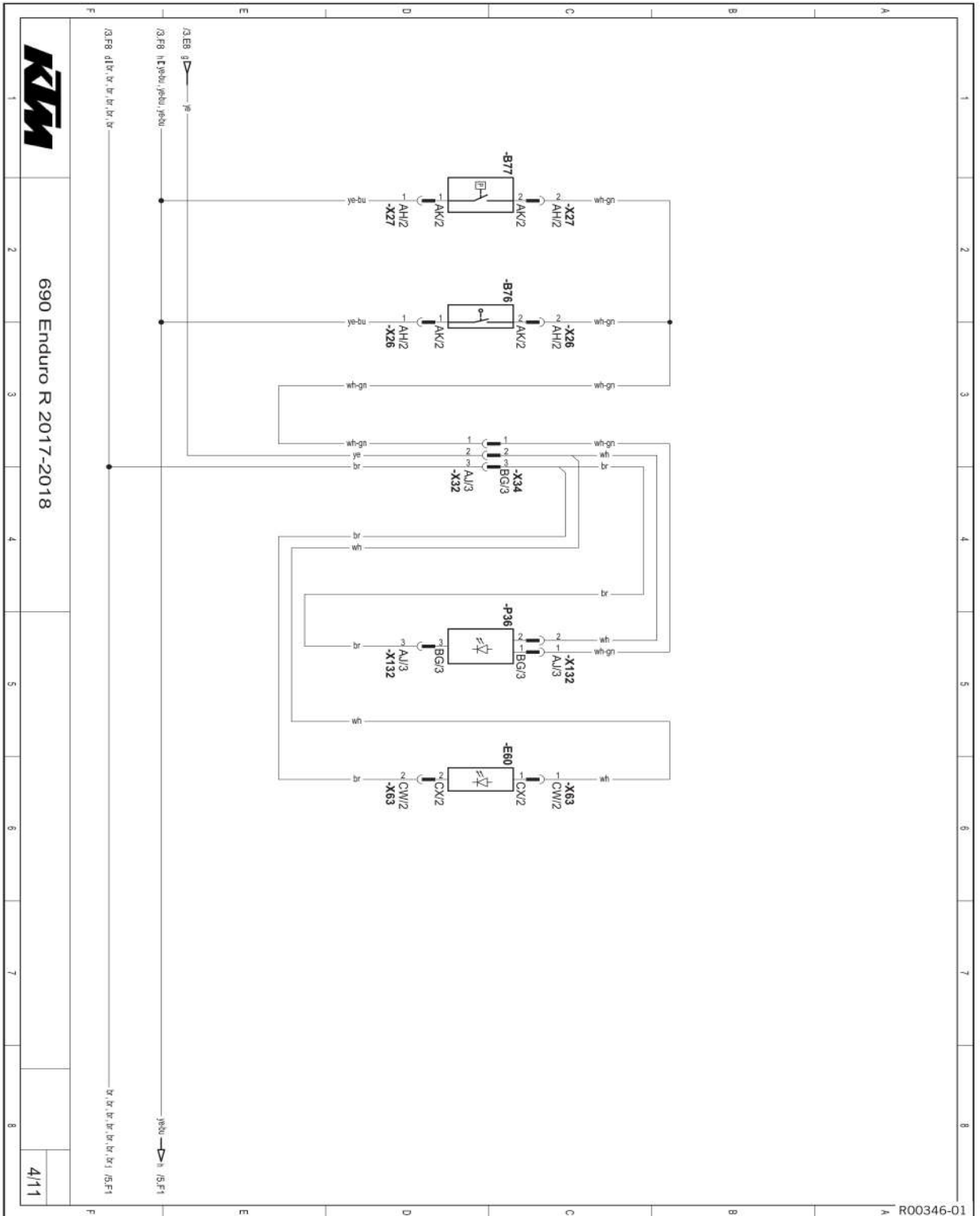
**Components:**

|      |   |
|------|---|
| A11  | Engine electronics control unit               |
| F1   | Fuse  |
| F3   | Fuse  |
| K12  | Light relay                                   |
| K30  | Power relay                                   |
| M13  | Fuel pump                                     |
| P10  | Combination instrument                        |
| S11  | Ignition and steering lock                    |
| S23  | Emergency OFF switch, electric starter button |
| X295 | Diagnostics connector                         |



**Components:**

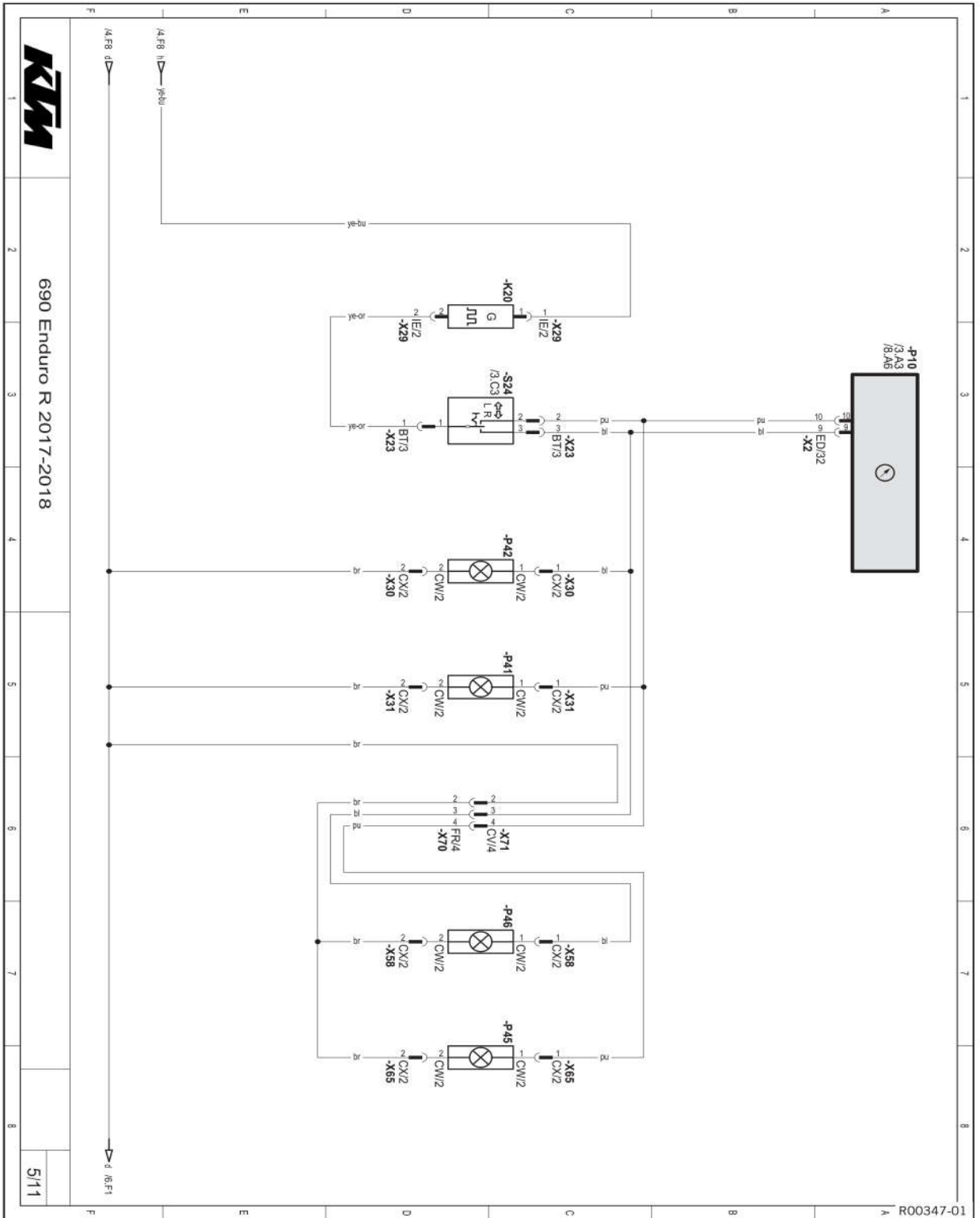
|     |   |
|-----|---|
| E13 | Low beam, high beam   |
| F5  | Fuse  |
| F6  | Fuse  |
| P10 | Combination instrument  |
| P15 | Horn  |
| P35 | Parking light   |
| S24 | Light switch, horn button, high beam flasher button, turn signal switch |





