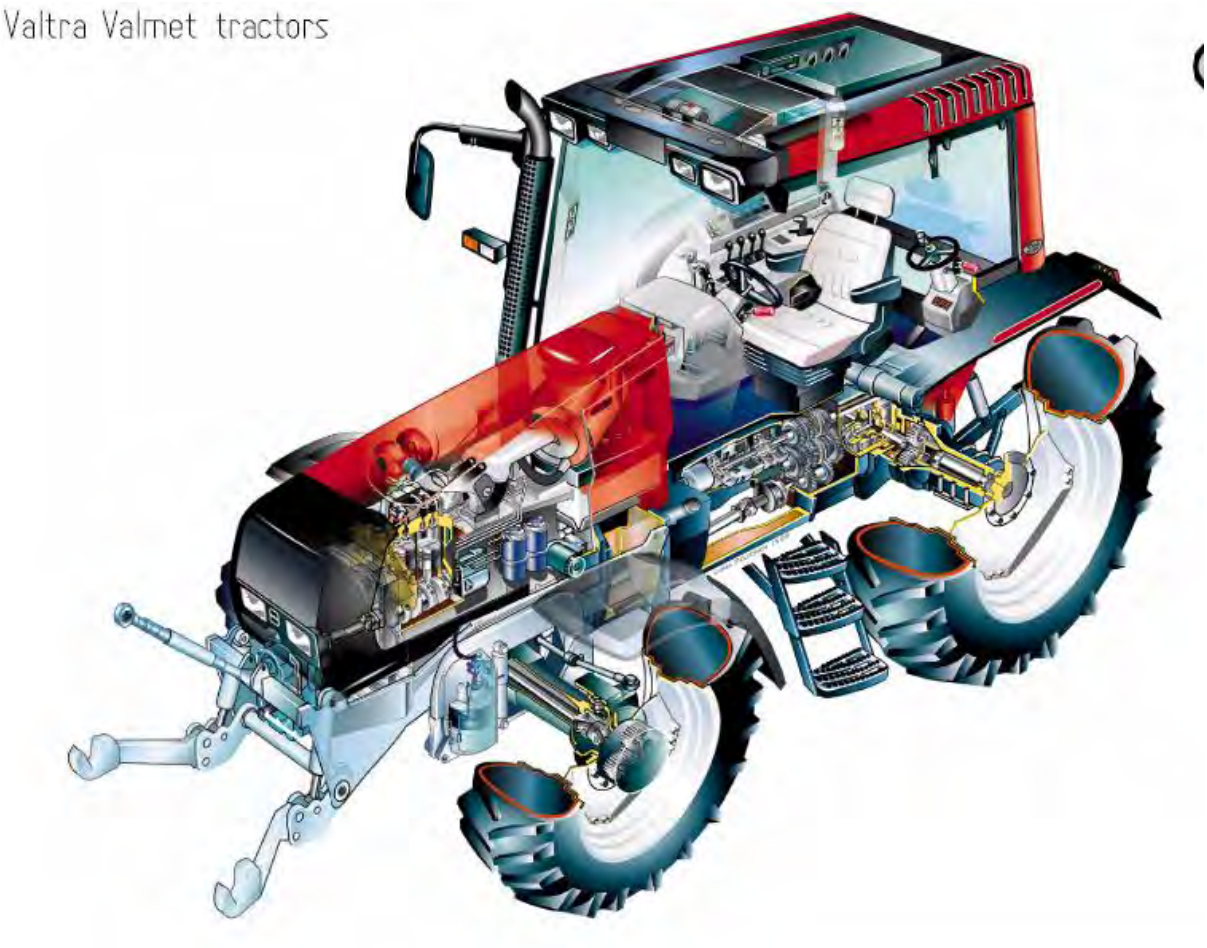
# VALTRA – VALMET

# MEGA MEZZO HI-TEC




# WORKSHOP MANUAL

VALTRA

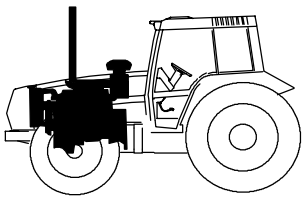
# Service Manual

## Tractors

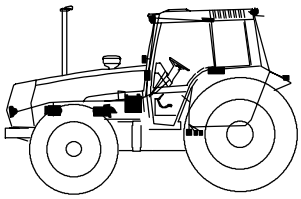
## Groups 10–100

Valtra Inc.
44200 Suolahti, Finland

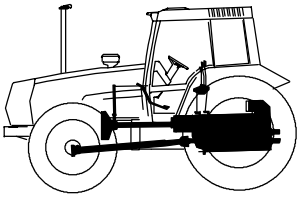

10 General



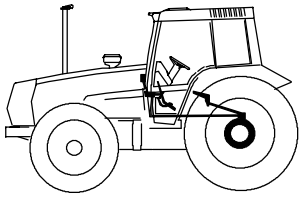
20 Engine



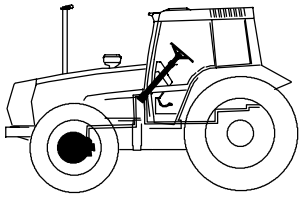
30 Electrical system



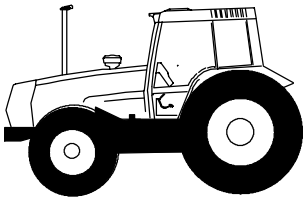
40 Power transmission



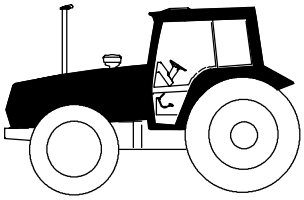
50 Brake system



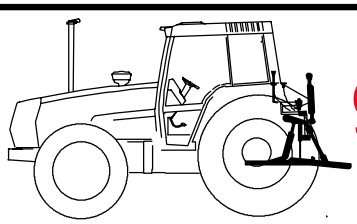
60 Steering system and Front axle



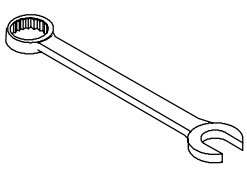
70 Frame and Wheels



80 Cab and Shields



90 Hydraulics



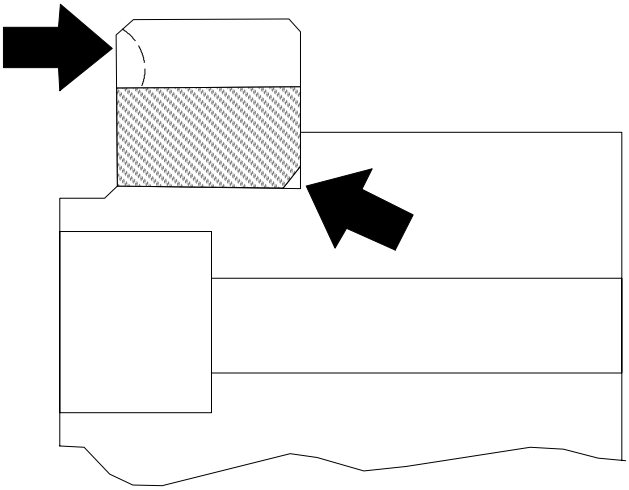
100 Tools

## C. Changing starter ring gear on flywheel

If the ring gear is worn, change it with a new one. The ring gear cannot be turned around because its teeth are chamfered and hardened on the starter motor side.

1. Split the tractor at clutch (see Op **411 1A**). Detach the clutch assembly (and possible turbine clutch) and the flywheel.

1. Detach the earlier ring gear by tapping it with a drift. Clean the ring gear seat on the flywheel with a steel–wire brush.



2. Warm the ring gear to the temperature of **150–200°C**. Fit the ring gear with the inner diameter chamfering turned against the flywheel and the teeth chamfering against the starter motor.

3. Allow the ring gear to cool freely without using any coolant.

## D. Fitting the flywheel

1. Clean the contact surfaces on the crankshaft rear flange and on the flywheel.

2. Fasten the flywheel to the crankshaft rear end. As a guide pins can be used studs (M12, 2 pcs) which are screwed in to the flywheel fixing bolt holes.

**Note!** On the flywheel there is a fuel injection timing mark. Fit the flywheel in the right position according to the guide pins.

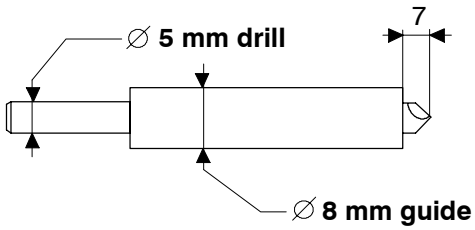
**Note!** In the E–engines there is an injection timing register mark on the flywheel and the flywheel has been positioned with a guide sleeve to the crankshaft.

3. Tighten the flywheel fixing bolts evenly to a torque of **140 Nm** (10.9) or **160 Nm** (12.9).

**Note!** If a flywheel must be changed on the E–engines, an injection timing mark must be made on a new flywheel as follows:

– Rotate the crankshaft so that the piston in the first cylinder is in the top dead centre. Drop a valve down against the piston top. Place a dial gauge stylus against the valve upper end and zero the gauge to the top dead centre. Rotate the crankshaft in the running direction until the dial gauge shows value **4,633 mm** after the top dead centre (420, 620) or **5,307 mm** after the top dead centre (634).

– Drill the injection timing mark in the flywheel with the aid of a drill shown below.



# Cylinder head and valve mechanism (Op no 212)

## 1. Cylinder head

## A. Removing cylinder head

1. Remove the engine hood plates. Clean the engine externally and drain the coolant. Disconnect the coolant hoses from the cylinder head and the thermostat housing.

2. Remove the suction hoses between the turbocharger and the air filter and between the turbocharger and the inlet manifold (turbocharger only on 6100–6600 tractors).

3. Disconnect the turbocharger pressure and return oil pipes.

4. Remove the pipes to the thermostart fuel reservoir.

5. Remove the injector leak–off fuel pipes and the delivery pipes. Remove the injectors. Fit blanking–off caps on all open connections.

6. Remove the inlet and exhaust manifolds and the thermostat housing.

**Note!** It is possible to remove the cylinder head even thought these parts are attached to the head.

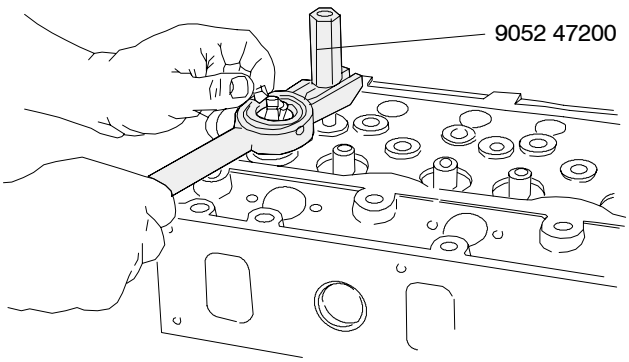
7. Remove the valve cover and the breather hose.

8. Remove the rocker arm mechanism and the push rods.

9. Loosen all the cylinder head bolts first by a 1/4 turn and then remove them. Remove the cylinder head.

## B. Removing valves

Ensure that valves which are to be re–used are marked, so that they are fitted in their original locations.



