



INSTRUCTIONS FOR: PETROL ENGINE SETTING / LOCKING KIT - BMW MINI, CITROEN & PEUGEOT MODEL No: VS5020

Thank you for purchasing a Sealey product. Manufactured to a high standard this product will, if used according to these instructions and properly maintained, give you years of trouble free performance.



IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY. NOTE THE SAFE OPERATIONAL REQUIREMENTS, WARNINGS AND CAUTIONS. USE THE PRODUCT CORRECTLY AND WITH CARE FOR THE PURPOSE FOR WHICH IT IS INTENDED. FAILURE TO DO SO MAY CAUSE DAMAGE AND/OR PERSONAL INJURY AND WILL INVALIDATE THE WARRANTY. PLEASE KEEP INSTRUCTIONS SAFE FOR FUTURE USE.

1. SAFETY INSTRUCTIONS

- WARNING!** Ensure Health and Safety, local authority and general workshop practice regulations are adhered to when using tools.
- DO NOT** use tools if damaged.
- Maintain tools in good and clean condition for best and safest performance.
- Ensure that a vehicle which has been jacked up is adequately supported with axle stands.
- Wear approved eye protection. A full range of personal safety equipment is available from your Sealey dealer.
- Wear suitable clothing to avoid snagging. **DO NOT** wear jewellery; tie back long hair.
- DO NOT** attempt to start engine or move vehicle whilst in gear with locking devices fitted.
- Always display warning notification on steering wheel when locking engine components.
- Account for all tools, locking bolts, pins and parts being used and do not leave them in or near the engine.
- WARNING!** Incorrect or out of phase camshaft timing can result in contact between valve head and piston crown causing engine damage.
- IMPORTANT:** These instructions are provided as a guide only. Always refer to the vehicle manufacturer's service instructions, or a proprietary manual, to establish the current procedure and data.

2. CONTENTS & APPLICATIONS

Suitable for timing 1.4 and 1.6 16v Valvetronic direct injection petrol chain drive engines, fitted in BMW Mini, Citroen and Peugeot vehicles. Supplied in carry-case with warning tag.

Applications:

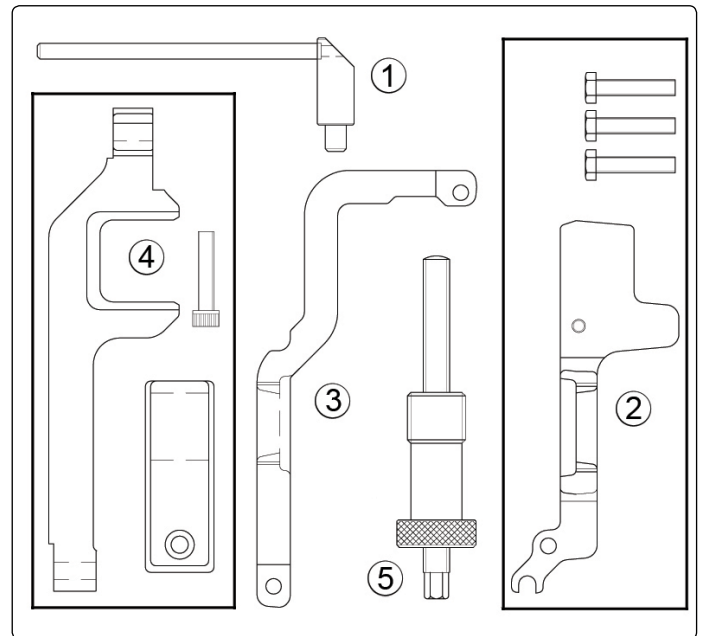
BMW Mini, Citroen and Peugeot 1.4 and 1.6 16v. Valvetronic / Direct Injection Petrol engines in:

BMW MINI:	R55 R56 Cooper S R55 R56 Cooper R56 Mini One
CITROEN:	C4 C4 Picasso
PEUGEOT:	207 308
Engines:	BMW: N12 (1.4 / 1.6) and N14 (1.6) PSA: EP3, EP6 and EP6DT/DTS

The N12/EP3/EP6 twin camshaft petrol engines with VANOS variable camshaft timing on both inlet and exhaust camshafts, were developed jointly between BMW and PSA Citroen Peugeot and use the BMW Valvetronic system to vary the timing and the lift of the inlet valves.

The Valvetronic layout incorporates a conventional inlet camshaft and a secondary eccentric shaft, with intermediate levers and followers, activated by a stepper motor. The stepper motor changes the phase of the eccentric shaft, altering the action of the inlet valves.

The N14/EP6DT/DTS twin camshaft turbocharged petrol engines with high-pressure direct fuel injection were also developed jointly between BMW and PSA. The cylinder head comes with conventional valve drive featuring roller-type drag arms and hydraulic valve play compensation.



Kit contents / Spares

Item	Part Number	Description
1	VS5021	Flywheel Locking Pin
2	VS5022	Exhaust Camshaft Setting Plate
3	VS5023	Inlet Camshaft Setting Plate (N12/EP3/EP6)
4	VS5024	Inlet Camshaft Setting Plate Assembly (N14/EP6D1/DTS)
5	VS4803	Chain Tensioner Pre-Load Tool
-	VS5020-84	Case and Insert

3. INSTRUCTIONS

Part 1: N12/EP3/EP6 1.4/1.6 16v (Valvetronic)

3.1. Checking camshaft timing

3.2. Adjusting camshaft timing

Part 2: N14/EP6DT/DTS 1.6 16v (Direct Injection)