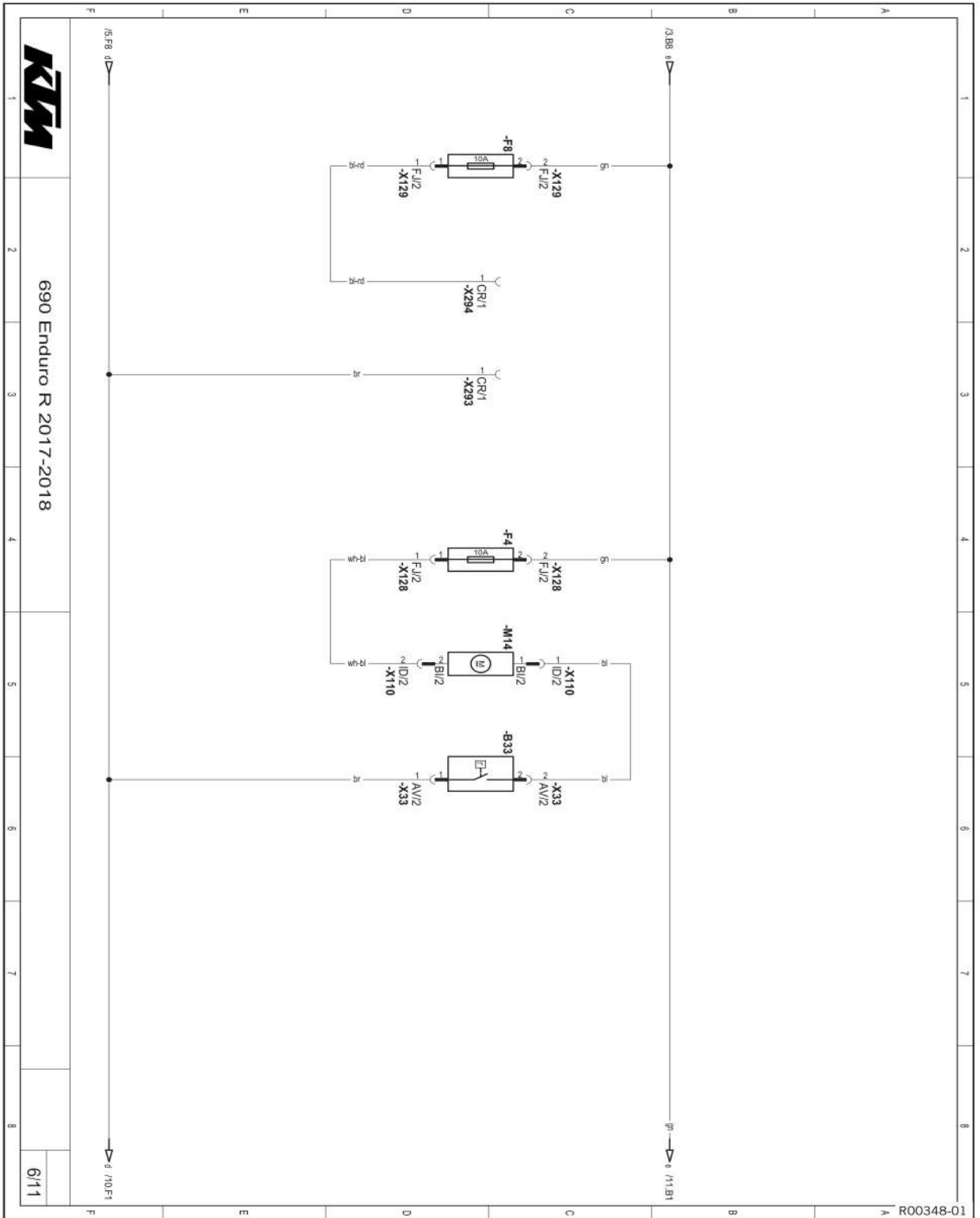
**Components:**

B76 Front brake light switch  
B77 Rear brake light switch  
E60 License plate lamp  
P36 Brake/tail light



**Components:**

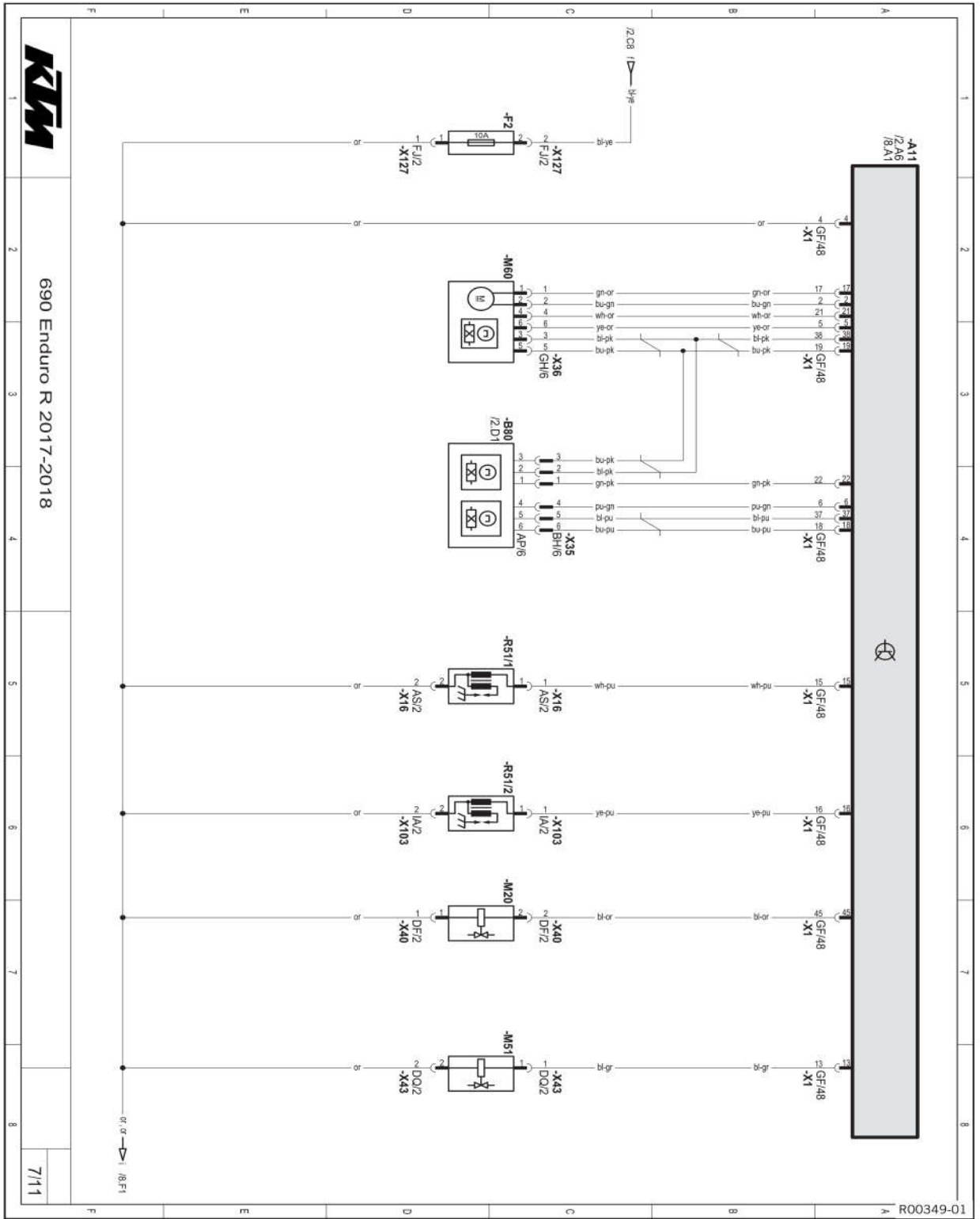
|     |   |
|-----|---|
| K20 | Turn signal relay   |
| P10 | Combination instrument  |
| P41 | Turn signal, front left   |
| P42 | Turn signal, front right  |
| P45 | Turn signal, rear left  |
| P46 | Turn signal, rear right   |
| S24 | Light switch, horn button, high beam flasher button, turn signal switch |



**Components:**

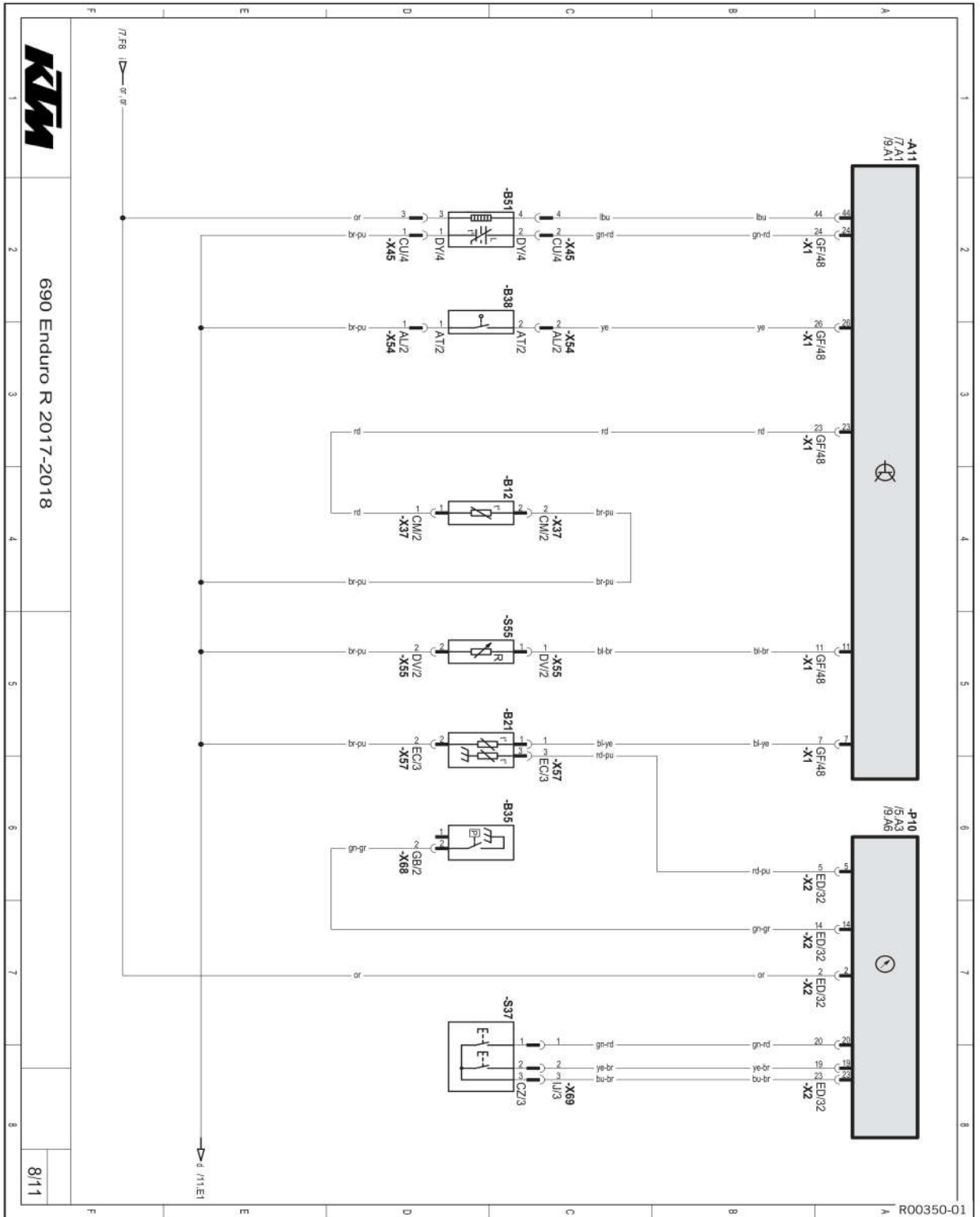
|      |  |
|------|--|
| B33  | Radiator fan temperature switch  |
| F4   | Fuse   |
| F8   | Fuse   |
| M14  | Radiator fan   |
| X293 | Connector for accessory ground (terminal 31) <b>ACC 2</b> (not assigned) |
| X294 | Connector for accessory plus (terminal 15) <b>ACC 2</b> (not assigned)   |





