VOLVO

# Service Manual

## Fault tracing

## Repairs

## Maintenance

Sec. 2 (20–22)

Engine B 200, B 230

740/760 1985–19. .

TP 30871/1; Reprinted w/o changes

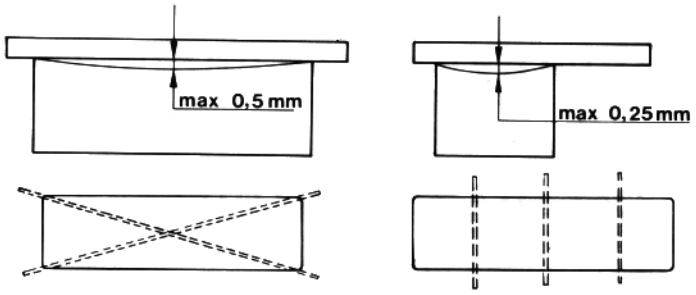
April 1989

Max distortion .....

**NOTE** that if distortion is greater than 1.0 mm (0.04 in) lengthwise and 0.5 mm (0.02 in) crosswise the cylinder head must not be machined but replaced.

Thickness of gasket:

| | | |
|---|---|---|
| New ..... | mm | 1.3 (0.051 in) |
| Fitted ..... | mm | 1.2 (0.047 in) |




129 826

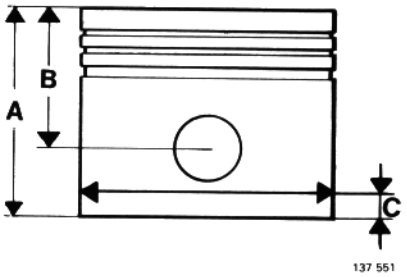
# CYLINDER BLOCK

## Bore

| | | B 200 | B 230 |
|---|---|---|---|
| Standard marked C ..... | mm | 88.90–88.91 | 96.00–96.01 |
| | (in) | (3.5000–3.5004) | (3.7795–3.7799) |
| marked D ..... | mm | 88.91–88.92 | 96.01–96.02 |
| | (in) | (3.5004–3.5008) | (3.7799–3.7803) |
| marked E ..... | mm | 88.92–88.93 | 96.02–96.03 |
| | (in) | (3.5008–3.5012) | (3.7803–3.7807) |
| marked G ..... | mm | 88.94–88.95 | 96.04–96.05 |
| | (in) | (3.5016–3.5020) | (3.7811–3.7815) |
| Oversize 1 ..... | mm | 89.29 | 96.3 |
| | (in) | (3.5154) | (3.7914) |
| 2 ..... | mm | 89.67 | 96.6 |
| | (in) | (3.5303) | (3.8031) |

Rebore if wear exceeds 0.1 mm (0.004 in) and oil consumption is abnormal.

# PISTONS

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| Engine type | Compression ratio | Weight grams (oz) | Dimension, mm (in) | | |
|---|---|---|---|---|---|
| | | | A | B | C |
| B 200 | 8.5 | 440±7 (15.5±0.25) | 67.7 (2.665) | 39.7 (1.563) | 13.4 (0.53) |
| | 10.0 | 440±7 (15.5±0.25) | 69.9 (2.752) | 41.9 (1.650) | 13.4 (0.53) |
| B 230 | 8.7 | 540±7 (19.0±0.25) | 64.7 (2.5472) | 39.7 (1.5630) | 7 (0.28) |
| | 9.0 | 535±7 (18.87±0.25) | 64.7 (2.5472) | 39.7 (1.5630) | 7 (0.28) |
| | 9.8 | 535±7 (18.87±0.25) | 64.7 (2.5472) | 39.7 (1.5630) | 7 (0.28) |
| | 10.3 | 535±7 (18.87±0.25) | 64.7 (2.5472) | 39.7 (1.5630) | 7 (0.28) |

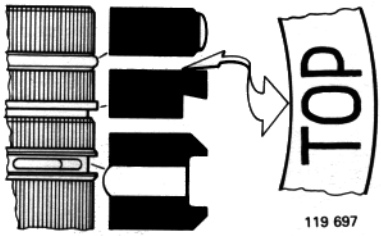
**NOTE:**

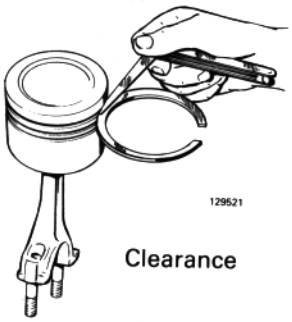
[1] Max weight difference for pistons in same engine is 16 grams (0.56 oz).

