Timing/Balance Shaft Belt, Replacement

Special tool: 998 8500

Important: See table in specifications in belt replacement is carried out at engine temperature other than that specified.

Remove:

- battery (-) lead
- alternator drive belt
- radiator fan and pulley
- fan shroud
- servo pump and (if fitted) AC compressor drive belts

Remove all three transmission covers
Remove all bolts.
Remove covers, starting with topmost (1).

Turn engine until camshaft/crankshaft markings coincide

Turn engine to TDC in No. 1 cylinder.

Check that markings on camshaft pulleys coincide with those on transmission mounting plate.

Check that marking on belt guide plate on crankshaft is opposite TDC marking on cylinder block.

**Removal Of Timing Belt**

Remove timing belt
Slacken tensioner locknut.

Compress tensioner spring.

Tighten tensioner locknut.

Remove belt.

**CAUTION:** Crankshaft and camshafts must not be rotated while timing belt is slack or has been removed.
Spin tensioner pulley and listen for bearing noise. Check that pulley surface in contact with belt is clean and smooth.

| Check timing belt idler pulleys |
Spin pulleys and listen for bearing noise.

Check that pulley surfaces in contact with belt are clean and smooth.

Check pulley mountings. Torque: 25 Nm (18.5 ft.lb).

**Removal Of** [Balance Shaft Belt]
Check pulley surface and bearing for faults.

Slacken belt tensioner
Slacken locknut.

Remove balance shaft belt
Slide belt off drive pulleys and tensioner. Work belt out under crankshaft pulley assembly. Check tensioner bearing and inspect for oil leakage from shaft seals.
Check that balance shaft markings coincide with markings on transmission mounting plate.

Check that crankshaft marking is opposite TDC marking on cylinder block.

**Installation Of Balance Shaft Belt**

A. RH balance shaft (yellow dot).
B. Lower marking on crankshaft (blue dot).
C. LH balance shaft (yellow dot).

A-B = 18 teeth
B-C = 34 teeth
**Carefully** work belt in **under** crankshaft pulley assembly.

Ensure that blue dot (marking B) is opposite **bottom** (TDC) marking on belt guide plate (at bottom of crankshaft).

Fit belt **around** left-hand (upper) balance shaft with marking C opposite marking on pulley.

Fit belt **on** right-hand (lower) balance shaft with marking A opposite marking on pulley.

Fit belt **around** tensioner.

Check that markings are still aligned.

Tension belt using Allen key inserted in adjusting hole (1) in tensioner.
Turn crankshaft **carefully** through a few degrees on either side of the TDC position to ensure that belt engages properly in pulleys.

Return crankshaft to TDC position.

Adjusting hole in tensioner must be **immediately below** '3 o'clock' when tightening locking bolt.

Tighten locking bolt (2) to **40 Nm** (29.5 ft.lb). Use Allen key inserted in adjusting hole (1) as **counterhold**.

Use gauge **998 8500**.

Position gauge immediately above location of dismantled idler.

Belt tension **must** be within 1-4 unit range.

**NOTE:** If belt tension is outside above range, slacken tensioner and repeat.

**Installation Of Timing Belt**
Align double-line marking on belt with **top** marking on belt guide plate (at top of crankshaft).
**NOTE:** Arrows on belt should point towards front (i.e. away from engine).

Stretch belt around crankshaft pulley and place **over** tensioner and **right-hand** idler.

Place belt on camshaft pulleys. Both single-line markings should coincide with pulley markings.

Place belt **around** oil pump drive pulley and press belt onto **left-hand** idler.

![Diagram showing belt routing](image)

Check that all markings are aligned and that engine is turned to TDC in No.1 cylinder.

![Diagram showing slackening tensioner](image)

**Turn crankshaft clockwise**
Crankshaft pulleys should rotate one turn until pulley markings again coincide with those on transmission mounting plate.

**NOTE:** Engine must not be rotated counterclockwise while belt is being tensioned.

Turn crankshaft further clockwise until pulley markings are 1 1/2 teeth past markings on housing.

**NOTE:** Rotate crankshaft smoothly.

- Slacken tensioner locknut
Use gauge **998 8500**. Measure tension above location of dismantled idler.

Belt tension should be **3.8 ±0.2** units at **20°C (68°F)**.

**If belt tension is too low:** Correct by adjusting tensioner clockwise.

**NOTE:** Tensioner may be adjusted clockwise only. Only small adjustments are required.

**If belt tension is too high:** Turn crankshaft through one revolution and recheck/adjust belt tension.
Install:

- guide (i.e. ensure that guide is in position)
- middle transmission cover (3)
- fan shroud
  - heater hose tie
- radiator fan and pulley
- all auxiliary drive belts
- battery (-) lead

Run engine until thermostat opens.

Stop engine.

**CAUTION:** Remember that transmission covers (1) and (2) have not been replaced at this point.

**Check/Adjust Timing Belt Tension After Thermostat Has Opened**
Use gauge **998 8500**.

Rotate crankshaft to bring engine to TDC position in No.1 cylinder.

Position gauge between exhaust camshaft pulley and idler.

Read gauge.

Belt tension must be within the 5.5 ±0.2 unit range.

**NOTE:** If belt tension is correct, no adjustment necessary, skip to next section. If reading is outside above range, continue with the following steps.

Remove protective rubber cap over locknut.
Position gauge in measuring zone.

Insert screwdriver between tensioner pulley and spring carrier pin.

**If belt tension is too low:**
Move roller to adjust belt tension to **6.0 ±0.2** units.

**If belt tension is too high:**
Adjust to obtain reading of **5.0 ±0.2** units.

Tighten tensioner locknut.

Turn crankshaft to rotate camshaft pulleys through one revolution.
Belt tension should now agree with specified value of $5.5 \pm 0.2$ units.

Tighten tensioner locknut

Tighten to **50 Nm** (37 ft.lb).

Replace protective cap over locknut.

**Check/Adjust** Balance Shaft Belt Tension After Opening Of Thermostat
Use gauge **998 8500**.

Position gauge above location of dismantled idler.

Belt tension must be within the **4.9 ±0.2** unit range.

**NOTE:**

- If belt tension is correct, skip to next 3 operations.
- If belt tension is too low, carry out following operations.

**NOTE:** Tensioner may be turned clockwise only. Only small movements are necessary.
Turn crankshaft clockwise through one revolution.

Belt tension should now agree with specified value of \(4.9 \pm 0.2\) units.

Install idler
Remount idler in position.

Install:

- lower transmission cover (2)
- upper transmission cover (1)

Check operation
Test run engine.