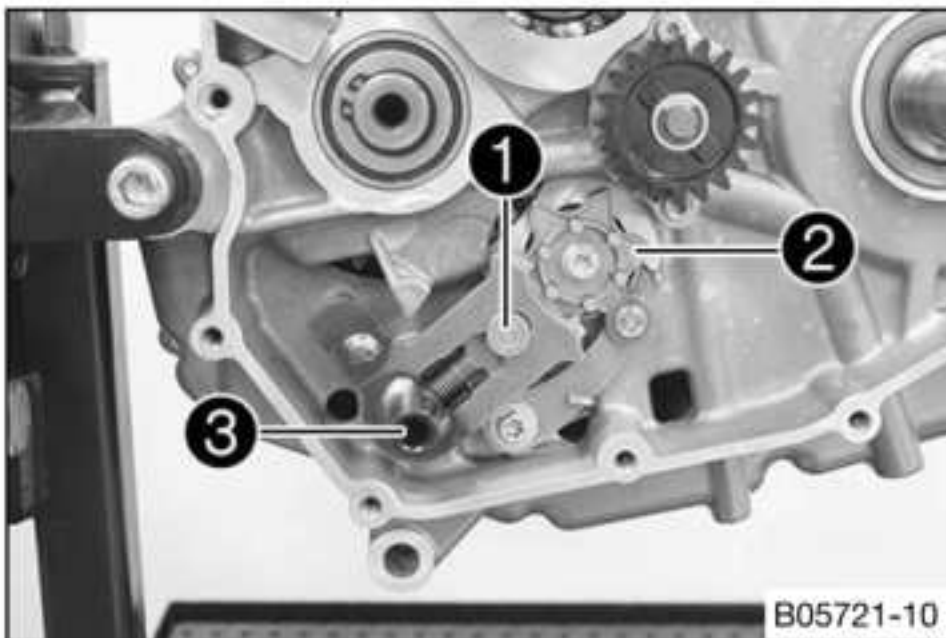


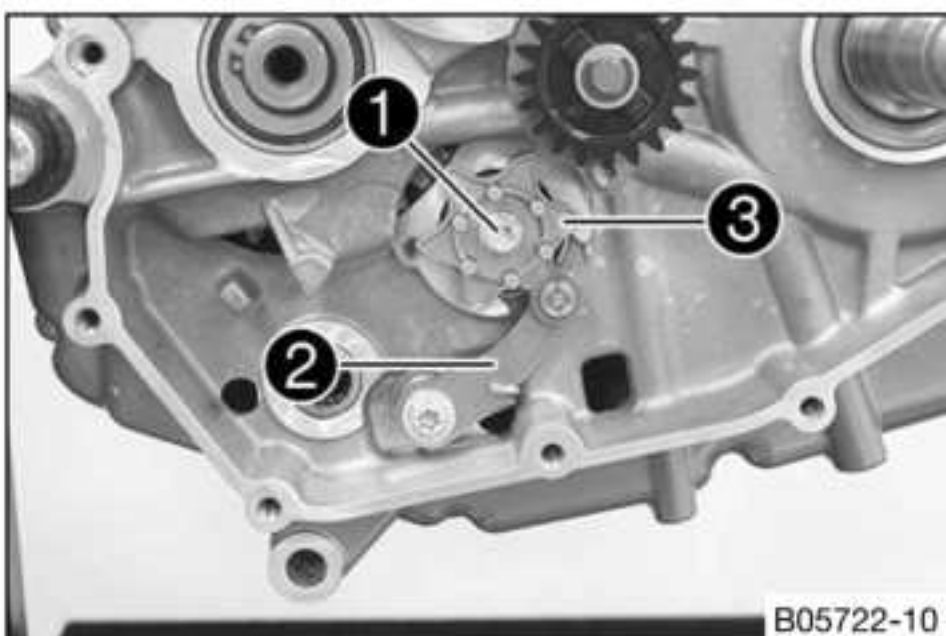
- Remove woodruff key ⑥ and both needle bearings ⑦.

### 18.3.27 Removing the shift shaft



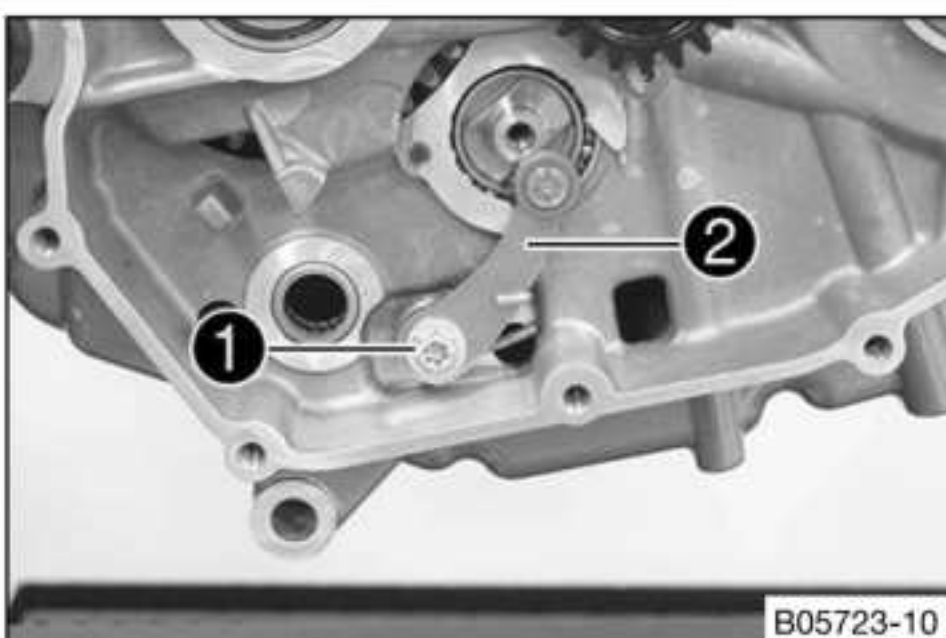
- Push sliding plate ① away from shift drum locating unit ②.
- Remove shift shaft ③ with washer.

### 18.3.28 Removing shift drum locating



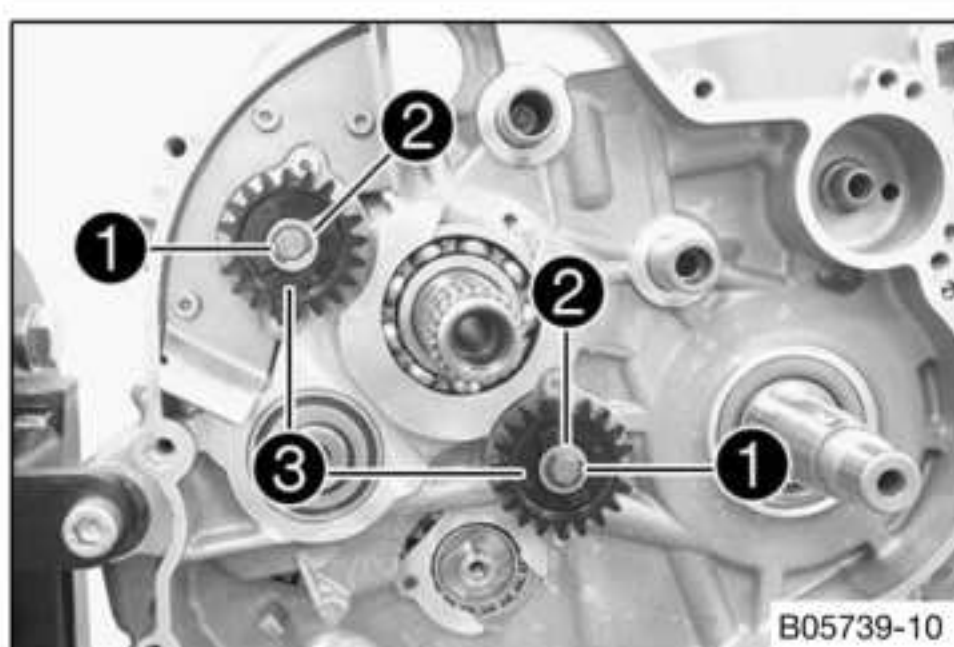
- Remove screw ①.
- Press locking lever ② away from shift drum locating ③ and take off the shift drum locating.
- Release the locking lever.