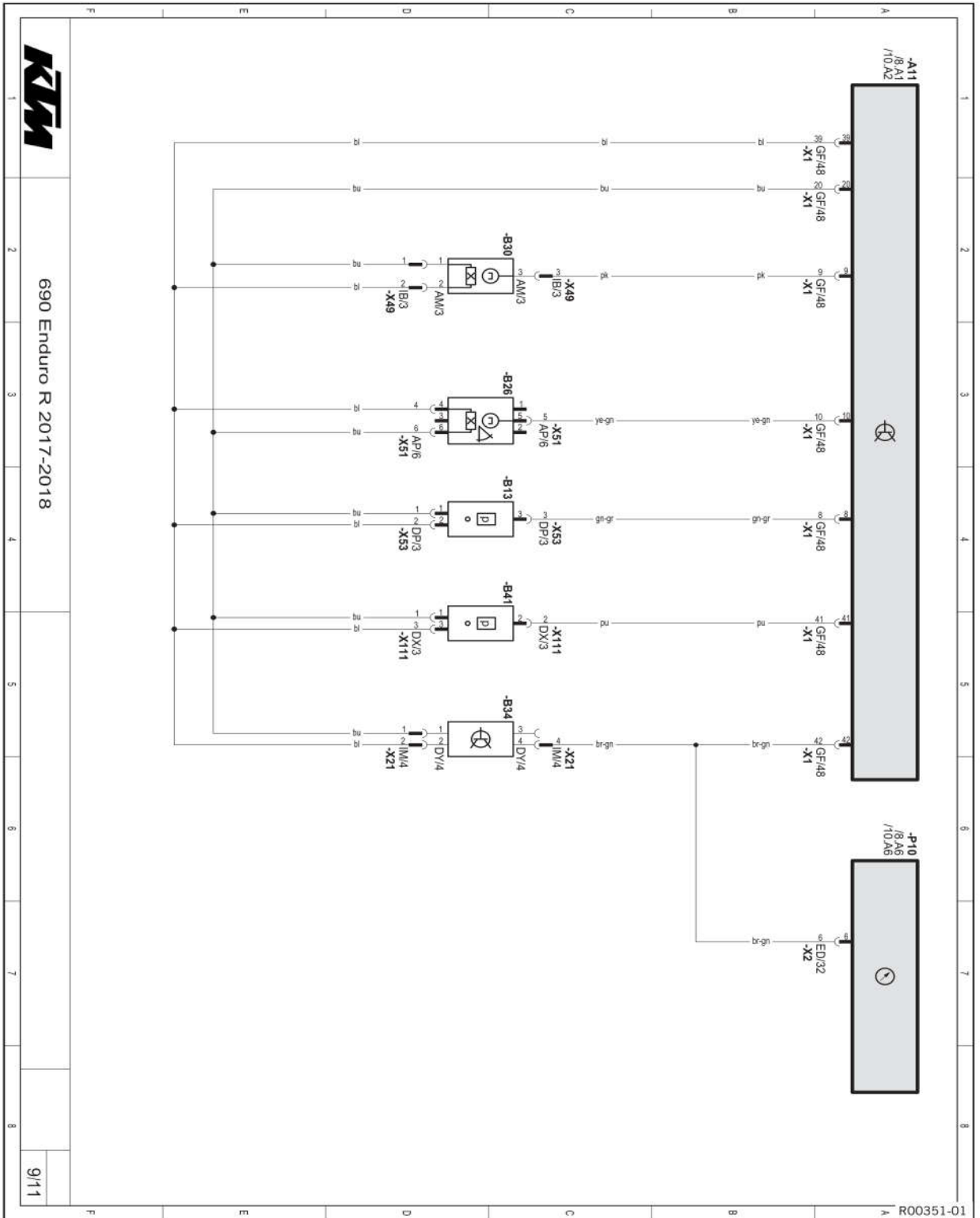
**Components:**

|       |   |
|-------|---|
| A11   | Engine electronics control unit             |
| B80   | Throttle grip                               |
| F2    | Fuse  |
| M20   | Evaporate emission control valve (optional) |
| M51   | Injection valve cylinder 1                  |
| M60   | Throttle stepper motor                      |
| R51/1 | Ignition coil 1, (cylinder 1)               |
| R51/2 | Ignition coil 2, (cylinder 1)               |



**Components:**

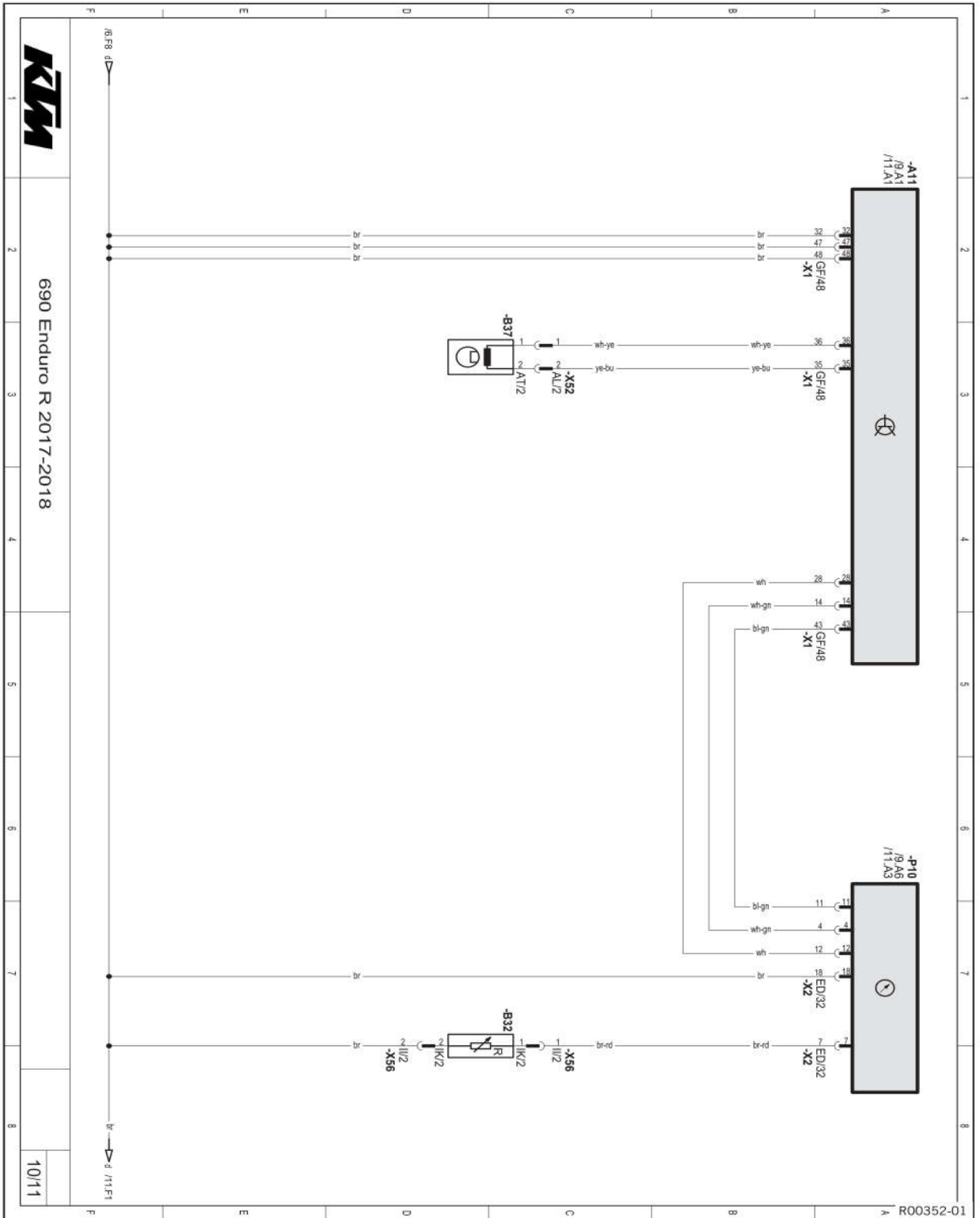
|     |   |
|-----|---|
| A11 | Engine electronics control unit         |
| B12 | Intake air temperature sensor           |
| B21 | Coolant temperature sensor (cylinder 1) |
| B35 | Oil pressure sensor                     |
| B38 | Clutch switch                           |
| B51 | Lambda sensor (cylinder 1)              |
| P10 | Combination instrument                  |
| S37 | Switch                                  |
| S55 | <b>Map-Select</b> switch                |





