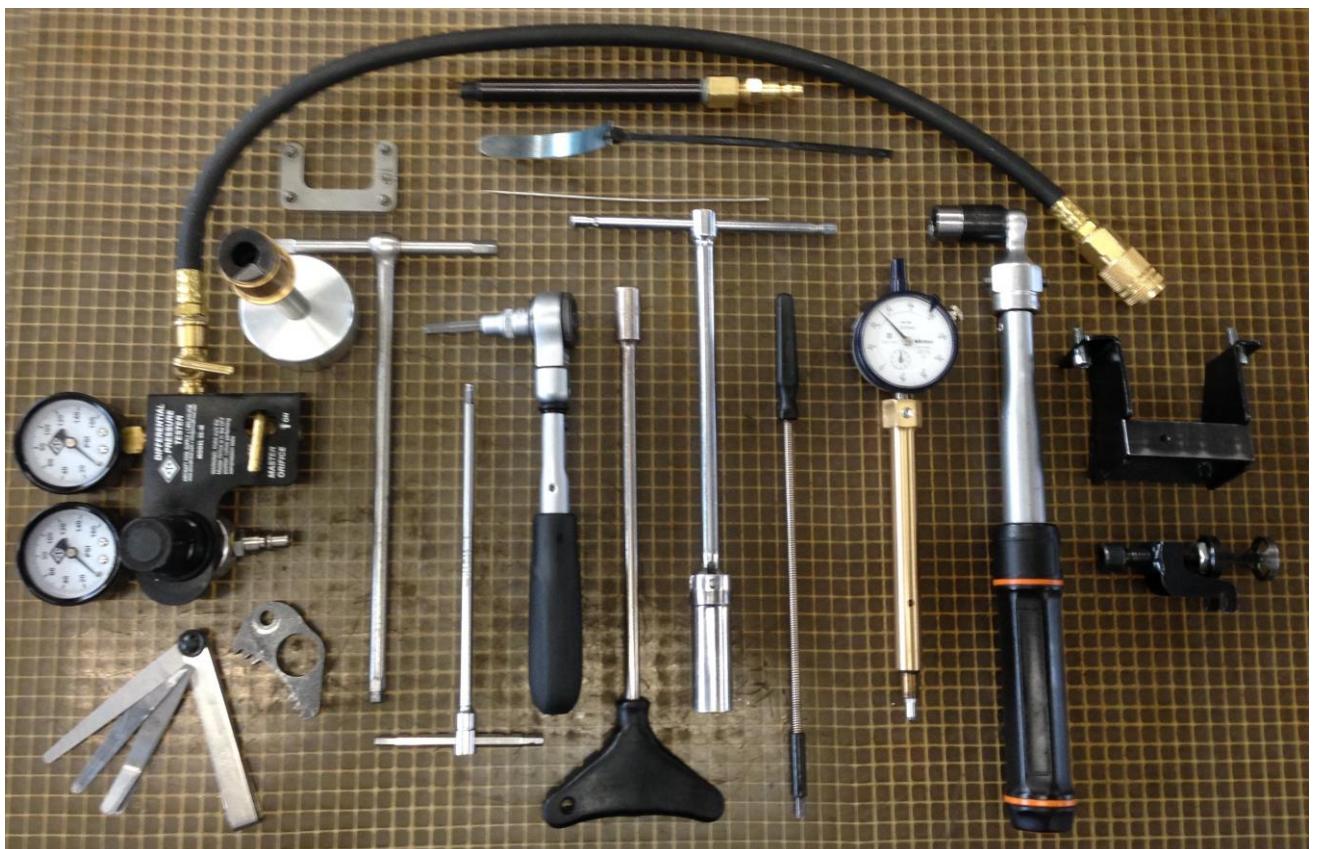


Exchanging the valve springs

Necessary tools:



1 Set metric feeler gages	1 Genuine swissauto250 valve spring surface cutter
1 Clutch block tool	1 x Needle pin tool
1 Valve spring compressing tool	1 x 16mm Spark-plug wrench
1 Camshaft block tool	1 x Torque wrench
1 Leak tester + spark-plug hole connector	1 x Magnet tool
1 Original 1,2mm bended feeler gauge	Socket wrenches n°10 & n°15
1 Gaging set (Mitutoyo)	Allen keys n°5 & n°8

