CRANKSHAFT AND RECIPROCATING COMPONENTS

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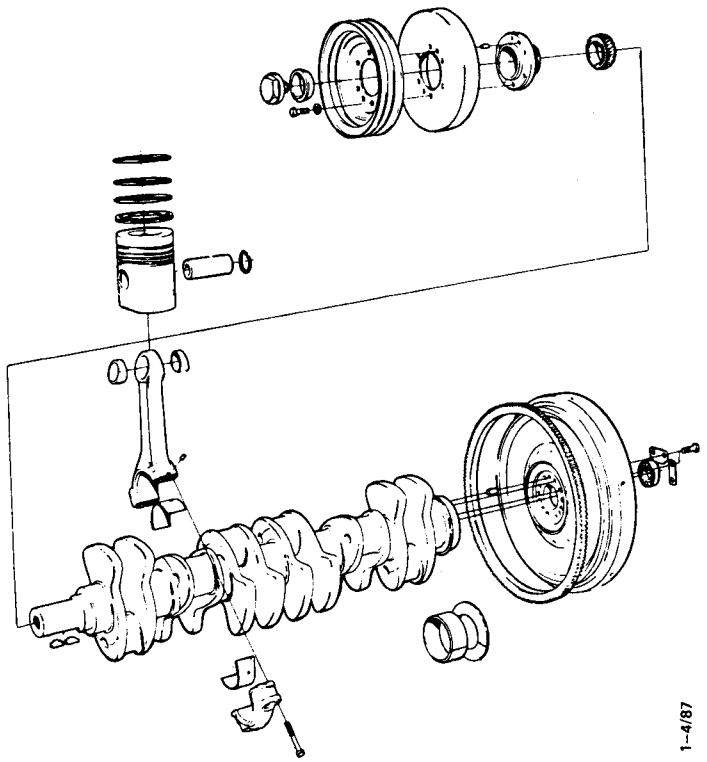

Fig. 1

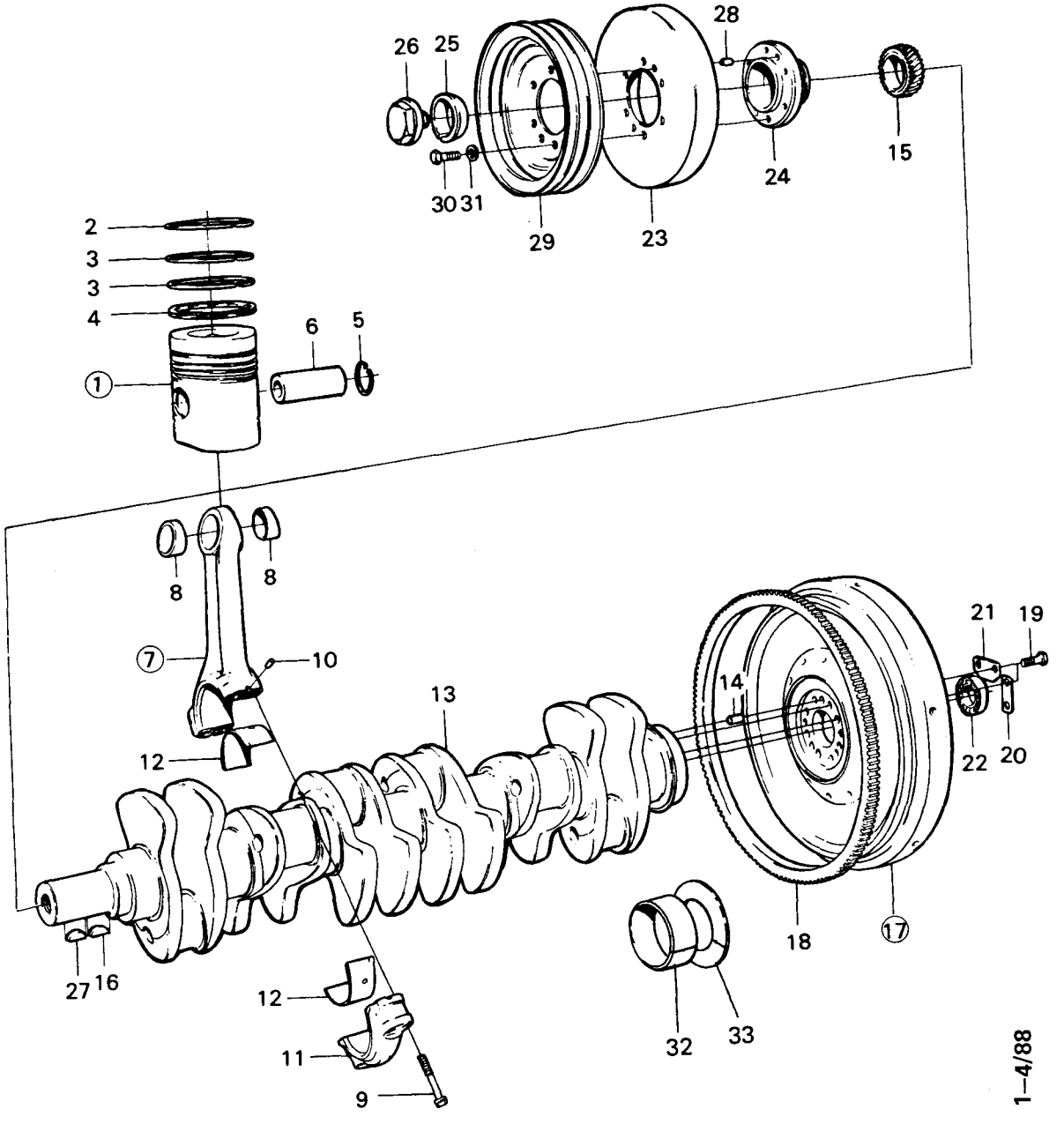

Fig. 2

1. *Piston*
2. *Compression ring, top*
3. *Compression ring, bottom*
4. *Oil ring*
5. *Lock ring*
6. *Piston ring*
7. *Connecting rod*
8. *Bushing*
9. *Screw*
10. *Locating pin*
11. *Bearing cap*
12. *Bearing half for connecting rod*
13. *Crankshaft*
14. *Locating pin*
15. *Crankshaft gearwheel*
16. *Key*
17. *Flywheel*
18. *Gearwheel*
19. *Screw*
20. *Lock washer*
21. *Lock washer*
22. *Ball bearing*
23. *Vibration damper*
24. *Hub for vibration damper*
25. *Tensioning cone*
26. *Screw*
27. *Key*
28. *Locating pin*
29. *Pulley*
30. *Screw*
31. *Washer*
32. *Bearing half for crankshaft*
33. *Guide washer for crankshaft*

Connecting rod and piston

Removal and dismantling

1. Scrape off the soot from the cylinder liner.

2. Remove the oil nozzle for piston cooling.

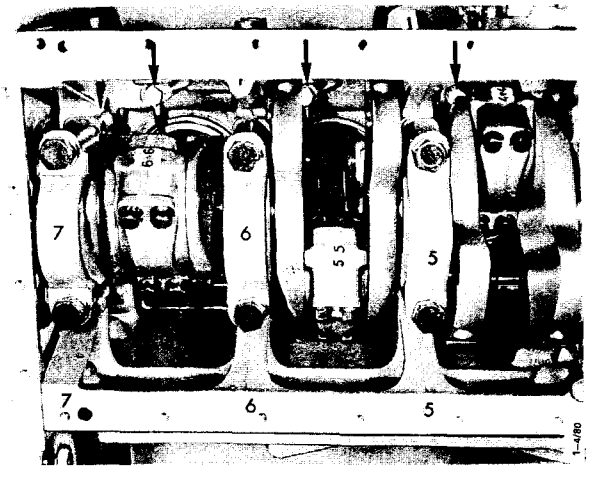

Fig. 3 Marking of main and big-end bearing caps
A. Oil nozzle for piston cooling

3. Remove the bearing cap and bearing shells. Protect the oilway in the crankshaft with, for example, a piece of tape, applying it with the tacky side outwards.

4. Press the piston and connecting rod out.

5. Remove the piston pin retaining rings, heat the piston to approx. 100°C and press the piston pin out.

Remove the piston rings and oil rings, taking care not to scratch the sides of the piston.

When graphited (black) pistons are cleaned in a washing machine the graphiting occasionally disappears. This is of no importance for pistons which have been in use for some time. New pistons should, however, be cleaned with a certain degree of caution, for instance with white spirit.

Checking of connecting rod

Check the connecting rods in a tool intended for this purpose. The procedure is as follows:

1. When the piston pin bushing has been checked and replaced if necessary, fit the bearing cap according to the marking and tighten the screws to the prescribed torque.

2. Set up the connecting rod in the tool with the aid of the expander and fit the appropriate piston pin in the piston bushing. Then place the indicator on the piston pin.

With the indicator tips horizontal, check whether the connecting rod is twisted.

With the indicator tips vertical, check whether the connecting rod is bent.

3. Check also to see whether the connecting rod is bent into the shape of an S. Do this by measuring the distance between the outer side of the piston pin bushing and the flat face of the tool. Turn the connecting rod over and take the corresponding measurement. The difference must not be more than 0.6 mm.

It is not advisable to straighten connecting rods. Defective connecting rods should therefore be discarded and replaced by new ones.

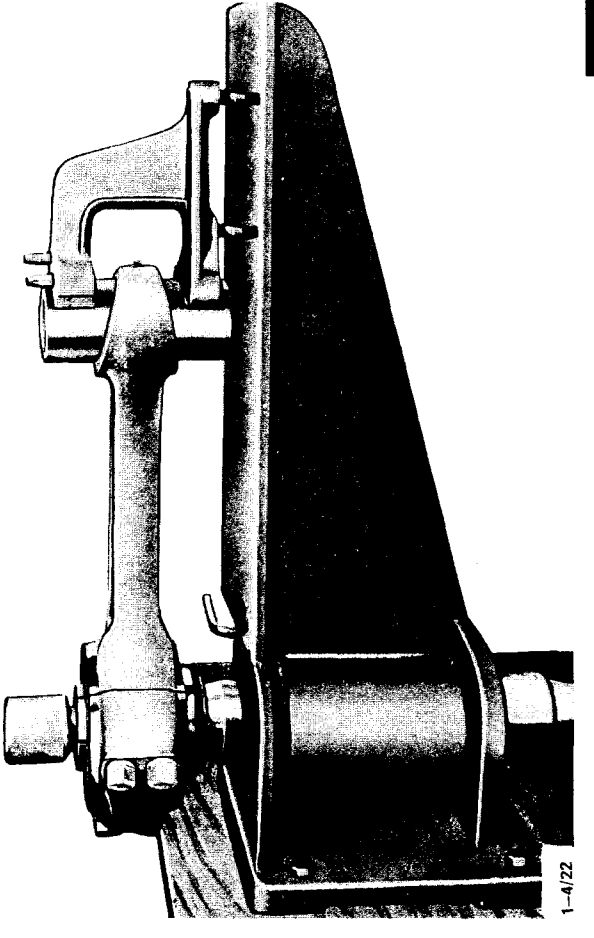

Fig. 4 Check the connecting rod for bentness with the aid of the indicator

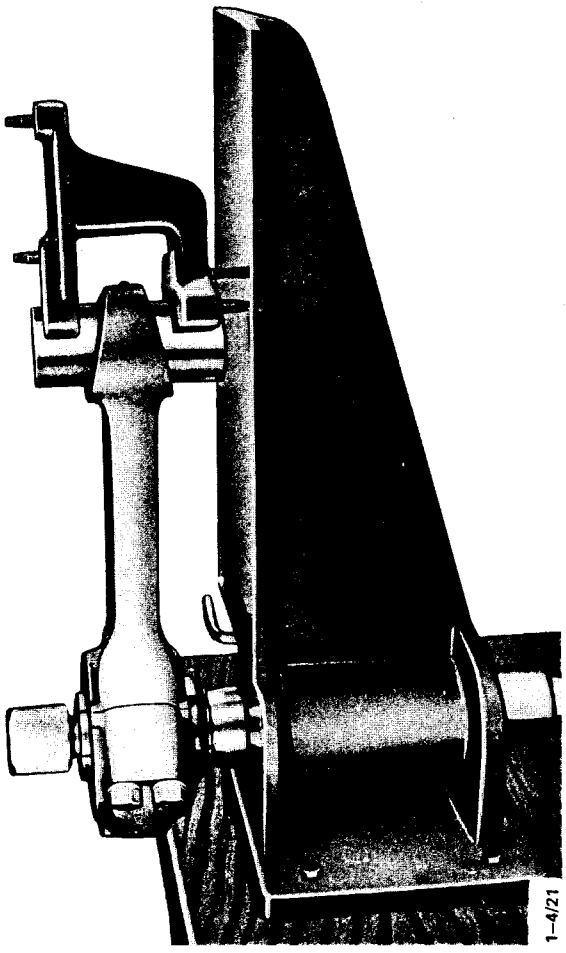

Fig. 5 Check the connecting rod for twist with the aid of the indicator

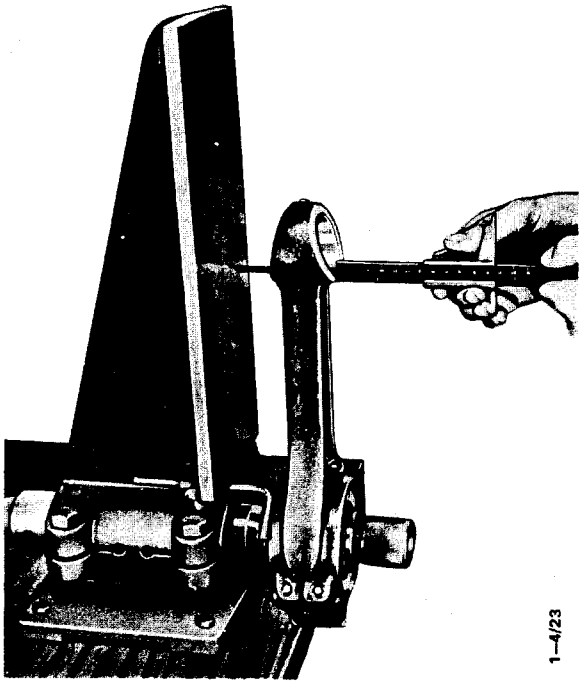

Fig. 6 Check whether the connecting rod is bent into the shape of an S

Assembly and fitting of piston and connecting rod

Assembly

Clean the pistons and their ring grooves thoroughly without scratching the sides of the grooves. Clean out the oil holes in the piston with a suitable drill bit.

Before fitting, check that the piston and piston-ring gaps are correct and that the axial play does not exceed the permissible value (0.25 mm).

Fig. 7 Measuring axial play for piston ring

The upper compression ring is cylindrical and the two following ones are conical and must be fitted with the side marked TOP facing upwards.

The oil ring is fitted with an expander.

When a new piston with fitted piston rings is to be installed, check the ring gap in piston ring compressor 87629 and gauge 87147.

The ring gap is measured through the hole in the tool. The same tools can also be used to check the ring gap on unfitted piston rings.

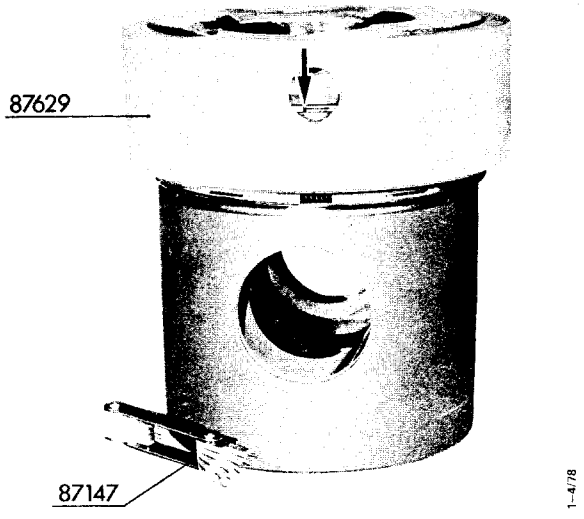

Fig. 8 Checking the piston ring gap

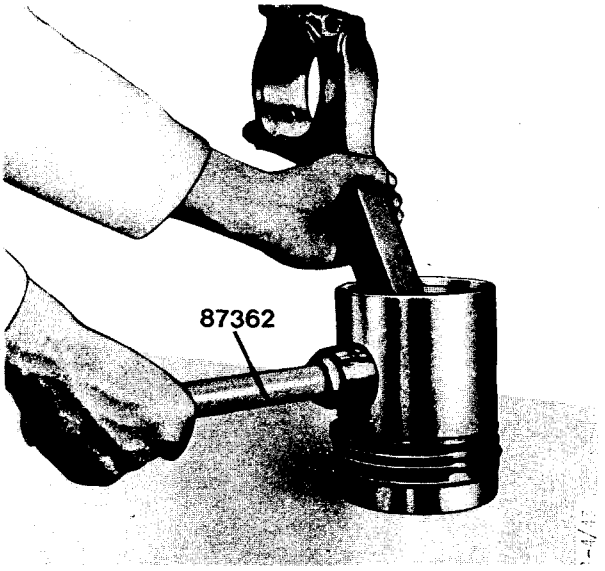

Fig. 10 Fitting the piston to the connecting rod

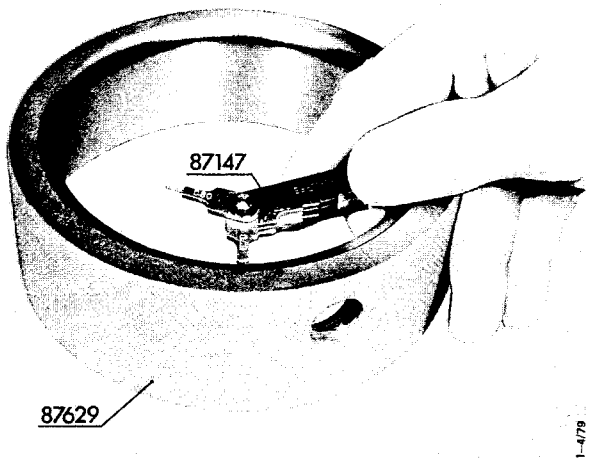

Fig. 9 Checking the gap of an unfitted piston ring

Remember to fit the second lock ring for the piston pin!

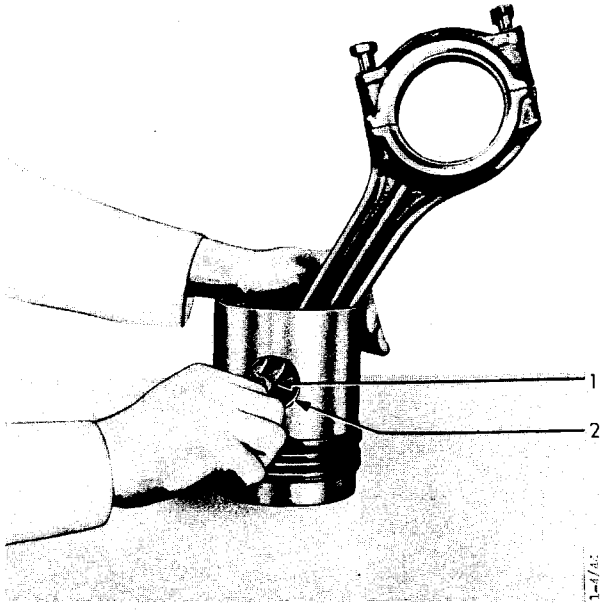

Fig. 11 Fitting the lock ring for the piston pin

Fit one of the lock rings for the piston pin. Heat the piston to approx. 100°C and mount the piston on the connecting rod. The piston is marked with an arrow which must point forwards. The connecting rod (= cylinder) number is punched into the right side at the dividing face for the cap.

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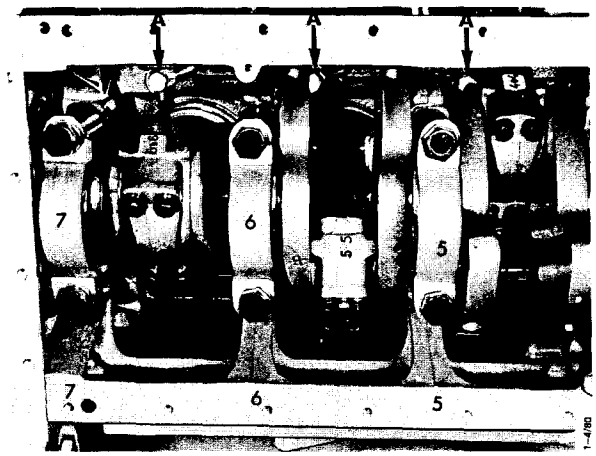

Fig. 12 Marking of connecting rods, cylinder block and bearing caps
A. Oil nozzle for piston cooling

Fitting

1. Place the piston ring compressor on the cylinder liner.

2. Lubricate the piston, piston rings, cylinder liner and piston ring compressor copiously with engine oil. Turn the piston rings so that their gaps are spread around the piston instead of being opposite each other.

3. Press the piston down into the cylinder. Remove the protection from the crank pins.

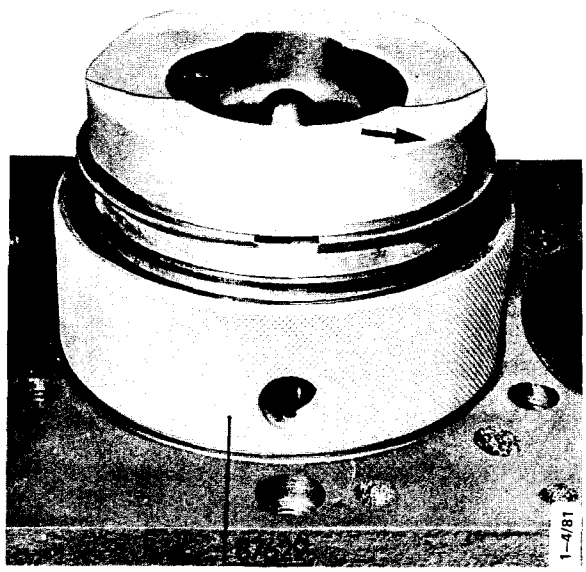

Fig. 13 Fit the piston with the aid of the piston ring compressor

4. Fit the big-end bearing halves, lubricate the crank pin and screw the cap on using well oiled screws. Tighten the screws with a torque of 110 Nm (11 kpm).

5. Fit the oil nozzle for piston cooling. The position of the nozzle is fixed by an arm with a pin which fits into a hole in the block.

NOTE! A damaged nozzle must always be discarded and replaced by a new one so that the oil jet comes in the right direction. Tighten the banjo screw for the nozzle with a torque of 23 Nm (2.3 kpm).

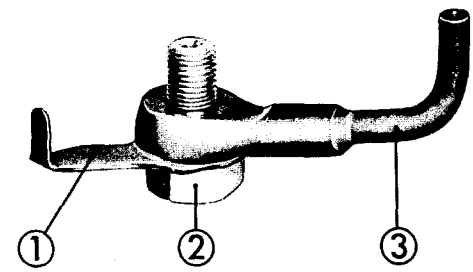

Fig. 14 Oil nozzle

1. Arm *2. Banjo screw* *3. Oil nozzle*

Flywheel

Removal

1. Fold the tabs of the lock washers down and remove the screws.

2. Pull the flywheel off the crankshaft with the puller screws.

3. Tap out the ball bearing.

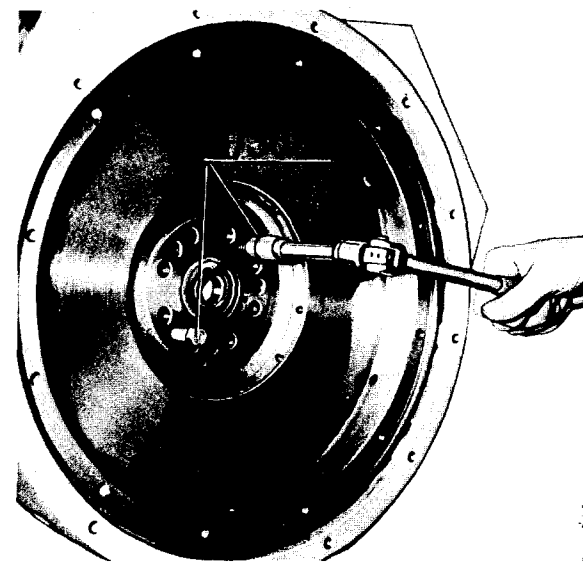

Fig. 15 Remove the flywheel with the aid of the puller screws

Changing the ring gear

Change the flywheel ring gear if the teeth have become so severely worn that the pinion of the starter motor has difficulty in engaging. The changing is performed as follows:

1. Grind as deep a groove as possible in the ring gear and split gear and split it with a cold chisel. Remove the ring gear grom the flywheel.

