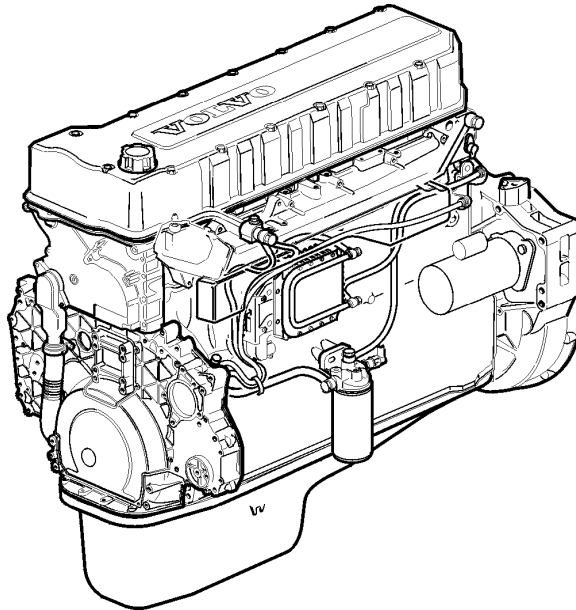


This TSI Service Bulletin replaces TSI 213-002, "Cylinder Liner, D12, D12A, D12B, D12C" (11.2001), publication no. PV776-TSP160571.

Date	Group	No.	Supp.	Page
10.2003	213	002		1(14)

Cylinder Liner
D12, D12A, D12B, D12C

Cylinder Liner



W2003244

Fig. 1: VOLVO D12C Engine

This information covers procedures for servicing the cylinder liners of VOLVO D12 engines.

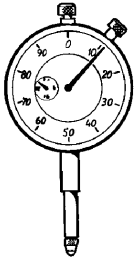
Contents

- ["Special Tools" page 2](#)
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- ["Cylinder Liner and Piston, Wear Check" page 6](#)
- ["Cylinder Liner Height, Checking \(One\)" page 8](#)
- ["Cylinder Liner Seat, Overhaul" page 11](#)

Tools

Special Tools

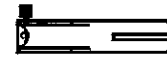
The following special tools are used to replace or repair components. The tools can be ordered from Volvo. Please use the specified part number when ordering.