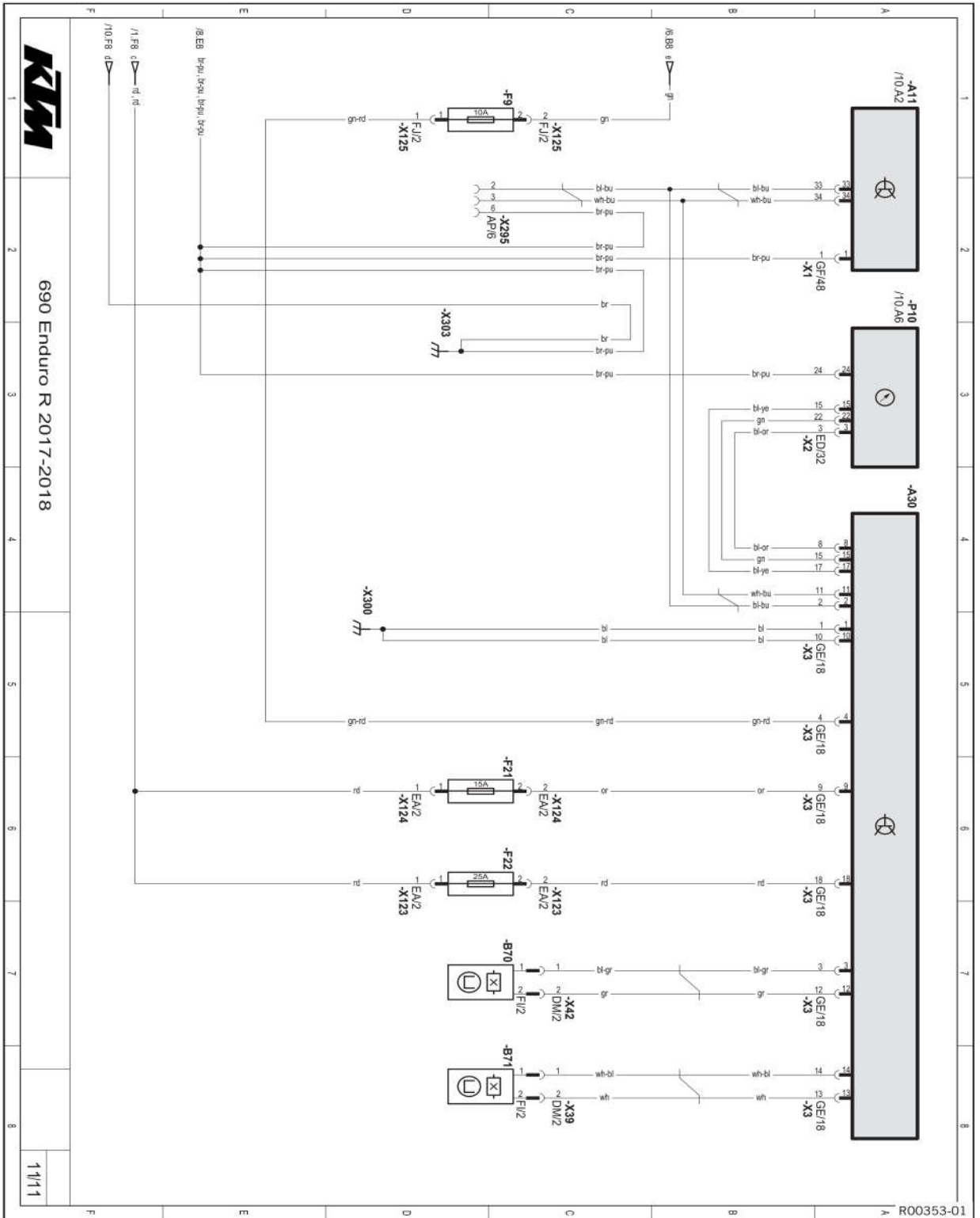
**Components:**

|     |   |
|-----|---|
| A11 | Engine electronics control unit               |
| B13 | Ambient air pressure sensor                   |
| B26 | Rollover sensor                               |
| B30 | Side stand sensor                             |
| B34 | Gear position sensor                          |
| B41 | Induction manifold pressure sensor cylinder 1 |
| P10 | Combination instrument                        |



**Components:**

A11 Engine electronics control unit  
B32 Fuel level sensor  
B37 Crankshaft position sensor  
P10 Combination instrument



**Components:**

|      |                                 |
|------|---------------------------------|
| A11  | Engine electronics control unit |
| A30  | ABS control unit                |
| B70  | Front wheel speed sensor        |
| B71  | Rear wheel speed sensor         |
| F9   | Fuse                            |
| F21  | ABS fuse                        |
| F22  | ABS fuse                        |
| P10  | Combination instrument          |
| X295 | Diagnostics connector           |

**Cable colors:**

|     |            |
|-----|------------|
| bl  | Black      |
| br  | Brown      |
| bu  | Blue       |
| gn  | Green      |
| gr  | Gray       |
| lbu | Light blue |
| or  | Orange     |
| pk  | Pink       |
| pu  | Violet     |
| rd  | Red        |
| wh  | White      |
| ye  | Yellow     |



**Brake fluid DOT 4 / DOT 5.1****Standard/classification**

- DOT

**Guideline**

- Use only brake fluid that complies with the specified standard (see specifications on the container) and that exhibits the corresponding properties.

**Recommended supplier****Castrol**

- **REACT PERFORMANCE DOT 4**

**Motorex®**

- **Brake Fluid DOT 5.1**

**Coolant****Guideline**

- Only use high-grade, silicate-free coolant with corrosion inhibitor additive for aluminum motors. Low grade and unsuitable antifreeze causes corrosion, deposits and frothing.
- Do not use pure water as only coolant is able to meet the requirements needed in terms of corrosion protection and lubrication properties.
- Only use coolant that complies with the requirements stated (see specifications on the container) and that has the relevant properties.

|                                   |                 |
|-----------------------------------|-----------------|
| Antifreeze protection to at least | -25 °C (-13 °F) |
|-----------------------------------|-----------------|

The mixture ratio must be adjusted to the necessary antifreeze protection. Use distilled water if the coolant needs to be diluted.

The use of premixed coolant is recommended.

Observe the coolant manufacturer specifications for antifreeze protection, dilution and miscibility (compatibility) with other coolants.

**Recommended supplier****Motorex®**

- **COOLANT M3.0**

**Engine oil (SAE 10W/60) (00062010035)****Standard/classification**

- JASO T903 MA (p. 301)
- SAE (p. 301) (SAE 10W/60)
- KTM LC4 2007+

**Guideline**

- Use only engine oils that comply with the specified standards (see specifications on the container) and that possess the corresponding properties.

|                      |
|----------------------|
| Synthetic engine oil |
|----------------------|

**Recommended supplier****Motorex®**

- **Cross Power 4T**

**Engine oil (SAE 10W/50)****Standard/classification**

- JASO T903 MA (📄 p. 301)
- SAE (📄 p. 301) (SAE 10W/50)

**Guideline**

- Use only engine oils that comply with the specified standards (see specifications on the container) and that possess the corresponding properties.

Fully synthetic engine oil

**Recommended supplier****Motorex®**

- Power Synt 4T

**Fork oil (SAE 4) (48601166S1)****Standard/classification**

- SAE (📄 p. 301) (SAE 4)

**Guideline**

- Use only oils that comply with the specified standards (see specifications on the container) and that exhibit the corresponding properties.

**Shock absorber fluid (SAE 2.5) (50180751S1)****Standard/classification**

- SAE (📄 p. 301) (SAE 2.5)

**Guideline**

- Use only oils that comply with the specified standards (see specifications on the container) and that exhibit the corresponding properties.

**Super unleaded (ROZ 95/RON 95/PON 91)****Standard/classification**

- DIN EN 228 (ROZ 95/RON 95/PON 91)

**Guideline**

- Only use unleaded super fuel that matches or is equivalent to the specified fuel grade.
- Fuel with an ethanol content of up to 10 % (E10 fuel) is safe to use.

**Info**

Do **not** use fuel containing methanol (e. g. M15, M85, M100) or more than 10 % ethanol (e. g. E15, E25, E85, E100).