2. Clean the contact surface on the flywheel with a steel brush.

3. Heat the new ring gear so that it is uniformly heated all round to approx. 250°C. In order to be able to check when this temperature has been reached, start off by grinding a couple of bright spots at different places on the ring gear. Heating should be discontinued at the latest when these spots start becoming blued. If heating is prolonged beyond this point there is a risk that the ring gear will lose its temper.

4. Drive the heated ring gear onto the flywheel so that the bevelling on the teeth faces towards the starter motor. Make sure that the ring gear bears up firmly against the flywheel.

5. The ring gear must not be cooled rapidly but should be allowed to cool freely in air.

Fitting

Press a new ball bearing into the flywheel and mount the flywheel on the crankshaft.

Insert new tabbed lock washers. On certain types of flywheels, one of these washers also serves to lock the ball bearing.

Tighten the screws with a torque of 190 Nm (19 kpm).

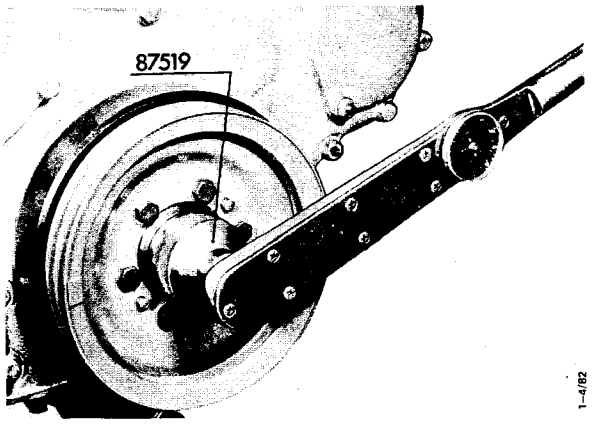

Fig. 16 Backing off the screw for the vibration damber hub

3. Withdraw the vibration damper hub, using puller 87665 and thrust pad 87663, inserting the latter in the crankshaft end. Pull the hub off 2–5 mm. Detach the puller and remove the cone. Refit the puller and pull the hub off completely.

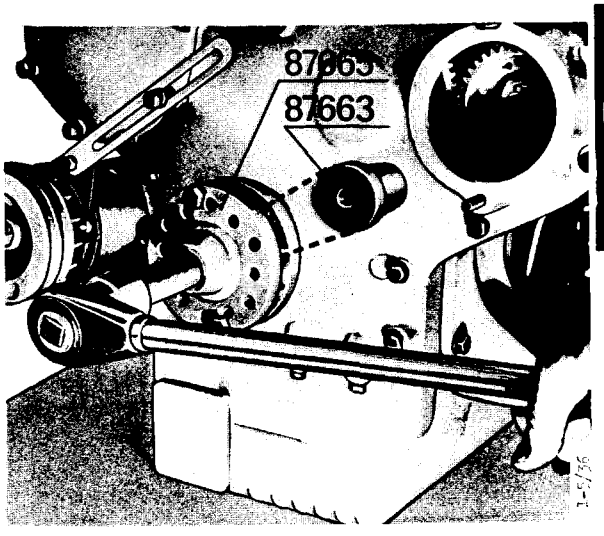

Fig. 17 Pulling off the vibration damper hub

4. Remove the woodruff key.

Engines with a polygon joint in the crankshaft: The vibration damper hub is pulled off with the same tools as are used for engines with a woodruff key in the crankshaft. The cone between the vibration damper hub and crankshaft is not included in the case of polygon joints.

5. Remove the oil pan, the oil pump and the timing-gear housing.

6. Rotate the crankshaft so that an O-marked tooth on the crankshaft gearwheel and O-marked teeth on the camshaft and pump shaft gearwheels point towards the centre of the idler gear. (Independent of O-marking on idler gear).

Vibration damper, hub and crankshaft gearwheel

Removal

1. Remove the pulley and vibration damper. Handle the vibration damper cautiously so that it does not get distorted and put out of action, which could result in crankshaft rupture.

2. Back off the screw for the vibration damper hub, using socket wrench 87519.

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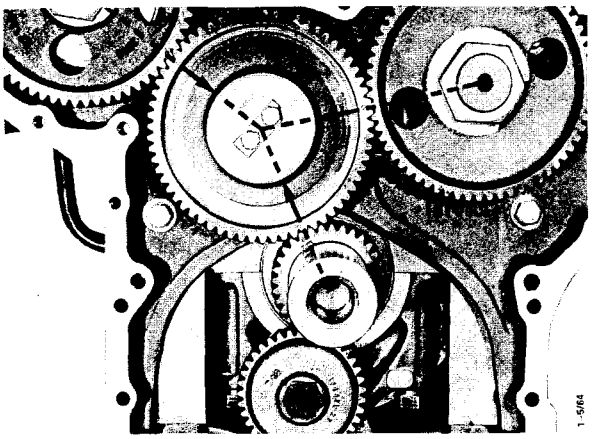

Fig. 18 Setting of timing-gears before idler gear is removed

7. Remove the idler gear and pull the crankshaft gearwheel off with puller 87358 and thrust pad 87663.

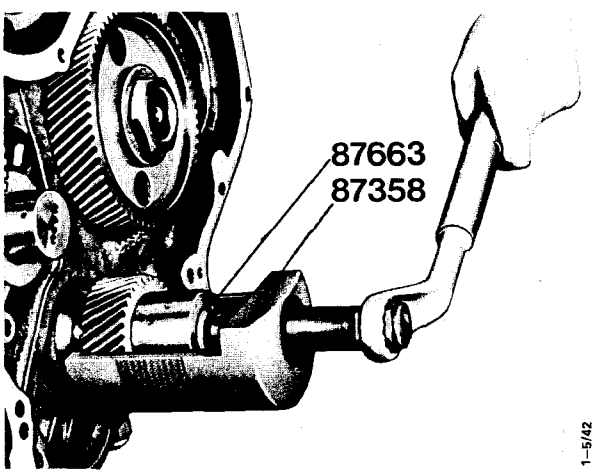

Fig. 19 Pull the crankshaft gearwheel off

NOTE! Never rotate the crankshaft or camshaft after having removed any of the gears, as there would then be a risk of the valve heads striking against the pistons.

Fitting

1. Insert the key for the crankshaft gearwheel in the crankshaft. Make sure that the key is tapped right down to the bottom of the groove.

2. Heat the crankshaft gearwheel in boiling water. Turn the "O" marking forwards and push the gearwheel in onto the crankshaft. If necessary, use drift 87932. Fit the idler gear so that an O-marked tooth fits into a marked tooth space. See 1a AR 5.

3. Insert the key for the vibration damper hub in the crankshaft. Make sure that the key is tapped right down to the bottom of the groove.

4. Fit the oil pump, timing-gear housing and oil pan. (With regard to the sealing ring in the timing-gear housing see 1a AR 3).

5. Drive the vibration damper hub on with drift 87509.

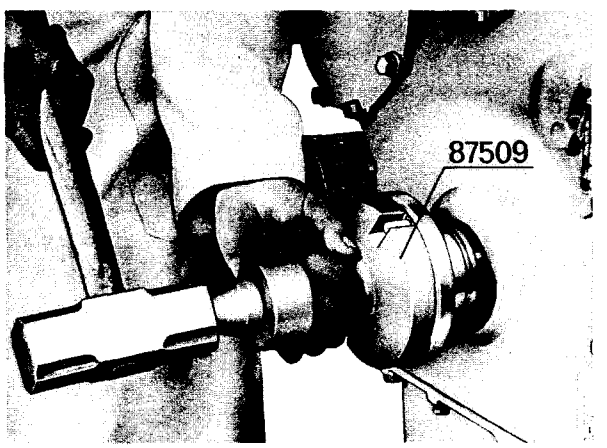

Fig. 20 Driving on the vibration damper hub

6. Fit the cone and tighten the screw with a torque of 735 Nm (75 kpm).

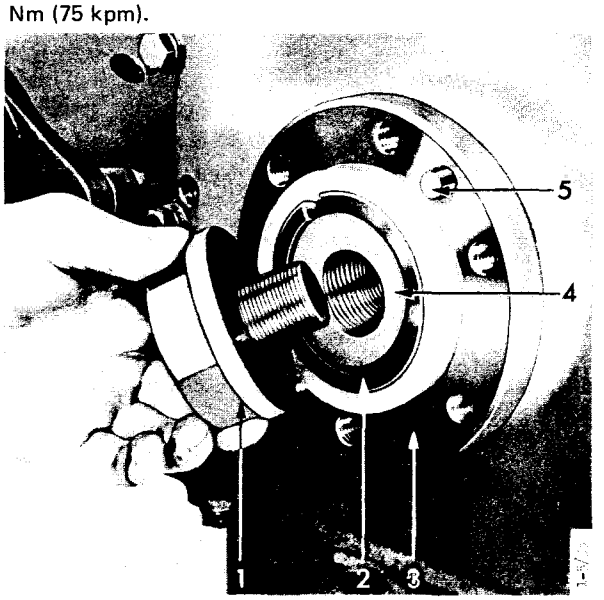

Fig. 21 Attachment of hub

7. Put on the vibration damper and pulley and tighten the screws with a torque of 110 Nm (11 kpm).

Crankshaft

Removal

1. Remove all pushrods and valve lifters. If pistons or liners are to be changed at the same time as the crankshaft also remove the cylinder heads.

2. Remove the flywheel and flywheel casing.

3. Remove the vibration damper, hub, oil pan, timing-gear housing and idler gear.

4. Remove the oil pump, all oil nozzles for piston cooling and all connecting rod caps. Push all pistons to the TDC position or, if the cylinder heads have been taken off, remove them.

5. Remove all main bearing caps and lift the crankshaft out carefully, for instance with a lifting strap which will not damage the shaft journals.

6. Remove main bearing halves and thrust washers at the 7th main bearing.

Checking and grinding

1. Measure the crankshaft pins. Measure the shaft journals with a micrometer at two diameters rectangularly opposite each other. If any of these diameters falls short of the stipulated lower limit regrinding of the crankshaft should be considered. Due allowance should also be made to the oil pressure, which in turn is influenced by factors such as wear in main and big end bearing shells.

2. In regrinding, the stipulated undersizes must be adhered to. Suitable bearing shells for these sizes are available.

3. In grinding the crankshaft, it is of vital importance for the correct fillet radius on journals and pins to be preserved.

Fitting

1. Take particular pains to clean all oilways in the crankshaft, bearing pins and contact surfaces for bearing shells and caps thoroughly.

2. Check that the sizes of the bearing shells and thrust washers are correct. Position the bearing shells in the block and bearing caps. Lubricate bearings and bearing pins copiously.

3. Lift the crankshaft carefully into position. Put on the caps and tighten the screws with a torque of 290 Nm (29 kpm). Check that the shaft rotates easily.

4. Fit the idler gear in the timing-gear housing, so than an O-marked tooth meshes with an O-marked tooth space. See 1a AR 5. Insert the key for the vibration damper hub.

5. Put the timing-gear housing on.

6. Refit all other removed parts.

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TIMING GEARS

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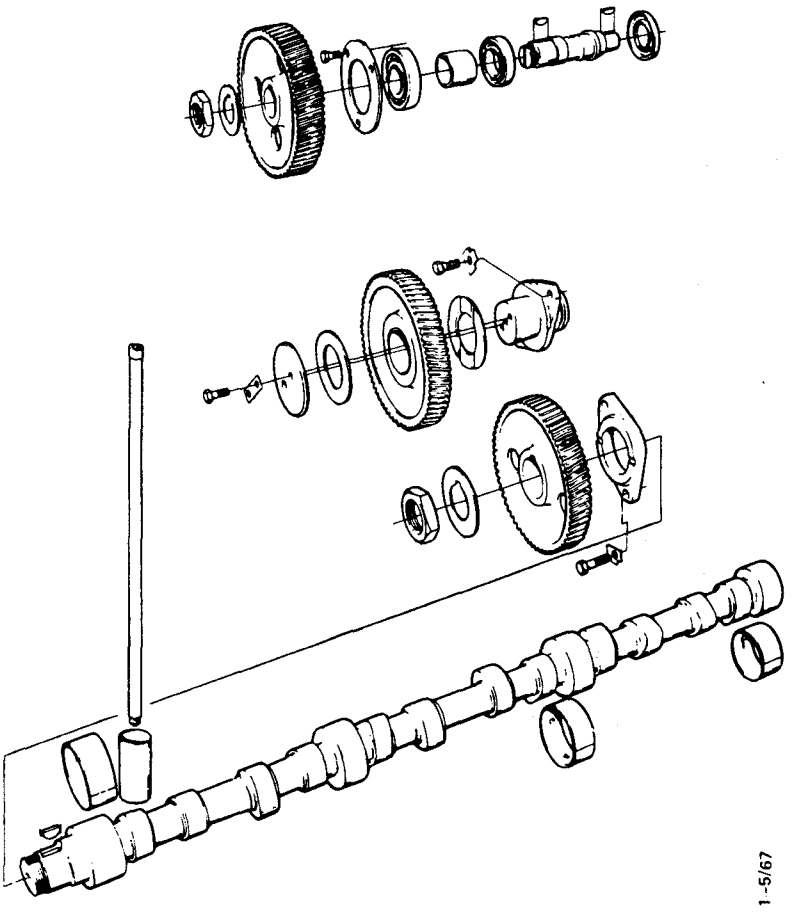

Fig. 1

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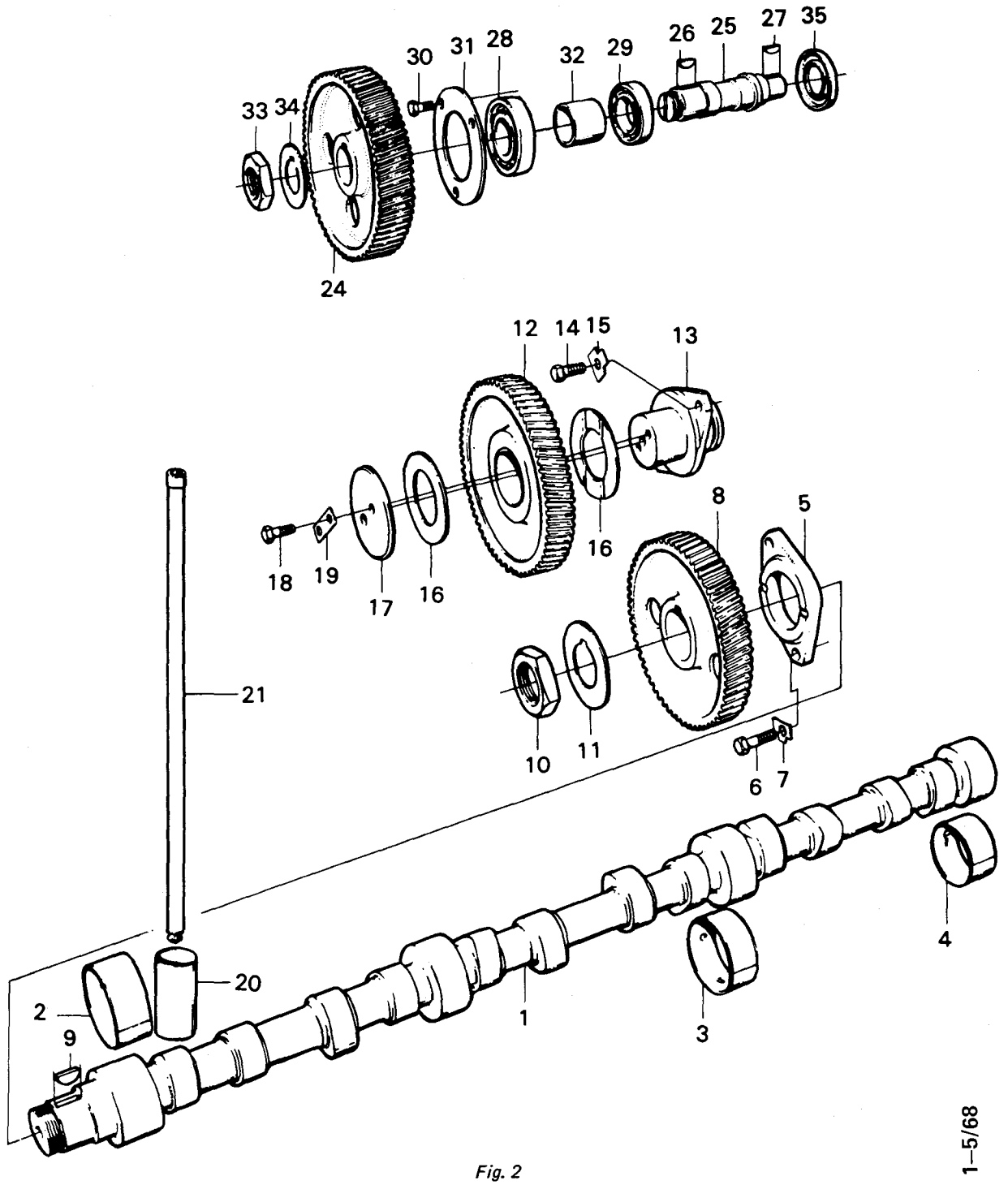

Fig. 2

1. *Camshaft*
2. *Camshaft bearing, 1st*
3. *Camshaft bearings, 2nd and 3rd*
4. *Camshaft bearing, 4th*
5. *Flange*
6. *Screw*
7. *Lock washer*
8. *Camshaft gearwheel*
9. *Key*
10. *Nut*
11. *Lock washer*
12. *Idler gearwheel with bushing*
13. *Axle stub*
14. *Screw*
15. *Lock washer*
16. *Guide washer*
17. *Washer*
18. *Screw*
19. *Lock washer*
20. *Valve lifter*
21. *Pushrod*
24. *Pump shaft gearwheel*
25. *Drive shaft for injection pump*
26. *Key for pump shaft gearwheel*
27. *Key for connection to injection pump*
28. *Ball bearing*
29. *Ball bearing*
30. *Screw*
31. *Washer*
32. *Spacer sleeve*
33. *Nut*
34. *Lock washer*
35. *Sealing ring*

Gearwheels

Removal of gearwheels

1. Remove the crankshaft belt pulley, vibration damper and hub as well as the woodruff key.

2. Remove the timing-gear housing. See 1a AR 3.

3. Fold up the tabs of the lock washers for the pump and camshaft gearwheels and back off the nuts.

4. Rotate the crankshaft so that an O-marked tooth on the crankshaft gearwheel and O-marked teeth on the camshaft and pump shaft gearwheels point towards the centre of the idler gearwheel. (Regardless of the O-marking on the idler gearwheel).

5. Take out the idler gear.

6. Remove the pump shaft gearwheel and camshaft gearwheel with puller 87359.

NOTE! Remove the pushrods if the crankshaft or camshaft has to be turned round a little when any of the timing-gears has been removed. Otherwise there is a risk of the valve heads striking against the pistons.

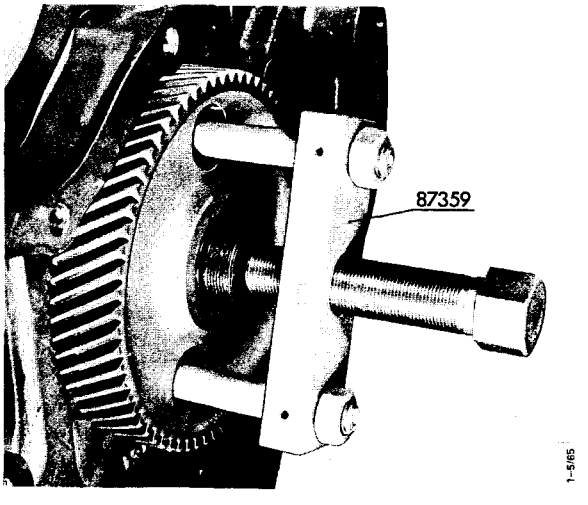

Fig. 3 Puller for pump gearwheel and camshaft gearwheel

7. Remove the idler gear bearings.

Fitting of gearwheels

The timing-gear wheels are marked with an "O" on a tooth or tooth space and must be adjusted when fitting so that an O-marked tooth meshes with an O-marked tooth space.

Fig. 4 Marking of timing-gears

Fit the timing gearwheels for the injection pump and camshaft. Heat the gears to 100°C before fitting. Then insert the idler gear and adjust so that the O-markings on the gearwheels come opposite each other. It should be possible to push the idler gear in by hand.

Check after fitting that an O-marked tooth meshes with an O-marked tooth space.

The thrust washers for the idler gear must be turned so that the oilways in the washers face towards the gearwheel.

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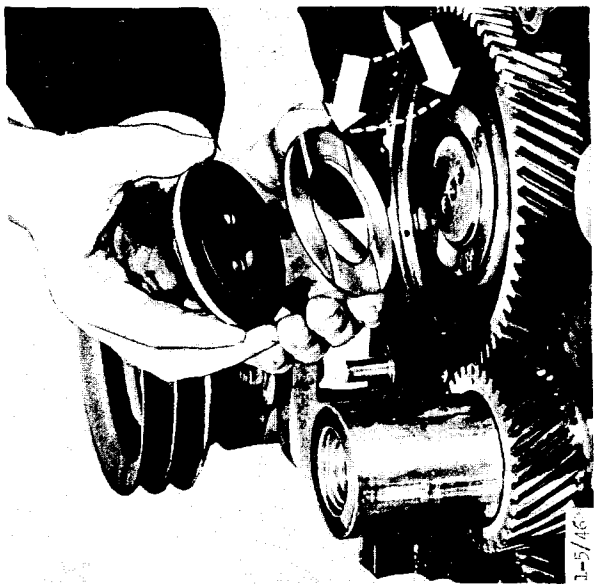


Fig. 5 Washers for idler gear

After having fitted the idler gear, tighten the nuts for the pump gearwheel with a torque of 200 Nm (20 kpm) and those for the camshaft gearwheel with a torque of 400 Nm (40 kpm). Lubricate the nuts with oil on the side which rests against the locking plate. Fold up the tabs on the locking plate (lock washer).

Camshaft

Removal and fitting

1. Remove the timing-gear housing.

2. Remove the rocker arm mechanism.

3. Lift the pushrods out and mark them so that they can be refitted in the same place as before.

4. Take away the side doors, take out the valve lifters and mark them also.

5. Remove the screws for the locating flange. (These screws can be removed even when the camshaft gearwheel is mounted on the camshaft, through the holes in the gearwheel).

6. Pull the camshaft out cautiously so as not to damage the cams and bearings.

7. Fitting is carried out in the reverse order.

Replacement of camshaft bearings

The camshaft and camshaft bearings are subjected to only negligible wear and it is seldom that anything needs to be done about these parts. In connection with engine overhauls, however, check that the cams and bearing surfaces are not obnormally worn.

New bearings must be fitted so that their lubrication holes come opposite the oil passages in the block.

After fitting, the bearings must be machined to the specified dimensions. See section SP. A boring mill will be needed for machining of the bearings.

Checking the camshaft setting

1. Turn the crankshaft to the T.D.C. position after the compression stroke of the first cylinder. (Valve clearance on both valves).

2. Secure two dial indicators to the guide washers for the valve springs.

3. Adjust the rocker arms so that the clearance no longer exists and an additional 0.1 mm (both valves are thus open 0.1 mm).

Zero-set both dial indicators.

4. Turn the crankshaft one revolution in its direction of rotation until the TDC position is reached once again.

5. Take readings on both dial indicators and compare with the values stated below.

DS11, camshaft art. No. 238401:

Intake valve lifting height	2.4–3.5 mm
Exhaust valve lifting height	2.5–3.5 mm

D11, camshaft art. No. 228830:

Intake valve lifting height	0.7–1.4 mm
Exhaust valve lifting height	1.0–1.5 mm

Rocker arm mechanism

Valve lifters and pushrods

Removal

1. Remove the rocker arm mechanism.

2. Lift the pushrods out and mark them so that they can be refitted in the same place as before.

3. Take away the side doors, lift the valve lifters out and mark them also.

Check that the valve-lifter contact surface against the camshaft is undamaged. Check that the pushrods are straight by rolling them on a faceplate. Minor deviations from true can be corrected by straightening with a rubber mallet. Check also that ball sockets and ball studs are seated in the pushrods.