9989876
Dial Indicator



9992000
Standard Handle for Drifts (25 x 200)



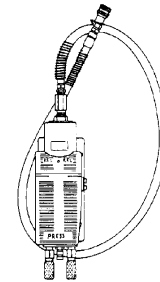
9992479
Gauge Block



9992955
Puller Plate



9996159
Adapter/Tap (for 9996161)



9996222
Hydraulic Pump



9996394
Spacers



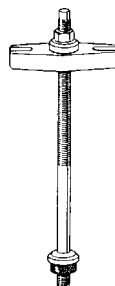
9996395
Spacers



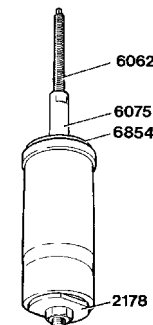
9996599
Cylinder Liner Drift



9996606
Yoke



9996645
Cylinder Liner Extractor



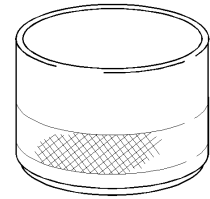
9996854
Drift



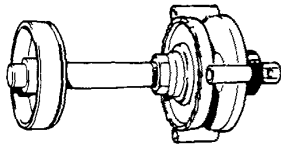
9996956
Flywheel Turning Tool



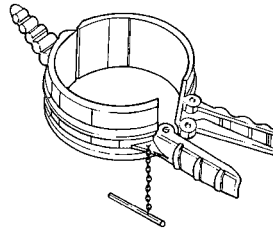
9996966
Cylinder Liner Press Tool



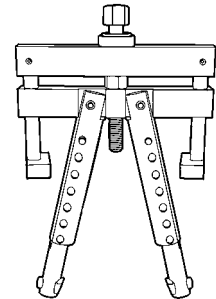
9998265
Ring Compressor



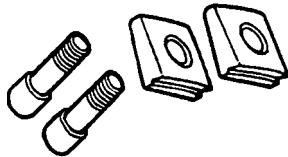
9998272
Milling Tool



9998531
Piston Ring Compressor



PT6400C
Cylinder Liner Puller



PT6410-4A
Puller Feet



9996161
Hydraulic Cylinder

Service Procedures

2131-01-01-01

Cylinder Liner, Removal (One)

(Cylinder head and oil pan removed)

You must read and understand the precautions and guidelines in Service Information, group 21, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Special tools: 9992955, 9996394, 9996395, 9996645, 9996956, 9996966, PT6400C, PT6410-4A

1

Install clamping tool 9996966 on the cylinder liners that are not to be removed.

9996966

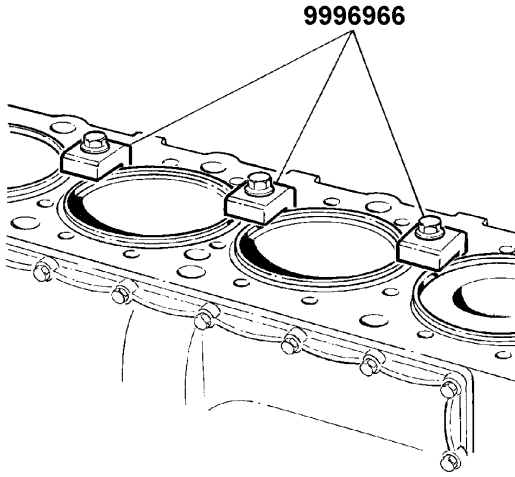


Fig. 2: Clamping tools installed (D12A/B/C shown)

2

Remove the inspection cover from the bottom of the flywheel housing and install turning tool 9996956. Rotate the flywheel until the connecting rod/piston to be removed is in position.

9996956

3

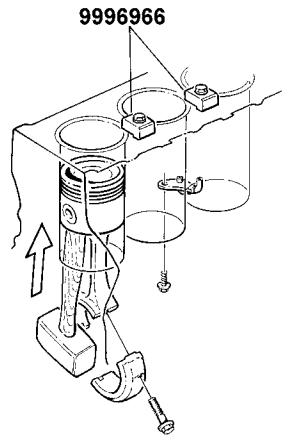
Remove the piston cooling jet.



CAUTION

Do not bend tube. Doing so will permanently damage the tube.

Note: If the jet is contaminated, refer to cleaning procedure in Service Information, Group 22.



C2000448

Fig. 3: Forcing the piston up with a hammer handle

4

Remove the connecting rod bearing cap and the bearing shells.

5

Note: If the cylinder liner is excessively worn or carbon has accumulated at the top of the liner, polish this area of the liner so the piston may be easily removed. Push up on the piston until the piston rings are above the edge of the cylinder liner. Lift out the piston and the connecting rod.

6

When reinstalling the cylinder liner, use a felt-tip pen to mark on the block the correct position from which the liner was removed.

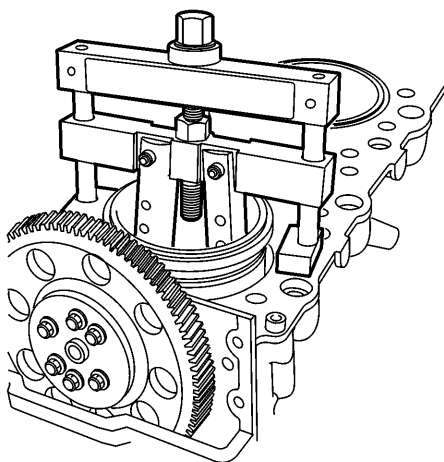
7

Note: Must use puller feet PT6410-4A on liner puller PT6400C to remove the liners. The use of other puller feet can result in damage to the cylinder block.