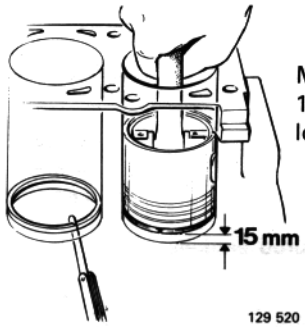
## Piston running clearance

| | | |
|---|---|---|
| B 200 1986–, B 230 1985– ..... | mm (in) | 0.010–0.030 (0.0004–0.0012) |
| B 200 1985 ..... | mm (in) | 0.003–0.027 (0.0001–0.0011) |

## Piston rings



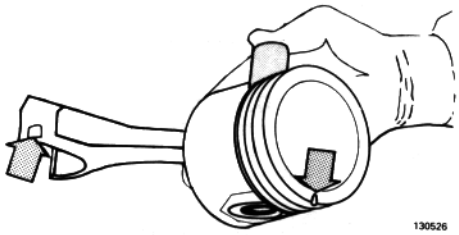




Measure ring gap 15 mm (0.6 in) from lower edge of cylinder.

| | | Upper compr. ring | Lower compr. ring | Oil scraper ring |
|---|---|---|---|---|
| Height | mm | 1.728–1.740 | 1.728–1.740 | 3.475–3.490 |
| | (in) | (0.0681–0.0685) | (0.0681–0.0685) | (0.1368–0.1374) |
| Clearance in piston groove, measured with ring on piston | | | | |
| B 200 | mm | 0.060–0.092 | 0.030–0.062 | 0.020–0.055 |
| | (in) | (0.0024–0.0036) | (0.0012–0.0025) | (0.0008–0.0022) |
| B 230 | mm | 0.060–0.092 | 0.040–0.072 | 0.030–0.065 |
| | (in) | (0.0024–0.0036) | (0.0016–0.0028) | (0.0012–0.0025) |
| Ring gap, measured in cylinder, cylinder diam. 88.9, resp. 96.0 mm | | | | |
| B 200 | mm | 0.30–0.50 | 0.30–0.55 | 0.25–0.50 |
| | (in) | (0.012–0.020) | (0.012–0.022) | (0.010–0.020) |
| B 230 | mm | 0.30–0.55 | 0.30–0.55 | 0.30–0.60 |
| | (in) | (0.012–0.022) | (0.012–0.022) | (0.012–0.024) |

## Piston pin

| | | |
|---|---|---|
| Fit, in connecting rod | | Light thumb pressure (close running fit) |
| in piston | | Thumb pressure (push fit) |
| Diameter, standard | mm (in) | 23.00 (0.9055) |
| oversize | mm (in) | 23.05 (0.9075) |
| Length, B 200 | mm (in) | 60 (2.36) |
| B 230 | mm (in) | 65 (2.56) |

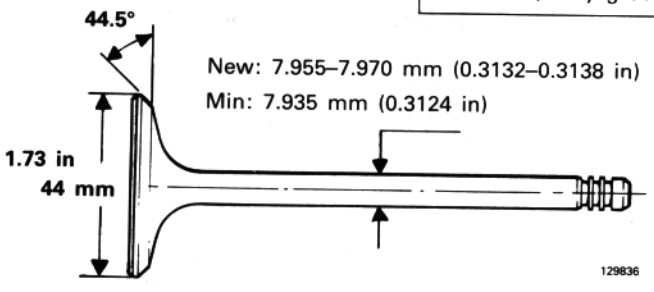



## Valve system

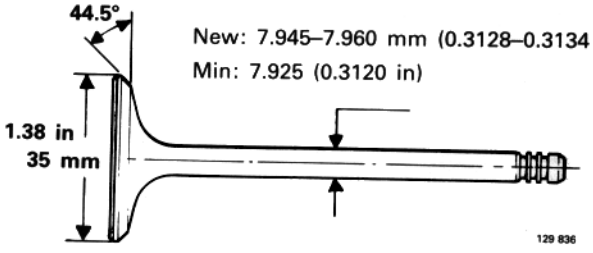
| Valve clearance | | Checking | Adjusting |
|---|---|---|---|
| Inlet and exhaust valves | | | |
| cold engine | mm (in) | 0.30–0.40 (0.012–0.016) | 0.35–0.40 (0.014–0.016) |
| warm engine | mm (in) | 0.35–0.45 (0.014–0.018) | 0.40–0.45 (0.016–0.018) |
| Adjusting shims, thickness | mm | 3.30–4.50 in increments of 0.05 mm | |
| | (in) | (0.1300–0.1772) in increments of 0.002 in | |

## Valves

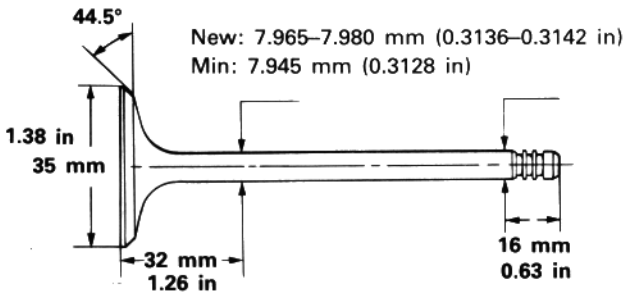
**IMPORTANT!** Valves are Stellite coated and must not be machined, only ground-in with paste against seat.




