

## TOYOTA

### 4AGE 16v

Valve lifts quoted assume a rocker ratio of 1:1

CAM CODE CAM KIT CODE	APPLICATION	POWER BAND	POWER INCREASE	DURATION INLET/EXHAUST	VALVE LIFT INLET/EXHAUST	TIMING	FULL LIFT INL ATDC EXH BTDC	LIFT AT TDC <small>with clearance</small>		VALVE CLEARANCE	
								INLET/EXHAUST		INLET/EXHAUST	
TOY16VBP270	Fast Road	2000-6500	9BHP	252° 252°	.303" .303" 7.70mm 7.70mm	16 - 56 56 - 16	110° 110°	.037" .035" 0.94mm 0.89mm	.008" .010" .20mm .25mm		
TOY16VBP285	Ultimate Road	2800-7500	12BHP	288° 288°	.353" .351" 8.94mm 8.89mm	38 - 70 70 - 38	106° 108°	.096" .094" 2.41mm 2.36mm	.008" .010" .20mm .25mm		
TOY16VBP300	Rally	3000-8000	-	300° 300°	.351" .349" 8.89mm 8.84mm	44 - 76 76 - 44	106° 106°	.144" .142" 3.62mm 3.57mm	.008" .010" .20mm .25mm		
TOY16VBP320	Race For use with 'shim under' buckets	4000-9000	-	326° 326°	.375" .373" 9.49mm 9.44mm	57 - 89 89 - 57	106° 106°	.158" .156" 4.01mm 3.96mm	.008" .010" .20mm .25mm		

### 4AGE 1.6 20v

Valve lifts quoted assume a rocker ratio of 1:1

TOY20VBP270	Fast Road	1800-7000	10BHP	264° 264°	.342" .318" 8.69mm 8.08mm	22 - 62 62 - 22	110° 110°	.049" .033" 3.17mm 2.62mm	.010" .012" .25mm .30mm
TOY20VBP285	Ultimate Road	2500-8000	-	276° 264°	.340" .340" 8.64mm 8.64mm	30 - 66 60 - 24	108° 108°	.073" .055" 1.84mm 1.39mm	.010" .012" .25mm .30mm
TOY20VBP300	Rally	3000-8500	-	296° 280°	.327" .327" 8.31mm 8.31mm	42 - 74 66 - 34	106° 106°	.125" .103" 3.17mm 2.62mm	.010" .012" .25mm .30mm
TOY20VBP320	Race	4000-9000	-	320° 296°	.402" .325" 10.16mm 9.00mm	56 - 84 72 - 42	104° 106°	.142" .123" 3.61mm 3.12mm	.008" .012" .20mm .30mm

### CELICA 2ZZ VVTLI

Valve lifts quoted assume a rocker ratio of 1.645:1 low lift / 1.795:1 high lift

VVTLIBP270	Fast Road	2000-8500	15BHP	268° 288°	.268" .284"	N/A	.362" .472" 9.20mm 12.00mm	.362" .433" 9.20mm 11.00mm	.008" .010" .20mm .25mm
VVTLIBP285	Ultimate Road	2000-8500	-	276° 288°	.276" .284"	N/A	.382" .482" 9.70mm 12.30mm	.380" .445" 9.65mm 11.30mm	.008" .010" .20mm .25mm
VVTLIBP320	Race	2000-8500	-	276° 304°	.276" .296"	N/A	.382" .500" 9.70mm 12.70mm	.380" .460" 9.65mm 11.68mm	.008" .010" .20mm .25mm

*The rules of successful camshaft installation.*

*Research shows the majority of camshafts that fail; do so during the first few moments of operation. Many camshafts are irreparably damaged even before the engine is started, because the basic rules of camshaft break-in are not followed.*

*The cause of premature cam and tappet failure is metal to metal contact between the tappet and camshaft lobe. Should this contact occur due to lack of proper lubrication or excessively high pressure due to valve train interference shearing the oil film, then 'galling' will take place. When this happens, metal is transferred from the tappet to the lobe or vice versa in a process comparable to welding. Microscopic high spots, which are present on all machined parts, become overheated due to friction and pressure and bond together, tearing sections loose from the tappet or lobe. These pieces of metal remain attached and create further local overheating during following revolutions of the camshaft and lead to ultimate failure of the affected components.*