### 18.3.29 Removing locking lever

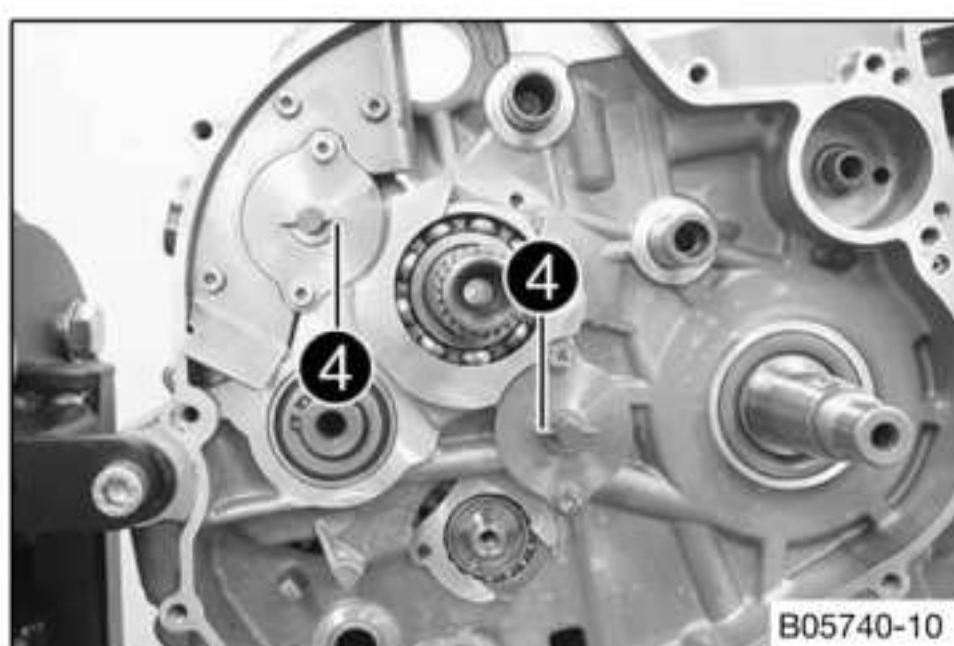


- Remove screw ①.
- Take off locking lever ② with the sleeve and spring.

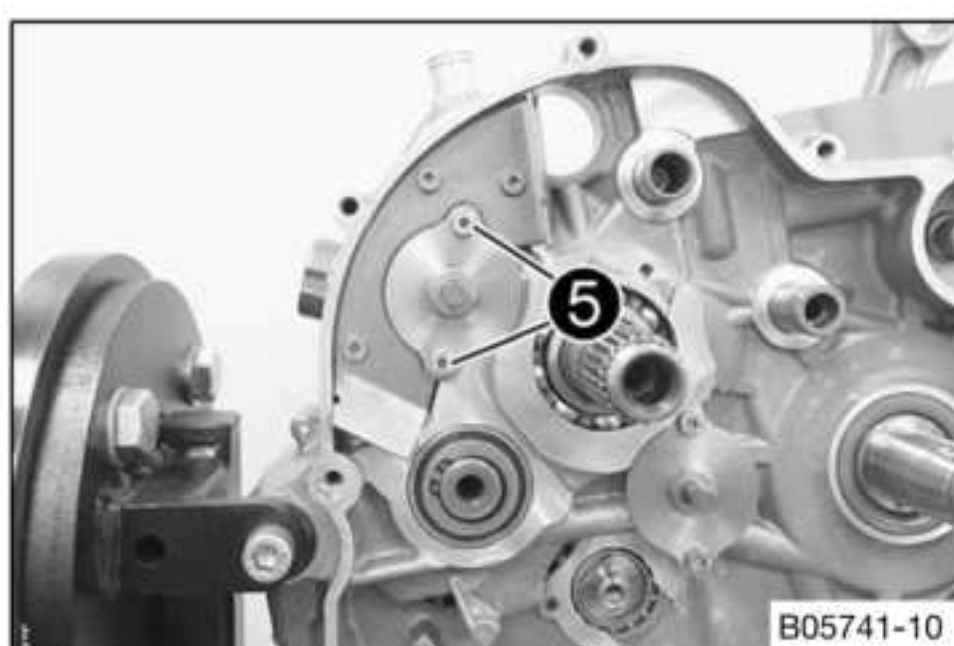
## 18.3.30 Removing the oil pumps



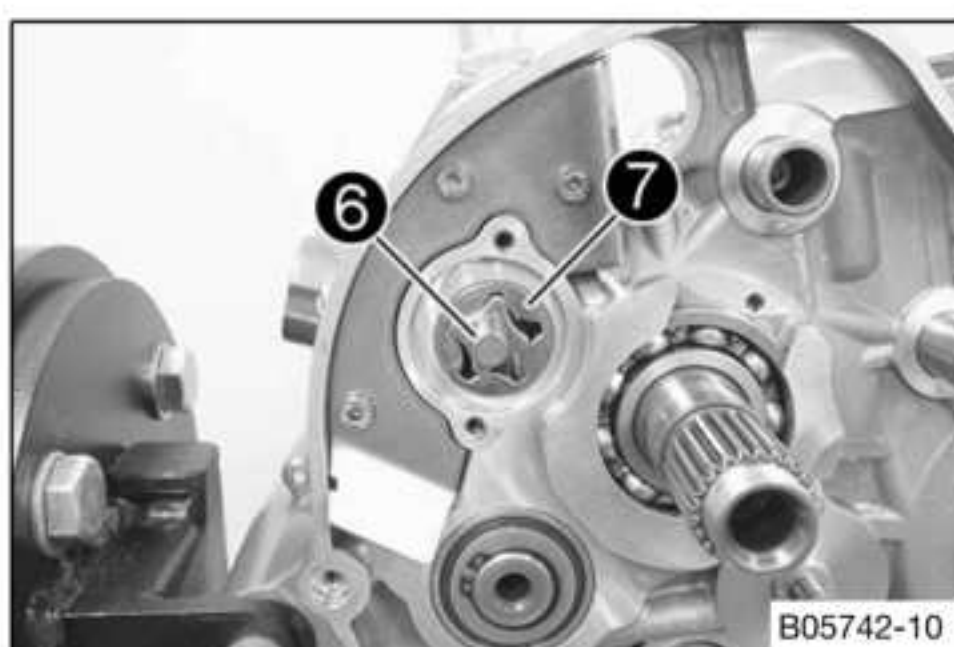
- Remove lock washers ① and normal washers ② from both oil pumps.
- Take off oil pump gear wheels ③.



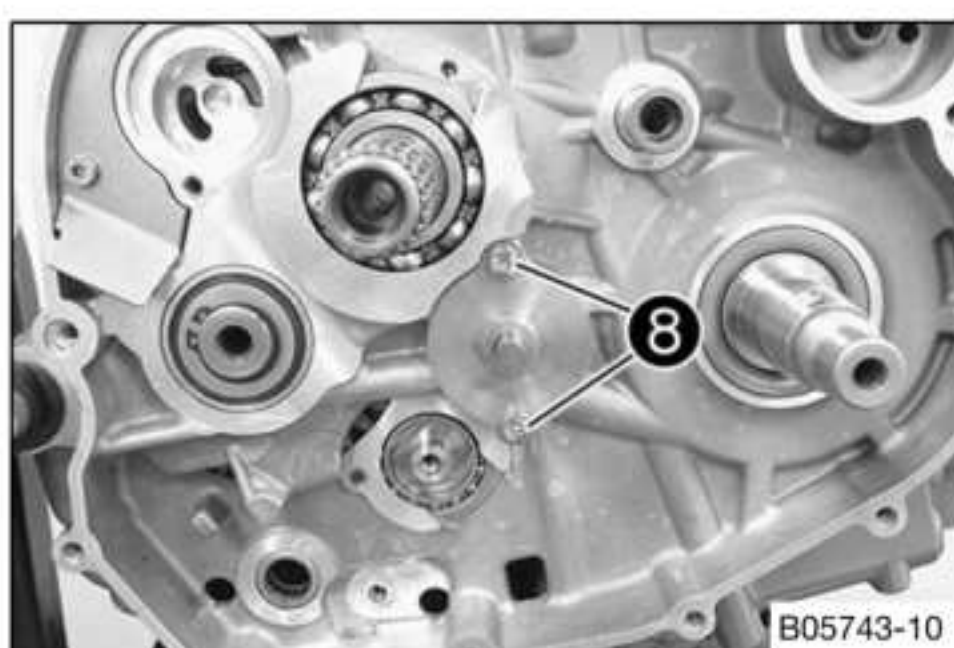
- Remove pins ④ and washers.



