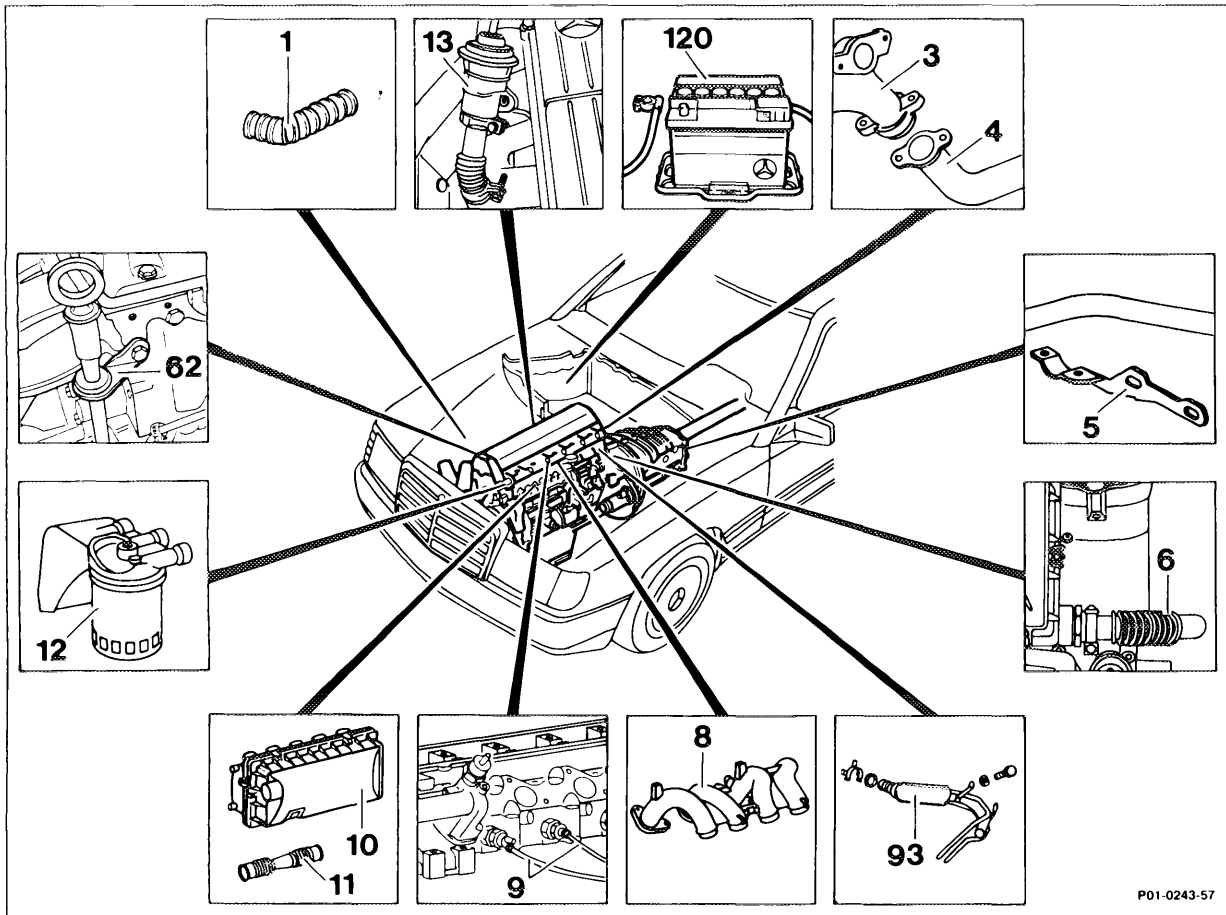


01-415 Removal and installation of cylinder head

Preliminary operations:
 Camshaft removed (05-220).
 Nozzle holders removed (01-417).
 Radiator removed (20-420).
 Poly-V-belt tensioning device removed (13-345).



P01-0243-57

⚠ Warning

Remove cylinder head only after engine has cooled off.

Battery (120) disconnect negative cable, if not already disconnected (item 1).