Install cylinder liner puller PT6400C (with puller feet PT6410-4A) into position on the cylinder liner to be removed.

Note: Use either puller PT6400C or the Volvo liner puller tool to remove the cylinder liners.

PT6400C, PT6410-4A



W2003962

Fig. 4: Pulling the cylinder liner (D12C)

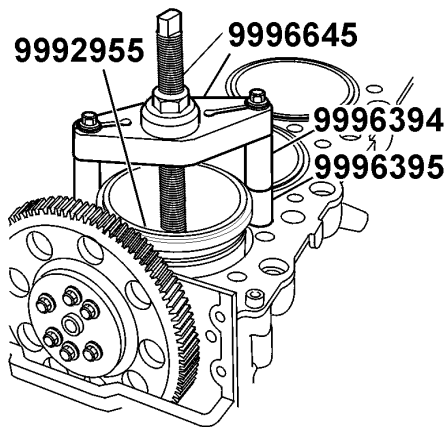


Fig. 5: Pulling the cylinder liner

8

Install extractor 9996645 and puller plate 9992955 (with spacers 9996394 and 9996395) into position on the cylinder liner to be removed.

9996645, 9992955, 9996394, 9996395

9

Pull the cylinder liner out of the block.

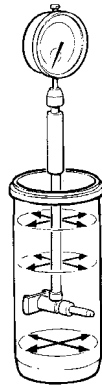
10

Remove all sealing rings from the lower liner bore in the cylinder block.

2131-06-04-01 Cylinder Liner and Piston, Wear Check

You must read and understand the precautions and guidelines in Service Information, group 21, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Thoroughly clean the cylinder liners and pistons before inspecting and measuring. To thoroughly check for cracks, remove the cylinder liner from the cylinder block. Mark the position of the cylinder liner in the block with a felt-tip pen before removing so it can be reinstalled in the same position.



T2007071

Fig. 6: Checking the liner for wear

Cylinder Liner

1

Check for cracks, paying special attention to the liner collar. The magnesium powder method can be used when checking.

Note: Pistons and cylinder liners are available from stock only as matched pairs and cannot be mixed.

2

Bore wear measurements should be taken diagonally in four height locations. The original bore size is 131 mm (5.1547 in.). Wear should be no greater than 0.5 mm. Total bore size should not exceed 131.5 mm (5.1771 in.).

3

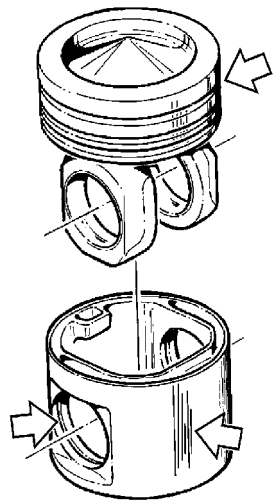
If wear is greater than 0.45 – 0.50 mm (0.0177 – 0.0197 in.), use a complete liner kit (piston, liner, piston rings, piston pin, and seals). Also consider engine oil consumption to determine when to replace the cylinder liner.

Pistons

4

Replace pistons that have deep scratches in the piston skirt, a cracked or damaged piston ring land, worn ring grooves, or a damaged snap-ring groove.

The two-piece piston must also have movement between the skirt and crown.