3.3. Checking camshaft timing

3.4. Adjusting camshaft timing

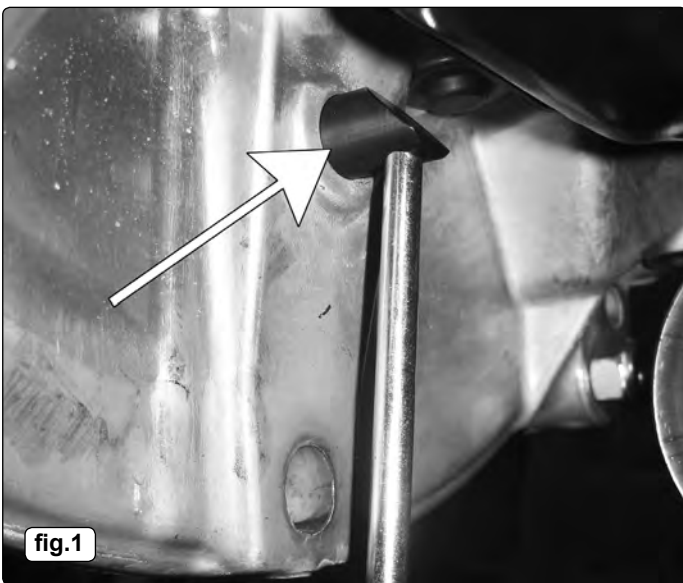
NOTE: The tools in this kit are used in a specific sequence, and it will save time and make selection of the correct tools easier if the operator reads and becomes familiar with the timing procedure beforehand.

Part 1: N12/EP3/EP6 1.4/1.6 16v (Valvetronic)

3.1. Checking camshaft timing

IMPORTANT: Camshaft timing is determined when all pistons are at 90 degrees (level) **NOT** when number one cylinder is at TDC.

3.1.1. Remove the cylinder head cover.



3.1.2. Turn the crankshaft in normal direction of engine rotation using a wrench on the crankshaft pulley centre bolt, position crankshaft by inserting VS5021 Flywheel Locking Pin through the datum hole and into the timing hole in the flywheel (**fig.1**).

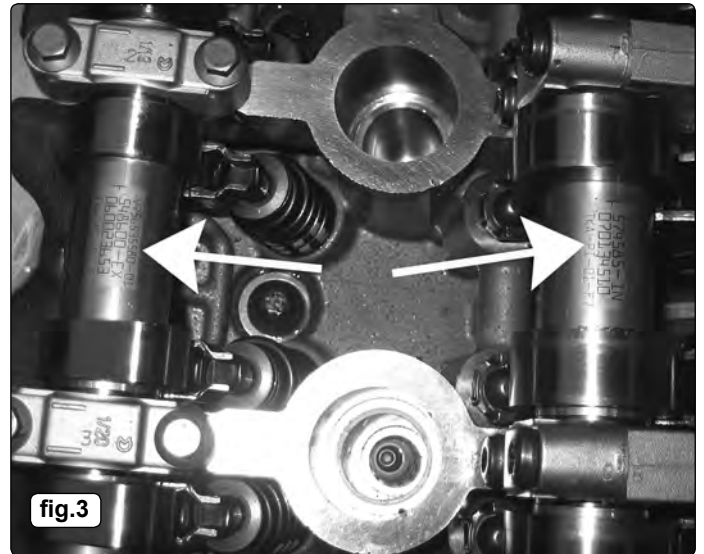
WARNING: Never turn the crankshaft in the opposite to normal direction of engine rotation.

Balance hole and flywheel locking pin hole can be mixed up. In order to check that the correct hole has been selected, ensure that all pistons are in the 90-degree position, via the spark plug holes.

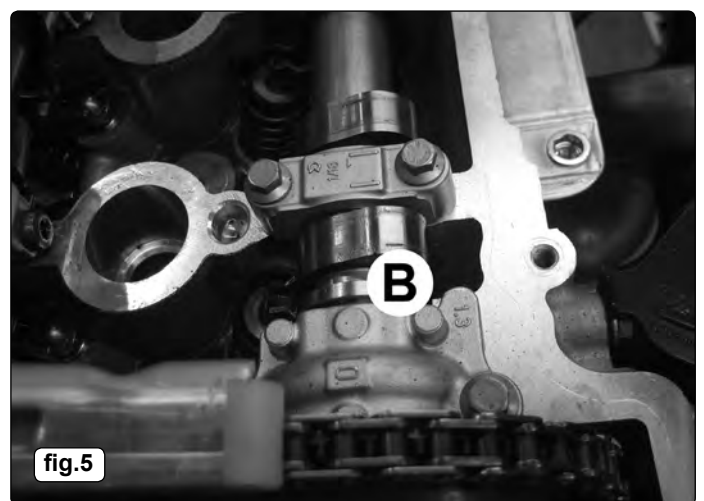
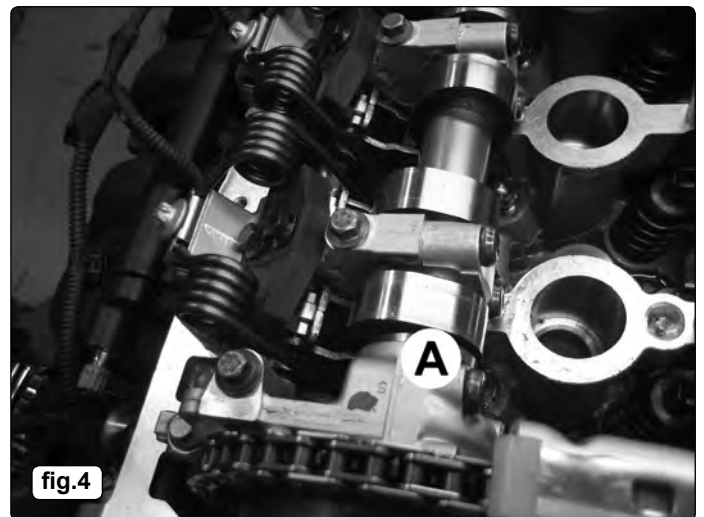


3.1.3. Check the locking of the VANOS adjustment units to the camshafts by attempting to rotate the camshafts, in the direction of engine rotation using an open-ended wrench on the end of the camshaft (**fig.2**).

