

Toolkit for Camshaft Adjustment Instructions



199627

To Fit:

VW Group 1.0, 1.2, 1.4, 1.5 & 1.6 MPI/TSI
Petrol Engines



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Engine Timing Kit – for VW Group 1.0, 1.2, 1.4, 1.5 & 1.6 MPI/TSI Petrol Engines

This kit has been developed to allow the user to align, set and check the engine timing of the Volkswagen group EA 211, 3 & 4-cylinder TSI petrol engines without the need to resort to computer- based alignment tools.

The kit utilises a battery-powered digital inclinometer combined with precision manufactured adaptors and alignment tooling to ensure the camshafts are set to the manufacturer's specification. There should be no requirement for interaction with the vehicle's OBD system when following the procedures detailed below.

- Applications include Audi (from 2012), SEAT (from 2012), Škoda (from 2011) & Volkswagen (from 2011).
- Engine Applications include: 1.0, 1.2, 1.4, 1.5 & 1.6 MPI/TSI petrol engines - For full engine code list please see applications below.
- Engine variants include EA211, EA211 EVO, 3 & 4-cylinder TSI/MPI & ACT.
- Suitable camshaft pulley holding tools must be used when loosening or tightening the camshaft pulleys. (febi part No.1001111)

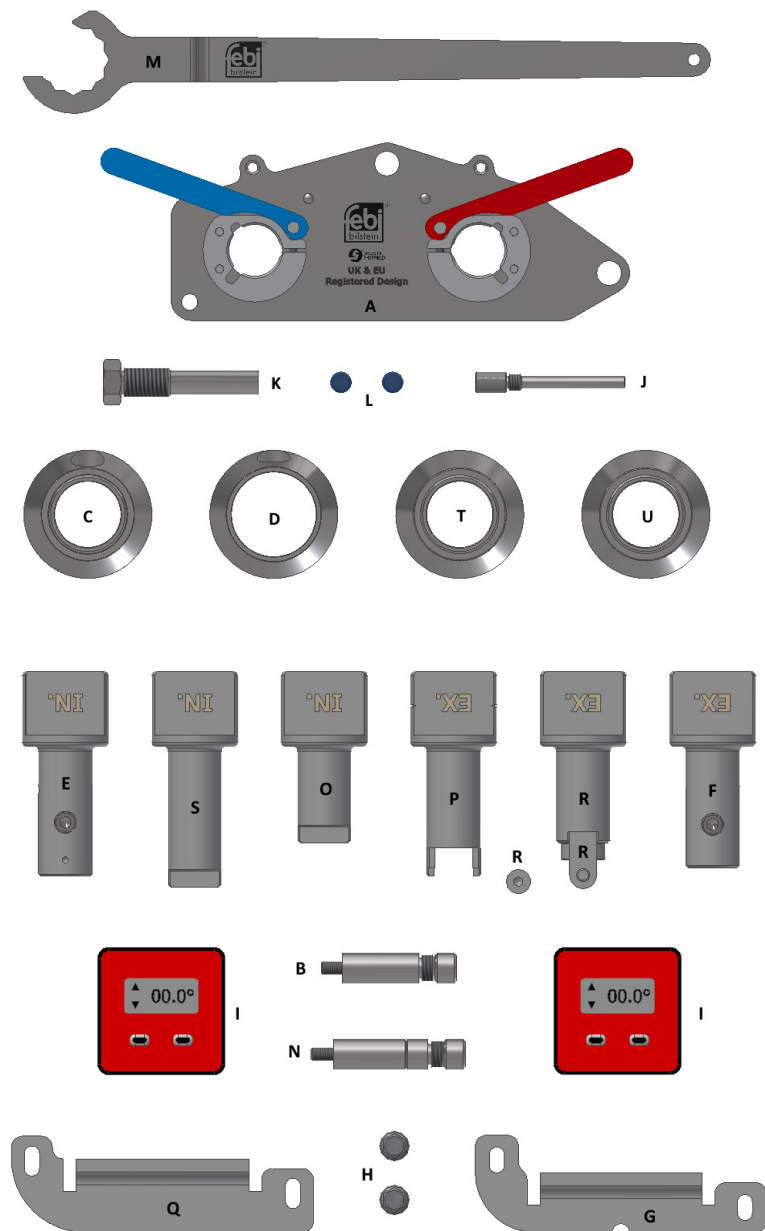
Warning: Hybrid Vehicles use a high voltage system. Please ensure the proper precautions are taken when working on **hybrid vehicles to avoid the risk of shock and injury. Personnel working with hybrid and PHEV vehicles must be trained to the level required by the vehicle manufacturer.**

Applications:

