

## 05.9 Piston overhaul

It is not necessary to remove the big end bearing when pulling a piston, because the bearing covers are held together using auxiliary bolts. Loosen and withdraw the big end bolts only. A threaded bolt hole is provided in the piston crown for lifting tool (3VP2-010AS2).

The pistons are marked on the connecting rods. The connecting rod and the big-end bearing on A-side are marked towards the A-side. Corresponding marking on the B-side.

### Piston with lifting tool

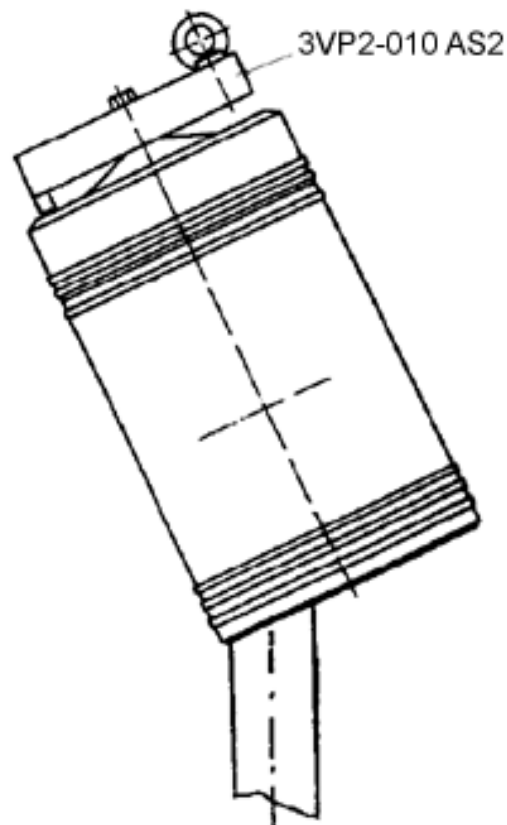


FIG. 05-11

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### 05.9.1 Piston withdrawal

- 1) Remove the edge of carbon deposits in the cylinder liner just above the TDC.
- 2) Clean out the lifting tool bore in centre of the piston crown.
- 3) Loosen the auxiliary bolts (pos. 5 - Fig 05-2) half a turn.
- 4) Crank the big-end in question in position near the crank case door at the opposite side. From this side and with the same crank position it is possible to loose all four big-end bearing bolts.
- 5) Loosen all big-end bearing bolts.

- 6) Crank the engine into TDC position and remove the bolts.
- 7) Assemble the tool (3VP2-010 AS2) and lift out the piston. Take care when the connecting rod slips the dowel pin on top of the big-end bearing cap. The rod should be hand-guided and rested into the cylinder liner when pulling out the piston.
- 8) Take care and keep the shim located between the connecting rod and big-end bearing cap. Cover up the big-end journal oil bore.

### 05.9.2 Piston ring and ring groove control

- 1) Dismantle the piston rings by using the pliers "Unisterss D280") and note the position. Take care when cleaning the piston, ring grooves and piston rings.
- 2) Perform measurement of the ring grooves and piston rings.

Piston crown with 7 mm groove for ring no. 1		
RING GROOVE	ORIGINAL MEASURE	MAX. MEASURE
Nr. 1	7.20 mm	7.45 mm
Nr. 2	5.17 mm	5.40 mm
Nr. 3	8.17 mm	8.45 mm
Piston crown with 5 mm groove for ring no. 1		
Nr. 1	5.20 mm	5.45 mm
Nr. 2. Nr. 3	Ref. piston with 7 mm piston ring.	

### 05.9.3 Assembly of piston

When the piston is assembled in the cylinder liner, the piston ring guide (3VP2-1209BS1) must be used.

When assembling rings from the piston, take care and always use the pliers ("Unistress D280").

- 1) Place the piston ring guide on top of the cylinder liner. Fix it to the liner by means of the device (3VP2-1213A).
- 2) Clean the top surface of the big-end bearing cap and the adjacent bores. Crank the engine into TCD position. Place the shim.
- 3) Assemble the piston rings and lift the piston up into the cylinder liner.
- 4) Lubricate the piston and piston rings.
- 5) Lower the piston carefully into the cylinder liner.
- 6) The connecting rod is guided onto the big-end bearing cap. Take care for the dowel pin. Assemble the big-end bearing bolts.
- 7) Dismantle the lifting tool and the ring guide.