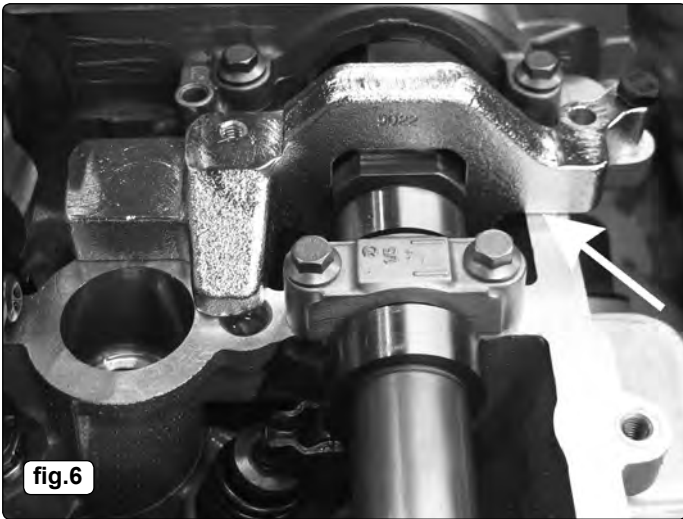
The adjustment units are faulty if there is no fixed connection to the camshaft.



3.1.4. Both camshafts are in the correct position when the markings (**IN**) on the inlet camshaft and (**EX**) on the exhaust camshaft point upwards (**fig.3**).



3.1.5. The cam lobe of the inlet camshaft at cylinder number 1 (**A**) points upwards and to the left, and the cam lobe of the exhaust camshaft at cylinder number 1 (**B**) points upwards and to the right, when viewed from the direction of the VANOS adjustment units (**figs 4 and 5**).



3.1.6. Position VS5022 Exhaust Camshaft Setting Plate onto the rectangular section at the rear of the exhaust camshaft, and ensure the Plate rests fully on the surface of the cylinder head and secure in place with the fixing bolt provided (**fig.6**).



3.1.7. Position VS5023 Inlet Camshaft Setting Plate on to the rectangular section at the rear of the inlet camshaft and ensure the Plate rests fully on the surface of the cylinder head and the exhaust camshaft setting plate, then secure in place with the fixing bolts provided (**fig.7**).

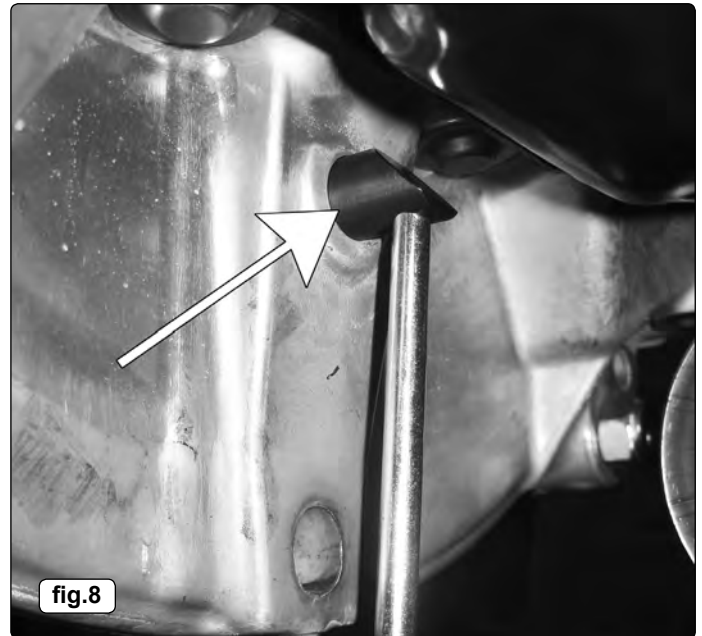
3.1.8. To make assembly of the tools easier, a slight rotation clockwise or anti-clockwise of the inlet and exhaust camshafts is permitted using an open-ended wrench on the ends of the camshafts. If camshaft timing is correct both setting plates should rest on the surface of the cylinder head **without any gap**. If the above position cannot be achieved with the Setting Plates, it will be necessary to adjust the timing.

3.1.9. Remove the camshaft setting plates and the flywheel locking pin.

3.2. Adjusting camshaft timing

IMPORTANT: Camshaft timing is determined when all pistons are at 90 degrees (level) **not** when number one cylinder is at TDC.

3.2.1. Remove the cylinder head cover.

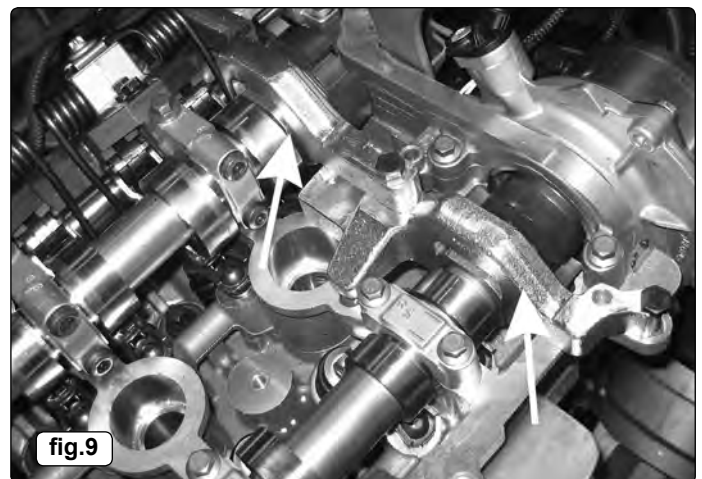


3.2.2. Turn the crankshaft in normal direction of engine rotation using a wrench on the crankshaft pulley centre bolt, position crankshaft by inserting VS5021 Flywheel Locking Pin through the datum hole and into the timing hole in the flywheel (**fig.8**).

