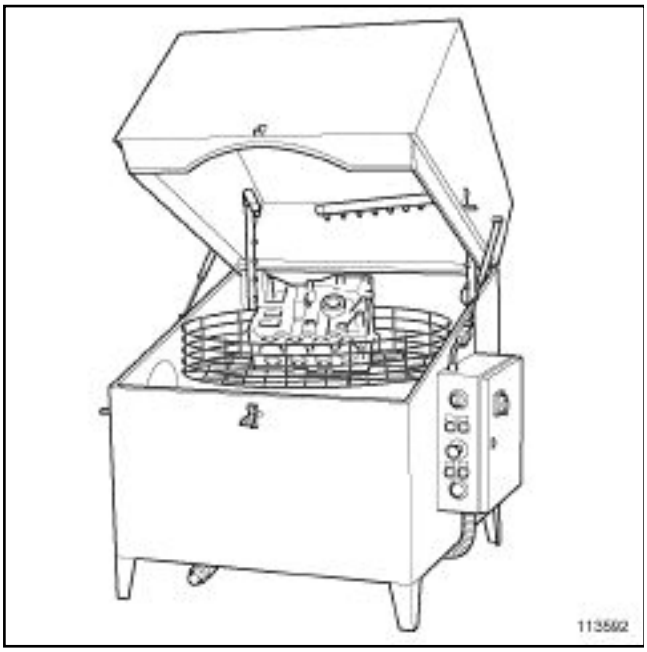
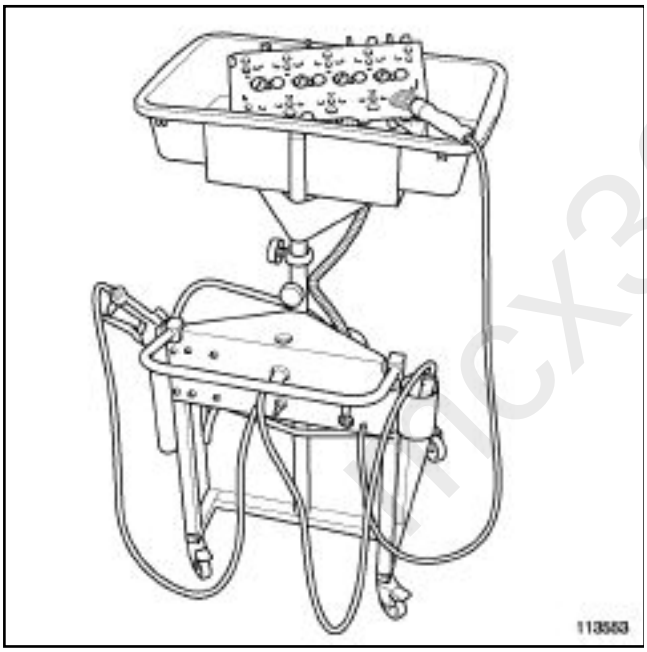


113592



113553

Wash the cylinder block parts using a cleaning fountain or a heated cleaning bath.

Special tooling required	
Mot. 1493-01	Crankshaft bearing centring tool.
Mot. 1492-03	Tool for fitting main bearing shells.
Mot. 1492	Tool for fitting main bearing shells.

I - RECOMMENDATIONS FOR REPAIR

WARNING

Parts should be clean before examining and testing them.

No adjustment is authorised to the cylinder block or the crankshaft.

II - PARTS AND CONSUMABLES FOR THE REPAIR

Consumables

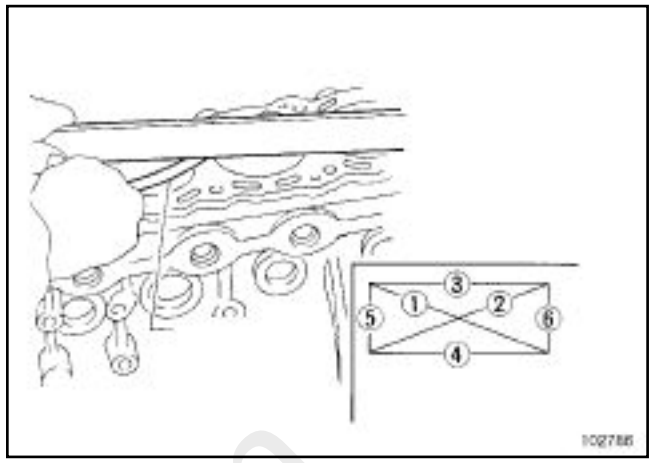
- Degreasing agent, part no. **77 11 224 559** .

III - EQUIPMENT REQUIRED

- Torque wrench and cylinder head bolt tightening gauge (angular measuring type),
- Torque/angle wrench,
- Radial play measuring tape.
- Sliding calliper,
- Micrometer,
- Dial gauge,
- Body jig bench and a pair of v-blocks.
- Magnetic holder,
- Set of shims,
- Cylinder head rule.

IV - CYLINDER BLOCK CHECK

1 - Checking the cylinder block gasket face



102786

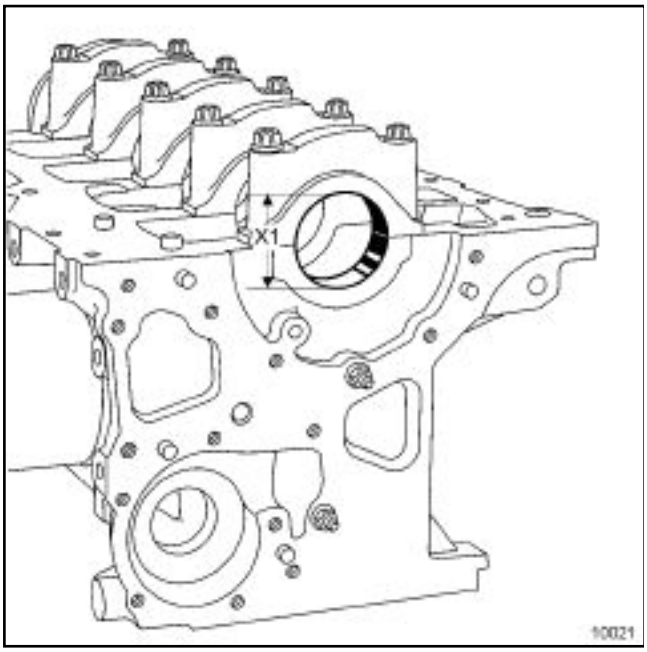
Use a cylinder head adjuster and set of shims to check the seal face bow.

Maximum deformation: **0.03 mm** .

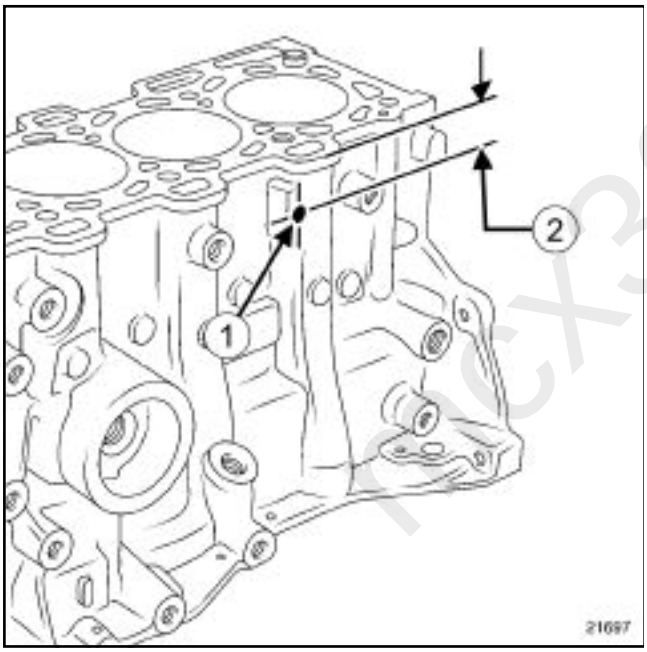
2 - Checking the diameter of the crankshaft bearings on the cylinder block

Refit the crankshaft bearing caps, fitting cap no. **1** at the flywheel end.