Make Model Year		
Audi	A1	From 2012
	A3	From 2012
	Q2	From 2016
	Q3	from 2015
SEAT	Alhambra	From 2015
	Arona	2017 to 2021
	Ateca	From 2016
	Ibiza	From 2013
	Leon/ST	From 2012
	Mii	2012 to 2020
	Tarraco	From 2019
	Toledo	2014 to 2022
Škoda	Fabia III/IV	Fron 2014
	Kamii	From 2019
	Karoq	From 2017
	Kodiaq	From 2017
	Octavia III/IV	From 2013
	Rapid/Spaceback	From 2015
	Scala	From 2019
	Superb III/IV	From 2015
	Yeti/Outdoor	2014 to 2017
Volkswagen	Arteon	2017 to 2020
	Caddy/Caddy Maxi	2015 to 2017
	CC	2015 to 2017
	Golf /VII/VIII/SV/Sportsvan	From 2012
	Load Up!	2014 to 2020
	Passat	From 2014
	Polo	From 2012
	Scirocco	2014 to 2018
	Sharan	From 2015
	T-Cross	From 2018
	T-Roc/Cabriolet	From 2017
	Taigo	From 2021
	Tiguan	From 2015
	Touran II	From 2015
	Up!	From 2011

Engine Codes		
1.0L	DKRB	CUKC
CHYA	DKRC	CXSA
CHYB	DKRF	CXTC
CHYC	DLAA	CZCA
CHYE	DLAB	CZDA
CHZA	DLAC	CZDB
CHZB	DSGB	CZDD
CHZC	DSGC	CZEA
CHZD	DSGD	DGEA
CHZF	1.2L	DGEB
CHZJ	CJZA	DJKA
CHZK	CJZB	1.5L
CHZL	CJZC	DACA
CPGA	CJZD	DACB
CPGA	CYVA	DADA
DAFA	CYVB	DFYA
DBYA	CYVD	DHFA
DFNA	1.4L	DPBA
DFNB	CHPA	DPBE
DKJA	CMBA	DPCA
DKLA	CPTA	1.6L
DKLB	CPVA	CWVA
DKLC	CPVB	CWVB
DKLD	CPWA	
DKRA	CUKB	

Kit List:



Item	Comp. No.	Description
A	C1052	Adaptor Plate for Camshaft Housing
B	C1053	Mounting Spacers & Screws for A
C	C1056	Inlet Camshaft Spacer Boss (EA211 EVO)
D	C1057	Exhaust Camshaft Spacer Boss (EA211 EVO)
E	C1058	Inlet Camshaft Adaptor (EA211 EVO)
F	C1059	Exhaust Camshaft Adaptor (EA211 EVO)
G	C1060	Inclinometer Reference Bar (EA211 EVO) 1.5
H		Fixing Screws for G / Q
I	C784	Inclinometer
J	C735	Camshaft Rear (water pump) Sprocket Timing Pin
K	C439	Crankshaft Timing Pin
L	C1044	Lever Stop Pins x2
M	C685	Tensioner Pulley Adjuster Tool
N	C1062	Fixing Bolts, Adaptor Plate From 8824
O	C1063	Inlet Camshaft Adaptor (TSI ACT, EA211 3 & 4 cylinder (without ACT))
P	C1064	Exhaust Camshaft Adaptor TSI ACT, EA211 3 & 4 cylinder (without ACT)
Q	C1065	Inclinometer Reference Bar TSI ACT, EA211 3 & 4 cylinder (without ACT)
R	C1076	Exhaust Camshaft Adaptor (1.4 TFSI COD, TSI ACT, TFSI, BlueGT TSI ACT)
S	C1085	Inlet Camshaft Adaptor
T	C1086	Inlet Camshaft Spacer Boss – Long
U	C1087	Inlet Camshaft Spacer Boss – Short

Adaptor Reference List:

Engine Code	Engine Size	Mounting Spacers	Inlet Spacer	Exhaust Spacer	Inlet Adaptor	Exhaust Adaptor	Inclinometer Reference Bar
CHYA	1.0	B	T	N/A	S	P	Q
CHYB		B	T	N/A	S	P	Q
CHYC		B	T	N/A	S	P	Q
CHYE		B	T	N/A	S	P	Q
CHZA		N	N/A	N/A	O	P	Q
CHZB		N	N/A	N/A	O	P	Q
CHZC		N	N/A	N/A	O	P	Q
CHZD		N	N/A	N/A	O	P	Q
CHZF		N	N/A	N/A	O	P	Q
CHZJ		N	N/A	N/A	O	P	Q
CHZK		N	N/A	N/A	O	P	Q
CHZL		N	N/A	N/A	O	P	Q
CPGA		B	T	N/A	S	P	Q
DAFA		B	T	N/A	S	P	Q
DBYA		N	N/A	N/A	O	P	Q
DFNA		B	T	N/A	S	P	G
DFNB		B	T	N/A	S	P	G
DKJA		N	N/A	N/A	O	P	Q
DKLA		N	N/A	N/A	O	P	Q
DKLB		N	N/A	N/A	O	P	Q
DKLC		N	N/A	N/A	O	P	Q
DKLD		N	N/A	N/A	O	P	Q
DKRA		N	N/A	N/A	O	P	Q
DKRB		N	N/A	N/A	O	P	Q
DKRC		N	N/A	N/A	O	P	Q
DKRF		N	N/A	N/A	O	P	Q
DLAA		B	U	N/A	S	P	G
DLAB		B	U	N/A	S	P	G
DLAC		B	U	N/A	S	P	G
DSGA		B	T	N/A	S	P	G
DSGB		B	T	N/A	S	P	G
DSGC		B	T	N/A	S	P	G
DSGD		B	T	N/A	S	P	G
DSHA		N	N/A	N/A	O	P	Q
CJZA	1.2	N	N/A	N/A	O	P	Q
CJZB		N	N/A	N/A	O	P	Q
CJZC		N	N/A	N/A	O	P	Q
CJZD		N	N/A	N/A	O	P	Q
CYVA		N	N/A	N/A	O	P	Q
CYVB		N	N/A	N/A	O	P	Q
CYVD		N	N/A	N/A	O	P	Q
DPCA		B	C	D	E	F	G