WARNING: Never turn the crankshaft in the opposite to normal direction of engine rotation.

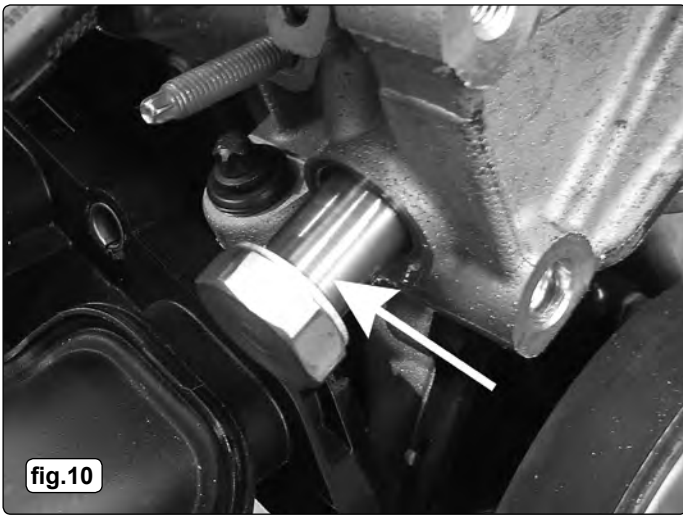
Balance hole and flywheel locking pin hole can be mixed up. In order to check that the correct hole has been selected, ensure that all pistons are in the 90-degree position, via the spark plug holes.

Both camshafts have three machined surfaces to enable fitting of the camshaft setting plates. The fourth surface is not machined and is crescent shaped, this **must** point downwards.



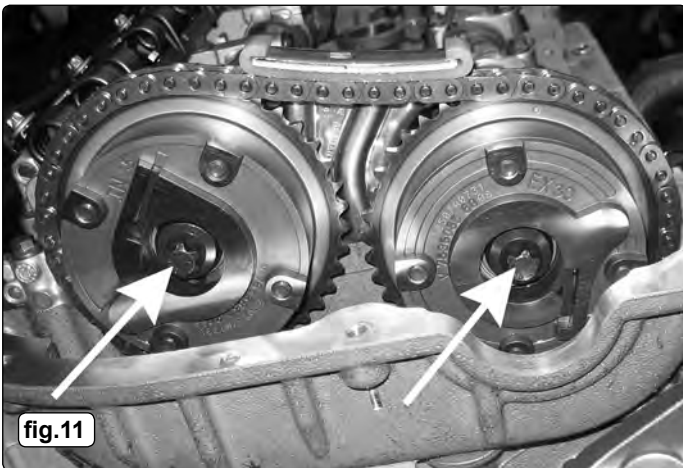
3.2.3. Position VS5022 Exhaust Camshaft Setting Plate onto the rectangular section at the rear of the exhaust camshaft (**fig.9**).

3.2.4. Position VS5023 Inlet Camshaft Setting Plate onto the rectangular section at the rear of the inlet camshaft (**fig.9**).



3.2.5. Remove the timing chain tensioner (**fig.10**).

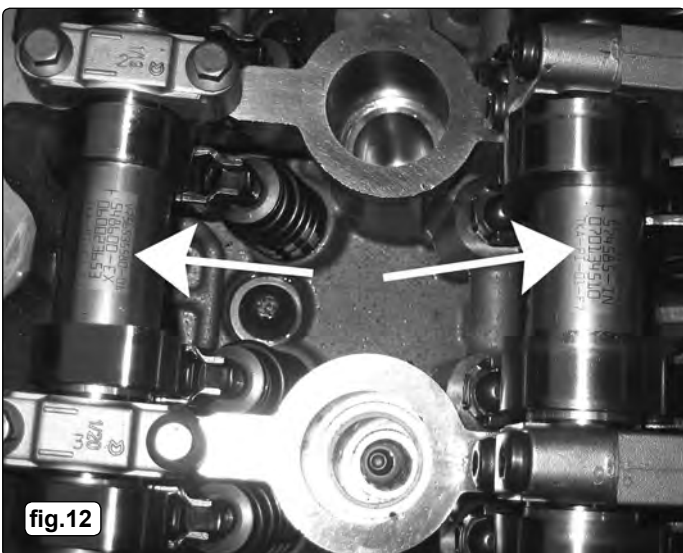
In order for timing to be adjusted the central bolts of the VANOS adjustment units must be released to allow the camshafts to be turned so that the setting plates rest fully on the cylinder head.