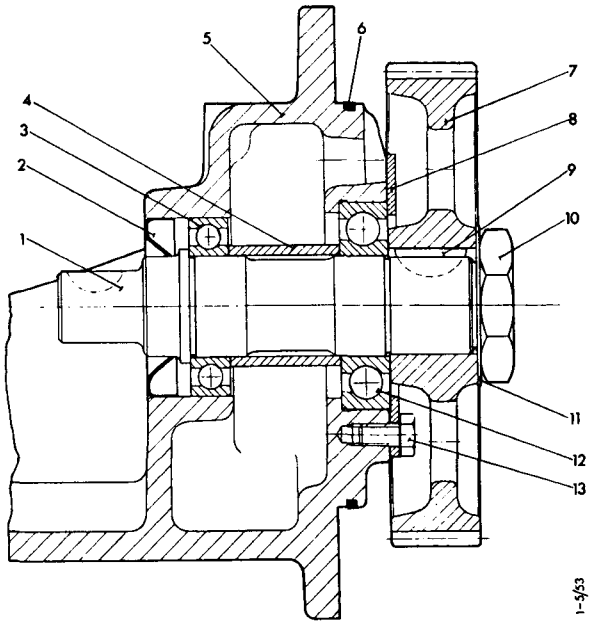


Fig. 6 Drive for injection pump

1. Drive shaft
2. Sealing ring
3. Ball bearing
4. Spacer sleeve
5. Pump shelf
6. O-ring
7. Pump shaft gearwheel
8. Washer
9. Key
10. Nut
11. Lock washer
12. Ball bearing
13. Screw

AR

Drive shaft for injection pump

Removal and fitting

The drive shaft can be removed with or without the pump shaft gearwheel. Back off the three screws for the washer (accsssible through holes in the gearwheel) and tap the drive shaft out forwards.

Remove the gearwheel, washer, front ball bearing, spacer sleeve and rear ball bearing. Tap the sealing ring out.

Fitting is carried out in the reverse order. See also Fitting of gearwheels.

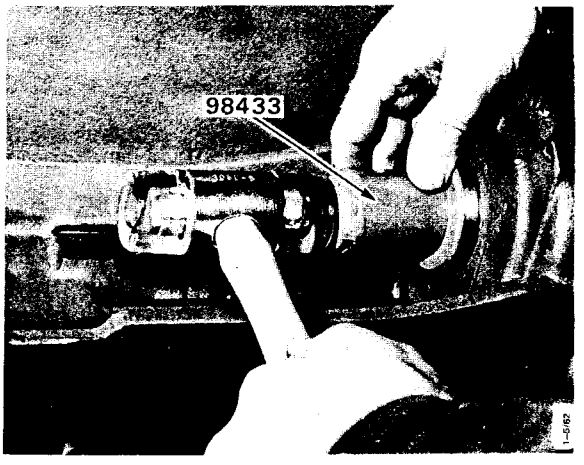
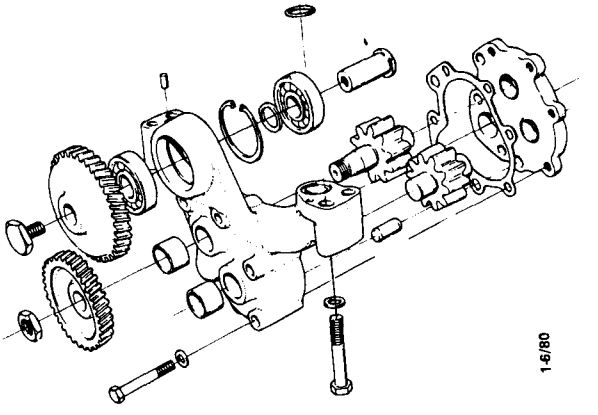


Fig. 7. Drift 98433 for sealing ring

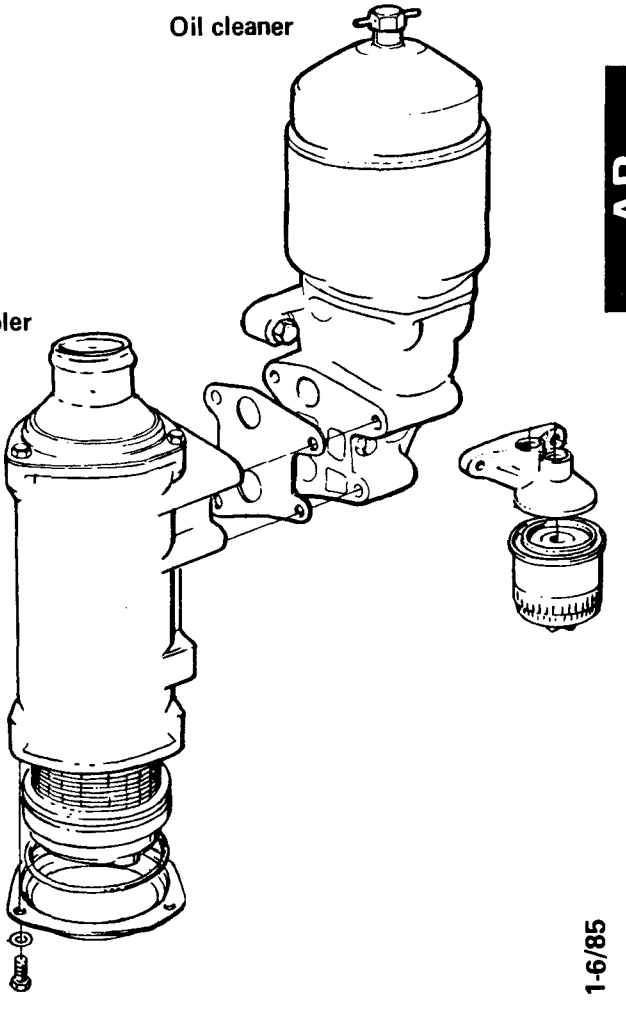
LUBRICATING SYSTEM

Oil pump



Oil cleaner

Oil cooler



Oil pressure valve

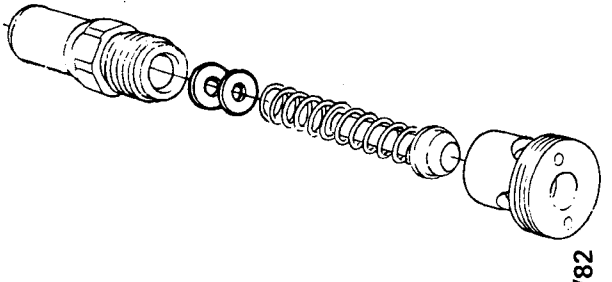


Fig. 1

AR

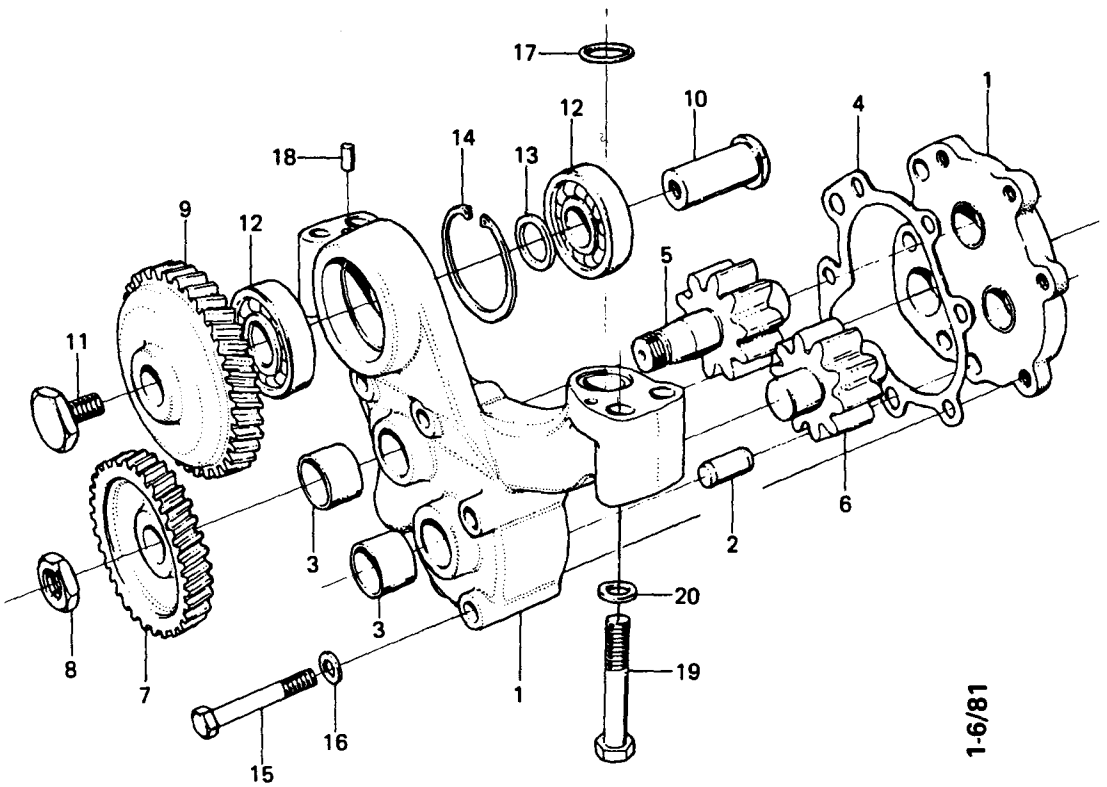


Fig. 2

1. *Housing with cover*
2. *Pin*
3. *Plain bearing*
4. *Gasket*
5. *Pump gearwheel*
6. *Pump gearwheel*
7. *Pump pinion*
8. *Nut*
9. *Gearwheel*
10. *Pump shaft*
11. *Screw*
12. *Ball bearing*
13. *Spacer*
14. *Lock ring*
15. *Screw*
16. *Washer*
17. *O-ring*
18. *Locating pin*
19. *Screw*
20. *Washer*

Dismantling

1. Remove the lock screw for the idler gear.

NOTE! The lock screw has a left-hand thread.

2. Back off the nut for the pump pinion and pull the pinion off with a universal puller.

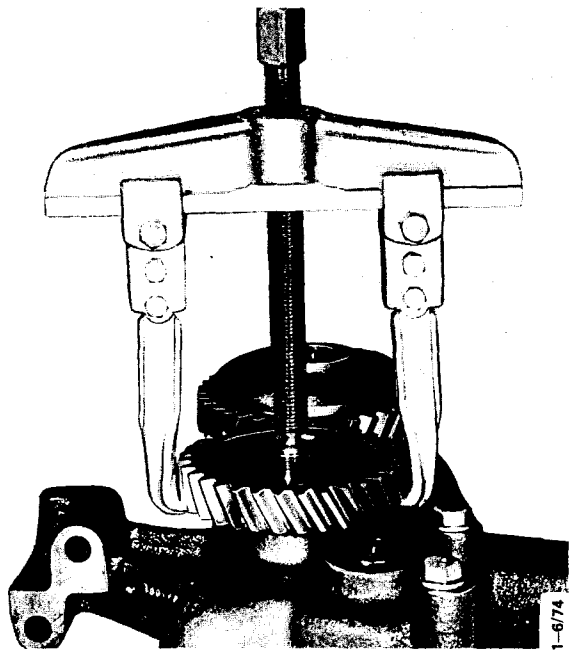


Fig. 3 Pulling off the oil pump pinion

3. Press the idler gear pin out. Use, for instance, thrust pad 87663.

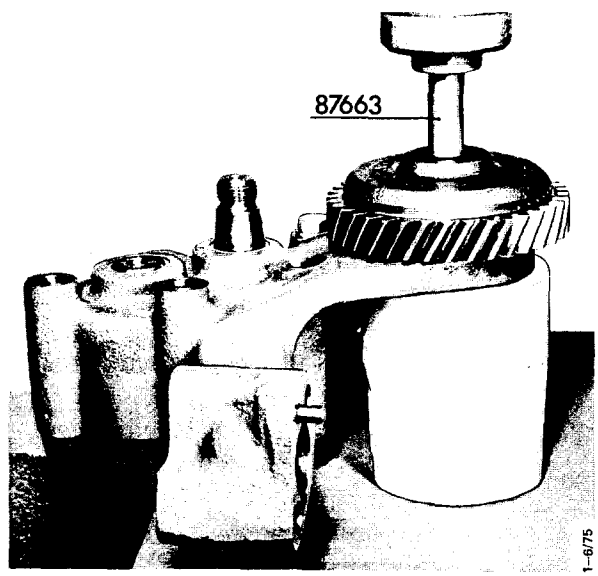


Fig. 4 Pressing out the idler gear pin

4. Press the pin out of the rear ball bearing.

5. Remove the lock ring and tap the remaining ball bearing out.

6. Remove the screws and separate the cover from the housing. Remove the oil pump gearwheels.

7. Press the bearing bushings out.

The pump housing cover is drilled with the pump housing as a matched item and must not be changed separately. New bushings are available as spare parts. After new bushings have been pressed in they must be accurately machined, which requires special tools.

Assembly

1. Press new bearing bushings in. Screw the cover and housing together and tighten the screws with a torque of 20 Nm (2.0 kpm). Machine the bushings to the prescribed dimensions according to 1a SP – 6 and check that the distance between the gearwheel shafts is correct.

2. Insert both oil pump gearwheels and measure the distance between the gearwheel and the surface of the pump housing.

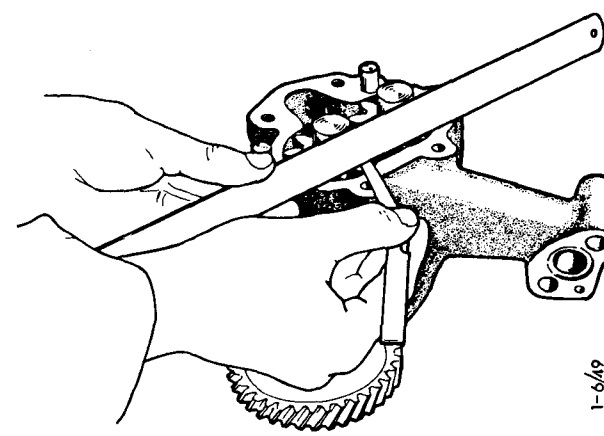


Fig. 5 Measuring clearance in the oil pump

Gaskets for fitting between pump housing and cover are available in the following thicknesses: 0.05; 0.07 and 0.10 mm. NOTE! The gaskets "give" 0.02 mm when the screws are tightened, and consequently the gasket thickness must be reduced by this amount (0.02 mm) when calculating the clearance.

The correct clearance is 0.07–0.10 mm and is obtained as follows:

Measured clearance plus gasket thickness less 0.02 mm.

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3. Screw the cover and pump housing together. Tighten the screws with a torque of 20 Nm (2.0 kpm).

4. Press the rear ball bearing onto the idler gear pin. Fit the lock ring in the housing. Tap the bearing (with the pin) into the housing. Insert the spacer and press the front bearing on.

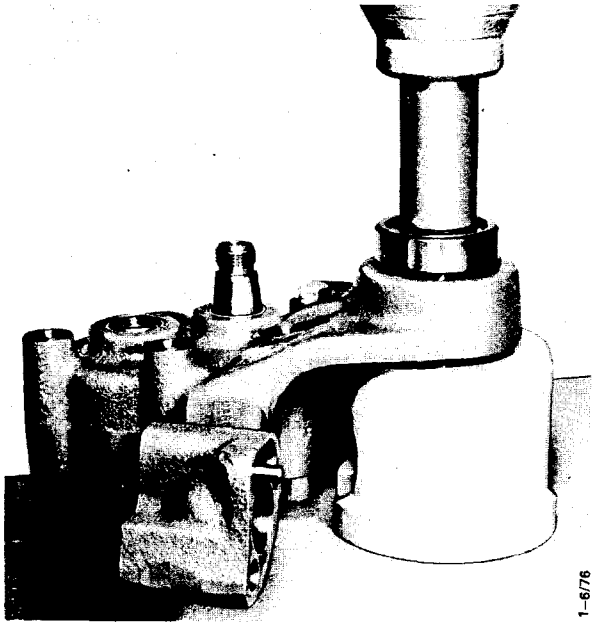

Fig. 6 Pressing on the front bearing

5. Press the idler gear onto the pin.

6. Screw the lock screw in and tighten it with a torque of 40 Nm (4.0 kpm). Note that the screw has a left-hand thread.

7. Put the gearwheel on and tighten the nut with a torque of 140 Nm (14 kpm).

8. Lubricate the oil pump copiously with oil before mounting it on the engine block.

Oil pressure valve

The oil pressure valve is screwed to the engine block under the bracket for the oil cleaner and oil cooler.

Adjustment of oil pressure

1. Remove the bracket for the oil cleaner and oil cooler from the engine block. The cooler and cleaner can remain on the bracket.

2. Remove the oil pressure valve, using stud wrench 98386.

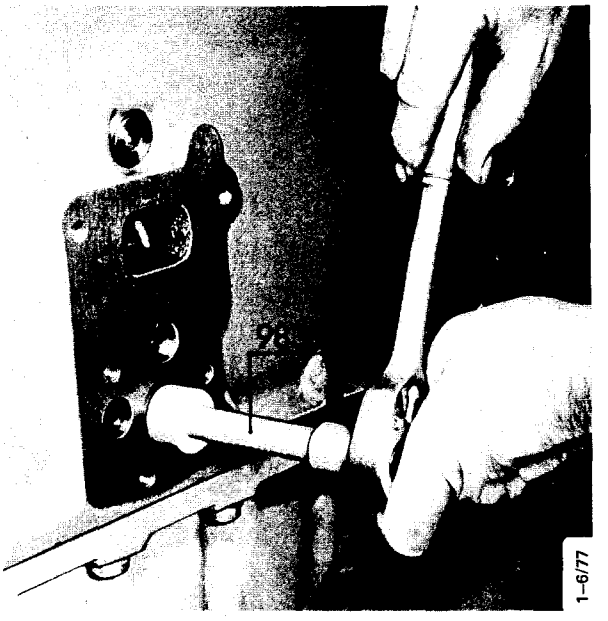

Fig. 7 Stud wrench for oil pressure valve

3. Dismantle the oil pressure valve. The pressure is raised by increasing the number of shims. One shim increases the pressure by approx. 0.12 bar. Adjust the oil pressure to 4.5–6.0 bar with the engine warm and running at 2 200 r/min.

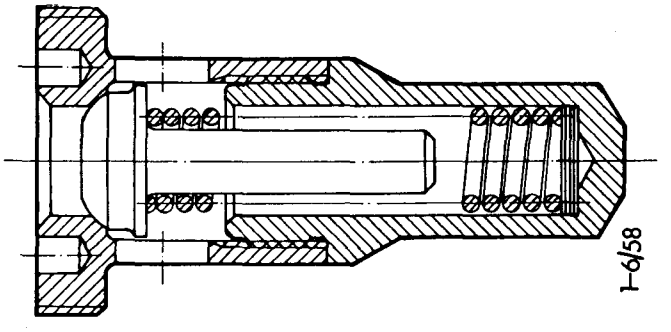

Fig. 8 Oil pressure valve, earlier version

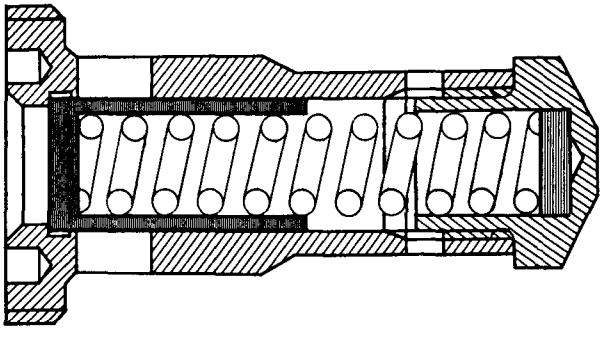

Fig. 9 Oil pressure valve, new version as from engine number 953406

Oil cleaner

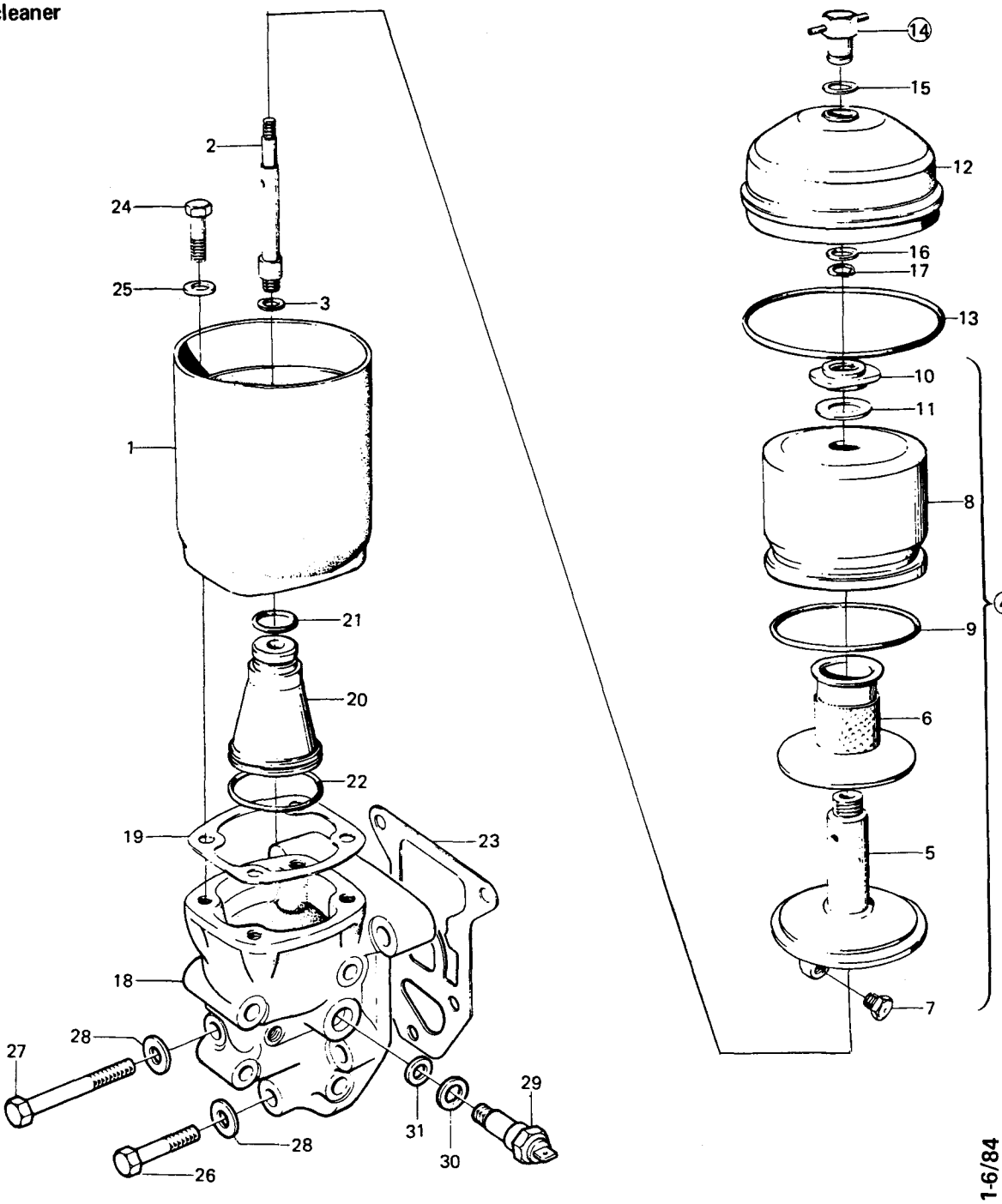

Fig. 10

1. *Housing*
2. *Shaft*
3. *Washer*
4. *Rotor assembly*
5. *Rotor*
6. *Strainer*
7. *Nozzle*
8. *Cover*
9. *O-ring*
10. *Nut*
11. *Washer*
12. *Cover*
13. *O-ring*
14. *Lock nut*
15. *Gasket*
16. *Washer*
17. *Lock ring*
18. *Bracket, complete*
19. *Gasket*
20. *Cyclone*
21. *O-ring*
22. *O-ring*
23. *Gasket*
24. *Screw*
25. *Washer*
26. *Screw*
27. *Screw*
28. *Washer*

AR

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Centrifugal oil cleaner

When routine cleaning of the oil cleaner is to be carried out there should be a coating of dirt in the rotor cover. If not, it is probable that the rotor does not rotate. The cause of this must be determined immediately.

If the coating of dirt exceeds the maximum permissible thickness (20 mm) when cleaning is performed at the prescribed intervals the rotor cover should be cleaned more frequently.

Dismantling and assembly

1. Unscrew the lock nut holding the cover and take the cover off.

2. Lift the rotor out. Wipe the outside clean. Slacken the rotor nut and back it off about three turns (in order to protect the bearing).

If it proves difficult to loosen the rotor nut, turn the rotor upside down and clamp the rotor nut in a vice. Turn the rotor counterclockwise by hand or, if this proves impossible, by inserting a screwdriver between the outlet holes.

NOTE! Never clamp the rotor itself in a vice.

3. Hold the rotor cover by its outside diameter and strike gently with a blow of the hand or with a plastic mallet on the rotor nut so that the rotor cover lets go of the rotor. Never strike directly on the rotor, as such action could cause damage to its bearings.