Engine Code	Engine Size	Mounting Spacers	Inlet Spacer	Exhaust Spacer	Inlet Adaptor	Exhaust Adaptor	Inclinometer Reference Bar
CHPA	1.4	N	N/A	N/A	O	P	Q
CHPB		N	N/A	N/A	O	P	Q
CMBA		N	N/A	N/A	O	P	Q
CPTA		N	N/A	N/A	O	R	Q
CPVA		N	N/A	N/A	O	P	Q
CPVB		N	N/A	N/A	O	P	Q
CPWA		N	N/A	N/A	O	P	Q
CUKB		N	N/A	N/A	O	P	Q
CUKC		N	N/A	N/A	O	P	Q
CXSA		N	N/A	N/A	O	P	Q
CXSB		N	N/A	N/A	O	P	Q
CZCA		N	N/A	N/A	O	P	Q
CZCC		N	N/A	N/A	O	P	Q
CZDA		N	N/A	N/A	O	P	Q
CZDB		N	N/A	N/A	O	P	Q
CZDC		N	N/A	N/A	O	P	Q
CZDD		N	N/A	N/A	O	P	Q
CZDE		N	N/A	N/A	O	P	Q
CZEA		N	N/A	N/A	O	R	Q
DGEA		N	N/A	N/A	O	P	Q
DGEB		N	N/A	N/A	O	P	Q
DJKA		N	N/A	N/A	O	P	Q
DJVA		N	N/A	N/A	O	R	Q
DACA	1.5	B	C	D	E	F	G
DACB		B	C	D	E	F	G
DADA		B	C	D	E	F	G
DFYA		B	C	D	E	F	G
DHFA		B	U	N/A	S	P	G
DPBA		B	C	D	E	F	G
DPBE		B	C	D	E	F	G
DPCA		B	C	D	E	F	G
CWVA	1.6	B	T	N/A	S	P	Q
CWVB		B	T	N/A	S	P	Q

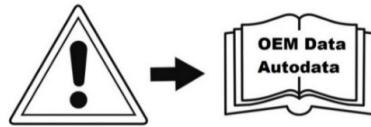
For torque settings Please refer to OEM derived data such as the vehicle manufacturer's own data e.g. Erwin, Autodata or Haynes Pro, for example.

Instructions for use:

Note: When loosening and tightening any pulley or sprocket fixing, do not use the camshaft or crankshaft alignment tools to torque against. ALWAYS use the correct sprocket/pulley holding tool.

Important - before each use:
Digital Camshaft Angle Setting Kit – Preparation and Clamp adjustment.

Before each use the clamping action of the adaptor locking levers may require adjustment.

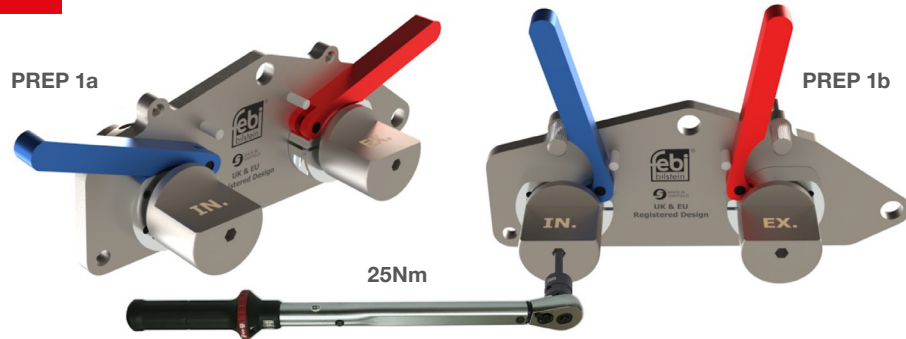


The following procedure should be used to set the clamping force (see image PREP 1):

Assemble the camshaft locking tools on a bench as shown in image PREP 1a, including fitting the camshaft adaptor into the assembly.

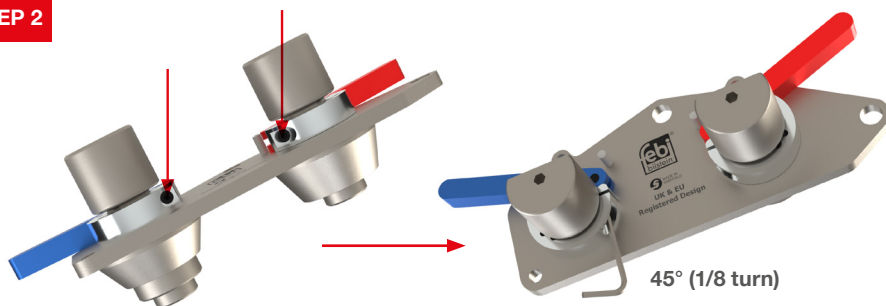
Lock the adaptor locking levers and insert the lever stop pins as shown in image PREP 1b. Using a 6 mm hex-key socket and torque wrench check that the adaptors do **not** rotate when a torque of 25 Nm is applied (Image PREP 1b).