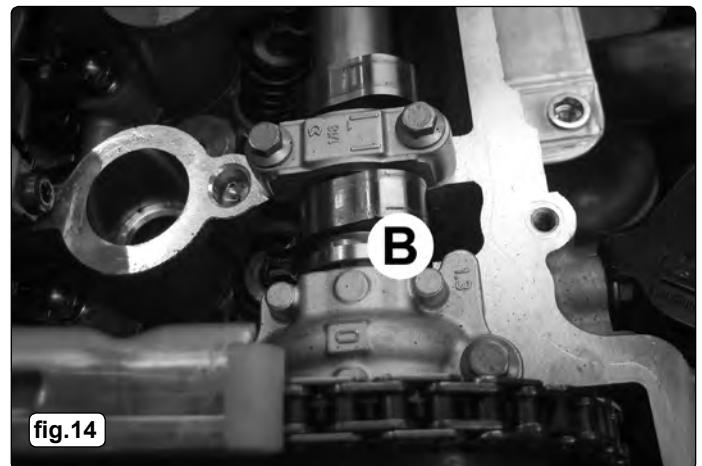
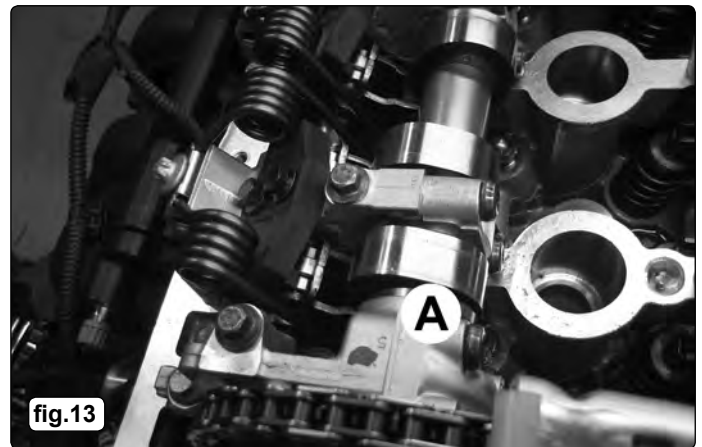
3.2.6. Counter hold each of the camshafts in turn with an open-ended wrench on the hexagon at the rear of the camshafts whilst releasing the central bolts of the VANOS adjustment units (**fig.11**).

WARNING: These bolts are likely to be tight do not rely on the Flywheel Pin to counter hold when loosening these bolts.

Ensure that the Camshaft Setting Plates rest fully on the surface of the cylinder head and secure in place with the fixing bolts.



3.2.7. Both camshafts are in the correct position when the markings (**IN**) on the inlet camshaft and (**EX**) on the exhaust camshaft point upwards (**fig.12**).



3.2.8. The cam lobe of the inlet camshaft at cylinder number 1 (**A**) points upwards and to the left, and the cam lobe of the exhaust camshaft at cylinder number 1 (**B**) points upwards and to the right, when viewed from the direction of the VANOS adjustment units (**figs.13 and 14**).



3.2.9. Insert VS4803 Chain Tensioner Pre-Load Tool into cylinder head (**fig.15**). Screw in the adjusting screw of VS4803 by hand until it makes contact with the tensioner rail **but does not apply pressure**.

3.2.10. Attach a suitable torque wrench to the adjusting screw of VS4803 and turn to pre-load the tensioner rail to **0.6Nm**.

3.2.11. Remove and discard the camshaft sprocket bolts and replace with new bolts.

3.2.12. Tighten the central bolt of the exhaust camshaft to the specified torque **20Nm. +90° +90°**, followed by the bolt of the inlet camshaft, to the specified torque **20Nm. +90° +90°**.

3.2.13. Unscrew the adjusting screw of VS4803 and remove the Pre-Load Tool.

3.2.14. **IMPORTANT:** Install the chain tensioner.

3.2.15. Remove **all** timing tools and turn the crankshaft twice (at the crankshaft pulley centre bolt), in the normal direction of engine rotation, returning to the engine timing position.

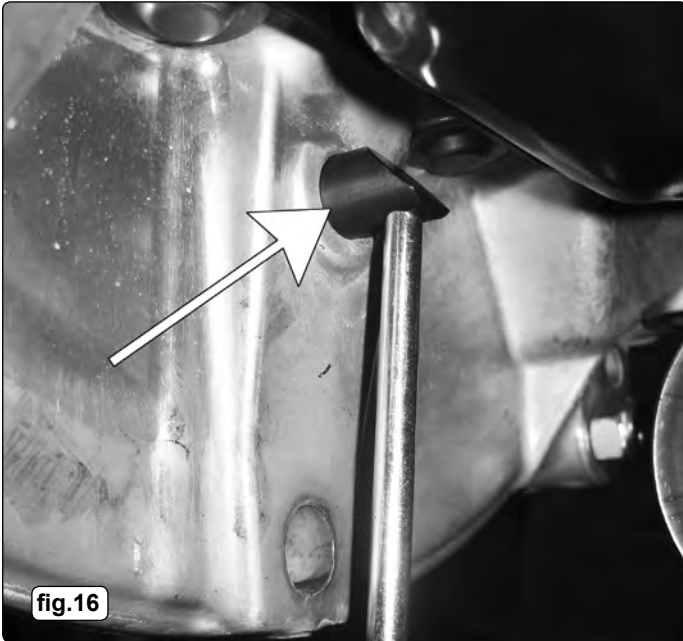
3.2.16. Insert the Flywheel Locking Pin and Camshaft Setting Plates to check timing position, following the procedure as described in **3.1. Checking camshaft timing**.

Part 2: N14/EP6DT/DTS 1.6 16v (Direct Injection)

3.3. Checking camshaft timing

IMPORTANT: Camshaft timing is determined when all pistons are at 90 degrees (level) **not** when number one cylinder is at TDC.

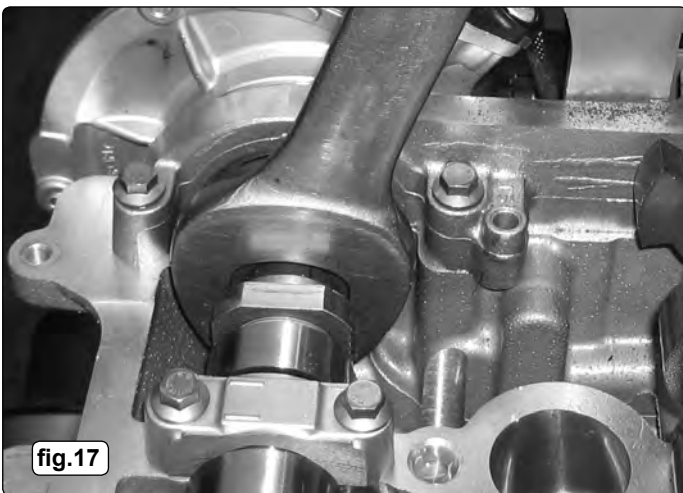
3.3.1. Remove the cylinder head cover.



