



## Fitting and removing piston pin bush

Commercially available tools:

- Press or threaded pin

Special tools:

- base plate: 131200
- Set of assembly tools: 131220
- Nitrogen (liquid)
- Degreaser/detergent
- Compressed air
- Heating device

### DANGER



Risk of accident, do not touch hot components! Risk of accident, do not touch super cooled components or liquid nitrogen! Wear protective gloves and safety goggles!

### WARNING



The process of pressure fitting must be carried out quickly due to the thermal shock between the bush of the piston pin and the connecting rod drum. The necessary work steps must be carried out before pressure fitting.

### NOTE



The extraction of the piston pin bush is illustrated with a pneumatic press. Alternatively, also a threaded pin can be used.

## Disassembly of the piston pin bush



### WARNING

Never force the piston pin bush!

- Insert the housing of the connecting rod bearing (3) in the base plate (2).
- Insert the disassembly gauge (1) in the base plate.



### WARNING

Do not mix up the disassembly gauge and the assembly gauge!



### NOTE

The groove (arrow) must face the housing of the connecting rod bearing. Make sure that the disassembly gauge is perfectly levelled.

1.

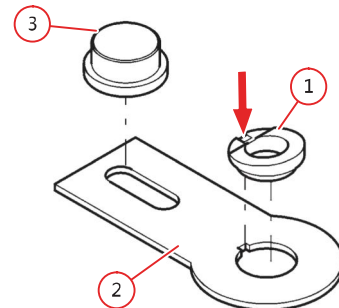
- Insert the lower part of the assembly tool (3) from below in the disassembly gauge.
- Position the connecting rod drum (1) on the base plate.



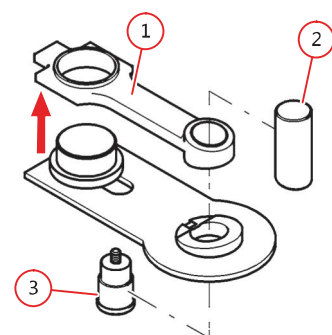
### NOTE

The flat side (arrow) of the connecting rod drum must face downwards.

- Rotate the lower part (3) in the upper part (2) of the assembly tool.



© 404043



© 404034

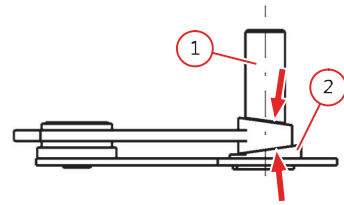
2.

- o Align the upper part (1) of the assembly tool with the disassembly gauge (2).



**NOTE**

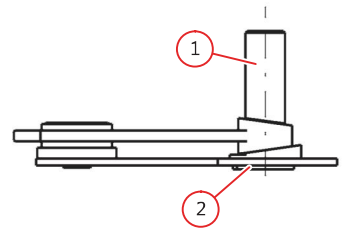
The upper part of the assembly tool and the disassembly gauge are flush with the angular surfaces (arrow) of the connecting rod bearing.



© 404013

3.

- o Tighten the upper part (1) and the lower part (2) of the assembly tool.



© 404023

4.

- o Align the pneumatic press horizontally with the base plate.



**NOTE**

The extractor punch must be situated in the centre above the top of the assembly tool.



© 362843

5.

- o Remove the piston pin bush with slight pressure.
- o Clean the hole in the bush.



**NOTE**

The hole in the bush must be free of grease and dirt.



© 362853

6.

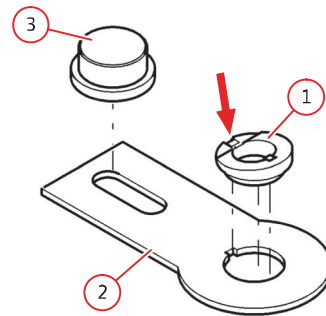
### Assembly of the piston pin bush

- o Insert the housing of the connecting rod bearing (3) in the base plate (2).
- o Insert the assembly gauge (1) in the base plate.