Naturally aspirated engines:

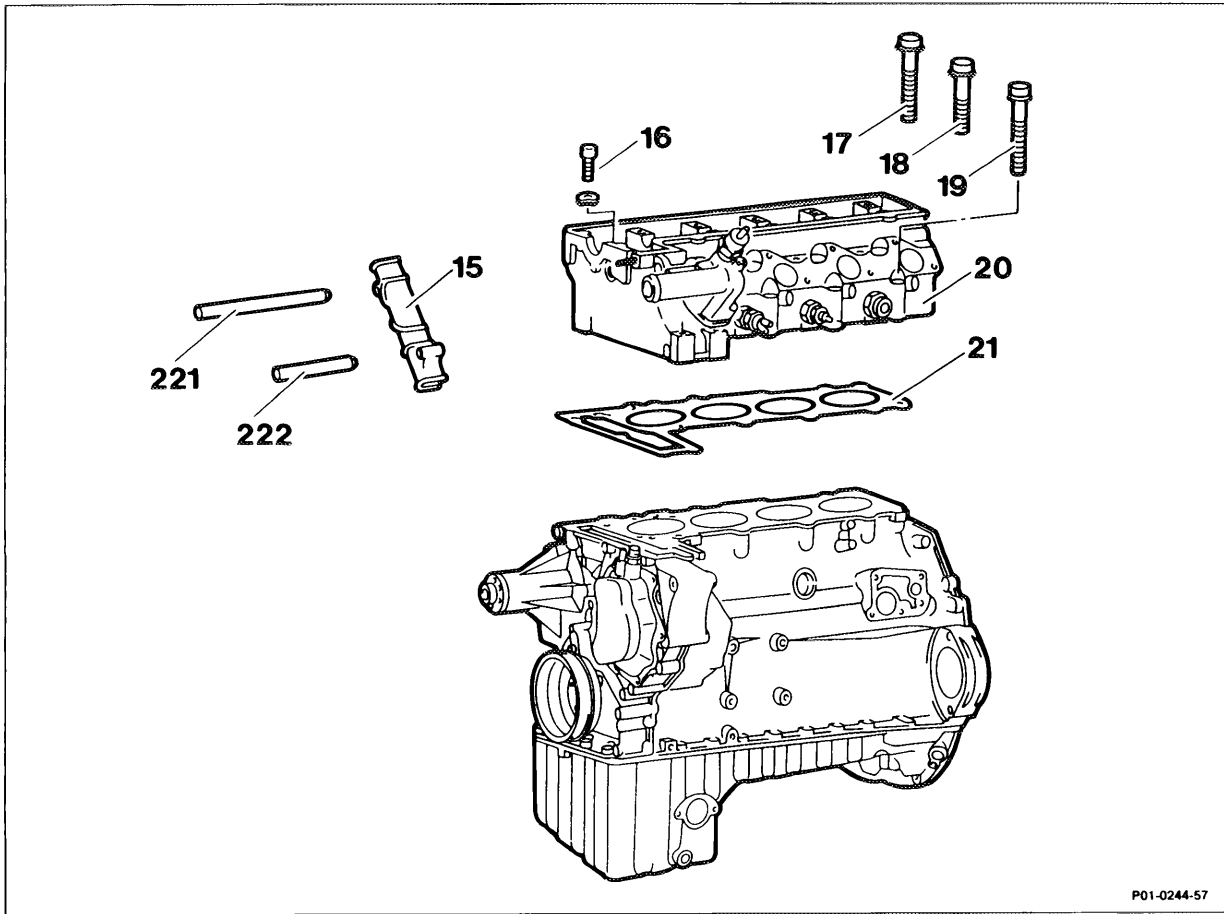
Air intake hose (11) and air cleaner cover (10) if not already removed, remove together with filter cartridge, install (item 2).

Turbo-engines:

Intake hose (1) to exhaust gas turbocharger, remove, install (item 3).

Fuel filter (12) remove, install (items 4, 5, 35, 36).

| | |
|--|--|
| Holder (62) | for oil dipstick tube, remove, reinstall (items 6, 34). |
| Engines with exhaust gas recirculation: | |
| Pipe (6) | between exhaust gas recirculation valve (13) and intake manifold or charging air manifold, remove, install (item 7). |
| Exhaust gas recirculation valve (13) | remove line to air guide housing, install (items 7, 33). |
| Side exhaust support (5) | on transmission, unbolt, bolt on, 25 Nm (items 8, 32). |
| Exhaust pipe (4) | unbolt from exhaust manifold (3), bolt on, 25 Nm (items 9, 31). |
| Pipe elbow (7) | for heater feed, remove, install (items 10, 11, 29). |
| Note | |
| Replace O-ring. | |
| Glow plugs | unbolt connection lines (9), bolt on (items 12, 37). |
| Intake manifold (8) on naturally aspirated engines or charging air manifold on turbo-engines | remove, install, 25 Nm (14-180). |



Slide rail bolts (221, 222) on cylinder head, knock out, knock in, impact puller 116 589 20 33 00, threaded rod 116 589 02 34 00 and threaded insert 123 589 00 34 00 (items 14, 30).

Note

When installing coat collar on slide rail bolts with sealant.

Slide rail (15) for timing chain, remove from timing chain case, install (items 15, 28).

