

## 5. ENGINE REASSEMBLY

### 1. Crankcase

Press the bearing bush with a suitable driver.



**Caution**

Take care that the joining line of the bearing bush is located as shown and that the oil holes in the bushing and in the crankcase bore are properly lined up.

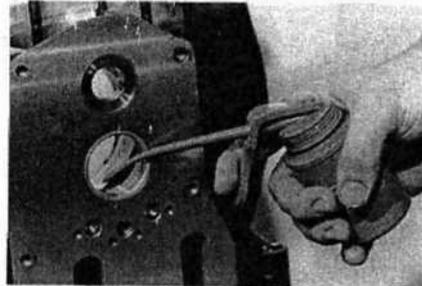


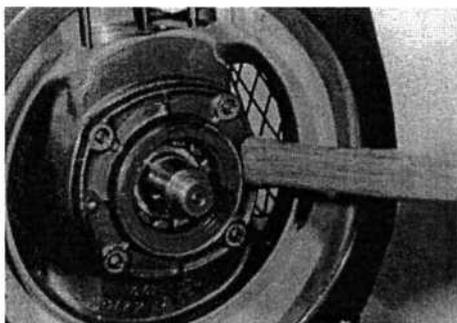
### 2. Crankshaft

To install the crankshaft gear and the inner race of the roller bearing heat up the parts to a temp. Of 90°C - 100°C ( 195 - 210 °F ).  
-> use oil bath or electric heater plate.



Oil the bearing bush and slide crankshaft into the crankcase. Take care not to damage the bearing bush with the gear teeth.





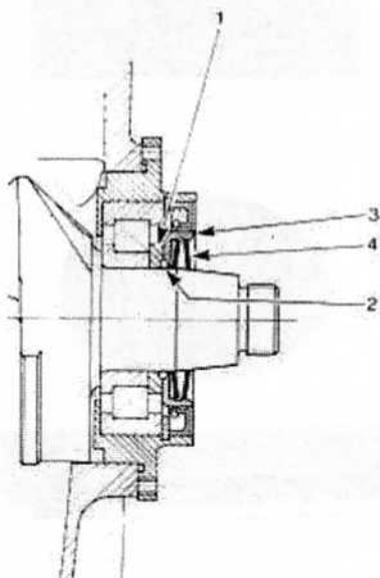
### 3. Main bearing housing

Press the outer race of the driver into the bearing cover. Insert the retaining ring with pliers. Press the oil sealing ring into the housing using the correct driver. Don't use grease for assembly. Insert o-ring in the bearing housing and put onto studs.

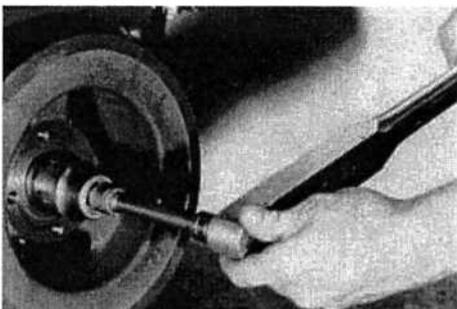


Caution

Bearing housing can only be fitted in one position. Tap lightly with a soft faced hammer to seat the cover. Torque down the fastening nuts crosswise.



Assemble the thrust washer (1) and o-ring (2), followed by the angle ring (3) and the two Belleville washers (4) exactly as shown.

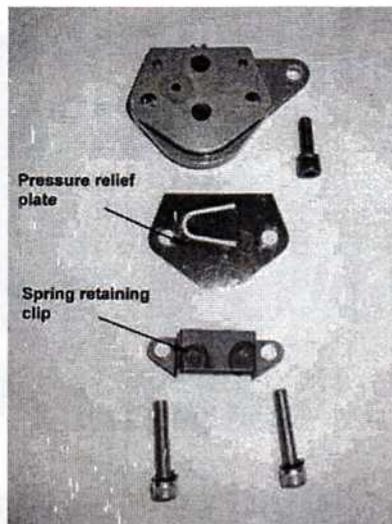


### 4. Flywheel

Clean crankshaft and flywheel taper free of oil or grease. Insert flywheel key and slide flywheel onto the crankshaft taper. Assemble flywheel retaining nut and tighten to specified torque.