**NOTE**



The groove (arrow) must face the housing of the connecting rod bearing. Make sure that the assembly gauge is perfectly levelled.



© 404051

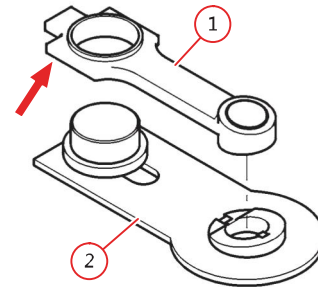
1.

- o Heat the connecting rod shank (1): 220 °C.
- o Position the connecting rod drum on the base plate (2).



**NOTE**

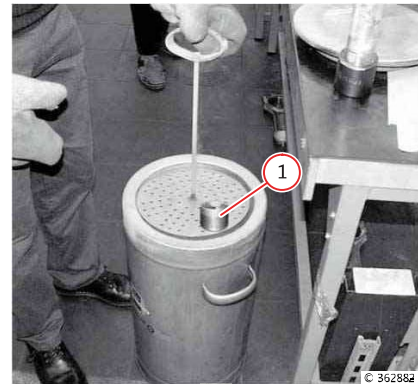
The flat side (arrow) of the connecting rod drum must face downwards.



© 404051

2.

- o Chill the piston pin bush (1) in liquid nitrogen to approximately -40 °C.



© 362882

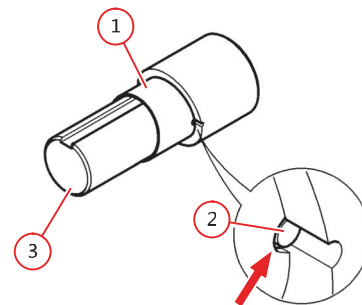
3.

- o Position the supercooled bush of the piston pin (1) on the assembly bolt (3).



**NOTE**

The index (2) must be situated in the groove (indicated by arrow) in the piston pin bush.



© 404071

4.

- o Insert the assembly bolt (1) with the piston pin bush (2) in the hole of the connecting rod.



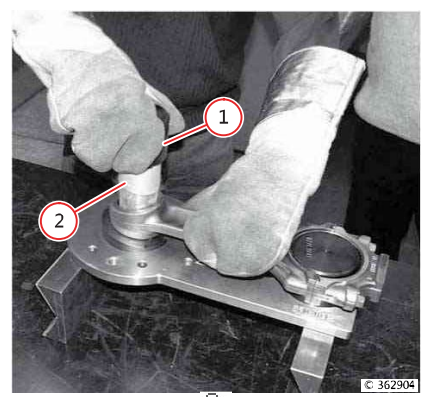
**NOTE**

The piston pin bush must be inserted without force into the connecting rod hole. Pay attention to the assembly position of the piston pin bush.

- o Remove the assembly bolt.

**NOTE**

The piston pin bush must not slip any more.



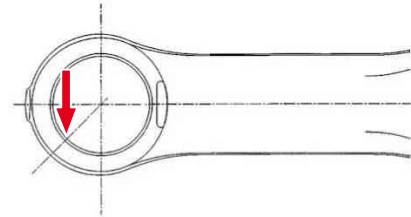
5.

- o Check the assembly position.



**NOTE**

Position of bush separation line (indicated by arrow) as seen when looking towards the flat side of the connecting rod shank.



© 409681

6.

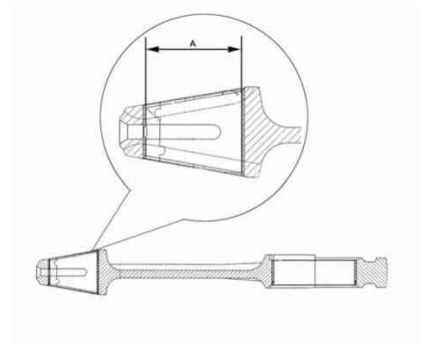


**NOTE**

After the assembly operation, mechanically adjust the piston pin bush.

- o Turn the piston pin bush to dimension A.