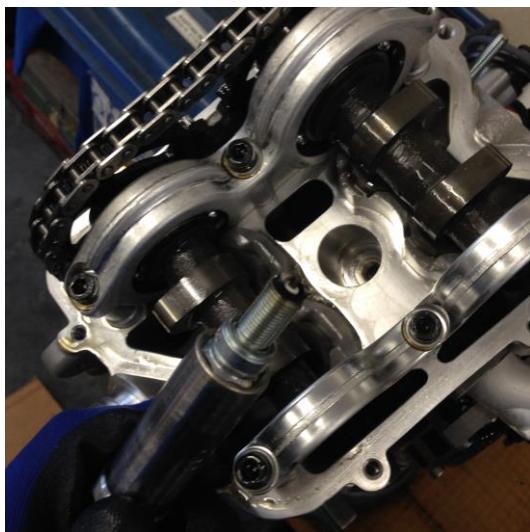
Exchanging the valve springs



Remove the cam-cover (8 M6 bolts).



Remove the spring of the automatic cam chain spanner. (1 screw)

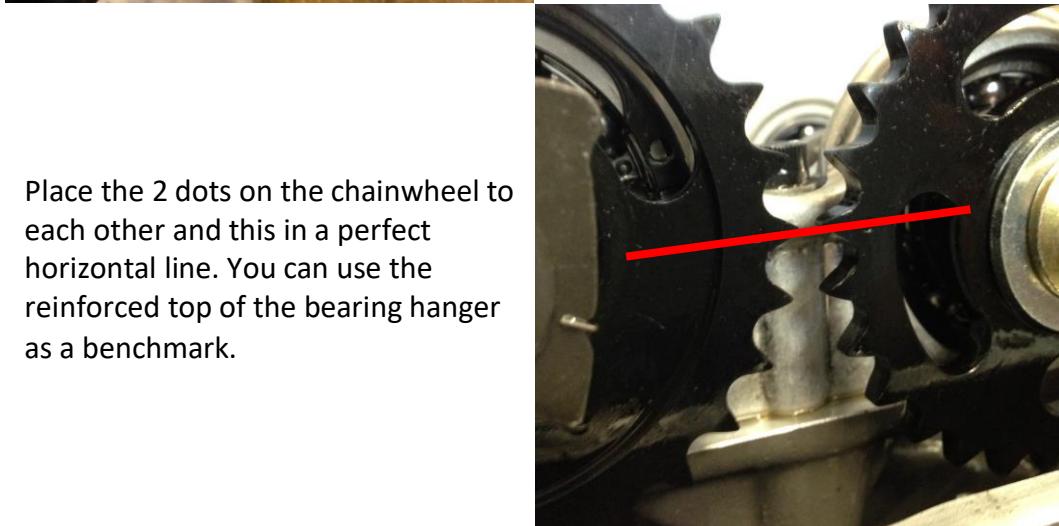


Remove the spark-plug.

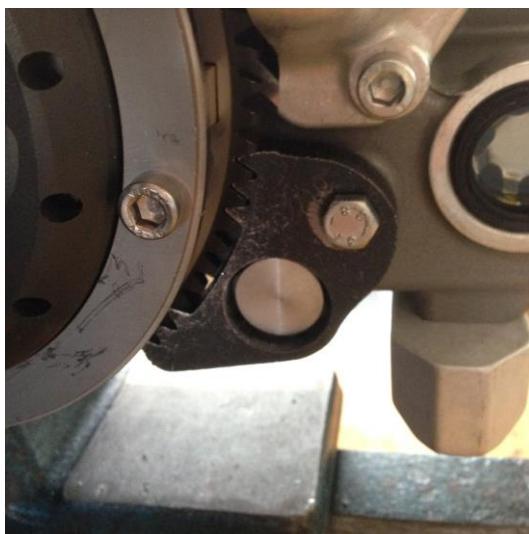
Exchanging the valve springs



Remove the charge coil (2 M6 bolts).



Place the 2 dots on the chainwheel to each other and this in a perfect horizontal line. You can use the reinforced top of the bearing hanger as a benchmark.

