

ST4/ST4S VALVE: MEASUREMENT AND ADJUSTMENT GUIDE

This guide is supplemental to a good shop manual: LT Snyder's Desmoquattro Maintenance Guide is an excellent resource and is recommended. Use the accompanying worksheet to track existing measurements and determine replacement shim sizes.

Desmodromico (Desmo) engines use a positive valve control system to open and close the valves at the same time in the combustion cycle regardless of RPM. Ducati has made several variations on the 4 valve engine since its introduction. This process can be time consuming. For ease of mind it can be broken down into manageable steps:

1. Measure the clearances and record on the worksheet.
2. Compare the measurements to Ducati specifications and determine which shim(s) to replace.
3. Remove the shims that require replacement. Only work on one valve at a time to avoid mixing of shims. Measure the removed shims and record the measurement on the worksheet. Set the shim aside clearly labeled with the valve it came from (i.e. - a zip-lock bag).
4. Obtain correct size shim.
5. Reassemble: install the new shim(s) and re-measure the clearance.
6. Reassemble the engine and the components removed from the motorcycle.

Remove the fairing and interferences such as the battery, radiator, oil pressure sensing switch or other items that interfere with removing the cam belt covers and the valve covers. Remove the cam belt covers. Raise or remove the gas tank to gain access to the intake side of the engine. On Desmoquattro engines, access to the intake and exhaust rockers is by removing cover plates on either side of the engine directly above the intake boots and the exhaust outlet.

Refer to the Valve Clearance Measurement and Adjustment Worksheet that came with the kit. This worksheet is designed to sequentially track the measurements required for adjusting the valve.

Valve Measurement and Adjustment Procedure

Referring to a maintenance manual, or other reference, record the Ducati specification for the opening and closing shim clearances for your model. If you don't have the model available, the clearances are listed in LT Snyder's book and can be found in the Valve Clearances Fact Sheet (included). Enter the specified clearance in the worksheet in column "B" (the clearance specified for the opening shim). Enter into column "I" the clearance specified for the closing shim.

The valve clearances are measured when the respective cylinder is at Top Dead Center (TDC). That is the maxim end of the stroke of the piston.

On the ST4, when the Horizontal cylinder is at TDC, all the cam belt timing marks align.

Rotate the engine and set the horizontal cylinder at TDC. It is a good practice to mark the cam positions, belt location, and rotating direction with a paint pen or similar marking tool.

Remove the cover plates to access the opening and closing rocker arms and the associated valves and shims.

ENGINE SET-UP

REMOVE THE SPARK PLUGS.



Install the engine turning tool by removing the cover on the left side and inserting the tool, making sure the tangs on the tool engage the indents on the crank shaft. Once the tool is positioned correctly, tighten the retaining bolt snug with a 13 mm wrench.

Place the transmission in neutral.

REMOVE THE SPARK PLUGS.



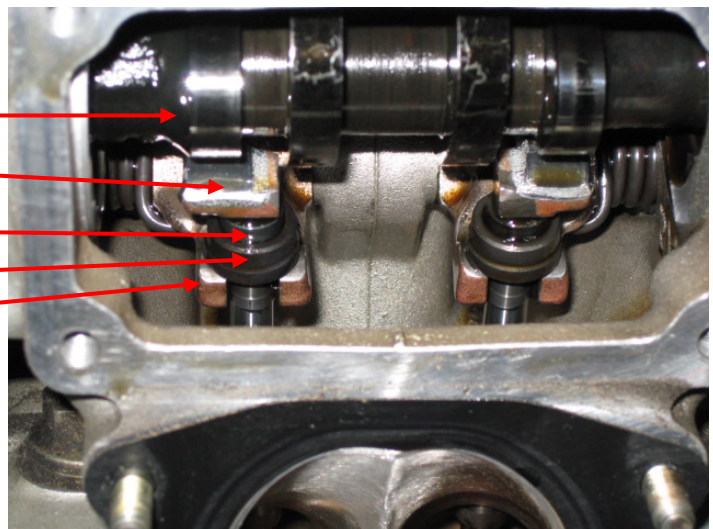
Rotate the engine counter-clockwise to find Top Dead Center (TDC) of the cylinder you are working on and align the timing mark on the crank.

NOTE: Lining up the timing mark verifies only 1 cylinder is at TDC, be sure to determine which cylinder is at TDC and work on that cylinder first.

