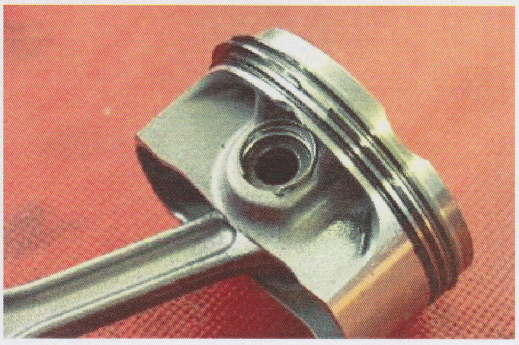
WITH CLASS SELECTION

CAUTION

THE MEASUREMENT OF THE PISTON DIAMETER IS PERFORMED AT 6 mm (0.24 in) FROM ITS BASE



Characteristic

Piston diameter

Class A: 77.961-77.971 mm (3.0693-3.0697 in).

Class B: 77.971-77.981 mm (3.0697-3.0701 in)

Maximum clearance between the cylinder and piston

0.1 mm (0.0039 in)

Maximum wear limit of the clearance between pin and pin hole on the piston

0.040 mm (0.0016 in)

Maximum allowed clearance between the first piston ring and respective slot on the piston

0.1 mm (0.0039 in)

Maximum allowed clearance between the second piston ring and respective slot on the piston

0.1 mm (0.0039 in)

Maximum opening of the piston ring fit on the pin First piston ring

0.5 mm (0.0197 in)

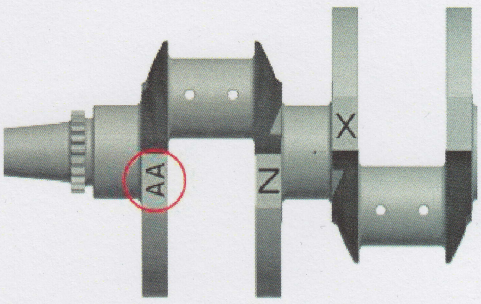
Second piston ring

0.7 mm (0.0275 in)

Selecting connecting rods

SELECTING CRANKSHAFTS AND CONNECTING RODS ACCORDING TO BALANCING CLASS

crankshafts and connecting rods have been introduced which are matched with each other in relation to their balancing class. The class is easily identifiable as it is marked on the component itself.



CAUTION

IT IS NOT POSSIBLE TO ORDER CERTAIN CONNECTING ROD AND CRANKSHAFTS CLASSES, THEREFORE, IF NECESSARY, REPLACE THE CONNECTING RODS OR CRANKSHAFTS, FOLLOW THE TABLE BELOW.

The permitted crankshaft-connecting rod balancing class combinations are listed in the following table:

CRANKSHAFT-CONNECTING ROD ORIGINAL BALANCING CLASSES

Crankshaft balancing classes	Balancing class combinations for alternator side connecting rod pair	Balancing class combinations for primary drive side connecting rod pair
HH	AA+AA	AA+AA
LL	BB+BB / **AA+CC**	BB+BB / **AA+CC**
MM	CC+CC / **BB+DD**	CC+CC / **BB+DD**
NN	DD+DD / **CC+EE**	DD+DD / **CC+EE**
OO	EE+EE	EE+EE