Allen bolts (16) in area of timing chain case, unbolt, bolt on, 25 Nm (items 16, 27).

Cylinder head bolts (17, 18, 19) unbolt in opposite order of torquing diagram, check length of cylinder head bolts and replace if necessary. Bolt on according to torquing diagram, socket 601 589 00 10 00 (items 17, 20, 23 – 28).

Note

Observe different lengths of bolts and tightening specifications.

Cylinder head (20) remove together with cylinder head gasket (21), install (items 18, 19, 21, 22).

Note

Clean parting surfaces on cylinder head and check for cracks. Install cylinder head with new gasket.

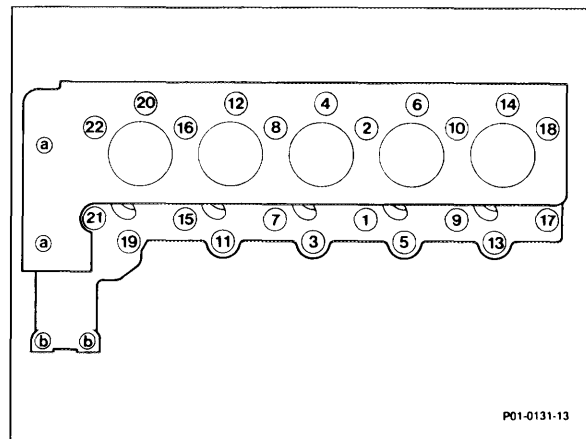
After assembling engine check cooling and engine oil systems for leakage (item 38).

| Tightening torques and rotation angles (tightening in stages) | | | Nm |
|--|---------------------------|---------|-----|
| Cylinder head bolts with 12-point Allen head (engine cold) | Initial tightening torque | Stage 1 | 15 |
| | | Stage 2 | 35 |
| | Rotation angle | Stage 3 | 90° |
| | Interval for setting | 10 min | |
| | Rotation angle | Stage 4 | 90° |
| M 8 Allen bolts in area of timing chain case (reference value) | | | 25 |
| Exhaust pipe on exhaust manifold | | | 25 |
| Side exhaust support | | | 25 |

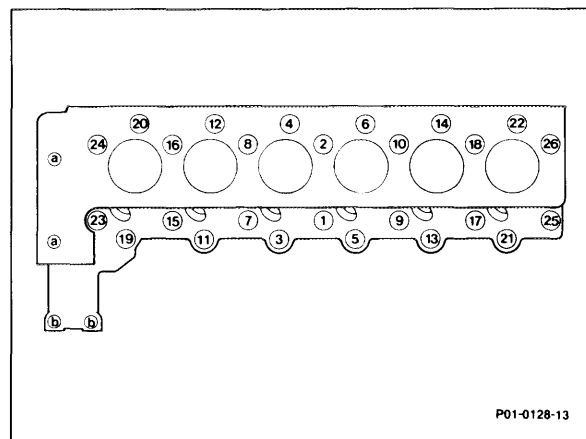
Cylinder head bolt dimensions and maximum permissible lengths (L)

| New state | Max. permissible length (L) in mm |
|------------|-----------------------------------|
| M 10 × 80 | 83,6 |
| M 10 × 102 | 105,6 |
| M 10 × 115 | 118,6 |

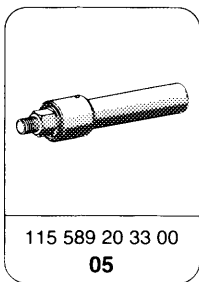
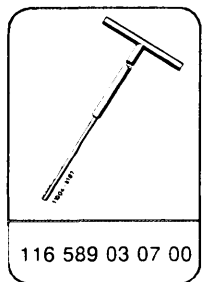
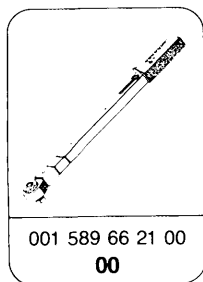
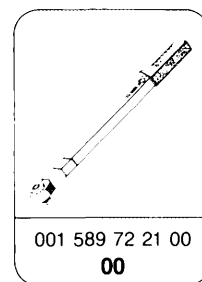
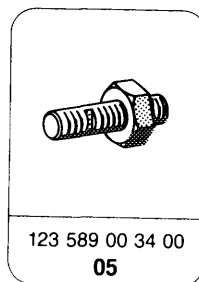
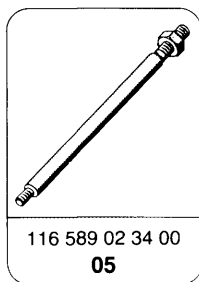
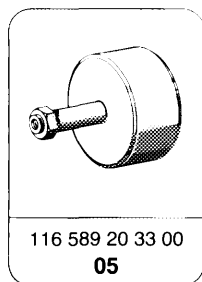
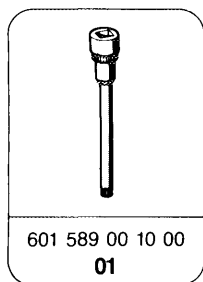
Tightening sequence, engine 602