Once the interferences are removed and the engine is aligned, the valve covers can be removed to reveal the internals to be measured.

4 Valve Ducati Identifier

Cam
Opening Rocker Arm
Opening Shim
Closing Shim
Closing Rocker



All measurements will be taken between the opening rocker arm and the opening shim. There are 2 intake valves, left and right, and 2 exhaust valves, left and right, on each cylinder

OPENING GAP MEASUREMENT

Once the engine is at TDC for the cylinder being measured, remove the valve cover. Be gentle with the gasket if you plan on reusing it. At TDC, the opening shim should be easy to spin with finger pressure.

Use the included feeler gauge to measure the opening gap: the gap between the opening rocker arm and the opening shim. Begin measuring using a thin gauge, ~ .05mm; proceed using thicker/thinner gauges until the gap can be discerned. The correct feeling is one of slight resistance, similar to the feeling of inserting the gauge into a large book and moving it about between the pages.

Record the measurement on the accompanying worksheet as measurement **A**. This is referred to as the “unloaded gap” and is the clearance for the opening shim. This measurement is good for two things: It is the clearance for the opening shim and it will be used to compute the clearance for the closing shim.



Measurement **A** is recorded in the measurement for the opening shim and the closing shim (for reference).

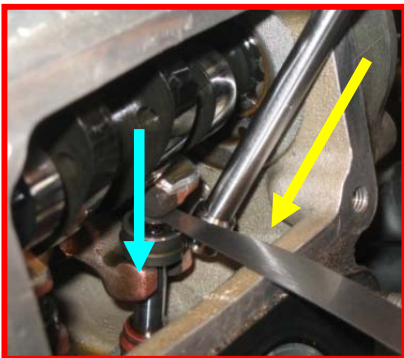
Record the Ducati recommended clearance in column **B**.

Compare the two measurements. If **A** is greater than **B** (if the measured is greater than the recommended, subtract and record the result in column **C**: this measurement will be added to the existing shim measurement to obtain the new shim size (if required). If **B** is greater than (or equal to) **A** the valve is within tolerance and nothing needs to be done.

PROCEED TO CLOSING GAP MEASUREMENT

CLOSING GAP MEASUREMENT

The measurement for the closing shim gap is referred to as the “loaded” gap. Measuring in the same place while pressing down on the closing rocker arm will determine the gap on the closing shim/rocker. Using the included valve depressing tool, press downward on the closing rocker. Measure using the



following procedure:

While pressing down on the closing rocker arm, measure the gap between the opening rocker arm and the opening shim. This is an easier measurement than trying to measure the gap between the closing rocker arm and the closing shim directly.

Record this measurement on the worksheet as measurement **F**.

To get the accurate closing shim clearance measurement, the unloaded gap (A) must be subtracted from the loaded gap (F). Subtract and record the difference as H.

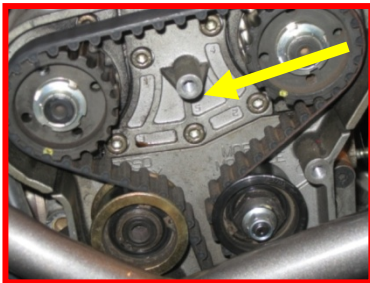
COMPARE measurement (H) to the value for (I). If (H) *is less than* or equal to (I), the clearance is within specification and nothing needs to be done: If measurement (H) *is greater than* (I) a new shim will have to be installed to bring the gap into specifications.

To figure out how much bigger the new shim should be, subtract (I) from (H) to get the difference and record the difference as (J). The value of (J) will be added to the measurement of the existing closing shim to obtain the size of the new shim required to bring the clearance into Specification.

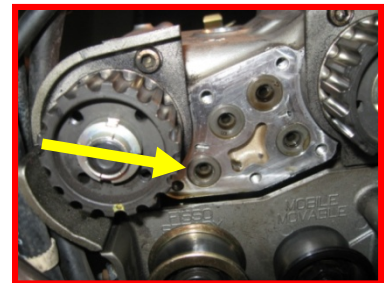
Repeat this procedure for the remaining valves. It is easier to measure all the clearances before any disassembly: once a valve is disassembled, no more engine rotation can occur until it is reassembled

OPENING SHIM REMOVAL AND MEASUREMENT

Changing shims will require moving the rocker arms out of the way to gain access to the opening and closing shims. The rockers arms are moved by the camshaft and pivot on rocker shafts. The opening rocker arms both pivot on one shaft while the closing rocker arms pivot on a different shaft. The respective shaft must be removed to allow the shim(s) to be changed. If only the opening shim(s) require replacement, then the only shaft to remove would be the one which the opening rocker arms pivot on. The “slap-hammer” included in the tool kit is used to pull the rocker shafts.