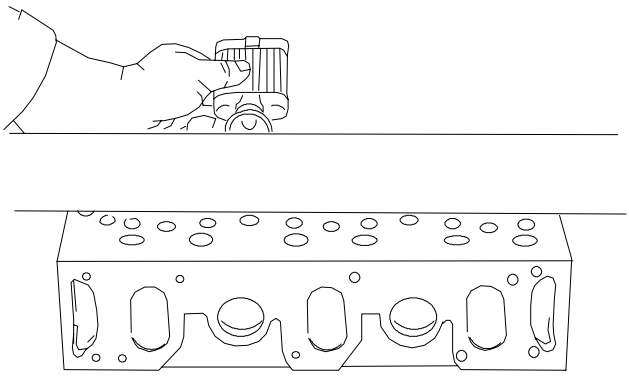

1. Thread the counterhold nuts 9052 47200 onto a screw stud for the rocker arm mechanism. On the 320–, and 620–engines there is not a screw stud at the valves for the centre cylinder. A bolt of suitable length should be used instead.

2. Compress the valve springs using lever 9101 66200. Remove the valve cotters, spring guide and spring. Remove the valves.

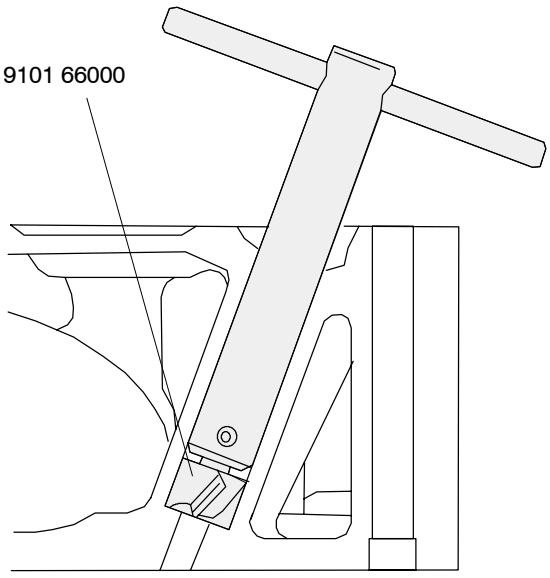
## C. Checking cylinder head

1. Remove carbon deposits from the exhaust ports, clean the sealing surfaces and wash the cylinder head.

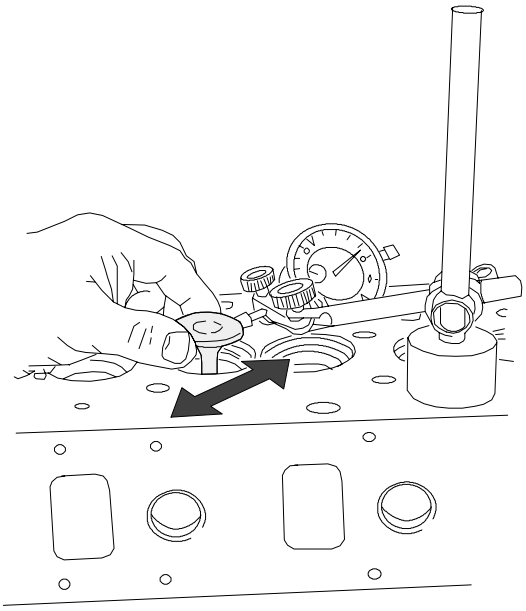
2. Check for cracks and other damage.



3. Check the flatness of the cylinder head by using a straight edge. An uneven or warped surface should be surface ground. The height of the cylinder head, after grinding, should not be less than **104,00 mm**. The valve disc depth from the cylinder head surface should be **0,60 mm** for the exhaust valves and **0,70 mm** for the inlet valves.

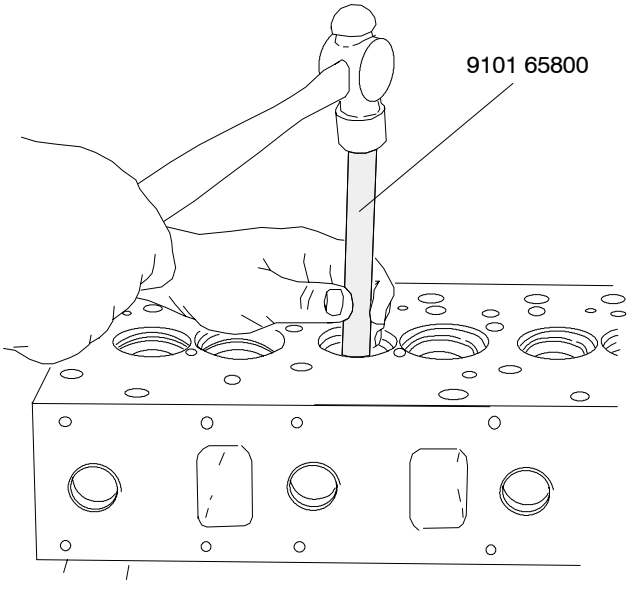



4. Straighten and clean the injector location seat in the cylinder head with cutter 9101 66000.



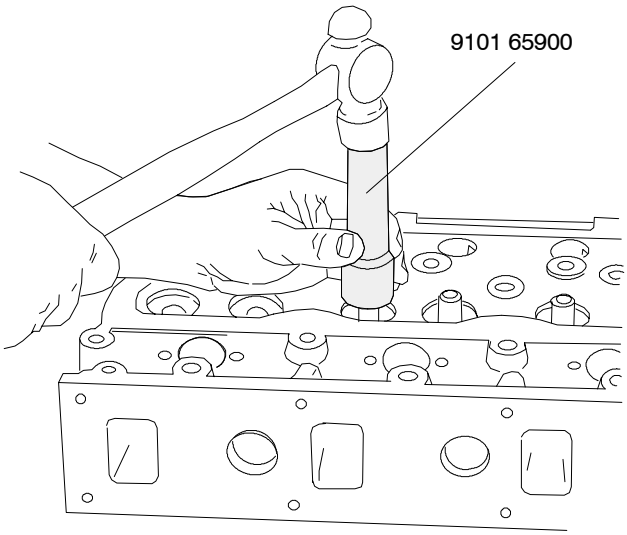
5. Measure the clearance between the valve stem and the valve guide with a dial gauge. Lift the valve so that the valve head is 15 mm from the face of the cylinder head, and measure the clearance. It must not be greater than **0,30 mm** for the inlet valves and **0,35 mm** for the exhaust valves. In order to establish the valve guide wear, a new valve should be used when measuring.

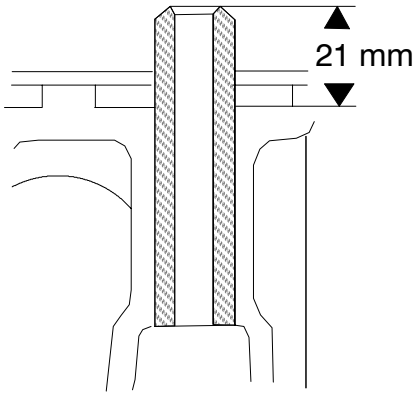
## D. Changing valve guides




1. Press or knock out the old guides using drift 9101 65800. Clean the valve guide locations.

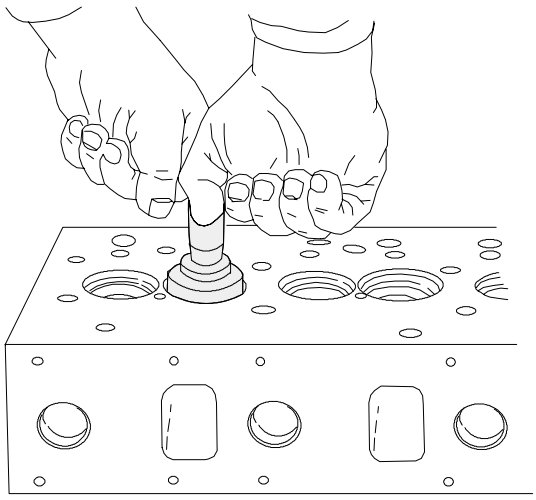
2. Lubricate the outside of the new guides and fit them using drift 9101 65900, which ensures the correct fitting height (**21 mm** over the spring face)




3. The guides are the same for the inlet and exhaust valves. Ensure that the steepest chamfer on the guide, faces the valve head. Check that the valves do not bind in the guides.

## E. Machining valve seat



Machine the damaged valve seat with milling cutter (see page 210/10). If the width of the seat exceeds **2,3 mm** in exhaust and **3,7 mm** in intake, it should be reduced primarily at the outer edge.

The valve seat angle is **45°+20'** for exhaust valve and **35°+20'** for inlet valve.

## F. Changing valve seat inserts

Exhaust valves are fitted with separate valve seat inserts. If the sealing surface is damaged so badly that it cannot be repaired with machining, the seat inserts should be changed.

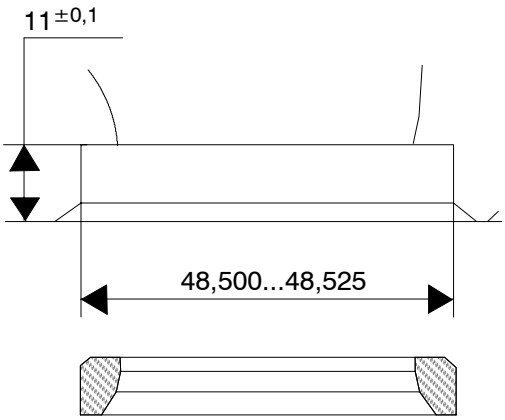
1. Grind the valve head on a discarded valve so that it sits down in the valve seat. Fit the valve and weld it in place in the seat. Cool with water.

2. Turn the cylinder head over and knock out the valve and seat.

3. Clean the valve seat location. Cool the new seat in liquid nitrogen until it stops bubbling, or alternatively place it in dry ice.

4. Fit the seat with a suitable drift. Machine the seat.

**N.B.** Where necessary, standard size seats can be replaced by inserts with a larger outer diameter. See Specifications.

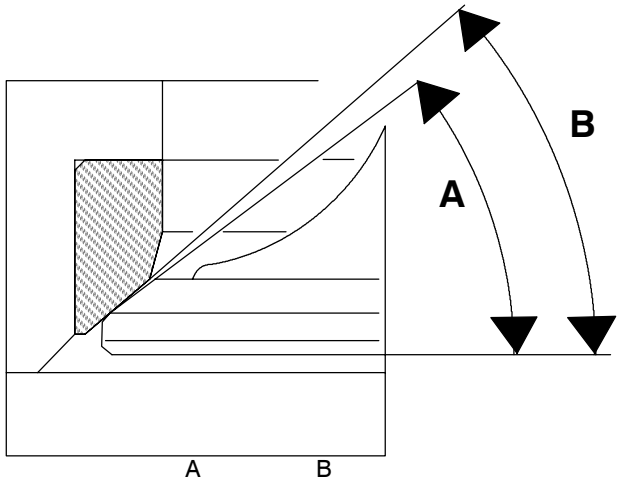



The inlet valve seat machined direct on the cylinder head, can be provided with a separate valve seat insert, order no 8366 47936. Machine the seat insert location on the cylinder head (see figure above). Fit the insert like a seat of the exhaust valve.

**Note!** Engines on tractors 8550 and 8750 have the valve seat inserts also on the inlet valves. From March 96 these cylinder heads have been marked with letter V, which is stamped on the cylinder head front upper surface on the exhaust side. As a spare part these heads can be fitted on all engines. The V–marked cylinder heads are also available for the 4–cylinder engines.