Dimension	Maximum dimension	Minimum dimension
Hole of the piston pin bush, dimension A	38.035 mm	38.025 mm
Piston pin diameter	38.000 mm	37.994 mm
Theoretical clearance	0.041 mm	0.025 mm



© 397302

7.



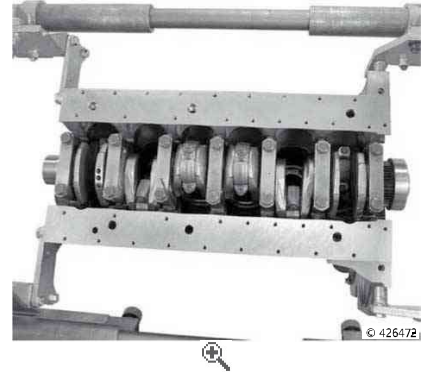
## Assembly and disassembly of the crankshaft

Special tools:

- Box spanner insert: 8035
- Rotation device: 100330

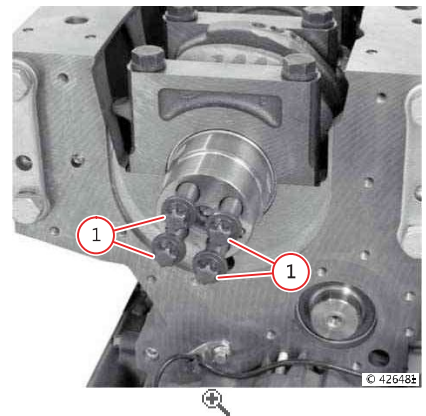
### Disassembly of the piston pin bush

- Disassemble the front cover.  
See para. Removal and refitting of the front cover (opposite end to flywheel)
- Disassemble the gear case cover.  
See para. Disassembly and assembly of the gear case cover



1.

- Tighten screws (1).
- Disassemble all the connecting rod bearing covers.
- Remove the connecting rod bearing shells.  
See para. Disassembly and assembly of the piston and connecting rod drum



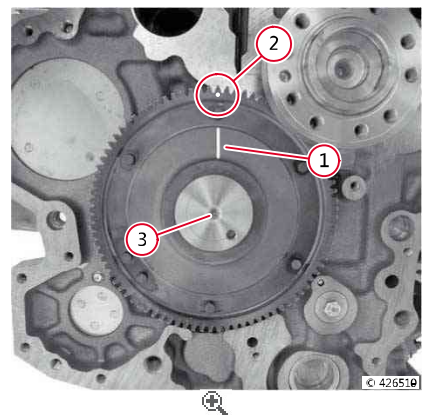
2.

- Place the mark of reference (1) on the ring gear of the camshaft.



#### NOTE

The reference mark must be located on a line between the marking (2) and the mid point (3) of the camshaft.



3.

- Uniformly rotate the crankshaft until the mark (1) on the flange of the shaft coincides with the auxiliary mark (2) on the camshaft ring gear.



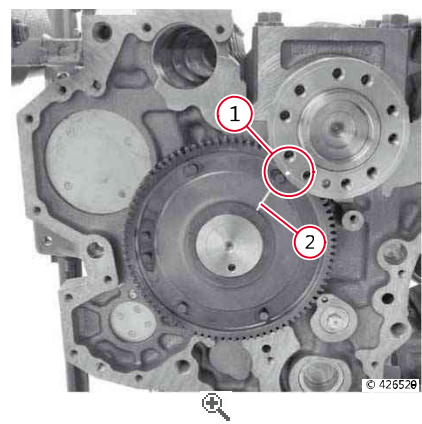
#### NOTE

If the crankshaft flange is aligned, the mark on the camshaft ring gear will be covered.

#### WARNING



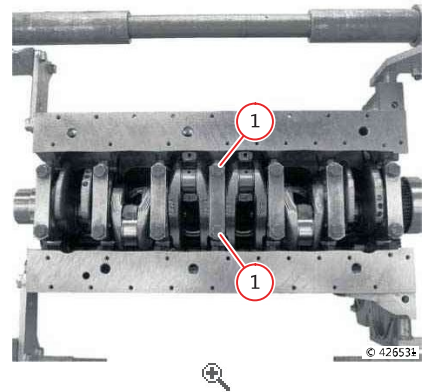
Do not bend the connecting rod drums while rotating the crankshaft.