Torque and angle tighten **the main bearing cap mounting bolts (25 ± 2.5 Nm + 47° ± 6)** .



10021



21697

Note:

The hole (**1**) defines the diameter category of the crankshaft bearings on the cylinder block.

It is only possible to have one diameter category of crankshaft bearings on one engine.

Measure the dimension (**2**) to identify the diameter category of the crankshaft bearings on the cylinder block.

(2) = **33 mm** :

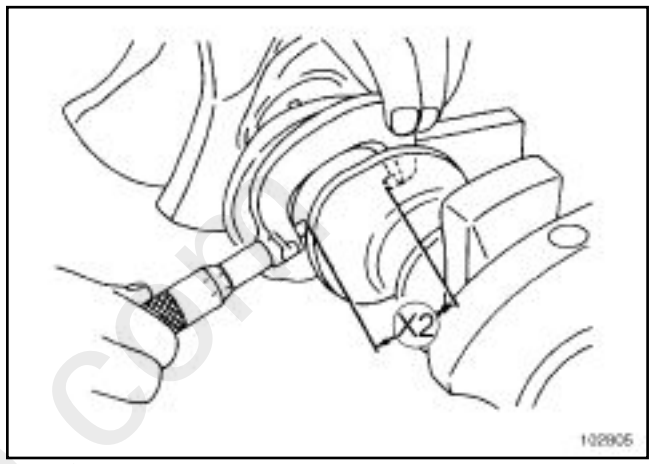
- the diameter category is **1** ,
- the diameter of the crankshaft bearings on the cylinder block is **51.936 to 51.942 mm excl.** .

(2) = **43 mm** :

- the diameter category is **2** ,
- the diameter of the crankshaft bearings on the cylinder block is **51.942 incl. to 51.949 mm** .

Remove the crankshaft bearing caps.

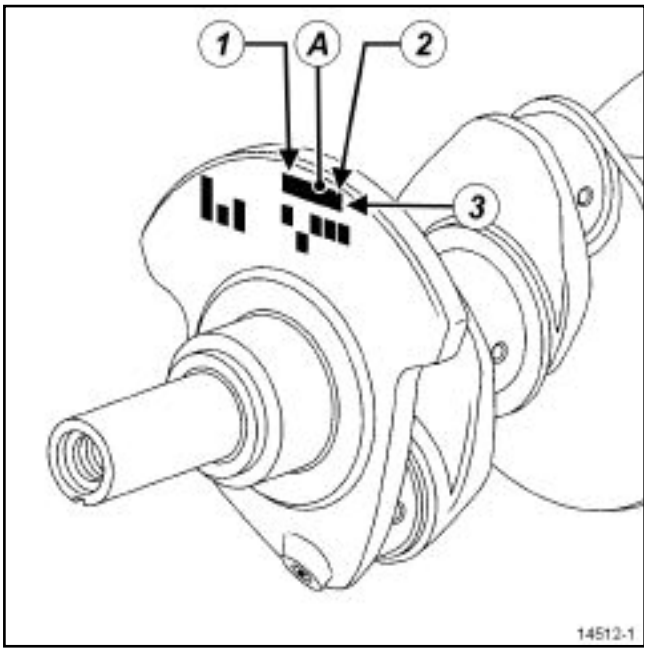
3 - Check the diameter of the crankshaft journals



102805

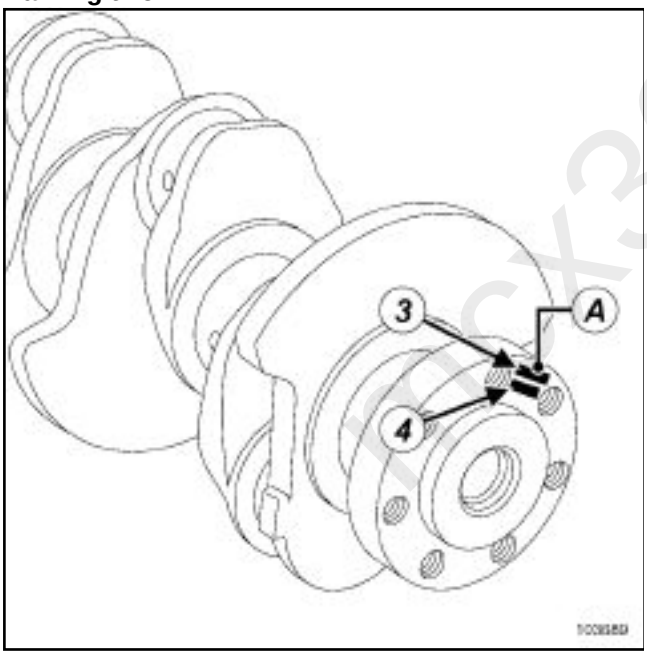
Measure the diameter of the journals using a micrometer (**X2**) .

Marking one



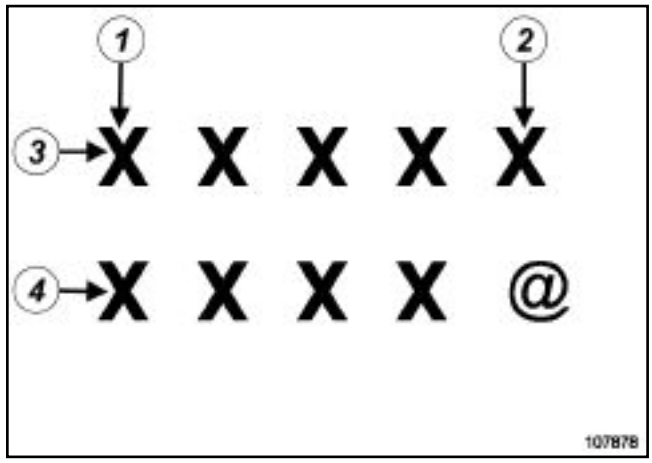
14512-1

Marking two



103689

Detail of marking "A".



107878

(**1**) diameter category of journal no.1, flywheel end,

(**2**) diameter category of journal no.5, timing end,

(**3**) line indicating the diameter class of the journals,

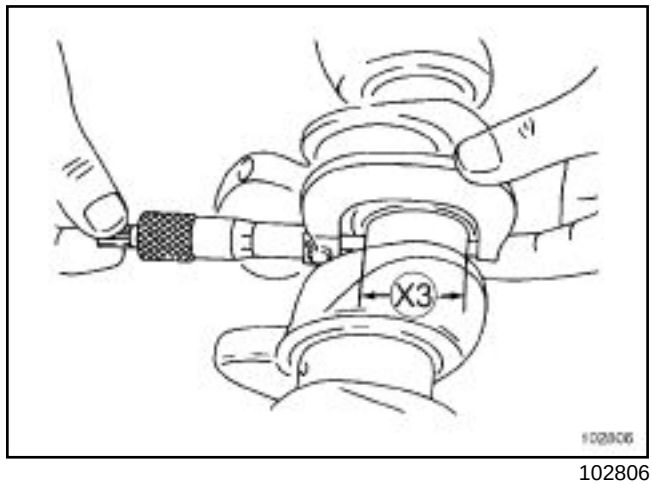
(**4**) line indicating the diameter class of the crankpins.

The marks of journal category **A, G, K, R,W** correspond to a diameter of **47.990 to 47.997 mm excl.** ,

The marks of journal category **B, H, L, S, Y** correspond to a diameter of **47.997 incl. to 48.003 mm excl.** ,

The marks of journal category **C, J, O, T, Z** correspond to a diameter of **48.003 incl. to 48.010 mm excl.** ,

4 - Check the diameter of the crankshaft crankpins



102806

Using a micrometer, measure the diameter of the crankpins (**X3**) which should be **43.97 ± 0.01 mm** .