## G. Grinding valves

In order to ensure that there is a proper seal around the valves, there is a difference in the sealing surface angles. Thus there is a very narrow sealing surface which seals effectively even after prolonged running.




| | A | B |
|---|---|---|
| INLET | 35° –20' | 35° +20' |
| EXHAUST | 45° –20' | 45° +20' |

1. Grind the damaged valve disc with a valve refacer. Adjust angles to **45° –20'** for exhaust valves and **35° –20'** for inlet valves.

2. If the edge of the valve head is less than **1,5 mm** after it has been ground, or if the valve stem is bent, the valve should be discarded.

3. If necessary, grind the end of the valve stem.

4. Lap the valves with lapping paste and check the contact surface with marking paint.

5. Clean the cylinder head and valves of any remaining lapping paste.

## H. Fitting valves

1. Check the valve springs for straightness, length and tension using a spring tester. Compare with specifications.

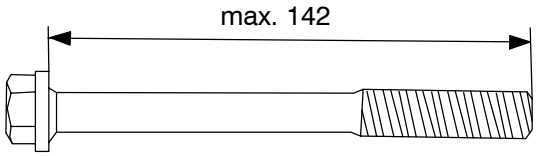
2. Lubricate the valve stems and fit the valves in the correct order in the cylinder.

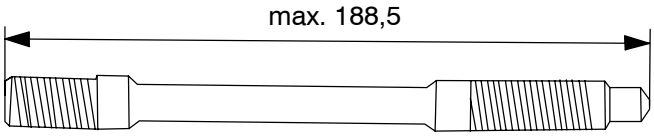
3. Fit the springs, spring guides and valve keepers with the aid of a lever for compressing valve springs, 9101 66200.

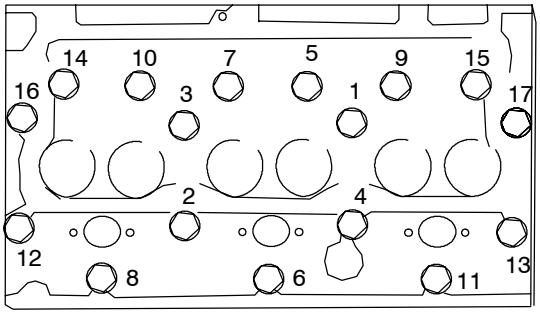
4. Tap the end of the valve stems lightly after fitting the valve in order to ensure that they are secure.

## I. Fitting cylinder head

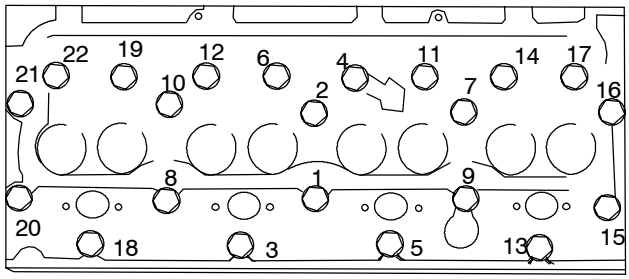
1. Measure the length of the cylinder head bolts. Compare with dimensions shown in figure below. Change too long bolts.




**320, 620, 634**




**420**

2. Screw the cylinder head stud bolts in to the cylinder block to a torque of **30 Nm**. Fit the valve tappets if removed.

3. Check that the sealing surfaces are clean and fit the cylinder head gasket(s) and the cylinder head(s). Ensure that on the six cylinder engines both cylinder heads are parallel by fastening lighty the exhaust manifold before tightening the cylinder head bolts (the exhaust manifold can damage, if the heads are not parallel). Clean and lubricate and fit the bolts.

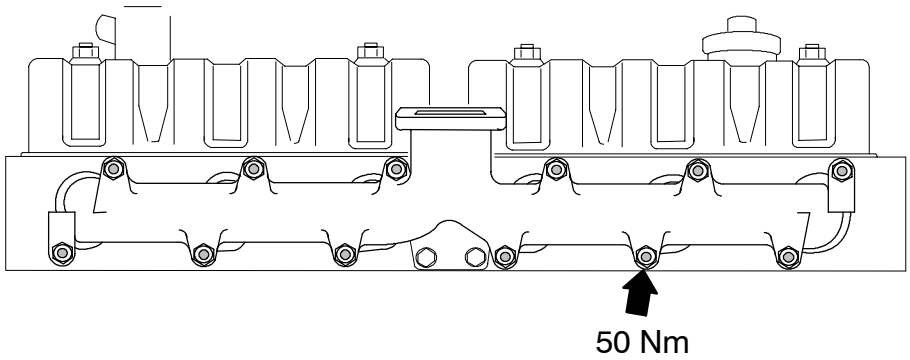
**Note!** The cylinder head gasket order numbers are 8366 46351 (320/620/634) and 8367 46354 (420).

4. Pictures above show the correct tightening order of the cylinder head bolts. The order has also been marked on the cylinder heads.

5. Tighten the cylinder head bolts progressively as follows:

**1. First tightening to 80 Nm**
**2. Tightening of 90˚**
**3. Tightening of 90˚**
**4. Adjust valve clearances**
**5. Warm engine up to normal operating temperature with light loading (approx. +75˚C)**
**6. Tightening of 60˚. Adjust valves.**

Tighten the exhaust manifold bolts/nuts to **50 Nm**. DO NOT OVERTIGHTEN.

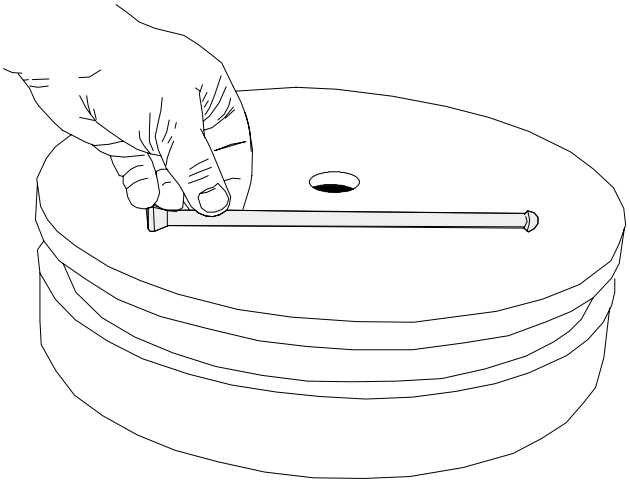



**Note!** On the six–cylinder engines the exhaust manifolds must always be fastened with new, thinner stud bolts and self–locking nuts (in the tractor production: F12761–). In the tractor production and in the spare parts the material of the exhaust manifolds (six–cylinder engines) has been changed into new type (6900, 8000–8200: **H01722–**. 8400, 8050–8750: **H01169–**).

# 2. Valve mechanism

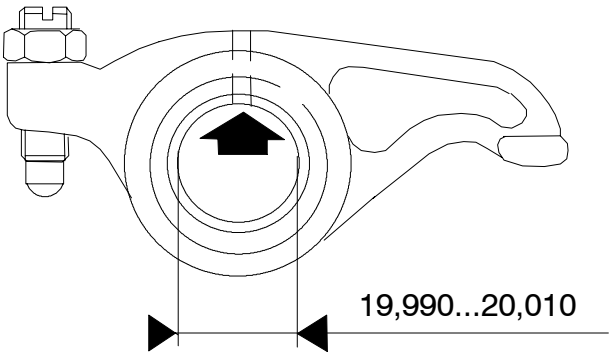
## A. Reconditioning rocker arm mechanism

1. Check the valve tappets, especially the contact surface against the camshaft. Worn or damaged tappets should be discarded.

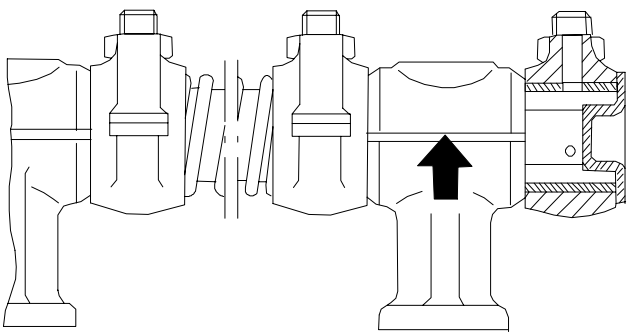


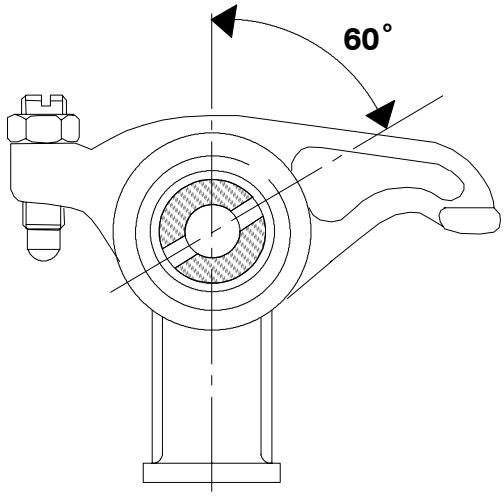
2. Check the straightness of the pushrods by rolling them on a surface table. Check also the spherical surfaces at the ends.

3. Dismantle and clean the rocker arm mechanism. Check the shaft for wear and that the oilways are clean.




4. Check that the rocker arm bushings are not worn. Ensure that the oil hole is positioned correctly when pressing in new bushings. After pressing in the bushings they should be reamed to **19,990–20,010 mm**. Where necessary grind the rocker arm valve contact surface to the correct shape. Do not grind more than necessary as the hardened layer is thin.






5. Fit the plug to the other end of the rocker arm shaft. Lubricate the shaft and fit various parts in a correct order. Note the correct position of the shaft and the bearing brackets. The split side of the bracket and the shaft oil holes must be turned to the valve side (see figure above). Fit the other end plug.

## B. Changing camshaft/camshaft gear

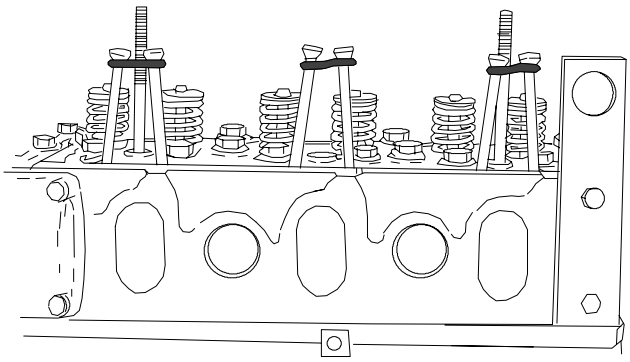
1. Remove the inlet pipe between the turbocharger and the induction manifold. Remove the valve cover and the breather pipe. Remove the rocker arm mechanism.

2. Remove the radiator, cooling fan, alternator and the v–belt.

3. Remove the crankshaft nut. Remove the V–belt pulley including the hub (on 620–engines the belt pulley must be removed first).

4. Remove the timing gear casing cover (engine front cover).

5. Connect the pushrods in pairs, using o–rings or elastic bands to prevent them from falling through.



**Note!** Do not connect the pushrods too tightly as this might cause them to bend or snap.

6. Crank the engine until the aligning marks on the idler gear and camshaft gear are facing each other. Extract the camshaft.

7. Separate the camshaft from the gear wheel using a press or suitable drift.

8. Clean the parts which are to be refitted.

9. Fit the key in its groove. Heat the camshaft gear to 200°C in an oven and fit it on the shaft.

10. Lubricate bearing surfaces and lobes and insert the shaft in the cylinder block. Ensure that the aligning marks on the gears agree.