Inlet valve



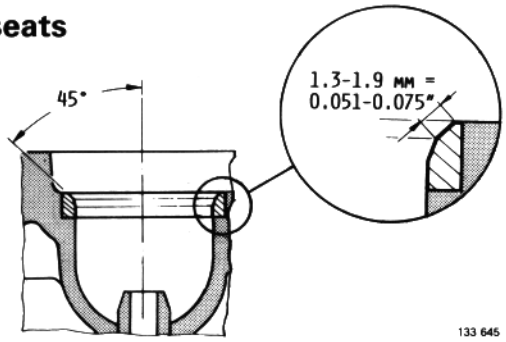

Exhaust valve (not Turbo)

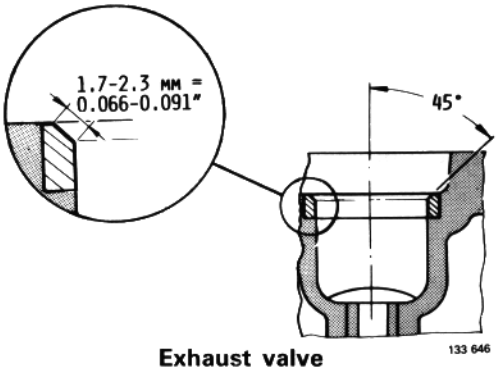



**Exhaust valve, Turbo engines**

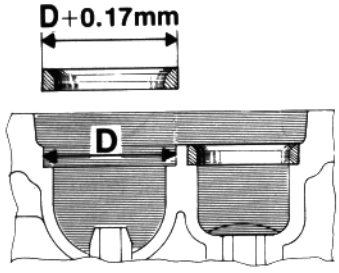
**Caution!** The exhaust valves on Turbo engines are sodium filled. Discarded valves must not be mixed with ordinary scrap iron until after sodium content has been removed.

## Valve seats




| Valve seat diameter | | Inlet valve seat | Exhaust valve seat |
|---|---|---|---|
| standard | mm (in) | 46.00 (1.8110) | 38.00 (1.4960) |
| oversize 1 | mm (in) | 46.25 (1.8209) | 38.25 (1.5059) |
| 2 | mm (in) | 46.50 (1.8307) | 38.50 (1.5157) |




**NOTE!** When replacing valve seats, the interference between the seat and its bore should be 0.17 mm = 0.0067 in. That means that the valve seat diameter should be 0.17 mm = 0.0067 in greater than diameter of bore in cylinder head.

## Valve guides

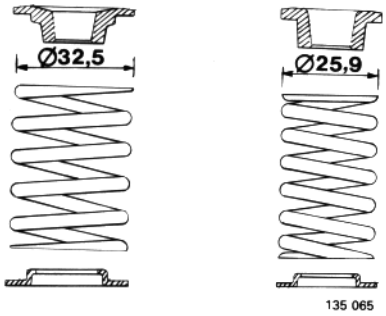
| | | Inlet valve | Exhaust valve |
|---|---|---|---|
| Length | mm, (in) | 52 (2.047) | 52 (2.049) |
| Inner diameter | mm | 8.000–8.022 | 8.000–8.022 |
| | (in) | (0.3150–0.3158) | (0.3150–0.3159) |
| Height above upper face of cylinder head | mm | 15.4–15.6 | 17.9–18.1 |
| | (in) | (0.6063–0.6142) | (0.7047–0.7126) |
| Clearance, valve stem to valve guide (measured with new valve) | mm | 0.030–0.060 | 0.060–0.090 |
| | (in) | (0.0012–0.0024) | (0.0024–0.0035) |
| max. | mm (in) | 0.15 (0.006) | 0.15 (0.006) |

Valve guides are available in three oversizes, marked with grooves.

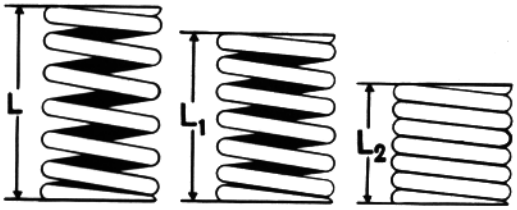
| | Marking | Reamer for seat |
|---|---|---|
| Standard | No groove | – |
| Oversize 1 | 1 groove | 5161 |
| 2 | 2 grooves | 5162 |
| 3 | 3 grooves | 5163 |


**NOTE!** The force used when pressing in valve guides must be minimum **9000 N = approx,** 20,000 lbs. If the pressing force is lower, then the recess for the guide must be reamed to the nearest oversize and a guide of corresponding size pressed in.

## Valve springs




Type 1 Type 2




There are two types of valve springs.