- Remove screws ⑤.
- Take off the oil pump cover.

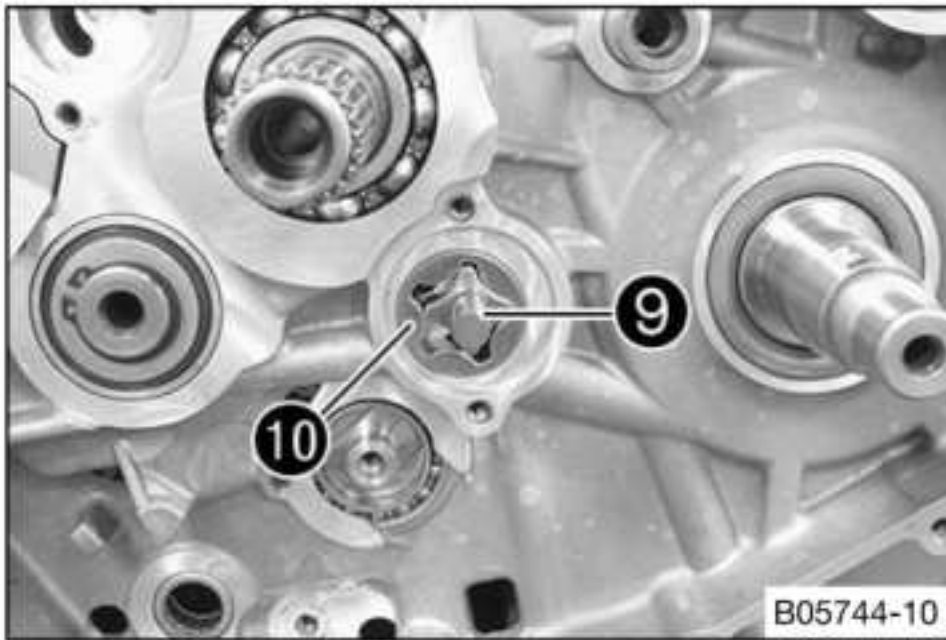


- Remove oil pump shaft ⑥ with the internal rotor.
- Remove external rotor ⑦.



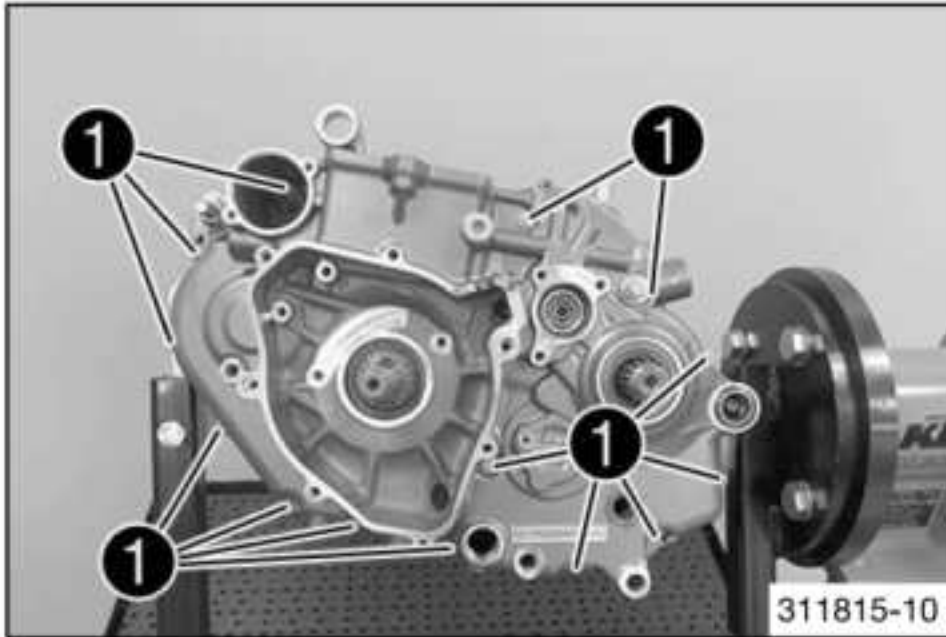
- Remove screws ⑧.
- Take off the oil pump cover.



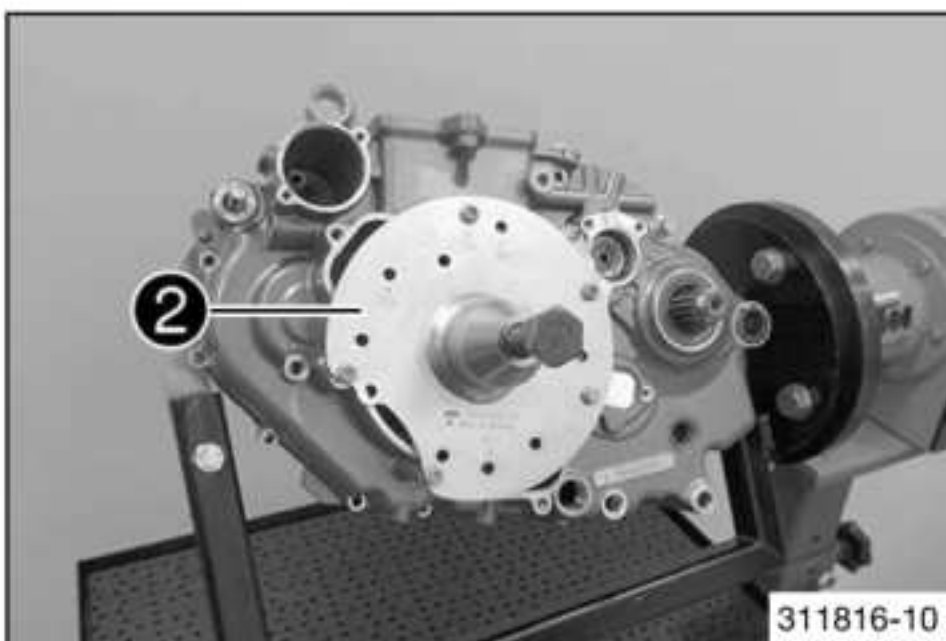


- Remove oil pump shaft ⑨ with the internal rotor.
- Remove external rotor ⑩.

## 18.3.31 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. 389)



### Info

Use the drill hole with marking 750.

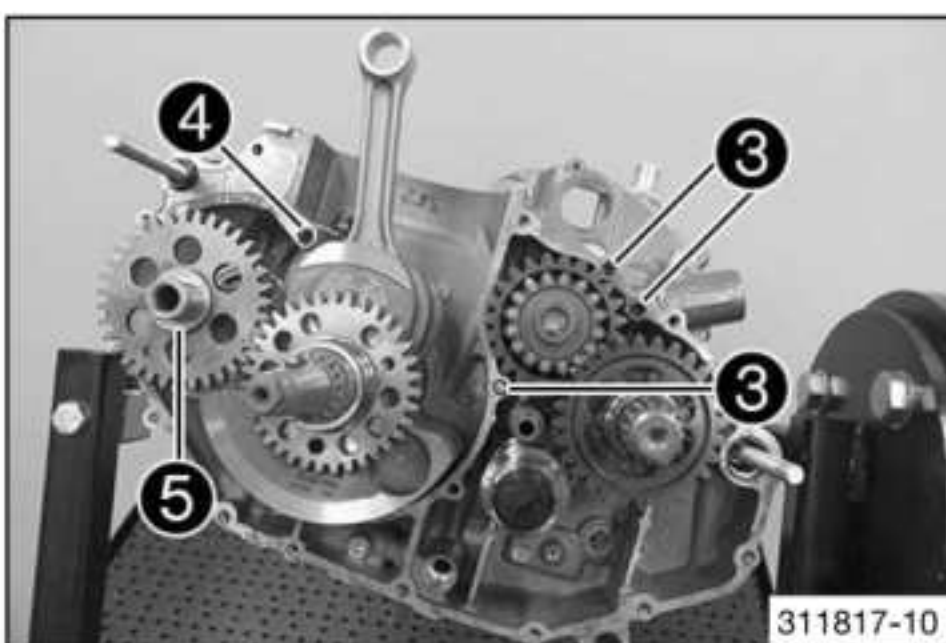
- Pull off the section of the engine case.



### Info

Do not tension the section of the engine case.

- Take off the left section of the engine case.
- Remove the special tool.