### Chain cleaner

Recommended supplier

Motorex®

- Chain Clean

### Fuel additive

Recommended supplier

Motorex®

- Fuel Stabilizer

### Long-life grease

Recommended supplier

Motorex®

- Bike Grease 2000

### Lubricant (T14034)

Recommended supplier

WP Performance Systems

- WP Racing Grease IPR 2

### Lubricant (T159)

Recommended supplier

Bel-Ray®

- MC-11®

### Lubricant (T158)

Recommended supplier

Lubcon®

- Turmogrease® PP 300

### Lubricant (T625)

Recommended supplier

Molykote®

- 33 Medium

### Motorcycle cleaner

Recommended supplier

Motorex®

- Moto Clean

### Off-road chain spray

Recommended supplier

Motorex®

- Chainlube Offroad

**Perfect Finish and high gloss polish for paints**

Recommended supplier

Motorex®

- Moto Polish & Shine

**Preserving materials for paints, metal and rubber**

Recommended supplier

Motorex®

- Moto Protect

**Special cleaner for glossy and matte paint finishes, metal and plastic surfaces**

Recommended supplier

Motorex®

- Quick Cleaner

**Universal oil spray**

Recommended supplier

Motorex®

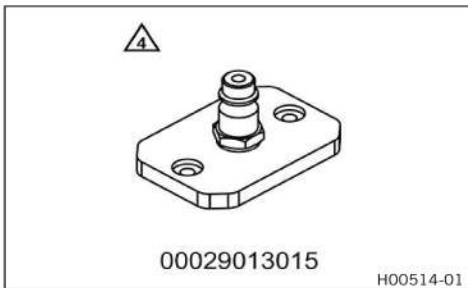
- Joker 440 Synthetic

## Bleeder cover



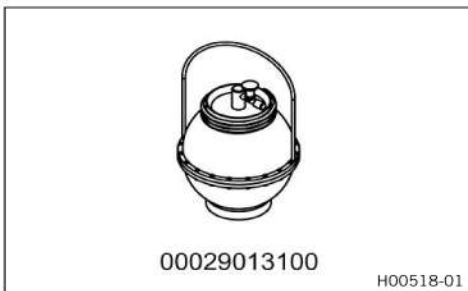
Art. no.: 00029013004

## Bleeder cover



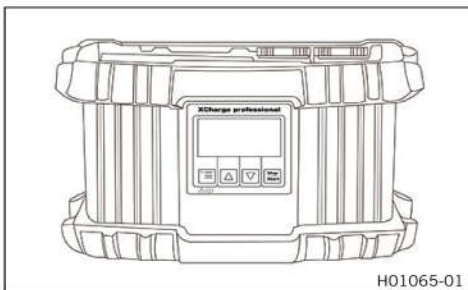
Art. no.: 00029013015

## Bleeding device



Art. no.: 00029013100

## EU battery charger XCharge-professional



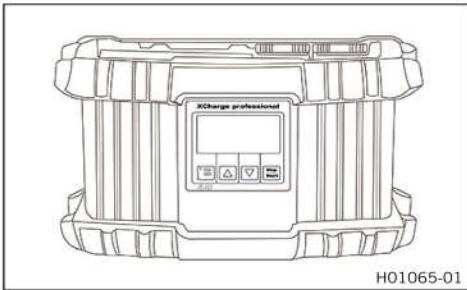
Art. no.: 00029095050

### Feature

|                              |             |
|------------------------------|-------------|
| EU safety plug               |             |
| Nominal voltage              | 230 V       |
| Mains fuse                   | 16 A        |
| Power cable length approx.   | 5 m (16 ft) |
| Charger cable length approx. | 5 m (16 ft) |



**US battery charger XCharge-professional**

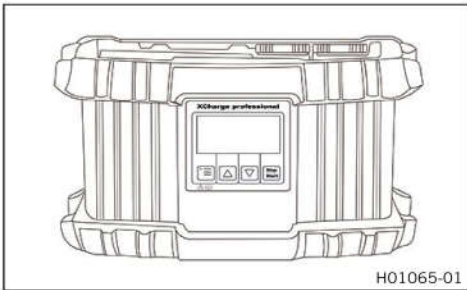


Art. no.: 00029095051

**Feature**

|                              |             |
|------------------------------|-------------|
| US plug                      |             |
| Nominal voltage              | 120 V       |
| Mains fuse                   | 32 A        |
| Power cable length approx.   | 5 m (16 ft) |
| Charger cable length approx. | 5 m (16 ft) |

**UK battery charger XCharge-professional**

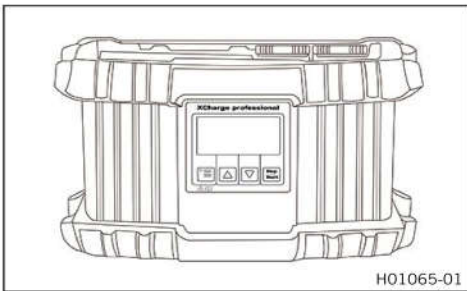


Art. no.: 00029095052

**Feature**

|                              |             |
|------------------------------|-------------|
| UK safety plug               |             |
| Nominal voltage              | 230 V       |
| Mains fuse                   | 16 A        |
| Power cable length approx.   | 5 m (16 ft) |
| Charger cable length approx. | 5 m (16 ft) |

**CH battery charger XCharge-professional**

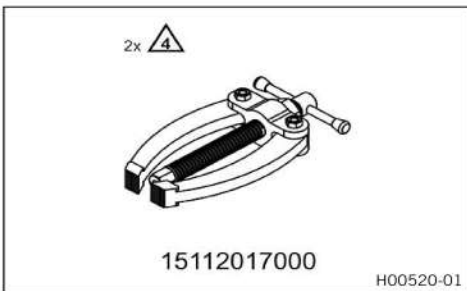


Art. no.: 00029095053

**Feature**

|                              |             |
|------------------------------|-------------|
| CH plug                      |             |
| Nominal voltage              | 230 V       |
| Mains fuse                   | 16 A        |
| Power cable length approx.   | 5 m (16 ft) |
| Charger cable length approx. | 5 m (16 ft) |

**Bearing puller**

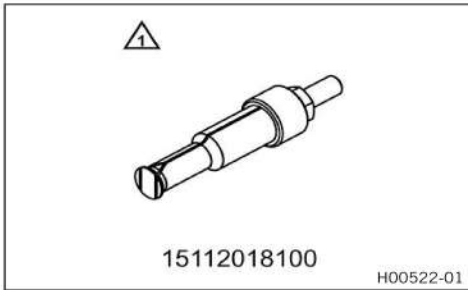


Art. no.: 15112017000

15112017000

H00520-01

## Internal bearing puller

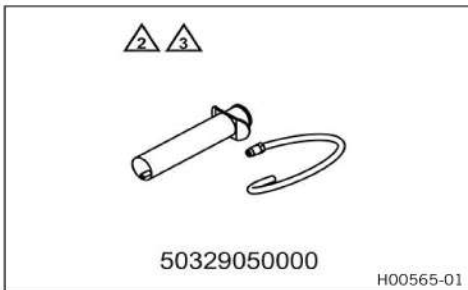


Art. no.: 15112018100

### Feature

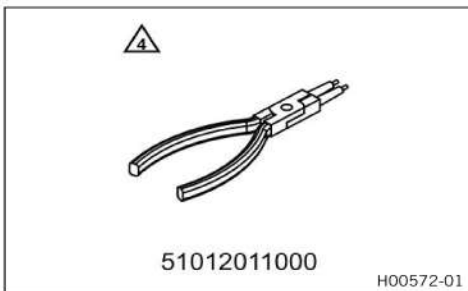
18 ... 23 mm (0.71 ... 0.91 in)

## Syringe



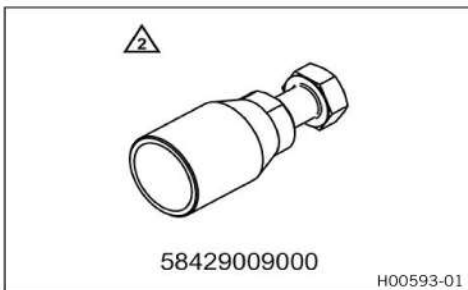
Art. no.: 50329050000

## Lock ring plier

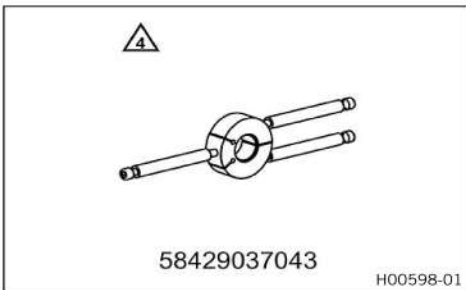


Art. no.: 51012011000

## Puller



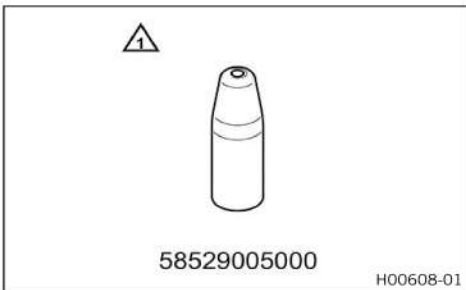
Art. no.: 58429009000

**Puller**

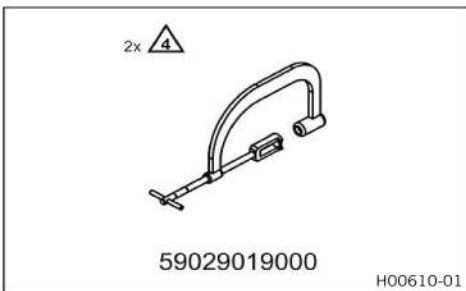
Art. no.: 58429037043

**Feature**

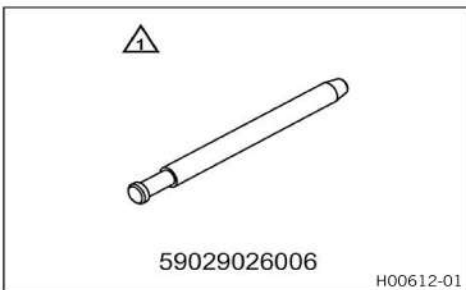
|                 |                    |
|-----------------|--------------------|
| Inside diameter | 43.9 mm (1.728 in) |
|-----------------|--------------------|