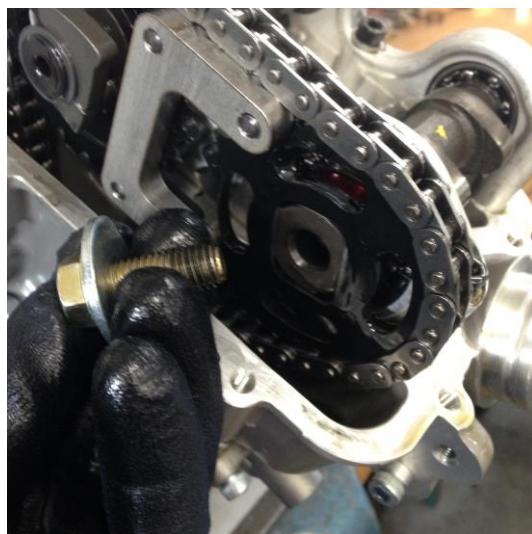


Place the clutch blok tool on the starter ring gear. Use a M6 bolt to keep it in place.

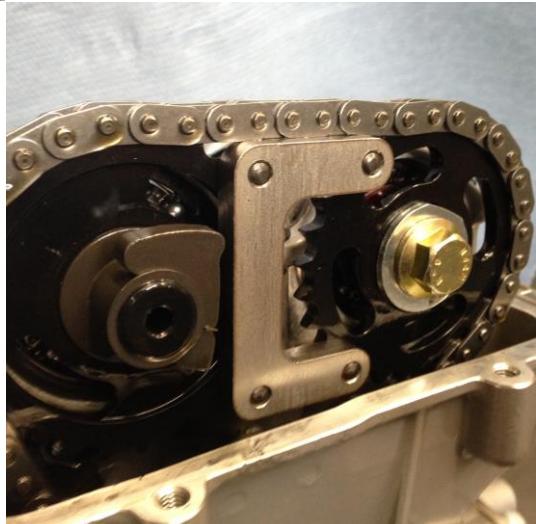
Exchanging the valve springs



Place the camshaft block tool between the 2 chainwheels. The top is marked on the tool.



Be sure the chain isn't stressed; it must rest on the top of the tool.



Remove the centerbolt of the inlet camshaft with socket wrench N°15.
(1 M10 bolt).

Exchanging the valve springs



Disassemble the automatic cam chain spanner (2 bolts).



Push down the catch to release the tensioner arm of the automatic cam chain spanner.



Push the tensioning arm of the automatic cam chain spanner completely to the end. Now it is ready for later.

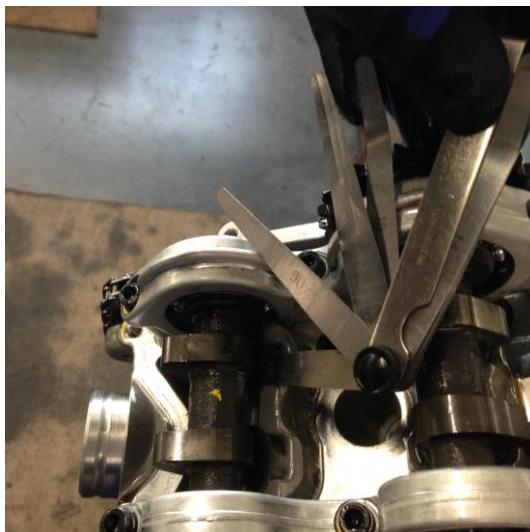
Exchanging the valve springs



Remove the chain wheel of the inlet camshaft.

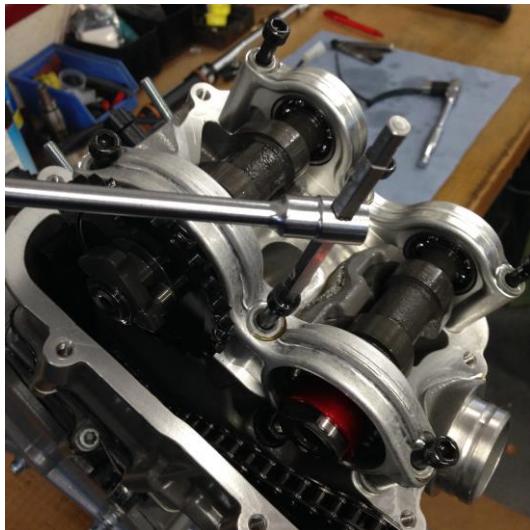


Place the cam chain in this position.