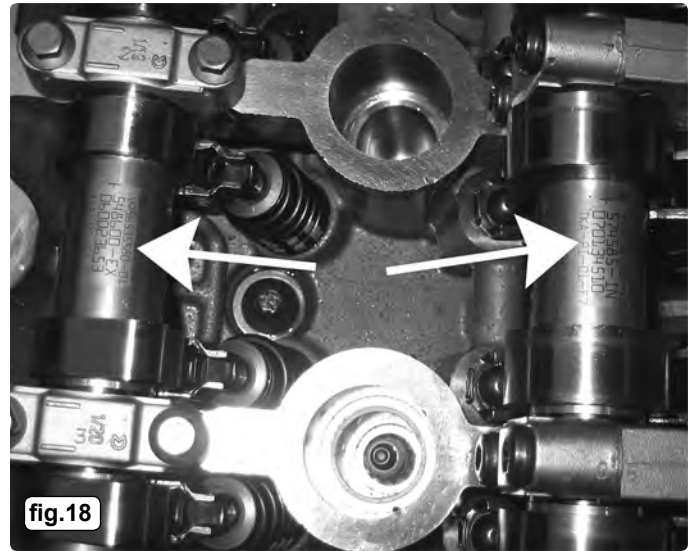
3.3.2. Turn the crankshaft in normal direction of engine rotation using a wrench on the crankshaft pulley centre bolt, position crankshaft by inserting VS5021 Flywheel Locking Pin through the datum hole and into the timing hole in the flywheel (fig.16).

WARNING: Never turn the crankshaft opposite to normal direction of engine rotation.

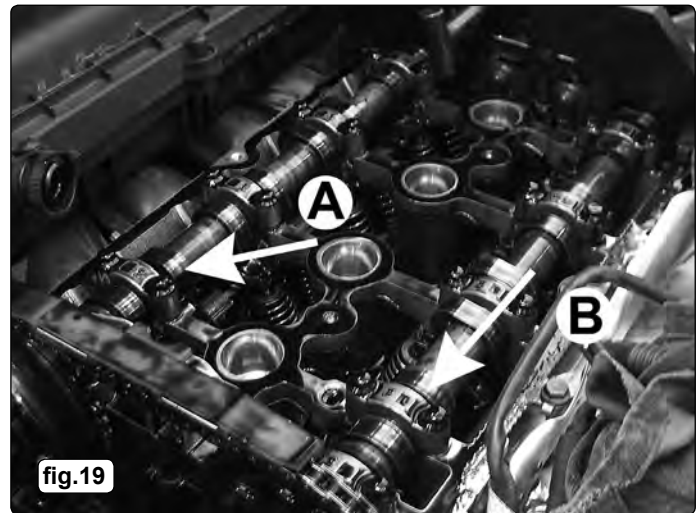
Balance hole and flywheel locking pin hole can be mixed up. In order to check that the correct hole has been selected, ensure that all pistons are in the 90-degree position, via the spark plug holes.



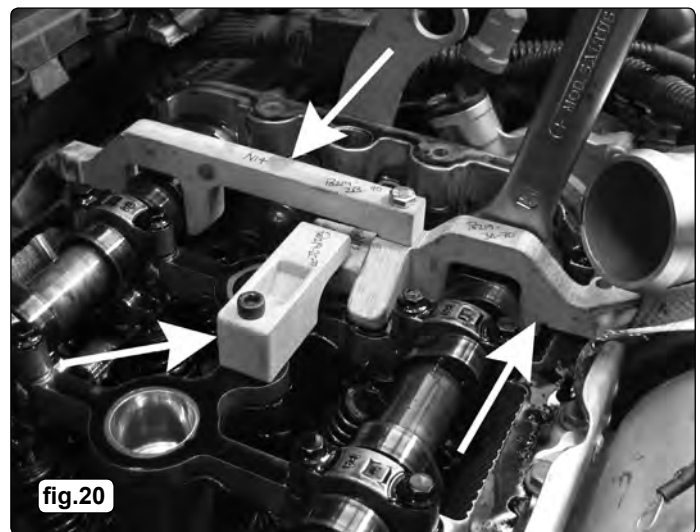
3.3.3. Check the locking of the VANOS adjustment unit to the camshaft by attempting to rotate the camshaft in the direction of engine rotation using an open-ended wrench on the end of the camshaft (fig.17). The adjustment unit is faulty if there is no fixed connection to the camshaft.



3.3.4. Both camshafts are in the correct position when the markings (IN) on the inlet camshaft and (EX) on the exhaust camshaft point upwards (fig.18).



3.3.5. The cam lobe of the inlet camshaft, at cylinder number 1 (A) points upwards and to the right and the cam lobe of the exhaust camshaft at cylinder number 1 (B) points downwards and to the left, when viewed from the direction of the VANOS adjustment unit (fig.19).