**Type 1** is used on: B 200 K and E
B 230 A, K, E and ET

**Type 2** is used on: B 200 ET
B 230 F and FT

| Type 1 | | Type 2 | |
|---|---|---|---|
| **Length, mm (in)** | **Load, N (lbs)** | **Length, mm (in)** | **Load, N (lbs)** |
| 45.0 (1.77) | 0 (0) | 45.5 (1.79) | 0 (0) |
| 38.0 (1.50) | 280–320 (62–70) | 38.0 (1.50) | 280–320 (62–70) |
| 27.0 (1.06) | 710–790 (156–174) | 27.5 (1.08) | 702–782 (154–172) |

## Tappets (Valve depressors)

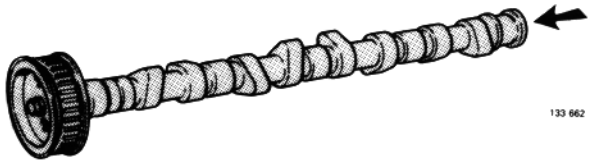
| | | |
|---|---|---|
| Diameter | mm (in) | 36.975–36.995 (1.4557–1.4565) |
| Height | mm (in) | 30–31 (1.18–1.22) |
| Clearance, shim to tappet | mm (in) | 0.009–0.064 (0.0004–0.0025) |
| tappet to cyl. head | mm (in) | 0.030–0.075 (0.0012–0.0030) |

## Adjusting shim (for valve clearance)

| | | |
|---|---|---|
| Thickness | mm | 3.30–4.50 in increments of 0.05 mm |
| | (in) | (0.1300–0.1772) in increments of 0.002 in |
| Diameter | mm (in) | 32.980–33.000 (1.2984–1.2992) |

# TIMING GEARS

## Camshaft




Camshaft is marked with a letter on rear end.

| Engine type | | Camshaft | Check values (cold engine) | |
|---|---|---|---|---|
| | **Marking** | **Max lift height mm (in)** | **Valve clearance No. 1 inlet valve mm (in)** | **Inlet valve should open at:** |
| **B 200 K** | Y | 10.35 (0.407) | 0.7 (0.028) | 8° btdc |
| **B 200 E** | V | 11.37 (0.448) | 0.7 (0.028) | 11° btdc |
| **B 200 ET** | T | 9.9 (0.390) | 0.7 (0.028) | 7° btdc |
| **B 230 A** | A | 10.5 (0.413) | 0.7 (0.028) | 13° btdc |
| **B 230 K** | X | 10.65 (0.419) | 0.7 (0.028) | 10° btdc |
| **B 230 E** | V | 11.37 (0.448) | 0.7 (0.028) | 11° btdc |
| **B 230 ET** | A | 10.5 (0.413) | 0.7 (0.028) | 13° btdc |
| **B 230 F** | M | inlet 9.5 (0.374) | 0.7 (0.028) | 6° atdc |
| | | exh. 10.5 (0.413) | 0.7 (0.028) | 44° bbdc |
| **B 230 FT** | T | 9.9 (0.390) | 0.7 (0.028) | 4° btdc |

* btdc = before top dead centre; atdc = after top dead centre; bbdc = before bottom dead centre;

**Camshaft (cont.)**

| | | |
|---|---|---|
| Bearing journal, diameter | mm (in) | 29.950–29.970, (1.1791–1.1799) |
| Radial clearance, new | mm (in) | 0.030–0.071, (0.0012–0.0028) |
| max. | mm (in) | 0.15, (0.006) |
| Axial clearance | mm (in) | 0.1–0.4, (0.004–0.016) |

## Camshaft bearings

| | | |
|---|---|---|
| Bearing diameter | mm (in) | 30.000–30.021, (1.1811–1.1819) |

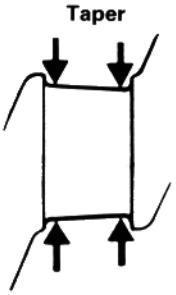
## Intermediate shaft

| | | Bearing journal | Bearing in cylinder block |
|---|---|---|---|
| Diameter, front | mm | 46.975–47.000 | 47.020–47.050 |
| | (in) | (1.8494–1.8504) | (1.8512–1.8524) |
| centre | mm | 43.025–43.050 | 43.070–43.100 |
| | (in) | (1.6939–1.6949) | (1.6957–1.6969) |
| rear | mm | 42.925–42.950 | 42.970–43.000 |
| | (in) | (1.6900–1.6909) | (1.6917–1.6929) |
| Radial clearance | mm (in) | 0.020–0.075, (0.0008–0.0030) | |
| Axial clearance | mm (in) | 0.20–0.46, (0.008–0.020) | |

# CRANKSHAFT ASSEMBLY

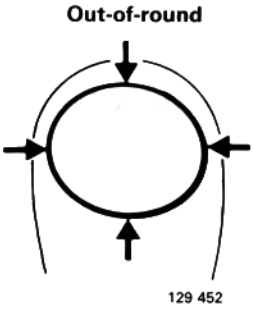
## Crankshaft

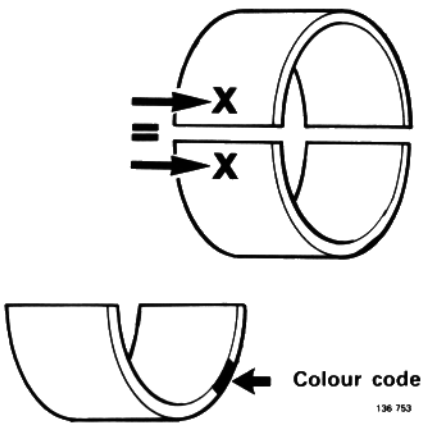
| | | |
|---|---|---|
| Max. out-of-true | mm (in) | 0.025, (0.01) |
| Crankshaft: | | |
| Axial clearance, max. | mm (in) | 0.080–0.270, (0.0032–0.0106) |
| Radial clearance (main bearings) | mm (in) | 0.024–0.072, (0.0009–0.0028) |
| Conn rod bearings, radial clearance | mm (in) | 0.023–0.067, (0.0009–0.0026) |