W2003724

Fig. 7: Checking piston for wear

2131-06-03-06 Cylinder Liner Height, Checking (One) Cylinder Head Removed

Not Included:

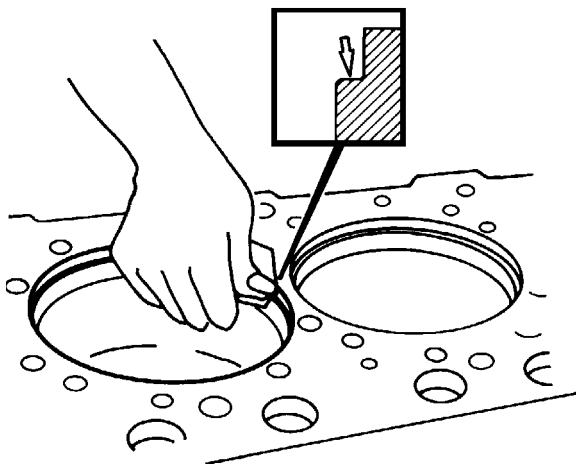
- "Cylinder Liner Seat, Overhaul" page 11

You must read and understand the precautions and guidelines in Service Information, group 21, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Special tools: 9992000, 9992479, 9996159, 9996161, 9996222, 9996599, 9996606, 9996854, 9996966, 9989876

1
Remove the old seals from the cylinder block and carefully clean the sealing surfaces. Use a brass wire brush and cleaning fluid.

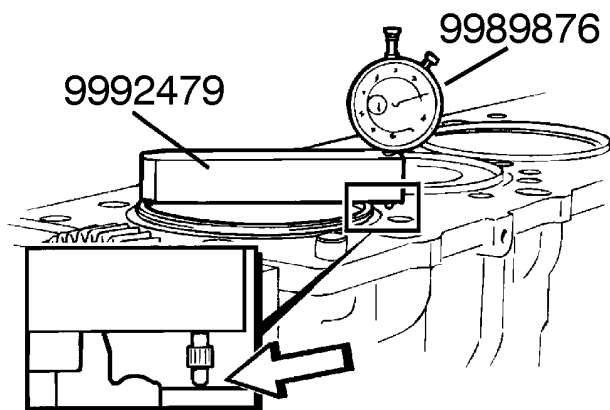
Note: Do not use scraping tools (or any tool that can damage the sealing surface).



W2000727

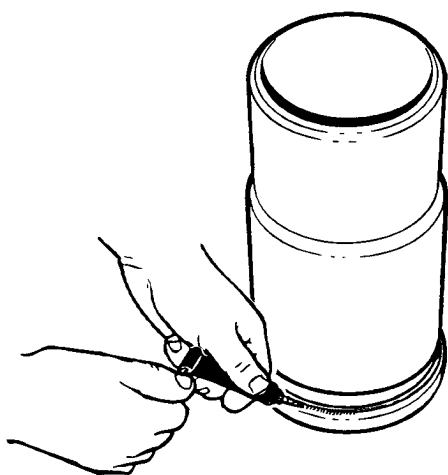
2
If the cylinder liner seat has not been reconditioned, install the cylinder liner without seals. Firmly attach the liner, using two press tools 9996966.

9996966

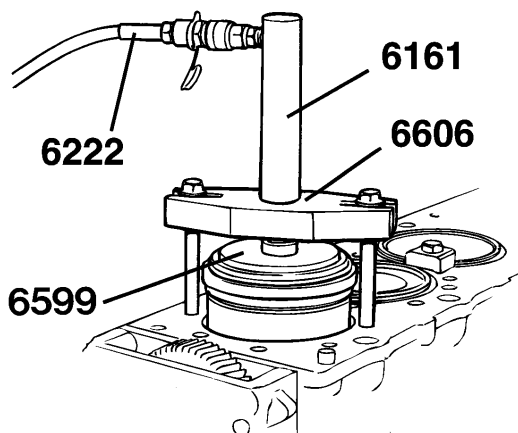


W2004329

Fig. 8: Zeroing the dial indicator against the cylinder block.



T2008973



T2007154

Fig. 9: Pressing the liner into place in the block

3

Install dial indicator 9989876 on gauge block 9992479 and zero the indicator against the cylinder block.

Note: The block and liner must be clean to ensure accurate measurements.

9992479, 9989876

4

If the cylinder liner is installed **without** a shim, an even strand of jointing compound, approximately 0.8 mm thick, should be applied to the underside of the cylinder liner collar.

