

03-316 Removal and installation of piston

Piston/cylinder allocation

Engine	Piston code	Group No.	Piston dia	Normal size Std (standard) cylinder bore	
				1	2-4 and 5
615.913/940 (40 kW)	35.38	0 1 2	86.98	87.009-87.018	86.998-87.008
615 (44 kW)	48.52		86.99	87.019-87.028	87.009-97.018
615.912/941	24, 26 ¹⁾ , 27 ¹⁾		87.00	87.029-87.038	87.019-87.028
616.912/916 (48 Kw)	03.38	0 1 2	90.98 90.99 91.00	91.009-91.018 91.019-91.028 91.029-91.038	90.998-91.008 91.009-91.018 91.019-91.028
616.912 (USA) 1979 and South Africa	35.44	0 1 2	90.88	90.909-90.918	90.898-90.908
616.912 (63 kW)	40.41		90.89	90.919-90.928	90.909-90.918
			90.90	90.929-90.938	90.919-90.928
617.910/912 1st version till August 1978	03.38	0 1 2	90.98 90.00 91.00	91.009-91.018 91.019-91.028 91.029-91.038	90.998-91.008 91.009-91.018 91.019-91.028
617.912 2nd version from August 1978	35.44	0 1 2	90.88 90.89 90.90	90.909-90.918 90.919-90.928 90.929-90.938	90.898-90.908 90.909-90.918 90.919-90.928

¹⁾ Only for cylinder liners of low carbon content (see note)

Piston projection

Engine	Distance between piston crown and crankcase parting surface	
	Projection min.	Projection max.
615.912/940	0.50	0.90
615.913/941	0.65	1.05
616, 617	0.50	0.90

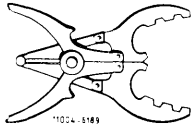
Testing data		as new	tolerance limit
Piston play		0.018–0.038 ¹⁾	0.12
Difference in weight between any two pistons in one engine		5 g	10 g
Piston pin diameter		25.995–26.000	
Piston pin play	in small-end bushing	0.012–0.023	
	in piston	0.00–0.01	
End clearance of piston rings	Groove 1	0.20–0.40	1.5
	Groove 2	0.20–0.40	1.0
	Groove 3	0.25–0.40	1.0
Side clearance of piston rings	Groove 1	0.100–0.132	0.2
	Groove 2	0.070–0.102	0.15
	Groove 3	0.030–0.062	0.1

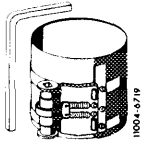
¹⁾ Cylinder No. 1 = 0.029–0.048.

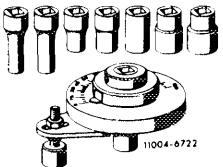
Tightening torque

Clamp nuts	Initial torque	40–50 Nm (4–5 kpm)
	Final torquing angle	90–100°

Special tools

Piston ring expander		000 589 51 37 00
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Piston ring compressor		000 589 04 14 00
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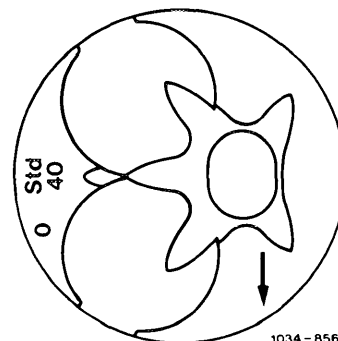
Torquing angle set		116 589 01 13 00
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Note

Group Nos. 0, 1 or 2, the piston code (e. g. 40), and the straight-ahead arrow are stamped in the piston crown.

The group No. is additionally stamped in the crank-case parting surface.

Both group Nos. (cylinder bore and piston) must agree.



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This rule does not apply to cylinder No. 1 where the piston play is 0.01 mm greater. A bore bearing code No. "1" will accept a piston with code No. "0" – or a bore bearing code No. "2" a piston with code No. "1".

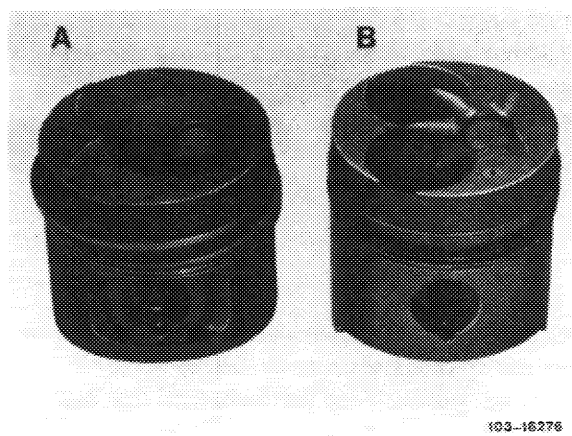
The piston play specification is thus met.