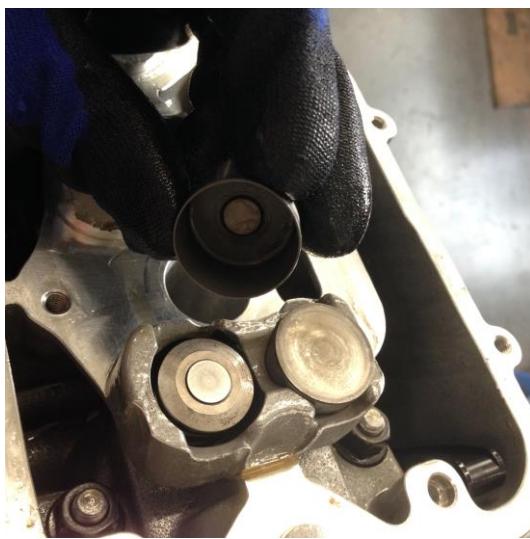
Control the valve clearance and take note of the values.

Exchanging the valve springs



Unscrew the bolts on both camshaft bearing hangers (6 M6 bolts).

Remove the camshaft assembly.
Watch out you don't lose the dowel pins (4 in total)!



Remove the 4 cam followers.

Exchanging the valve springs



Take off the 4 valve clearance shims; use a magnet to avoid they fall into the engine.

Place them together with the cam followers on a paper in such way you can place them later on back in the correct position.



Take your notes of the valve clearance and check if these are within the factory tolerances.

The INLET valve clearance should be between minimum 0,08mm and maximum 0,15mm.

The EXHAUST valve clearance should be between minimum 0,23mm and maximum 0,30mm.

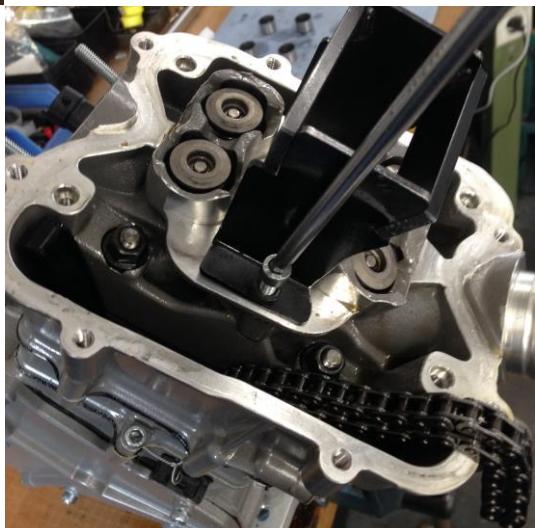
Exchanging the valve springs



To adjust valve clearance, measure shim, calculate difference and replace with the correct shim. Now the valve clearance is set and ready for later.



Place the air connector tube in the spark-plug hole.



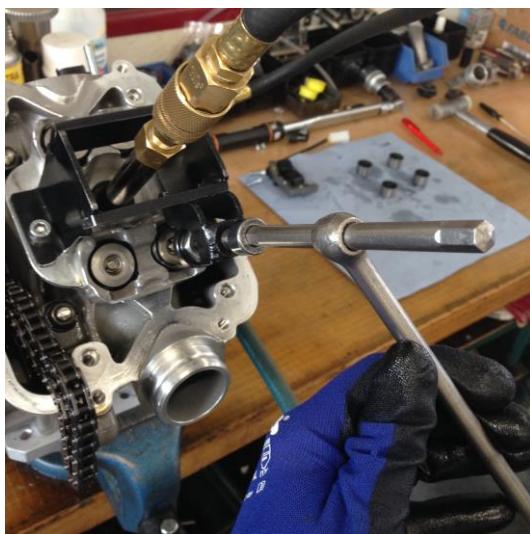
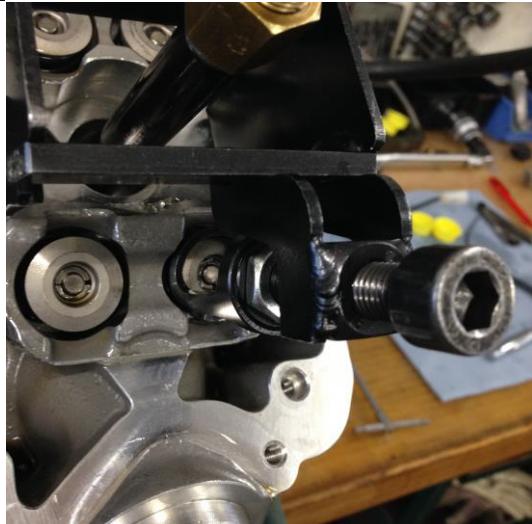
Exchanging the valve springs