- Remove dowels ③.
- Remove O-ring ④.
- Remove washer ⑤.

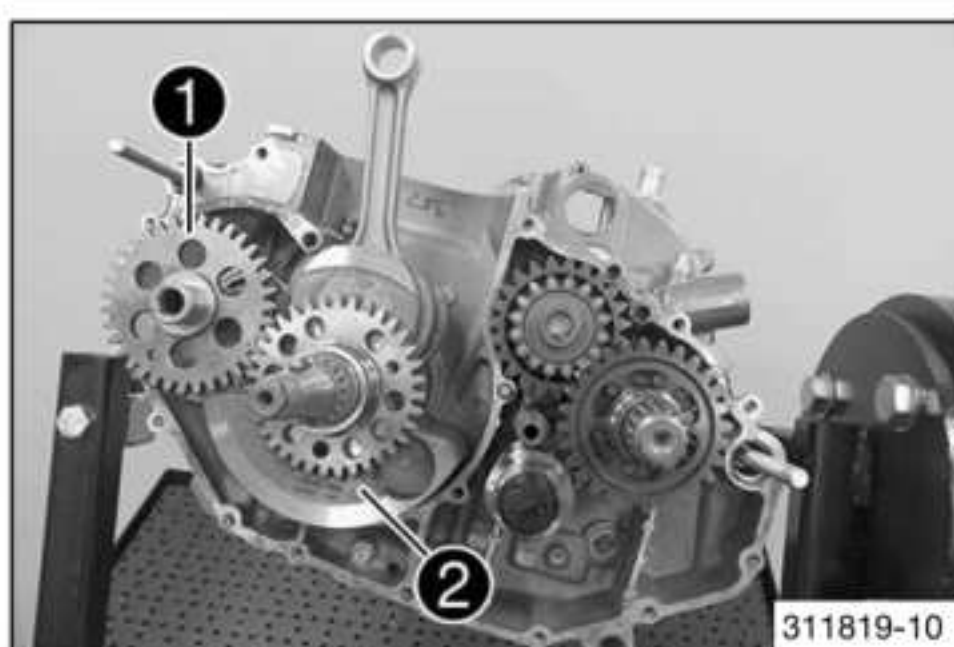


### Info

The washer of the balancer shaft usually sticks to the bearing.

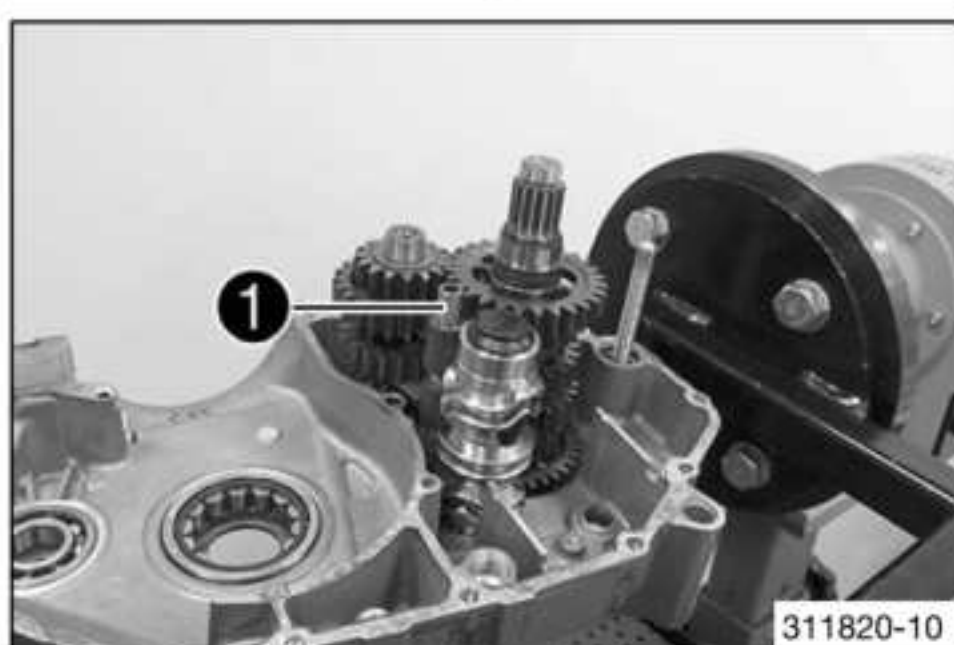


## 18.3.32 Removing the crankshaft and balancer shaft

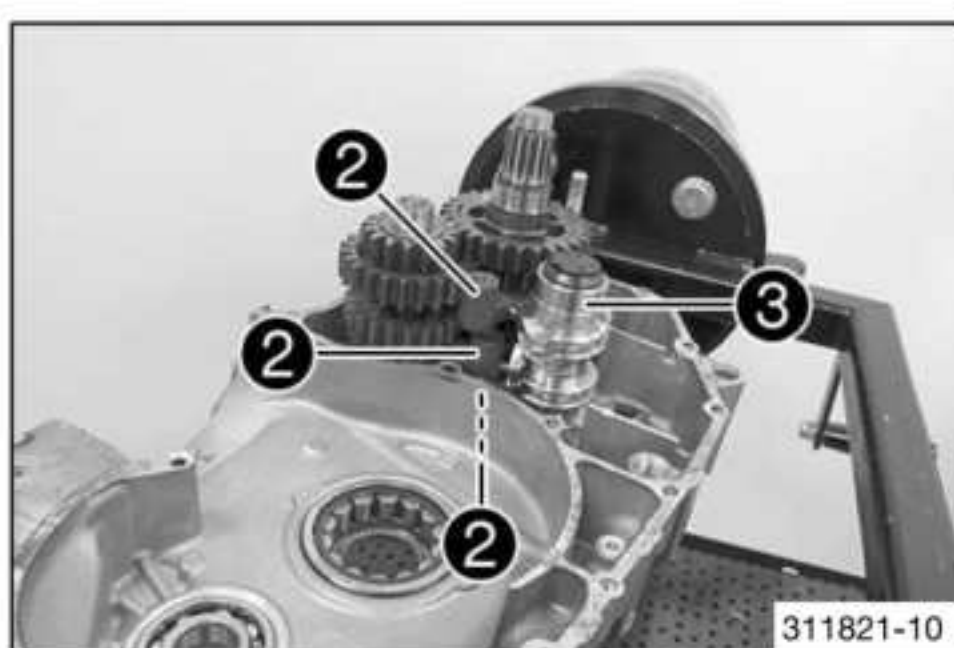


- Remove balancer shaft ① and crankshaft ②.

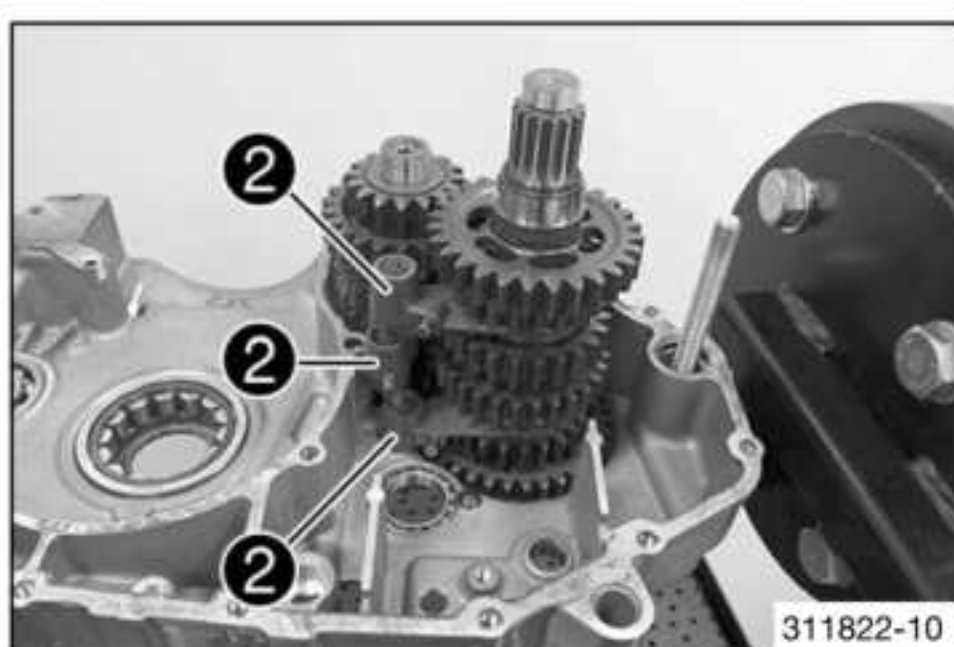
## 18.3.33 Removing the transmission shafts



- Remove shift rail ①.