PREP 2



If the adaptors rotate at less than 25 Nm tighten the clamping adjuster screw as shown in image PREP 2.

PREP 2



Adjusting the Clamping Force:

Unlock the levers and turn the assembly upside down to access the adjuster screws.

Note: ensure the camshaft adaptors are fully inserted into the clamps.

Adjust the clamping force using a 3 mm hex key as shown in image PREP 2. Tighten the screw by 1/8 of a turn then recheck the torque figure detailed in image PREP 1b.

Vehicle Preparation:

Access is required to both ends of the cam drive system which may require the removal of some or all of the following dependent on vehicle model:

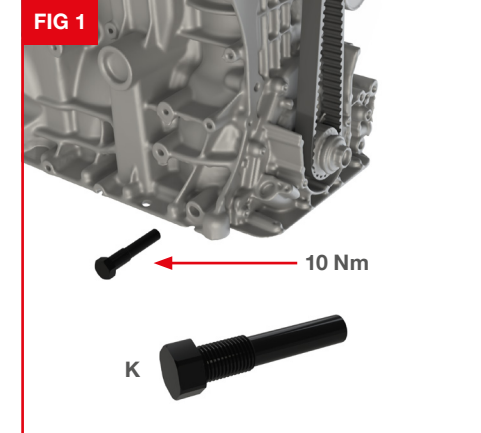
- Engine coolant.
- Engine top and bottom covers.
- Right hand front wheel and inner wheel arch.
- Coolant expansion bottle.
- Air filter housing and turbo charger pipes.
- Water pump drive belt and hoses.

Working from the transmission end of the engine remove:

- The Inlet camshaft end cover.
- Water pump (exhaust camshaft end).

Working from the belt end of the engine:

- Remove the timing belt cover.
- Remove the exhaust camshaft adjuster cover plate.



Initial setting of the engine (old belt in place):

Component K – Crankshaft Locking Pin

Locate the crankshaft locking pin blanking plug on the rear of the engine block and remove it. Screw the crankshaft locking pin (K) into the threaded hole and tighten to 10 Nm. If (K) will not screw fully in remove it and turn the crankshaft through 1/4 of a turn clockwise. Refit (K) and tighten to 10 Nm. Now turn the crankshaft clockwise until it locks against the nose of (K). See figure 1.

Component J – Exhaust Camshaft Rear Sprocket Timing Pin:

Fit the exhaust camshaft rear sprocket timing pin (transmission end) as shown in figure 2. If the hole in the pulley is 180 degrees out, remove (K) and rotate the crankshaft 360 degrees. Refit (K) and fit (J) as shown.

Once the initial mechanical alignment has been set remove (J) and using a suitable pulley holding tool remove the water pump drive pulley from the camshaft. (febi Part No. 1001109) Check both camshaft flats are in the 12 o'clock (horizontal) position as shown in Figure 3.

FIG 2

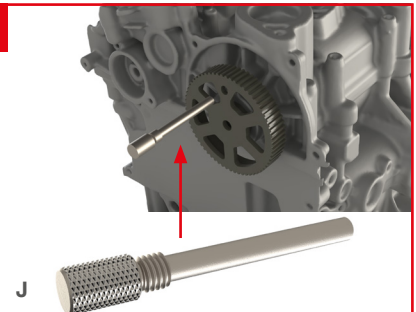
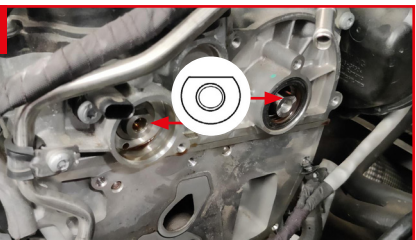


FIG 3



Fitting Camshaft Timing Kit:

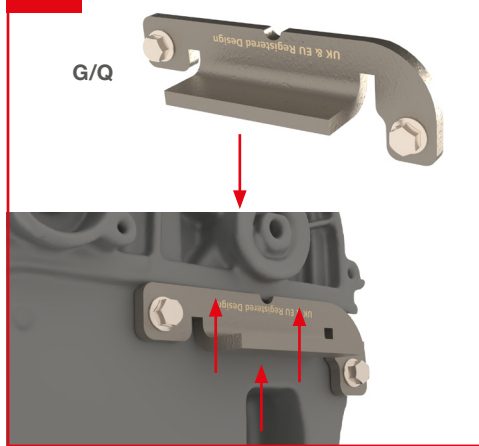
To accurately check the camshaft timing, it is necessary to fit the kit to the transmission end of the camshafts as follows:

Components G/Q & H - Inclinator Reference Bar:

First fit the corresponding reference bar (G / Q) using fixing screws (H) as shown in Figure 4.

Important: Ensure this area is clean so that the bar fits flush and touching against the bottom of the cylinder head for the full length of the top of (G/Q) as shown.

