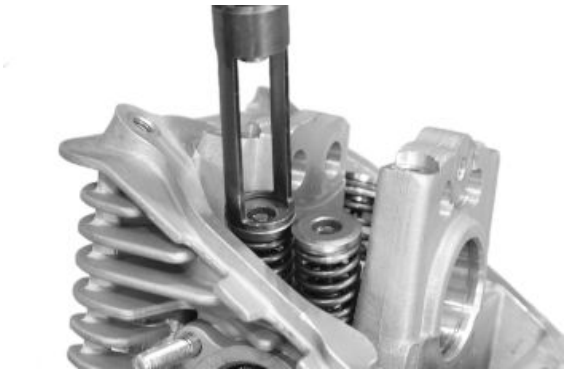
Refitting the valves

- Lubricate the valve guides with graphite grease.
- Place the lower caps of the valve spring on the head.
- Use the punch to fit the 4 sealing rings one at a time.

- Fit the valves, the springs and the upper caps.
- Using the appropriate tool, compress the springs and insert the cotters in their seats.



Inspecting the cam shaft

- Inspect the camshaft for signs of abnormal wear on the cams.

Characteristic

Standard diameter - Bearing A:

Ø 12 +0.002 +0.010

mm **Standard diameter - Bearing B:**

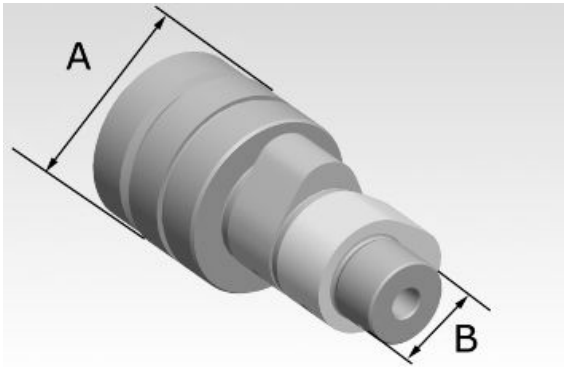
Ø 16-0.015 -0.023 mm

Minimum diameter allowed - Bearing A:

Ø 11.98 mm

Minimum diameter allowed - Bearing B:

Ø 15.96 mm



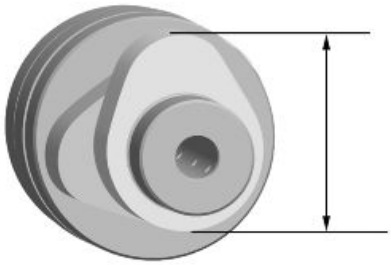
-Using a gauge, measure the cam height.

Check the axial clearance of the camshaft

- If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace the defective components with new ones.

N.B.

A BALL BEARING IS FITTED ON BEARING «A»; CONSEQUENTLY, BEARING «B» IS THE MOST IMPORTANT AS IT WORKS DIRECTLY ON THE HEAD ALUMINIUM



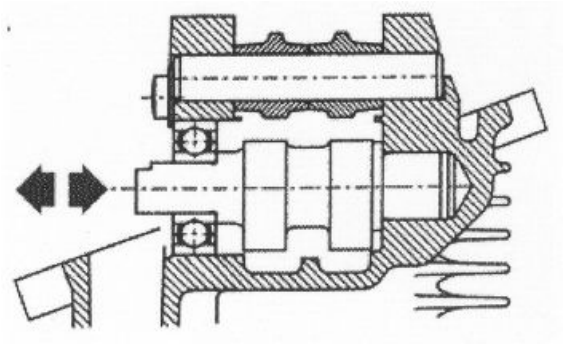
Characteristic

Standard height - Inlet

24.397 mm

Standard height - Outlet

23.996 mm



Fitting clearance

Maximum admissible axial clearance: 0.5 mm

- Measure the outside diameter of the rocking lever pins
- Check the rocking lever pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocking lever.
- Check that the pad in contact with the cam is not worn.

ROCKING LEVERS AND PIN DIAMETER:

Specification	Desc./Quantity
Rocking levers - Inside diameter	11.015 ÷ 11.035 mm
Rocking levers - Pins diameter	10.977 ÷ 10.985 mm

Refitting the head and timing system components

- Fix the head on a workbench.
- Screw the tool to fit the camshaft fully down on the bearing's inner track.
- Fit the camshaft fully into its seating together with the bearing with the aid of a mallet.
- Remove the tool.
- Fit the head gasket after cleaning the faying surface carefully.

- Insert the head in the cylinder stud bolts and tighten the 4 fixing nuts to the prescribed torque.

Specific tooling

020450Y Camshaft fitting/removal tool

- Fit pins, inlet rocking lever and discharge rocking lever.
- Lubricate the 2 rocking levers through the holes.