In the event of repair the cylinder bores are to be honed to the dimensions of the existing pistons, plus the allowance for the piston play.

In order to confine the compression tolerance for engine model 615.940, the pistons with round combustion chamber cavities have been replaced by types with star-shaped cavities and flat precombustion chamber recesses (B).

Introduced starting end chassis No. 097 064.

In the event of repair these pistons may be installed in engines with older Nos.

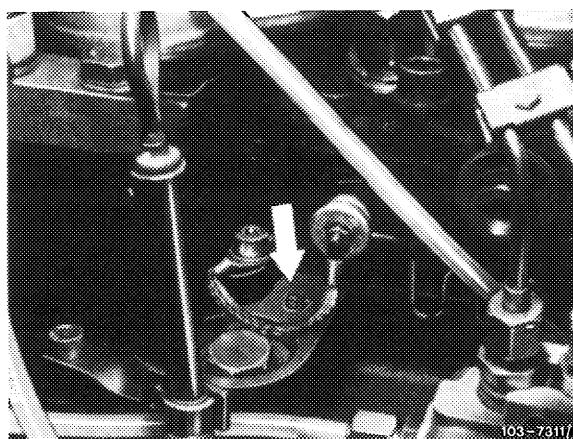


A Piston with round combustion chamber cavity
B Piston with star-shaped combustion chamber cavity

In engine model 615.912, the piston bearing code No. "26" must not be used in cylinder liners of low carbon content.

These engines are identified as follows:

The code No. "4 B" is stamped in the metal adjacent to the thrust piece for the rev counter connection.



The cylinder bore of engine models 616 and 617 has been reduced from 91.00 mm to 90.9 mm, starting August 1978. This modification has been made to account in a variety of countries for road taxation by engine capacity.

The corresponding pistons have a diameter of 90.9 mm.

These pistons are to be identified by the code Nos. stamped in the piston crown (see table).

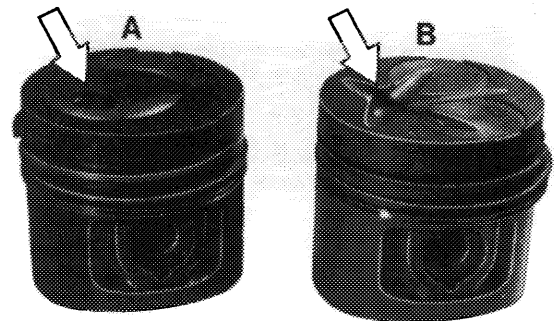
In the event of repair, pistons 90.9 mm in diameter may be installed in older engines, provided the cylinder bore allows.

Introduction of 90.90 mm cylinder bore

Type	End chassis No.
123.102/103/123/125	084808 (USA 085 150)
123.183	000766
123.105/130/132	105701
123.150	002839
123.190	000680

91.00 mm diameter pistons must not be used in 90.90 mm cylinder bores, and 90.90 mm diameter pistons must not be fitted in 91.00 mm cylinder bores.

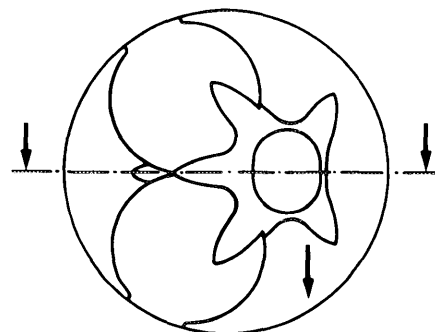
The pistons of the updated engines have a star-shaped combustion chamber cavity (arrow, B) in the piston crown and a deep, round precombustion chamber recess (D).



A Piston with round combustion chamber cavity
 B Piston with star-shaped combustion chamber cavity

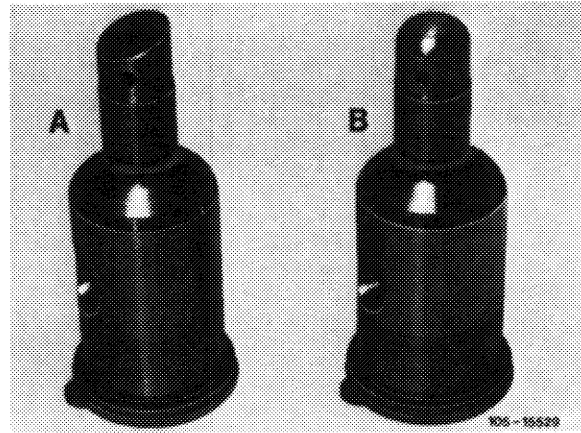
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The standard power engines feature pistons with round combustion chamber cavities (arrow, A) and engine model 615.940 incorporates pistons with star-shaped combustion chamber cavities and flat precombustion chamber recesses (C).