**Protection cap**

Art. no.: 58529005000

**Valve spring mouner**

Art. no.: 59029019000

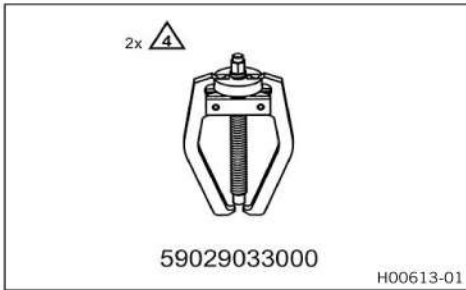
**Limit plug gauge**

Art. no.: 59029026006

**Feature**

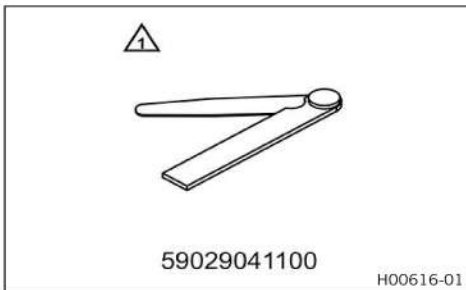
|          |                     |
|----------|---------------------|
| Diameter | 6.05 mm (0.2382 in) |
|----------|---------------------|

## Puller



Art. no.: 59029033000

## Feeler gauge

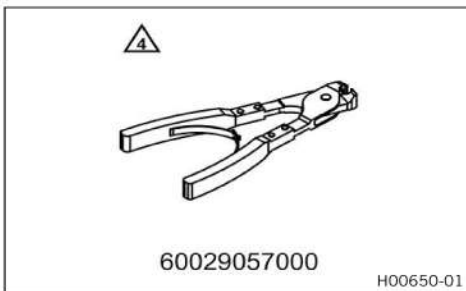


Art. no.: 59029041100

### Feature

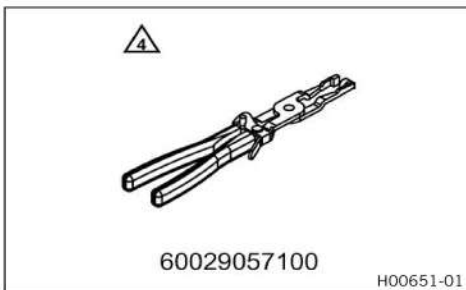
|         |   |
|---------|---|
| 5 piece | 0.10 ... 0.25 mm (0.0039 ... 0.0098 in) |
|---------|---|

## Hose clamp plier



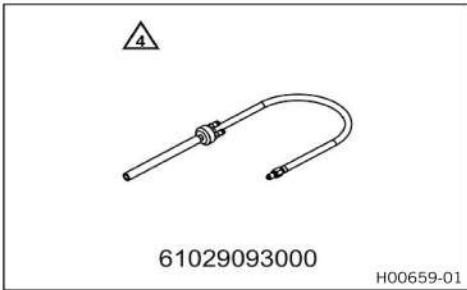
Art. no.: 60029057000

## Spring band clamps plier



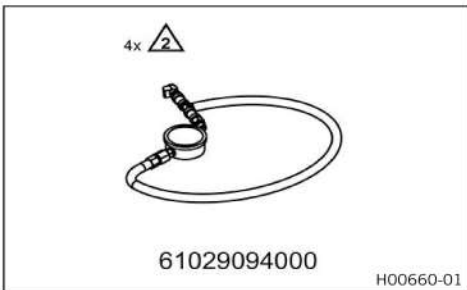
Art. no.: 60029057100

**Testing hose**



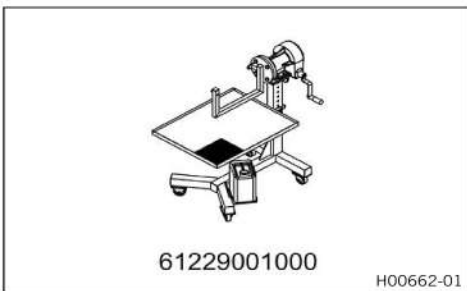
Art. no.: 61029093000

**Pressure testing tool**



Art. no.: 61029094000

**Engine work stand**



Art. no.: 61229001000

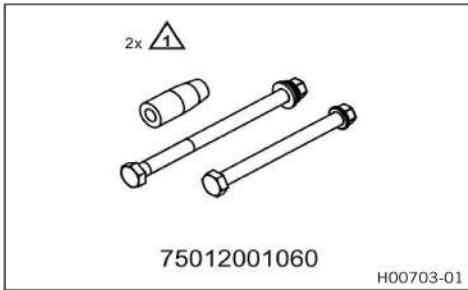
**Work stand**



Art. no.: 62529055100

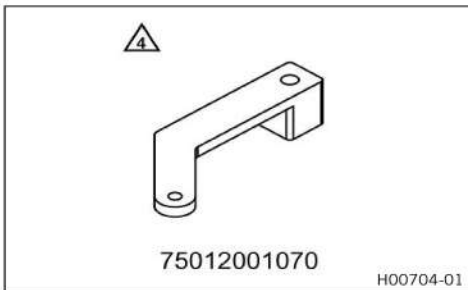


## Fitting for work stand



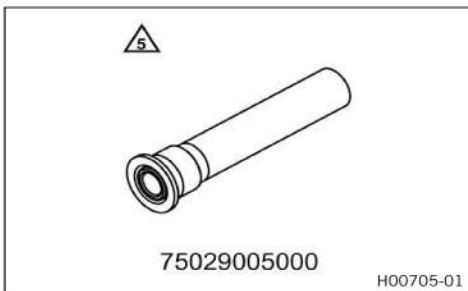
Art. no.: 75012001060

## Holder for engine motor stand



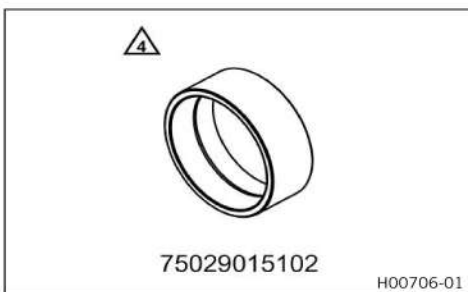
Art. no.: 75012001070

## Mounting tool for lock ring



Art. no.: 75029005000

## Piston assembly ring

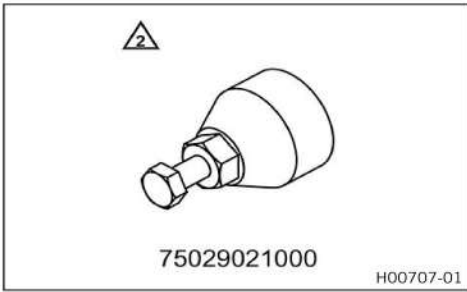


Art. no.: 75029015102

### Feature

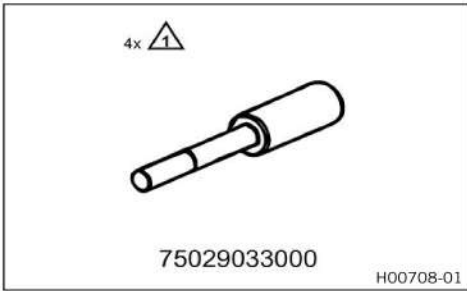
|          |                  |
|----------|------------------|
| Height   | 45 mm (1.77 in)  |
| Diameter | 102 mm (4.02 in) |