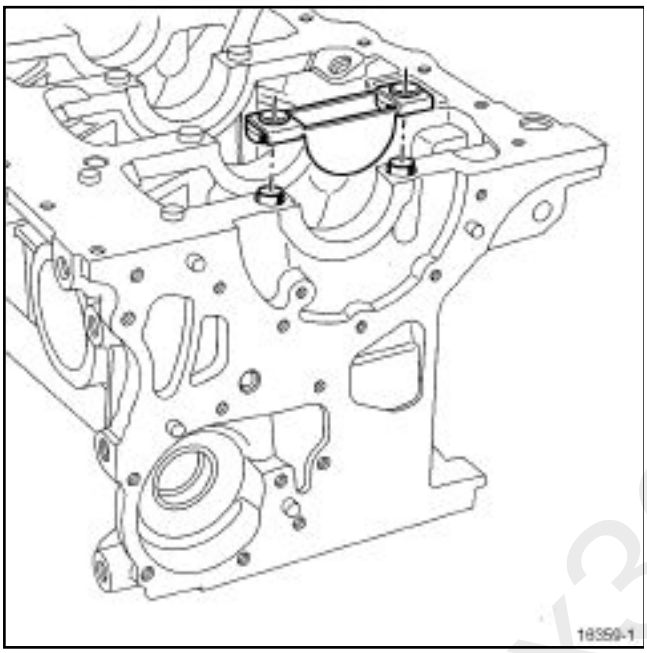
5 - Check for deformation of the contact surface of the crankshaft flywheel

Position the crankshaft on the v-blocks

Place the dial gauge at the base of the crankshaft.

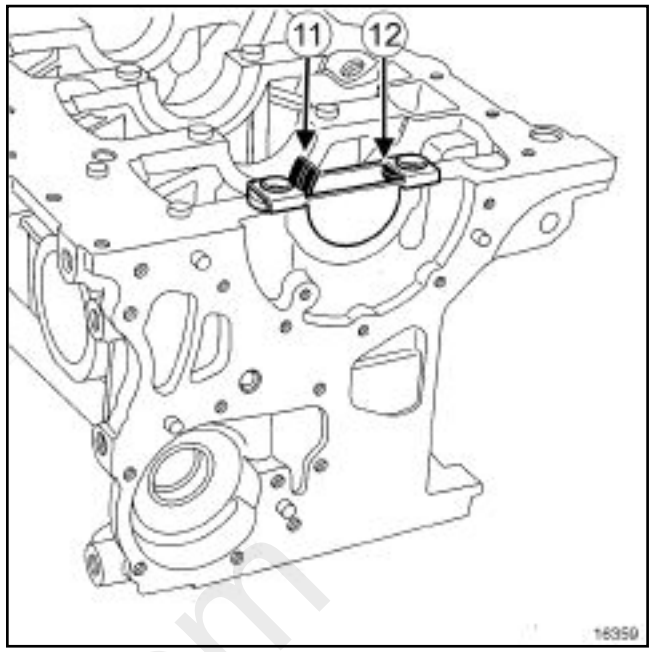
Measure the deformation of the contact surface of the flywheel which should not be greater than **0.6 mm** .

6 - Checking the crankshaft lateral clearance



16359-1

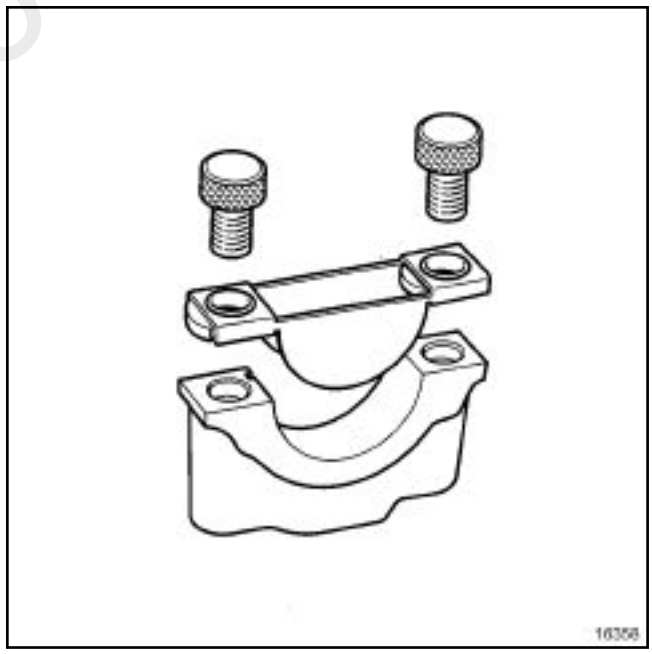
Position the **(Mot. 1493-01)** on the cylinder block.



16359

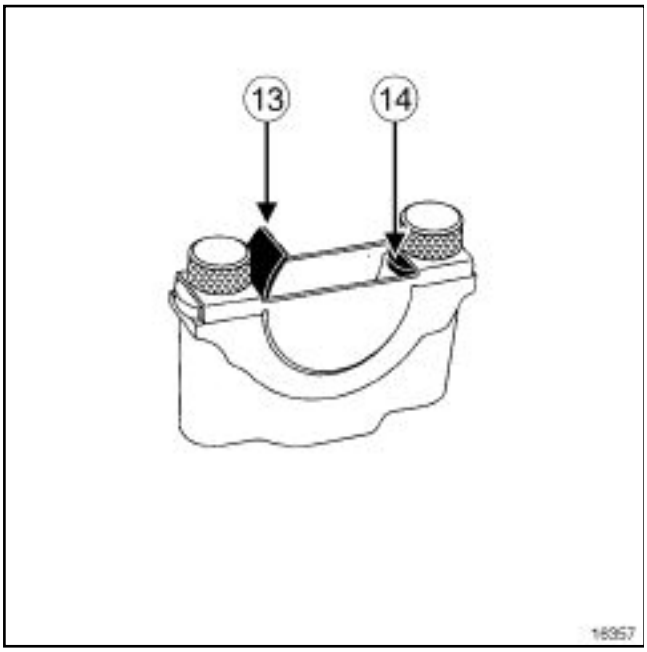
Mount the grooved bearing shell on the **(Mot. 1493-01)** .

Press at (**11**) on the bearing until it is in contact with the tool at (**12**) .



16358

Position the **(Mot. 1493-01)** on the crankshaft bearing cap.



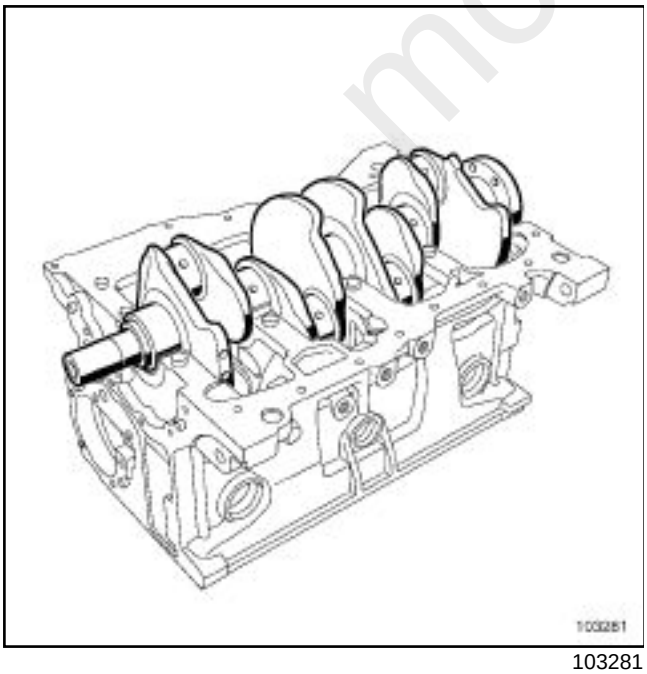
16357

Fit the non grooved bearing shell into the **(Mot. 1493-01)** .