- Swing shift forks ② to one side.
- Remove shift drum ③.

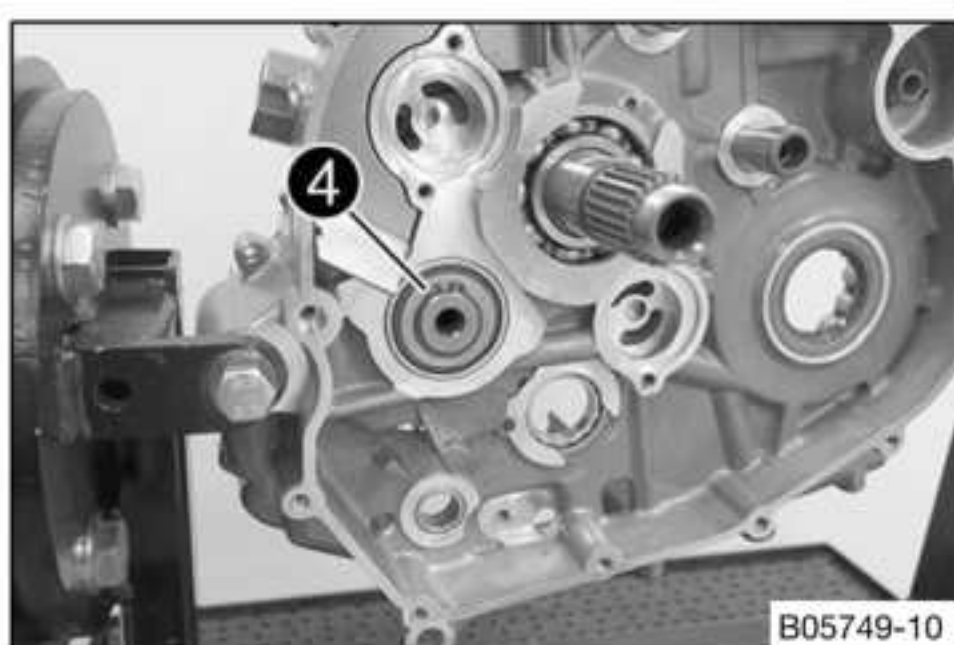


- Remove shift forks ②.



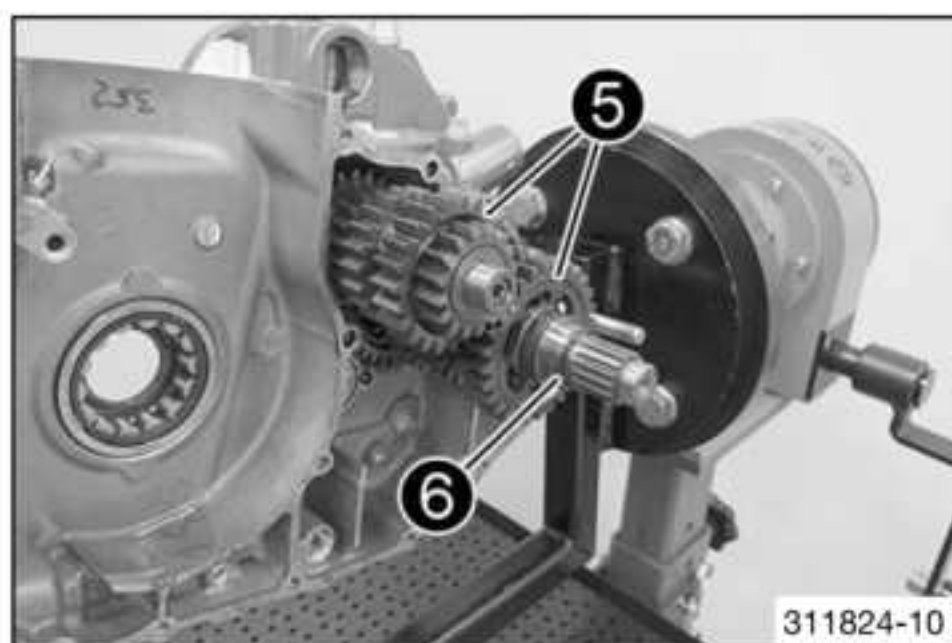
### Info

Ensure that the pins remain in place.



- Remove lock ring ④ and the stop disk.





- Remove transmission shafts **5**.



### Info

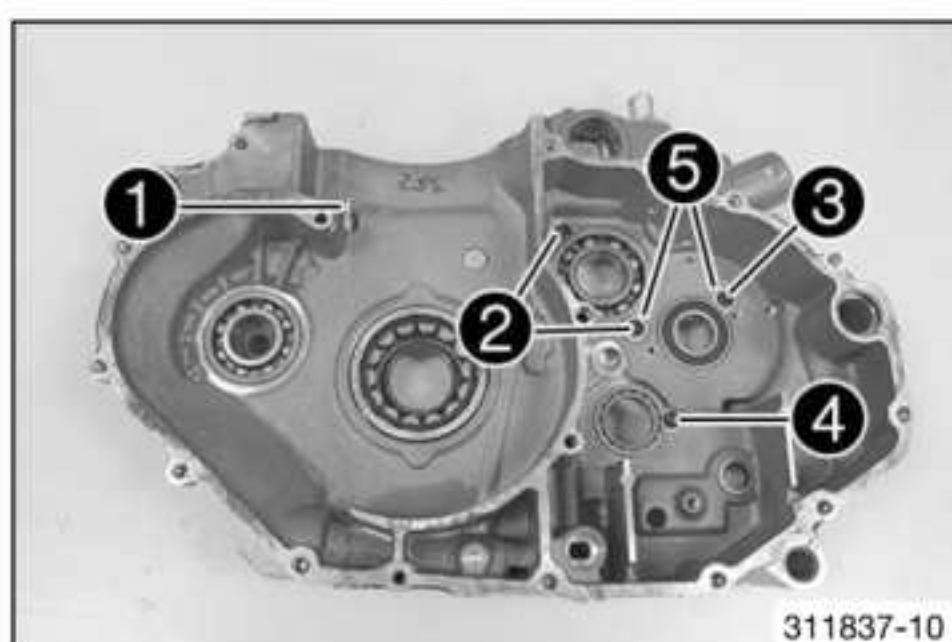
The stop disk of the countershaft usually sticks to the bearing.

- Take off the O-ring of countershaft **6**.



## 18.4 Working on individual parts

### 18.4.1 Working on the right section of the engine case



- Remove oil nozzle **1**.
- Remove bearing retainers **2** of the main shaft bearing, **3** of the countershaft bearing and **4** of the shift drum bearing.
- Remove washers **5**.
- 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

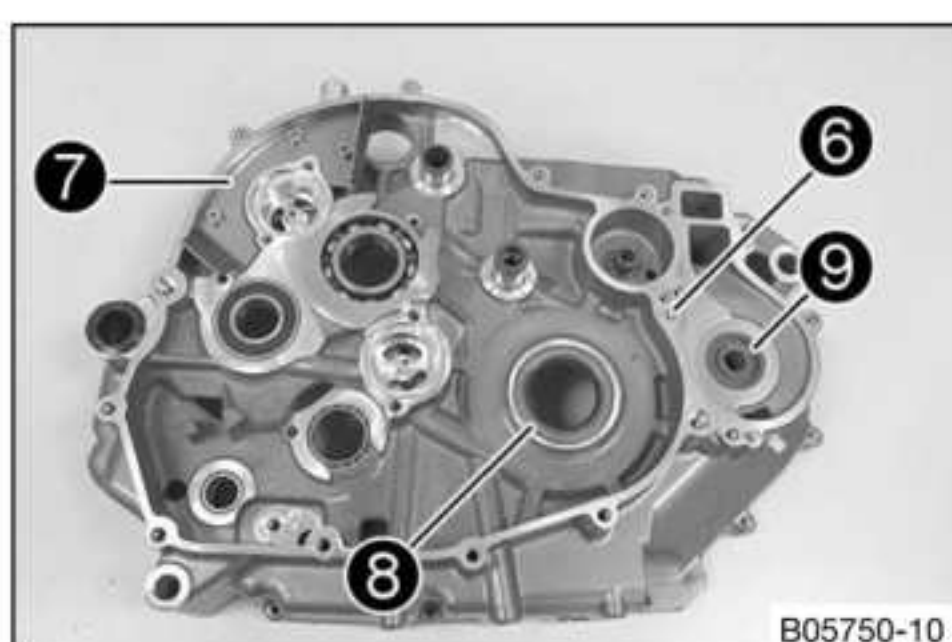
150 °C (302 °F)

- Knock the section of the engine case against a level wooden board. This will cause the bearings to drop out of the bearing seats.