1. Remove the cover between the cam-wheels to expose the ends of the rocker shafts.



2. The ends of the rocker shafts will now be exposed.



3. Thread the end of the “slap-hammer” into the end of the shaft until finger tight. Slide the weight along the threaded shaft until it hits against the end. Repeat this procedure until the rocker pin moves and the rocker arm has enough clearance to move allowing access to the opening shim.

Remove the Opening shim from the valve stem.

MEASURE

NOTE: The Opening Shim has a Flat side and a recessed side. Using light pressure, close the digital caliper all the way and “zero” the unit: hold the On/Off/Set button until all Zeros appear in the display.

Open the Caliper sufficiently to allow the Opening Shim to fit between the jaws of the micrometer. The flat side of the Opening Shim should rest against the stationary jaw of the micrometer. The moveable portion of the micrometer will fit inside the recessed portion of the opening shim.



RECORD this measurement as **D**, the size of the existing shim.

ADD column **C** to **D** to obtain **E**. The number in column **E** represents the new shim size required to bring the opening gap into specification. Buy or replace the existing shim with one closest to **E**. Note, it is not always possible to get the exact shim size, a larger shim can be made to the correct size using 400/600 wet /dry sand paper to adjust the size of the shim.

CLOSING SHIM REMOVAL AND MEASUREMENT



Use the included clamps to clamp the valve stem to prevent it from falling into the cylinder while the closing shim is measured. Once the clamp is securely on the valve stem ,push downward on the closing rocker to reveal the half-rings that retain the closing shim on the valve stem. With the half-rings exposed, use the magnet to extract both halves of the retaining rings and set aside in a very safe place (a zip lock bag properly labeled with the valve the rings belong to).

With the retaining rings removed, you can now slide the closing shim up and off the valve stem. If the shim gets “stuck” at the top of the valve stem, it is an indication the valve stem has mushroomed a bit. Some emery cloth/sandpaper is needed to remove the wide part at the top of the valve stem to provide clearance for the shim to slide off.

The valve shim measuring tool and the electronic caliper will be used to take the measurement. The tool sets inside of the closing shim and gives a standard 10mm addition to your measurement.



MEASURE

Turn the caliper on. Close the jaws using light pressure. Select the unit of measure: either inch or mm.



Then shims are designated by Ducati in millimeters and using mm as the unit of measure simplifies new shim size selection. Press ZERO to set the base line for the caliper. Place the Shim Measuring Tool inside the closing shim (narrow end in) and measure the overall length.



RECORD

REMEMBER- The TOOL adds 10mm to the measurement: subtract 10mm from the measurement and record your number as **K** (in the example pictured, 6.57 would be recorded in column K)

ADD column **K** to **J** to obtain **L**. The number in column **L** represents the new shim size required to bring the closing gap into specification. Buy or replace the existing shim with one closest to **L**. Note, it is not always possible to get the exact shim size, a larger shim can be made to the correct size using emery paper to adjust the size of the shim.

REASSEMBLY



Obtain the correct shim(s) and reassemble the valve train. Slide the closing shim onto the valve stem, narrow side slides onto the valve stem first.

Depress the closing rocker and install the half rings (retaining rings). Do this with your finger. While depressing the closing rocker, set a half ring in place on the valve stem. Rotate this ring around to the back side of the valve stem to leave room for the other half ring. Install the other half

ring and release the pressure from the closing rocker

Place the opening shim onto valve stem

Once installed, slide the opening rocker over the opening shim. REMEMBER, you may have to wiggle the motor using the Engine rotating tool to get the cams in position to slide the rocker over the valve. Use the “slap-hammer” to drive the rocker pin back into place.

Once the valve is reassembled, re-check the clearances to verify the valve train is within specification. With the cam belts installed, rotate the engine to verify smooth operation. Reassemble as required.