Press at (**13**) on the bearing until it is in contact with the tool at (**14**) .

Lubricate:

- the crankshaft bearing shells (only the surface in contact with the crankshaft).
- the crankshaft journals.

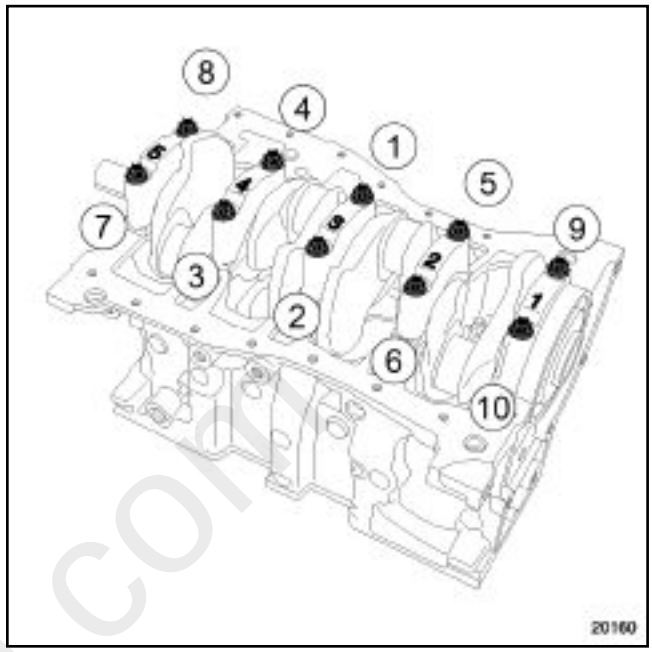


103281

Refit:

- the crankshaft,
- the crankshaft thrust washer on bearing **No.3** , positioning the grooves of the thrust washers at the crankshaft end.

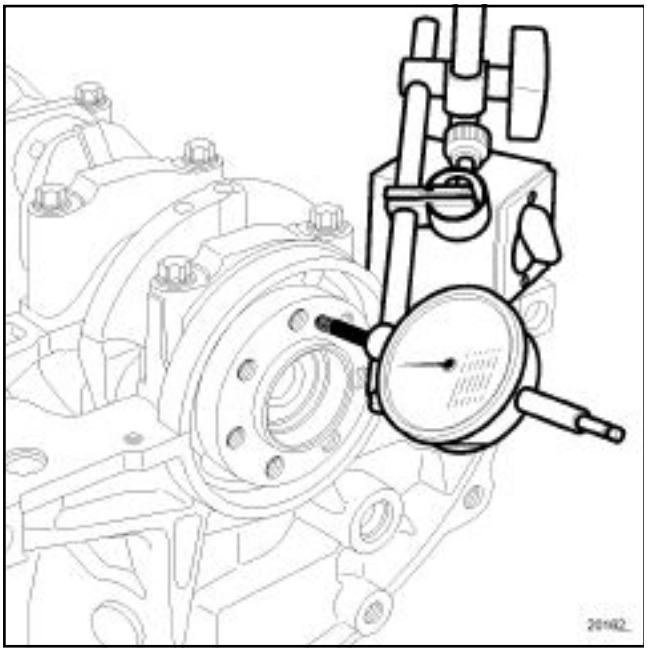
Refit the crankshaft bearing caps (positioning bearing cap No. 1 at the flywheel end).



20160

Torque and angle tighten in order **the crankshaft bearing cap mounting bolts (25 ± 2.5 Nm + 47° ± 6°)** .

Check that the crankshaft turns freely, with no resistance.


20162

Check the lateral clearance of the crankshaft, which must be:

- without thrust washer wear: **0.045 to 0.252 mm** ,
- with thrust washer wear: **0.045 to 0.852 mm** .

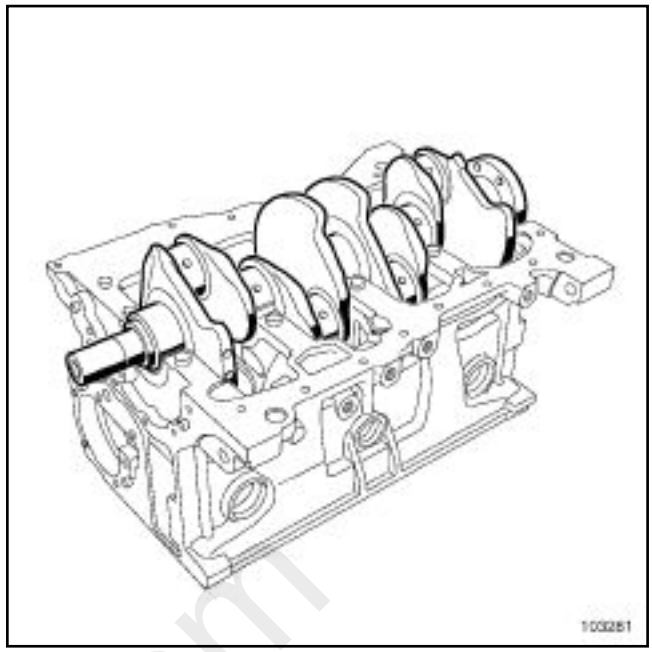
Remove:

- the crankshaft bearing caps,
- the crankshaft.

7 - Checking the crankshaft diametric clearance

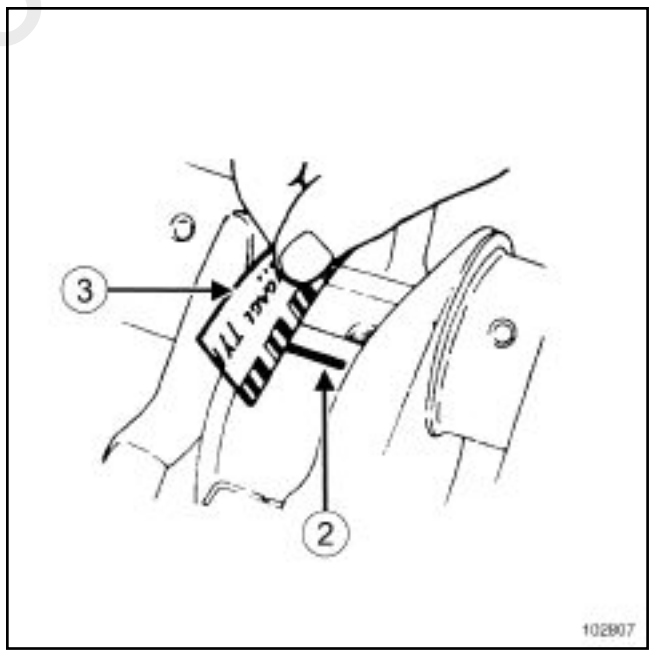
Note:
Never turn the crankshaft during the operation.

Remove any oil that may be on the crankshaft journals and cylinder block bearings.


103281

Refit:

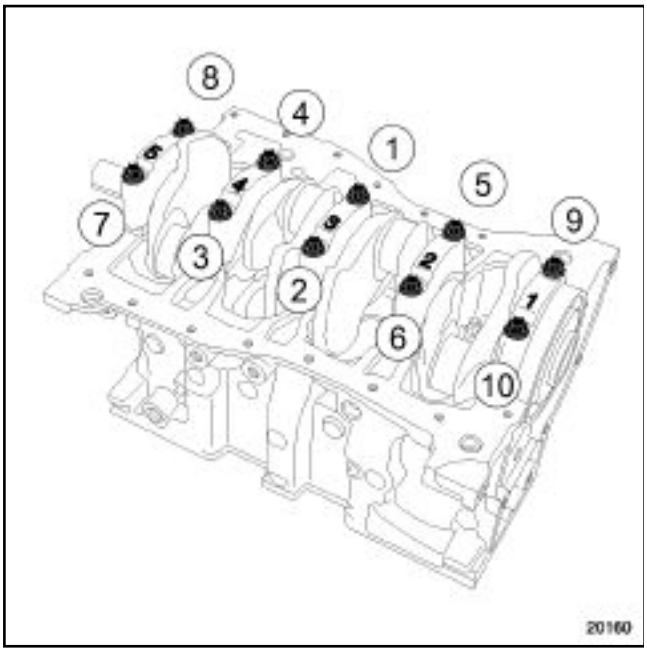
- the crankshaft,
- the crankshaft thrust washer on bearing **No.3** (grooves at crankshaft end).