4. Remove the rotor nut, the washer and the cover from the rotor.

5. Remove the strainer from the rotor. If it has stuck, pry it carefully off by inserting a knife in the lower edge between the rotor and the strainer.

6. Scrape off the deposits on the inside of the cover with a knife or other suitable implement.

7. Wash the parts.

8. Check the two nozzles on the rotor. Make sure that they are not clogged up or damaged. Defective nozzles should be discarded and replaced by new ones.

9. Check that the bearings are undamaged.

10. Put the O-ring in position in the cover. A new O-ring should be fitted if the old one shows the slightest sign of damage.

11. Fit the parts together and tighten the rotor nut by hand. Remember the washer under the nut

12. Check that the shaft is not loose. If it is, lock it with locking fluid 561056.

13. Refit the rotor and turn it round by hand to make sure that it rotates easily.

14. Check the O-ring on the cover of the cleaner housing and fit it into place. Tighten the nut by hand.

Bracket and cyclone

The cyclone is attached to the bracket for the centrifugal cleaner. The cyclone is sealed with two O-rings between the bracket and the housing for the centrifugal cleaner. When this housing has been removed the cyclone can be taken out. In the bracket there is a threaded hole where the oil pressure monitor is screwed in.

Oil filter for turbocharger

The turbocharger rotates at a very high speed, i.e. 60.000–100.000 r/min. It is therefore important for the lubrication to function satisfactorily. The special oil filter for the turbocharger must be changed at the prescribed intervals and the centrifugal cleaner for the engine oil must also be cleaned in accordance with our instructions. Otherwise, the filter for the turbocharger will become clogged up far too quickly and the resistance in the filter will increase as a result. A valve in the filter then opens and allows the oil to pass to the turbocharger and the bearings are subjected to heavy wear.

The opening pressure of the valve is adapted to the oil flow rate. For this reason, always use genuine Scania oil filters. The oil filters of similar type intended for certain car engines are not suitable since the valve will then have too low an opening pressure.

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Fig. 11 Lubricating oil filter for turbocompressor

Changing the filter

Release the filter with the aid of, for instance, a screwdriver with a square blade with fits into the keyway in the bottom of the filter. Fit a new filter as follows:

Smear the rubber gasket for the filter with oil.
Tighten the filter by hand until the gasket homes.
Tighten an additional half turn by hand.
Start the engine and check that no leakage occurs.

Oil cooler

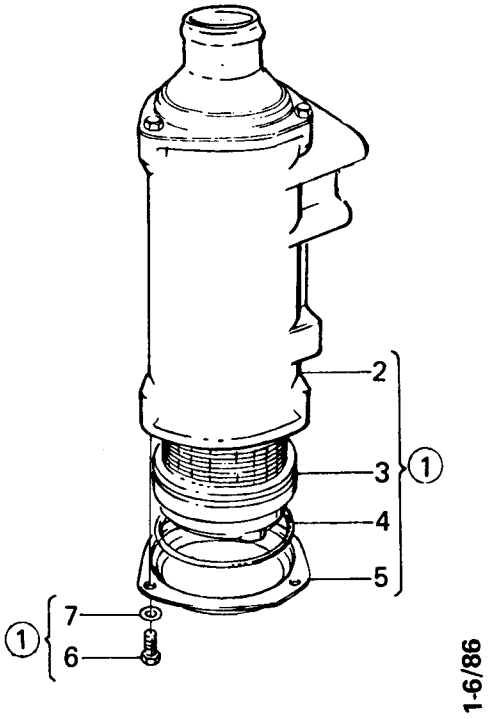

Fig. 12

1. Oil cooler
2. Housing
3. Element
4. O-ring
5. Cover
6. Screw
7. Washer

Normally the oil cooler requires no maintenance. If leakage is suspected, it should be pressure tested to the prescribed values.

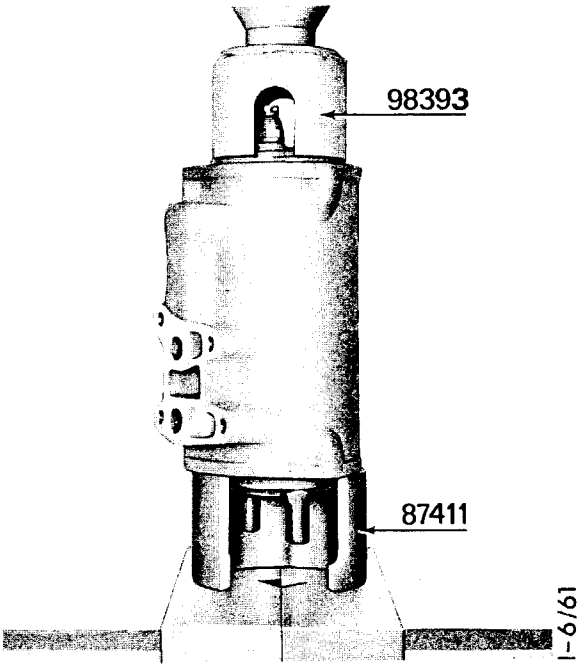

Fig. 13 The cooling element is pressed downwards. This picture shows a part-flow oil cooler

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Changing the O-rings

1. Remove the screws and take away the covers on the ends of the oil cooler.

2. Press the element out only far enough for the O-ring to become visible on the opposite side so that it can be replaced. Use drifts 87411 and 98393 for a part-flow oil cooler and drift 98512 for a full-flow oil cooler.

3. Oil the O-ring and its groove copiously and fit the O-ring.

4. Press the element back so that the other O-ring becomes visible and can be replaced.

5. Press the element back into position so that the covers can be screwed on.

6. Pressure test the oil cooler.

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GENERAL

Specifications

General

		D5	DS5	D8	DS8	D11	DS11	DS11[1]
Number of cylinders	pcs.	4	4	6	6	6	6	6
Cylinder bore	mm	115	115	115	115	127	127	127
Stroke	mm	125	125	125	125	145	145	145
Displacement	litres	5,19	5,19	7,79	7,79	11,02	11,02	11,02
Compression ratio		16,5:1	15,5:1	16,5:1	15,4:1	16:1	16:1	15:1
Firing order		1-2-4-3				1-5-3-6-2-4		
Working principle		4-stroke				4-stroke		
Injection		direct				direct		
Weight[2]	kg	approx. 518	approx. 530	approx. 695	approx. 760	approx. 875	approx. 890	approx. 890

Max. speed, output and torque: see the Operator's Manual or Service Card for the engine in question.
1) DS11 with higher output setting (DS11A)
2) Vehicle design excl. compressor, hydraulic pump, coolant and oil.

TOOLS

General

Description	D5, DS5 D8, DS8 Part No.	D11, DS11 Part No.	Class	Remarks
Hoisting tool for engines consisting of: hoisting strap 98094 and lever hoisting block 98095. Can be used for D, DS5, 8, 11 engines in all trucks except LB76.	98093	98093	1	Disc. No. 87065 87910
Equipment for removing and fitting of engine B, BF, CF-buses and LB76	–	98014	3x	Disc. No. 87235
Fixture for removing and fitting of starter motor	–	87395	3x	
Starter motor wrench (NV 24 mm) for LB76	–	87140	3x	
Starter motor wrench (NV 24 mm) L110	–	87146	3x	

x Drawing supplied by Saab-Scania Automotive Division
The tool is not delivered by us

SP

75.17265/3200-10.340

Discription	D5, DS5 D8, DS8 Part No	D11, DS11 Part No	Class	Remarks
Universal Stand	–	–	–	a)
Engine fixture for universal stand	–	–	–	a)
Tool for removing sealing rings and bearings	87596	87596	2	
Stud wrench for sealing plugs. (Applies to sealing plug of previous design with 2 holes Ø6 mm for stud wrench)	87536	87536	1	
Wrench for oil plug (NV 19 mm). (Fits also sealing plug of later design with hexagon ring NV 19 mm)	87202	87202	–	

a) Supplied by Surte Mek. Verkstads AB, Ytterby.

CYLINDER HEAD

Specifications

			D5,[2] DS5[2]	D8[2]	DS8[2]	D11 DS11	DS11[1]
Valve timing	Intake valve	opens	11°B.T.D.C.	11°B.T.D.C.	28°B.T.D.C.	13°B.T.D.C.	30°B.T.D.C.
		closes	41°A.B.D.C.	41°A.B.D.C.	24°A.B.D.C.	43°A.B.D.C.	26°A.B.D.C.
	Exhaust valve	opens	43°B.B.D.C.	43°B.B.D.C.	62°B.B.D.C.	46°B.B.D.C.	64°B.B.D.C.
		closes	7°A.T.D.C.	7°A.T.D.C.	26°A.T.D.C.	10°A.T.D.C.	28°A.T.D.C.
Diameter, head	Intake valve			50 mm		54 mm	
	Exhaust valve			42 mm		44 mm	
Position of intake-valve seat	Depth			11.20–11.30 mm		11.25–11.35 mm	
	Fillet radius			R 0.2 mm		R 0.2 mm	
Position of exhaust-valve seat	Depth			11.20–11.30 mm		11.25–11.35 mm	
	Fillet radius			R 0.2 mm		R 0.2 mm	
Valve guide, I.D	Intake valve			11.00–11.02 mm		11.00–11.02 mm	
	Exhaust valve			11.00–11.02 mm		11.00–11.02 mm	
Valve springs	Number per valve			2		2	
Rocker-arm shaft	Outside diameter			21.98–21.99 mm		24.98–24.99 mm	
Pushrods	Diameter			14 mm		14 mm	

1) DS11 with higher output setting (DS11A)
2) Reference is made to the appropriate Serive Instructions for definite particulars about the engine cylinder head.

SP

Setting values and tightening torques

		D5, DS5 D8, DS8	D11, DS11	
Tighten the cylinder head nuts (the bolts) according to the instructions			M16 Bolt	M18 Bolt
Tightening torque	50%	90 Nm (9kpm)	120 Nm (12kpm)	150 Nm (15kpm)
	75%	130 Nm (13kpm)	180 Nm (18kpm)	220 Nm (22kpm)
	complete	190 Nm (19Kpm)	240 Nm (24kpm)	300 Nm (30kpm)

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		D5, DS5, D8, DS8	D11, DS11
Valve clearance, cold engine	Intake valve	1) 0,35 2) 0,35 mm	0,35 mm
	Exhaust valve	1) 0,70 2) 0,45 mm	0.80 mm
Angle of valve head	Intake valve	29,5°	29,5°
	Exhaust valve	29,5°	29,5°
Diameter of valve seat	Intake valve (dimension D)	49 mm	53 mm
	Exhaust valve (dimension D)	41 mm	43 mm
Angle of valve seat	Intake valve	30°	30°
	Exhaust valve	30°	30°
Width of valve seat	Intake valve (dimension A)	1,2–1,5 mm	1,2–1,5 mm
	Exhaust valve (dimension A)	1,2–1,5 mm	1,2–1,5 mm
Distance between face plane of cylinder head and valve head (dimension B)		min. 0.75 mm	min. 0.75 mm
Chilling temperature for valve seat inserts and insertion drifts before the inserts are pressed in		ca –80°C	ca –80°C
Clearance between valve stem and guide		max. 0,14 mm	max. 0,14 mm
Height of valve guides above seating level of valve springs		24±0,25 mm	21±0,25 mm
The inside conical recess of the exhaust-valve guide should face the valve head			
Valve springs			
	Outer: free length	66 mm	66 mm
	Outer: length with at least 48 kg load or 470 N	36 mm	36 mm
	Inner: free length	59 mm	59 mm
	Inner: length with at least 20.5 kg or 200 N	32 mm	32 mm
The more closely wound end of the outer valve spring should face the cylinder head			
Inside diameter of rocker-arm bushing (after pressing in)		22.00–22.02 mm	25.00–25.02 mm
Profile depth of bearing surface		1.25 Ra	1.25 Ra
Two holes for the oil passages must be drilled in the rocker-arm bushing			
Fixing screws for the rocker-arm shaft		47 Nm (4,7 kpm)	84 Nm (8,4 kpm)

1) Applies to DS5 and DS8
2) Applies to D5 and D8

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Tools

	D5, DS5 D8, DS8 Part No.	D11, DS11 Part No.	Class	See Page Work Desc.	Remarks
Drift for removing stop cones on valve stem	87736	87736	3x	2	
Cleaning tool for valve guide (exhaust)	88287	88287	2		
Valve and valve seat gauges, set consisting of:	87905	87616	1		
Valve seat gauge (exhaust) 87931				6	
Valve seat gauge (intake) 87940					
Valve gauge 87941				7	
Valve spring presser	87407	87506	2	8	
Thread taps for sealing plugs with overdimension M46 x 1.5, M52 x 1.0	–	–	x		
Tools for replacing injection sleeves, set consisting of:	87059	87059	1	5	
Thread tap 87050					
Puller and guide bushing 87057					
Screw, nut, washer 87058					
Assembly drift 87056					
Milling tool for valve seat, set	–	–	–	6	a)
Drift for removing the valve guide	87961	87961	3x	3	
Drift for assembling the valve seat (exhaust)	87341	87343	1		
Drift for assembling the valve seat (intake)	87342	87344	1		
Drift for assembling the valve guide	87423	87620	1	4	
Drift for assembling the rocker-arm bushing	88091	87474	3x		
Puller for sealing washer to injector	87125	87125	2	2	
Hoisting tool for cylinder head	87401	87060	3x	2	
Hoisting tool for cylinder head D5, DS5	87090	87060	3x	2	
Torque wrench for injector	87529	87529	2		
Polygon wrench for retightening cylinder head nuts under the injector (NV 24 mm)	–	87171	2		
Polygon wrench for retightening of all cylinder head nuts (NV 21 mm)	87132	–	2		

x) Drawing is supplied by the Saab-Scania Automotive Division
The tool is not supplied by us.

a) The tool is supplied by AGB, Order No. 8-227-SV.

75.17265/3200-10.340

INTAKE AND EXHAUST SYSTEM

TURBOCHARGER

Wear limits when assembling reconditioned units

	3LD	4LE/LEK/ LGK/LGZ	T04B
Radial clearance of shaft	max. 0.60 mm	max. 0.65 mm	max. 0.90 mm
Axial clearance of shaft (after running-in)	0.10-0.20 mm	0.08-0.15 mm	max. 0.10 mm
Total run-out of shaft in V-block	max. 0.01 mm	max. 0.02 mm	max. 0.01 mm
Width of shaft piston ring grooves	max. 1.98 mm	max. 1.98 mm	max. 1.87 mm
Total distortion of turbine wheel measured at radius 30 mm	max. 0.04 mm	–	–
" " " " " " " " 25 mm	–	max. 0.03 mm	–
Diameter of bearing housing at bearing positions	max. 22.28 mm	max. 22.28 mm	max. 15.82 mm
Axial diameter at bearing positions	min. 12.19 mm	min. 14.25 mm	min. 10.14 mm

Tightening torques

Compressor wheel lock nut	18 Nm (1.8 kpm)	24 Nm (2.4 kpm)	First tighten to 2 Nm (0.2 kpm) ; after which the nut is turned an additional quarter of a turn.
V-clamp lock nut	14 Nm (1.4 kpm)	14 Nm (1.4 kpm)	–
Bolts for compressor cover	7 Nm (0.7 kpm)	7 Nm (0.7 kpm)	13 Nm (1.3 kpm)
Bolts for turbine housing	–	–	13 Nm (1.3 kpm)
Bolts for brace plate	–	–	9.5 Nm (0.95 kpm)

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Charging pressure

Revision table for measured charging pressure with consideration to temperature in °C of intake air. (Revised values refer to intake air temperature of +25°C and is compared with current charging pressure).

Charging pressure measured below bar	**(kp/cm²)**	**Temperature of intake air in °C (outside air temperature)**											
		−20	**−15**	**−10**	**−5**	**0**	**+5**	**+10**	**+15**	**+20**	**+25**	**+30**	**+35**
						Revised values							
0.20	(0.20)	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.22
0.30	0.31)	0.23	0.24	0.25	0.26	0.27	0.27	0.28	0.29	0.30	0.30	0.31	0.32
0.40	(0.41)	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42
0.50	(0.51)	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.49	0.50	0.51	0.52
0.60	(0.61)	0.46	0.48	0.50	0.51	0.52	0.54	0.55	0.57	0.58	0.60	0.62	0.63
0.70	(0.71)	0.54	0.56	0.58	0.59	0.61	0.63	0.65	0.66	0.68	0.70	0.72	0.73
0.80	(0.82)	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.76	0.78	0.80	0.82	0.84
0.90	(0.92)	0.70	0.72	0.74	0.76	0.79	0.81	0.83	0.85	0.88	0.90	0.92	0.94
1.00	(1.02)	0.77	0.80	0.82	0.85	0.87	0.90	0.92	0.95	0.97	1.00	1.02	1.05
1.10	(1.12)	0.85	0.88	0.91	0.94	0.96	0.99	1.02	1.05	1.07	1.10	1.13	1.16
1.20	(1.22)	0.93	0.96	0.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26

Example: A measured charging pressure of 1.0 bar (1.02 kp/cm²) at − 15°C is equivalent to 0.80 bar at + 25°C.
A measured charging pressure of 0.50 bar (0.51 kp/cm²) at + 35°C would at + 25°C have been 0.52 bar etc.

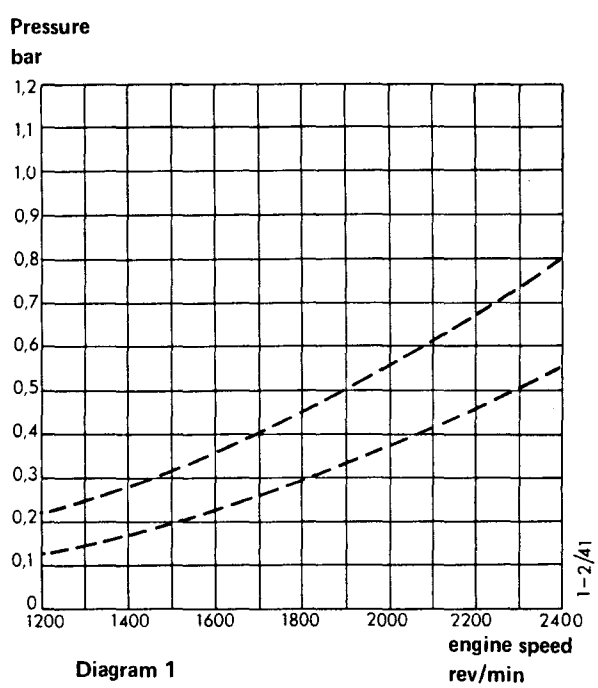

Diagram 1
Limits for revised charging pressure DS5

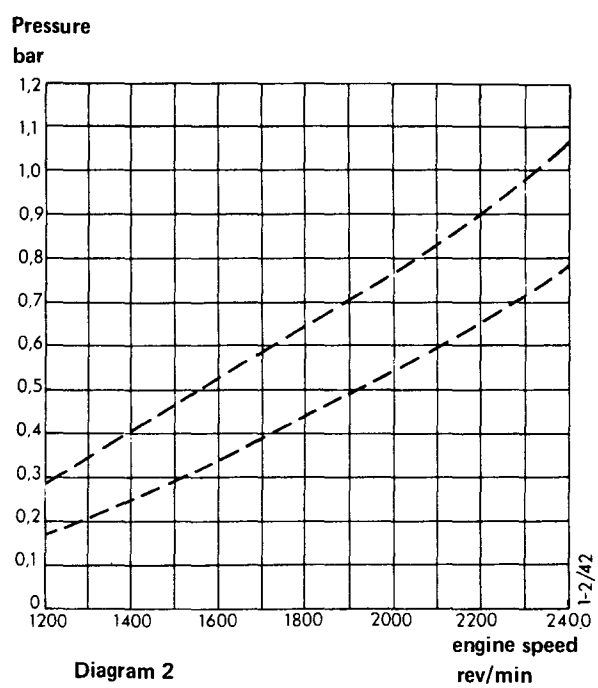

Diagram 2
Limits for revised charging pressure DS8

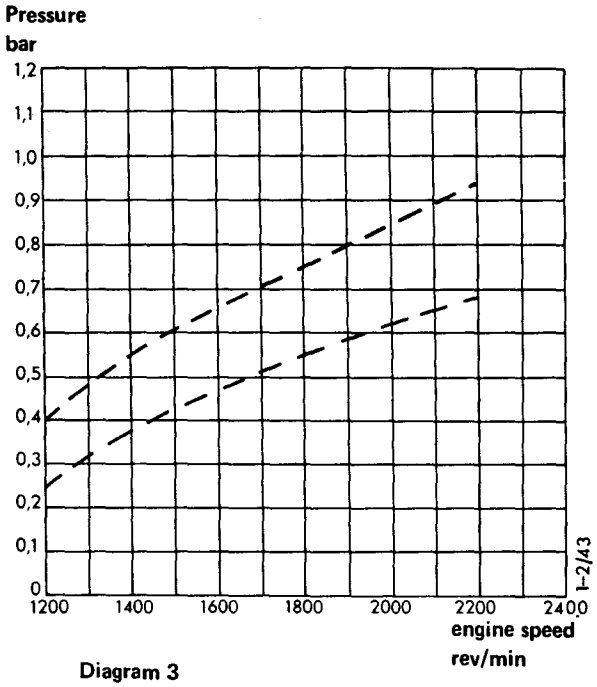

Diagram 3
Limits for revised charging pressure DS11 R01A

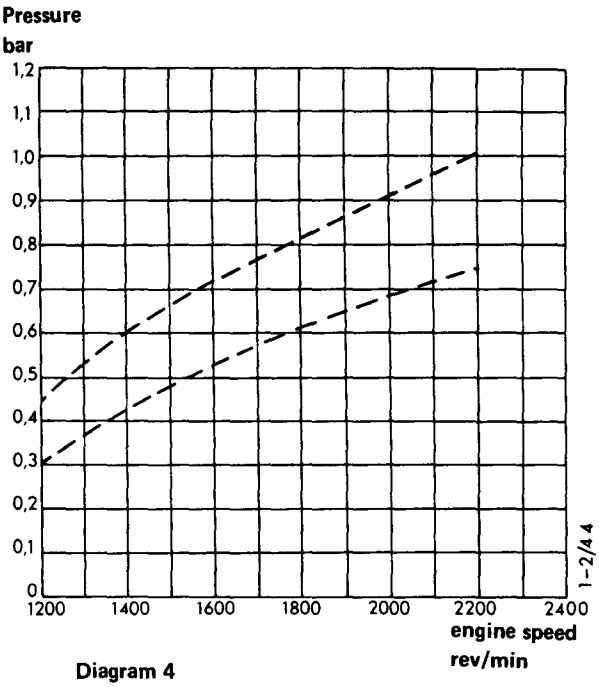

Diagram 4
Limits for revised charging pressure DS11 R06, DS11 LB01–3, DS11 LB05–07, DS11 L01–04

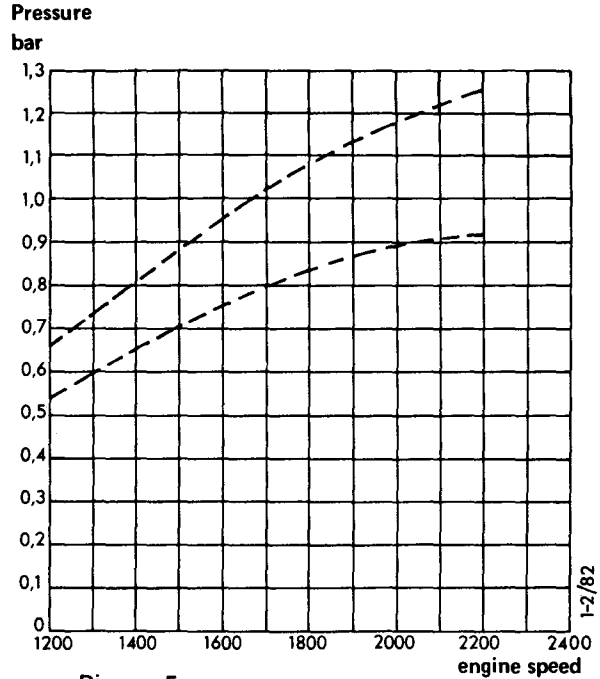

Diagram 5
Limits for revised charging pressure DS11 L05, DS11 LB08–09 DS11 L08, DS11 LB 12-13