To prevent that the valves drop into the cylinderhead we connect a pressure valve with the air connector tube (maximum 2 bar); in this case we use a leak tester for it.

Watch out ! To avoid damage of the tension rail alway be sure the clutch block tool is mounted before you open the air valve!

Hang the press unit under the bridge of the camshaft compressing tool and position it manually on top of the valve retainer.



Slowly increase the pressure on the valve spring assembly by turning in the compressing tool.
In case the valve opens, turn out again untill the valve closes. Then softly knock on the press unit with a metal hammer and retry.

Exchanging the valve springs



By compressing the valve spring, we create a gap between the retainer and the valve stem keys. Once big enough, it is possible to remove the 2 valve stem keys with a magnet tool.



Take off the pressure tool and the valve spring is ready to get out.



Take out the pressure washer.

Exchanging the valve springs



Control if the aluminium surface below the pressure washer is smooth and flat. If not, go to page 25 before you continue.

Place a new pressure washer in the valve spring opening.



Prepare the new valve spring set and add a little oil between the parts.

Exchanging the valve springs

Put the valve spring assembly in the valve spring opening.



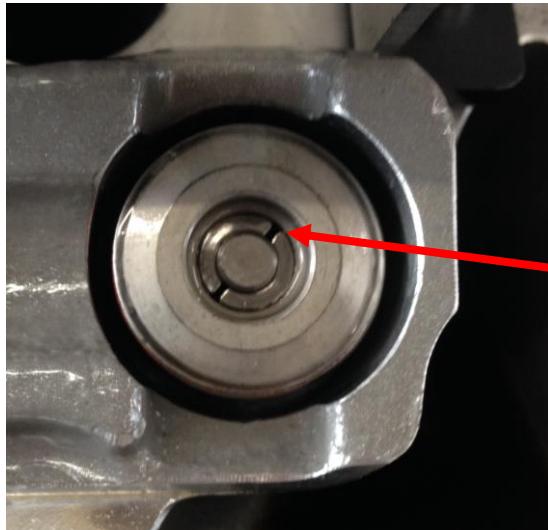
Hang the press unit under the bridge of the camshaft compressing tool and slowly increase the pressure on the top of the valve retainer by turning in the compressing tool.

Once the gap between the retainer and the valve stem keys is big enough, the valve stem keys will fall in. (Sometimes it is necessary to put some pressure on the keys with your finger)

Slowly unscrew the compression tool. Use a needle pin tool to keep space between the two valve stem keys equal.



Exchanging the valve springs



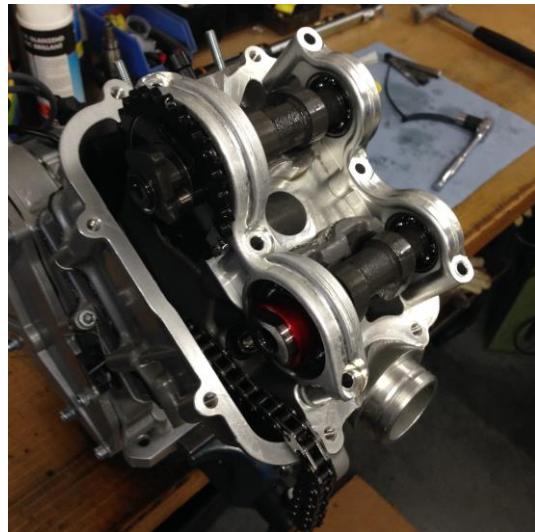
Refit the 4 shims in their retainers.



Mount the 4 cam followers.

Exchanging the valve springs

Place the camshaft assembly on the cylinderhead.
Again watch out you don't lose the dowel pins (4 in total)!