102807

Cut bits of wire (**2**) to measure the clearance.

Insert the wire into the axis of the crankshaft journals (avoiding the bearing lubrication holes).



20160

Refit the crankshaft bearing caps, fitting **No.1** at the flywheel end.

Torque and angle tighten in order **the crankshaft bearing cap mounting bolts (25 ± 2.5 Nm + 47° ± 6°)** .

Remove:

- the crankshaft bearing caps,
- the crankshaft.

Measure the flattening of the clearance measuring wire using packaging paper **(3)** .

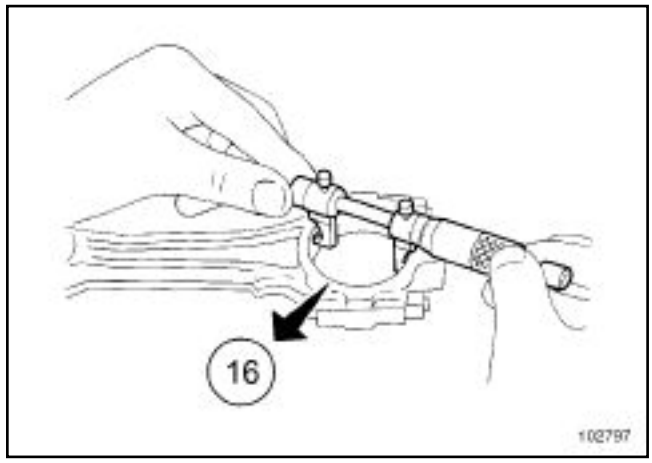
Check the clearance value, which must be between **0.010 and 0.054 mm** .

Clean any traces of measuring wire off the crankshaft and the bearing shells using degreasing agent.

8 - Checking the centre distance of the con rod

The distance between the small end and big end of the con rod should be **133.75 mm** .

9 - Checking the centre distance of the con rod



102797

Using a micrometer, measure the diameter of the big end, which should be **47.619 ± 0.009 mm** .

10 - Checking the diameter of the con rod small end

Using a micrometer, measure the diameter of the con rod small end (with ring):

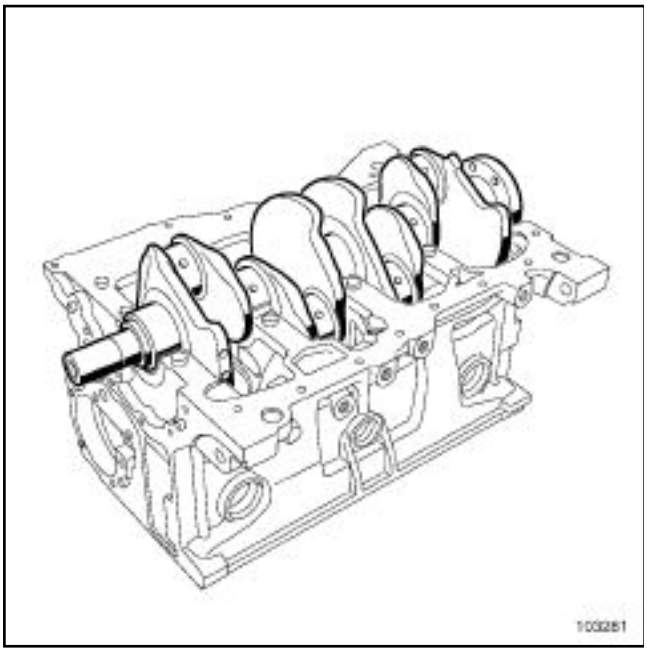
- For engines K9K 260-700-702-704-710-722 manufactured up to 25/11/2002 the diameter should be **25.019 ± 0.006 mm** ,
- For engines K9K 260-700-702-704-710-722 from 25/11/2002 and engines K9K 270-272-274-276-706-712-714-716-718-724-728-729-732-750-752-760-762-764-766-768-790-792, the diameter should be between **26.019 ± 0.006 mm** .

11 - Checking the diametric clearance of the big ends

Note:

Never turn the crankshaft during the operation.

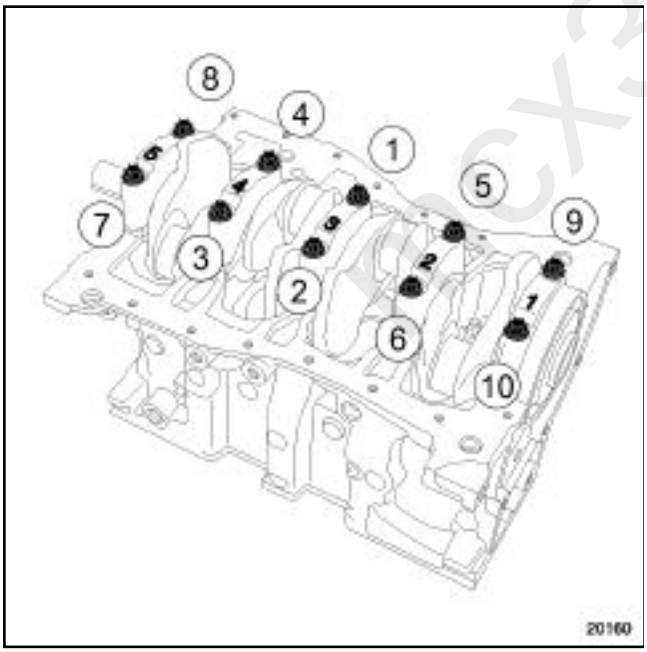
Remove any oil that may be on the crankshaft journals and cylinder block bearings.



103281

Refit:

- the crankshaft,
- the crankshaft thrust washers on bearing **No.3** (grooves at crankshaft end).

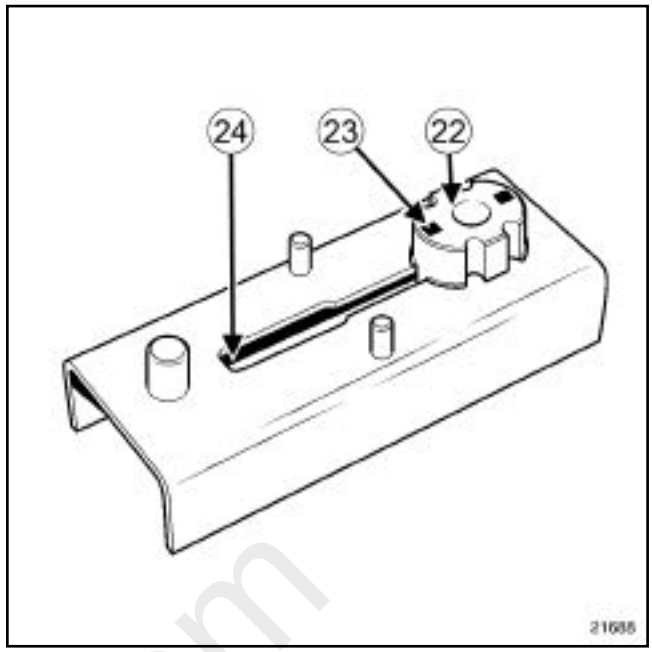


20160

Refit the crankshaft bearing caps, fitting **No.1** at the flywheel end.

