Section E4

Crankcase and Cylinder liners

The crankcase and cylinders form a monobloc casting of aluminium alloy that carries 'wet-type' cylinder liners.

The centrifugally spun cast iron liners are sealed by a single rubber 'O' ring at the top and by two rubber 'O' rings at the bottom (see Fig. E3).

The main bearing caps are an aluminium forging and have an interference fit in the crankcase of up to 0,0254 mm. (0.001 in.).

The camshaft runs in bores machined directly in the crankcase.

Each cast iron tappet block is located by two dowels fitted into the crankcase. One of the locating holes in the tappet block is elongated and forms a slot to allow for the different rates of expansion between the two metals.

The bores of the tappet blocks are graded into two sizes and colour coded either white or red.

Some setscrew holes are fitted with helicoil inserts and the threads in the crankcase into which these inserts screw are non-standard sizes, therefore, setscrews should not be fitted until the helicoils have been correctly installed.

Studs screw directly into the crankcase, their threads having an interference fit of up to 0,0508 mm. (0.002 in.).

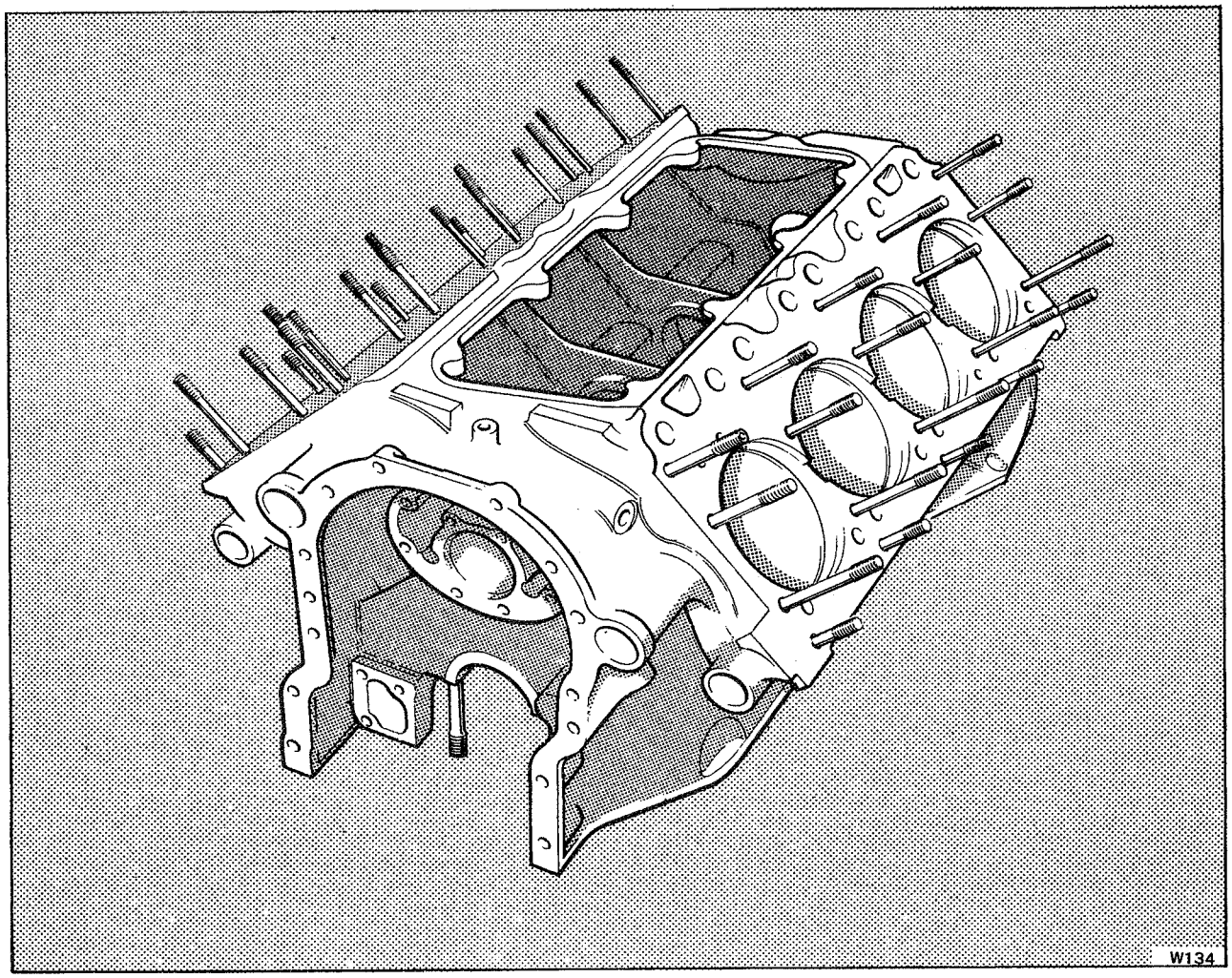

Fig. E2 Crankcase

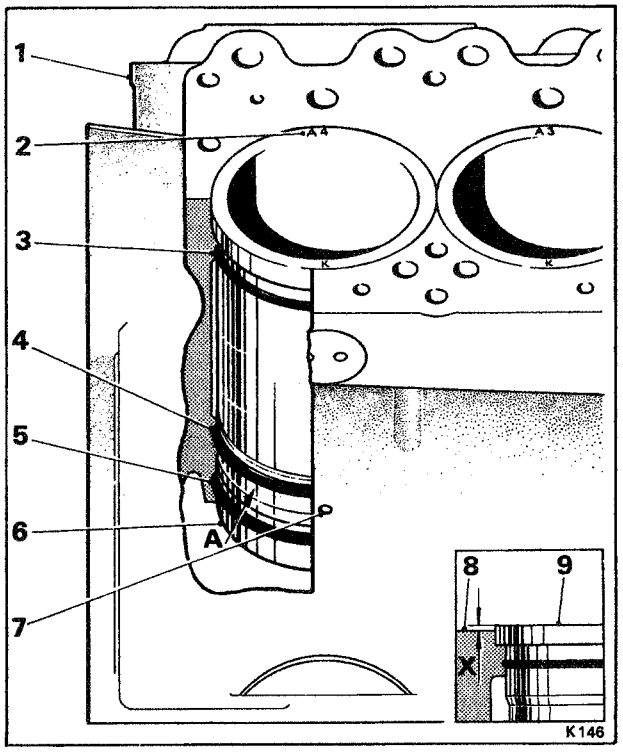

Fig. E3 Cylinder liner in position

1 Crankcase
2 Bore reference number
3 Rubber 'O' ring
4 Upper sealing ring
5 Lower sealing ring
6 Cylinder liner
7 Tell-tale hole (8 off)
8 Crankcase
9 Cylinder liner
A Position of corrosion build-up on cylinder liner and crankcase
X Cylinder liner nip

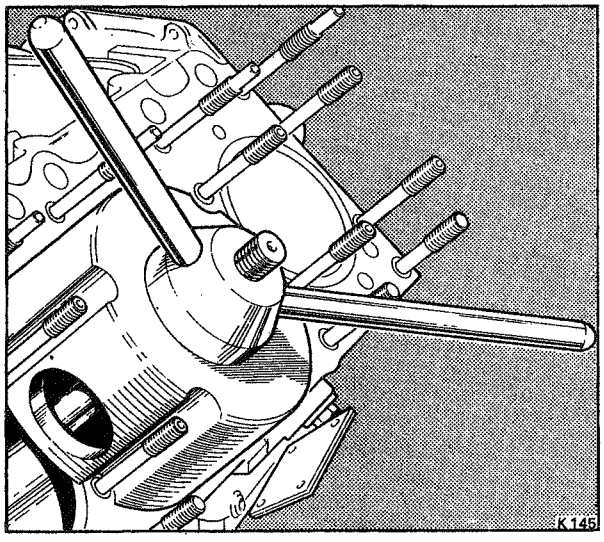

Fig. E4 Cylinder liner extraction

Cylinder liners and seals

The cylinder bore dimensions should only be checked with all the liners from any one bank in position. Any deviation from this rule could result in false readings.