## Main bearing journals

| | | |
|---|---|---|
| Out-of-round, max. | mm (in) | 0.004, (0.00016) |
| Taper, max. | mm (in) | 0.004, (0.00016) |
| Diameter: | | |
| standard | mm | 55 (54.987–55.000) |
| | (in) | 2.1654 (2.1648–2.1654) |
| undersize 1 | mm | 54.75 (54.737–54.750) |
| | (in) | 2.1555 (2.1550–2.1555) |
| undersize 2 | mm | 54.50 (54.487–54.500) |
| | (in) | 2.1457 (2.1451–2.1457) |
| Bearing recess width | mm (in) | 22.9–25.1 (0.902–0.988) |
| Width on crankshaft for flange bearing shell | | |
| standard | mm (in) | 31.96–32.00 (1.258–1.260) |
| oversize 1 | mm (in) | 32.21–32.25 (1.268–1.270) |
| oversize 2 | mm (in) | 32.46–32.50 (1.278–1.280) |




**Main bearings** are made by two different manufacturers. Upper and lower bearing halves in a bearing should be from the same manufacturer.

At manufacture, sized bearing halves are used. They are colour coded, red-yellow-blue. They are according to one of the following alternatives:

**Alt 1** Both bearing halves marked yellow.
**Alt 2** One bearing half marked blue and one red. The bearing half marked blue is located in the connecting rod and the red one in the cap.

Note, that for Spare Parts only yellow marked bearings are used.

## Connecting rod bearing journals

| | | | US measurements |
|---|---|---|---|
| Out-of-round, max. | mm | 0.004 | 0.00016 in |
| Taper, max. | mm | 0.004 | 0.00016 in |
| Diameter, standard | mm | 49.00 (48.984–49.005) | 1.9291 in (1.9285–1.9293) |
| undersize 1 | mm | 48.75 (48.734–48.755) | 1.9193 in (1.9187–1.9203) |
| 2 | mm | 48.50 (48.484–48.505) | 1.9094 in (1.9088–1.9096) |
| Bearing recess width | mm | 23.9–26.1 | 0.94–1.03 in |

## Connecting rods

| | | | |
|---|---|---|---|
| Axial clearance at crankshaft | mm | 0.25–0.45 | 0.001–0.018 in |
| Length, centre to centre | mm | 152 | 5.98 in |
| Max. weight deviation between connecting rods in same engine | grams | 20 | 0.7 oz |

## Flywheel

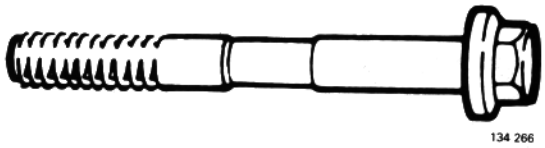
| | |
|---|---|
| Axial throw, max. | 0.02 mm/100 mm diameter (0.0008 in/4 in diameter) |

# TIGHTENING TORQUES

The tightening torques apply to oiled screws, bolts and nuts. Degreased (washed) parts must be oiled before use.

Cylinder head, tightening stages:

1 = **20 Nm** 15 ft lbs
2 = **60 Nm** 45 ft lbs
3 = Angle-tighten **90°**



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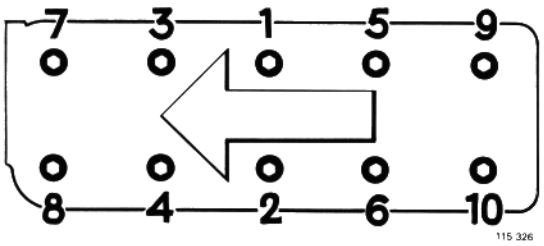
- Replace bolts if center section shows signs of extension.
- Do not reuse bolts more than 5 times.

If in doubt, fit new bolts.

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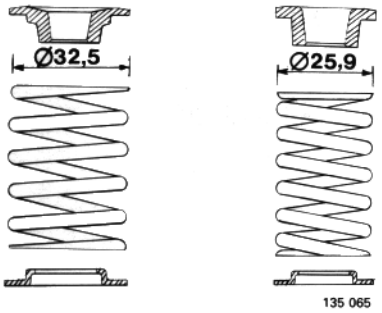
**Tightening sequence for cylinder head bolts**

| | Nm | ft lbs |
|---|---|---|
| Main bearings | 110 | (80) |
| Connecting rod bolts* first stage | 20 | (14) |
| second stage | angle-tighten 90° | |
| Flywheel (use new bolts) | 70 | (50) |
| Spark plugs (not to be oiled) | 25±5 | (18±4) |
| Camshaft gear | 50 | (35) |
| Intermediate shaft gear | 50 | (35) |
| Camshaft caps | 20 | (14) |
| Crankshaft center bolt first stage | 60 | (45) |
| second stage | angle-tighten 60° | |

*Old bolts can be reused if length does not exceed 55.5 mm (2.185 in).