4.

### Disassembly of the main bearing cover

- Unscrew all the screws (1) using the long reach socket.



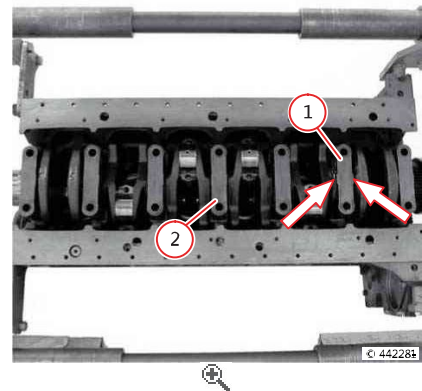
1.

- Remove flanged bearing cover (1).
- Remove the bearing shell.
- Remove the two halves of the thrust ring (arrows).
- Remove all the main bearing covers (2).
- Remove the bearing shells.



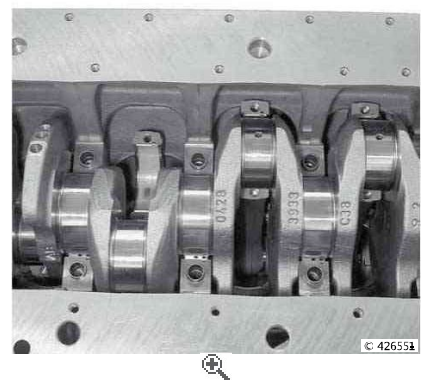
**NOTE**

Put the components to one side in the order in which they were removed. Note the cylinder order.



2.

- Delicately extract the connecting rod drums from the relative pins.
- Extract the crankshaft by applying leverage.



3.

- Remove the two halves of the thrust ring (arrows).
- Remove all the main bearing shells (1).

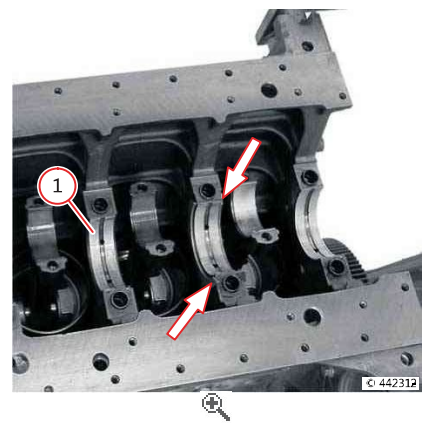


**NOTE**

Put the components to one side in the order in which they were removed. Note the cylinder order.

- Carry out a visual inspection of the components.

- o Check the endfloat of the crankshaft (disassembled crankshaft). See para. Check the endfloat of the crankshaft See para. Check the crankshaft



4.

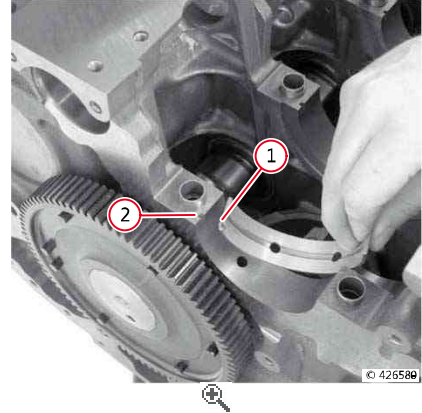
### Assembly of the crankshaft

- o Insert the upper shells of the main bearings.



**NOTE**

Take care to couple the bearing shells. The anti-twist safety (1) must enter the groove (2).