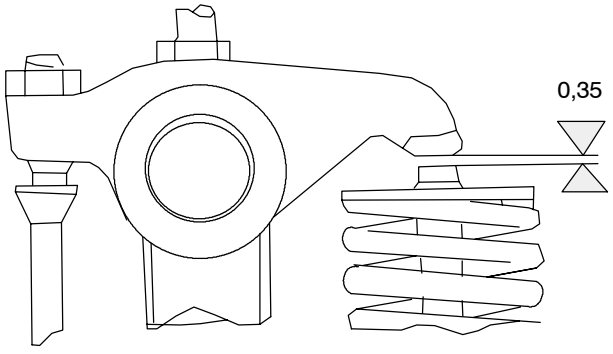
11. Fit the timing gear casing cover and the crankshaft V–belt pulley and hub.

12. Free the pushrods and fit the rocker arm mechanism. Adjust the valves. Fit the valve cover and the breather pipe and the inlet pipe between the turbocharger and the induction manifold.

13. Fit the alternator. Fit the fan and the fan belt. Fit the radiator.

## C. Adjusting valves

**Note!** Valmet 6400 DW, 6800 DWI and 8450 DW tractors have a by–pass turbo. The adjusting rod of this turbo should be released before removing the valve cover. Detach the front end joint of the rod. Do not detach the rod rear end from the membrane box since then the by–pass passage opening pressure changes. Before adjustment, also remove the silencer, fan space protective frame (if fitted), radiator support iron in the upper part and the boost pipe (if fitted), after which the valve covers can be removed.




The valve clearance, which can be adjusted on a hot or cold engine, is **0,35 mm** for both inlet and exhaust valves. The clearance is adjusted when the respective piston is at T.D.C. in the compression stroke. The valves for the different cylinders are adjusted in the same sequence as the order of injection.

– slacken the lock nut of the adjusting screw
– measure clearance with a feeler gauge. The clearance is correct when a **0,35 mm** feeler gauge is slightly tight–fitted between the rocker arm and the valve stem end. Adjust clearance by rotating the adjusting screw.
– tighten the locking nut and check the clearance

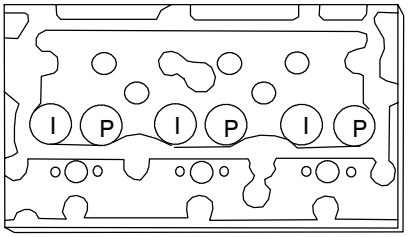
**320–engines**
Check the valve clearances in the injection order of the engine. Injection order is 1–2–3.
– check valves in the 1st cylinder, when the exhaust valve of no. 3 cylinder is completely open (valve no. 6)
– check valves in the 2nd cylinder, when the exhaust valve of no. 1 cylinder is completely open (valve no. 2).
– check valves in the 3rd cylinder, when the exhaust valve of no. 2 cylinder is completely open (valve no. 4).

**420–engines**
– rotate the crankshaft in the running direction until the valves in the 4th cylinder are rocking (exhaust closes, inlet opens). Check the valve clearance of the 1st cylinder
– Rotate the crankshaft by 1/2 of a turn in the running direction so that valves in the 3rd cylinder are rocking. Check valves in the 2nd cylinder
– continue according to the order of injection:

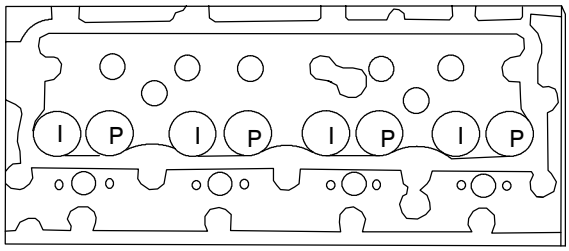
| | |
|---|---|
| Injection order | 1 2 4 3 |
| Valves rock in cyl. no | 4 3 1 2 |

**620–engines**
– rotate the crankshaft in the running direction until the valves in the 6th cylinder are rocking (exhaust closes, inlet opens). Check the valve clearance of the 1st cylinder
– rotate the crankshaft by 1/3 of a turn in the running direction so that valves in the 2nd cylinder are rocking. Check valves in the 5th cylinder
–continue according to the order of injection:

| | |
|---|---|
| Injection order | 1 5 3 6 2 4 |
| Valves rock in cyl. no | 6 2 4 1 5 3 |




320, 620, 634




420

I=inlet P=exhaust

**Note!** With effect from engine serial no. **C6828**, the support strips have been added onto the valve covers. These strips prevent the gasket from moving inwards. At the same time the cover manufacturing accurancy has been improved. Spare part numbers of the covers do not change.

# Crank mechanism (Op. no 213)

## 1. Crankshaft

## A. Removing crankshaft

1. Split the tractor at the clutch, remove the clutch assembly (and possible turbine clutch) and the flywheel. Remove the engine (see also page **219**/**1**).

2. Disconnect the balancing unit lubricating oil pipe from the cylinder block and unscrew the balancing unit fixing bolts. Remove the balancing unit and the lubricating oil pipe (only 420–engines).

3. Unscrew the lubricating oil pump pressure pipe fixing screws from the cylinder block. Remove the oil pump and the suction and pressure pipes.

4. Remove the flywheel housing.

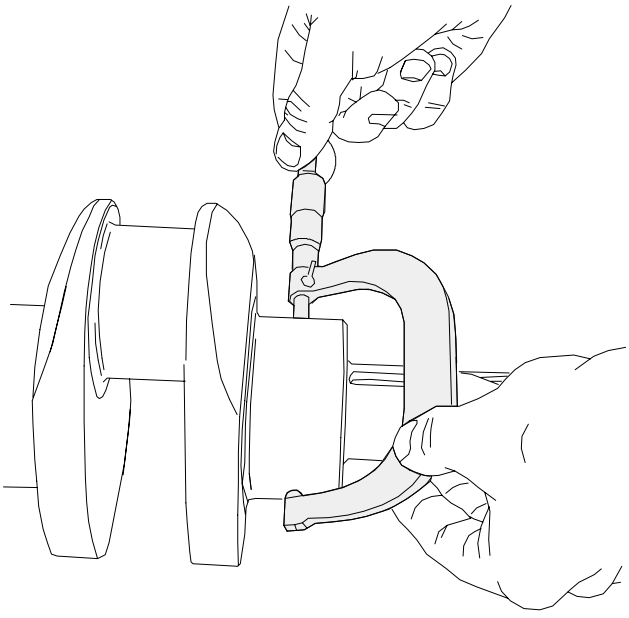
5. Detach the belt pulley/hub from the crankshaft front end (see instr. timing gears).

6. Remove the connecting rod bearing caps and push the connecting rods out of the way of the crankshaft.

7. Remove the main bearing caps and lift out the crankshaft.

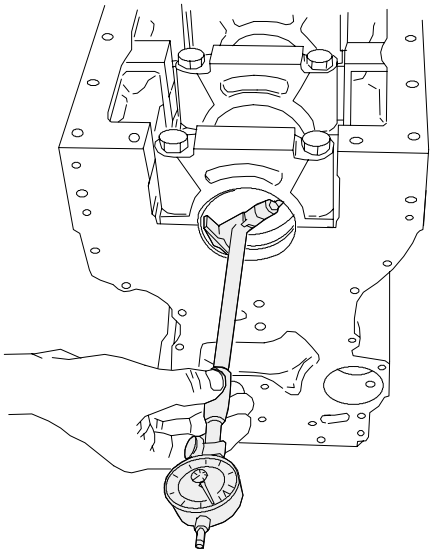
## B. Checking crankshaft

1. Clean the crankshaft. Do not forget the oilways.



2. Measure the journal wear in several points. Out–of–round, taper or other wear must not exceed **0,03 mm**.

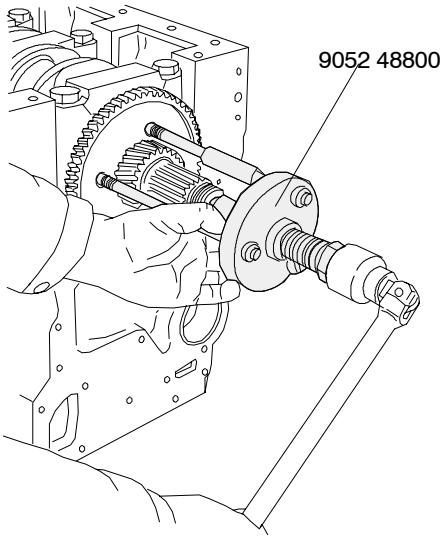
3. Refit the bearing caps with new bearing shells and tighten them to the correct torque. Measure the I.D. with a dial gauge which has been zeroed to the dimensions obtained in point 2. With this method the indicator shows the actual bearing clearance. Measure in several points in case the worn bearing housing is not round.



4. If the bearing clearance exceeds **0,18 mm** for main bearings or **0,14 mm** for connecting rod big–end bearings with new bearing shells, the bearing journals on the crankshaft should be ground. Refer to the specifications for the relevant correct undersize and the corresponding bearings. Ensure that the radii are not changed when grinding.

**Note!** Main bearings are available, which are 1,0 mm oversize (outer diameter) and 0,5 mm undersize (inner diameter). The cylinder block must then be machined to a dimension of 92,000–92,025 mm. The crankshaft must be machined to a dimension of 84,485–84,520 mm. The bearing shell with a hole and an oil groove must be fitted to the cylinder block and the other shell to the bearing cap.

## C. Changing crankshaft gears

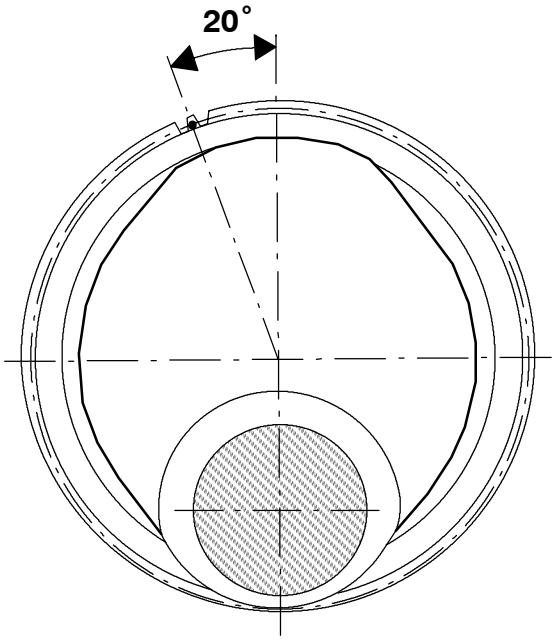



1. Apply puller for the crankshaft gears and pull off both gears.

2. Clean the seat on the crankshaft with, for example, a wire brush.

3. Heat the new gears to **200° C**. Tap them onto the shaft with a suitable sleeve or soft drift. Note the position of the key and ensure that the aligning marks on the front gear are visible. Leave it to cool.

## D. Changing camshaft ring gear (420–engines only)




1. Mark the position of the ring gear on the shaft.

2. Heat the ring gear with a welding torch and drive it off using a suitable drift.

3. Heat the new ring gear to max. **250°C**. Fit the ring gear with the chamfer facing the crankshaft flange, and with the teeth according to markings or according to figure above. Tap the ring gear down and leave it to cool.