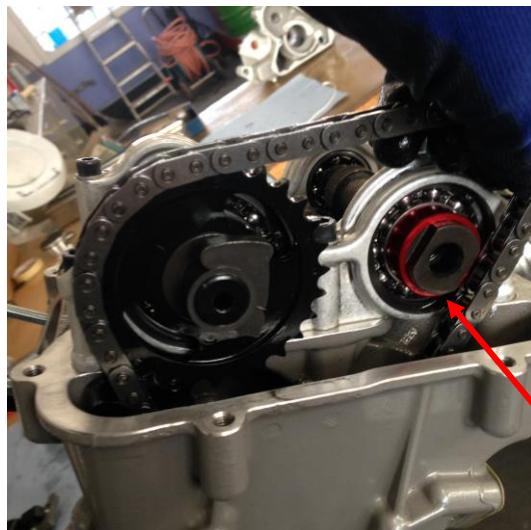
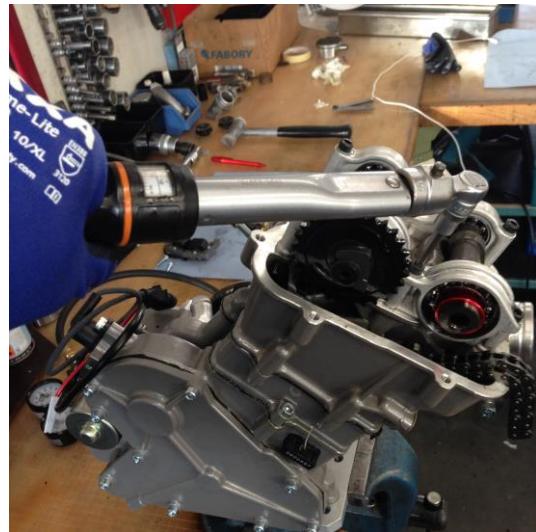
Always use a new set of these special forged bolts & HD washers.

Use a torque wrench to tighten the bolts. Set-up : 12Nm



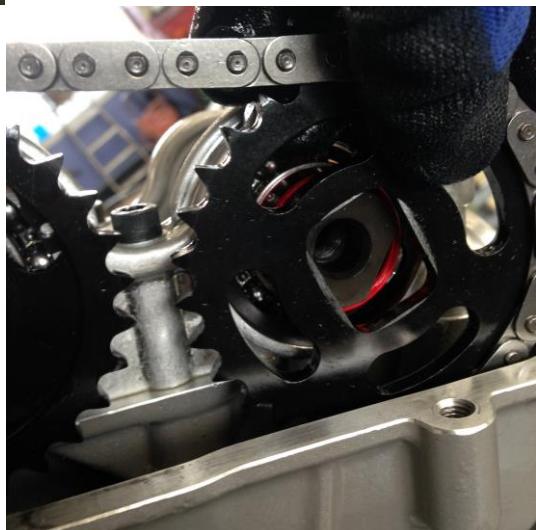
Exchanging the valve springs

Start with the middle bolts and cross-tighten the bolts uniformly. (6 bolts)



Refit the chain on the chainwheel of the exhaust camshaft on such way the dot is on the right side in a \pm horizontal line with the reinforced top of the bearinghanger. Keep the chain under tension with your hand by doing that.
Caution: Don't forget the red spacer!

Take the chainwheel of the inlet camshaft and hang it into the chain with the dot on the left side in a \pm horizontal line with the top of the bearinghanger. Again keep the chain on tension.



Exchanging the valve springs



Stick the chain wheel on the inlet camshaft in such way both marks inlet/exhaust point to each other. Push the tension rail with your finger via the opening of the automatic cam chain spanner to get exact position.

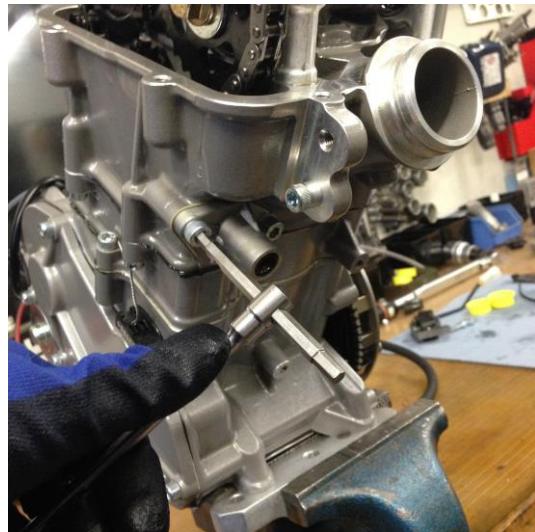
View from above; correct position of the camshafts.