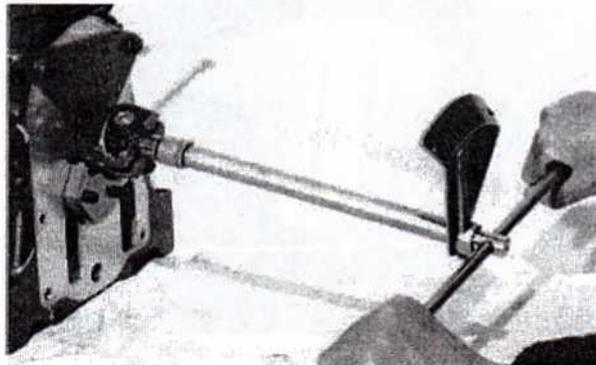
## 5. Oilpump

Reassemble oilpump with thin pressure relief plate, spring retaining clip and gasket. Before tightening the screws to specified torque pull the pump downwards. The clearance in the screw holes allows a sufficient backlash between crankshaft gear and pump gear.



## 6. Governor

Install holding device ( special tools ) on crankshaft or fix crankshaft with a hammer stick. Make sure that governor and crankshaft threads are free of oil and grease. Apply a couple of drops of Loctite 270 ( or similar ) on the governor thread. Torque the governor down according the torque table.



Attention

Governor with lefthand thread ! Spread flyweights to mount the socket of the torque wrench.

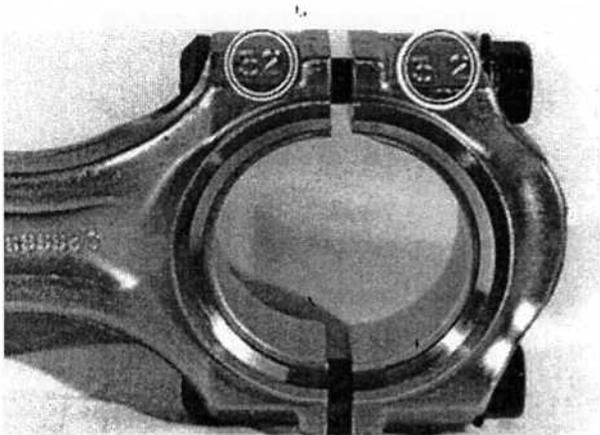
For correct governor setting refer to section Adjustments !

## 7. Connecting rod

To install new bearing shells, take a shell half and lay it to approx.  $\frac{3}{4}$  into the cap. Now press the bearing in a sliding move onto its seat. The bearing lip must fit into the groove in the cap. Install the bearing shell on the rod-side in the same way.

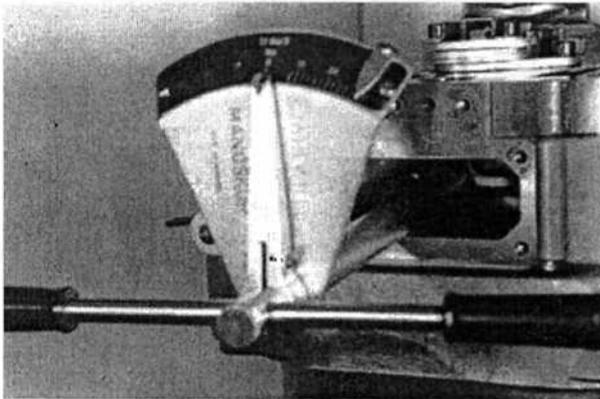


## REASSEMBLY PROCEDURES



Notice the stamped numbers on conrod and cap – side . These are matching marks i.e. identical numbers must be on rod and cap.

Oil the bearing shells and install conrod into the crankcase until it seats on the crank pin. Insert conrod cap through the bottom inspection cover



The stamped numbers must be aligned on the same side of the rod but it is not important which engine side the numbers face. Tighten the conrod nuts to the specified torque and reinstall crankcase cover.



### 8. Camshaft

Heat the camshaft gear wheel in an oil bath or an electric heater plate to 90-100 °C ( 195-210 °F). Thrust gear onto the camshaft using a suitable length of pipe and a hydraulic press.



The timing mark must face towards cam side of assembly.