FIG 4



Camshaft Locking Tool Assembly:

Components A & B/N:

Assemble the corresponding mounting spacers (B) or (N) into plate (A) as shown in Figure 5.

FIG 5

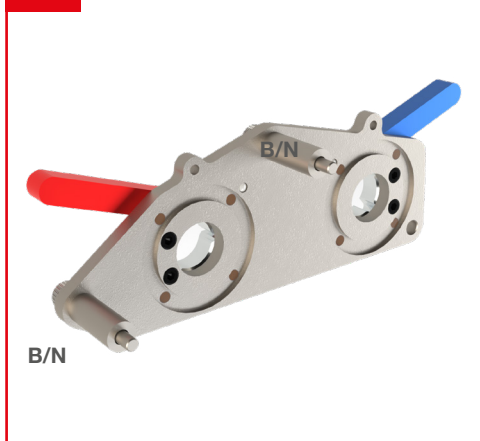
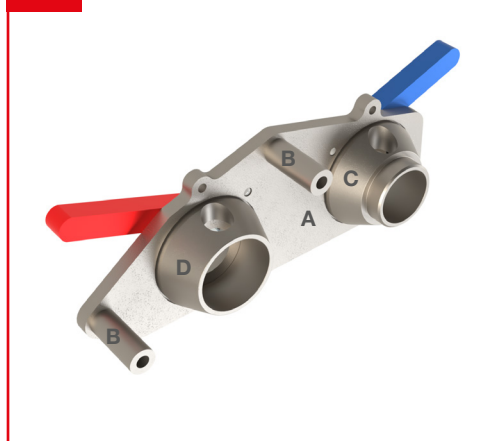


FIG 6



Components C & D:

Assemble components (C) and (D) onto plate (A) as shown in Figure 5. Ensure the holes in (C) & (D) are facing up as shown in Figure 6.

Components T/U:

When using components T or U, these are mounted on the inlet side only, as shown in Figure 7.

Camshaft Adaptors:

Components E & F:

Insert the 2 camshaft adaptors (E & F) through plate (A). See Figure 8.

Note: It is important that (E) & (F) are fitted to the correct camshaft as dictated by the markings. (E) must be fitted to the inlet camshaft and (F) to the exhaust camshaft. The ends of (E) & (F) must engage properly with the camshafts.

Tighten the clamping screws on both (E) & (F) using a 6 mm hex key as shown in Figure 9.

Max torque 15 Nm.

Note: When using spacers (C) or (D) the holes in have to be facing up as shown in Figure 6.

Note: Ensure the adaptors (E) & (F) are tight on the camshafts and cannot be rotated.

FIG 7

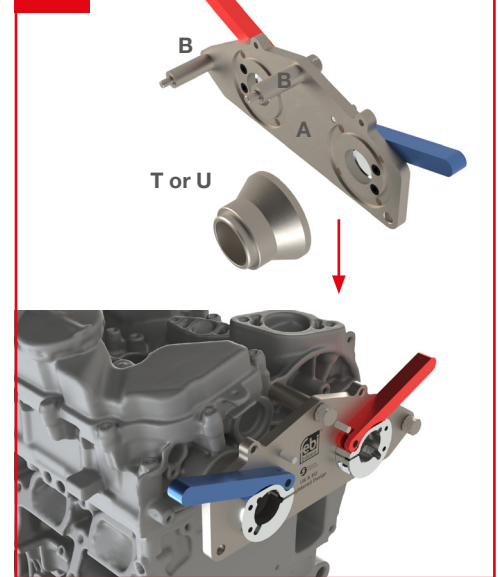


FIG 8

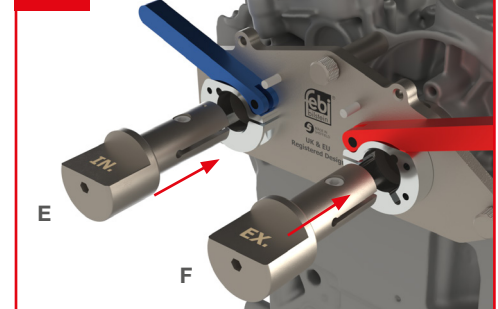
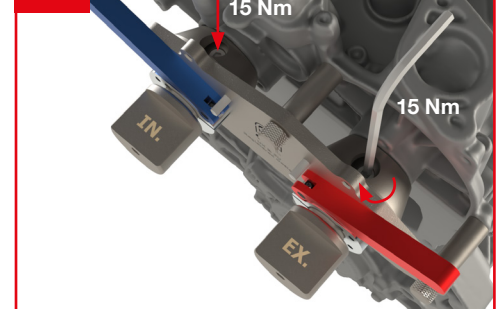


FIG 9



Components O & P:

Insert the 2 camshaft adaptors (O) & (P). See Figure 10.

Note: it is important that (O) & (P) are fitted to the correct camshaft as dictated by the markings.

(O) must be fitted to the inlet camshaft and (P) to the exhaust camshaft. The ends of (O) & (P) must engage properly with the camshafts.

Components O & R:

Insert the 2 camshaft adaptors (O) & (R). See Figure 11.

(O) must be fitted to the inlet camshaft and (R) to the exhaust camshaft. The ends of (O) & (R) must engage properly with the camshafts.