Assemble the M10 bolt and washer on the side of the inlet camshaft. Don't tighten it yet!

Exchanging the valve springs

Take the automatic cam chain tensioner and reassemble it. (2 M6 bolts)



Place the spring in the automatic cam chain tensioner and tighten it. Always check if the o-ring is still on!

Remove the clutch block tool.



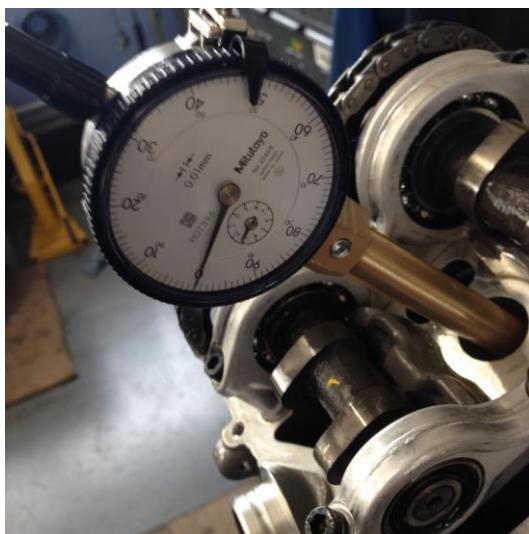
Exchanging the valve springs



Use the swissauto250 gaging set to put piston in TDC. Screw the gauge into the spark-plug hole and rotate slowly the crankshaft until the piston is in TDC. Zero the gauge!



Rotate the crankshaft minimum 720° by hand. (Possibly you will need some force to overcome the load of the valve train.)



Continue rotating until the gauge is on zero again. The piston is now on TDC.

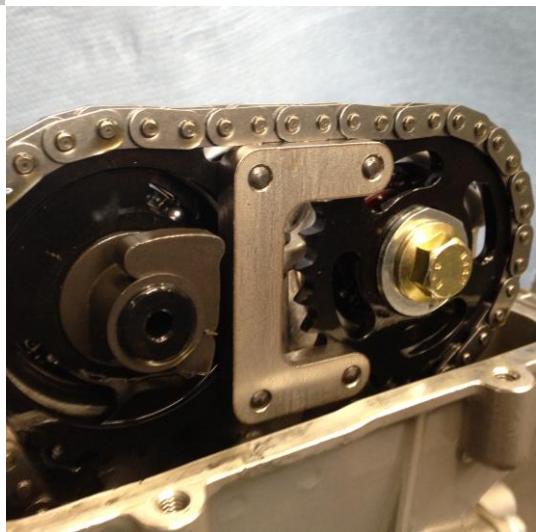
Exchanging the valve springs

Control if the marks on the chainwheels are in the right position.
If yes, the cam timing is correct.

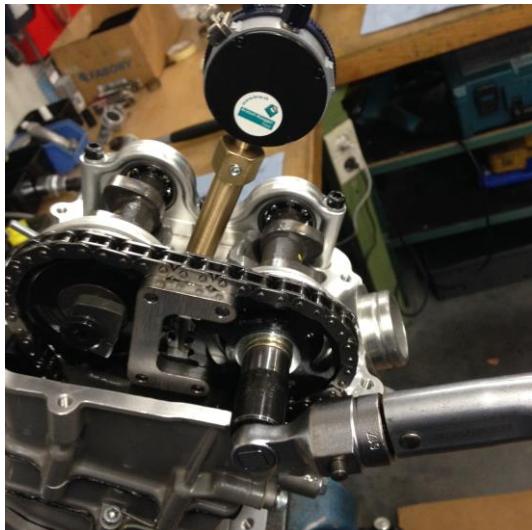


Use a torque wrench to tighten the M10 bolt on the side of the inlet camshaft. Set-up : 46Nm

Stick the camshaft block tool between the chainwheels.