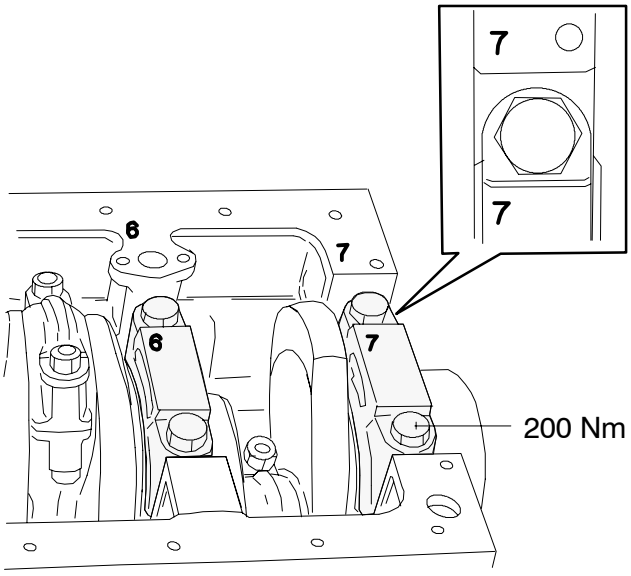
**Note!** The figure above shows a rear view of the crankshaft and no 2 cylinder big end bearing journal.

## E. Fitting crankshaft

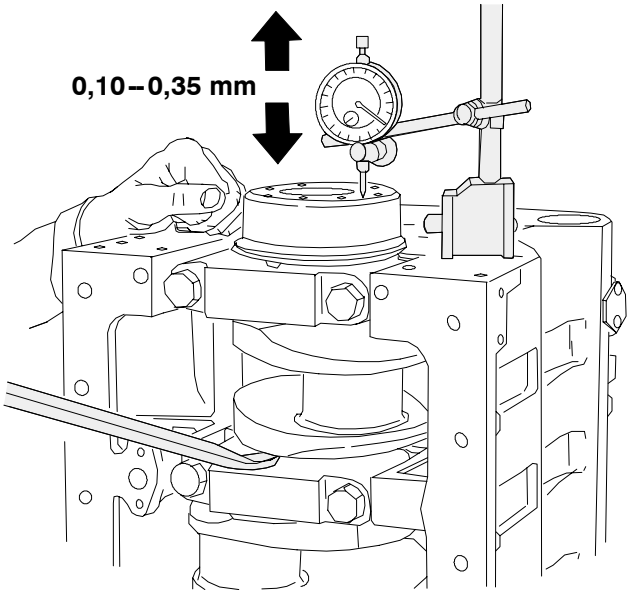
1. Clean the oilways, bearing shells and bearing locations. Check that the crankshaft is clean.

2. Fit the bearing shells into the cylinder block and the bearing caps. Ensure that the bearing shell clamping claws fit into their notches and that the shells to be fitted in the cylinder block have a hole coinciding with the oil port.

3. Lubricate the bearing surfaces and fit the crankshaft. Fit the crankshaft thrust bearings with the lubricating grooves facing the crankshaft.




4. Fit the main bearing caps according to their numbering, the rear with thrust bearings provided with guide lugs. Lubricate the bolts and tighten them to **200 Nm**.




5. Check that the crankshaft can rotate without binding. Check the end float using a dial gauge. The correct end float is **0,10–0,35 mm**. If the end float is too large, oversize thrust bearings should be fitted.

**Note!** Bearing shells should never be reamed or machined in any other way, nor should the sides of the bearing caps be filed

# 2. Connecting rods and pistons

## A. Removing pistons together with connecting rods

**Note!** Pistons and connecting rods can be removed from the engine when the engine is attached to the tractor by removing the front axle and the oil sump (see page **219**/**1**).

1. Detach the engine and the lubricating oil pressure and suction pipes.

2. Detach the cylinder head.

3. Scrape off the carbon edge in the cylinder liner. If the turning edge is clearly marked, smooth it down carefully with a scraper.

4. Remove the big–end bearing caps and bearing shells. Place the shells in order if they are to be re–used.

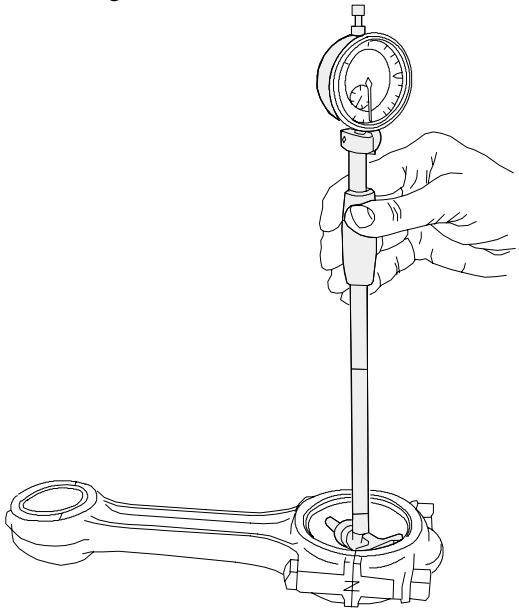
5. Push up the piston and connecting rod with the shaft of a hammer or similar wooden tool.

6. Remove the piston pin snap rings. Push out the pin.

**Note!** If the piston pin does not move under thumb pressure the piston should be heated to **100°C**.

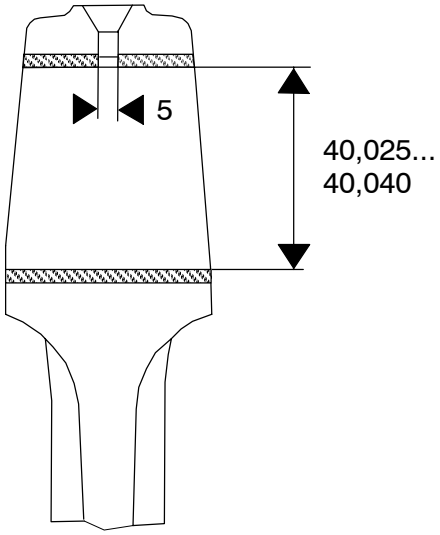
## B. Changing connecting rod bearings

1. Clean the connecting rod and bearing shells. Fit them together and tighten the bolts to **40 Nm+90°**.



2. Measure the I.D. using a cylinder gauge which has been zeroed to the diameter of the respective bearing journal. If the clearance exceeds **0,14 mm** with new bearing shells, the big–end journals require grinding. Refer to the specifications for the correct undersize and the corresponding bearing. Ensure that the radii at the end of the bearing journals is not altered when grinding.

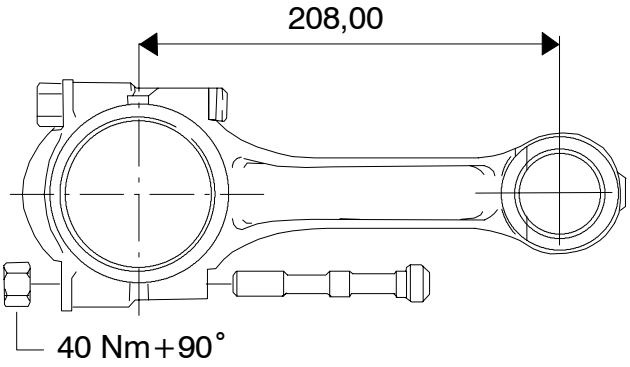
3. If the piston pin bushing is worn, it should be driven out using a suitable drift.




4. Drive in the new bushing and ensure that the oil hole is in the correct position. Ream the bushing to **40.025–40.040 mm** after it is fitted.

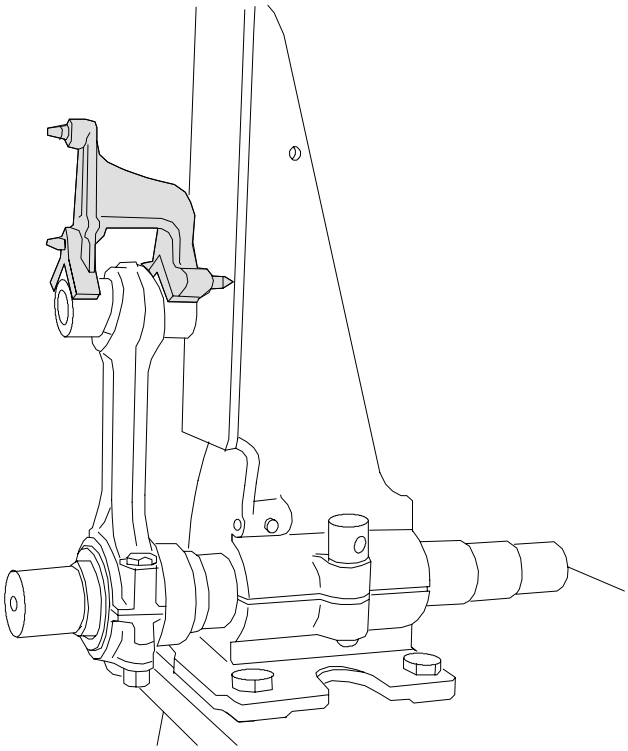
## C. Checking connecting rod

The connecting rod is checked in a special fixture, intended for the purpose (e.g. Carl Larsson).

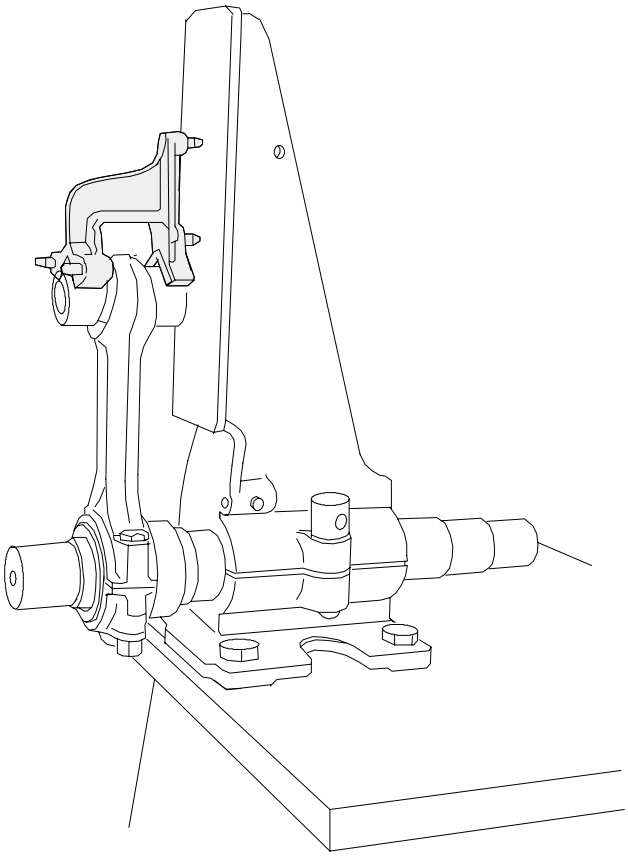



1. Fit the big–end bearing caps and tighten the bolts to **40 Nm+90°**.

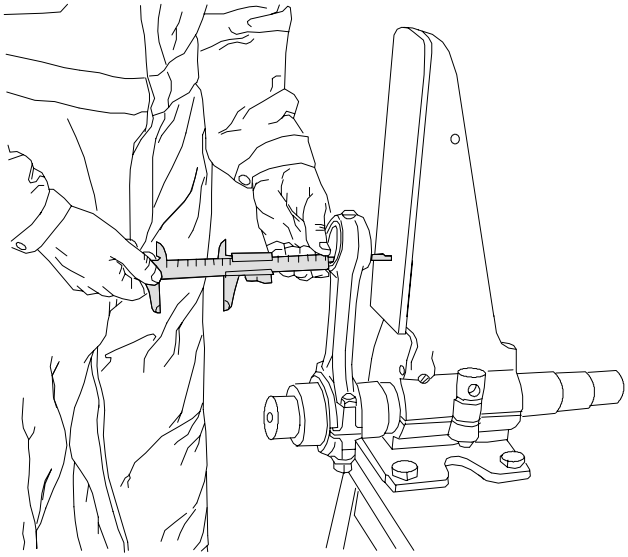
2. Fit the connecting rod in the fixture and fit the piston pin which corresponds to that connecting rod.