Note: Camshaft spacer adaptor (R) must be assembled into the adaptor plate (A) first before mounting plate A to the engine as shown in Figure 11 & 11a.

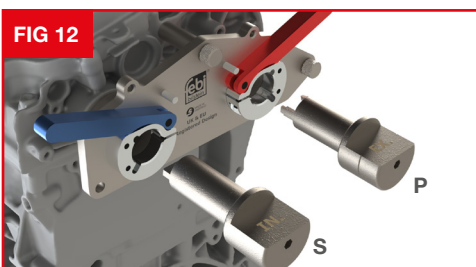
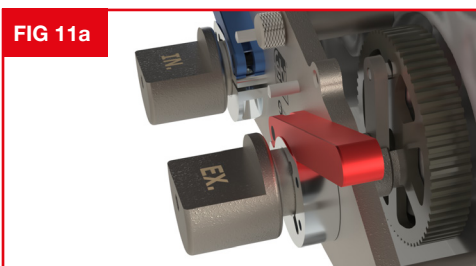
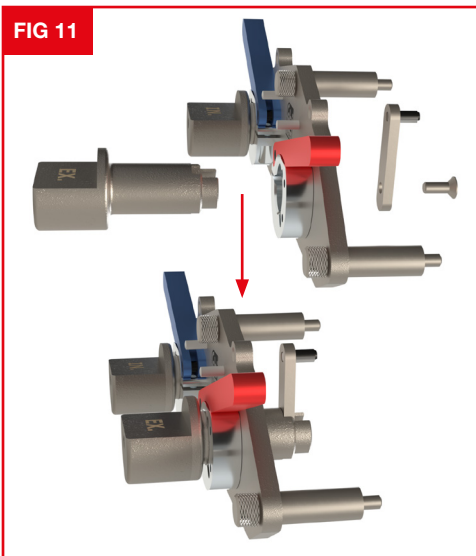
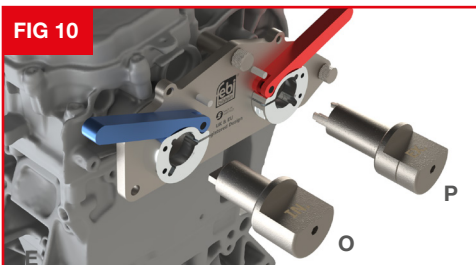
Components S & P:

Insert the 2 camshaft adaptors (S) & (P). See Figure 12.

(S) must be fitted to the inlet camshaft and (P) to the exhaust camshaft.

The ends of (S) & (P) must engage properly with the camshafts.

Note: It is important that (S) & (P) are fitted to the correct camshaft as dictated by the markings.



Checking Timing:

Component I – Inclinator:

Place the inclinometer (I) on a flat surface and switch it on. Allow the reading to stabilise.

With the engine set as detailed above place the inclinometer (I) upside down up against the inclinometer reference bar (G/Q) as shown in Figure 13 and allow to stabilise.

Holding the inclinometer against (G/Q) press ZERO to set the inclinometer to 00.0

Move the inclinometer to the flat on the inlet adaptor (the correct way up) and record the value shown. Repeat for the exhaust adaptor and record the readings. See Figure 14.

Note: Always record the direction of the reading.

Arrow up (▲) = Negative angle,

Arrow down (▼) = Positive angle.

Note: The arrows on the inclinometer indicate the direction to go to find zero.

Compare recorded reading to the vehicle manufacturer engine specific data.

Example: Engine Code DADA (1.5lt)

Specified inlet timing angle -0.3°
 $\pm 1.2^{\circ}$ = range of -1.5° (▲) to $+0.9^{\circ}$ (▼)

Specified exhaust timing angle $+1.1^{\circ}$
 $\pm 1.2^{\circ}$ = range of -0.1° (▲) to $+2.3^{\circ}$ (▼)

Warning: Figures quoted above are for demonstration purpose only. Please refer to specific engine tolerances as quoted by the vehicle manufacturer



Camshaft Drive Belt Removal:

With the kit fitted as per engine requirement, lock the camshaft adaptors and by lifting the red and blue locking levers and inserting the lever stop pins (L) as shown in Figure 15.

Using an appropriate pulley holding tool loosen the inlet camshaft adjuster control valve. See Figure 16.

Using an appropriate pulley holding tool loosen the exhaust camshaft pulley bolt and replace with new (finger tight only). See Figure 16.

Note: the exhaust pulley fixing bolt should not be reused.

Warning: Never attempt to loosen or tighten against the camshaft or crankshaft locking tools.

Component M – Tensioner Pulley Adjuster Tool

With the crankshaft still seated against the crankshaft locking pin (K) and the camshaft locked as shown in Figure 15 release the timing belt tensioner using the tensioner pulley adjuster tool (M). See Figure 17.

Remove the belt leaving the pulleys on the camshaft with their fixings finger-tight.