- 1. New Piper followers and springs are recommended. Piper springs must be used when stated.*
- 2. Coat camshaft(s) & followers in Piper cam lube or a high grade engine oil.*
- 3. Camshaft retaining cap bolts typically have a low torque wrench setting, therefore when fitting camshaft retaining caps it is important to observe the following rules. 1. Never use any power tools to tighten retaining cap bolts. This includes pneumatic or cordless impact wrenches, cordless impact drivers and drills, pneumatic or cordless ratchets. 2. Torque bolts to the manufacturers torque wrench settings. 3. Follow manufacturers recommended tightening sequences and stages. Camshafts are prone to snap when these rules are ignored and may render your warranty void. If you are unsure of the correct torque wrench settings, tightening sequences and stages for your engine; consult an official workshop manual or ask the workshop of your local dealer for advice. Do not rely on online forums.*
- 4. Check entire valve train for interference before starting the engine, i.e. valve to piston contact, for twin-cam engines, valve to valve possible contact and spring boxing. Valve springs should show .0.30" clearance between centre coils. Valve should have minimum .060" clearance from piston/block. Engines that utilise hydraulic tappets should have at least one inlet and one exhaust tappet temporarily replaced with mechanical tappets set with zero clearance. This allows accurate figures to be obtained from the above checks. When all checks are complete, ensure original hydraulic tappets are refitted.*
- 5. It is essential you check your new Piper camshaft is identical to the camshaft you are replacing, (except for lobe forms). In the unlikely event you notice any manufacturing defects, stop installation and contact Piper after sales for advice.*
- 6. Ensure coolant level is correct. The engine must start instantly and must not be subjected to a long grind on the starter motor.*
- 7. When installing cams in classic cars, before attempting to start the engine for the first time, fill the carburettor with petrol, prime oil system by manually turning the oil pump and ensure the ignition timing is correct).*
- 8. Do not idle the engine during the first 20 minutes of operation. RPM should be kept at 2500 or above. In pushrod engines oil throw-off from the crank may not be sufficient to lubricate the followers. Also contact stresses at the nose of the cam are very high at low speed. If adjustments are needed during the 20 minute run-in period, shut the engine off completely. **DO NOT IDLE.***
- 9. In some overhead cam engines where re-profiled camshafts are being used, you may require larger than standard shims.*
- 10. When modifying engines which utilise finger followers such as the Ford 'Pinto' engine, it is imperative that you ensure the followers sit in the horizontal position. Failure to do so will alter the rocker geometry.*
- 11. If the lobes of your Piper camshaft(s) are coated with a black phosphorus coating, this must not be removed. All camshafts are coated with a protective oil coating which must be removed with a suitable solvent prior to installation, please see separate documentation.*
- 12. If your new Piper camshaft came supplied with any of the following, please ensure to fit these after the protective oil coating has been removed. 1. Grub Screw. 2. Core Plug. 3. Ball Bearing (See note below). 4. Woodruff Key. 5 Bissell Pin / Dowel. Piper strongly recommends using a retaining compound when fitting core plugs, and a thread locking compound when fitting grub screws.*

*Note: With the following Vauxhall camshafts, only fit the supplied ball bearing if the camshaft being replaced has a ball fitted. Astra / Nova 1.3 / 1.4 / 1.6 GTE. Astra 1.8 J Series. Astra C20XE 16v exhaust camshaft.*

*A guide to correct camshaft timing*

*To check your camshaft timing you will need a 360° protractor (Piper Timing Disc or Pro Disc) and a dial gauge. The engine must be set at TDC and the protractor bolted to the crank pulley. Attach the dial gauge so that the foot is resting on the valve spring cap (or follower in OHC engines). Attach the pointer to the engine and zero the protractor. Engine is now at TDC with the protractor reading zero. Turn the engine until full lift is first shown on the dial gauge. Note number of degrees (e.g. 106° ATDC). Continue to turn the engine and note when lift starts to reduce (e.g. 110° ATDC). True lift position in this case, will be 108°. Your figures will differ but full lift is at midway point. Correct full lift position for your camshaft is shown in the Piper timing sheet for your engine.*