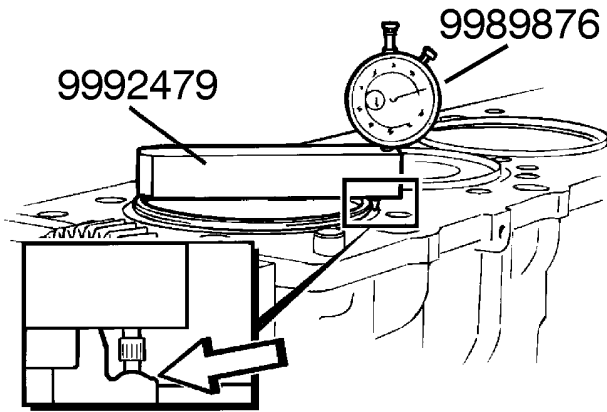
Note: After applying jointing compound, the liner must be installed **within 20 minutes**. If the cylinder head cannot be installed and torqued within 20 minutes, the liner must be secured under tension in the engine block with two press tools 9996966.

9996966

5

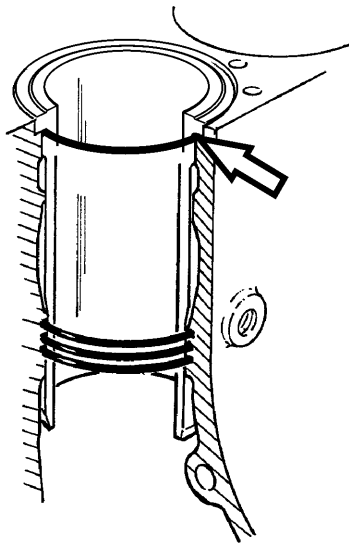
Install all sealing rings into the block and to the cylinder liner, using the following tools:

9996161, 9996606, 9996222, 9996599



W2004330

Fig. 10: Zeroing the dial indicator against the cylinder block.



T2019854

6 Measure the liner protrusion at four locations, 90° apart. Mark the liner against the block so that it can be reinstalled in the correct position. Measure each cylinder for each bore.

9992479, 9989876

7 Lubricate the sealing rings with the lubricant provided with the liner kit. Install them in the cylinder block.

Note: The violet sealing ring should sit in the lowest groove.

8 All liner protrusion should be within the following specifications:

D12, D12A, D12B	0.15 – 0.20 mm (0.006 – 0.008 in.)
D12C	0.15 – 0.21 mm (0.006 – 0.008 in.)

Note: Once the liners have been installed, the liner height variance between all cylinders is 0.06 mm

9 Lubricate the three lower seals that are to be placed in the cylinder block with the lubricant provided with the seals. The small O-ring seal that fits under the liner collar does not require lubrication. Position the rings in the grooves as outlined in the installation instructions enclosed in the carton.

2131-04-05-01 Cylinder Liner Seat, Overhaul

Not Included:

- "Cylinder Liner Height, Checking (One)" page 8

You must read and understand the precautions and guidelines in Service Information, group 21, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Note: A damaged cylinder liner seat can be repaired by milling the liner shelf. Always add shims to compensate for material removed by milling. Shims are available in different thicknesses.

Special tools: 9992479, 9996966, 9998272, 9989876

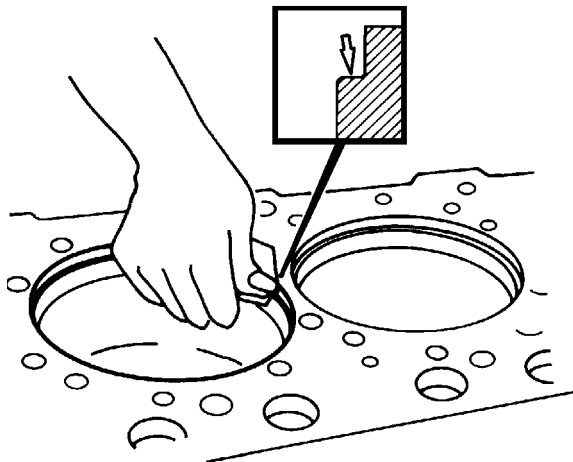
1

Clean the liner seat and estimate the amount of wear.