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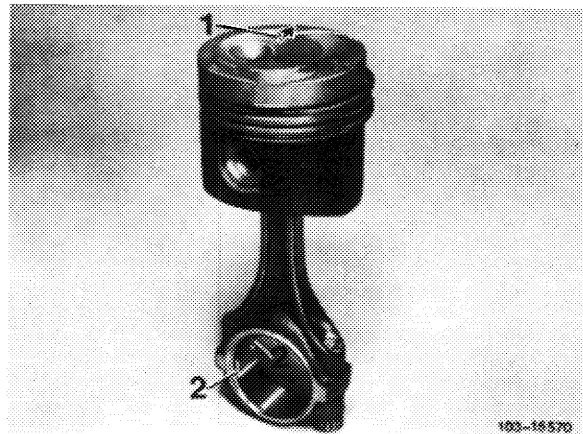
Precombustion chambers with slanting tips (A) must not be used in uprated engines because they would strike the precombustion chamber recess.



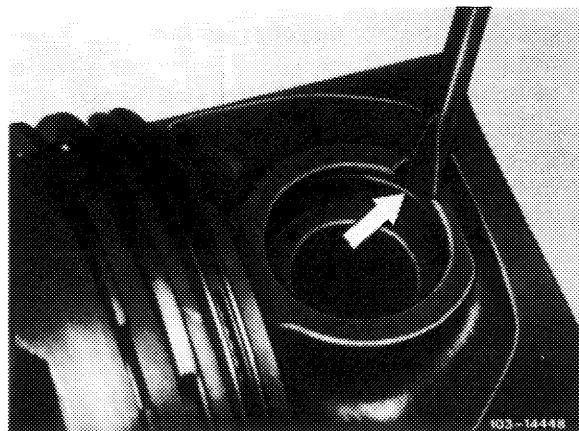
For the same reason, the precombustion chambers of uprated engines (round tip, B) must not be fitted in engines with pistons featuring round combustion chamber cavities.

Removal

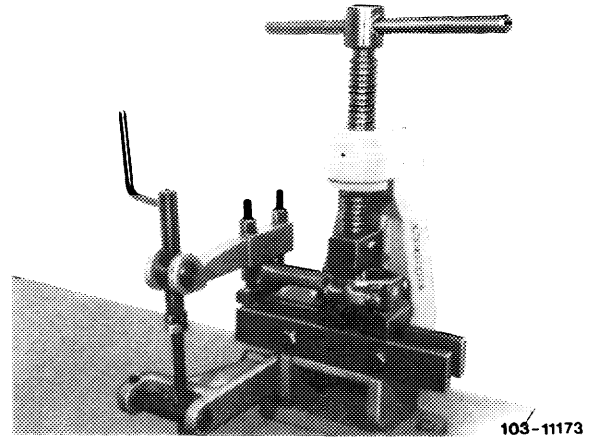
1 Remove connecting rod and piston in upward direction.



2 Remove piston pin retainer and force piston pin out.



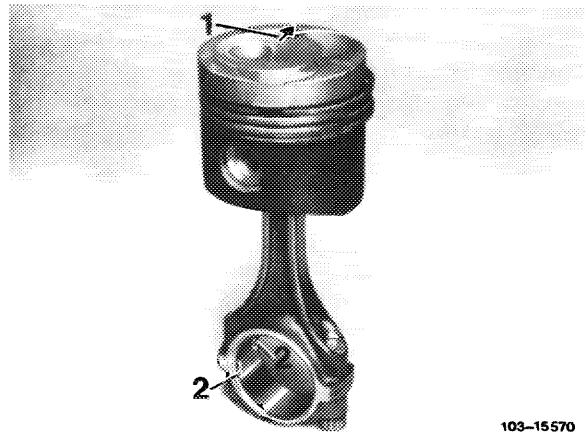
3 Recondition and square connecting rod (03—313).



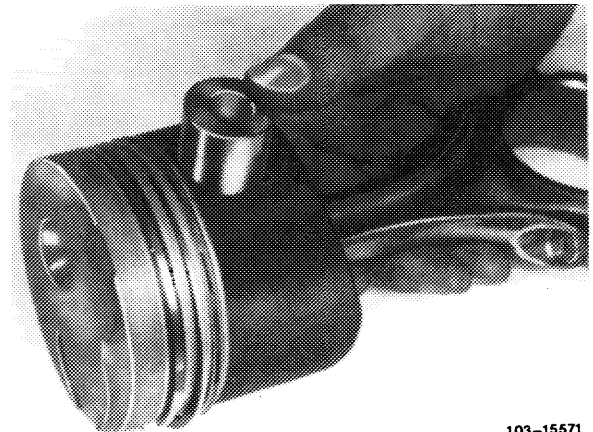
Installation

4 Position piston on connecting rod so that arrow (1) points straight-ahead and retainer grooves (2) in connecting rod are at left-hand side of engine.