### Info

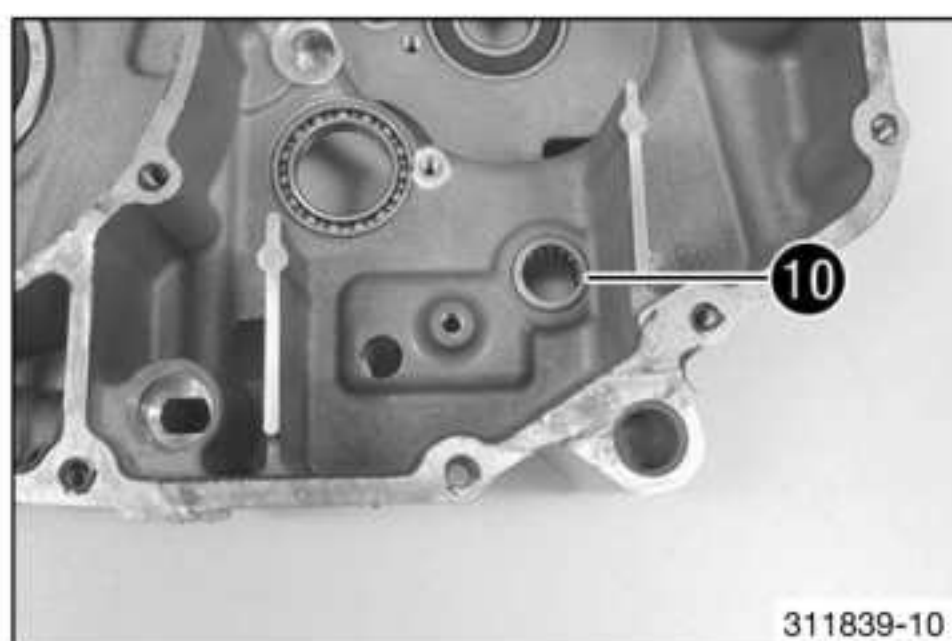
Any bearings that remain in the section of the engine case must be removed using a suitable tool.



- Remove oil nozzle **6**.
- Remove screws and cover plate **7**.
- Press out shaft seal ring **8** of the crankshaft from the inside to the outside.
- Remove shaft seal ring **9** of the water pump.
- 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 section of the engine case 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 until flush.



i

**Info**

Shift shaft bearing 10 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) <b>Loctite®243™</b>
---------------------------	----	--

- Press in new shaft seal ring 8 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 new shaft seal ring 9 of the water pump with the open side facing out so that it is flush.
- Mount and tighten oil nozzle 1.

Guideline

Oil jet, piston cooling	M6x0.75	4 Nm (3 lbf ft) <b>Loctite®243™</b>
-------------------------	---------	--

- Mount and tighten oil nozzle 6.
- Guideline

Oil nozzle for conrod bearing lubrication	M4	2 Nm (1.5 lbf ft) <b>Loctite®243™</b>
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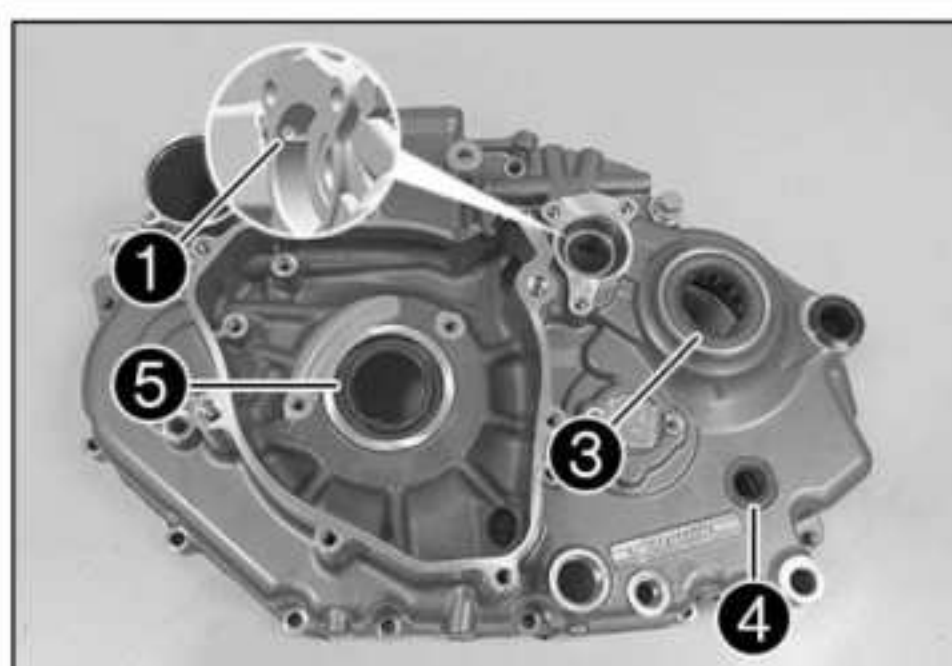
- Blow compressed air through all oil channels and check that they are clear.
  - Position cover plate 7. Mount and tighten the screws.
- Guideline

Screw, cover plate for oil return line	M5	6 Nm (4.4 lbf ft)
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- Reinstall the dowels.



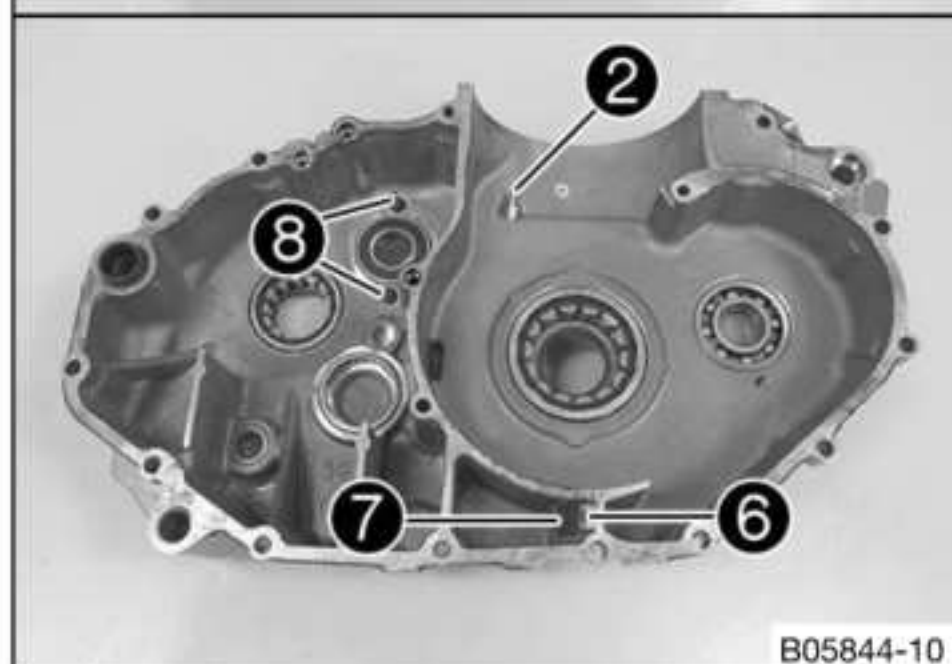
## 18.4.2 Working on the left section of the engine case