Tightening sequence, engine 603



Special tools



Commercially available tool

7 mm hex. socket on flexible shaft for hose clamps with worm drive

e.g. Hazet,
D-5630 Remscheid
Order no. 426-7

Removal

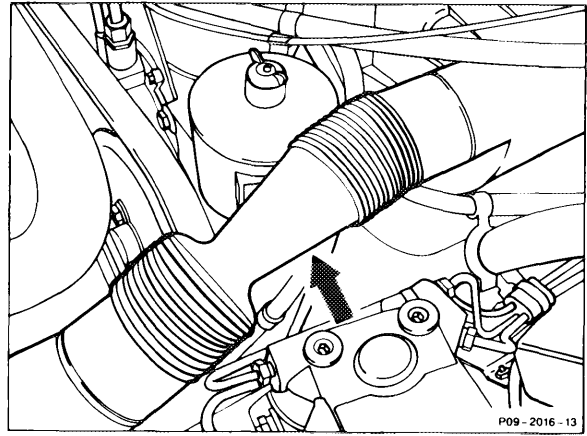
Warning

Remove cylinder head only when engine is cool.

- 1 Disconnect negative cable on battery.

Naturally aspirated engines:

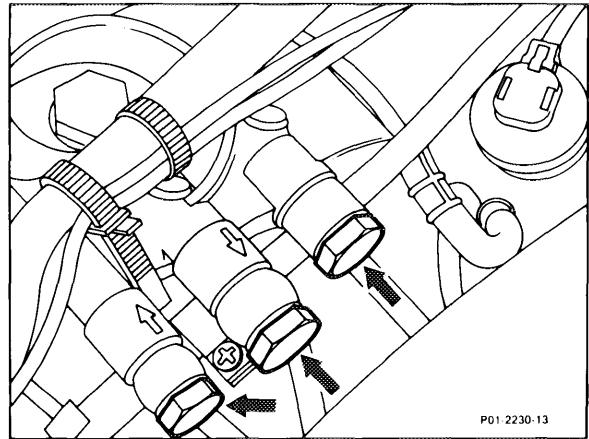
2 Remove air intake hose (arrow) and air cleaner cover together with filter cartridge, if not already removed.



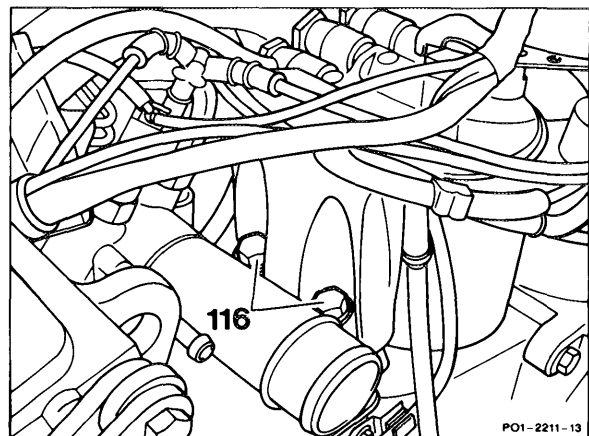
Turbo-engines:

3 Remove intake hose to exhaust gas turbocharger.

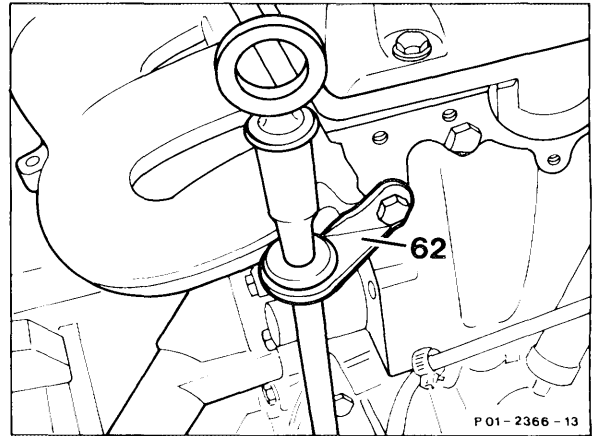
4 Disconnect fuel lines (arrows) from fuel filter and remove lines from fuel filter.