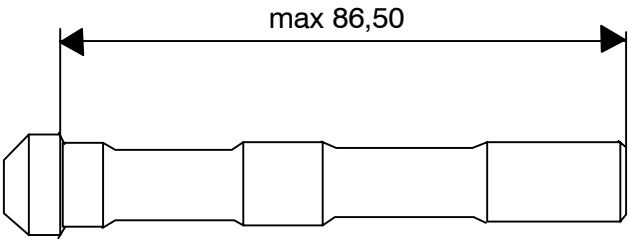
3. Check that the connecting rod is not twisted by positioning the measuring tool with the horizontally placed measuring points against the face of the fixture.



4. Turn the measuring tool round with the vertically placed measuring points against the face, and check the straightness of the connecting rod



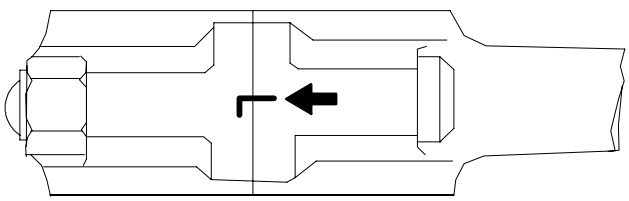
5. Also check the S – bending of the connecting rod by using sliding calipers to measure the distance between the edge of the small – end bearing bushing and the face of the fixture. turn the connecting rod round so that the other side of the connecting rod faces the fixture. Then measure the same distance. The accepted deviation is **0,6 mm**.




6. Measure the length of the connecting rod bolts. The length should be max 86,50 mm. If the bolt is longer, change it with a new one. It is recommended that the bolts are always changed when they are unscrewed.

## D. Connecting rod weight classes

The connecting rods are divided into weight classes with intervals of **20 g**. The weight class (a letter) is stamped on the side face of the connecting rod. All the connecting rods in one engine should be of the same weight class, that is to say the greatest permissible weight difference is **20 g**.



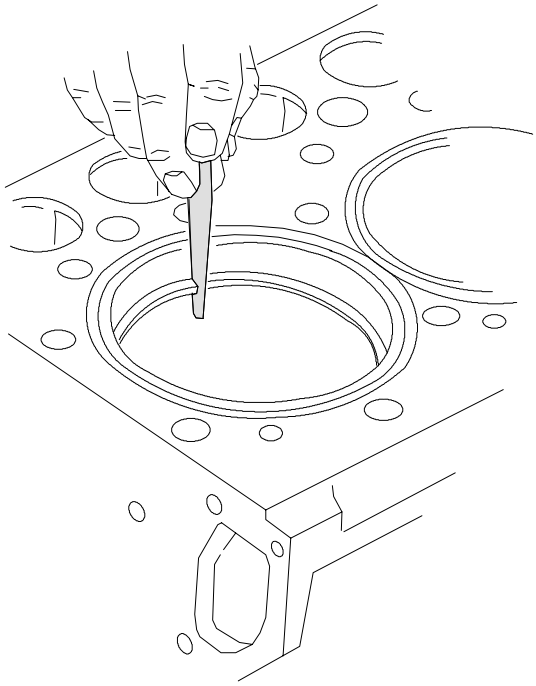
The letters show the weight classes as follows:

| | Weight | Part no |
|---|---|---|
| **A** | 2170–2189 g | 8366 52104 |
| **B** | 2190–2209 g | 8366 52105 |
| **C** | 2210–2229 g | 8366 52106 |
| **D** | 2230–2249 g | 8366 52107 |
| **E** | 2250–2269 g | 8366 52108 |
| **H** | 2270–2289 g | 8366 52109 |
| **I** | 2290–2309 g | 8366 52110 |
| **J** | 2310–2329 g | 8366 52111 |
| **K** | 2330–2349 g | 8366 52112 |
| **L** | 2350–2369 g | 8366 52113 |
| **M** | 2370–2389 g | 8366 52114 |
| **N** | 2390–2409 g | 8366 52115 |
| **O** | 2410–2429 g | 8366 52116 |
| **P** | 2430–2449 g | 8366 52117 |
| **R** | 2450–2469 g | 8366 52118 |
| **S** | 2470–2489 g | 8366 52119 |
| **T** | 2490–2509 g | 8366 52120 |
| **U** | 2510–2529 g | 8366 52121 |

## E. Changing piston rings

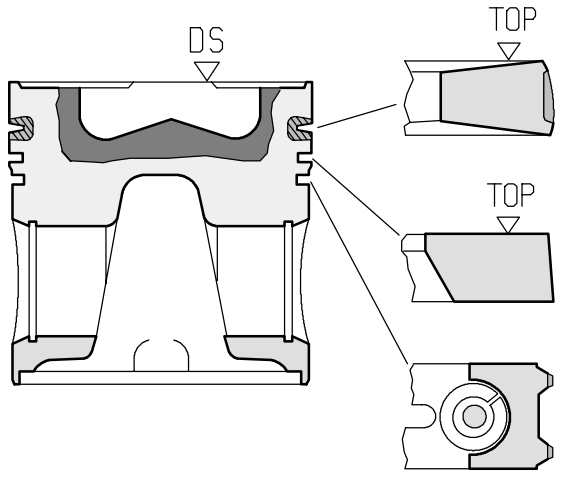
1. Remove the piston rings with piston ring pliers. Do not open the rings more than necessary. If the rings are to be used again ensure that they are fitted in the same groove.

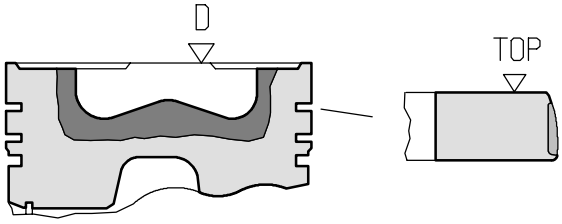
2. Clean the piston ring groove and measure the piston ring clearance, which must not exceed **0,15 mm**. Determine whether too large a clearance is due to worn rings or a worn groove. Change worn parts.



3. Measure the piston ring gap by pushing one piston ring at a time into the cylinder bore. The piston ring gap must not exceed **1 mm** on 1. and 3. piston rings and **1,5 mm** on 2. piston ring.

4. Fit the piston rings on the piston using the piston ring pliers. Ensure that the rings are fitted in the correct groove and that "TOP", or the manufacturer's designation, faces upwards.

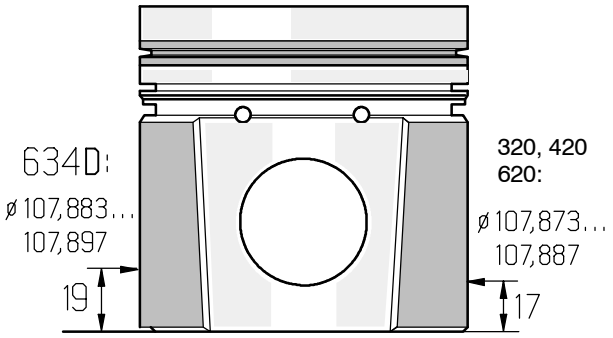



**Note!** The uppermost ring is square on tractors 6000, 6200, 6300, 8000R, 8000, 8100, 8050 and 8150. The uppermost ring is wedge–shaped on tractors 6100, 6400, 6600, 6800, 8200, 8400, 8450, 8550, 8750.

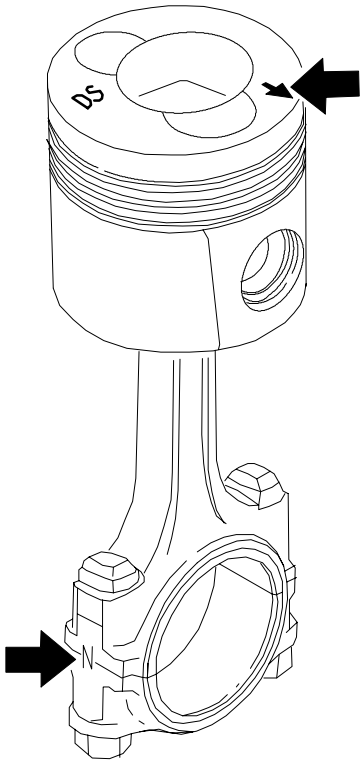
## F. Checking pistons

Check the condition of the pistons and piston pins. Pay special attention to possible cracks on the edge of the combustion chamber and on the upper edge of the piston pin hole. Measure the diameter of the piston at the point shown in the figure below. Renew a piston if needed.




## G. Fitting piston pin

1. Place the connecting rod inside the piston and push the piston pin into place.



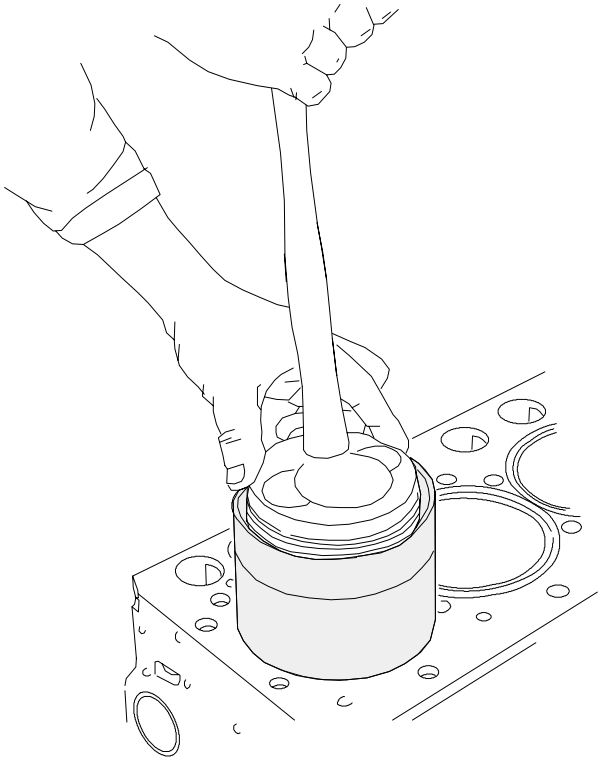

**Note!** The combustion chamber and the weight class letter should be on opposite sides!

2. Fit the piston pin circlips. Ensure the the circlips are pressed correctly into the grooves. The circlip ends must point upwards.

## H. Fitting piston together with connecting rod.

1. Check that the bearing locations are clean and place the bearing shells in the connecting rod and bearing cap. Note the position of the bearing shells.

2. Lubricate piston, rings and cylinder bore. Ensure that the piston ring gaps are spread around the piston.



3. Fit the piston with the marking on the connecting rod (weight class) facing the camshaft (an arrow on the piston must point forward).

4. Lubricate the big–end bearing journal and bearing shells, and push the piston down. Fit the bearing cap so that the notches for the guide lugs are in the same side. Tighten the connecting rod bolts to **40 Nm+90°**.