**Puller**



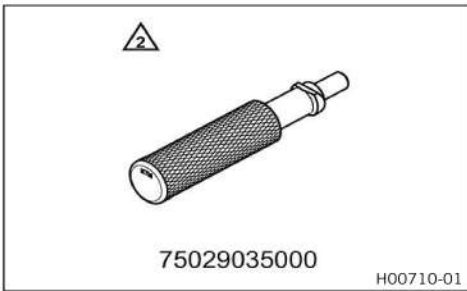
Art. no.: 75029021000

**Assembly screws**



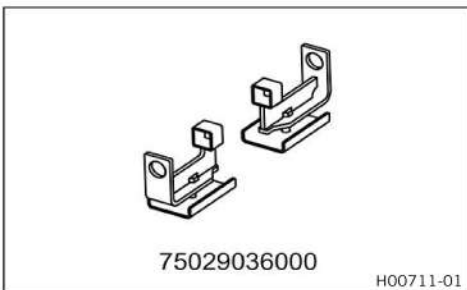
Art. no.: 75029033000

**Insertion for piston ring lock**



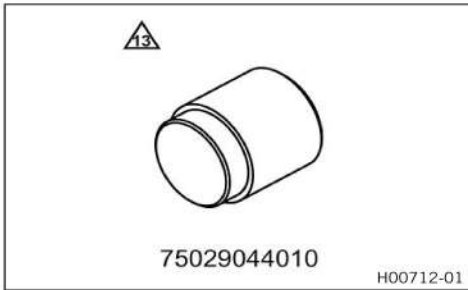
Art. no.: 75029035000

**Work stand attachments**



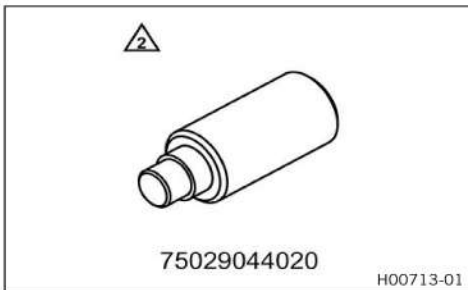
Art. no.: 75029036000

## Pressing tool



Art. no.: 75029044010

## Pressing tool



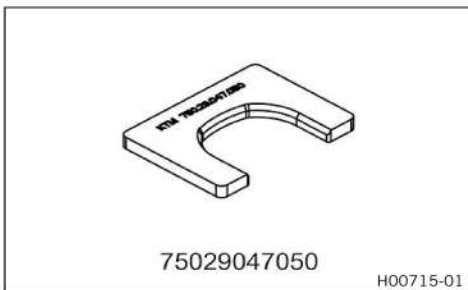
Art. no.: 75029044020

## Crankshaft pressing tool

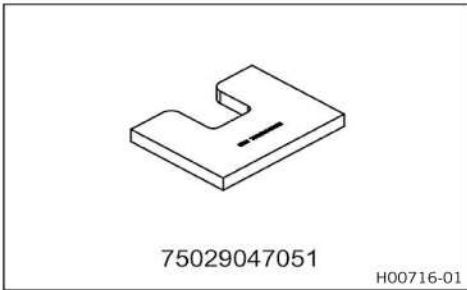


Art. no.: 75029047000

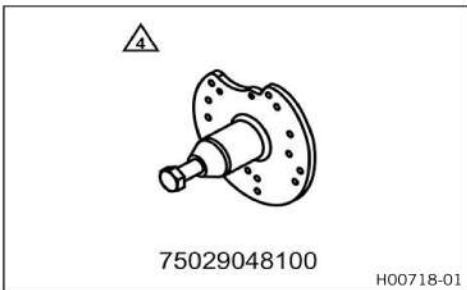
## Separator plate, upper part



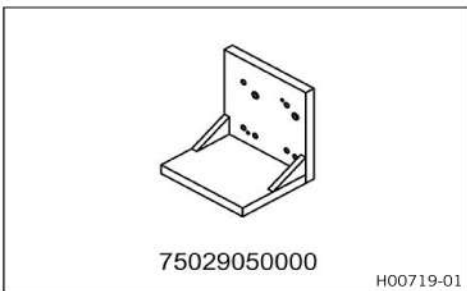
Art. no.: 75029047050

**Separator plate, base**

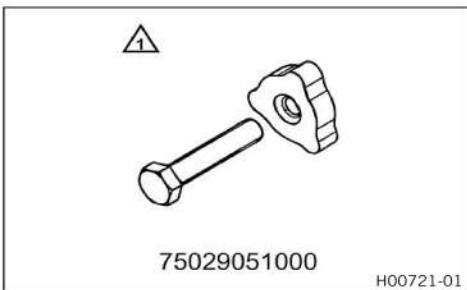
Art. no.: 75029047051

**Puller**

Art. no.: 75029048100

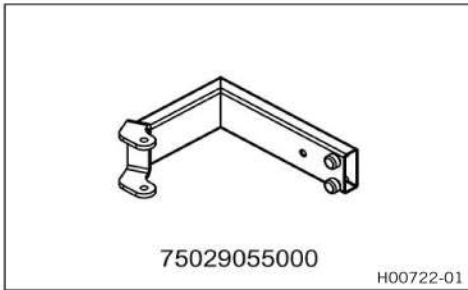
**Clamping plate**

Art. no.: 75029050000

**Pressing tool**

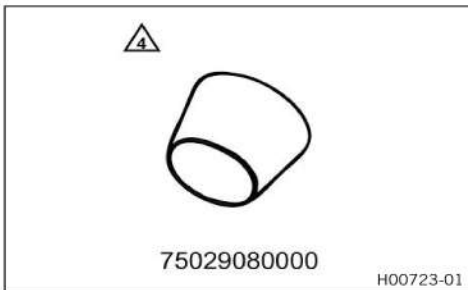
Art. no.: 75029051000

## Floor jack attachment



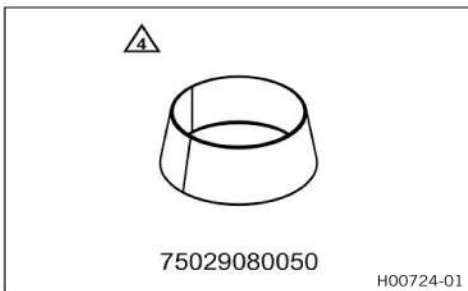
Art. no.: 75029055000

## Protecting sleeve



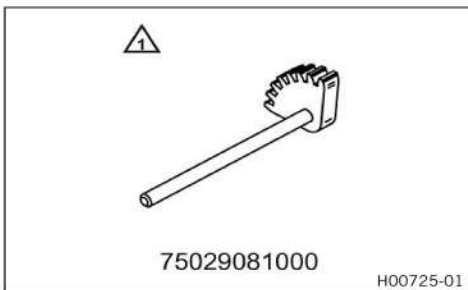
Art. no.: 75029080000

## Protecting sleeve



Art. no.: 75029080050

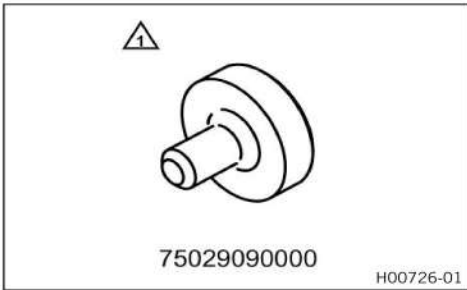
## Gear segment



Art. no.: 75029081000

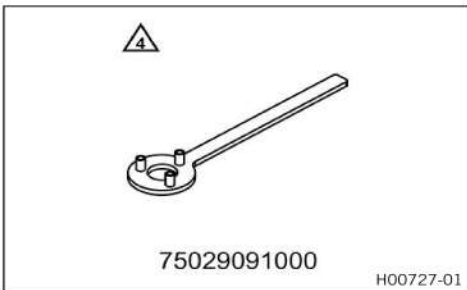


**Protection cap**



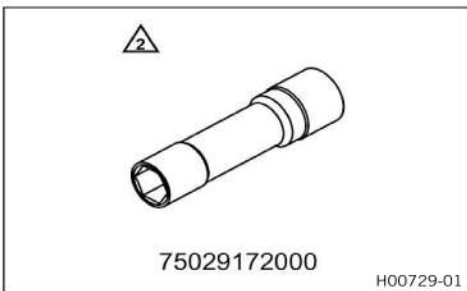
Art. no.: 75029090000

**Holding wrench**



Art. no.: 75029091000

**Spark plug wrench**

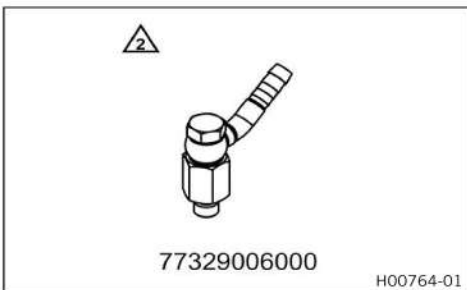


Art. no.: 75029172000

**Feature**

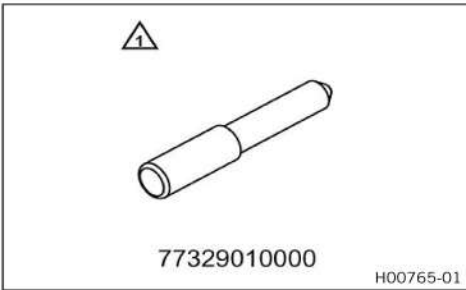
|                |                 |
|----------------|-----------------|
| Drive          | 1/2 in          |
| Hexagonal part | 14 mm (0.55 in) |
| Length         | 85 mm (3.35 in) |

**Oil pressure adapter**



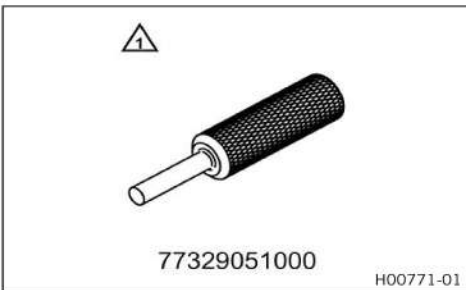
Art. no.: 77329006000

## Locking screw



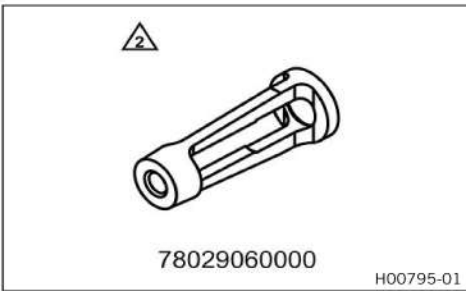
Art. no.: 77329010000

## Release device for timing chain tensioner



Art. no.: 77329051000

## Insert for valve spring lever



Art. no.: 78029060000

## XC\_1 NG DE



Art. no.: 00029196000DE

**XC\_1 NG EN**

Art. no.: 00029196000EN

**XC\_1 NG ES**

Art. no.: 00029196000ES

**XC\_1 NG FR**

Art. no.: 00029196000FR

**XC\_1 NG IT**

Art. no.: 00029196000IT

## XC\_1 NG JP



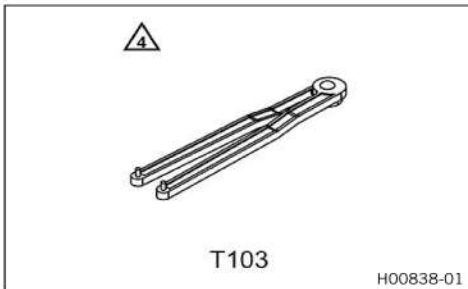
Art. no.: 00029196000JP

## XC\_1 NG US



Art. no.: 00029196000US

## Pin wrench

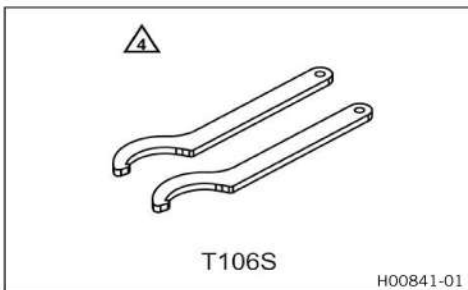


Art. no.: T103

### Feature

|            |                |
|------------|----------------|
| adjustable |                |
| Diameter   | 4 mm (0.16 in) |