5 Unbolt hex. head bolts (116) from fuel filter and remove fuel filter from cylinder head.

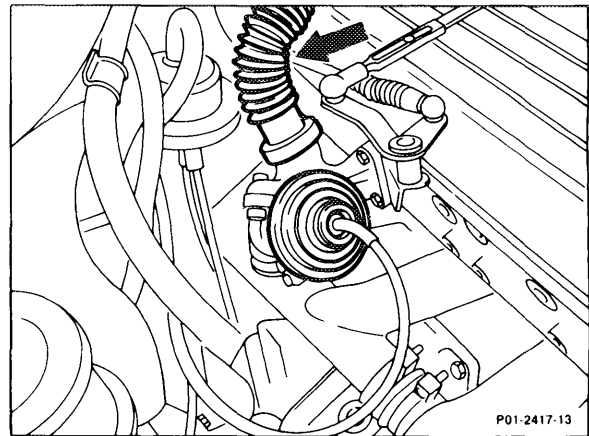


6 Unbolt holder (62) for oil dipstick tube from cylinder head.



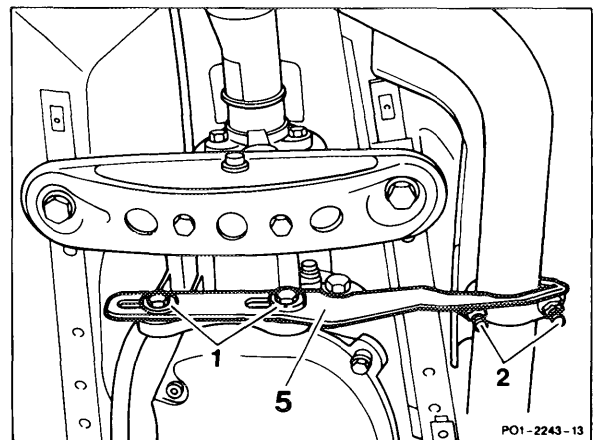
Engines with exhaust gas recirculation (naturally aspirated engines):

7 Remove line (arrow) from exhaust gas recirculation valve to air guide housing.



8 Unbolt hex. head bolts (1) for side exhaust support (5) from transmission. Loosen hex. nuts (2) on exhaust pipe.

9 Unbolt exhaust pipe at exhaust manifold.



10 Pull off retainer (91) for heater feed line with hook (01).

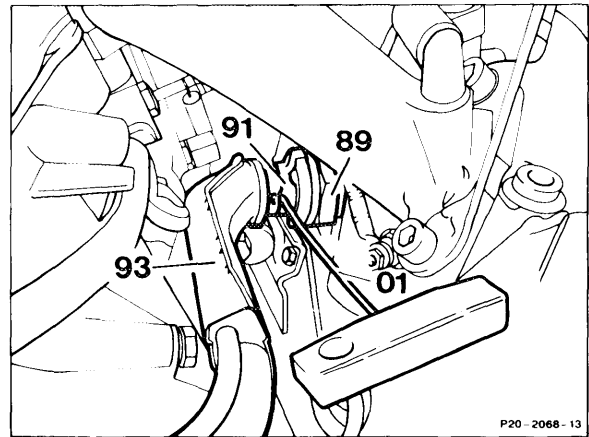
11 Unbolt pipe elbow (93) from oil filter and pull pipe elbow off of connection fitting (89).

12 Unbolt connection lines from glow plugs.

13 Remove intake manifold (naturally aspirated engines) or charge air manifold (turbo-engines) (14-180).

Note

Leave exhaust manifold mounted on cylinder head.

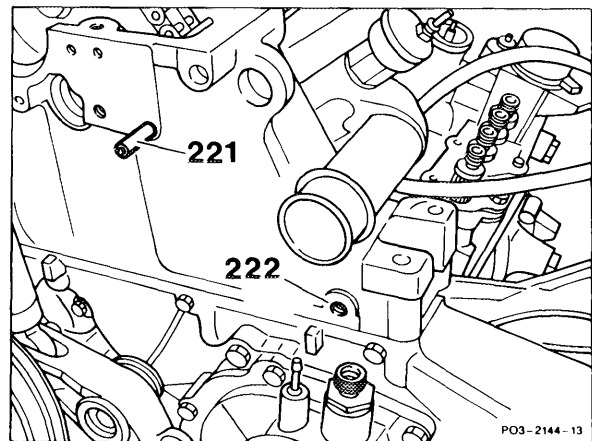


14 Knock slide rail bolts (221, 222) out of cylinder head with impact puller 116 589 20 30 00, threaded rod 116 589 02 34 00 and threaded insert 123 589 00 34 00.

Note

If the slide rail bolts are too tight, puller 115 589 20 33 00 can also be used.