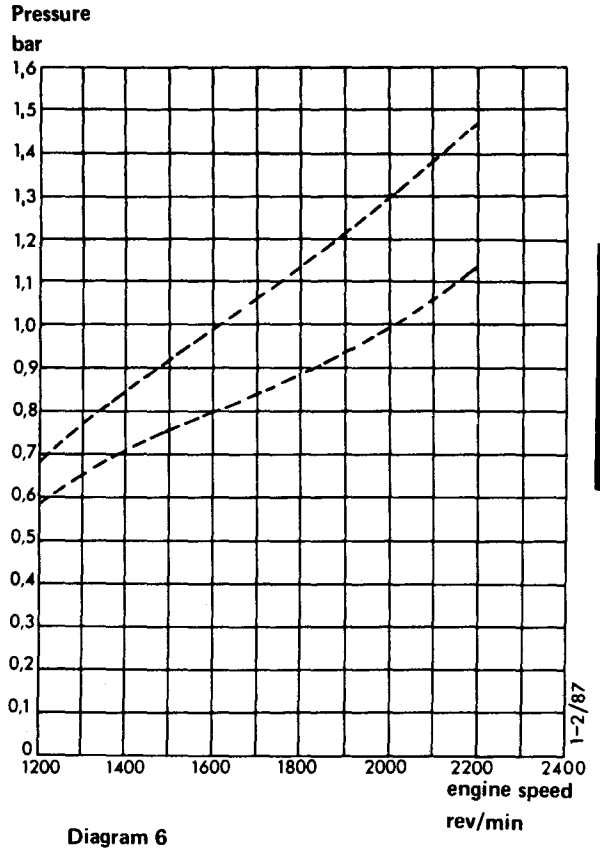

Diagram 6
Limits for revised charging pressure DS11 L07, DS11 LB11

SP

TURBOCHARGER

Engine type	Engine No. (trucks) Scania Sverige fr.o.m.	Scania Sverige t.o.m.	Scania Nederland fr.o.m.	Scania Nederland t.o.m.	Manufacturers designation	Part No. Complete	Bearing Housing with rotor	Replace-ment unit	Repair set Outer	Inner	Nozzle ring Marked	Part No.	Notes
DS 5	600219	602112	100000	105216	Holset 3A	169300	176046	570122	550087	550086	140	173611	Devided compressor housing
DS 5	602113	604110	105217	111465	" 3A	173738	176047	570124	550088	550086	140	173611	
DS 5	604111	–	111466	–	" 3LD	202664	205338	570128	550092	550090	–	–	
DS 5R42			–	–	" 3LD	189141	195817	570131	550092	550090	–	–	For Kockum
DS 5R42			–	–	" 3LD	202858	205338	570128	550092	550090	–	–	" "
DS 8	735435	736778	100000	108941	" 3LD	183360	191083	570126	550089	550090	–	–	Threaded fitting on oil pipe
DS 8	736779	753844	108942	131429	" 3LD	202665	205332	570127	550092	550090	–	–	Flange on oil pipe
DS 8	753845	761784	131430	133868 **	AiResearch T04B 20	230323	232937	570134	550102	550103	–	–	On DS8 LB02 as from engine No. 748546. On DS8 R40 as from engine No. 753611.
DS 8	761785	–	133869 **		AiResearch T04B 55	257232	265560	570137	550156	"			
DS 10	801269	818698	–	–	Holset 4	139529	149331	570120	550080	550085	210	149327	
DS 11	819006	851128	100 000	107387	" 4	160511	149331	570120	550084	550085	224	160638	
DS 11	852129	867999	–	–	" 4LE	189975	205324	570129	550095	550093	–	–	Replaced by 246498
DS 11	868000	888806	–	–	" 4LEK	223620	230100	570133	550107	550093	–	–	Replaced by 246498
DS 11	–	–	107388	156269	KKK 4LE	207303	208116	570130	550095	550094	–	–	Replaced by 252320
DS 11 L	888806	–	156270*	–	KKK 4LGZ	252320	259409	570136	550095	550194	–	–	
DS 11 LB	–	–	156270*	–	KKK 4LGZ	252320	259409	570136	550095	550194	–	–	
DS 11 LB	888806	–	–	–	Holset 4LGK	246498	250642	570135	550107	550195	–	–	
DS 11 L07 DS 11 LB11	–	–	156476		KKK 4LGZ	257747	259409	570136	550095	550194	–	–	

* Except engine No. 156292 – 156299

** Engine No. 133727 has 257232

Turbocharger separate engines

Engine type	Manufacturers designation		Part No.			
			Standard design		Special design	
			Not classified	Classified	Not classified	Classified
DS 5	Holset	3A	173738	179649	–	–
DS 5	Holset	3LD	202664	220565	202073	220566
DS 8	Holset	3LD	183360	203547	–	–
DS 8	Holset	3LD	202665	–	203182	208902
DS 8	AiResearch	T04 B	230323	246228	246229	246230
DS 10	Holset	4	139529	–	–	–
DS/DSI 11	Holset	4	160511	162267	–	–
DS/DSI 11	Holset	4LE	189975	208906	–	–
DS/DSI 11	Holset	4LEK	223620	235463	–	–
DS/DSI 11	KKK	4LE	207303	215904	–	–
DS/DSI 11	Holset	4LGK	246498	251133	–	–
DS/DSI 11	KKK	4LGZ	252320	250248	–	–

1) Displaced compressor and turbine covers, otherwise identical standard.

TOOLS

Description	3LD	T04 B	4LE/LEK/ LGK/LGZ	See page work description	Class
Gauge for measuring width of piston ring groove "No–Go"	98335	–	98335	5, 10	1
Fixture for dismantling	–	98338	–	6	2*)

*) Can be ordered from our Spare Parts Department

Lubricant for exhaust line bolts: Special high-temperature resistant yellow coloured lubricant part No. 561205.

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CYLINDER BLOCK

Specifications

		D5, DS5 D8, DS8	D11, DS11
Cylinder liners	Type	Wet, renewable	Wet, renewable
	Cylinder bore	115.000-115.020 mm	127.000-127.025 mm
	Shims, thickness	0.20, 0.25, 0.30, 0.50 0.75 mm	0.20, 0,25, 0.30, 0.50 0.75 mm

Adjustment Values and Tightening Torques

Fit all liners with the marking turned to face the front of the engine		
Height above level of cylinder block during repair	0.07–0.10 mm	0.05–0.10 mm
Tightening torque when pressing down liner	50 Nm (5 kpm)	60 Nm (6 kpm)
Max. permissible difference between dimensions read off at two diametrically opposite points transverse to the engine	0.02 mm	0.02 mm
Max. permissible height difference for liners belonging to the same cylinder head	0.03 mm	0.03 mm
Max. permissible deviation from parallelism in the cylinder-liner flange	0.02 mm	0.02 mm
Wear	max. 0.35 mm	max. 0.35 mm
Ovality (with cylinder head fitted)	max. 0.05 mm	max. 0.05 mm
Tightening torques for injection nozzles for oil cooling of pistons.	16 Nm (1,6 kpm)	23 Nm (2,3 kpm)
Bolts for timing gear housing – cylinderblock	55 Nm (5,5 kpm)	55 Nm (5,5 kpm)
Bolts for flywheel housing	60 Nm (6,0 kpm)	85 Nm (8,5 kpm)

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Tools

Description	D5, DS5 D8, DS8 Part No.	D11, DS11 Part No.	Class	See page Work desc.	Remarks
Puller for cylinder liner	87627	87627	1	2	
Spare yoke for 87627	–	87151	–		
Stud extension	87372[1]	87499[2]	1	2	
Rule for dial indicator	87198	87198	2	2	
Sleeves for pressing down cylinder liner, set (87493 comprises 1 87494 and 1 87626)	98318[1]	87493	1		
Adjusting reamer for cylinder liner position, complete (87175 excluding down feed tool)	87179	87175	1	3.4	Disc. No. 87392
Spare steel for 87175	–	87179	–		
Shims for adjusting reamers, set of 20 (0.03, 0.05, 0.10 and 0.20 mm)	87207	87207[3]	1		
Feed tool for adjusting reamers	87051	87051	1	4	Disc. No. 87185
Assembly tool for cylinder liners	87424	87521	1	5	

1) Order No. comprises the number of tools required
2) Order No. comprises one tool only
3) One set of shims is included in 87175

CRANKSHAFT AND RECIPROCATING COMPONENTS

Specifications

		D5,DS5 D8, DS8	D11, DS11
Pistons[1]			
Material		Light metal	Light metal
Compression rings	Number per piston	3	3
Scraper rings	Number per piston	2 alt. 1	2 alt. 1

1) For definite particulars about piston type, reference is made to the appropriate service instructions.

Crankshaft

Thrust washers	Thickness		
	Standard	3.429–3.378 mm	3.429–3.378 mm
	Oversize 1	3.505–3.454 mm	3.505–3.454 mm
	Oversize 2	3.556–3.505 mm	3.556–3.505 mm
	Oversize 3	3.683–3.632 mm	3.683–3.632 mm
	Oversize 4	3.937–3.886 mm	4.191–4.140 mm [1]
Main-bearing journals	Diameter		
	Standard	85.000–84.978 mm	101.598–101.620 mm
	Undersize 1 (ground down by 0.25 mm)	84.750–84.728 mm	101.349–101.371 mm
	Undersize 2 (ground down by 0.50 mm)	84.500–84.478 mm	101.097–101.120 mm
	Undersize 3 (ground down by 0.75 mm)	84.250–84.228 mm	100.848–100.871 mm
	Undersize 4 (ground down by 1.00 mm)	84.000–83.978 mm	100.597–100.620 mm
	Undersize 5 (ground down by 1.25 mm)	83.750–83.728 mm	100.348–100.371 mm
	Undersize 6 (ground down by 1.50 mm)	83.500–83.478 mm	100.096–100.119 mm
	Fillet radius	4.7–4.3 mm	5.2–4.8 mm
	Profile depth of bearing surface	0.25 Ra	0.25 Ra
	Width		
	Journal without axial guide (No. 1, 2, 3, 5 and 6)	–	47.00–47.20 mm
	Journal without axial guide (No. 4)	–	61.80–62.00 mm [2]
	Journal without axial guide (No. 1–6)	42.00–42.20 mm	–
	Journal with axial guide (No. 7)	42.20–42.25 mm	47.20–47.25 mm
Crankpins	Diameter		
	Standard	75.000–74.981 mm	84.233–84.255 mm
	Undersize 1 (ground down by 0.25 mm)	74.750–74.731 mm	83.985–84.005 mm
	Undersize 2 (ground down by 0.50 mm)	74.500–74.481 mm	83.734–83.754 mm
	Undersize 3 (ground down by 0.75 mm)	74.250–74.231 mm	83.485–83.505 mm

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Crankpins		D5, DS5 D8, DS8	D11, DS11
	Undersize 4 (ground down by 1.00 mm)	74.000–73.981 mm	83.233–83.254 mm
	Undersize 5 (ground down by 1.25 mm)	73.750–73.731 mm	83.983–83.005 mm
	Undersize 6 (ground down by 1.50 mm)	73.500–73.481 mm	82.733–82.753 mm
	Undersize 7 (ground down by 1.75 mm)	73.250–73.231 mm	–
	Undersize 8 (ground down by 2.00 mm)	73.000–72.981 mm	82.235–82.255 mm
	Fillet radius	4.7–4.3 mm	5.2–4.8 mm
	Profile depth of bearing surface	0.25 Ra	0.25 Ra
	Width	52.0–52.1 mm	59.0–59.1 mm

1) For D/DS11 beginning from engine No. 880840 overdimension 4 3.937–3.886 mm and overdimension 5 4.318–4.267 mm.
2) For D/DS11 beginning from engine No. 880840: 57.80–58.00 mm.

	Sealing Ring Part No.	Colour	Dimensions mm Size B	Size C
Heat Crankshaft Sealing	178866	Black		
	231938	White		

Adjusting Values and Tightening Torques

		D5, DS5 D8, DS8	D11, DS11
PISTONS			
Before removing or fitting piston pin, piston must be heated to		100°C	100°C
Taper piston rings must be fitted with the marked side up			
Piston-ring gap	Top compression ring	0.5–0.7 mm	0.6–0.8 mm
	Second and third compression rings	0.3–0.6 mm	0.5–0.7 mm
Axial play, piston ring		max. 0.25 mm	max. 0.25 mm
CONNECTING RODS Marked from 1 to 6, alternatively 1 to 4			
The connecting rods must be fitted so that the numeral markings can be read from the same direction as the numeral markings in the cylinder block			
Big-end bolts	Tightening torque	110 Nm (11 kpm)	110 Nm (11 kpm)
Piston-pin bushing	Inside diameter (when pressed in)	42.051–42.058 mm	47.031–47.043 mm
	Profile depth of bearing surface	0.6 Ra	0.6 Ra

CRANKSHAFT

Axial play (adjusted with thrust washers at rear main bearing)		0.05–0.25 mm	0.09–0.29 mm
Bearing play (radial)	Main bearings	0.053–0.112 mm	0.058–0.126 mm
	Big-end bearings	0.044–0.094 mm	0.050–0.106 mm
Main-bearing nuts (bolts)	Tightening torque	210 Nm (21 kpm)	290 Nm (29 kpm)
Flywheel bolts	Tightening torque	190 Nm (19 kpm)	190 Nm (19 kpm)
Before fitting, flywheel ring gear must be heated to		250°C	250°C
Vibration-damper screws	Tightening torque[1)]	110 Nm (11 kpm)	110 Nm)11 kpm)
Screw for vibration-damper hub at front end of crankshaft	Tightening torque	735 Nm (75 kpm)	735 Nm (75 kpm)
Screw for flywheel housing	Tightening torque	60 Nm (6 kpm)	85 Nm (8.5 kpm)

1) Does not apply to D5, DS5.

Tools

Description	D5, DS5, D8, DS8 Part No.	D11, DS11 Part No.	Class	See page Work Desc.	Remarks
Assembly tool for rear crankshaft sealing					
Assembly tool for rear oil deflector	98	98	1		Disc. No. 87290
Puller screws for flywheel	87368	87368	2	4	a)
Assembly tool for flywheel casing	87508	87508	1		
Drift for fitting ball bearings in the flywheel	87510	87510	3x		
Piston ring compressor	87718	87629	1	10	b)
Testing device for piston ring gap, set (0.3, 0.5, 0.6, 0.7 and 0.8 mm)	87147	87147	2	9	
Drift for fitting the gudgeon pin	87822	87362	3x	9	
Drift for fitting the gudgeon pin bushing	88121	87475	1	6	

a) Order No. comprises one tool only
b) As class 3-tool there is also a piston ring compressor 98212 (divided hinged cylinder) Ø 127 mm, which is considered quicker and safer than 87629. A drawing is to be seen in the Service Handbook Workshops.
x) The drawing is to be seen in the Service Handbook Workshops. The tool is not delivered by us.

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TIMING GEARS

Adjustment values and tightening torques

			D5, DS5 D8, DS8	D11, DS11
Camshaft	Bearing play	Axial	0.10–0.25 mm	0.10–0.25 mm
		Radial bearing 1	0.045–0.083 mm	0.045–0.094 mm
		Radial bearings 2–4	0.030–0.079 mm	0.030–0.079 mm
Camshaft bushings				
(when pressed in)	Inside diameter	Bearing 1	68.200–68.230 mm	68.200–68.230 mm
		Bearing 2	68.100–68.130 mm	68.100–68.130 mm
		Bearing 3[1]	68.000–68.030 mm	68.000–68.030 mm
		Bearing 4	60.000–60.030 mm	60.000–60.030 mm
	Profile depth of bearing surface		0.6 Ra	0.6 Ra
Before fitting, camshaft gearwheel must be heated to			100°C	100°C
Before fitting, crankshaft gearwheel must be heated to			100°C	100°C
Tooth play (new engine)			0.03–0.09 mm	0.03–0.09 mm
Fixing screws for cooling fan LB80, LB85			24,0 Nm (2,4 kpm)	
Clearance between lock ring and injection pump shelf before tightening the fixing screws of the sealing ring retainer			0,2 mm	0,2 mm
Thicknesses of shims for adjusting the clearance between lock ring and injection pump shelf			0.10, 0.25, 0.50 mm	0.10, 0.25, 0.50 mm

Tools

Description	D5, DS5 D8, DS8 Part No.	D11, DS11 Part No.	Class	See page Work Desc.	Remarks
Sleeve for screw to vibration damper hub	87519	87519	2		
Puller for vibration damper hub	87665	87665	1	2	
Pad for 87665 and 87358	87663	87663	2		
Drift for fitting the vibration damper hub	87509	87509	1	7	
Puller for cam and pump shaft gearwheel (camshaft D5, DS5 only)	87359	87359	1	3	
Puller for crankshaft gearwheel	87358	87358	1	4	

1) Does not apply to D5, DS5

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LUBRICATING SYSTEM

Adjustment values and tightening torques

			D5, DS5 D8, DS8	D11, DS11
Oil pressure			1.5–5.0 bar (kp/cm^2)	1.5–5.0 bar (kp/cm^2)
Oil pressure, D/DS11 beginning from engine No. 880840				1.5–6.0 bar (kp/cm^2)
The reduction valve is fitted in the oil sump and adjusted to 5 bar (kp/cm^2) on warm engine and at engine speed			2.400 r/min	2.200 r/min
The reduction valve is fitted in the cylinder block and adjusted to 4.5–6.0 bar (kp/cm^2) on warm engine and at engine speed				2.200 r/min
Nuts for the rotor cover of centrifugal cleaner (applies to GF1)			First tighten with the fingers and then half a turn with a wrench	First tighten with the fingers and then half a turn with a wrench
Nut for rotor of centrifugal cleaner and nut for cover of lubricating oil cleaner (applies to GF5)			Tighten firmly with the fingers	Tighten firmly with the fingers
The permissible deposit thickness on the rotor walls (applies to rotor with undivided rotor casing)		GF 1	15 mm	15 mm
		GF 5	20 mm	20 mm
Oil-pan bolts	Tightening torques		50 Nm (5 kpm)	50 Nm (5 kpm)
Oil pump bushings (pressed in)	Inner diameter	Bearing 1	19.075–19.100 mm	19.075–19.100 mm
		Bearing 2	19.075–19.100 mm	19.075–19.100 mm
	Bearing surface profile depth			
		Bearing 1	0.6 Ra	0.6 Ra
		Bearing 2	0.6 Ra	0.6 Ra
Oil pump bushings in pump of gear type (pressed in)				
Pump gear bearing journal diameter			22.222–22.235 mm	22.222–22.235 mm
Pump housing bushing diameter (machined)			22.265–22.286 mm	22.265–22.286 mm
Distance between pump gear centre lines			47.68–47.72 mm	47.68–47.72 mm
Pump gear outer diameter			56.970–56.951 mm	56.970–56.951 mm
Diameter for recess of pump for the pump gears			57.100–57.130 mm	57.030–57.060 mm [1]
Smoothness of pump housing bushing surface			0.6 Ra	0.6 Ra
Tightening torques				
	Fixing bolt pump housing cover		20 Nm (2.0 kpm)	20 Nm (2.0 kpm)
	lock nut pump gear		140 Nm (14.0 kpm)	140 Nm (14 kpm)
Oil cooler pressure tested				
	Water side		4 bar (kp/cm^2)	4 bar (kp/cm^2)
	Oil side		10 bar (kp/cm^2)	10 bar (kp/cm^2) [2]

1) For D/DS11 beginning from engine No. 880840: 57.100–57.130 mm
2) For D/DS11 beginning from engine No. 880840: 14 bar (kp/cm^2)

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Tools

Description	D5, DS5 D8, DS8 Part No.	D11, DS11 Part No.	Class	See page Work Desc.	Remarks
Drift for fitting bushing in oil pump	87361	87361	3x	1	
Wrench for oil plug (Nv 18 mm)	87823	87823	–		
Wrench for oil plug (NV 19 mm). (Also fits sealing plug of later design with hexagon hole NV19 mm)	87202	87202	–		
Press Tool for oil cooler	87023	87023	1	7	
Press drift for oil cooler used together with 87411 applies to D/DS11 as from engine No. 880840.		98393	1	7	

x) Drawing supplied by Scania Automotive Division
We do not supply this tool.

GENERAL

CAUTION

This section is applicable to only Waukesha models F674D, DS, and DSI, which are designated by Scania as D, DS, and DSI11A04, A05, A06, and A07. Engine serial numbers for these models are from 888806 (Sweden) and 156300 (Netherland).

Specifications

Cylinder arrangement		In-line engine
Number of cylinders		6
Cylinder bore	mm	127
Stroke	mm	145
Displacement	dm^3	11.02
Number of main bearings		7
Firing sequence		1-5-3-6-2-4
Compression ratio		D11: 16:1, DS11: 15:1
Injection		Direct
Mode of function		4-stroke
Cooling		liquid
Weight [1]	kg, approx.	D11: 875, DS11: 890
Output		
Speed		See Instruction Manual or Service Card for the engine concerned.
Torque		

[1] Vehicle version without compressor, hydraulic pump, coolant and oil.

Tools

	Art. No.	Class
Hoisting tools for removal and fitting of engine in truck		
Lever hoisting block 1.500 kg	98317	2
Hoisting strap	98094	2
Hoisting tools for removal and fitting of engine in BR and CR111		
Engine fixture	98415	3
Pallet for engine fixture	98416	3
Regulating fixtures for height adjustment of air bellows, 2 off	98417	3
Equipment for removal and fitting of engine in B, BF buses	98014	3
Fixture for removal and fitting of starter motor	87395	3
Starter motor wrench (long), L-vehicles	98227	3
Wrench for oil plug and sealing plug	87202	1

SP

Lubricating oil:

Engines without a turbocompressor (D11 engines) are to be lubricated with an oil satisfying the requirements of the American specification MIL-L-2104B (API CC).

Engines with a turbocompressor (DS11 engines) are to be lubricated with an oil satisfying the requirements of the American specification MIL-L-2104C (API CD).

SAE 10W	at outdoor temperatures below $-10^{o}C$
SAE 20 (SAE 20W)	at outdoor temperatures between $-10^{o}C$ and $+10^{o}C$
SAE 30	at outside temperatures above $+10^{o}C$

Never use flushing oil in the engine.

Capacity: approx. 25.0 dm^3 (litres)

77.21151/3200-1081

CYLINDER HEAD

Specifications

Min. height of cylinder head after facing	124.4 mm
Distance "B" between plane of cylinder head and valve head (intake and exhaust valve)	min. 0.75 mm

Intake valve

Clearance (cold engine)	0.35 mm
Head angle	29.4°–29.6°
Overall length	162.5 mm
Head diameter	54 mm
Stem diameter	10.937–10.950 mm
Valve timing, D11 opens	15° B.T.D.C.
closes	43° A.B.D.C.
DS11 opens	28° B.T.D.C.
closes	26° A.B.D.C.
Lifting height without valve clearance D11 and DS11	14.6 mm

Exhaust valve

Clearance (cold engine)	0.80 mm
Head angle	44.4°–44.5°
Overall length	162.5 mm
Head diameter	45 mm
Stem diameter	10.927–10.940 mm
Valve timing, D11 opens	46° B.B.D.C.
closes	12° A.T.D.C.
DS11 opens	56° B.B.D.C.
closes	26° A.T.D.C.
Lifting height without valve clearance D11 and DS11	15.1 mm

Intake valve seat

Exchangeable

Seat angle	30.0°–30.5°
Width of contact surface "A"	1.1–2.1 mm
Height	7.7 mm
Outside diameter	56.002–56.015 mm
Valve seat position, diameter	55.934–55.953 mm
Valve seat position, depth	11.25–11.35 mm
Valve seat, oversize:	
Outside diameter	56.202–56.215 mm
Valve seat position, diameter	56.134–56.153 mm

Exhaust valve seat

Exchangeable

Seat angle	45°–45.5°
Width of contact surface "A"	1.6–2.8 mm
Height	7.7 mm
Outside diameter	51.994–52.007 mm
Valve seat position, diameter	51.914–51.933 mm
Valve seat position, depth	11.25–11.35 mm
Valve seat, oversize:	
Outside diameter	52.194–52.207 mm
Valve seat position, diameter	52.114–52.133 mm

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Valve bushings

Length intake	80 mm
exhaust	73 mm
Inside diameter (fitted)	10.98–11.00 mm
Max. clearance for valve stem	0.17 mm
Height above plane for valve spring	24.0 ± 0.25 mm

Valve springs

Outer spring

Free length	65.0 mm
Compressed to 593 N (59.3 kp)	37.1 mm

Inner spring

Free length	57.8 mm
Compressed to 299 N (29.9 kpm)	34.1 mm

Rocker arm mechanism

Rocker arm shaft, outside diameter	24.98–24.99 mm
Rocker arm bushing, inside diameter (pressed in)	25.00–25.02 mm
Profile depth	1.25 Ra
Diameter of lub. holes (2 holes)	Ø 3 mm
Springs on rocker arm shaft: Free length	88 mm
Clearance: outer rocker arm – bearing bracket, min.	0.10 mm
Lubrication via passage in camshaft:	Intermittent

Tightening torques

	50%	75%	100%
Cylinder head screws M16x2	120 Nm (12 kpm)	180 Nm (18 kpm)	240 Nm (24.0 kpm)
M18x2	150 Nm (15 kpm)	230 Nm (23 kpm)	300 Nm (30.0 kpm)
Screws for bearing bracket for rocker arm shaft			84 Nm (8.4 kpm)
Plugs in ends of rocker arm shaft			50 Nm (5.0 kpm)
Nuts for injectors			10 Nm (1.0 kpm)
Nuts for adjusting screw on rocker arm			40 Nm (4.0 kpm)

Tools

	Art. No	Class
Hoisting tool for cylinder head	87060	3
Polygon wrench for screws under injectors	98048	2
Extractor for washer under injectors	87125	2
Torque wrench for nuts for injectors	87529	2
Valve spring compressor	87506	2
Drift for pressing out valve bushing	87961	3
Drift for fitting of valve bushing	87423	1
Valve gauge	98429	1
Drift for fitting of valve seat	98501	1
Shank for valve seat drift	98500	1
Drift for bushing in rocker arm	87474	3

Tools for machining of valve seat rings and tools for milling of grooves in cylinder head: Mira DSK and Mira BB-M20. (These tools can be bought from Scania or directly from Baumgartner AG, Zürich, Schweiz).