- 8) The engine is cranked into the same position as when the big-endbearing bolts were loosened.
- 9) The big-end bearing bolts are tightened crosswise to the prescribed torque.
- 10) The auxiliary bolts (pos. 5 - Fig 05-2) are tightened to the prescribed torque.

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**Note!** Prior to starting the engine, the procedure described in chapter 04. is to be followed.

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#### **05.9.4 Dismantling of crosshead carrier and bearing**

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- 1) Place and fasten the piston up side down.
- 2) Remove the locking wire and loosen the bolts (4).
- 3) Dismantle the four carrier nuts.
- 4) By means of a chain block dismantle the connecting rod and crosshead carrier.
- 5) Before further dismantling, mark the unit by a felt pen or similarly. Dismantle the connecting rod.

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**Note!** At the same time the crosshead pin (6) is loosened and may slip out.

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- 6) Dismantle the crosshead pin (6) from the carrier (7). On before-hand, in order to have an easy dismantling, we recommend to whet the land surface for the connecting rod by mean of a whetstone.

## Piston with crosshead bearing

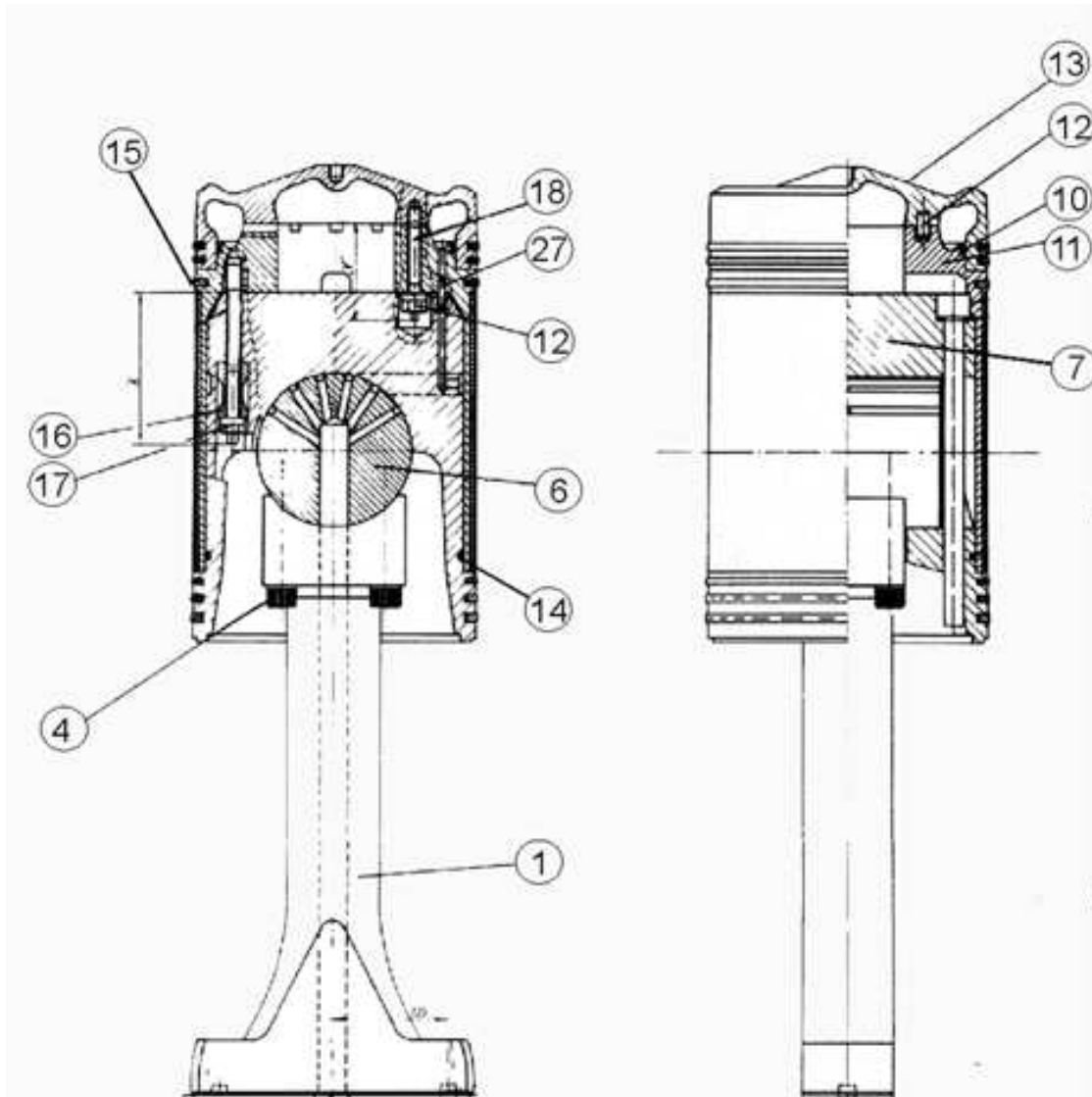


FIG. 05-12

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### 05.9.5 Control of the crosshead bearing and pin

The crosshead bearing and pin are visually controlled. The following items to be inspected:

- Crosshead bearing (crosshead pin and carrier), possible damages on contact faces.
- Carrier, possible cracks.

If no damages found, the parts are ready for assembling.

### 05.9.6 Crosshead bearing assembling

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- 1) Check the cleaning of the parts.
- 2) Oil the crosshead carrier and pin. The pin is mounted according to the felt pen marks.
- 3) Lift the connecting rod in position according to felt pen marks and mount the bolts (4).

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**Note!** Final tightening of the connecting rod to be carried out after assembling the crosshead carrier, see 05.9.10.

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- 4) Tighten the bolts crosswise to 125 Nm.
- 5) Loosen bolts again and tighten crosswise to 60 Nm.
- 6) Further tighten to 250 Nm.
- 7) Secure the bolts by using locking wire  $\varnothing 2$  mm.

