

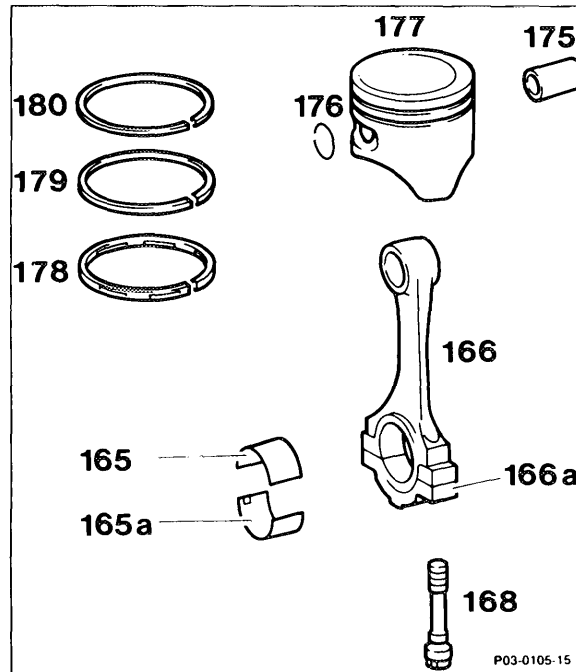
03-316 Removal and installation of pistons

Preliminary jobs:

Engine removed (01-030).

Cylinder head removed (01-415).

Oil pan removed (01-310).



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|--|---|
| Cylinder | clean. |
| Connecting rod bolts (168) | remove, check (03-310), reinstall (items 2, 12). |
| | Caution ! |
| | Do not mix up upper and lower connecting rod bearing shells (165, 165a). |
| Connecting rod bearing cap (166 a) | remove, oil connecting rod bearing, position connecting rod bearing cap (166 a) so that code numbers match on connecting rod (166) (item 11). |
| Piston (177) | remove together with connecting rod (166) toward top (item 2), check piston rings (178, 179, 180) for easy motion, check gap tolerance and axial play. Oil piston and cylinder. |

Caution !

Do not heat piston.

Attach clamping strap 000 589 04 14 00 and insert piston into cylinder bore (item 10). The arrow on the piston crown should point toward the front of the vehicle.

Piston pin retainer (176) remove, install (items 3, 7).

Piston pin (175) press out, oil, press in by hand (items 3, 6).

Piston (177) remove from connecting rod (166) (item 3), position on connecting rod (166), the arrow should point toward the front of the vehicle and the retaining groove in the connecting rod toward the left side of the engine (item 5).

After installation:

Crankshaft turn and check clearance between connecting rod and crankshaft (item 13).

Piston (177) move to TDC and measure distance between piston crown and crankcase mating surface (item 14).

Projecting length max.: 0.965 mm

Projecting length min.: 0.735 mm

Cross reference, pistons - cylinders

Engine	Piston code number	Group code letter	Piston dia.	Cylinder dia.
602.91	01, 05, 07, 08 ¹⁾ , 15 ²⁾ , 16 ³⁾ , 17 ³⁾ , 12 ⁶⁾ , 14 ⁷⁾	A	86.970-86.976	87.000-87.006
602.96, 603.96	09 ¹⁾ , 011 ¹⁾ , 004 ⁴⁾ , 13 ⁴⁾	B	upon 86.982-86.988	upon 87.012-87.018

¹⁾ Engines 602 and 603.96 from beginning of production.

²⁾ Engine 602.91 starting 02/88.

³⁾ Engine 602.91 starting 09/88.

⁶⁾ Engine 602.91 03/88 up to 06/88.

⁷⁾ Engine 602.91 06/88 up to 11/88.

Cross reference, pistons – cylinders

Engine	Piston code number	Group code letter	Piston dia.	Cylinder dia.
603.970	16	A	88,858–88,864	89,000–89,006
		X	88,863–88,871	89,006–89,012
		B	88,870–88,876	89,012–89,018

Piston projecting length

Distance between piston crown and crankcase parting surface	Projection max.0,965 Projection min.0,735
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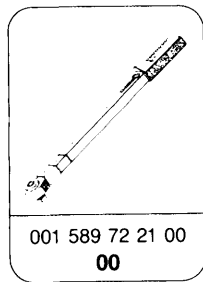
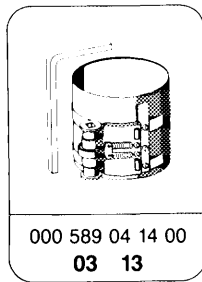
Test values