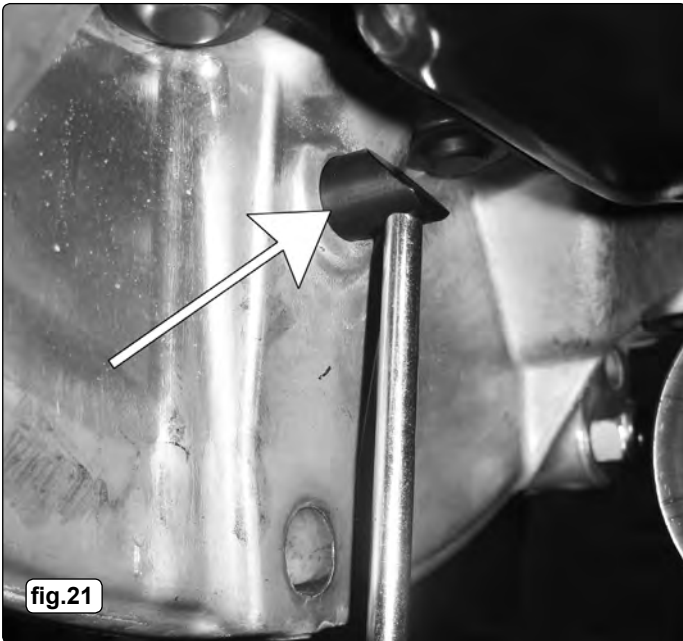
3.3.6. Position VS5022 Exhaust Camshaft Setting Plate onto the rectangular section at the rear of the exhaust camshaft, and ensure the Plate rests fully on the surface of the cylinder head and secure in place with the fixing bolts provided (fig.20).

- 3.3.7. Position VS5024 Inlet Camshaft Setting Plate onto the rectangular section at the rear of the inlet camshaft. Ensure the Plate rests fully on the surface of the cylinder head and secure using the Retaining Clamp and the fixing bolts provided.
- 3.3.8. To make fitting of the tools easier, a slight rotation clockwise or anti-clockwise of the inlet and exhaust camshafts is permitted using an open-ended wrench on the ends of the camshafts. If camshaft timing is correct both Setting Plates should rest on the surface of the cylinder head without any gap. If the above position cannot be achieved with the Setting Plates, it will be necessary to adjust the timing.
- 3.3.9. Remove the camshaft setting plates and flywheel locking pin.

3.4. Adjusting camshaft timing

IMPORTANT: Camshaft timing is determined when all pistons are at 90 degrees (level) not when number one cylinder is at TDC.

- 3.4.1. Remove the cylinder head cover.

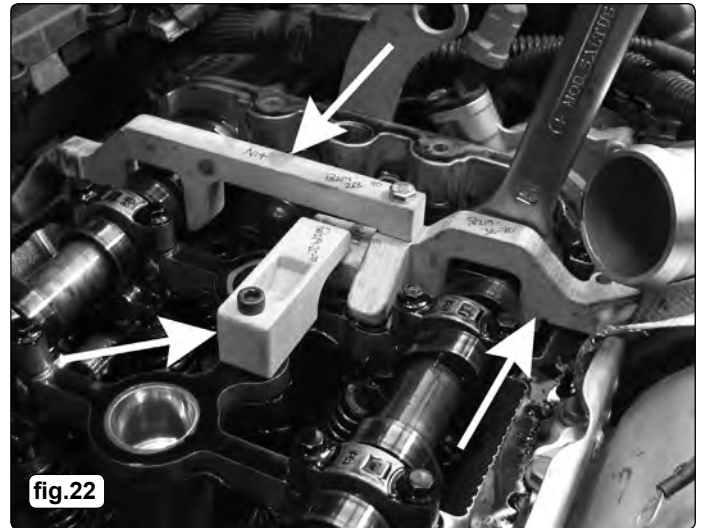


- 3.4.2. Turn the crankshaft in normal direction of engine rotation using a wrench on the crankshaft pulley centre bolt, position crankshaft by inserting VS5021 Flywheel Locking Pin through the datum hole and into the timing hole in the flywheel (fig.21).

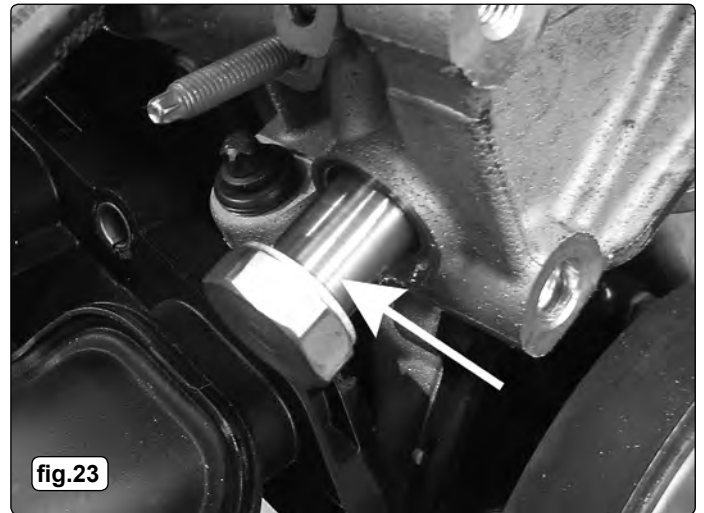
WARNING: Never turn the crankshaft in the opposite to normal direction of engine rotation.

Balance hole and flywheel locking pin hole can be mixed up. In order to check that the correct hole has been selected, ensure that all pistons are in the 90-degree position, via the spark plug holes.

Both camshafts have three machined surfaces to enable fitting of the camshaft setting plates. The fourth surface is not machined and is crescent shaped, this **must** point downwards.



- 3.4.3. Position VS5022 Exhaust Camshaft Setting Plate onto the rectangular section at the rear of the exhaust camshaft (fig.22).
- 3.4.4. Position VS5024 Inlet Camshaft Setting Plate on to the rectangular section at the rear of the inlet camshaft and loosely fit its Retaining Clamp (fig.22).



- 3.4.5. Remove the timing chain tensioner (fig.23). In order for timing to be adjusted the central bolts of the exhaust camshaft sprocket and VANOS adjustment unit must be released to allow the camshafts to be turned so that the setting plates rest fully on the cylinder head. Counter hold each of the camshafts in turn with an open-ended wrench on the hexagon at the rear of the camshafts whilst releasing the central bolt of the camshaft sprocket and VANOS adjustment unit.

WARNING: These bolts are likely to be tight do not rely on the Flywheel Pin to counter hold when loosening these bolts.