Note: Do not use scraping tools.

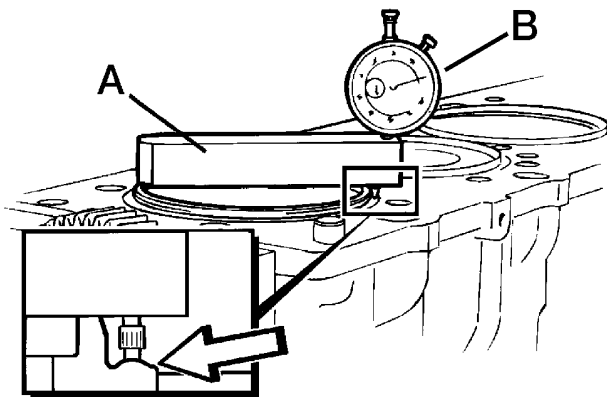
2

Before milling the liner shelf, rough up the surface with emery cloth to prevent dulling the cutter.



W2000727

Fig. 11: Roughing up liner seat



W2003722

Fig. 12: Measuring the height of the cylinder liner

3
Install a new liner with a shim, without liner packing, into the bore. Measure the amount needed to be cut from the liner ledge, and mark it for each bore.

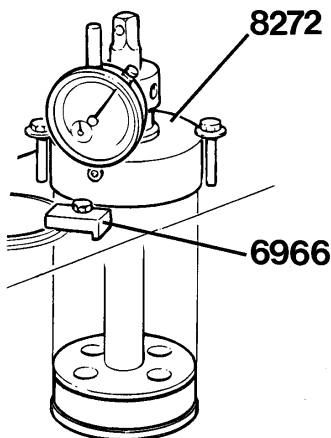
Note: Available shims for D12C Engine:
0.020 mm (0.007874 in.), 0.030 mm (0.01181 in.),
0.050 mm (0.01968 in)

9992479, 9989876

4
Remove the liner from each bore and mark it for that cylinder bore.

5
Attach milling tool 9998272 to the cylinder block, making sure that the feed sleeve does not press against the cutter.

9998272



T2007147

Fig. 13: Using milling tool 9998272

6
Note: Use a ratchet and socket to turn the cutter. Do not use an air-powered tool.
When attaching the milling tool, tighten the feed bolt until it presses lightly against the cutter. Install and set the dial indicator at zero (0).

7
Turn the cutter with an even movement while turning the feed sleeve at the same time.

8
While observing the dial indicator, continue cutting until you have removed the estimated amount of material measured to be cut from the bore.

9

Stop the feed and rotate the miller several turns in order to clean up any burrs from the liner shelf

Note: When cutting the counter bore ledge, cut small amounts in order to avoid cutting too much.

10

Remove the cutting tool. Install the liner with shim and check the height.

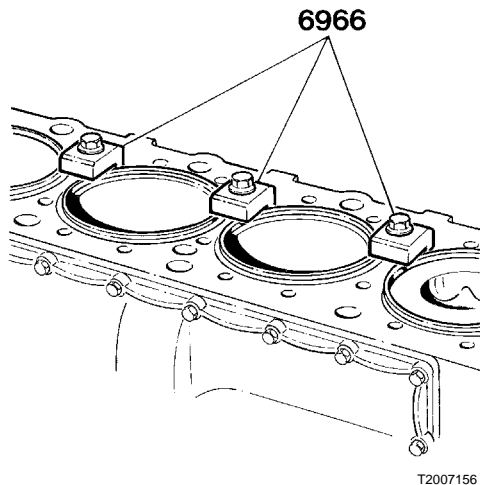
11

If there is not enough material to cut out, remove the liner and the shim. Install the cutter back into the bore and remove the remainder of the material from the bore ledge. Remove the cutter and again measure with the liner.