TURBOCHARGER

A sign plate on the turbocharger states the make, type and Scania article number.

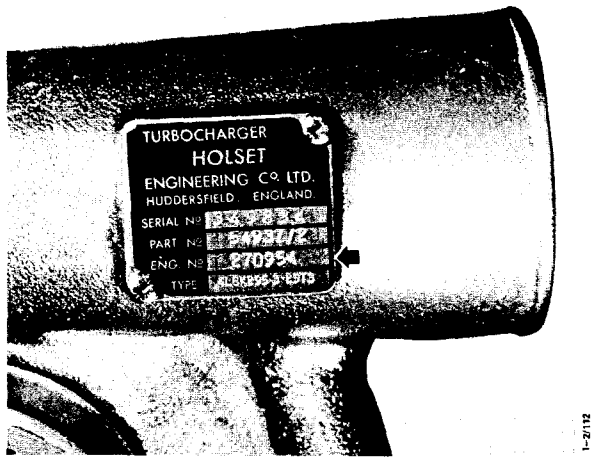

Fig. 1 Holset make type 4LGK. The Scania article number is stamped in where the arrow points. Fitted on engines for LB trucks

Fig. 2 Make KKK type 4LGZ. The Scania article number is stamped in where the arrow points. Fitted on engines for L trucks and on separate engines

Charging pressure at different engine speeds

NOTE that the engine must be run up to full output at the speed concerned. See 1a AR 2 page 3.

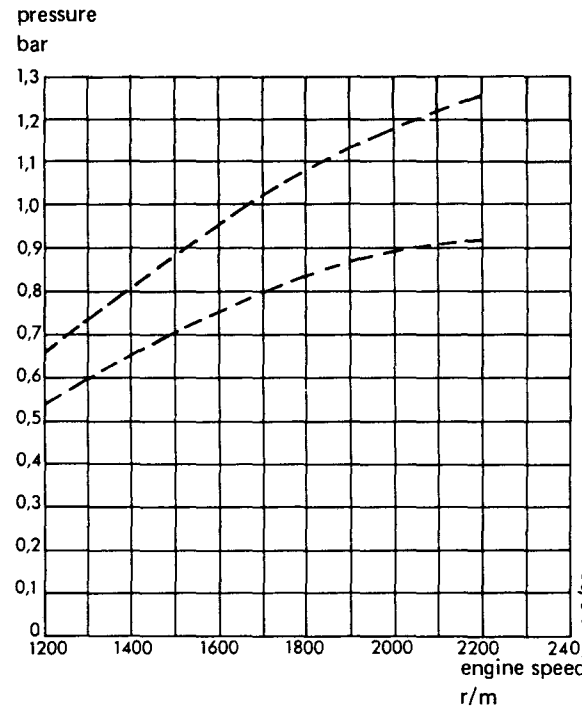

Diagram 1

Limits for corrected charging pressure valid for:

DS11	L05
	L08
	LB08
	LB09
	LB12
	LB13
	LB15
	LB16
	LB18
	LB19

SP

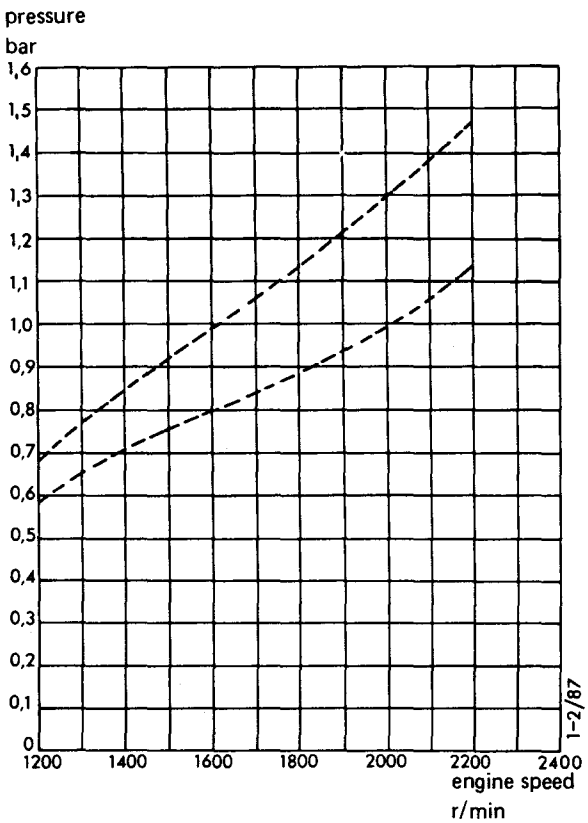

Diagram 2

Limits for corrected charging pressure valid for:

DS11 L07
LB11
LB14
LB17
LB20

The pressure values given in the two diagrams (above and on page 1) are applicable when measuring is carried out at an intake air temperature of +25°C. If measuring is carried out at other temperatures, the measured value must be corrected in accordance with the table below.

Measured charging pressure		Temperature of intake air in °C (temperature of outdoor air)											
		−20	−15	−10	−5	0	+5	+10	+15	+20	+25	+30	+35
bar	(kp/cm²)	Corrected values											
0.20	(0.20)	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.22
0.30	(0.31)	0.23	0.24	0.25	0.26	0.27	0.27	0.28	0.29	0.30	0.30	0.31	0.32
0.40	(0.41)	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42
0.50	(0.51)	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.49	0.50	0.51	0.52
0.60	(0.61)	0.46	0.48	0.50	0.51	0.52	0.54	0.55	0.57	0.58	0.60	0.62	0.63
0.70	(0.71)	0.54	0.56	0.58	0.59	0.61	0.63	0.65	0.66	0.68	0.70	0.72	0.73
0.80	(0.82)	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.76	0.78	0.80	0.82	0.84
0.90	(0.92)	0.70	0.72	0.74	0.76	0.79	0.81	0.83	0.85	0.88	0.90	0.92	0.94
1.00	(1.02)	0.77	0.80	0.82	0.85	0.87	0.90	0.92	0.95	0.97	1.00	1.02	1.05
1.10	(1.12)	0.85	0.88	0.91	0.94	0.96	0.99	1.02	1.05	1.07	1.10	1.13	1.16
1.20	(1.22)	0.93	0.96	0.99	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26

Example: If a charging pressure of 1.0 bar is measured at −15°C it is found from the table that this corresponds to 0.80 bar. In this case, then, 0.80 bar must be compared with the appropriate diagram. If measuring was carried out at +35°C and gave a pressure of 0.5 bar, this corresponds to 0.52 bar which must be compared with the appropriate diagram.

Wear limits

Radial clearance of shaft	max. 0.65 mm
Axial clearance of shaft (after running in)	0.08–0.15 mm
Shaft run-out in V-block	max. 0.02 mm
Width of shaft piston ring grooves	max. 1.98 mm
Lateral throw of turbine wheel at 25 mm radius	max. 0.03 mm
Diameter of bearing housing at bearing positions	max. 22.28 mm
Shaft diameter at bearing positions	min. 14.25 mm

Tightening torques

Compressor wheel lock nut	24 Nm (2.4 kpm)
V-clamp lock nut	14 Nm (1.4 kpm)
Screws for compressor casing	7 Nm (0.7 kpm)
Nuts for turbine casing - exhaust manifold	39 Nm (3.9 kpm)
Screws for intake manifold	40 Nm (4.0 kpm)
Screws for exhaust manifold	70 Nm (7.0 kpm)

Tools

	Art. No.	Class
Gauge for measuring piston ring groove	98335	1
Fixture for dismantling	98338	3
Pressure gauge for charging pressure	98111	3
Nipple for connection of pressure gauge	98113	3
Lubricant for exhaust manifold screw threads	561205	
Gasket set (incl. oil filter), Holset 4LGK	550107	
Gasket set (incl. oil filter), KKK 4LGZ	550095	
Repair kit for Holset 4LGK	550195	
Repair kit for KKK 4LGZ	550194	

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CYLINDER BLOCK

Specifications

Permissible grinding of upper plane of cylinder block	max. 0.10 mm
Cylinder liners Type	wet, exchangeable
Cylinder bore	127.000–127.025 mm
Shims thickness	0.20, 0.25, 0.30, 0.50 and 0.75 mm
Max. ovality (cylinder head fitted)	0.05 mm
Height above cylinder block	0.03–0.09 mm
Max. permissible height difference under same cylinder head	0.03 mm
Max. permissible height difference on one and the same liner between dimensions measured at two diametrically opposite points in the transverse direction of the engine	0.02 mm
Max. wear	0.35 mm
Drilling mark on top of liner flange to face forwards	
Sealing rings for cylinder liners:	
Upper: black	
Middle: black	
Lower: black with violet colour marking or green	
A black ring with violet colour marking or a green ring can also be fitted in the top and middle ring grooves. A black unmarked ring may not, however, be fitted in the lower ring groove.	

Tightening torques

Screws for pressing down cylinder liner	60 Nm (6.0 kpm)
Screws, timing-gear housing - cylinder block	55 Nm (5.5 kpm)
Screws, flywheel casing	85 Nm (8.5 kpm)
Screws, injection pump self	55 Nm (5.5 kpm)
Screws, oil pan	50 Nm (5.0 kpm)
Drain plug	80 Nm (8.0 kpm)
Banjo screw for oil nozzle	23 Nm (2.3 kpm)
Screws for main bearing caps	290 Nm (29 kpm)

Tools

	Art. No.	Class
Puller for cylinder liners	87627	1
Support screw for 87627, set of 4	98168	1
Sleeve for pressing down cylinder liner, 2 required	87626	1
Adjusting reamer for cylinder liner seat	87175	1
Feeder for adjusting reamer	87051	1
Reserve piece for adjuster ream	87179	1
Shims for adjusting reamer, set of 20 – 0.03, 0.05, 0.10 and 0.20 mm (one set included in 87175)	87207	1
Straight edge for dial indicator	87198	2
Dial indicator	98075	2
Measuring point for dial indicator	98410	1
Sealing ring extractor	98484	1
Assembly tool for sealing ring in flywheel casing	98321	1
Assembly tool for sealing ring in timing-gear housing	98494	1

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CRANKSHAFT AND RECIPROCATING COMPONENTS

Specifications

Pistons

Type	With combustion chamber in piston top
Material	Light alloy with ring carrier of cast iron for first compression ring. Fitted with the arrow on the piston top pointing forwards.
Diameter measured at an angle of 90° to and under piston pin	126.828–126.852 mm
Piston pin hole	49.997–50.003 mm
Ring groove width: compression ring alt. 1	2.465–2.485 mm
alt. 2: with Keystone ring at diam. 124.000 mm	2.875–2.905 mm
Compression ring 2	2.465–2.485 mm
Compression ring 3	2.445–2.465 mm
Oil ring	4.787–4.807 mm

Piston pin

Type	Floating
Diameter	49.995–50.000 mm
To be removed or fitted in a piston which has been heated to +100°C	

Piston rings

No. of compression rings	3
Gap: 1st ring	0.6–0.8 mm
2nd and 3rd rings	0.5–0.7 mm
Max. clearance in groove	0.25 mm
Height	2.37 mm
Rings marked "TOP" must be fitted top side up	
No. of oil rings	1
Gap	0.4–0.8 mm
Max. clearance in groove	0.25 mm
Height	4.73 mm

Connecting rods

Connecting rods and caps marked 1–6	
To be fitted with marking facing towards the right-hand side	
Axial clearance	0.20–0.35 mm
Bearing clearance	0.05–0.112 mm
Connecting rod bushing	
Diameter	50.030–50.043 mm
Finish	0.6 Ra

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Crankshaft

Main bearing journals	Diameter	
	Standard	101.598–101.620 mm
	Undersize 1	101.349–101.371 mm
	Undersize 2	101.097–101.120 mm
	Undersize 3	100.848–100.871 mm
	Undersize 4	100.597–100.620 mm
	Undersize 5	100.348–100.371 mm
	Undersize 6	100.096–100.119 mm
	Fillet radius	4.8–5.2 mm
	Profile depth of bearing surface	0.25 Ra
	Width	
	Journal No. 1, inclusive chamfer	42.20–43.00 mm
	Journal No. 2, 3, 5 and 6	47.00–47.28 mm
	Journal No. 4	57.80–58.08 mm
	Journal No. 7	47.20–47.28 mm
	Bearing play	0.054–0.116 mm
Crankpins	Diameter	
	Standard	84.233–84.255 mm
	Undersize 1	83.985–84.005 mm
	Undersize 2	83.734–83.754 mm
	Undersize 3	83.485–83.505 mm
	Undersize 4	83.233–83.254 mm
	Undersize 5	82.983–83.005 mm
	Undersize 6	82.733–82.753 mm
	Undersize 7	82.235–82.255 mm
	Fillet radius	4.8–5.2 mm
	Profile depth of bearing surface	0.25 Ra
	Width	59.00–59.10 mm
	Bearing play	0.050–0.112 mm
Thrust washers	Thickness	
	Standard	3.378–3.429 mm
	Oversize 1	3.454–3.505 mm
	Oversize 2	3.505–3.556 mm
	Oversize 3	3.632–3.683 mm
	Oversize 4	3.886–3.937 mm
	Oversize 5	4.267–4.318 mm
	Axial clearance	0.09–0.29 mm

Flywheel	Max. machining of pressure surface for disc: See group 4 Clutch
Ring gear	Heat to approx. +250°C before fitting
Crankshaft gearwheel	Heat to approx. 100°C before fitting. Tooth play against idler gear 0.03–0.15 mm

Tightening torques

Big-end bolts (oiled threads)	110 Nm (11 kpm)
Main bearing screws	290 Nm (29 kpm)
Flywheel screws	190 Nm (19 kpm)
Crankshaft screw	735 Nm (75 kpm)
Vibration damper hub, screws	110 Nm (11 kpm)

Tools

	Art. No.	Class
Piston ring compressor	87629	1
Alt.: Piston ring compressor	98212	3
Gauge for measurement of piston ring gap	87147	2
Drift for fitting of piston pins	87362	3
Puller screws for flywheel	87368	2
Wrench for crankshaft screw	87519	2
Puller for vibration damper hub	87665	1
Thrust pad (included in 87665)	87663	1
Drift for vibration damper hub	87509	1
Puller for crankshaft gearwheel	87358	1
Drift for crankshaft gearwheel	87932	1

Tools for sealing rings for crankshaft: see 1a SP No. 3.

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TIMING GEARS

Specifications

Camshaft

Axial play	0.10–0.25 mm
Bearing play, bearing 1	0.045–0.094 mm
Bearing play, bearings 2–4	0.030–0.079 mm

Checking the camshaft setting, see 1a AR page 4

Camshaft bearings (to be finely drilled in a machine when changed)

Inside diameter bearing 1	68.200–68.230 mm
2	68.100–68.130 mm
3	68.000–68.030 mm
4	60.000–60.030 mm
Profile depth of bearing surface	0.6 Ra
Thickness of thrust bearing (guide flange)	18.20–18.25 mm

Camshaft gearwheel

Heat before fitting to	+100°C
Tooth play against idler gear	0.03–0.15 mm

Pump shaft gearwheel

Heat before fitting to	+100°C
Tooth play against idler gear	0.03–0.15 mm

Idler gear

Axial play, max.	0.238 mm

Valve lifters

Diameter	34.940–34.955 mm
Diameter in cylinder block	34.988–35.012 mm

Tightening torques

Nut for pump shaft gearwheel	200 Nm (20 kpm)
Nut for camshaft gearwheel	400 Nm (40 kpm)

Tools

	Art. No.	Class
Puller for pump shaft gearwheel and camshaft gearwheel	87359	1
Drift for sealing ring	98433	1

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LUBRICATING SYSTEM

Specifications

Oil pump

Capacity	120 dm^3/min at 2.200 r/min
Tooth play: crankshaft gearwheel - idler gear on oil pump	0.05–0.23 mm
Tooth play: idler gear - pump gearwheel	0.01–0.11 mm
Tooth play: oil pump gearwheels in pump	0.13–0.43 mm
Radial play: pump gearwheels - pump housing	0.130–0.179 mm
Axial play: pump gearwheels - pump housing cover	0.07–0.10 mm
C/c distance between pump gearwheels	47.68–47.72 mm
Diameter of pump gearwheel journals	22.222–22.235 mm
Inside diameter of pump housing bushings, machined	22.265–22.286 mm
Finish, pump housing bushings	0.6 Ra

Oil pressure valve

Oil pressure:	
With warm engine and speed of 2.200 r/min	4.5–6.0 bar (kp/cm^2)
With warm engine and speed of 800 r/min	min. 1.5 bar (kp/cm^2)
Free spring length: Earlier version	66.4 mm
New version as from engine No. 953406	61.4 mm
Shims thickness	0.5 mm
One shim changes the oil pressure approx.	0.12 bar (kp/cm^2)

Oil cleaner

Permissible deposit thickness on wall of cover	20 mm
Shaft diameter	
at upper bearing	9.497–9.512 mm
at lower bearing	12.667–12.685 mm
Diameter of bearings	
upper	9.576–9.591 mm
lower	12.751–12.769 mm

Oil filter for turbocompressor

Use only SCANIA original filter, part No. 173171

Oil cooler

Pressure test at:	water side	4 bar (kp/cm^2)
	oil side	10 bar (kp/cm^2)

Tightening torques

Oil pump

Screws for oil pump cover	20 Nm (2 kpm)
Lock screw (l.h. thread) for idler gear	40 Nm (4 kpm)
Nut for pump drive wheel	140 Nm (14 kpm)

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Oil cleaner

Screw for rotor cover and screw for oil cleaner housing cover	Tighten with fingers

Oil cooler

Drain cock (if provided)	23 Nm (2.3 kpm)

Oil nozzles for piston cooling

Banjo screw	23 Nm (2.3 kpm)

Tools

	Art. No.	Class
Drift for idler gear journal	87663	1
Stud wrench for oil pressure valve	98386	1
Drift for oil cooler, part-flow type	87411	1
Drift for oil cooler, " " "	98393	1
Drift for oil cooler, full-flow type	98512	1
Locking fluid for rotor shaft in oil cleaner	561056	
Activator "T" for faster hardening of locking fluid	561045	

1. Engines

a. D5, DS5, D8, DS8, D11, DS11

List of Contents

STARTING OF ENGINES AT LOW TEMPERATURES

General pre-requisites for starting an engine:

1. The engine must be given a sufficient cranking speed on starting.
2. This cranking speed must be kept up for a certain amount of time (=a certain number of revolutions).
3. The fuel-air mixture must be in an easily ignitable state.

In view of these pre-requisites the engine must be correctly adjusted and in good condition. The storage batteries must also be in good condition and the connections between them and the starting motor thoroughly satisfactory. The capacity of the batteries should correspond to the recommendations which you will find below. The fuel system shall be free from water so that no ice crystals block the fuel filters ets.

Temperature down to about -15°C

It is possible to start normally without special equipment or special motor fuel.

A lubricating oil with viscosity recommended for the ambient temperature and a diesel fuel specified in the Service Manual are pre-requisites.

When starting at temperatures between +5°C and -0°C the cold-start device of the injection pump shall be engaged. Please see maintenance instructions.

Attempts to start at still lower ambient temperatures are to be made with the clutch pedal depressed; by so doing the work of the starting motor is facilitated.

At attempts to start the starting motor should be kept engaged without interruption until the engine starts. However, if no ignition or start occurs after a continued period of engagement for say 15 seconds the attempt to start should be interrupted. If, during this attempt the engine ignites but does not start up the attempt period may be extended up to 30 seconds after which time the attempt shall be interrupted. When the batteries have recovered sufficiently during 30 seconds a fresh attempt to start can be undertaken similar to the previous one.

Recommended battery capacities:

Engines D5, DS5, D8 and DS8: 114 ampere/hours
Saaj E 1312 Tudor 6E6, Noack 219 or corresponding

Engines D11 and DS11: 135 ampere/hours
Saaj ET1912, Noach 221, Tudor 6Ex9 or corresponding

Applies to: D5, D8 and D11

Temperatures down to about -25°C

1. The additional conditions according to the specification below must be complied with:

   a) The lowest pour point of the fuel shall be at least 5°C below the ambient temperature.

   b) The batteries shall be of a cold-resisting type (with an increased active surface, i.e. a comparatively low internal resistance).

      If the batteries are kept warm by means of a heating device such devices of a normal type can be used, too.

2. We recommend the following additional equipment:

   a) ENGINE HEATER

      The coolant system of the engine heater shall be connected to that of the engine according to the following instruction:

      Connect the inlet hose of the heater to the suction side of the water pump.

      Connect the outlet hose of the heater as far away as possible from the thermostats in the coolant system of the engine, i.e. to the cylinder head fitted at the extreme rear.

      For more detailed instructions, reference is made to fitting instructions provided by suppliers of engine heaters.

      N.B. The inlet and outlet hoses of the engine heater shall be provided with shut-off cocks. **These may only remain opened when the engine heater is in operation.** If a cock is left opened during operation there is danger of insufficient cooling of the engine (in an engine with lubricating oil cooler a subsequent increase of the lubricating oil temperature is then possible.

      The capacity of the engine heater should be decided upon in consultation with the supplier of engine heaters. Especially the lowest possible starting temperature and other circumstances concerning the starting of the engine should be taken into consideration. The capacity required is influenced by different factors, e.g. by how well the engine and radiator are protected against wind.

SE, SF, SG, SH

As a guide when deciding upon the heater capacity we can add that at the above mentioned low starting temperature, -25°C, the heater should be constructed so as to be able to keep the coolant at a temperature of about 50° (above that of the ambient temperature, i.e. +25°C).

A well wind-protected engine (and radiator) of 6 cylinders requires in this case an output of 2–3kW.

b) ETHER SPRAYER

In those cases when it is not possible to use an engine heater an "automatic starting pilot" can be fitted. Fitting Instructions for such "pilots" can be obtained from our Service Department after application. In that case, please indicate type of engine and chassis.

Temperatures down to -40°C

It is still possible to start with the help of the starting motor. Then it is a pre-requisite, however, that not only the coolant but also the lubricating oil is heated. As lubricating oil congeals slightly below -30°C, it is advisable to maintain a steady heat in order to prevent this critical temperature occurring during an interruption in operation.

1. WHEN STARTING

a) Push in the stop control completely.

b) Pull out the hand throttle control completely (this is now necessary for the injection pump with pneumatic governor, too, on account of the choke damper introduced in the throttle housing).

c) Put the injection pump in cold start position by pressing in the cold start button or, on the majority of CAV pumps, by pulling out the axle of stop lever arm.

d) **Injection Pump with Pneumatic Governor**

Push in the hand throttle control to a position corresponding to a slightly increased idling speed (approx. 600 rev/min., depress the clutch pedal (but not the accelerator) and start the engine. Let the engine warm up slightly at low speed, approx. 600 rev/min. This will give smoother ignition and less smoke formation than if the engine is operated at higher speeds.

Injection Pump with Centrifugal Governor

Depress the clutch pedal and accelerator and start the engine. Let the engine speed rise to about 1000 rev/min. and then very gently reduce the acceleration to about 600 rev/min. Allow the engine to warm up slightly at this speed. This will give smoother ignition and less smoke formation than if the engine is operated at higher speed.
In certain cases, despite the above mentioned method of procedure, starting difficulties have arisen, which have been caused by one or several of the below mentioned factors.

2. In cold weather the control rod moves relatively slowly and it may, therefore, occur that it will not reach max. delivery position when the cold start device is connected in. There is risk, therefore, that the control rod will not go into the cold start position when this is engaged, which will show up by the cold start device not remaining in engaged position when it is released.