		When new	Wear limit
Difference in weight between pistons in one engine			20 g
Piston pin diameter	Engines 602.91	1st version 2nd version	26.995–27.000 25.995–26.000
	Engines 602.961, 603.96		27.995–28.000
Distance, piston pin eye	1st version 2nd version	22.05–22.35 24.1–24.3	
	Piston pin clearance	in connecting rod bushing	1st version 2nd version
in piston			0.004–0.015
Connecting rod in piston (end play)		1st version 2nd version	0.126–0.274 0.050–0.402
Piston ring gap clearance	Groove 1	0.25–0.45	1.0
	Groove 2	0.20–0.40	1.0
	Groove 3	0.20–0.40	1.0
Piston ring side clearance	Groove 1	0.090–0.122	0.20
	Groove 2	0.050–0.085	0.15
	Groove 3	0.030–0.065	0.1

Tightening torque and rotation angle

Connecting rod bolts	Initial tightening torque	30 Nm
	Rotation angle	90 – 100°

Special tools



Standard tool

Dial gauge A1 DIN 878

e.g. Mahr,
D-7300 Esslingen
Order No. 810

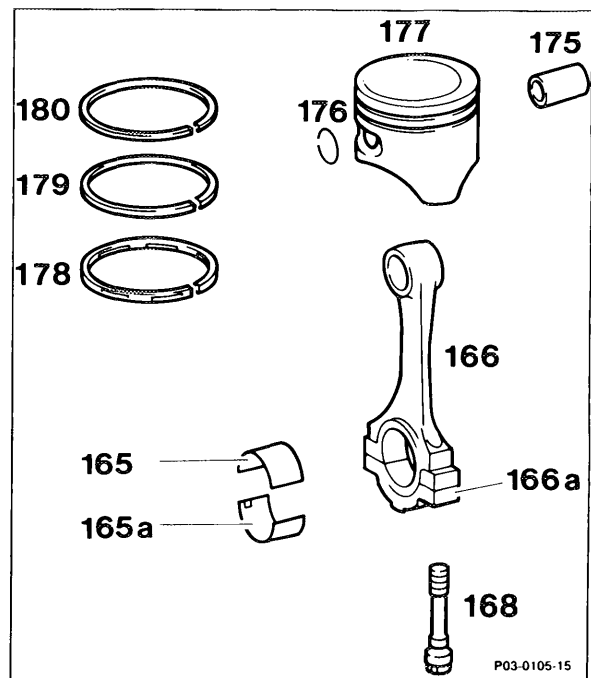
Removal

- 1 Remove combustion residues in cylinder.
- 2 Remove connecting rod bolts (168), remove connecting rod bearing cap (166a) and remove connecting rod (166) together with piston (177) in upward direction.

Caution !

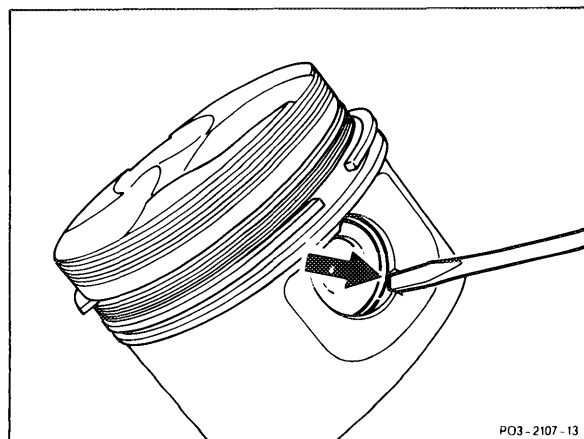
Do not mix up upper and lower connecting rod bearing shells (165, 165a).

- | | |
|-----|---------------------|
| 175 | Piston pin |
| 176 | Piston pin retainer |
| 178 | Piston ring |
| 179 | Piston ring |
| 180 | Piston ring |



- 3 Remove piston pin retainer (arrow) and press out piston pin, remove piston from connecting rod.

- 4 Recondition and square connecting rod (03-313).

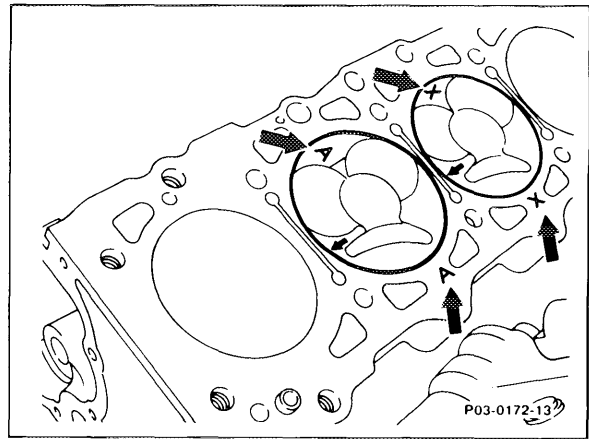


Installation

Note

The group code letters (arrows) are stamped on the crankcase mating surface. Only pistons with the group code letter "X" are available for repair. These pistons should also be installed in cylinder bores with group code letters "A" or "B".