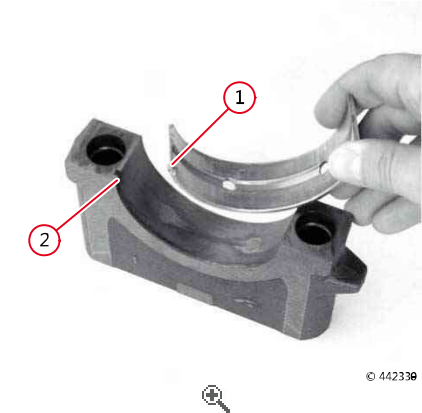
1.

- o Insert the lower shells of the main bearings in the relative main bearing covers.



**NOTE**

Take care to couple the bearing shells. The anti-twist safety (1) must enter the groove (2).

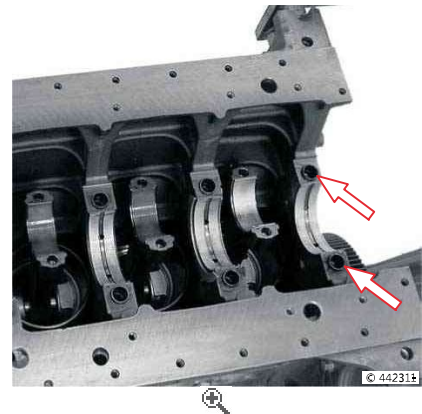


2.



**NOTE**

Make sure all the tightening bushes are present (arrows).



3.

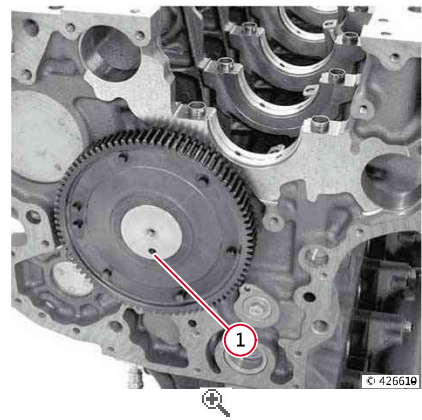
- o Position the camshaft.



**NOTE**

Align the hole (1) in the direction of the cylinder head.

- o Oil the surfaces of the bearings.



4.

- o Delicately insert the crankshaft in the crankcase.



**WARNING**

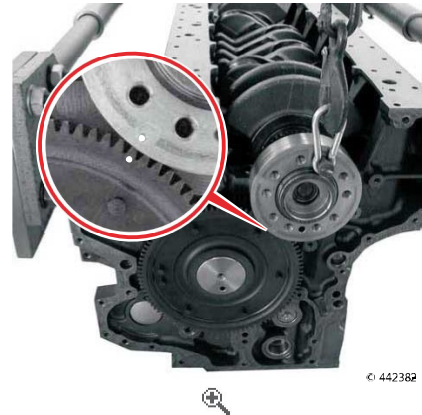
Do not bend the connecting rod drums while inserting the crankshaft!

- o Move the crankshaft in correspondence of the camshaft.



**NOTE**

Make sure the marks line up.



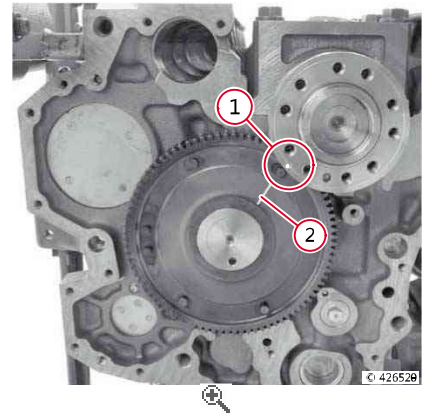
5.

- o Check the control times.



**NOTE**

The mark (1) on the flange of the crankshaft must line up with the reference mark (2).



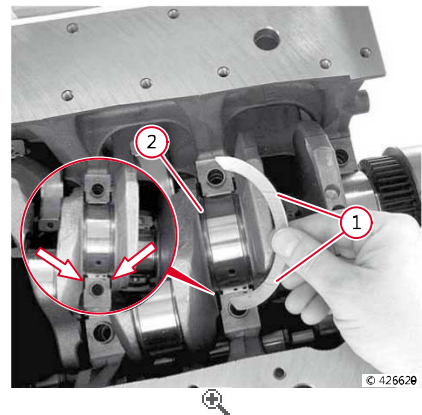
6.