3. When the control rod has reached max. delivery position, it may occur, by reason of the slow movement of the rod, that this will only move a little way past the max. delivery position if the cold start device is released immediately after the process of engagement. The amount of friction then experienced in the cold start device, in this case, will be sufficient to prevent the rod from moving further to max. cold start position. In order to prevent this from happening, it is advisable that the cold start button and the axle of stop lever arm respectively be operated in and out several times.

4. It has occurred that with pneumatic governors of make CAV, the diaphragm has become stiff in very cold weather, which apart from other reasons can make the engagement of the cold start device very difficult.

In order to prevent this from happening the cold hardiness of the diaphragm has now been improved. The new diaphragm is introduced as standard on both D5 and D8 series injection pumps with pneumatic governors beginning from pumps with the date code "XG", which is indicated on the type plate of pump in connection with serial numbers. The first letter in the code indicates the month of manufacture and the other the year of manufacture, i.e. "X" refers to October and "G" to 1965. Pumps of a later make during 1965 have the code "YG" (for November) and "ZG", (December). Pump manufactured in 1966 has designation "H" for year of manufacture.

The new diaphragm can, if necessary, also be fitted in retroactively. As the part number of the diaphragm is unchanged the improved diaphragm has been provided with an identification sign consisting of a drill mark on the front diaphragm axle end - towards the pump housing. One other difference is that the old diaphragm easily blackens when it is handled by the fingers, which the new design does not do.

(Note: Pages 105 thru 112 have been obsoleted)

SMÖRJOLJEREKOMMENDATIONER

Bakgrund

Multigradeoljor avsedda för dieselmotorer finns nu tillgängliga. Våra motorer får smörjas med antingen single grade eller multigradeoljor som uppfyller nedanstående krav.

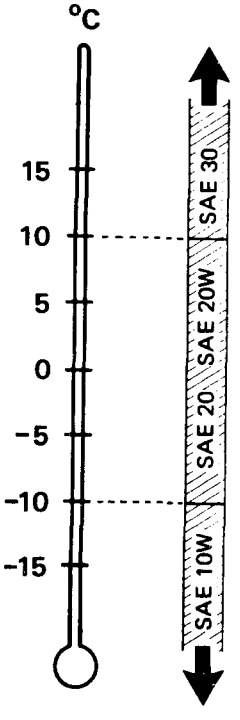
Aktuell information

Sugmotorer ska smörjas med en olja som uppfyller kraven för service CC eller CD enligt API.

Överladdade motorer ska smörjas med en olja som uppfyller kraven för service CD enligt API.

Viskositetsrekommendationer

Single grade



LUBRICATING OIL RECOMMENDATIONS

Background

Multigrade oils for diesel engines are now available. Our engines may be lubricated by either single or multigrade oils, provided that they meet the demands specified below.

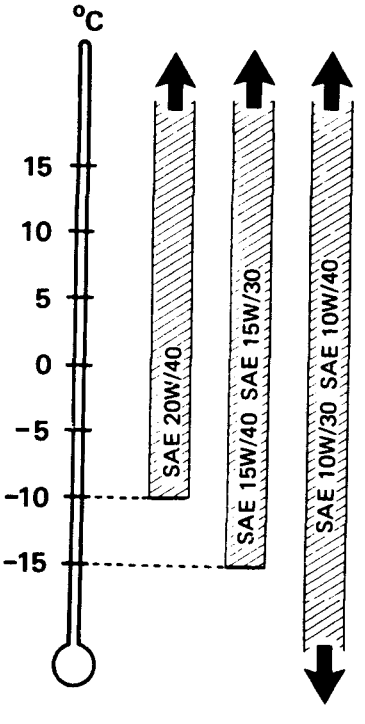
Current information

Naturally aspirated engines should be lubricated by an oil meeting the demands of API service class CC or CD.

Supercharged engines should be lubricated by an oil meeting the demands of API service class CD.

Viscosity recommendations

Multigrade



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SCHMIERÖLEMPFEHLUNGEN

Anlaß

Mehrbereichsmotorenöle für Dieselmotoren sind jetzt verfügbar. Unsere Motoren dürfen entweder mit Einbereichs- (single grade) oder Mehrbereichsölen (multigrade), welche den nachstehenden Forderungen entsprechen, geschmiert werden.

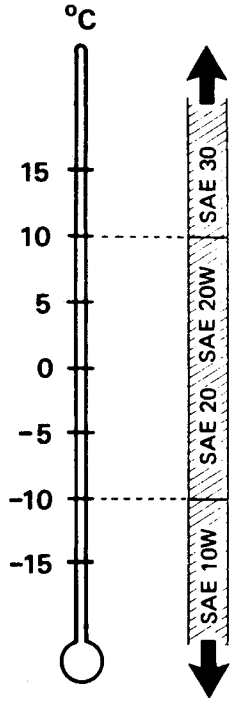
Aktuelle Information

Saugmotoren müssen mit einem Öl geschmiert werden, welches den Forderungen für Service CC oder CD nach API entspricht.

Aufgeladene Motoren müssen mit einem Öl geschmiert werden, welches den Forderungen für Service CD nach API entspricht.

Viskositätsempfehlungen

Single grade



RECOMENDACIONES SOBRE ACEITES LUBRICANTES

Antecedentes

Existen actualmente aceites multigrados para motores diesel. Nuestros motores pueden lubricarse sea con aceites "monogrados" (single grade) sea con aceites multigrados, siempre y cuando cumplan con las siguientes exigencias.

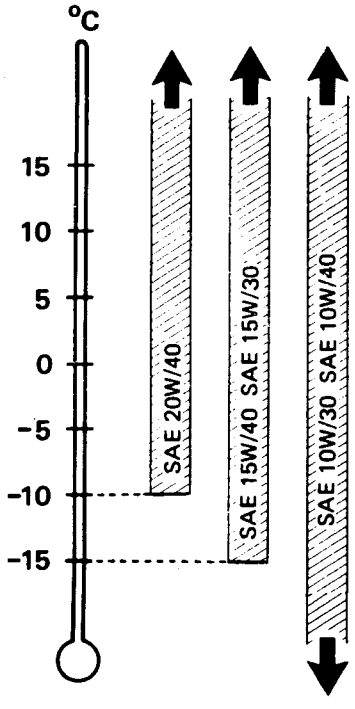
Información actual

Los motores de aspiración natural deberán lubricarse con un aceite que cumpla con las exigencias de servicio CC o CD según API.

Los motores sobrealimentados deberán lubricarse con un aceite que cumpla con las exigencias de servicio CD según API.

Recomendaciones de viscosidad

Multigrade



MODIFIERAD DS11–MOTOR

Fr o m motor nr 5202428 har DS11-motorn modifierats. Motorn förekommer nu i två versioner benämnda DS1101 och DS1102.

DS1101

Motorn har försetts med en modifierad insprutningspump. Modifieringen består av att tryckventiler med två tomgångshål införts, se fig. Tidigare utförande hade endast ett hål.

DS1102

Motorns insprutningspump har tryckventiler med ett tomgångshål. Insprutningspumpen har försetts med en ny typ av regulator (fullastregulator) benämnd RQV-K.

Turbokompressorns turbinhus är tillverkat av ett speciellt värmebeständigt material. I övrigt är turbokompressorn inte ändrad.

Motortypbeteckningar för lastbilar med DS1102-motor

Lastbil	Nya beteckningar
L111-serien med enkellamellkoppling	DS1102 L17
L111-serien med dubbellamellkoppling	DS1102 L19
LB111 V-serien med enkellamellkoppling	DS1102 LB23
LB111 H-serien med enkellamellkoppling	DS1102 LB28
LB111 V-serien med dubbellamellkoppling	DS1102 LB26
LB111 H-serien med dubbellamellkoppling	DS1102 LB29

MODIFIED DS11–ENGINE
(Starting with S/N 5202428)

The DS11-engine has been modified as from engine No. 5202428. The engine now exists in two versions designated DS1101 and DS1102

DS1101

The engine has been provided with a modified injection pump. The modification implies that pressure valves with two idling holes have been introduced, see figure. The earlier design had only one hole.

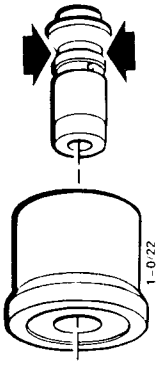
DS1102

The engine injection pump has pressure valves with one idling hole. The injection pump has been provided with a new type of governor (full load governor) designated RQV–K.

The turbocharger turbine housing is made of special heat-resisting material. Otherwise the turbocharger remains unchanged.

Engine type designations for trucks with DS1102–engines

Truck	New designations
L111-series with single disc clutch	DS1102 L17
L111-series with dual disc clutch	DS1102 L19
LB111 V-series with single disc clutch	DS1102 LB23
LB111 H-series with single disc slutch	DS1102 LB28
LB111 V-series with dual disc clutch	DS1102 LB26
LB111 H-series with dual disc clutch	DS1102 LB29



Tryckventil med två tomgångshål *Pressure valve with two idling holes*

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MODIFIZIERTER DS11–MOTOR

Ab Motor Nr. 5202428 ist der DS11-Motor modifiziert. Der Motor ist jetzt in zwei Versionen mit der Bezeichnung DS1101 und DS1102 erhältlich.

DS1101

Der Motor ist mit einer modifizierten Einzpritzpumpe versehen. Die neue Ausführung hat Druckventile mit zwei Leerlauflöchern, siehe Abb. Die frühere Ausführung hatte nur ein Loch

DS1102

Die Einspritzpumpe des Motors hat Druckventile mit einem Leerlaufloch. Die Einspritzpumpe ist mit einem neuen Regulatortyp versehen (Vollastregler) genannt RQV–K.

Das Turbinengehäuse des Turboladers ist aus einem speziellen wärmebeständigem Material gefertigt. Im übrigen ist der Turbolader unverändert.

Motortypbezeichnungen für Lkw mit DS1102-Motor

LKW	Neue Bezeichnungen
L111-Serie mit Einscheibenkupplung	DS1102 L17
L111-Serie mit Doppelscheibenkupplung	DS1102 L19
LB111 V-Serie mit Einscheibenkupplung	DS1102 LB23
LB111 H-Serie mit Einscheibenkupplung	DS1102 LB28
LB111 V-Serie mit Doppelscheibenkupplung	DS1102 LB26
LB111 H-Serie mit Doppelscheibenkupplung	DS1102 LB29

MOTOR DS11 MODIFICADO

A partir del núm 5202428 se ha modificado el motor DS11. El motor existe ahora en dos versiones designadas DS1101 y DS1102.

DS1101

El motor está equipado con una bomba de inyección modificado. La modificación consiste en que se han introducido válvulas de presión con dos agujeros de ralentí, ver la fig. la versión anterior tenía un solo agujero.

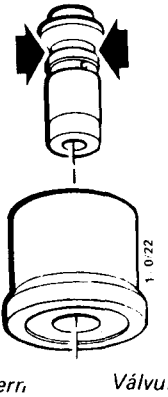
DS1102

La bomba de inyección del motor tiene válvulas de presión con un agujero de ralentí. La bomba de inyección lleva un nuevo tipo de regulador (regulador de carga total) designado RQV-K..

La caja de turbina del turbocompresor está fabricada con un material especial resistente al calor. Por lo demás el turbocompresor ne se ha modificado.

Designaciones de tipos de motores para camiones con motor DS1102

Camión	Nueva designación
Serie 111 con embrague monodisco	DS1102 L17
Serie 111 con embrague bidisco	DS1102 L19
Serie LB111 (iz[a]) con embrague monodisco	DS1102 LB23
Serie LB111 (der[a]) con embrague monodisco	DS1102 LB28
Serie LB111 (izq[a]) con embrague bidisco	DS1102 LB26
Serie LB111 (der[a]) con embrague bidisco	DS1102 LB29



Druckventil mit zwei Leerlauflöchern *Válvula de presión con dos agujeros de ralentí*

(Note: Pages 113 and 114 have been obsoleted)

MEASURES TO COUNTER GAS LEAKS ON D8 SERIES ENGINES

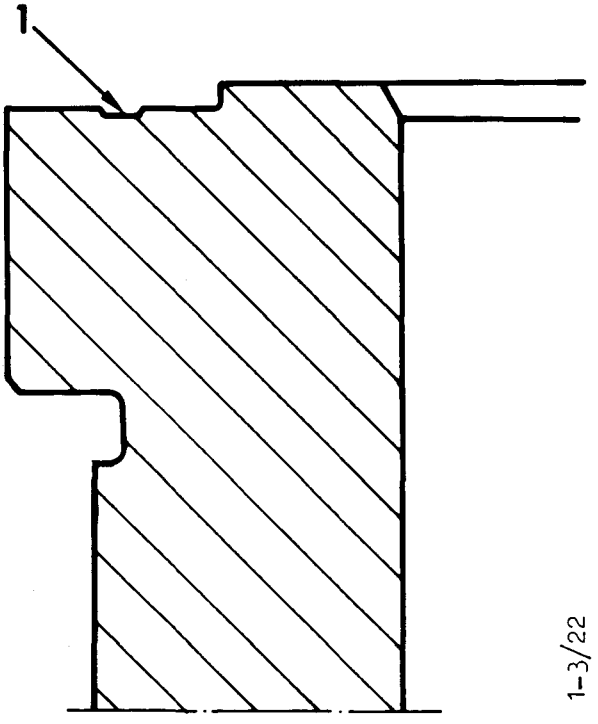
Tightness check on cylinder head nuts

Operating experiences of difficult operating conditions have revealed that the inspection of tightening torques for the cylinder head nuts should be made more stringent on all DS8 engines, thereby increasing the safety margin as regards gas leaks.

In future, therefore it is recommended that tightness torques (186 Nm or 19 kpm) are also checked in conjunction with the **inspection** of a new engine **before** delivery to the customer.

Suitable measures have always been recommended for engine repairs involving the replacement of the cylinder head gasket. It should be noted that initial tightening should be carried out as soon as the engine has warmed up, with no load. After subsequent test running the engine under load, the final check tightening of the cylinder head nut torques is carried out before it is handed over to the customer.

In all other respects, tightening must be carried out as per the earlier recommendation after the first 2500 km.



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1. Groove in sealing surface against cylinder head gasket.

Increased cylinder liner projection on D5/DS5 and D/DS8

To improve the gas tightness on the above mentioned types of engines, the liner projection has been increased from 0.03 - 0.07 mm to 0.07 - 0.10 mm. This increase in liner projection has been introduced in production from and including engine No. 606792 on D/DS5 and from and including engine No. 749391 on D/DS8. On D/DS8 engines the liner projection has been increased in two stages. The first increase to 0.04 - 0.08 mm was introduced in production from and including engine No. 748930.

New cylinder liner for D/DS5 and D/DS8

To improve gas tightness even more, a new cylinder liner has been introduced in our production, from and including engine No. 753511 on DS8, from and including engine No. 753955 on D8 and from and including engine No. 607715 on D/DS5.

The new cylinder liner has been provided with a groove in the sealing plane against the cylinder head gasket.

Description	Old	New
Cylinder liner	228110	243817

Measures to counter gas leaks

When replacing blown cylinder head gaskets, the cylinder liners should as a standard measure be raised on engines with an engine number lower than 749391. At the same time it is recommended that the liners be replaced by item No. 243817 on all cylinders.

The new cylinder liner does not involve any change in the tightness torque of the cylinder head nuts or the cylinder head gasket.

When inspecting the liner projection, make sure that the liner is pressed down properly with sleeve set 98318.

When replacing the cylinder head gasket, it is important for the sealing surfaces on the cylinder block, cylinder head and cylinder liner to be throughly cleaned so that the sealing properties are not impaired by remaining dirt, particles etc.

Also make sure that the guide pins in the cylinder block for fixing the cylinder head are properly hammered down. When fully hammered down, the guide pins have a projection of 10 mm above the cylinder block plane.

3200-569

For instructions as to inspection of liner projection, removal and fitting of cylinder liner and reamering the stop in the cylinder block, refer to the appropriate work description.

Level indicator for cooling liquid on LB80/85

To reduce the risk of gas pockets and other engine damage, caused by too low a cooling liquid level, retroactive fitting of the level indicator for the cooling liquid is recommended. The level indicator can be fitted on the LB80/85. Full fitting instructions will be found in Special Information 2a:9-9.

Inspection of cylinder block surface

When replacing blown cylinder head gaskets, the cylinder block surface or plane must be inspected. This is done with a ruel 87198 and the indicator dial, or with a face plate and marking ink. In teh case of unevenness of more than 0.02 mm, the block plane should be levelled. Raised surfaces may occur, for example, around the holes for the stud bolts. Unevenness of up to 0.04 - 0.05 mm can be levelled off with emery cloth. The procedure is described below. With greater unevenness (e.g. corrosive damage), the block plane must be machined. Max. permissible machining 0.10 mm. After planing the cylinder block, check whether it is necessary to adjust the height of the cylinder liner above the cylinder block.

Polishing or levelling cylinder block plane with emery cloth.

To obtain a satisfactory result, great accuracy is required from the person carrying out this operation, for it is very easy to spoil or damage a block.

A suitable method for levelling a cylinder block with emery cloth is as follows:

1. Glue two strips of emery cloth (width 70-80 mm) under a scrapped but plane or level cylinder head for a D or DS11 engine. The strips must be glued along both longitudinal sides of the cylinder head. The glued strips are used to ensure that the strips of emery cloth later used for levelling are retained and do not slide.

2. Dip two strips of emery cloth, about 700 mm long, 70-80 mm wide, and with a grain size of 60-80, in white spirit or paraffin. Place the strips under the glued strips on the cylinder head.

3. Plug up the openings in the block plane with rags to prevent grinding dust from penetrating the engine. Coat the block surface with white spirit or paraffin.

4. Place the cylinder head with the emery cloth on the cylinder block. The cylinder head must be placed along and on the centre-line of the cylinder block. Fold up the projecting ends of the emery cloth strips and hold them tight. Push the cylinder head to and fro 7-10 times. The entire length of the cylinder block plane must be covered each time the cylinder head is pushed backwards and forwards. The surfaces between the cylinders have not yet been levelled. This is done by subsequent fine polishing.

5. Screw a steel plate about 25 mm thick under a scrapped cylinder head for a D or DS8 engine. Check that the steel plate is level. Then glue a sheet of emery cloth under the whole plate. Fold up the emery cloth against the edges of the plate.

6. Place a sheet of emery cloth under the cylinder head and then place the cylinder head on the cylinder block. Grain size 150 of the emery cloth. The emery cloth must first be dipped in white spirit and paraffin and the block plane coated with these liquids.

7. Polish off the block surface by pushing the cylinder head backwards and forwards **once** in small circular movements.

(Note: Pages 117 and 118 have been obsoleted)

VENTILSÄTEN AV ÖVERDIMENSION

Ventilsäten av överdimension kan monteras om läget för ventilsätet i cylinderhuvudet har skadats. Hålet i cylinderhuvudet brotschas då till nedan angivna mått. För att uppnå dessa toleranser är det i allmänhet nödvändigt att använda fasta brotschar. Dessutom krävs kvalificerad mätutrustning.

Motor	Ventilsäte	Art. nr	Hålets storlek
D/DS8	Avlopp	18376	Ø47,2 $^{-0,100}_{-0,120}$
	Inlopp	152670	Ø55,2 $^{-0,100}_{-0,120}$
D/DS11	Avlopp	154992	Ø52,2 $^{-0,067}_{-0,086}$
	Inlopp	156096	Ø60,2 $^{-0,035}_{-0,054}$

VENTILSITZE MIT ÜBERMASS

Ventilsitze mit Übermaß können montiert werden, wenn die Ventilsitzlage im Zylinderkopf beschädigt ist. Die Ventilsitzlage wird dann auf nachstehende Maße ausgeräumt. Um diese Toleranzen zu erreichen, muß im allgemeinen ein Ausräumer benutzt werden, der nicht verstellbar ist. Außerdem ist eine geeignete Meßausrüstung erforderlich.

Motor	Ventilsitz	Teil Nr.	Lochgröße
D/DS8	Auslaß	18376	Ø47,2 $^{-0,100}_{-0,120}$
	Einlaß	152670	Ø55,2 $^{-0,100}_{-0,120}$
D/DS11	Auslaß	154992	Ø52,2 $^{-0,067}_{-0,086}$
	Einlaß	146096	Ø60,2 $^{-0,035}_{-0,054}$

OVER–DIMENSION VALVE SEATS

Over-dimension valve seats can be fitted if the position of the valve seat in the cylinder head has been damaged. The hole in the cylinder head shall then be reamed to the dimensions indicated below. To attain these tolerances it is generally necessary to use fixed reamers. In addition first-rate measuring equipment is required.

Engine	Valve Seat	Part No.	Size of Hole
D/DS8	Outlet	18376	Ø47.2 $^{-0.100}_{-0.120}$
	Intake	152670	Ø55.2 $^{-0.100}_{-0.120}$
D/DS11	Outlet	154992	Ø52.2 $^{-0.067}_{-0.086}$
	Intake	156096	Ø60.2 $^{-0.035}_{-0.054}$

ASIENTOS DE LAS VALVULAS SOBREDIMENSIONADOS

Los asientos sobredimensionados de las válvulas pueden montarse si la posición del asiento en la culata se ha deteriorado. En este caso se escariará el agujero en la culata a las dimensiones abajo mencionadas. Para obtener estas tolerancias, generalmente resulta necesario emplear escariadores fijos. Además se requiere un equipo de medición de un alto nivel técnico.

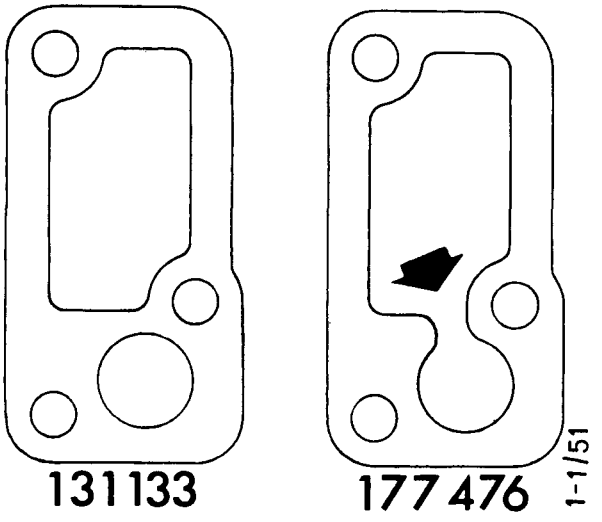
Motor	Asiento de válvula	No. de artículo	Tamaño del agujero
D/DS8	Escape	18376	Ø47,2 $^{-0,100}_{-0,120}$
	Admisión	152670	Ø55,2 $^{-0,100}_{-0,120}$
D/DS11	Escape	154992	Ø52,2 $^{-0,067}_{-0,086}$
	Admisión	156096	Ø60,2 $^{-0,035}_{-0,054}$

PACKNINGAR VID CYLINDERHUVUDET PÅ D/DS11

I packningssats 550008, 550150 och helrenoveringssats 550024 till D/DS11 ingår packningarna på bilden.

GASKETS ON CYLINDER HEAD OF D/DS11

The gaskets shown in fig. are included in gasket set 550008, 550150 and complete reconditioning set 550024 respectively on D/DS11.



Packning 131133 är avsedd att monteras vid blindflänsen på bakre cylinderhuvudet och vid termostathuset.

Packning 177476 är endast avsedd för vissa bussar (BR/CR110) som saknar termostathus vid främre cylinderhuvudet.

Uttaget används istället för uppvärmning av bussen. För att på sådana motorer tillåta en viss vattencirkulation i "by-pass"-ledningen i blocket och cylinderhuvudet är packningen uppskuren (vid pilen på bilden). Genom detta mellanrum kan en mindre mängd vatten passera.

Gasket 131133 is intended to be fitted on the blank flange of rear cylinder head and on the thermostat housing.

Gasket 177476 is only intended for certain buses (BR/CR110), which lack thermostat housing on the front cylinder head.

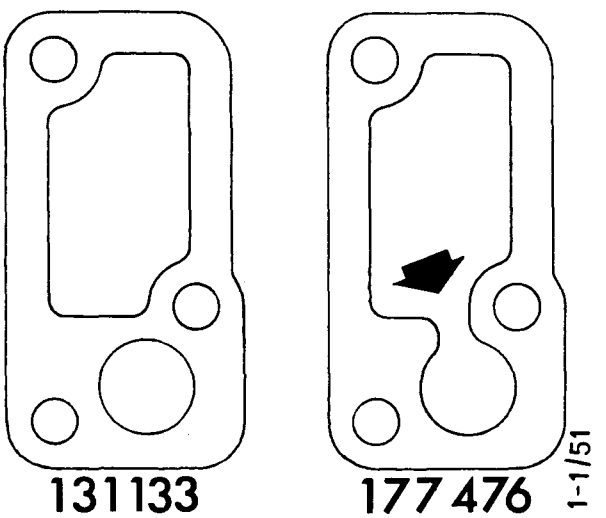
The outlet is used instead for the heating up of the bus. In order to permit on such engines a certain amount of water to circulate in the "by-pass"-line, in block and cylinder head, the gasket has been cut up (marked by arrow in fig.). Through this space a smaller quantity of water can pass through.