FIG 17

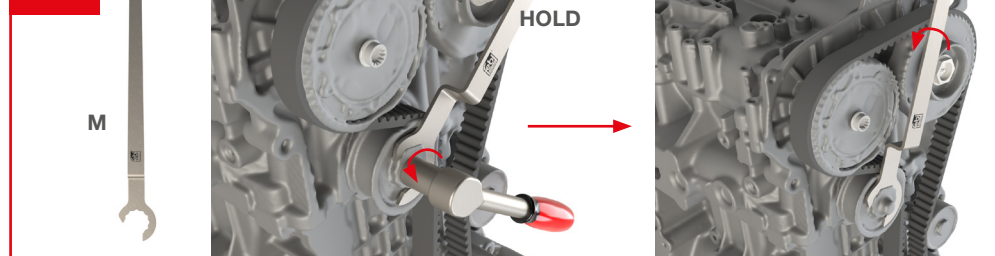


FIG 15

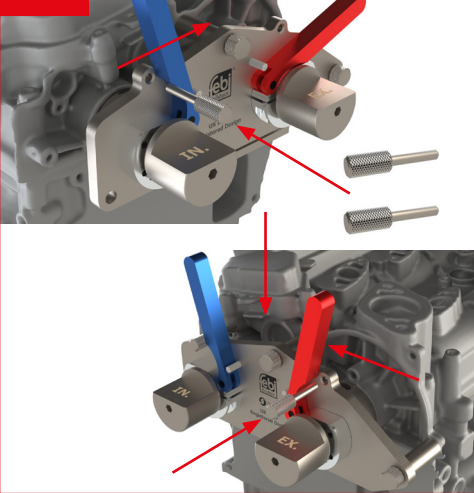
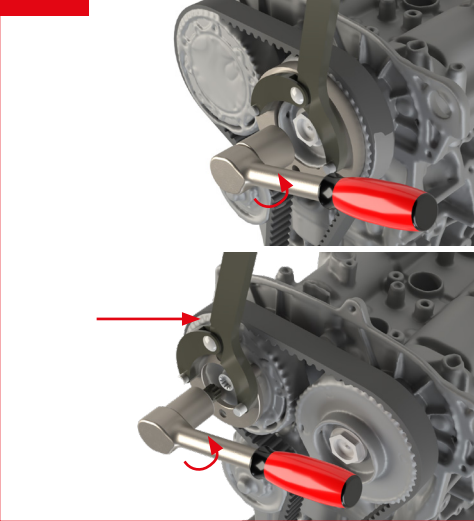


FIG 16



Camshaft Drive Belt Fitting:

Note: Before fitting the new belt ensure the camshaft adjuster control valve and crankshaft sprocket are in good order as described in the manufacturer's instructions.

With the crankshaft still seated against the crankshaft locking pin (K) and both camshafts locked as shown in Figure 15, fit the new belt to the crankshaft pulley only.

Fit the lower timing belt cover and crankshaft pulley as detailed in the manufacturer's instructions using an appropriate crankshaft pulley holding tool. Tighten the crankshaft pulley bolt to the correct torque and angle (see manufacturer's data).

Fit the new belt to the rest of the pulleys in the following order – guide pulley, exhaust camshaft and the inlet camshaft.

Check the camshaft pulley fixings are finger-tight only and the pulleys can turn independently of the camshafts. Tension the belt using the tensioner pulley adjuster (M) as detailed in the manufacturer's instructions.

Check the camshaft adaptor angles as detailed in the **Checking Timing** section above to ensure the camshafts have not moved (Figures 13 and 14).

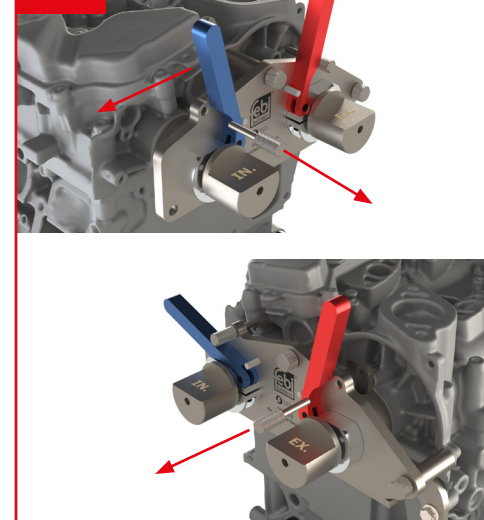
Using the appropriate holding tools tighten the camshaft pulley fixings to the manufacturers specified torque (Assembly torque only, not full final torque, in this example around 20 Nm).

Note: Every time the angles are checked always zero the inclinometer using the reference bar (G/Q) Figure 13 & 14. This is to ensure any change in the angle of the engine when for example raising or lower the vehicle ramp is compensated for.

Final Checks:

Release the red and blue locking levers by removing the lever stop pins (L) as shown in Figure 18.

FIG 18



Remove the crankshaft locking pin (K).

Turn the crankshaft 2 complete turns stopping just before returning to the TDC position and reinsert the crankshaft locking pin (K). Turn the crankshaft until it stops against (K).

Recheck the camshaft angles as detailed in the **Checking Timing** section (Figures 13 and 14) above.

Compare the reading to the manufacturer specification. If no adjustment is required the camshaft pulleys can be tightened to the manufacturer's full specification.

If adjustment is required perform the following procedure:

Initial Camshaft Setting & Calculation of Correction Angles:

With the crankshaft still set against the crankshaft pin (K) lock the camshafts as detailed in Figure 15. Using an appropriate pulley holding tool loosen the inlet camshaft adjuster control valve and finger tighten. See Figure 16.