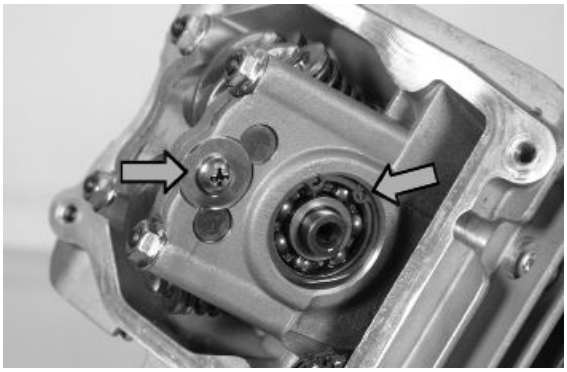
N.B.

IF A BEARING SEPARATES FROM THE CAMSHAFT, IT IS ESSENTIAL TO FIT A NEW BEARING.

- Screw up the limit screw of the rocking lever pins and tighten it to the prescribed torque.
- Reposition the Seeger ring retaining the camshaft

Locking torques (N*m)

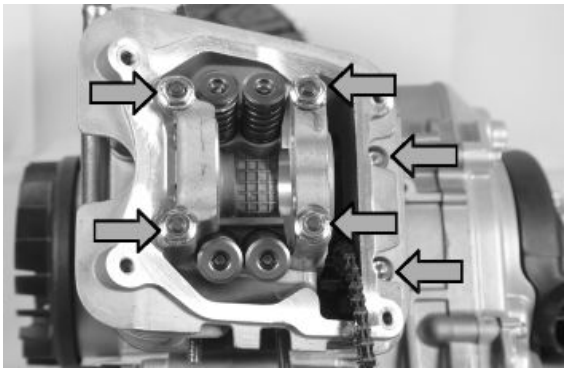
Rocking lever shafts screw 3 ÷ 4



- Finish the head tightening following the procedure below: screw the four head nuts to an initial torque at two crossed passes. Afterwards tighten the nuts with 2 turns of 90° each to be done at two crossed passes.
-Finish the tightening of the head to the crankcase with the 2 side screws.

N.B.

SHOULD THE CRANKCASE OR THE CYLINDER STUD BOLTS BE REPLACED, IT IS NECESSARY TO CARRY OUT AN INITIAL TIGHTENING PLUS OTHER 3 TURNS OF 90° EACH AT 3 CROSSED PASSES

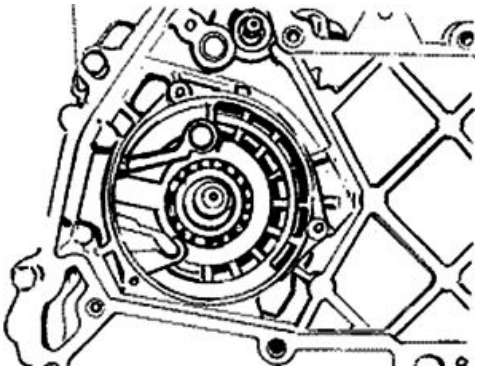


Locking torques (N*m)

Head-cylinder stud bolt nuts: 6 to 7 +135° +90° Nm first fitting, upon refitting tighten again at 6 to 7 90° +90° Nm Head cover screws 8 to 10 Nm

Refitting the timing chain

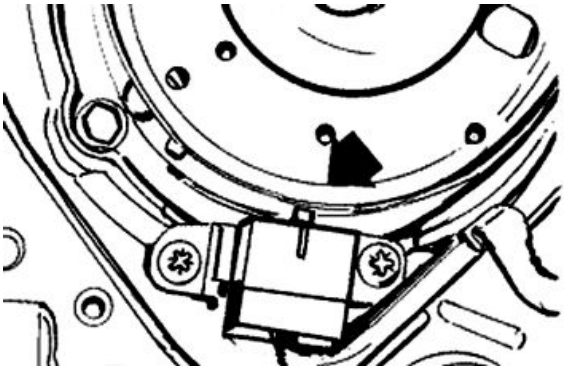
- Insert the timing chain pads in their corresponding seatings, the screw and the spacer as indicated in the figure.
- Tighten to the prescribed torque and check the tensioner pad moves adequately.
- Insert the timing pinion in driving shaft with the chamfered side facing the insertion (towards the main bearing).
- Loop the timing chain around the sprocket on the crankshaft.