DICHTUNGEN AM ZYLINDERKOPF BEI D/DS11

Die Dichtungssätze 550008, 550150 und der Überholungssatz 550024 für D/DS11 enthalten u.a. die auf dem Bild gezeigten Dichtungen.

JUNTAS EN LA CULATA DE D/DS11

En el juego de juntas 550008, 550150 y en el juego de reacondicionamiento total 550024 para D/DS11 entran las juntas que se muestran en la figura.



Die Dichtung 131133 ist für Montage am Blindflansch des hinteren Zylinderkopfes und für Montage am Thermostatgehäuse vorgesehen.

Die Dichtung 177476 ist nur für gewisse Busse (BR/CR110), die kein Thermostatgehäuse am vorderen Zylinderkopf haben, bestimmt.

Der Anschluß wird statt dessen für die Heizung des Busses benutzt. Um bei solchen Motoren eine gewisse Wasserzirkulation in der Nebenbohrung im Block und Zylinderkopf zu ermöglichen, ist die Dichtung aufgeschnitten (bei dem Pfeil auf dem Bild). Durch diesen Zwischenraum kann eine geringe Wassermenge passieren.

La junta 131133 está destinada a ser montada en la brida ciega de la culata posterior y en la caja de termostato.

La junta 177476 está destinada solamente a ciertos autobuses (BR/CR110), los cuales carecen de caja de termostato en la culata delantera.

La toma se emplea entonces para el calentamiento del autobús. Con el fin de permitir cierta circulación de agua en el conducto paralelo en el cilindro y en la culata, en estos motores, la junta está cortada (en el lugar indicado por la flecha en la figura). Por este espacio que queda puede pasar una pequeña cantidad de agua.

COOLANT LEAKAGE IN WATER CONNECTING FLANGE BETWEEN CYLINDER HEADS ON D5- AND D8-SERIES ENGINES

Applies to water connecting flange part Nos:

169472 respectively 131646 D5-series
149857 D8-series

Leakage has been reported in a number of cases primarily on D8 and DS8-engines. This has been on account of the fact that the two closely located cylinder heads, which form a joint sealing plane for the water connecting flange have either been parallel displaced or in relation to one another diagonally placed to a large extent.

Therefore, in such cases arising:

1. Check the parallel deviation or the size of the diagonal placing.

2. If the deviation is greater than 0,10 mm remove the front or rear cylinder head (in the case of diagonal placing possibly all three cylinder heads) depending on whether the leakage concerns the front or rear water connecting flange on the D8-series.

3. Check that the dowel pins of the cylinder head in engine block are well tapped down and faultless. Make a corresponding check of the holes in the cylinder head.

4. If there is no defect according to point 3 above, which explains the parallel deviation, ream up the diameter for the dowel pin holes in the cylinder head to a max. 0,2 mm.

5. Fit a new cylinder head gasket. Put on the cylinder head and screw in the fixing bolts **without tighting them up properly.**

6. Fit a levelling plate on the water connecting flange position (without gasket) and tighten it up. We advise you to make the plate (approx. 8x80x110 mm) of a flat bar in which holes corresponding to the water connecting flange fixing holes are drilled accordingly. After which the contact plane of the plate against the cylinder head, for the sake of safety should be face ground on a piece of emery paper on level face plate.

7. Afterwards tighten up the cylinder head in the prescribed manner.

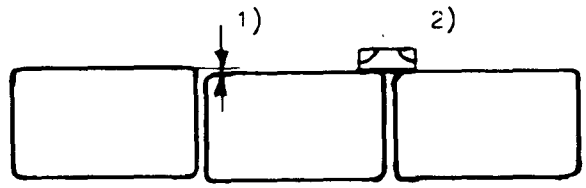
8. Then loosen the levelling plate, check the plane and also that the parallel deviation has been reduced to max. 0,10 mm. Fit a new gasket 131645 and fit the water connecting flange.

On recommended retightening of the cylinder head gasket, it is necessary to check that the fixing bolts of the water connecting flange have also been tightened up properly.

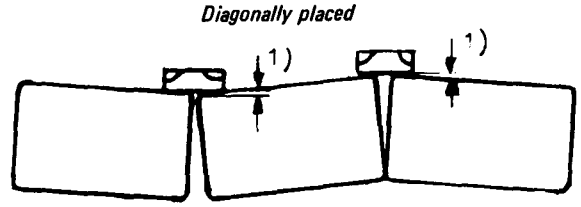
Remarks: Since the levelling of the cylinder heads according to point 6 always results in a minimum amount of parallel deviation and consequently gives better conditions for sealing effectively, this method is also advisabel for cylinder head assembly in those cases where only signs of slight leakage occur.

Contour of the cylinder heads D8-series

Parallel displaced



Diagonally placed



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1) Max. 0,10 mm
2) Rear water connecting flange

The above-mentioned solution must only be used in connection with cylinder head gasket of soft type.

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ÄNDRAD TILLVERKNINGSMETOD FÖR CYLINDERHUVUD TILL D/DS11-MOTORER

Bakgrund

D/DS11-motorer kommer att förses med cylinderhuvud, vilka skiljer sig från nuvarande utförande genom att en propp med tätningsring är monterad på cylinderhuvudets ovansida.

Aktuell information

Det nya cylinderhuvudet kommer att få samma artikelnr som nuvarande cylinderhuvud 272626. Ett begränsat antal cylinderhuvud kommer att få artikel nr 288936. Cylinderhuvudena är helt utbytbara med varandra.

Benämning	Artikelnr
Cylinderhuvud (begränsat antal)	288936
Cylinderhuvud (nytt)	272626
Cylinderhuvud (nuvarande)	
Propp	288428
Tätningsring	811940

CHANGED METHOD FOR MANUFACTURING CYLINDER HEAD FOR D/DS11–ENGINES

Background

The new style cylinder head for D/DS11 engines differs from the old style in that a plug and sealing ring are mounted on the upper surface of the cylinder head.

Current information

The new cylinder head retains the same part number 272626 as the old. A limited series of cylinder heads will be designated 288936. Old and new style cylinder heads are fully interchangeable.

Part name	Part No.
Cylinder head (limited series)	299836
Cylinder head (new style)	272626
Cylinder head (old style)	
Plug	288428
Sealing ring	811940

GEÄNDERTE FERTIGUNGSMETHODE FÜR ZYLINDERKÖPFE FÜR D/DS11–MOTOREN

Anlaß

D/DS11-Motoren werden mit Zylinderköpfen versehen, die sich von der bisherigen Ausführung durch einen auf der Oberseite des Zylinderkopfes montierten Stopfen mit Dichtring unterscheiden.

Aktuelle Information

Der neue Zylinderkopf wird dieselbe Artikel Nr. erhalten, wie der bisherige Zylinderkopf 272626. Eine begrenzte Anzahl Zylinderköpfe wird die Artikel Nr. 288936 erhalten. Die Zylinderköpfe sind völlig miteinander austauschbar.

Bennenung	Artikel Nr
Zylinderkopf (Begrenzte Anzahl)	288936
Zylinderkopf (Neuer)	272626
Zylinderkopf (Bisheriger)	
Stopfen	288428
Dichtring	811940

NUEVO METODO DE FABRICACION DE LA CULATA DE LOS MOTORES D/DS11

Antecedentes

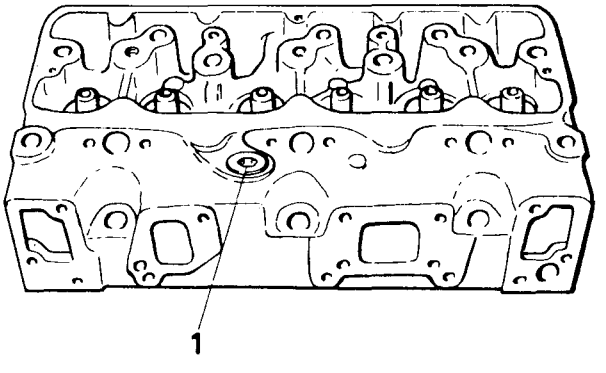
Los motores D/DS11 recibirán culata que difiere de la versión actual por un tapón con anillo de cierre ubicado en el plano superior.

Información actual

La nueva culata conserva el número de pedido de la culata actual 272626. Sin embargo, un número limitado de culatas recibirá el núm. de ped. 288936. Los diferentes tipos de culatas son intercambiables.

Denominación	Núm. de ped.
Culata (cant. limitada)	288936
Culata (nueva)	272626
Culata (actual)	
Tapón	288428
Anillo de cierre	811940

1. Propp 288428
1. Plug 288428



1. Stopfen 288428
1. Tapón 288428

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S1

INSPRUTARE FÖR D/DS11

Bakgrund

Det har förekommit att insprutaren har fastnat i cylinderhuvudet på grund av att avgaser trängt in i hålrummet för insprutaren. Detta kan ha orsakats av otillräcklig tätning mellan insprutaren och cylinderhuvudet i botten av hålrummet.

Aktuell information

På motorer där insprutaren har fastnat, kontrollera på följande sätt att insprutaren bottnar mot tätningsbrickan i hålrummets botten.

Sätt dit insprutaren utan bricka, samt mät eventuellt spel mellan cylinderhuvudet och insprutarens fästöra.

Sätt sedan dit insprutaren med en ny tätningsbricka, samt kontrollera tidigare nämnda spel. Spelet ska med brickan monterad ha ökat min 0,3 mm enligt fig 1.

Om spelet 0,3 mm ej erhålls ska insprutarhålets övre kant fasas enligt fig 2, och ny mätning utföras.

Visar det sig att spelet 0,3 mm ändå inte erhålls ska max 1 mm gods slipas bort runt insprutarhålet tills spelet 0,3 mm uppnäs.

INJECTOR FOR D/DS11

Background

Cases have occurred where exhaust gases have escaped into the injector cavity and caused injector to jam in cylinder head. Gas escape may be caused by poor sealing between injector and cylinder block at the bottom of the cavity.

Current Information

In engines where injectors have jammed, the following inspection should be carried out to ensure that the injector seats securely against the sealing washer in the cavity bottom.

Insert injector without washer and check play between cylinder head and retaining lug on injector.

Insert injector with a new washer and check play as above. Observed play should have increased by min.0.3 mm, see fig. 1.

If the required play of min.0.3 mm is not obtained,bevel upper edge of injector hole as shown in fig. 2 and recheck the play.

If bevelling edge of hole fails to achieve the minimum play of 0.3 mm, grind down the surface around the injector hole max. 1 mm until a play of min. 0.3 mm is obtained.

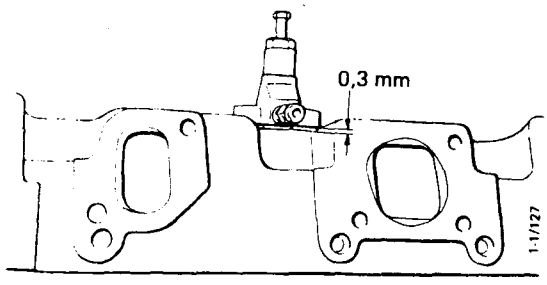

Fig 1

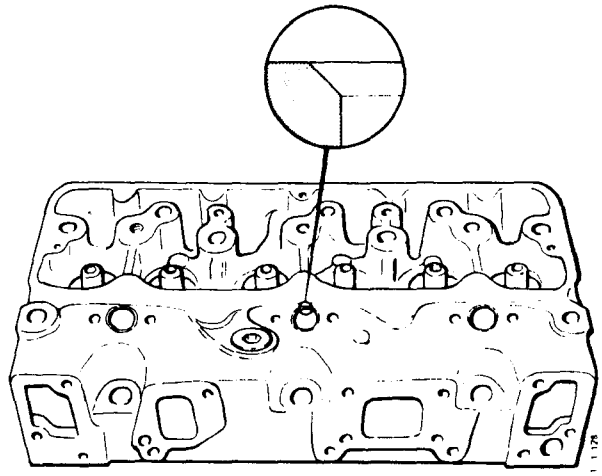

Fig 2

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gruppl	sekt	nr	sida
1a	SI	1–15	2

EINSPRITZVENTIL FÜR D/DS11

Anlaß

Es ist vorgekommen, daß sich das Einspritzventil im Zylinderkopf verklemmt hat, weil Abgase in den Hohlraum für das Einspritzventil eingedrungen sind. Das kann durch ungenügende Dichtung zwischen Einspritzventil und Zylinderkopf im Boden des Hohlraums verursacht worden sein.

Aktuelle Information

Bei Motoren, wo sich das Einspritzventil verklemmt hat, wird auf folgende Weise kontrolliert, daß das Einspritzventil an der Dichtungsscheibe im Hohlraum des Bodens anliegt.

Einspritzventil ohne Dichtungsscheibe einsetzen und das Spiel zwischen Zylinderkopf und Befestigungsöse des Einspritzventils messen.

Dann das Einspritzventil mit neuer Dichtungsscheibe einsetzen und das vorher genannte Spiel kontrollieren. Das Spiel muß mit montierter Scheibe um 0,3 mm größer geworden sein. Siehe Fig. 1.

Wenn das Spiel 0,3 mm nicht erreicht wird, muß die obere Lochkante des Einspritzventils laut Fig. 2 abgeschrägt und eine neue Messung ausgeführt werden.

Zeigt es sich, daß das Spiel 0,3 mm trotzdem nicht erreicht wird, muß max. 1 mm Material rundum das Einspritzventilloch des Zylinderkopfes abgeschliffen werden, bis das Spiel 0,3 gemessen wird.

INYECTOR PARA D/DS11

Antecedentes

Ha ocurrido que el inyector quede pegado en la culata debido a que gases de escape han penetrado en el alojamiento del inyector. Esto puede ser causado por falta de hermeticidad entre el inyector y la culata, en el fondo del orificio.

Información actual

En motores con tal defecto, controlar de la siguiente manera que el inyector hace tope contra la arandela de cierre en el fondo del alojamiento.

Colocar el inyector sin arandela y medir el eventual juego entre la culata y la oreja de fijación del inyector.

Colocar luego el inyector con una nueva arandela y medir de nuevo el mismo juego. La diferencia entre las dos medidas ha de ser por lo menos de 0,3 mm, según la fig. 1.

De no obtener este juego de 0,3 mm, achaflanar el borde superior del orificio del inyector según la fig. 2, y volver a medir.

Si aun así no se consigue el juego de 0,3 mm, quitar puliendo máx. 1 mm de metal alrededor del orificio del inyector hasta conseguir esta cota.

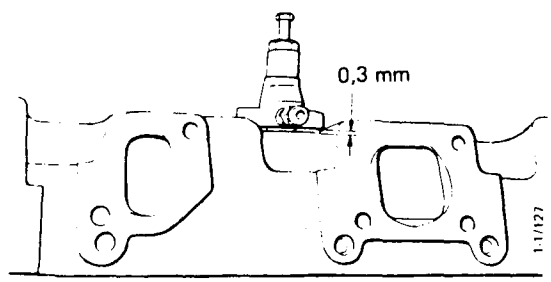

Fig 1

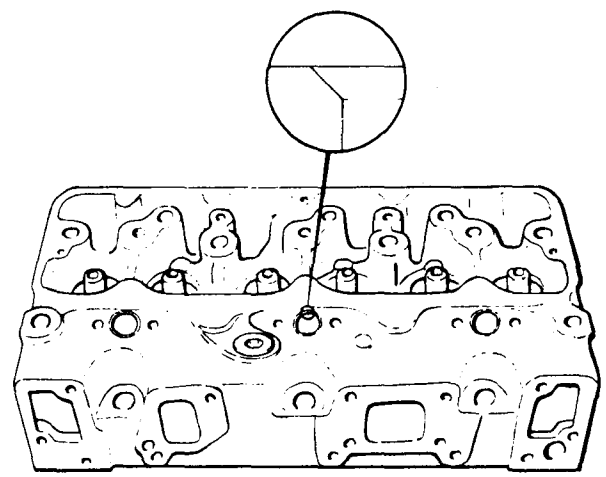

Fig 2

EFTERDRAGNING AV CYLINDERHUVUD–SKRUVAR SLOPAD

Nuvarande D/DS11-motorer är försedda med cylinderhuvudpackning av massiv stålplåt. Cylinderhuvudskruvarna på dessa motorer ska numera inte efterdras vid inkörningstillsynen.

Obs! Efter reparation ska dock cylinderskruvarna fortfarande efterdras efter provkörning med belastning under 30 minuter. Se 1a AR 1.

NACHZIEHEN DER ZYLINDERKOPF-SCHRAUBEN NICHT ERFORDERLICH

Die heutigen D/DS11-Motoren sind mit Zylinderkopfdichtung aus massivem Stahlblech versehen. Die Zylinderkopfschrauben sollen nunmehr bei diesen Motoren bei der Einfahrwartung nicht nachgezogen werden.

Beachten! Nach einer Reparatur müssen doch die Zylinderkopfschrauben nach dem Probefahren mit Belastung während 30 Minuten nachgezogen werden. Siehe 1a AR 1.

RETIGHTENING OF CYLINDER HEAD SCREWS DISCONTINUED

Current D/DS11 engines are equipped with a solid steel cylinder head gasket. Cylinder head screws on these engines should no longer be retightened at the running-in inspection.

Caution: Cylinder head screws should, as in the past, always be retightened after repair work. Engine should first be test run under load for 30 minutes. See 1a AR 1.

REAPRIETE DE LOS TORNILLOS DE CULATA YA NO SE EFECTUAN

Los motores D/DS11 actuales están equipados con una junta de culata en plancha de acero masivo. Los tornillos de culata de estos motores no se deben reapretar en la inspección de rodaje.

Nota! Sin embargo después de una reparación, se deberá reapretar los tornillos después de la prueba bajo carga de 30 minutos. Ver 1a AR 1.

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ÖVERLADDNINGSAGGREGAT 4LE (ART.NR 189975 OCH 207303)

På många av de överladdningsaggretag som sänds in för renovering har vi konstaterat att kompressorhjulets vingar är skadade, se fig.

Denna skada uppstår vid ovarsam isärtagning av kompressorkåpan från lagerhuset.

För att undvika onödiga kostnader bör följande iakttagas vid isärtagning:

Kompressorkåpan lossas genom att en skruvmejsel sticks in på flera ställen mellan kompressorkåpan och lagerhuset. När kompressorkåpan lossnat ifrån O-ringen, lyfts kompressorkåpan försiktigt rakt upp så att den ej skrapar mot kompressorhjulet.

TURBOLADER 4LE (TEIL NR. 189975 UND 207303

Bei vielen für Überholung übersandten Turboladern haben wir festgestellt, daß die Flügel des Kompressorrades beschädigt sind. Siehe Figur.

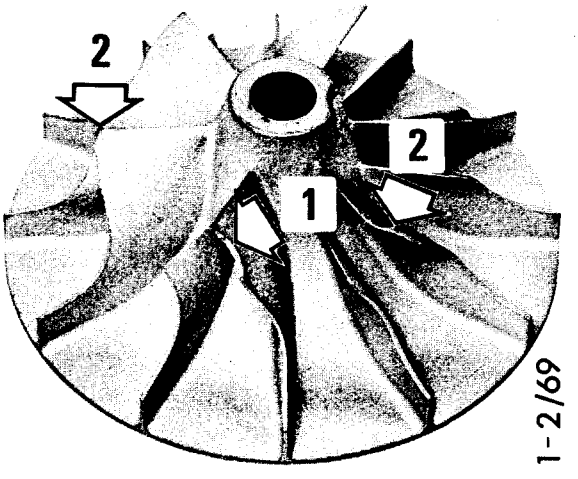
Dieser Schaden entsteht bei unachtsamem Ausbau des Kompressorgehäuses vom Lagergehäuse.

Damit unnötige Kosten vermieden werden, ist folgendes beim Zerlegen zu beachten:

Das Kompressorgehäuse lösen, indem ein Schraubenzieher an mehreren Stellen zwischen Kompressorgehäuse und Lagergehäuse gesteckt wird. Wenn sich das Kompressorgehäuse vom O-Ring gelöst hat, wird das Kompressorgehäuse vorsichtig gerade hochgehoben, so daß es nicht das Kompressorrad berührt.

Skadat kompressorhjul
1. Avbruten vinge
2. Skadade vingar

Damaged compressor wheel
1. Broken wing
2. Damaged wings



Beschädigtes Kompressorrad
1. Abgebrochener Flügel
2. Beschädigte Flügel

Rotor de compresor dañado
1. Ala rota
2. Alas dañadas

TURBOCHARGER 4LE (PART NO. 189975 AND 207303)

We have observed that the compressor wheel wings are damaged, see fig., in many of the turbochargers that are sent to the factory for reconditioning.

This damage is the consequence of a careless removal of the compressor cover from the bearing housing.

In order to avoid unnecessary costs the following instructions should be respected when dismantling takes place:

Loosen the compressor cover by inserting a screwdriver on various points between the compressor cover on the bearing housing. When the compressor cover has come loose from the O-ring the compressor cover should be carefully lifted straight upwards, so that it will not make any scratches on the compressor wheel.

TURBOCOMPRESOR 4LE (NOS DE ART. 189975 Y 207303)

Hemos observado que las alas del rotor de compresor están dañadas, véase fig., en muchos de los turbocompresores que llegan a la fábrica para reacondicionamiento.

Este daño se produce si se quita sin cuidado la cubierta de compresor al cárter de cojinete.

Para evitar costes innecesarios hay que seguir las instrucciones siguientes al efectuar el desarmado:

Soltar la cubierta de compresor insertanto un atornillador en varios puntos entre le cubierta de compresor y el cárter del cojinete. Cuando la cubierta de compresor esté soltada del anillo tórico, levantar todo derecho hacia arriba la cubierta de compresor, pero con cuidado, de modo que no toque el rotor de compresor.

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RENOVERING AV TURBOKOMPRESSORER DS11

Bakgrund

Vi har rekommenderat renovering av turbokompressorenhet efter 180 000 km (2 700 h).

Aktuell information

Livslängden för turbokompressorer har ökat efter hand som nya modeller har införts.

Att iaktta

Vi anser det inte längare vara nödvändigt att byta turbokompressor i förebyggande syfte.

Undantag
Turbokompressor typ 4 monterad t o m motornummer 852128 (Scania Sverige) resp 107387 (Scania Nederland) bör även i fortsättningen renoveras efter 180 000 km (2 700 h).

ÜBERHOLUNG VON TURBOLADERN DS11

Anlaß

Wir haben Überholung der Turboladereinheit nach 180 000 km (2 700 h) empfohlen.

Aktuelle Information

Die Lebensdauer der Turbolader hat sich erhöht, nachdem neue Modelle eingeführt worden sind.

Zu beachten

Wir finden es nicht mehr länger notwendig, den Turbolader als vorbeugende Maßnahme auszutauschen.

Ausnahme
Turbolader vom Typ 4, montiert bis einschließlich Motornummer 852128 (Scania Schweden) bzw. 107387 (Scania Nederland), sollen auch in der Fortsetzung nach 180 000 km (2 700 h) überholt werden.

RECONDITIONING OF TURBOCHARGERS DS11

Background

We have recommended reconditioning of the turbocharger unit after 180 000 km (2 700 h).

Current Information

The service life of turbochargers has been gradually increased as new models have been introduced.

Attention

We no longer consider it necessary to replace the turbocharger as a preventive measure.

Exceptions
Turbocharger type 4 fitted up to engine No. 852128 (Scania Sweden) and 107387 resp. (Scania Nederland) should also in the future, be reconditioned after 180 000 km (2 700 h).

REACONDICIONAMIENTO DEL TURBOCOMPRESOR DEL DS11

Antecedentes

Hasta ahora hemos recomendado reacondicionar la unidad del turbocompresor al cabo de 180 000 km (2 700 horas).

Información actual

La vida útil de los turbocompresores ha sido aumentada a medida que han salido nuevos modelos.

Se observará

Consideramos que en adelante no será necesario cambiar el turbocompresor por medida preventiva.

Excepción
Los turbocompresores tipo 4 que equipan los motores hasta el número 852128 (Scania Suecia) y 107387 (Scania Holanda) conviene seguir reacondicionándolos como anteriormente al cabo de 180 000 km (2 700 horas).

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