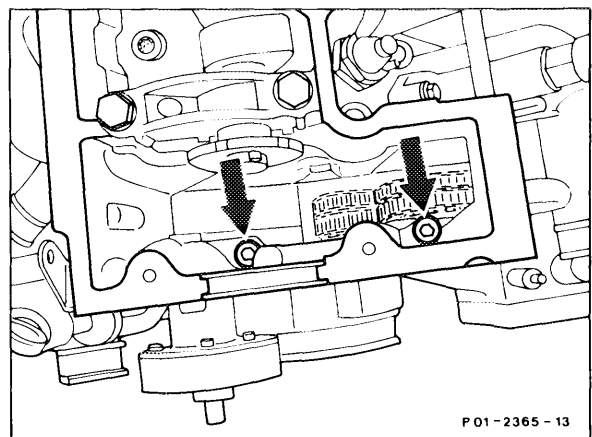
15 Remove slide rail for timing chain from timing chain case.



16 Remove M 8 x 30 Allen bolts (arrows) from the area of timing chain case.

Note

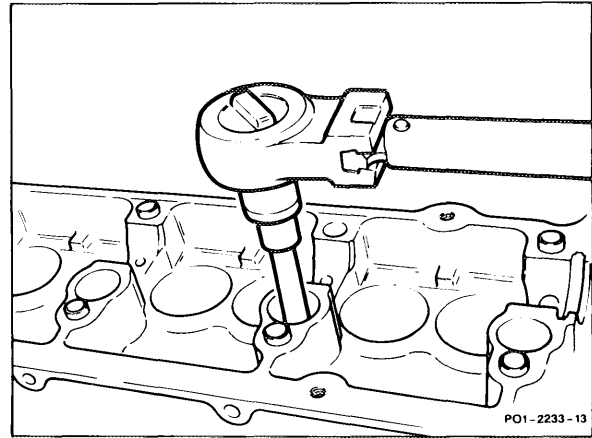
Longer bolts (M 8 x 50) are used in the area of the timing chain case on engine model 602.91 starting 09/87 or 10/87 respectively.



17 Unbolt cylinder head bolts in opposite order of torquing sequence using socket 601 589 00 10 00.

18 Remove cylinder head from cylinder block together with cylinder head gasket.

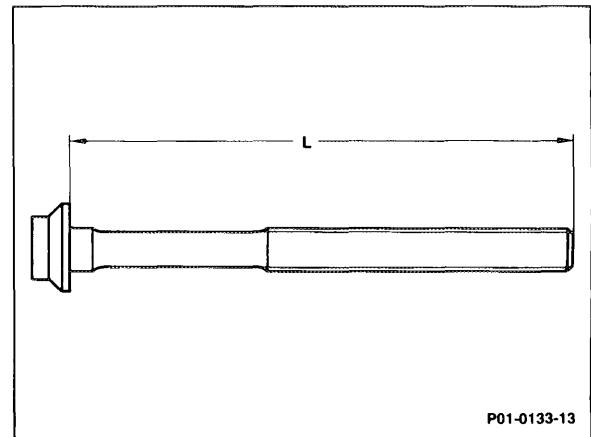
19 Clean parting surface on cylinder head and check for cracks.



20 Check length (L) of cylinder head bolts.

Note

If the length (L) exceeds the maximum dimension, use new cylinder head bolts for installation.



Installation

21 Position new cylinder head gasket on cylinder block.

22 Position cylinder head.

Note

When positioning the cylinder head use fitted sleeves for locating cylinder head.

23 Oil threads and head contact surface of cylinder head bolts.

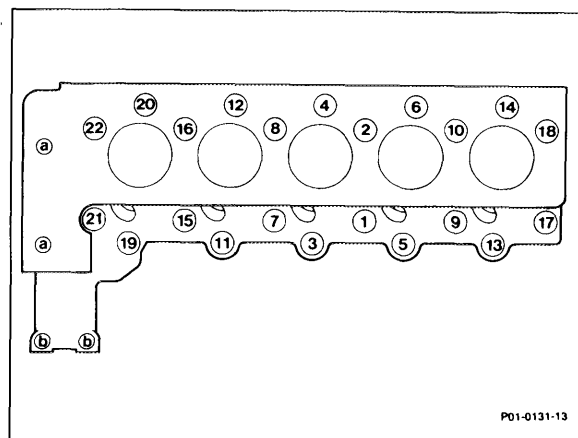
24 Install cylinder head bolts by hand making note of different bolt lengths and sizes, see tables below.

Note

Oil bolt head contact area.