Ensure that the Camshaft Setting Plates rest fully on the surface of the cylinder head and secure in place with Retaining Clamp and fixing bolts.

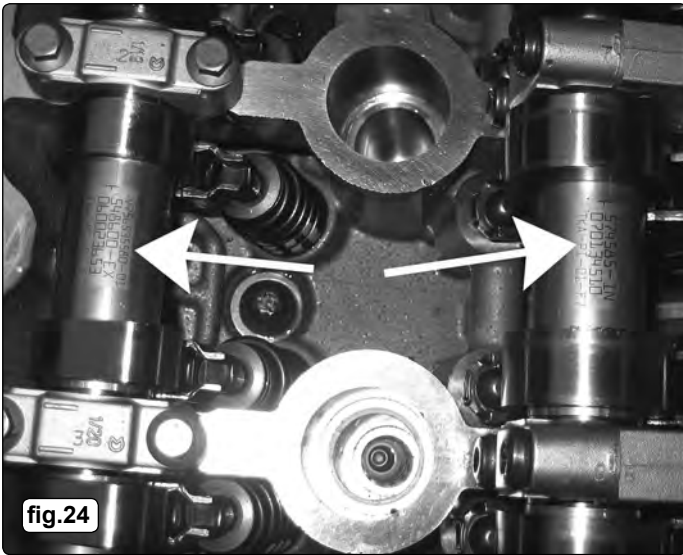


fig.24

3.4.6. Both camshafts are in the correct position when the markings **(IN)** on the inlet camshaft and **(EX)** on the exhaust camshaft point upwards (**fig.24**).

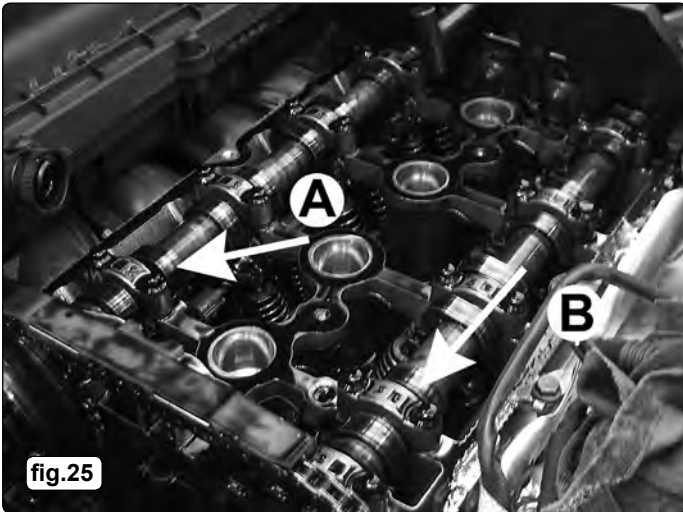


fig.25

3.4.7. The cam lobe on the inlet camshaft at cylinder number 1 **(A)** points upwards and to the right and the cam lobe on the exhaust camshaft at cylinder number 1 **(B)** points downwards and to the left, when viewed from the direction of the VANOS adjustment unit (**fig.25**).

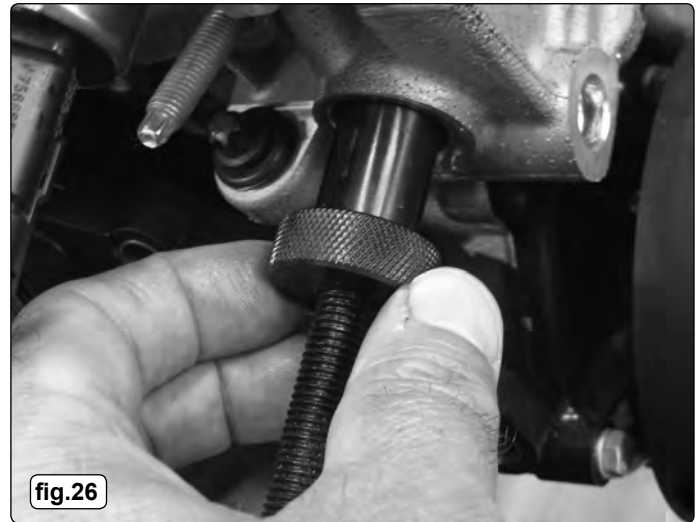


fig.26

- 3.4.8. Insert VS4803 Chain Tensioner Pre-Load Tool into cylinder head (**fig.26**). Screw in the adjusting screw of VS4803 by hand until it makes contact with the tensioner rail **but does not apply pressure**.
- 3.4.9. Attach a suitable torque wrench to the adjusting screw of VS4803 and turn to pre-load the tensioner rail to **0.6Nm**.
- 3.4.10. Remove and discard the camshaft sprocket bolts and replace with new bolts.
- 3.4.11. Tighten the central bolt of the exhaust camshaft to the specified torque **20Nm. +90°**, followed by the bolt of the inlet camshaft, to the specified torque **20Nm. +90° +90°**.
- 3.4.12. Unscrew the adjusting screw of VS4803 and remove the Pre-Load Tool.
- 3.4.13. **IMPORTANT:** Install the chain tensioner.
- 3.4.14. Remove **all** timing tools and turn the crankshaft twice (at the crankshaft pulley centre bolt), in the normal direction of engine rotation, returning to the engine timing position.
- 3.4.15. Insert the Flywheel Locking Pin and Camshaft Setting Plates to check timing position, following the procedure as described in **3.3. Checking camshaft timing**.

NOTE: It is our policy to continually improve products and as such we reserve the right to alter data, specifications and component parts without prior notice.

IMPORTANT: No liability is accepted for incorrect use of this equipment.

WARRANTY: Guarantee is 12 months from purchase date, proof of which will be required for any claim.

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