5. Check that the connecting rod has sufficient end float on the big–end bearing journal.

# 3. Balancer unit, 420–engines

## A. Removing and dismantling balancer unit

1. Remove the engine (**Note!** The balancer unit can also be detached when the engine is attached to the tractor. In this case, remove the front axle and the oil sump, see also page **219/1**).

2. Disconnect the lubricating oil pipe of the balancer unit.

3. Remove the balancer unit. Take care of any shims.

4. Loosen the locking screws and press out the shafts in the direction of the locking screws. Remove the counterweights and thrust washers.

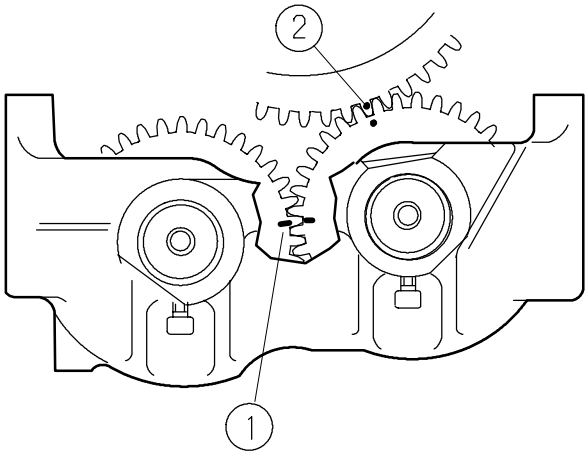
5. Clean all parts.

## B. Reconditioning balancer unit

Check the shafts, gear wheels and bushings for wear and damage.

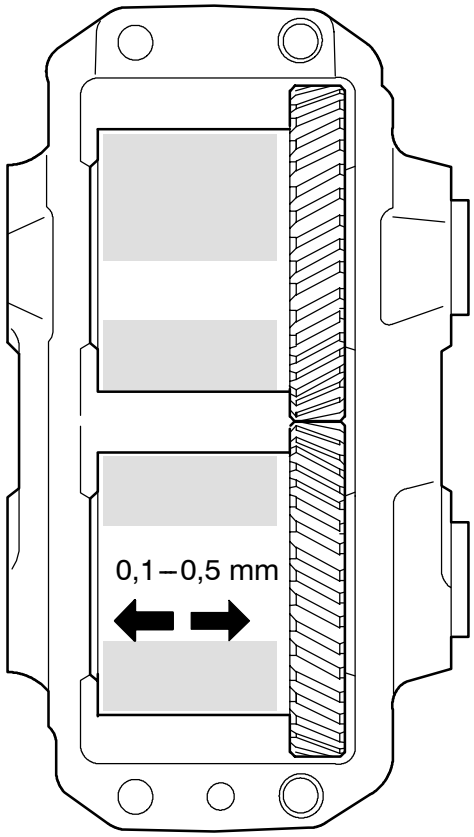
1. If one of the gear wheels is damaged, change both counter weights as a complete unit. The gear wheels are not available separately as a spare part.

2. Remove, if necessary, the old bearing bushings with a suitable drift. Before removing them, mark the position of the bushing oil groove on the counter weigh. Press in new bushings in the correct position. After fitting the bushings should be reamed to a correct dimension, see Specifications.




1. Synchronization marking (notch)
2. Marking against crankshaft (punch mark)

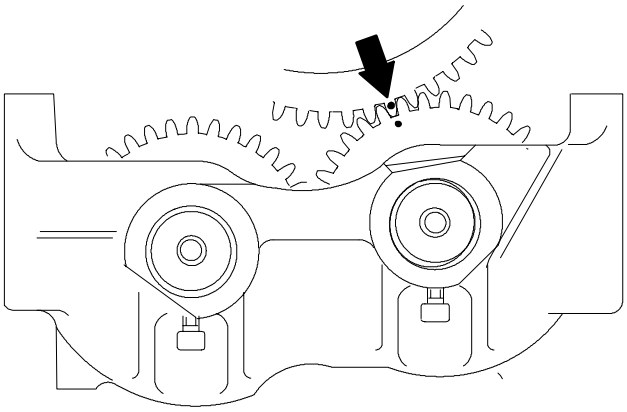
4. Place the weights in the body, observing the notch markings. The gear wheel with the punch mark runs against the crankshaft and should therefore be placed highest. Insert the shafts, remembering the thrust bearings. Apply thread lock fluid Loctite 270 to the locking screws, and lock the shafts.




4. Check that the tooth backlash is **0,05–0,25 mm** and that the end float is **0,1–0,5 mm**

## C. Fitting balancer unit

1. Fit the tension pins in the balancer unit body.



2. Turn the crankshaft and weights so that the markings agree, and lift the unit into place.

3. Tighten the bolts to **60 Nm**. Check that the tooth backlash between the crankshaft and counterweight is **0,1 – 0,3 mm**. The backlash can be increased by placing shims 0,2 mm thick (order no 8361 19920) between the cylinder block and balancer unit body. One shims (0,2 mm) changes tooth backlash about 0,07 mm.

4. Fit the lubricating oil pipe, using new seals.

5. Fit the engine.

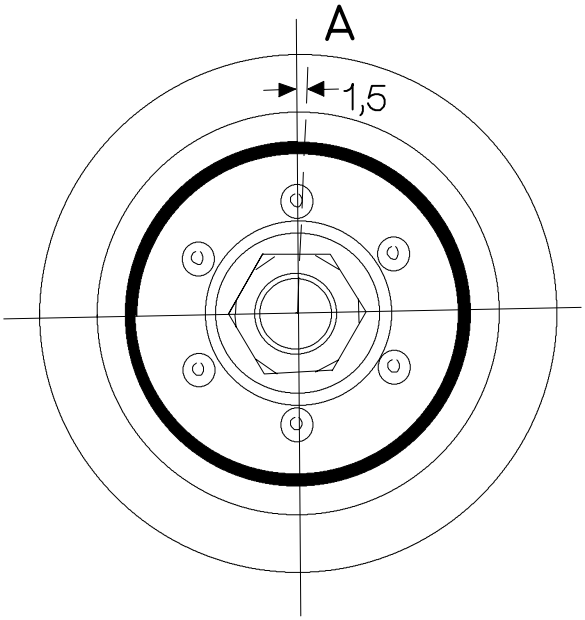
# 4. Rubber vibrations damper on 8000R, 8000, 8100, 8400 and 8050–8150

The outer circumference of the vibration damper (belt pulley) no 8368 46440 can twist in relation to the hub. For this reason alignment marks have been added to the damper front face, which indicate the possible twisting.

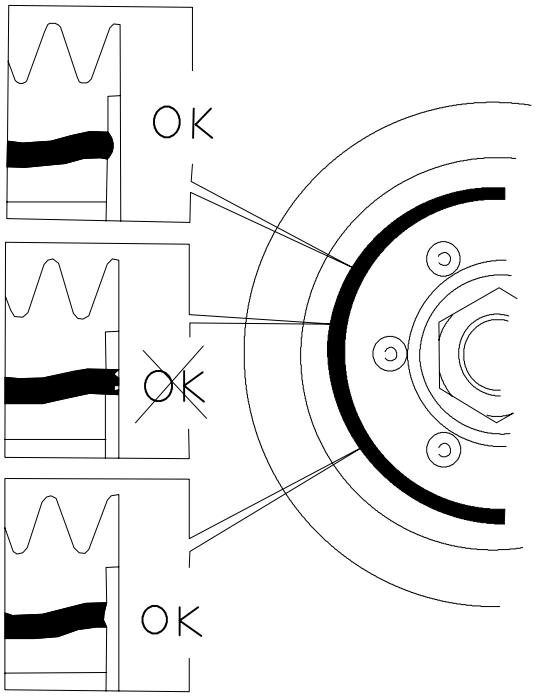
If the twisting has occured and the difference of the alignment marks is more than 1,5 mm, the vibration damper should be changed.

**Note!** On engines, that do not have the alignment marks, the condition of the vibration damper is checked according to instruction A. The damper should be changed at intervals of 4000 running hours.

## A. Checking element of the rubber damper




1. Check the alignment marks (A) on both sides of the rubber element. If the difference is more than 1,5 mm, change the damper for a new one.




2. Check also the condition of the rubber element:

– If rubber pieces have been loosened from the element or
– if rubber has been pressed to the depth of more than 3,5 mm or
– if the outer circumference is slack or it moves in the direction of the shaft, change the damper

**Note!** On 8200 tractor there is a viscous vibration damper, which does not require maintenance. However, check that the damper does not have flaws caused by external shocks. Tractors 8450, 8550 and 8750 have also the viscous damper.

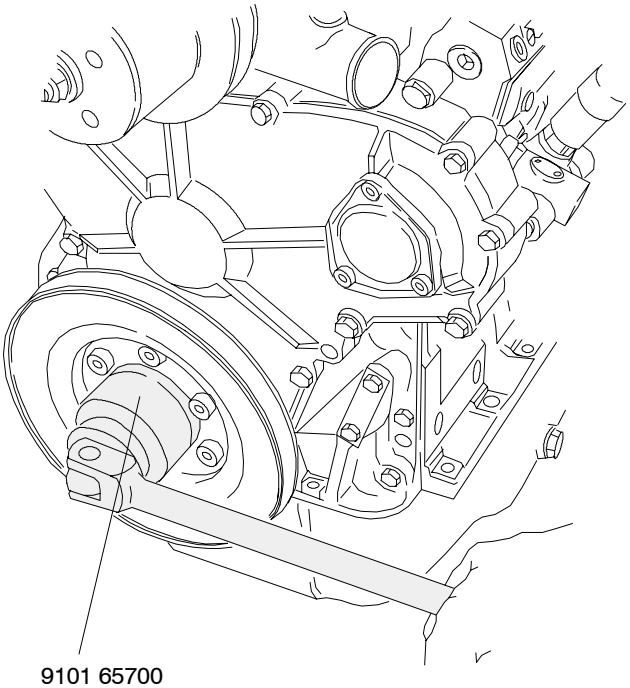
# Timing gears (Op no 214)

## A. Removing timing gear casing

As the timing gear casing forms a seal against the oil sump, the casing cannot be removed without first removing the front axle and the oil sump (see page **219**/**1** for working order).

1. Detach the engine (or the oil sump).

2. Remove the cooling radiator, alternator and the fan belt (if not removed earlier).



9101 65700

3. Loosen the crankshaft nut (special tool 9101 65700 for 320, 420, 620 engines and tool 9024 55800 for 634 engines) and remove the belt pulley/hub.

**Note!** Warm the nut with a hot–air blower before unscrewing (locking fluid. Do not damage the seal). The thread is normal RH thread. Support the key so that it cannot slip (600 Nm/1000 Nm). Rotation of the crank shaft can be prevented by fastening a support on the hub (remove the belt pulley and fasten the support to the hub) or you can use an air powered nut opener, and the crankshaft does not rotate. When needed, the hub is removed with an extractor.

**Note!** On 620–engines the belt pulley must be removed before unscrewing the nut.

4. Remove the timing gear casing cover and the oil deflector ring at the front end of the crankshaft.

5. Remove the injection pump.

**Note!** If the timing gear casing is not to be changed, the injection pump can remain in place. In which case disconnect all leads and pipes from the pump.