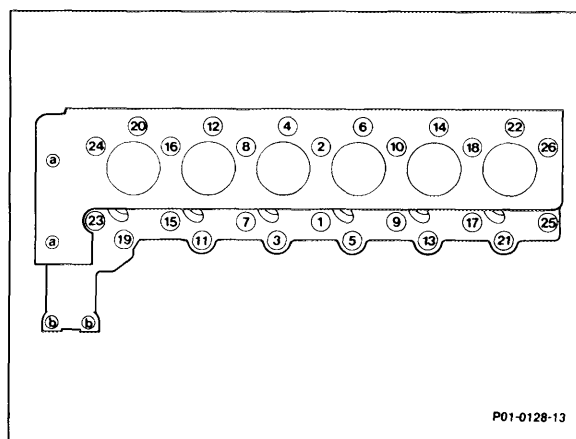
Engine 602
Bolt diagram

| Hole | Bolt size |
|---------------------------------------|---------------------|
| 3,5, 11, 13, 19 | M 10×80 |
| 2,4,6,8,10, 12, 14, 16, 18, 20, 22 | M 10×102 |
| 1, 7, 9, 15, 17, 21 | M 10×115 |
| a (Timing case area) | M 8×30 or M 8×50 |
| b (Fuel filter) | M 8×80 |



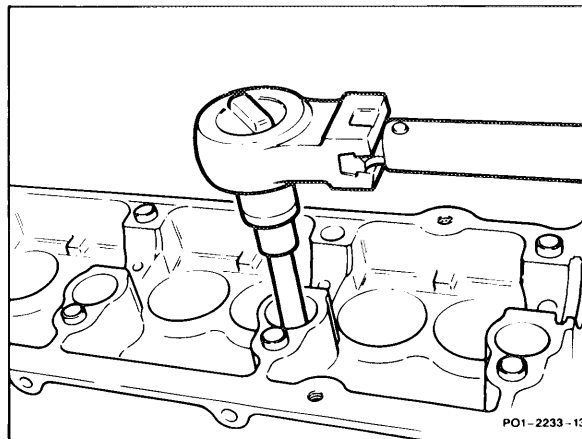
Engine 603
Bolt diagram

| Hole | Bolt size |
|---|---------------------|
| 3,5, 11, 13, 19, 21 | M 10×80 |
| 2,4,6,8,10, 12, 14, 16, 18, 20, 22, 24, 26 | M 10×102 |
| 1, 7, 9, 15, 17, 23, 25 | M 10×115 |
| a (Timing case area) | M 8×30 or M 8×50 |
| b (Fuel filter) | M 8×80 |



25 Tighten cylinder head bolts in stages in specified in the torquing sequence, use socket 601 589 00 10 00.

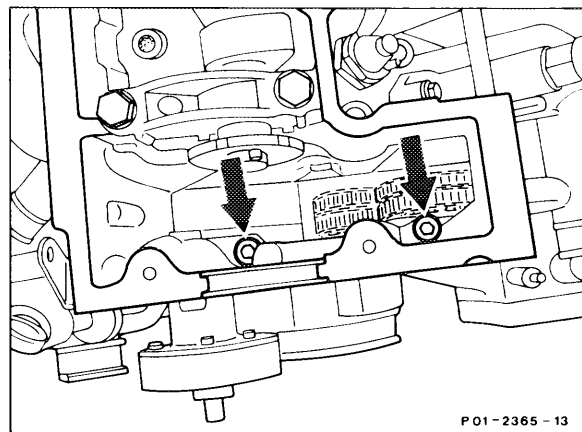
26 Torque cylinder head bolts in specified tightening sequence.



Tightening torques and rotation angles for cylinder head bolts

| | |
|--------------|--------|
| Stage 1 | 15 Nm |
| Stage 2 | 35 Nm |
| Stage 3 | 90° |
| Setting time | 10 min |
| Stage 4 | 90° |

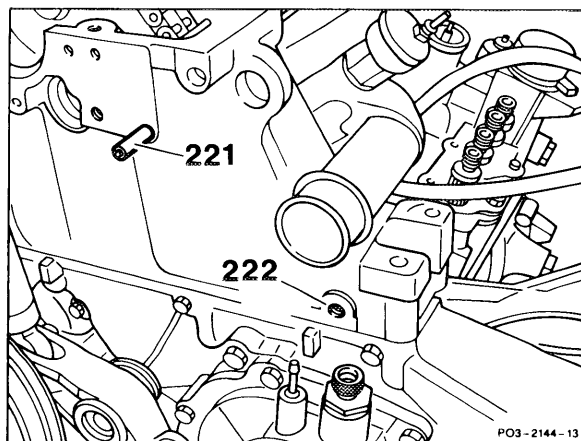
27 Tighten Allen bolts (arrows) in area of timing chain case, tighten in specified sequence, tightening torque 25 Nm.