Caution:
Do not warm up piston.



5 Smear piston pin with engine oil and force into position **by hand**.

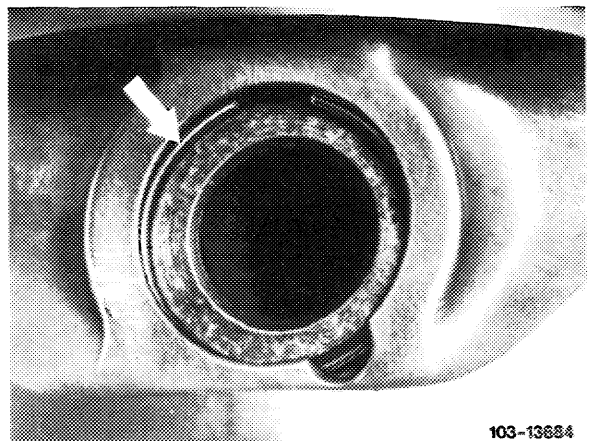


6 Fit piston pin retainer in groove.

Check piston rings for ease of movement.

If fitting used pistons, check piston rings for end and side clearance.

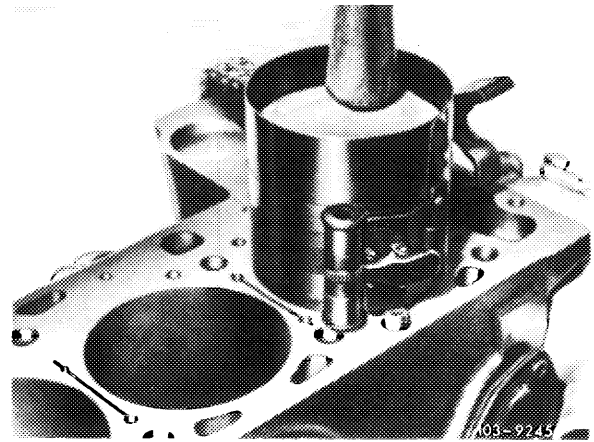
7 Oil cleaned cylinder bores, crankpins, big-end shell bearings and pistons.



8 Distribute piston ring gaps evenly around piston.

9 Apply piston ring compressor and insert piston.

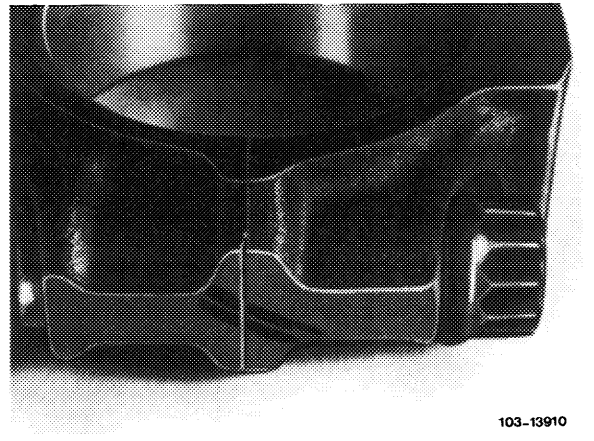
Arrow in piston crown must point straight-ahead.



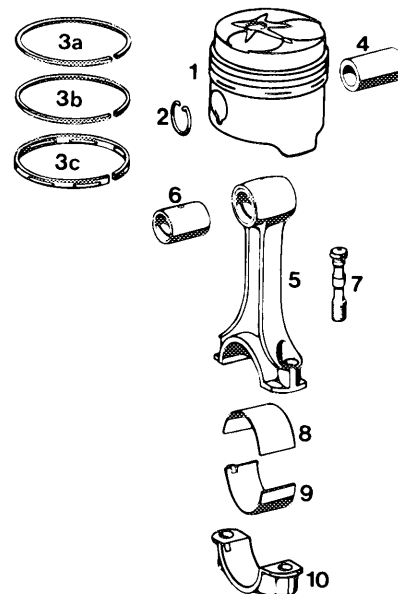
10 Position bearing cap on connecting rod (with code Nos. pointing toward one another), tighten clamp nuts to 40–50 Nm (4–5 kpm) initial torque and then secure by 90–100°.

11 Turn crankshaft and check clearance between piston pin boss and connecting rod.

12 With piston at TDC, measure gap between piston crown and crankcase parting surface (see table).



Piston and connecting rod



- 1 Piston
- 2 2 Piston pin snap rings
- 3a Straight-face ring 3 mm
- 3b Straight-face ring 2 mm
- 3c Slotted oil-control ring with spring expander
- 4 Piston pin
- 5 Connecting rod
- 6 Small-end bushing
- 7 2 clamp bolts
- 8 Big-end bearing, top and bottom halves
- 10 Bearing cap
- 11 2 clamp nuts

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