12

Install the cylinder liner without sealing rings. Firmly attach the liner with two clamping tools 9996966.

9996966

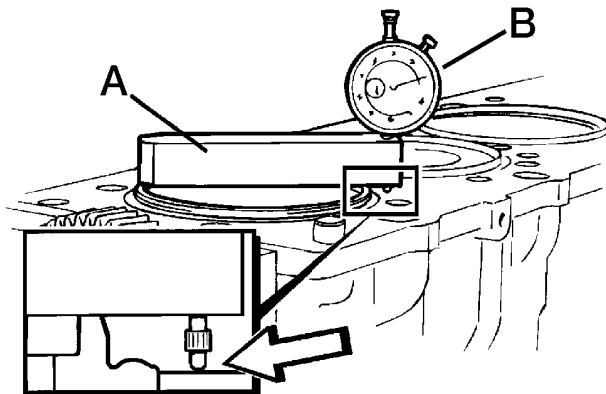


T2007156
Fig. 14: Clamping tools 9996966 in place

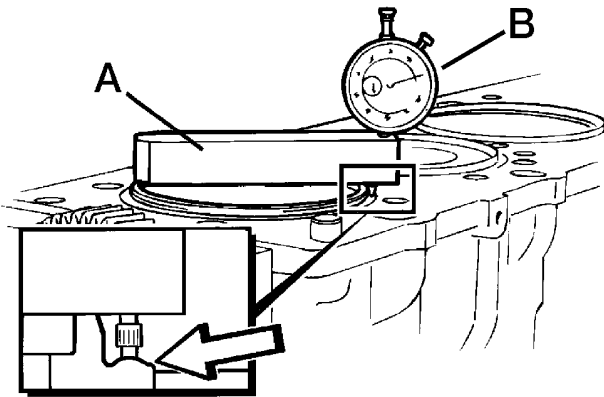
13

Install a dial indicator 9989876 on gauge block 9992479 and zero the indicator against the cylinder block.

9989876, 9992479



W2003723
Fig. 15: Zeroing the dial indicator



W2003722

Fig. 16: Measuring the height of the cylinder liner

14
Place the indicator probe against the liner shelf and read off the liner height above the face of the block.

15
Repeat this measurement at four locations, 90° apart. Make a note of each dial indicator reading. Sealing-surface height above the block face should be within the following specifications:

D12, D12A, D12B	0.15 – 0.20 mm (0.006 – 0.008 in.)
D12C	0.15 – 0.21 mm (0.006 – 0.008 in.)

Liner height variance between all cylinders: 0.06 mm

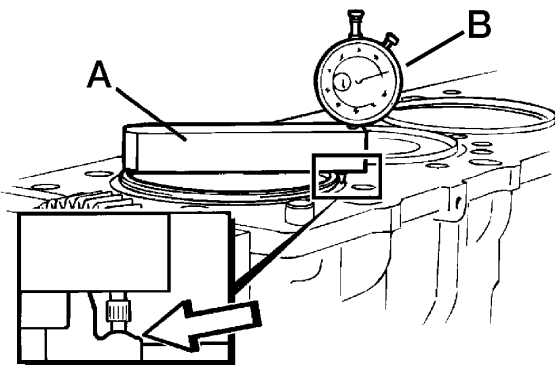
Note: Measure at the highest point of the liner (convex surface).

Note: Determine the number of shims required to allow the liner to protrude above the block face within the accepted specifications.

16
Remove the cylinder liner and install the recommended shim for that cylinder.

Note: Use the fewest number of shims possible to maintain specifications.

17
Reinstall liner with shims and clamp into place. Measure height of liner above block face to confirm that it is within specification. Mark the liner position so it can be reinstalled in the correct position.



W2003722