### 05.9.7 Piston skirt and crown dismantling

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Before dismantling, the crosshead carrier has to be dismantled

- 1) Dismantle the four nuts (17) for the piston crown (13)
- 2) Normally the connection skirt/crown will be stucked due to the o-ring (11). The parts have to be splitted by means of a suitable square timber and a hammer.

### 05.9.8 Control of piston skirt and crown

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- 1) Clean the parts.
- 2) Inspect the connecting surfaces.
- 3) Inspect the oil cooling chamber and remove the carbon deposit, if any.
- 4) Inspect the combustion surface. remove carbon deposit.
- 5) Replace the o-ring (11)
- 6) Control the length Y for the mounted studs (18). If the length exceeds 97,0 mm, the studs have to be replaced. The studs to be tightened to 40 Nm.

### 05.9.9 Piston skirt and crown assembly

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- 1) Check the cleaning of the parts.
- 2) Assemble the piston skirt and crown. Pay attention to the dowel pin (12).
- 3) Put on the washers (27), grease nut threads and contact faces with Molycote lubricant.
- 4) Tighten the nuts crosswise to 60 Nm.
- 5) Loosen the nuts and tighten crosswise to 20 Nm.
- 6) Further tightening to a twisting angle of 50°, max. 60° of a revolution.

### 05.9.10 Crosshead carrier and piston skirt assembly

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- 1) Control the length X for the mounted studs (15). If the length exceeds 144,5 mm the studs must be replaced. The studs to be tightened to 40 Nm.
- 2) Check the supporting face cleanliness.
- 3) Replace the o-ring (14).
- 4) Assemble the crosshead carrier, bearing and connecting rod to the piston skirt. Pay attention to the dowel pin (12).

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**Note! The assembling has performed well when the marking on the connecting rod and the locking pin in piston ring groove no. 3 is pointing in the same direction.**

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- 5) Final tightening of the connecting rod to be carried out, see 05.9.6 from item 4.
- 6) Put on the distance sleeves (16), grease nut threads and contact surfaces with Molycote lubricant.
- 7) Tighten the nuts crosswise to 60 Nm.
- 8) Loosen the nuts and tighten crosswise to 20 Nm.
- 9) Further tightening to a twisting angle of 110°, max. 120° of a revolution.