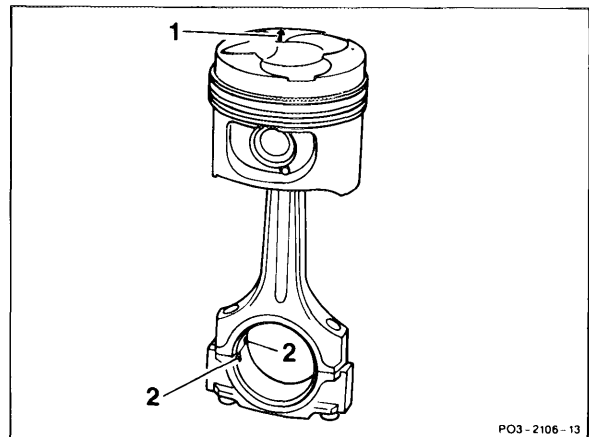
When repairing hone cylinder bores according to dimensions of present pistons "X" plus piston clearance.



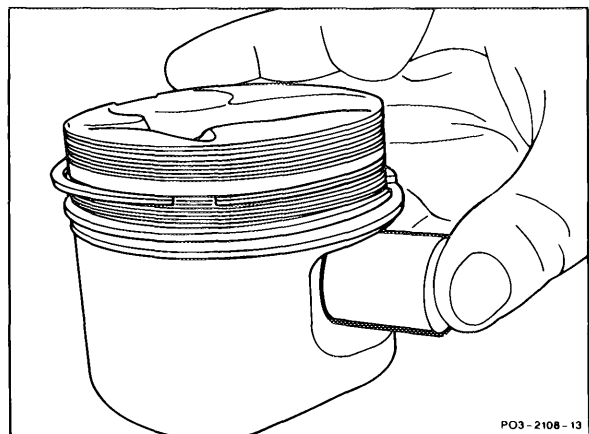
5 Position piston on connecting rod so that arrow (1) points toward front of vehicle and retaining grooves (2) in connecting rod point toward left side of engine.

Caution !

Do not heat pistons.



6 Coat piston pins with oil and press in by hand.

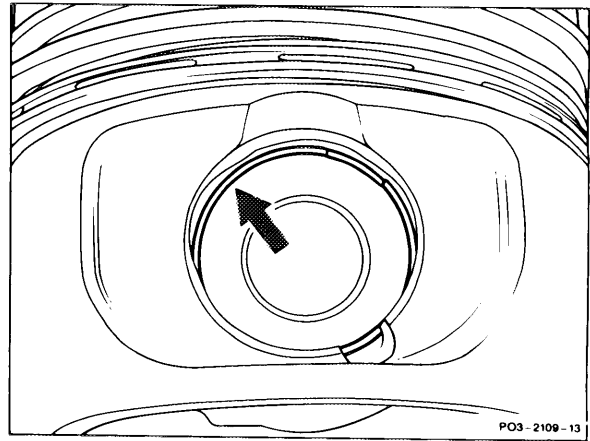


7 Insert piston pin retainer into groove (arrow).

Check piston rings for easy motion.

When installing used pistons check gap and side clearance of piston rings.

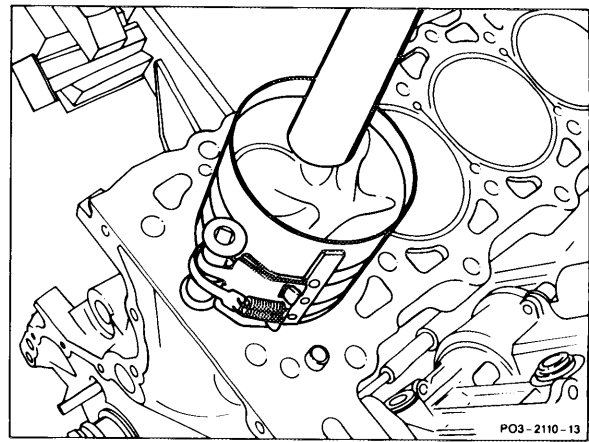
8 Oil cleaned cylinder bores, connecting rod bearing journals, connecting rod bearing shells and pistons.



9 Turn piston rings so that gaps are distributed uniformly around circumference of piston.

10 Attach clamping strap 000 589 04 14 00 and install piston.

The arrow on the piston crown must point toward the front of the vehicle.



11 Position connecting rod bearing caps on connecting rods with codes (arrow) on same side.

12 Check connecting rod bolts, replace and tighten (03-310).

13 Turn crankshaft and check clearance between connecting rod and crankshaft.

14 Measure distance between piston crown and crankcase parting surface with pistons in TDC position (see table).