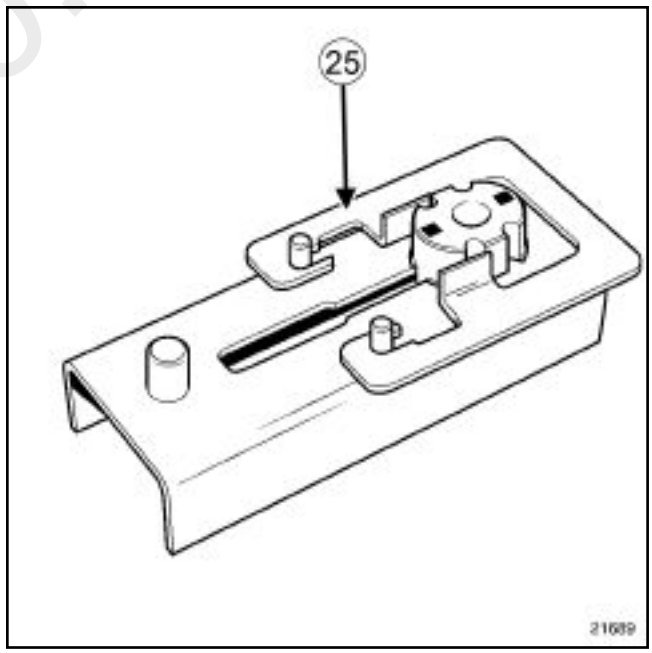
Torque and angle tighten in order **the crankshaft bearing cap mounting bolts (25 ± 2.5 Nm + 47° ± 6°)** .

Refitting the con rod bearings on the con rod body.



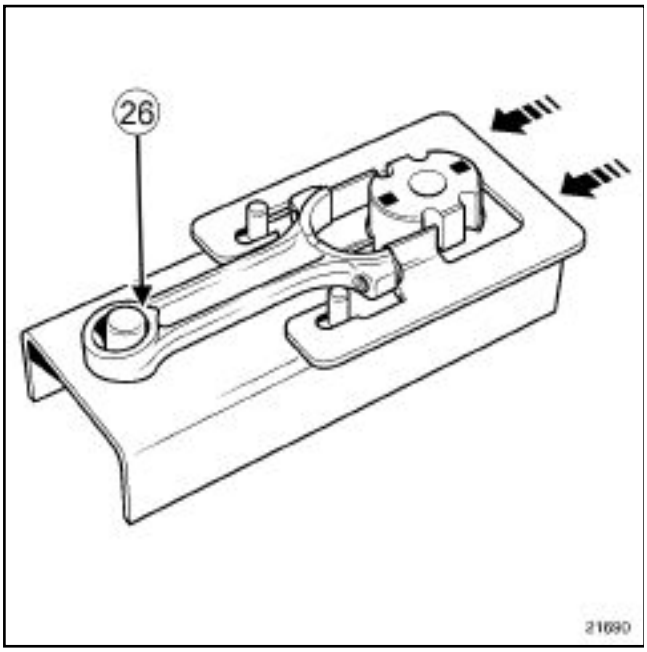
21688

Slide the bearing support (**22**) (positioning the marking "A" (**23**) as indicated in the diagram) of the **(Mot. 1492-03)** in the groove (**24**) of the tool block **(Mot. 1492)** .



21689

Place the rail (**25**) of the **(Mot. 1492-03)** on the base.

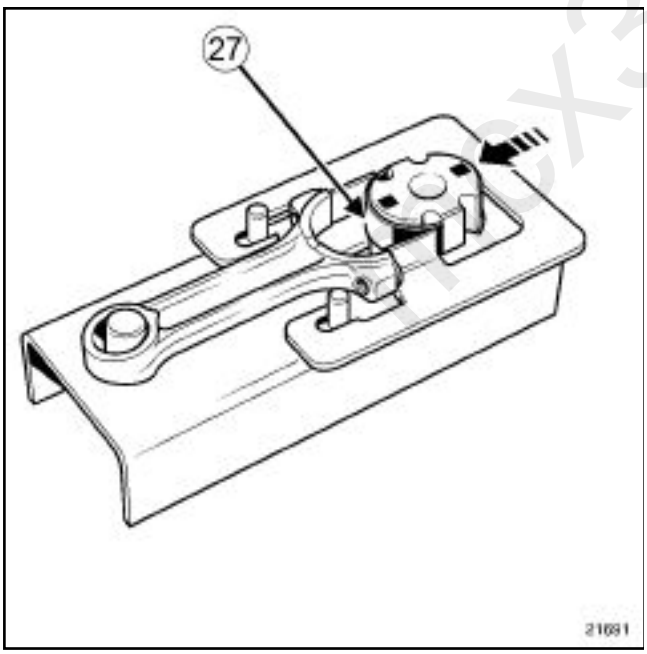


21690

Mount the con rod body on the base.

Check that the lower part (**26**) of the small end is in contact with the centring pin.

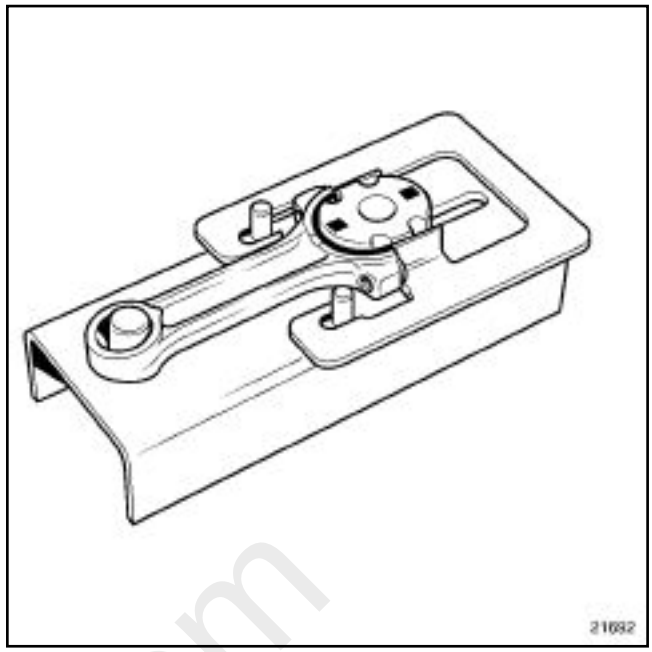
Push the rail (in the direction shown by the arrow) until the rail presses against the con rod end.



21691

Mount the bearing shell (**27**) (with a width of **20.625 mm** on the bearing shell support.

Push the bearing shell support in the direction shown by the arrow.



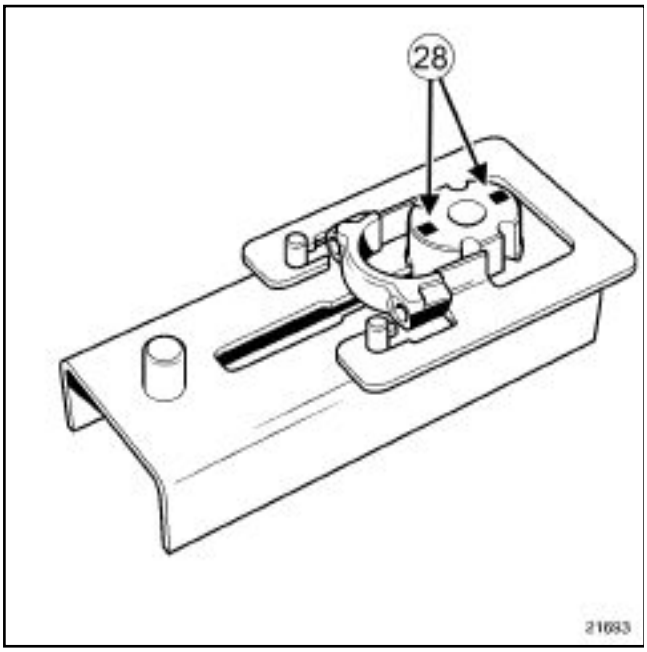
21692

Bring the bearing shell support to the end of the con rod body base.