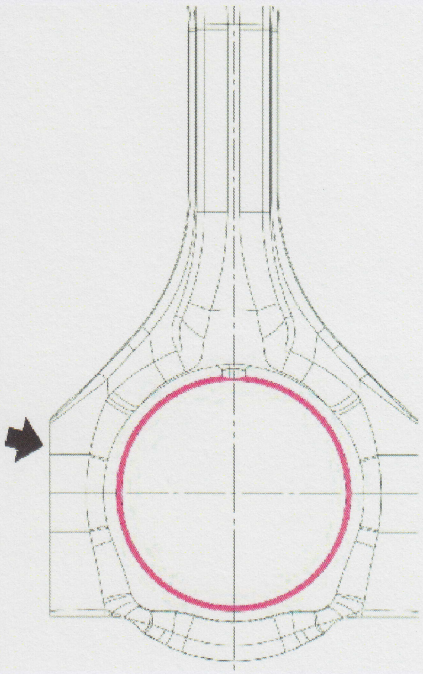
CRANKSHAFT-CONNECTING ASSISTANCE ROD BALANCING CLASSES

Crankshaft balancing classes	Balancing class combinations for alternator side connecting rod pair	Balancing class combinations for primary drive side connecting rod pair
HH	BB+BB	BB+BB
LL	BB+BB	BB+BB
MM	CC+CC	CC+CC
NN	DD+DD	DD+DD
OO	DD+DD	DD+DD

* if necessary replace a crankshaft of a class not available as spare part by keeping the connecting rods in the engine:

- for HH shaft - order LL SHAFT

The connecting rod class is stamped on its left side, viewed from the front, from the side with the bevelling on the big end hole.



Bushing selection

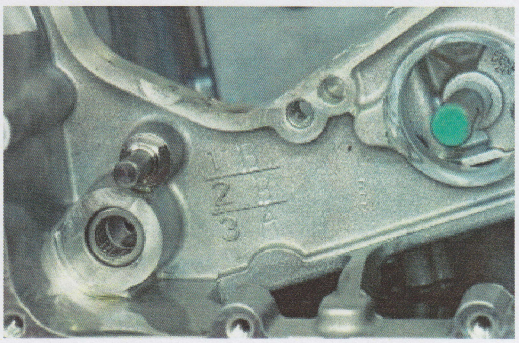
CRANKSHAFT BUSHINGS

CRANKCASE CATEGORY

Three crankcase classes are available (A - B- C) which differentiate in the diameter of the hole in the bearings.

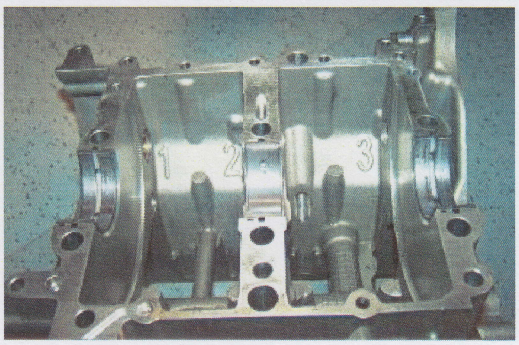
The category is marked on the crankcase, on the right side, in the area below the gearbox.

Different classes of bearings can be used (e.g.: A - B - C or B - B - C or A - B - A ....).



A number that indicates the position of the main journal is stamped on the crankcase:

1. flywheel side;
2. central;
3. clutch side.



CRANKCASE CATEGORY

Specification	Desc./Quantity
Class A	Bushing seat diameter 52.023 - 52.018 mm (2.0481 - 2.0479 in)
Class B	Bushing seat diameter 52.018 - 52.013 mm (2.0479 - 2.0477 in)
Class C	Bushing seat diameter 52.013 - 52.008 mm (2.0477 - 2.0475 in)

SHAFT CATEGORY

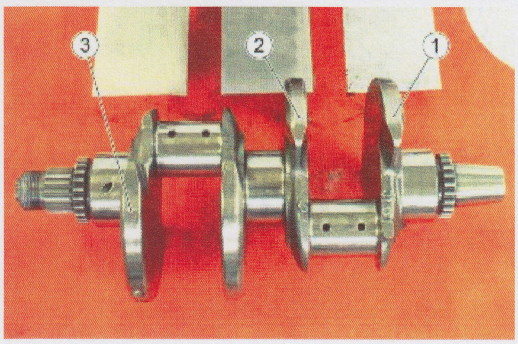
The three crankshaft main journals:

1. flywheel side;
2. central;
3. clutch side.

they are each selectable in two pairs of classes, A-B (up to engine No. 3990) or C-D-E (from Engine No. 3991).

The class is stamped on the flat face of the counterweight, as shown in the image.