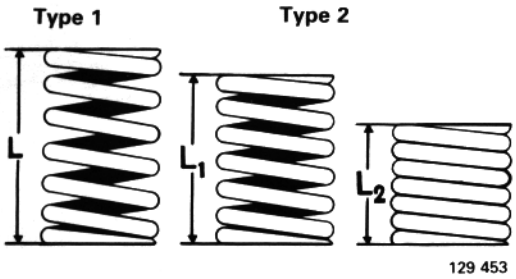

Type 1 Type 2

*C41*

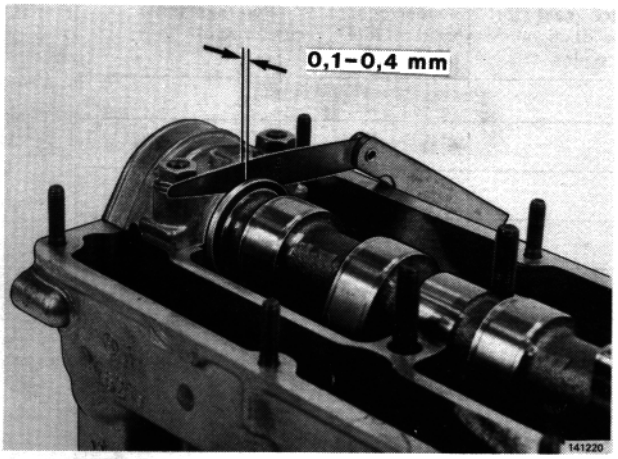
## Test valve springs in a spring tester

Two different types of valve springs are used.
**Type 1** is used on: B 200 K and E
B 230 A, K, E and ET
**Type 2** is used on: B 200 ET
B 230 F and FT

**Important!** Do not interchange different types of adjusting shims and valve springs in same engine.




| Type 1 | | Type 2 | |
|---|---|---|---|
| **Length mm (in)** | **Load N (lbs)** | **Length mm (in)** | **Load N (lbs)** |
| 45.0 (1.77) | 0 (0) | 45.5 (1.79) | 0 (0) |
| 38.0 (1.50) | 280–320 (62–70) | 38.0 (1.50) | 280–320 (62–70) |
| 27.0 (1.06) | 710–790 (156–174) | 27.5 (1.08) | 702–782 (154–172) |




*C42*

## Check camshaft end float

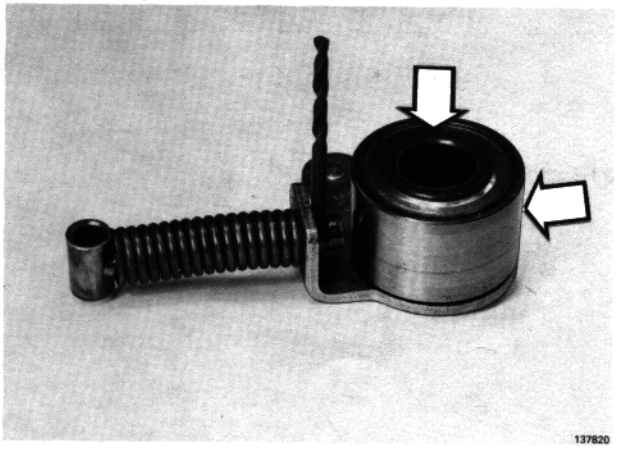
Position camshaft in cylinder head.

Fit rear bearing cap.

Slide camshaft back and forth.

End float should be **0.1–0.4 mm (0.004–0.016 in).** Use feeler gauge for measuring.

If end float is too large, replace rear bearing cap.




*C43*

## Check timing belt tensioner

Bearing must not be worn.

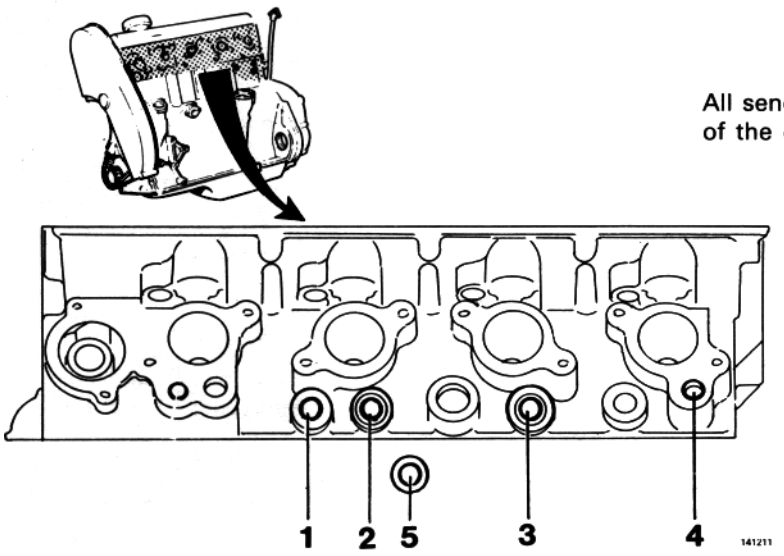
Roller running face must not be damaged. If surface is damaged, both roller and timing belt must be replaced.