Remove the support shell from the con rod body.

Repeat the operation for the other con rod bodies.

Refitting the con rod bearings on the con rod cap.

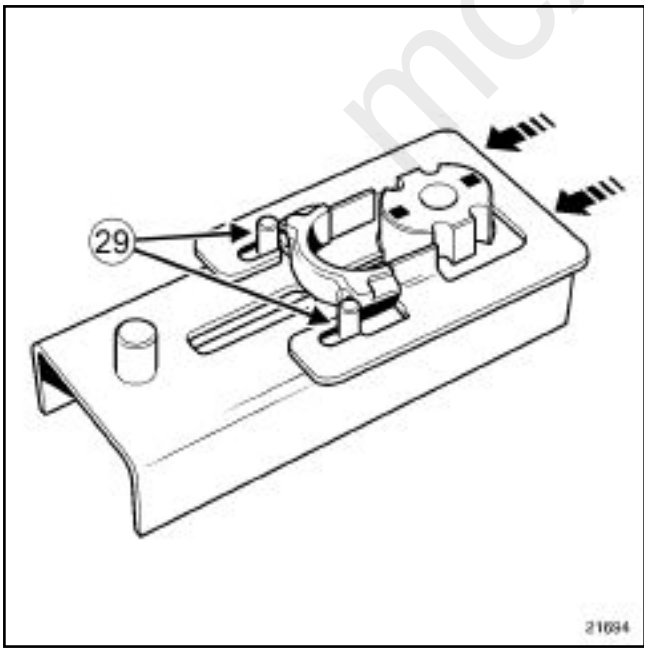


21693

Position the bearing shell support, aligning the marking "A" or "B" (**28**) on the side of the cap as follows:

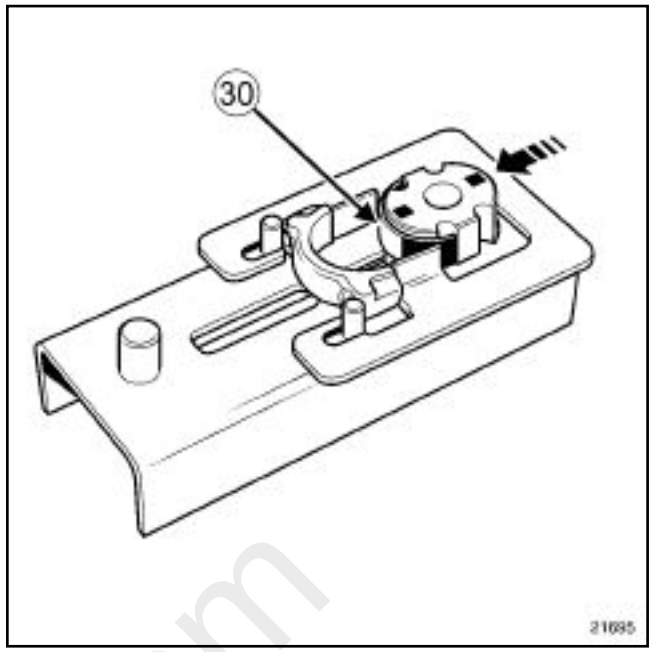
- a bearing shell width of **20.625 mm** corresponds to "A",
- a bearing shell width of **17.625 mm** corresponds to "B",

Mount the con rod cap on the base.



21694

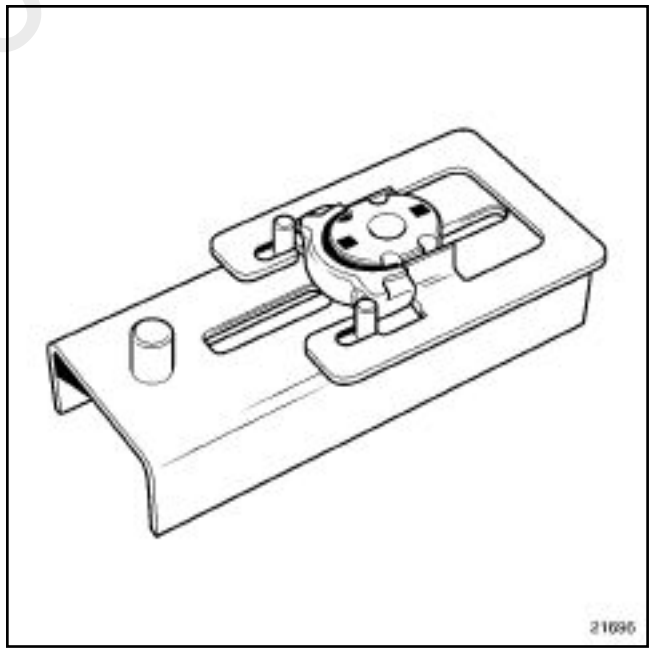
Push the rail in the direction shown by the arrow until the con rod cap presses against the pins (**29**) on the base.



21695

Mount the bearing shell (**30**) on the bearing shell support.

Push the bearing shell support in the direction shown by the arrow.



21696

Bring the bearing shell support to the end of the con rod cap base.

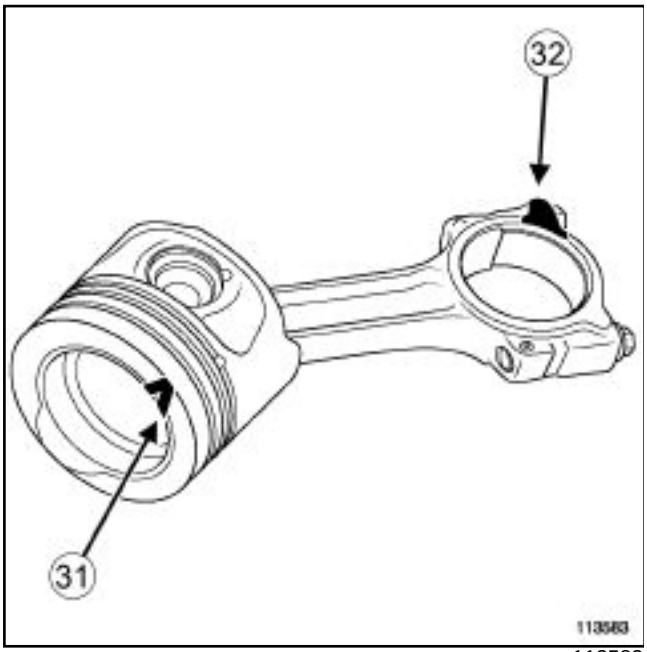
Remove the bearing shell from the con rod cap.

Repeat the operation for the other con rod caps.

Using an indelible pencil, mark the gudgeon pin position in relation to the piston.

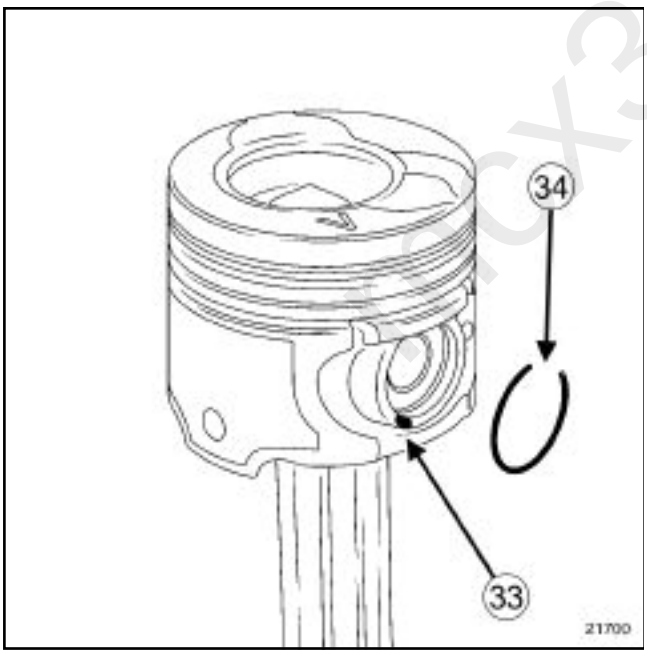
Lubricate gudgeon pin with engine oil.