From the measurements taken of the cylinder bore calculate the wear and ovality. If the figures exceed those quoted in Section E3, Dimensional data, a new liner (with new sealing rings) and piston assembly should be fitted.

Cylinder liner seal leakage can be detected by 'tell-tale' holes in the side of the crankcase.

If engine coolant issues from the 'tell-tale' hole the upper of the two bottom rings is leaking; if oil issues from the 'tell-tale' hole, the lower sealing ring is leaking. In either case, the appropriate liner should be removed and new sealing rings fitted into the crankcase (see Fig. E3).

It is most important when replacing cylinder liners that only one liner is removed at any one time. If this procedure is not adopted and a liner is extracted from a bore where the adjacent liners have been removed, it is possible for the crankcase bridge piece to sustain damage.

The damage is caused by a build-up of corrosion which forms on the liner immediately below the upper of the two bottom sealing rings (see Fig. E3). As the liner is withdrawn,the deposit has to pass under the sealing ring thus exerting an abnormally high bursting pressure. If the build-up of the corrosion is thick enough it can cause the rubber ring to twist and the bridge piece to fracture.

Cylinder liner - To remove

If a cylinder liner is suspect and the engine has been in service for only a short time, it may be possible to remove and fit one liner with the crankcase remaining in the vehicle (i.e. the crankcase in a cold condition).

1. Remove and dismantle the engine as necessary.
2. Using the cylinder liner extraction tool (RH 7095) as shown in Figure E4, withdraw the liner from the top face of the crankcase.

Cylinder liner - To fit

1. Ensure that the coolant drain hole in the crankcase wall is clean and unobstructed.
2. Ensure that the seal leakage 'tell-tale' holes in the crankcase wall are clean and unobstructed.
3. Inspect the cylinder liner, the liner location bore in the crankcase and the crankcase counterbore. Remove any burrs and thoroughly clean the parts (particularly the mating faces) with 'Genklene' or a similar alternative.

Meticulous care should be taken when carrying out these operations. Any dirt or burrs allowed to remain will have an adverse affect on the fit of the liner in the crankcase and may distort the liner bore.

4. When a cylinder liner is fitted into the crankcase it should stand proud of the crankcase top face by the amount stated in Section E3, Dimensional data. This is to provide a 'nip' when the cylinder head and gasket are fitted.

To obtain the correct 'nip' carry out Operations 5 to 8 inclusive (see Fig. E3).

5. Measure the depth of the cylinder liner collar and also that of the counterbore in the crankcase.

6. Subtract the counterbore measurement from the collar measurement to obtain the 'nip' figure.

7. If the figure obtained does not correspond with the figure quoted in Section E3, either

(a) grind the excess metal off the top face of the liner (always clean the liner after grinding).

(b) or try another liner.

8. Before fitting a cylinder liner into a crankcase always ensure that the bore number is etched onto the top face as shown in Figure E3. Other information which should be etched onto the top of the liner includes the piston grade letter and on a very limited number of engines the letters O/L adjacent to the piston grade.

The letters O/L refer to oversize liners (outside diameter) and these liners may be fitted to some reconditioned engines. These engines are identified by an SR number suffixed by the letter O/L stamped on a small boss situated at the front of the crankcase.

9. Fit three new rubber sealing rings into the crankcase. Thinly smear the rings and location diameters with Palmolive grease or its equivalent.

10. Place the crankcase into an oven having an approximate temperature of 150°C. (302°F.). Allow the crankcase to remain in the oven until it has attained oven temperature.

11. Remove the crankcase from the oven and then quickly push the liner into the crankcase bore until it seats correctly in the bottom of the counterbore. Ensure that the cylinder bore reference etched on the top face of the liner is positioned at the top (i.e. nearest point to the camshaft) as shown in Figure E3.

12. Allow the crankcase to return to its cold condition.

13. Using a depth micrometer, measure the amount that the liner stands proud above the crankcase face (refer to Section E3, Dimensional data).

14. If the liner stands proud of the crankcase by more than the specified limits, an even tap around the top face of the liner is permissible, using a plastic-headed mallet.

15. Should the liner either remain in excess of the stand proud limit or be below the limit, the liner should be withdrawn and the cause investigated.