# Assembling cylinder head

*Special tools: 5021, 5025, 5034, 5219, 5222*

**Location of senders/contacts on cylinder head and block**

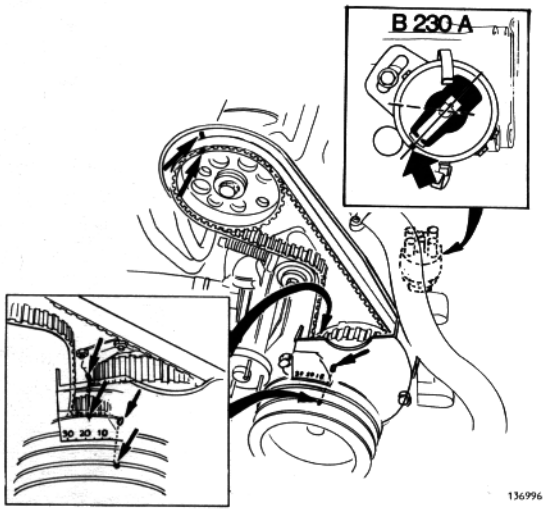
*C44*




All senders/contacts are located on the left-hand side of the cylinder head and block.

| Engine type, year model | Thermostatic valve, EGR System (black hoses) | Temperature sender (yellow) | Thermal time switch, cold start valve (blue-yellow and white) | Temperature sender, ign. system, idle comp. switch | Knock sensor, ign. system (brown) |
|---|---|---|---|---|---|
| B 200 K | 1[1] | 2 | – | – | – |
| B 200 E | – | 2 | – | 4 | 5 |
| B 200 ET | – | 2 | 3 | 4 | – |
| B 230 A | 1[2] | 2 | – | – | – |
| B 230 K | 1[2] | 2 | 3 | – | 5 |
| B 230 E | 1[2] | 2 | – | 4 | 5 |
| B 230 ET | 1[3] | 2 | 3 | 4 | – |
| B 230 F | – | 2 | 3 | 4 | 5 |
| B 230 FT | – | 2 | 3 | 4 | 5 |

[1] only Scandinavia, model year 1985
[2] only Scandinavia, Switzerland
[3] only automatic Scandinavia, Switzerland
[4] coolant temperature sensor for LH-system on B 230 F, B 230 FT engines

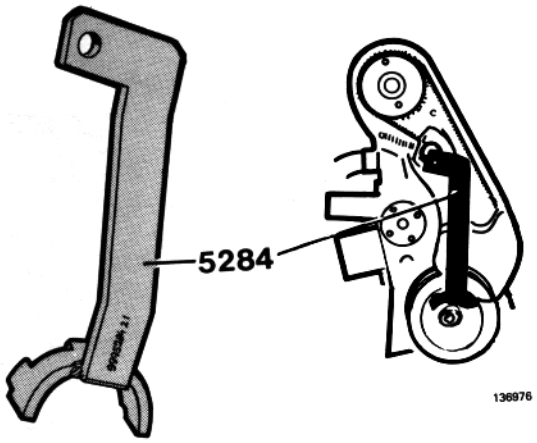



*E4*

**Set camshaft and crankshaft according to markings**

Use centre bolts to rotate crankshaft. Set camshaft so that marking on pulley is opposite marking on inner timing gear cover and crankshaft marking opposite 0 on cover.

*Engine with side-mounted distributor: Remove distributor cover and check that rotor is opposite marking.*




*E5*

**Remove vibration damper**

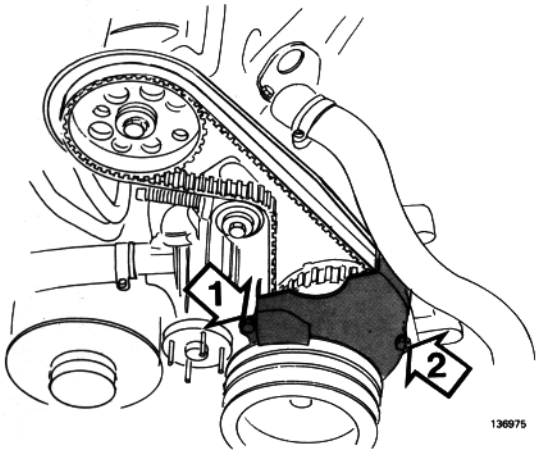
Remove belt tensioner nut and washer. Install tool **5284.**

Use the nut to retain it.

Remove bolt for vibration damper. Remove tool **5284.**

Check/adjust O-marking.

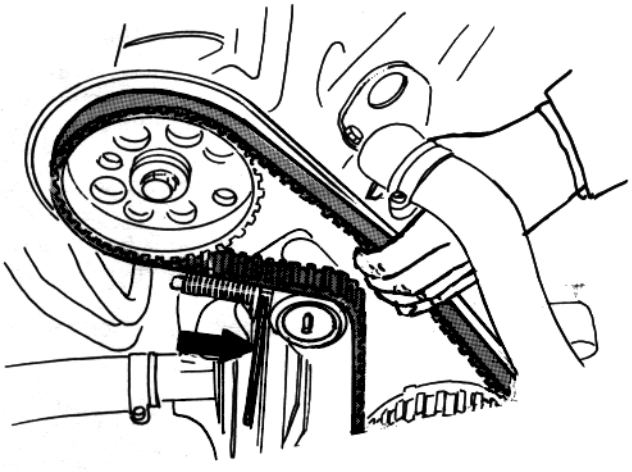
**Remove** vibration damper.