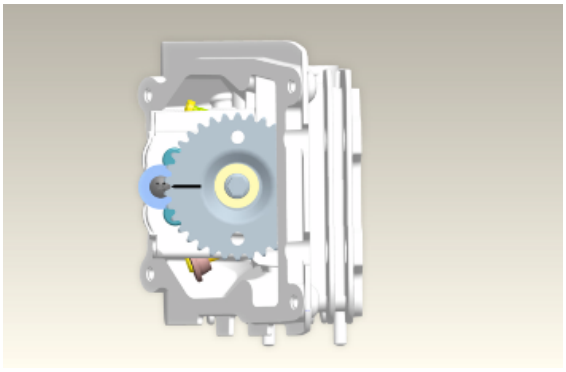
Locking torques (N*m)

Chain tensioner pad screw **5 to 7 Nm**

- Refit the spacer on the cam shaft.
- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.
- With this operation, insert the chain on the camshaft control pulley and make the reference notch coincide with the point on the head.
- Fit the pulley onto the camshaft.
- Fit the belleville washer so that the outer rim touches the pulley.
- Bring the screw closer but without reaching its final locking point.



- Push the tensioner pad lightly so as to check the correct timing.
- Use the specific tool to lock the camshaft crown gear and tighten the screw.
- Adjust valve clearance.
- Replace the O-ring on the tappet cover.
- Fit the tappet cover and lock it with the 4 fixing screws indicated in the figure.



Specific tooling

020565Y Flywheel lock calliper spanner

Locking torques (N*m)

Camshaft pulley screw 12 to 14 Head cover screw 8 to 10 Nm

- Set the tensioner cursor in the rest position.

- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the prescribed torque.

- Insert the spring with the central screw and tighten it to the prescribed torque.

- Fit the spark plug.

Characteristic

Electrode gap

0.5 ÷ 0.6 mm

Electric characteristic

Spark plug

NGK ER9EH-6N

Locking torques (N*m)

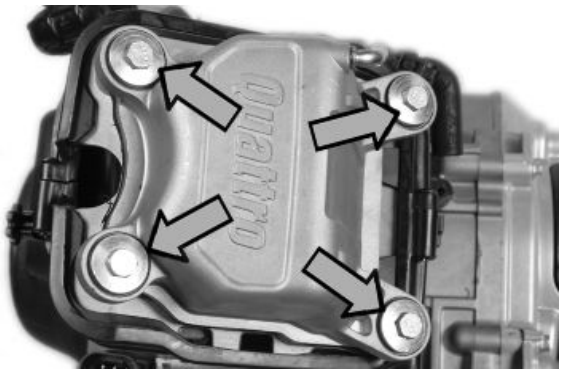
Timing chain tensioner central screw 5 to 6 Timing chain tensioner screw 8 to 10 Nm Ignition spark plug 10 to 15 Nm

Refitting the rocker-arms cover

- Carry out the removal procedure but in reverse order and tighten the four fixing screws to the specified torque.

N.B.

FIT A NEW O-RING ON THE TAPPET COVER.



Refitting the intake manifold

-Fit the cover sealing gaskets on the head.

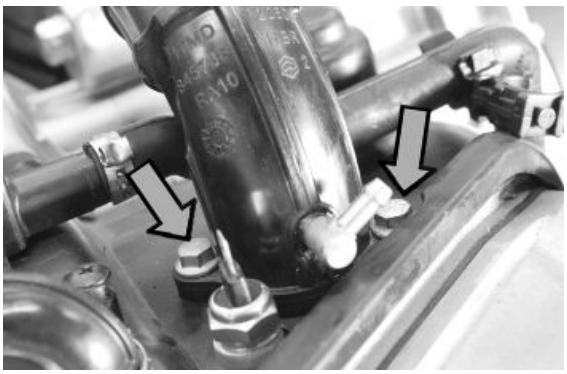
-Fit the 2 covers.

- Fit the inlet manifold and do up the 2 screws to the specified torque.

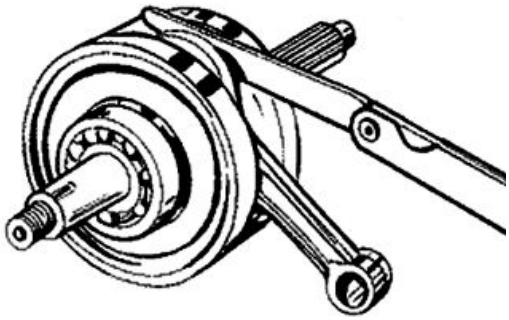
-Fit the carburettor on the inlet manifold and lock the clamp.

-Fit the secondary air pipe and fix it with the appropriate clamp.

N.B.