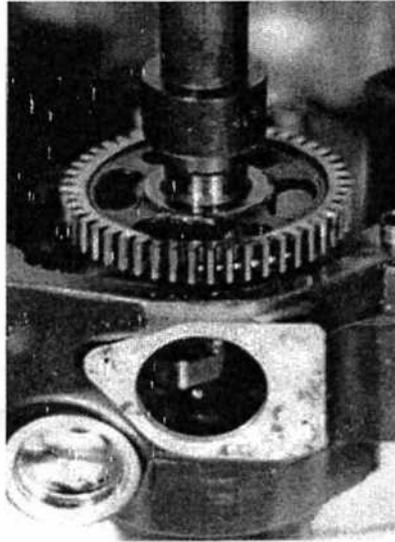


Press the camshaft bearing into the gear end cover using a driver:

## REASSEMBLY PROCEDURES

Now press the camshaft with a driver into the bearing. Use another driver as counter pressure piece for the bearing. Make sure that the bearing sears fully against the seat flange. Insert retaining ring. Install camfollower for the injection pump and tighten the fixing screw.

Every time install a new o-ring on the camshaft prior to pressing the camshaft into the bearing.

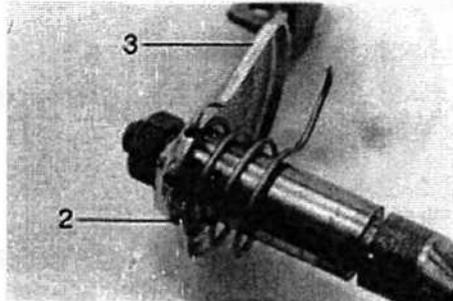
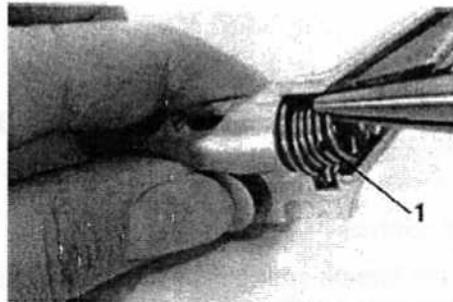


### 9. Governor control

Insert ratched pin and spring into the hole in the gear end housing.

Put the return spring (1) into small hole of the control lever.

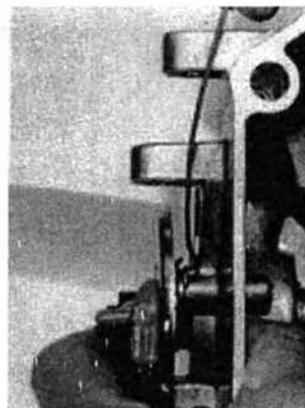
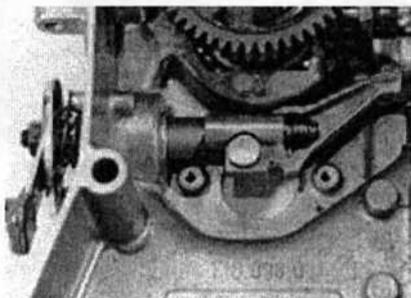
Move the torsion spring (2) over the eccentric shaft and hook spring leg in the space in the middle of the ratched plate (3).



Slide the eccentric shaft through the bearing bush in the housing and into the control lever.

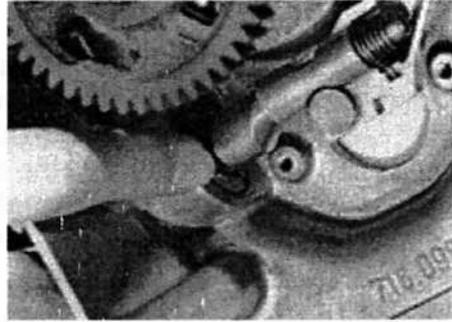
Turn the acceleration lever downwards ("stop") until spring leg of the return spring can be moved into the notch of the eccentric shaft end. (Figure c).

Use a wire loop to move and hook torsion spring leg to the boss of the gear end housing. (Figure d)



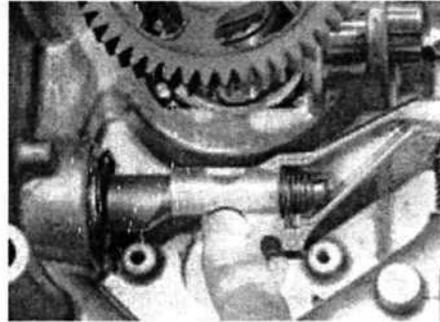
Push in eccentric shaft and clip ring spring into

the notch of the eccentric shaft.



Initiate performance test.

The tension of the return spring must be acting against the pressure onto the setting screw.



## Speed control - Stationary

The outer torsion spring pulls the acceleration lever from the stop-position back into idle-position.

## Speed control – Vehicle / Bowden cable

The outer torsion spring pulls the acceleration lever into stop-position.