*E6*

**Remove lower timing belt cover**

| | | |
|---|---|---|
| 1 | 10 mm socket | M 6 bolt |
| 2 | 12 mm socket | M 8 bolt |

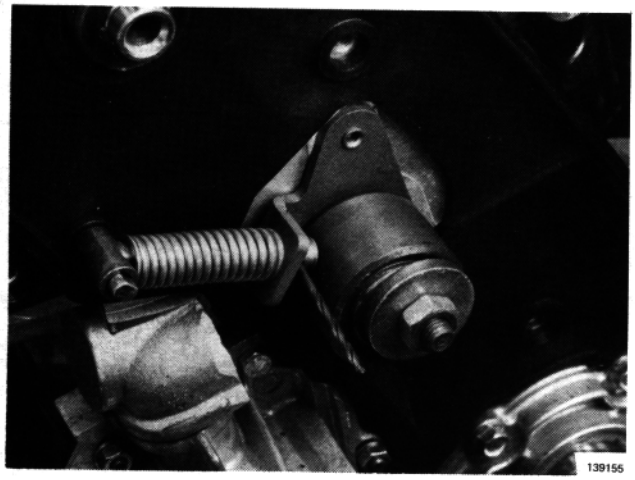



*E7*

**Remove timing belt**

Pull on timing belt to depress tensioner spring. Use a 3 mm drill to lock tensioner spring. Remove timing belt.

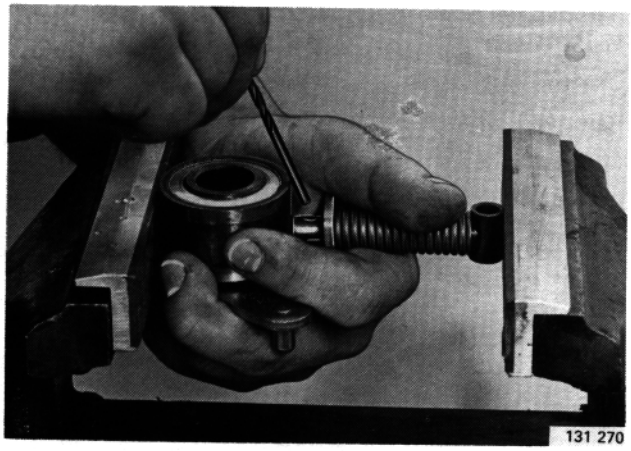
**Important!** Do not rotate crankshaft or camshaft. Pistons may strike valves.




*E8*

**Check timing belt tensioner**

Rotate tensioner roller and listen for abnormal noises from bearing. Check that contact face against belt is free from cracks and rubber deposits.




*E9*

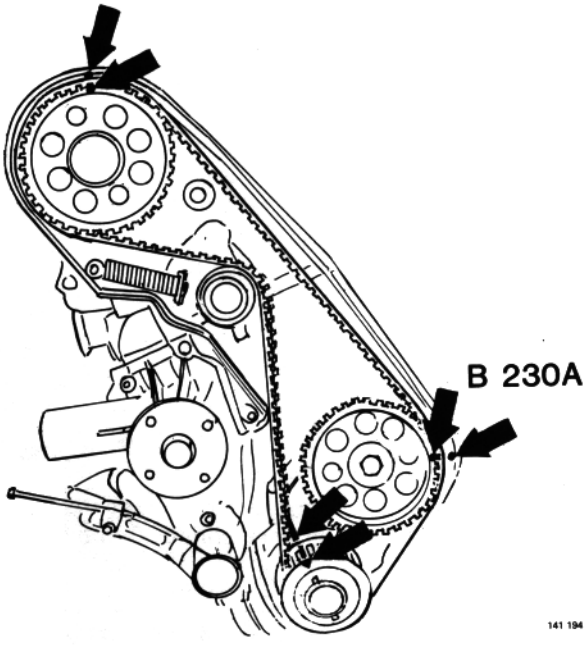
**Replacing belt tensioner**

**Remove belt tensioner**

Pull it straight out.

**Assemble and secure new belt tensioner**

Use a vice. Use a 3 mm drill to lock spring.




*E10*

**Check basic settings**

**Install timing belt**

**Important!** Do not rotate crankshaft or camshaft. Pistons may strike valves.

- Place pulleys in position according to marking.
- Place timing belt on crankshaft and intermediate shaft. Two lines on timing belt should be opposite crankshaft marking.
- Stretch timing belt and install it on camshaft and belt tensioner.
- Check that timing belt is correctly positioned and that markings on pulleys are opposite markings on engine.
- Pull on timing belt to depress belt tensioner spring and remove locking drill.