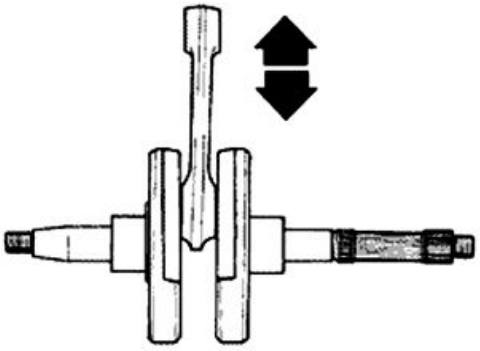
- Check the axial clearance on the connecting rod.



Fitting clearance

Standard connecting rod axial clearance 0.15 to 0.30 mm Max. connecting rod clearance 0.5 mm

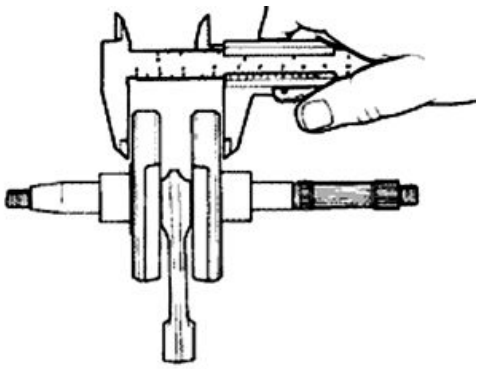
- Check the correct radial clearance of the connecting rod by holding the driving shaft with your hands and, with a dial gauge fitted to the rod small end, measuring the clearance, move the connecting rod vertically as shown in the figure.



Fitting clearance

Connecting rod radial - standard clearance 0.006 to 0.018 mm Connecting rod max. - radial clearance 0.25 mm

- Check that the half shaft surfaces are not scored and with the aid of a gauge check the driving shaft width as indicated in the figure.



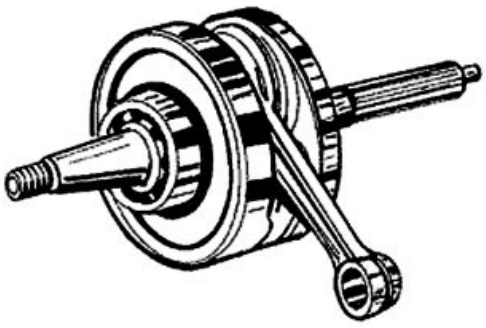
Characteristic

Standard measure

45 mm

Removing the crankshaft bearings

- Remove the flywheel bearing fitted on the driving shaft using the specific tool.



Specific tooling

004499Y Camshaft bearing extractor

004499Y001 Bearing extractor bell

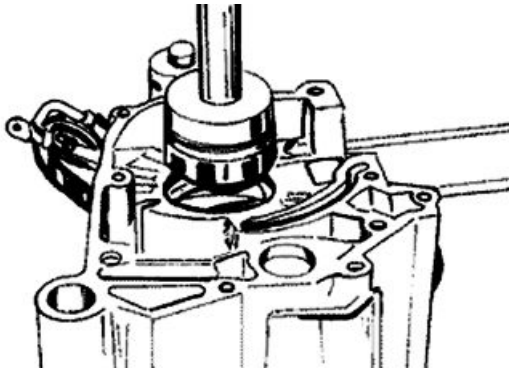
004499Y002 Bearing extractor screw

004499Y006 Bearing extractor ring

004499Y034 Bearing extractor part

Refitting the crankshaft bearings

- Support the crankcase on a surface and place it with the driving shaft axle in a vertical position.
- Warm the crankcase at ~ 120° C with a thermal gun (and support).
- Fit the punch with guide and adaptor, place the bearing on the punch using grease (to keep it from falling).
-Insert the bearing in the crankcase; if needed, use a mallet but do so with extreme care so as not to damage the engine crankcase limit stop.



Specific tooling

020359Y 42x47-mm Adaptor

020364Y 25-mm guide

020376Y Adaptor handle

020360Y 52x55-mm Adaptor

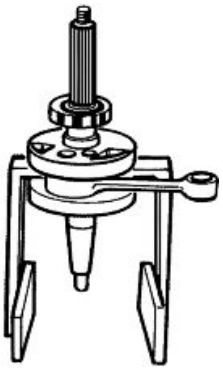
- Heat a new main bearing in an oil bath at 120°.
- Place the driving shaft on the support base and insert the bearing with the aid of an adequate piece of tube if necessary.

N.B.

USE A NEW BEARING WHEN REFITTING

WARNING

THE CENTRIFUGAL OIL FILTER IS IN THE FLYWHEEL AXLE SHAFT. DO NOT WASH WITH SOLVENTS OR BLOW COMPRESSED AIR SO THAT NO IMPURITIES LEAK OUT.



Specific tooling

020265Y Bearing fitting base

008119Y009 Tube to assemble shafts and axles