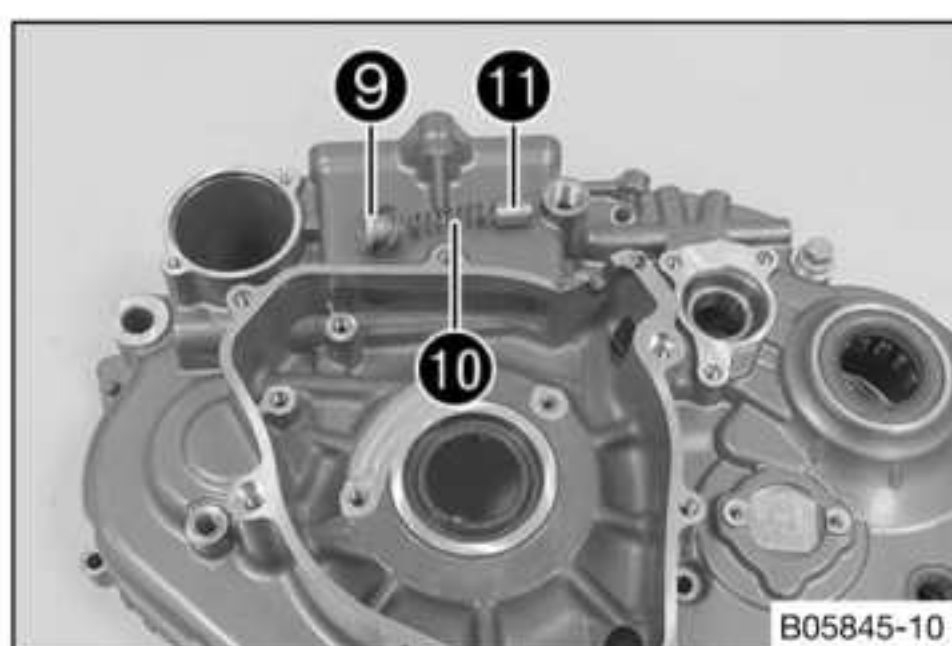
- Remove all dowels.
- Remove oil nozzle ①.
- Remove oil nozzle ②.
- Remove shaft seal rings ③ of the countershaft and ④ of the shift shaft.

**Info**

Shaft seal ring ⑤ of the crankshaft cannot be removed before the crankshaft bearing.



- Remove screws and membrane support plate ⑥ together with membrane ⑦.
- Remove screws ⑧ with the washer.



- Remove screw plug ⑨ and take pressure spring ⑩ with piston valve ⑪ 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.

**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 new shaft seal ring of the crankshaft from the inside toward the outside, with the open side facing outward.

**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 seat 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 **8** with the washers.

Guideline

Locking screw for bearing	M5	6 Nm (4.4 lbf ft) <b>Loctite®243™</b>
---------------------------	----	--

- Press in new shaft seal ring **3** of the countershaft and **4** of the shift shaft with the open side facing inward until it is flush.
- Mount and tighten oil nozzle **2**.

Guideline

Oil jet, piston cooling	M6x0.75	4 Nm (3 lbf ft) <b>Loctite®243™</b>
-------------------------	---------	--

- Mount and tighten oil nozzle **1**.

Guideline

Oil nozzle for clutch lubrication	M4x8	2 Nm (1.5 lbf ft)
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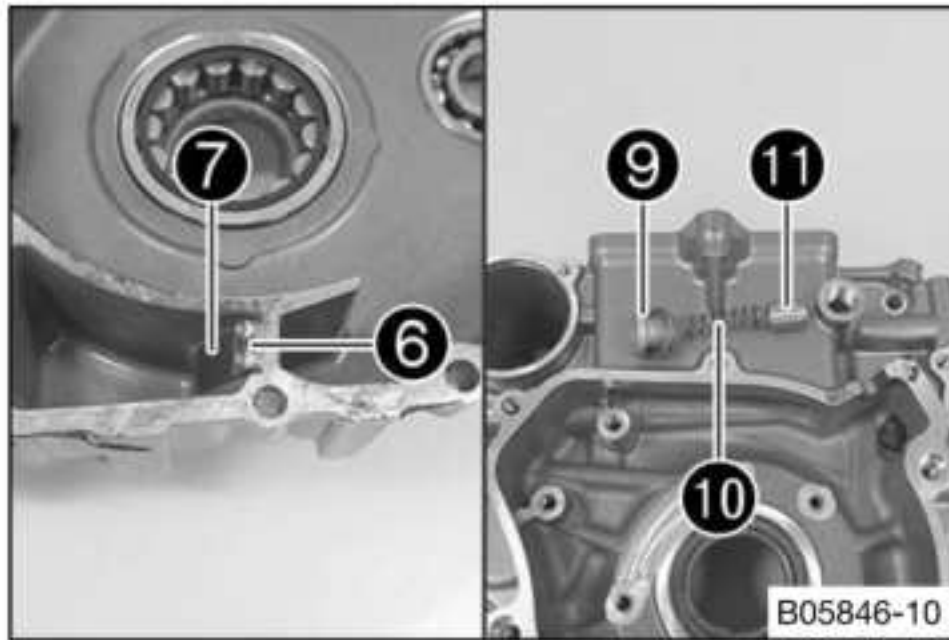
- Mount the dowels.
- Blow compressed air through all oil channels and check that they are clear.
- Measure the spring length of the oil pressure control valve.

Oil pressure regulator valve - minimum length spring	25.4 mm (1 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 11 and mount it with pressure spring 10. Mount and tighten screw plug 9 with a new seal ring.

Guideline

Screw plug, oil pressure control valve	M12x1.5	20 Nm (14.8 lbf ft)
--	---------	---------------------

- Position membrane support plate 6 with membrane 7. Mount and tighten the screws.

Guideline

Screw, membrane fixation	M3	2 Nm (1.5 lbf ft) <b>Loctite® 243™</b>
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## Info

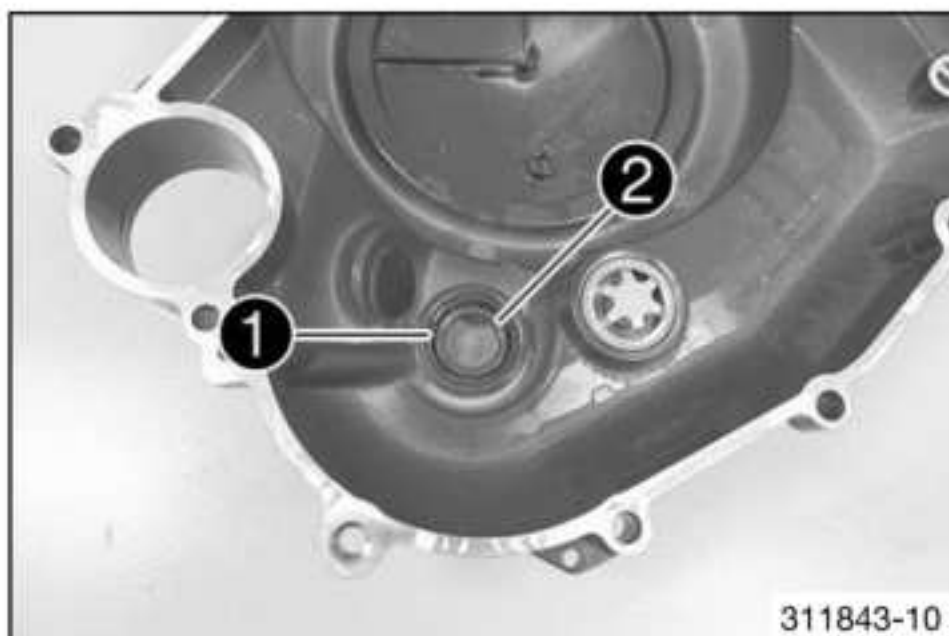
The membrane support plate is curved and must point away from the membrane.

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.



### 18.4.3 Working on the clutch cover



- Remove lock ring 1.
- Remove shaft seal ring 2 of the crankshaft.
- Press in new shaft seal ring as far as possible.