The three main journals may have different classes to each other according to the type of coupling (e.g: A - B - A or B - B - A etc.) o (e.g.: C - D - E or D - C - C etc.)



CRANKSHAFT CATEGORIES

Specification	Desc./Quantity
Class C	Main journals - diameter: 46.028 - 46.023 mm (1.8121 - 1.8119 in)
Class D	Main journals - diameter: 46.023 - 46.018 mm (1.8119 - 1.8117 in)
Class E	Main journals - diameter: 46.018 - 46.013 mm (1.8117 - 1.8115 in)

Once the categories below are checked:

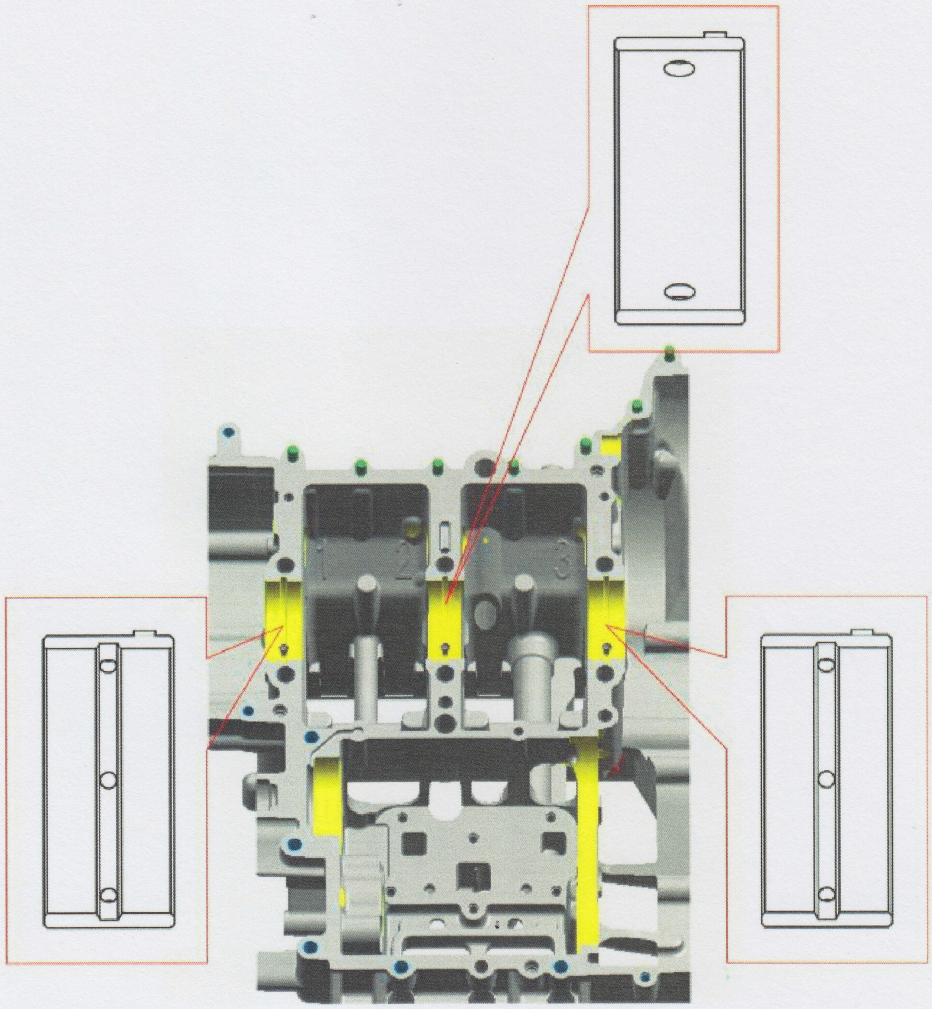
1. crankcase;
2. flywheel side main journal;
3. centre main journal;
4. clutch side main journal.