Check that the gudgeon pin slides and turns freely in the piston.



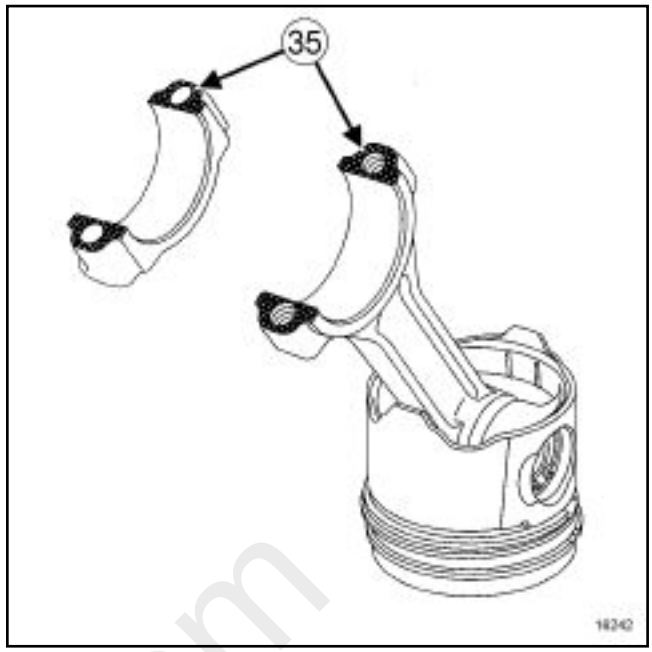
113583

Position the mark **"V"** (**31**) of the piston and the flat surface (**32**) of the con rod cap as indicated in the illustration.



21700

Refit the circlip of the gudgeon pin, positioning the opening (**34**) of the circlip opposite the notch (**33**) .



16242

Using degreasing agent, degrease the contact surfaces (**35**) between the cap and body of the con rod.

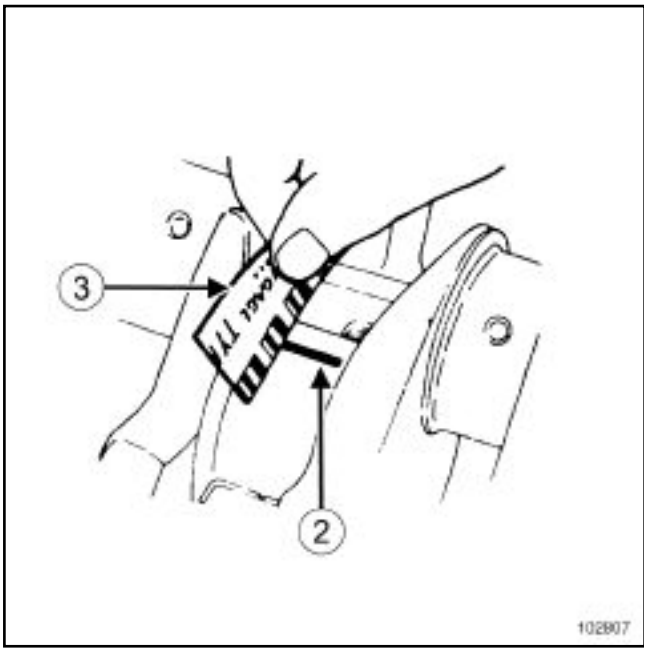
Note:

Ensure that the piston matches the cylinder block barrel (No.1 at flywheel end) .

Ensure the correct con rod-piston orientation, positioning the "V" engraved on the piston crown towards the flywheel .

Refit the con rod-piston assembly (without piston rings) onto the cylinder block.

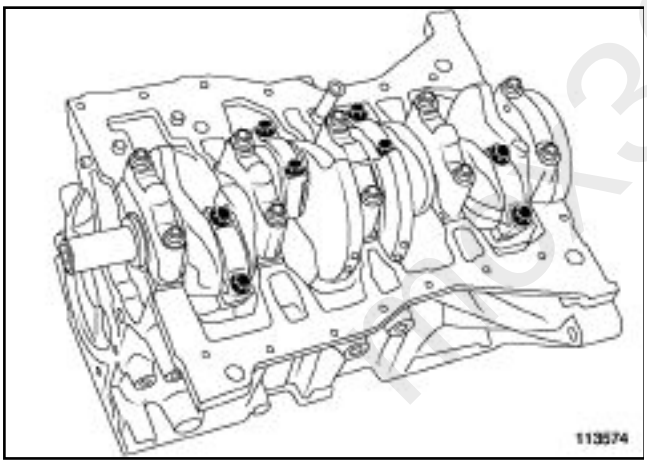
Mount the con rod heads on the crankshaft crankpins.



102807

Cut bits of wire (**2**) used to measure the clearance.

Insert the wire into the axis of the crankshaft crankpins (avoiding the bearing lubrication holes).



113574

Refit:

- the con rod caps, ensuring correct matching,
- the con rod cap mounting bolts.

Torque and angle tighten **the con rod cap mounting bolts (20 ± 2 Nm + 45° ± 6)** .

Remove:

- the con rod caps,
- the con rod-piston assembly.

Measure the flattening of the clearance measuring wire using packaging paper **(3)** .

Check the clearance value, which must be between **0.010 and 0.064 mm** .

Clean any traces of measuring wire off the crankshaft and the bearing shells using degreasing agent.

Remove:

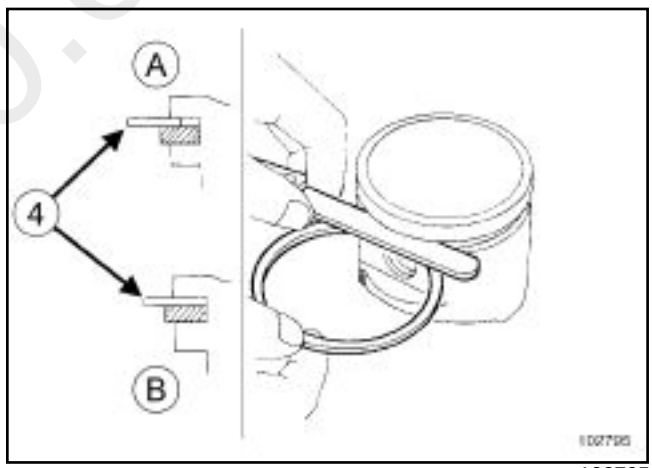
- the crankshaft bearing caps,
- the con rod pistons,
- the crankshaft.

12 - Checking the thickness of the piston rings

Measure the thickness of the piston rings using a micrometer.

- the compression ring must be **2 mm -0.01 / -0.03** .
- the sealing ring must be **2 mm -0.01 / -0.03** .
- the scraper ring must be **2.5 mm -0.01 / -0.03** .

13 - Checking the clearance between the piston grooves and the piston rings



102795

Measure the clearance between the piston grooves and piston rings using a set of shims (**4**) .

- (**A**) : Set of shims incorrectly positioned,
- (**B**) : Set of shims correctly positioned.

The compression ring clearance must be **0.10 to 0.12 mm** .

The clearance for the sealing ring must be **0.08 to 0.10 mm** .

the scraper ring clearance must be **0.03 to 0.05 mm** .

If the clearance is not within tolerance, replace the piston-gudgeon pin assembly, or the piston rings.