6. Unscrew the idler gear bolts (17 and 22 mm). Remove the flange, gear wheel and bearing journal.

7. Extract the camshaft.

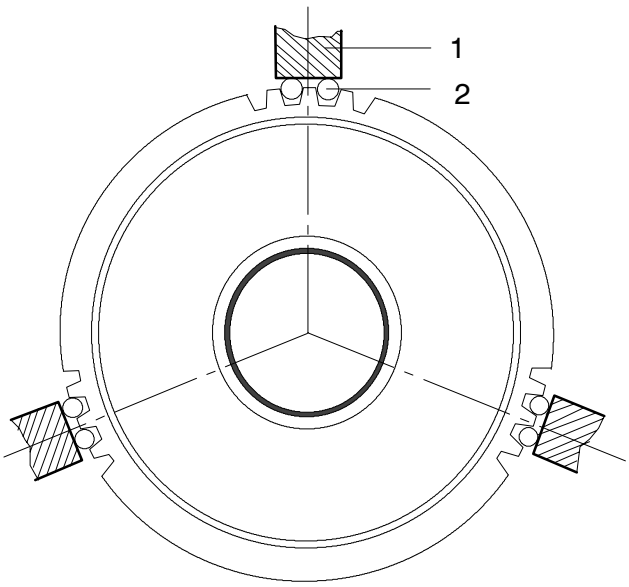
**Note!** If the cylinder head and valve mechanism have not been removed, the tappets must be prevented from falling down, see **Op. 212 2B**.

8. Remove the timing gear casing (13 mm). Ensure that all sealing surfaces are not damaged.

9. Remove the crankshaft front sealing ring from the front casing and clean all the parts that have been removed.

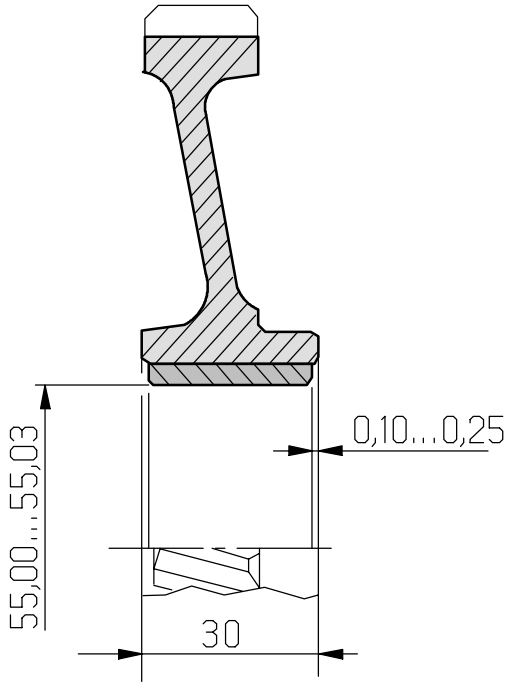
## B. Reconditioning idler gear

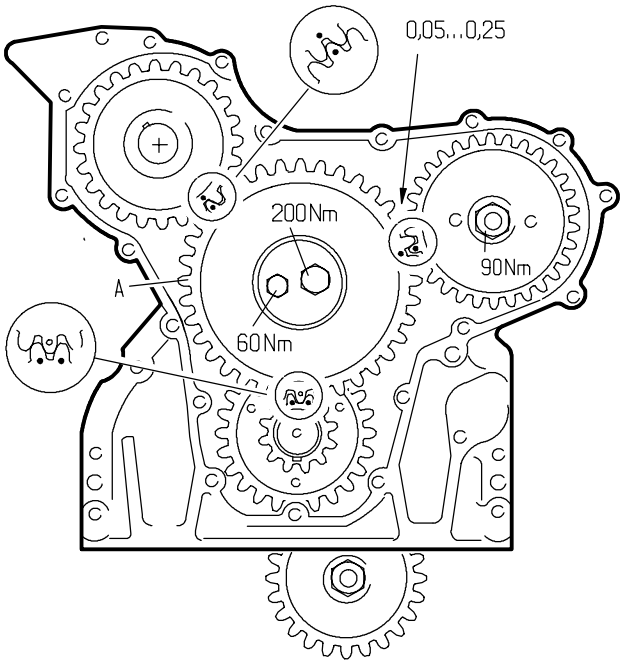
If the idler gear bushing is changed, press in a new bushing so that its rear edge is **0,1–0,25 mm** inside the gear wheel rear edge (see picture on next page).




1. Chuck of lathe
2. Roller ø=5 mm

Machine the idler gear bushing inner diameter to a correct dimension after fitting. Centre the idler gear according to figure above so that tooth backlash is kept the same.




## C. Fitting timing gear casing

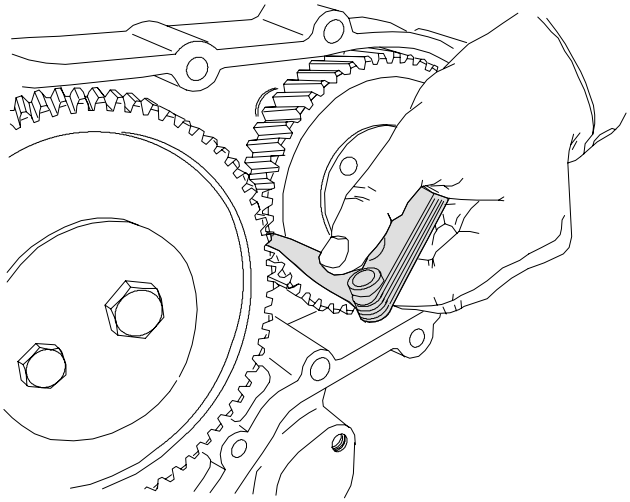
The position of the timing gear casing and cover is determined by two tension pins. Therefore centring should not be undertaken in connection with fitting. However, the tooth backlash between the different gears should be checked. Casing and covers that are delivered as spare parts also have holes for the tension pins already machined.

1. Fit the casing with a new gasket against the cylinder block. Drive in the tension pins with drift 9025 98700. Tighten bolts and nuts.

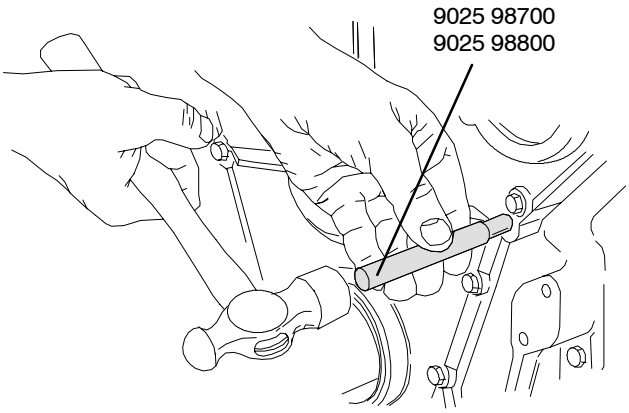
2. Fit the injection pump together with gear wheel (if removed).

3. Lubricate the camshaft bearings and insert the shaft in the cylinder block. Release the pushrods and tappets if they have been suspended.

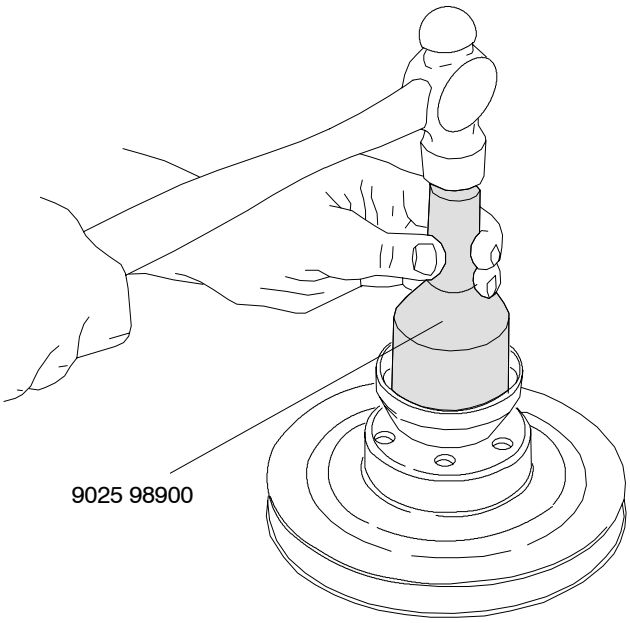
4. Fit the idler gear with shaft stud and ensure that the markings are in the correct position. Fit the washer and tighten the bolts to the correct torque.



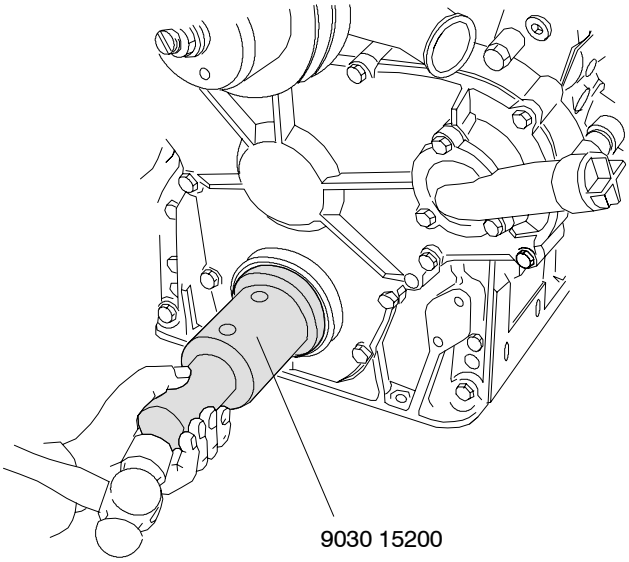
5. Check the tooth backlash which should be **0,05 – 0,25 mm**.




6. Fit the oil deflector ring on the crankshaft and fit the timing gear casing cover using a new gasket. Drive in the tension pins with drifts 9025 98700 and 9025 98800 respectively (the tubular pin round the screw stud). Tighten bolts and nuts.

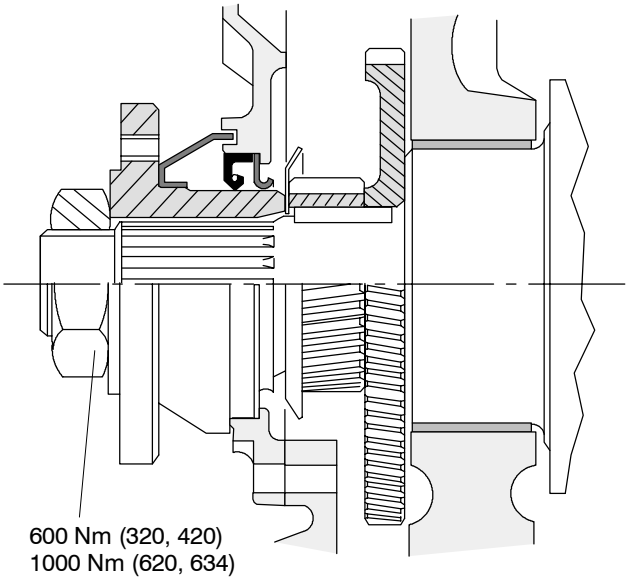



8. Fit the dust shield on the crankshaft V – belt pulley hub, if it has been removed. Use drift 9025 98900.




7. Fit the protective plate into the seal location and fit the crankshaft front seal with special tool 9030 15200.

**Note!** The crankshaft front oil seal can be changed while the engine is attached to the tractor. In this case, remove the cooling radiator and belt pulley/hub at the front end of the crankshaft.




9. Lubricate both the seal and sealing surfaces and fit the crankshaft V – belt pulley with hub.

10. Lubricate the crankshaft nut threads. Tighten the nut to **600 Nm** on 320 – and 420 – engines and **1000 Nm** on 620 and 634 engines.

11. Fit the other detached parts.