Using an appropriate pulley holding tool loosen the exhaust camshaft pulley bolt and finger tighten. See Figure 16.

Place the inclinometer (I) upside down up against the inclinometer reference bar (G/Q) as shown in Figure 13 and allow to stabilise.

Holding the inclinometer against (G/Q) press ZERO to set the inclinometer to 00.0° and move the inclinometer to sit it on the flat of the inlet camshaft adaptor (the correct way up).

Insert a 6mm hex key into the end of the inlet camshaft adaptor and while holding the hex key, unlock the inlet camshaft by removing the lever stop pin (L — inlet only).

Adjust the position of the camshaft using the hex key until zero (00.0°) is shown on the inclinometer and then lock the adaptor with the locking lever and reinsert the lever stop pin (L).

Repeat this procedure for the exhaust cam.

Once both camshafts are set to zero and locked tighten the camshaft pulley fixings to 20 Nm

Note: Re-check that both camshafts are still reading Zero, if not repeat the above process.

Release the red and blue locking levers by removing the lever stop pins (L) as shown in figure 13.

Remove the crankshaft locking pin (K).

Turn the crankshaft 2 complete turns stopping just before returning to the TDC position and reinstall the crankshaft locking pin (K). Turn the crankshaft until it stops against (K).

Recheck the camshaft angles as detailed in the **Checking Timing** section (Figures 13 and 14) above.

Take note of the recorded values, these will be used to calculate the correction angle.

The correction angles for each camshaft have to be calculated. This is using the following equation.

$$(\text{Specified Angle}) - (\text{Current Angle}) = \text{Correction Angle}$$

See examples below:

Example Calculation

Use vehicle manufacturer's engine specific data and measured camshaft timing angle from previous section.

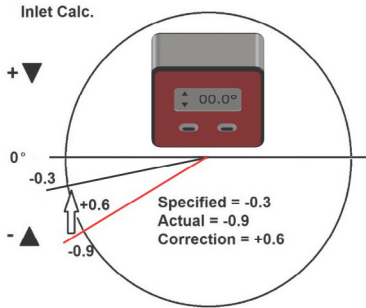
Example only
Engine code DADA (1.5lt)

Specified Inlet timing angle -0.3° +/- 1.2°
(manufacture data, engine specific)

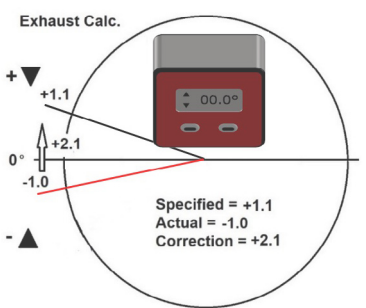
Specified Exhaust timing angle +1.1° +/- 1.2°

Examples

Current Inlet Camshaft Timing Angle
(Measured Angle) = (▲0.9°) -0.9°
(Specified Angle) – (Current Angle) = Inlet Correction Timing Angle
(-0.3°) – (-0.9°) = +0.6° turn 0.6° clockwise from Zero.



Current Exhaust Camshaft Timing Angle
(Measured Angle) = (▲1.0°) -1.0°
(Specified Angle) – (Current Angle) = Inlet Correction Timing Angle
(+1.1°) – (-1.0°) = +2.1 turn 2.1° clockwise from Zero.



Note: Arrows indicate the direction to rotate to reach zero

Final Setting of Timing:

Note: Once the Correction Angle is identified, the camshafts must be set to Zero and then adjusted from zero by the Correction Angle to compensate for the engine manufacturer's tolerances.

Using an appropriate pulley holding tool loosen the inlet camshaft adjuster control valve and finger tighten. See Figure 16.

Using an appropriate pulley holding tool loosen the exhaust camshaft pulley bolt and finger tighten. See Figure 16.

Place the inclinometer (I) upside down up against the inclinometer reference bar (G/Q) as shown in Figure 13 and allow to stabilise.

Holding the inclinometer against (G/Q) press ZERO to set the inclinometer to 00.0° and move the inclinometer to sit it on the flat of the inlet camshaft adaptor (the correct way up).

Insert a 6mm hex key into the end of the inlet camshaft adaptor and adjust the position of the camshaft using the hex key until the corresponding Calculated Correction Timing Angle is shown on the inclinometer and then lock the adaptor with the locking lever and insert the lever stop pin (L).

Repeat this procedure for the exhaust cam.

Once both camshafts are set to zero and locked, tighten the camshaft pulley fixings to 20 Nm.

Release the red and blue locking levers by removing the lever stop pins (L) as shown in Figure 14.

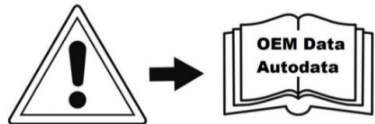
Remove the crankshaft locking pin (K).

Turn the crankshaft 2 complete turns stopping just before returning to the TDC position and reinstall the crankshaft locking pin (K). Turn the crankshaft until it stops against (K).

Recheck Timing:

Recheck the camshaft angles as detailed in the Checking Timing section (Figures 13 and 14) above.

Compare the reading to the manufacturer specification.





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