## Hook wrench

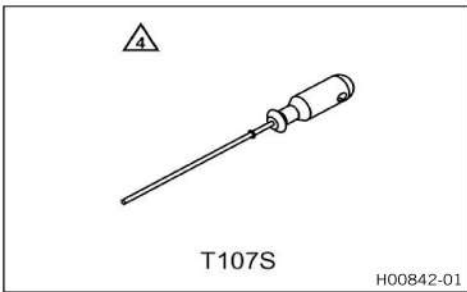


Art. no.: T106S

### Feature

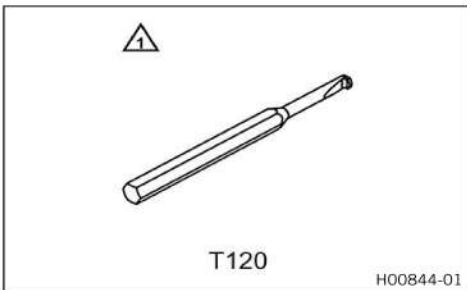
|          |                                 |
|----------|---------------------------------|
| Diameter | 68 ... 75 mm (2.68 ... 2.95 in) |
|----------|---------------------------------|

**Depth micrometer**



Art. no.: T107S

**Drift**

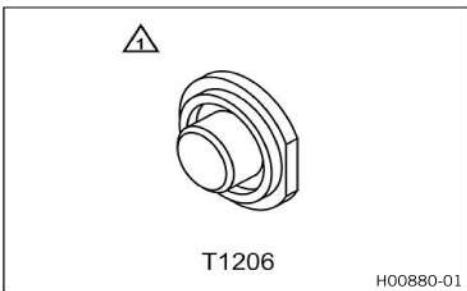


Art. no.: T120

**Feature**

|          |                |
|----------|----------------|
| Diameter | 8 mm (0.31 in) |
|----------|----------------|

**Pressing tool**

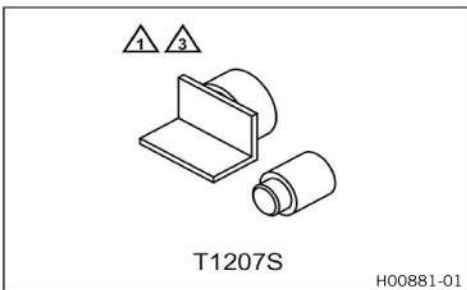


Art. no.: T1206

**Feature**

|          |                                 |
|----------|---------------------------------|
| Diameter | 15 ... 30 mm (0.59 ... 1.18 in) |
|----------|---------------------------------|

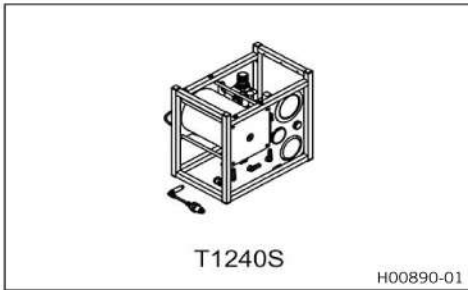
**Pressing tool**



Art. no.: T1207S

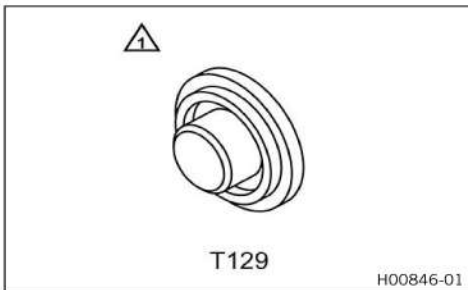


## Vacuum pump



Art. no.: T1240S

## Pressing tool

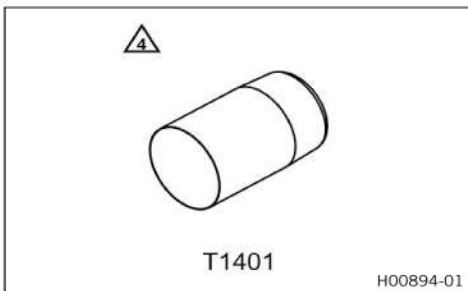


Art. no.: T129

### Feature

|          |                                 |
|----------|---------------------------------|
| Diameter | 15 ... 30 mm (0.59 ... 1.18 in) |
|----------|---------------------------------|

## Protecting sleeve

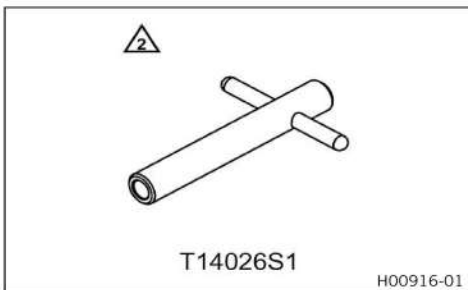


Art. no.: T1401

### Feature

|          |                 |
|----------|-----------------|
| Diameter | 48 mm (1.89 in) |
|----------|-----------------|

## Support tool

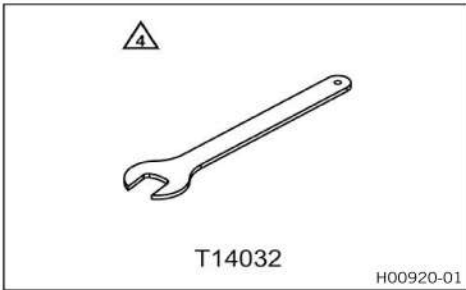


Art. no.: T14026S1

### Feature

|          |                 |
|----------|-----------------|
| M12      |                 |
| Diameter | 17 mm (0.67 in) |

**Open end wrench**

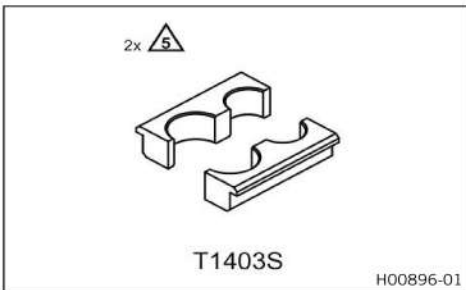


Art. no.: T14032

**Feature**

|             |                 |
|-------------|-----------------|
| Jaw opening | 22 mm (0.87 in) |
|-------------|-----------------|

**Clamping stand**

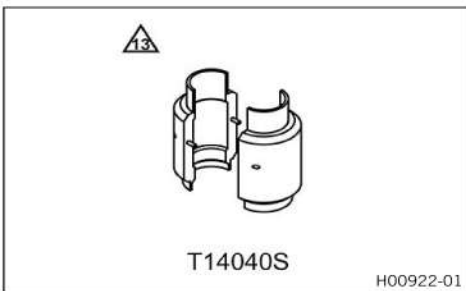


Art. no.: T1403S

**Feature**

|          |                 |
|----------|-----------------|
| Diameter | 48 mm (1.89 in) |
| Diameter | 60 mm (2.36 in) |

**Mounting tool**

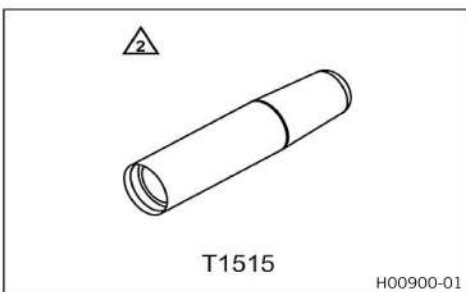


Art. no.: T14040S

**Feature**

|          |                 |
|----------|-----------------|
| Diameter | 48 mm (1.89 in) |
|----------|-----------------|

**Mounting sleeve**



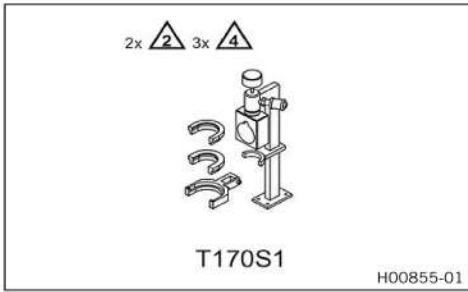
Art. no.: T1515

**Feature**

|          |                 |
|----------|-----------------|
| Diameter | 18 mm (0.71 in) |
|----------|-----------------|

## Filling tool

Art. no.: T170S1



**JASO T903 MA**

Different technical development directions required a separate specification for motorcycles – the **JASO T903 MA** standard.

Earlier, engine oils from the automobile industry were used for motorcycles because there was no separate motorcycle specification.

Whereas long service intervals are demanded for automobile engines, the focus for motorcycle engines is on high performance at high engine speeds.

In most motorcycle engines, the transmission and clutch are lubricated with the same oil.

The **JASO MA** standard meets these special requirements.

**SAE**

The SAE viscosity classes were defined by the Society of Automotive Engineers and are used for classifying oils according to their viscosity. The viscosity describes only one property of oil and says nothing about quality.

|     |                  |   |
|-----|------------------|---|
| ABS | ABS              | Safety system that prevents locking of the wheels when driving straight ahead without the influence of lateral forces |
| PA  | Preload adjuster | Device on the spring elements which enables adjustment of the spring preload  |



|          |                |
|----------|----------------|
| Art. no. | Article number |
| ca.      | circa          |
| cf.      | compare        |
| e.g.     | for example    |
| etc.     | et cetera      |
| i.a.     | inter alia     |
| no.      | number         |
| poss.    | possibly       |

|   |               |
|---|---------------|
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|                             |          |
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5230 Mattighofen/Austria  
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