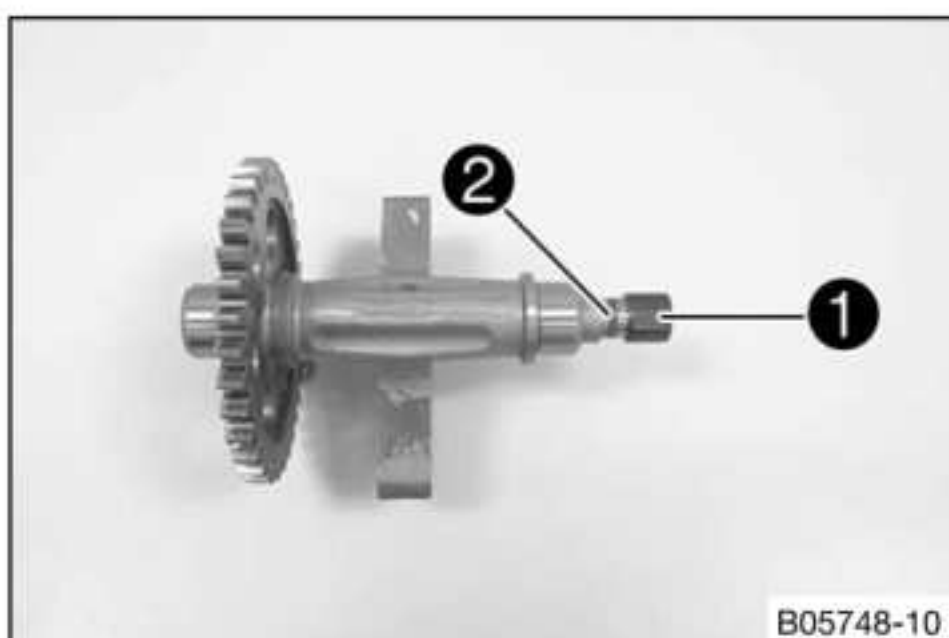
## Info

Provide suitable support for the clutch cover while pressing in.

- Mount lock ring 1.
- Blow out the oil channel with compressed air and check that it is clear.



### 18.4.4 Working on the water pump impeller

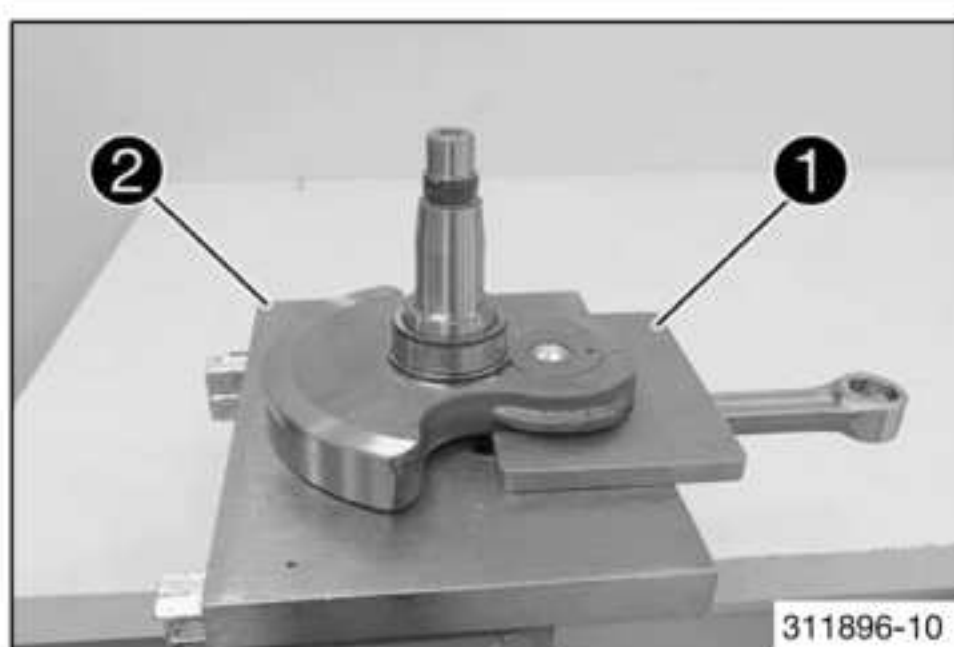


- Remove bushing 1.
- Remove O-ring 2.
- Mount new O-ring 2.
- Mount the new bushing 1.





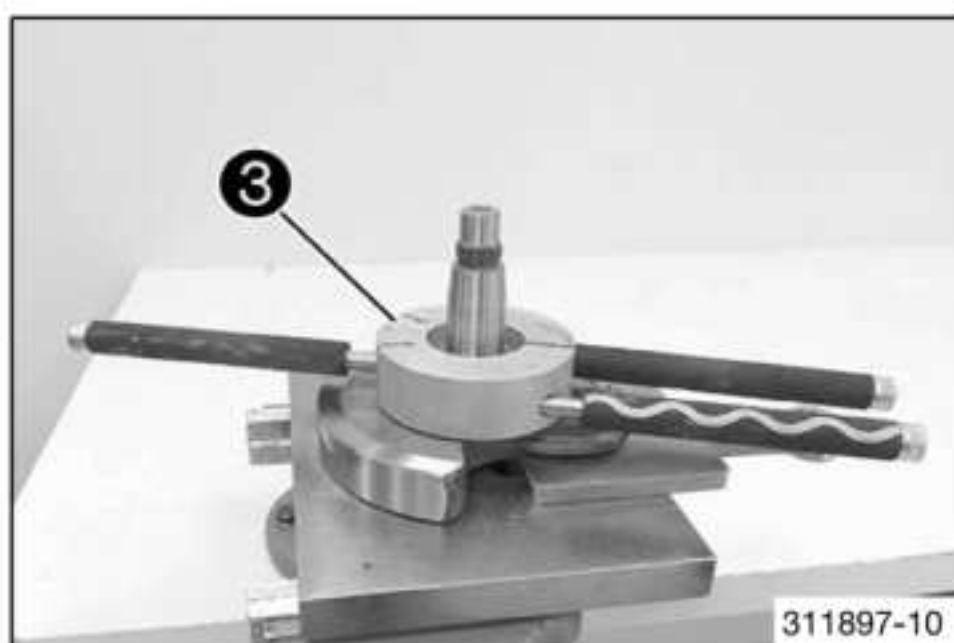
## 18.4.5 Removing the crankshaft bearing inner race



- Fix the crankshaft with special tool **1** and **2** secure in the vise.

Separator plate, upper part (75029047050) (p. 388)

Separator plate, base (75029047051) (p. 389)



- Warm up special tool **3**.

Guideline

150 °C (302 °F)

Puller (58429037043) (p. 383)

- Push the heated special tool **3** on to the inner bearing race, press them firmly together, and pull them both off the crankshaft.
- Take off the compensating disk.
- Repeat these steps on the opposite side.

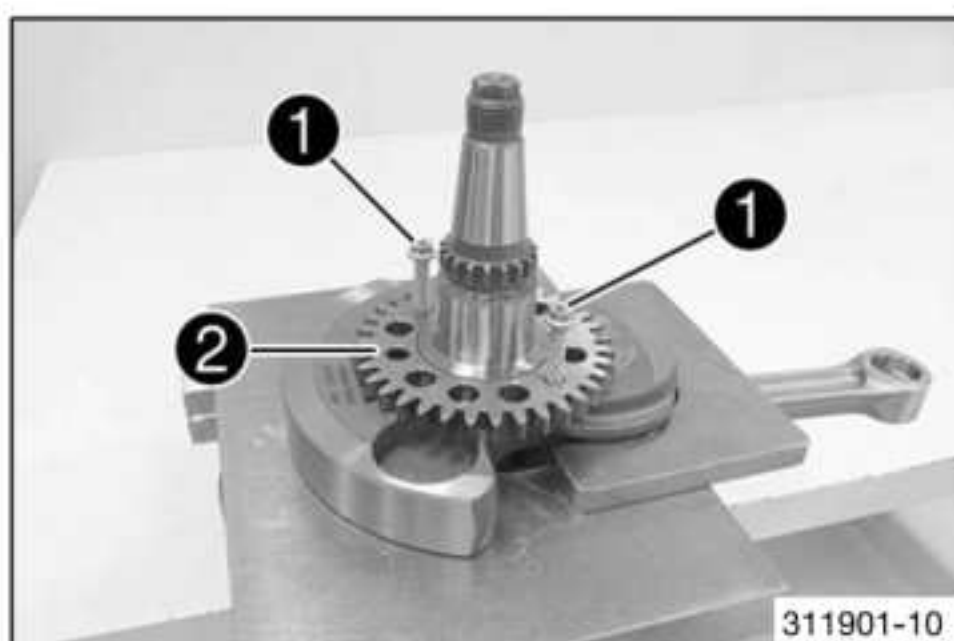
## 18.4.6 Removing the drive gear wheel of the balancer shaft

### Preparatory work

- Remove the crankshaft bearing inner race. (p. 208)

### Main work

- Screw suitable M6 screws **1** into the thread. Tighten the two screws evenly to pull drive gear wheel **2** off the crankshaft.



## 18.4.7 Changing the connecting rod, conrod bearing, and crank pin

### Preparatory work

- Remove the crankshaft bearing inner race. (p. 208)
- Remove the drive gear wheel of the balancer shaft. (p. 208)