- o Assemble the upper thrust ring halves based on the measured endfloat.



**NOTE**

Thrust ring halves without the key, between the crankshaft and crankcase (arrows). The oil grooves (1) in the thrust ring halves face towards the thrust discs (2) of the crankshaft (arrows).



7.

- o Fix the two thrust ring halves with a small amount of grease on the flanged bearing cover.



**NOTE**


Flanged bearing cover marked with "2". Use the halves of the thrust ring with the key (arrow). The oil grooves (1) face towards the shoulder disc of the crankshaft.

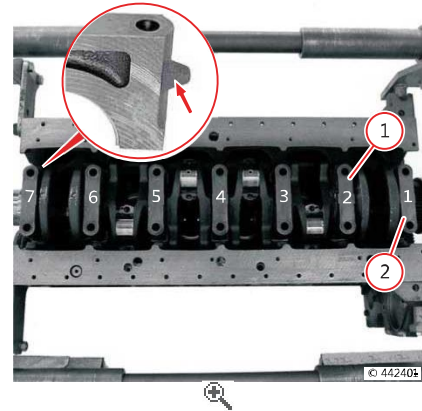
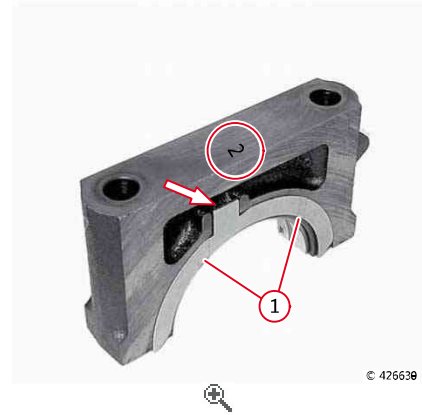


8.

### Assembly of the main bearing cover


- o Insert the flanged bearing cover (1).
- o Insert the main bearing cover (2) based on the numbering.

 **Pay attention to the attribution and assembly position:**  
Insert the main bearing cover with number 1 on the flywheel side. The end (arrow) of the bearing cover is facing the curve side.

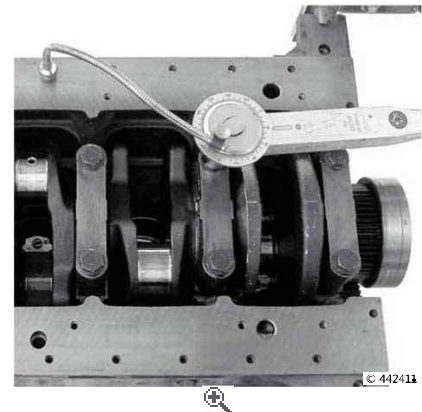


1.

- o Main bearing cover with socket wrench insert and rotation angle gauge: 50 Nm + 90° + 90°.

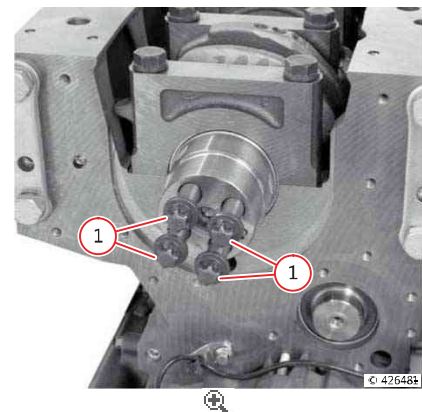
**WARNING**  
 In the case of written certification, the screws can be used a maximum of 3 times. Otherwise, replace the screws each time after being removed.

- o Assemble the flanged bearing cover.  
See para. Disassembly and assembly of the piston and connecting rod drum



2.

- o Remove screws (1).



3.

- o Assemble the gear case cover.  
See para. Disassembly and assembly of the gear case cover
- o Fitting the front cover.  
See para. Removal and refitting of the front cover (opposite end to flywheel)

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