28 Install slide rail for timing chain in timing chain case and knock in slide rail bolts (221, 222).

Note

Coat collar on slide rail bolts with sealant.



29 Install pipe elbow (93) for heater feed line using new O-ring and slide onto connection fitting (89). Attach retainer (91) with hook (01).

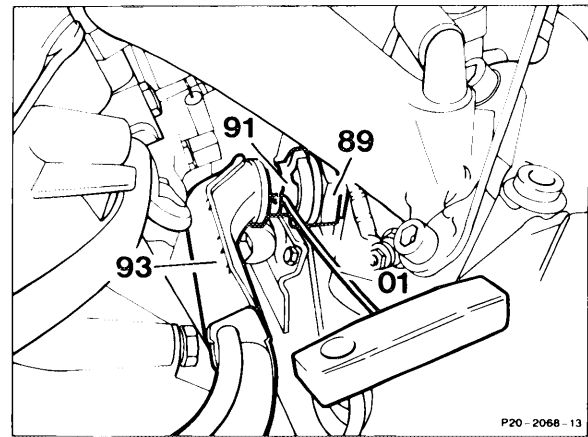
Note

Dip O-ring in coolant to facilitate installation.

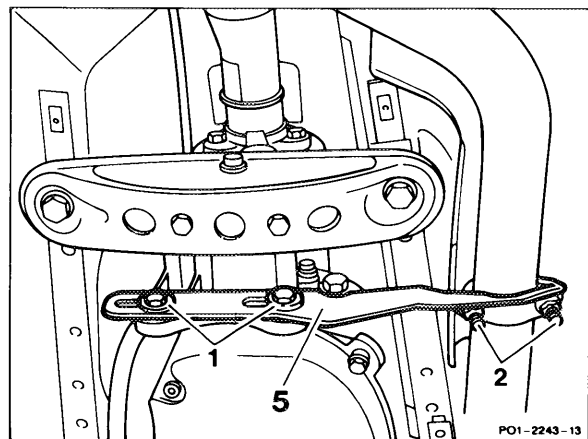
Do not use grease or oil.

30 Install intake manifold (naturally aspirated engines) or charge air manifold (turbo-engines) (14-180).

31 Bolt exhaust pipe onto exhaust manifold, tightening torque 25 Nm.

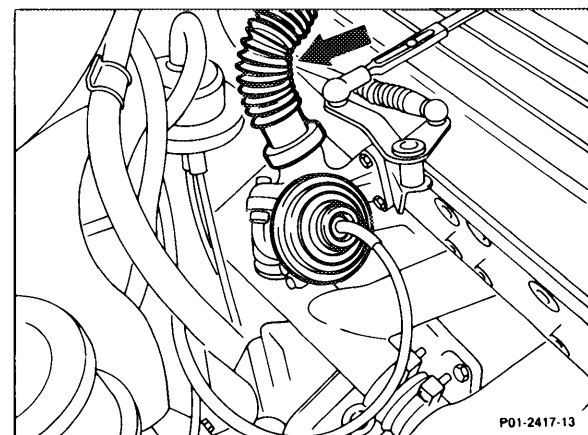


32 Bolt side exhaust support (5) onto transmission. Tighten hex. head bolts (1) and hex. nuts (2), tightening torque 25 Nm.

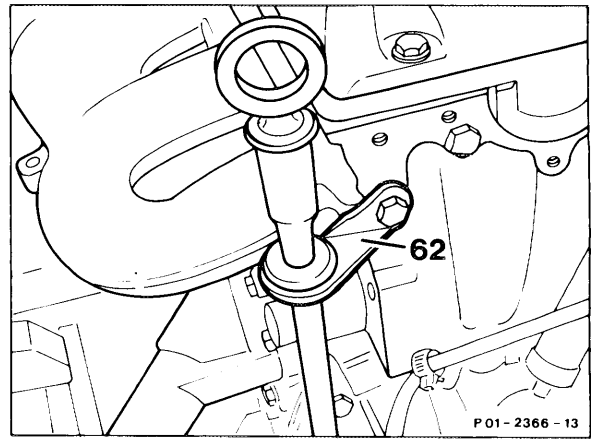


Engines with exhaust gas recirculation (naturally aspirated engines):

33 Attach line (arrow) from exhaust gas recirculation valve to air guide housing.



34 Bolt oil dipstick tube with holder (62) into cylinder head.



35 Install fuel filter, tighten hex. head bolts (116).

36 Connect fuel lines.

37 Bolt connection lines onto glow plugs.

38 After assembling engine check cooling and oil system for leakage after warming up engine.

Note

It is not necessary to retorque the cylinder head bolts.