Exchanging the valve springs



Tighten the M10 bolt on the side of the inlet camshaft. Don't forget to remove the camshaft block tool after!

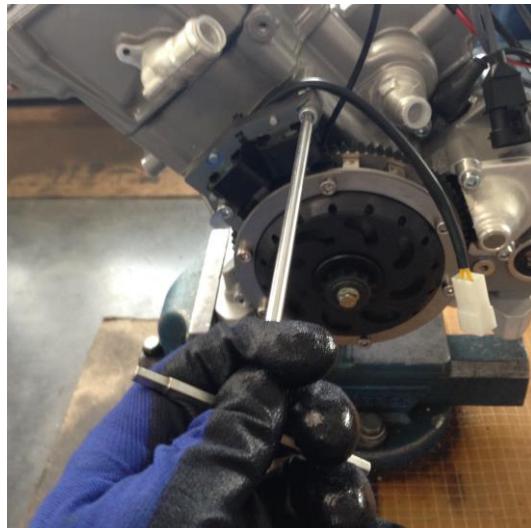


The tool must be positioned between the attachments for the charge coil.



Exchanging the valve springs

Place the charge coil on the bended feeler gauge. Be sure the metal segments rest on the gauge.



Fixate it with the 2 M6 bolts.

Rotate the crankshaft so far the bended feeler gauge is free



Exchanging the valve springs



Remove the 1,2mm bended feeler gauge by pulling on the tie-wrap.



Reinsert the spark-plug and tighten it by hand.



Put on the cam cover. Be sure both O-rings are mount correctly. (If the center rubber is clasped the engine will loose oil trough the 4mm bore above the waterbend on the right side of the cylinderhead.)

Exchanging the valve springs

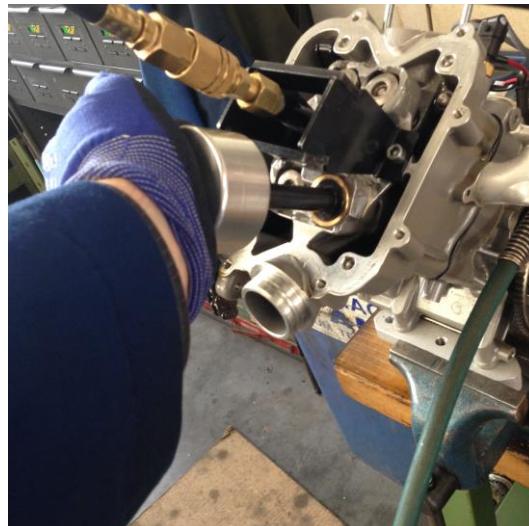
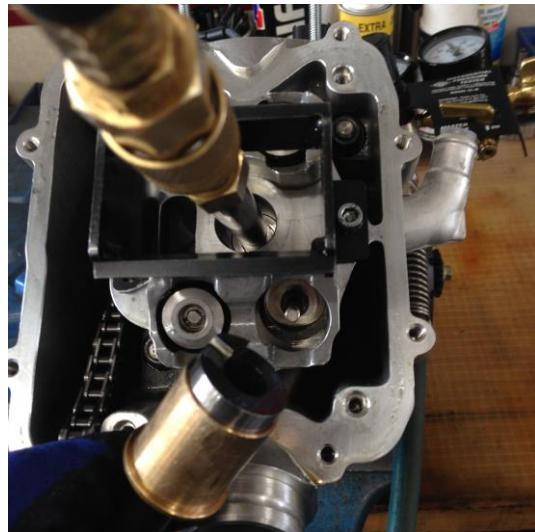


Tighten the 8 M6 bolts by hand.

Exchanging the valve springs

Follow up Page 12:

Use the genuine swissauto250 valve spring surface cutter if the surface below the pressure washer in the valve spring opening isn't smooth or flat.



The surface cutter uses an external guiding pilot that fits exactly in the cam follower bore. It has a hard metal head to flatten the surface around the valve stem seal. Rotate it clockwise (never counterclockwise) and add a little pressure. If there is any irregularity in the surface, you will feel the resistance of the cutter. Once the resistance disappears, the surface is repared. Use compressed air to remove eventual skimmes.

Example of 2 corrected surfaces on a new swissauto250 cylinder head.