Choose the bushings used for assembly from the following table

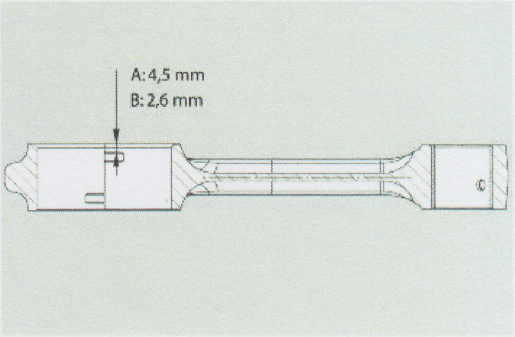
CRANKSHAFT BUSHINGS

Crankshaft main journal	Class A crankcase	Class B crankcase	Class C crankcase
Class C main journal	Bushing (green)	Bushing (green)	Bushing (yellow)
Class D main journal	Bushing (black)	Bushing (green)	Bushing (green)
Class E main journal	Bushing (black)	Bushing (black)	Bushing (green)

The flywheel side and clutch side main bearings are different from the central ones and therefore, so are the respective replacement part numbers.



CRANKSHAFT BUSHINGS - CONNECTING RODS



Three types of semi-bushing are available for the connecting rods:

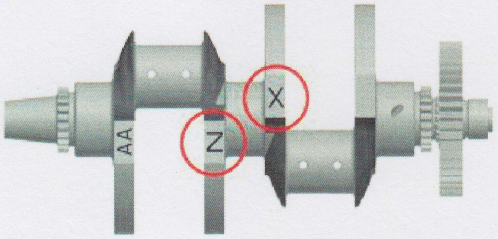
- Blue
- Yellow

- Green

For the coupling of the connecting rod with the crankshaft, according to the engraving on the counter-weights, observe the following table:

BUSHINGS THICKNESS

Bushing colours	Thickness
BLUE	1.547 - 1.552 mm
YELLOW	1.552 - 1.557 mm
GREEN	1.557 - 1.562 mm



CONNECTING RODS COUPLING - CRANKSHAFT

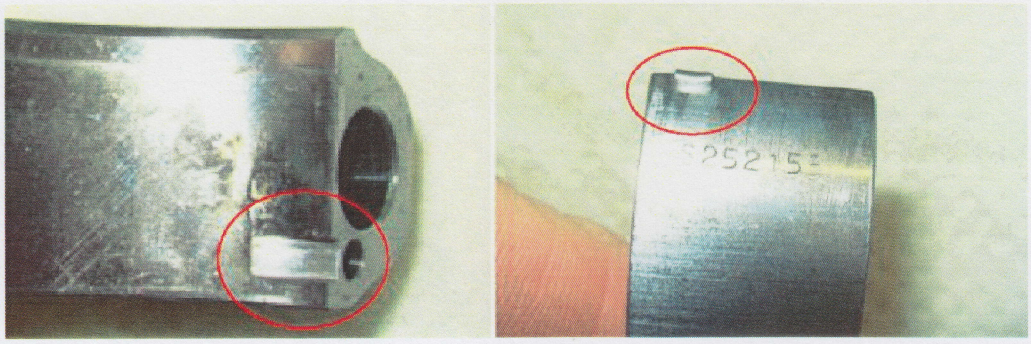
Selection connecting rod pin dimension	Connecting rod pin dimension	Bushing colours	Provided clearance
X	35.885 - 35.880 mm	Blue + Yellow (1)	0.055 - 0.026
Y	35.880 - 35.874 mm	Yellow + Yellow	0.056 - 0.026
Z	35.874 - 35.869 mm	Yellow + Green (1)	0.056 - 0.027

Key:

(1) If using bushing of different thickness, install the thickest on the side of the connecting rod shank

BIG END BUSHING REPLACEMENT PROCEDURE

When replacing the big end bushings, make sure that the tang of the semi-bushing is correctly housed in the corresponding notch in the connecting rod stem or cap.



Bearing fitting

BALANCING COUNTERSHAFT BEARING INSTALLATION

FLYWHEEL-SIDE