## Speed control – Generator

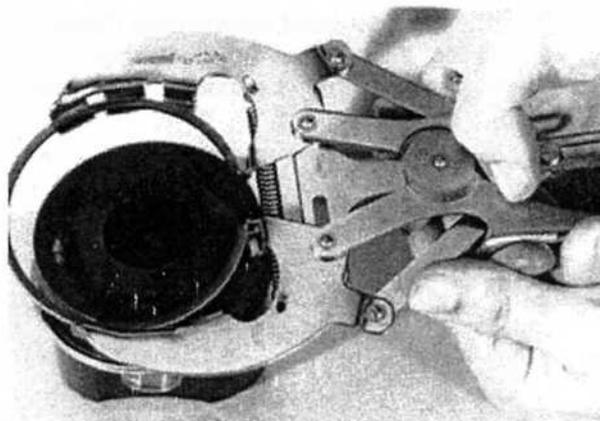
The outer torsion spring pulls the acceleration lever into full-speed-position.



The spring tension may be altered by hooking the spring leg into one of the neighboured notches !

## 10. Piston

Install the piston rings using a ring expander. Imprinted sign has to be on top.



# REASSEMBLY PROCEDURES



Oil the ring and piston skirts. Check that piston ring gaps are 120 degrees offset. Compress rings with ring compressor. Lay the cylinder down on the bench with bottom facing up. Install piston from bottom side of the cylinder. Never tap on the piston crown.



**Attention**

Never try to install piston through top of the liner as liner is slightly tapered. Push in the piston so far that the piston pin bore is slightly above edge of cylinder.

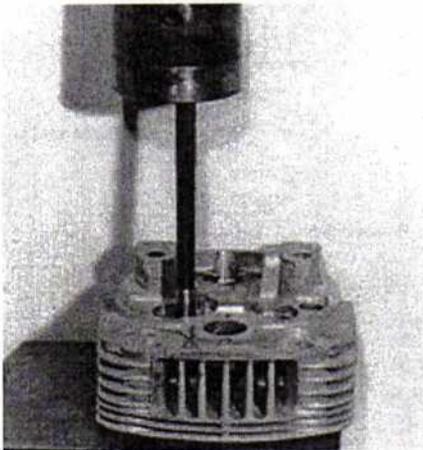


Slide the piston and cylinder over the studs.

**For 18W / 32W only :**

The arrow-sign ( or crankshaft-sign ) stamped on the piston top must point towards the fly-wheel.

Align the piston and connecting rod bores. Push the piston pin in and insert the retaining ring. Push the cylinder down until it seats firmly onto the engine crankcase.



## 11. Cylinder head

Press the valve guides into the cylinder head using a driver. Special care is necessary to ensure that the guide is exactly vertical before pressing in.



**Attention**

Before pressing in the exhaust valve guide, assemble the two small washers and retainer ring.

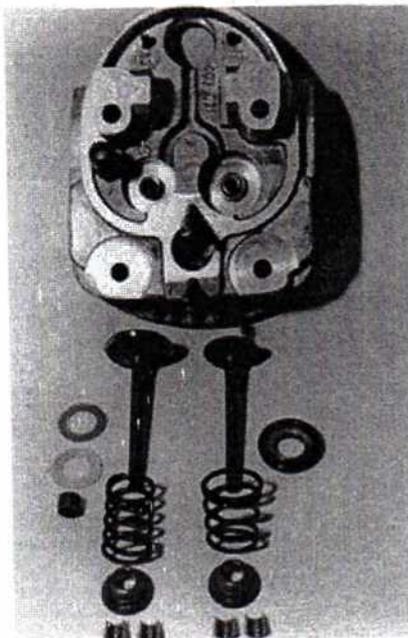
Note : Picture shows air cooled cylinder head !

# REASSEMBLY PROCEDURES

Grind in the valves. The rotocap and the conical shaped spring belong to the exhaust valve. The two thin steel washers must be under the cylindrical spring of the inlet valve. Fit new sealing cap onto the inlet valve guide. Before fitting the rotocap check for proper function : Spin the cap, if rattling sound or hard movement -> replace.

## NOTE :

32W engine => There's no difference between inlet and exhaust valve spring !



Fit cylinder head gasket and slide cylinder head down onto the cylinder. Fit spring washers and cylinder head nuts. On the shorter stud – intake side – fit the tote bracket and cylinder head nut without washer.

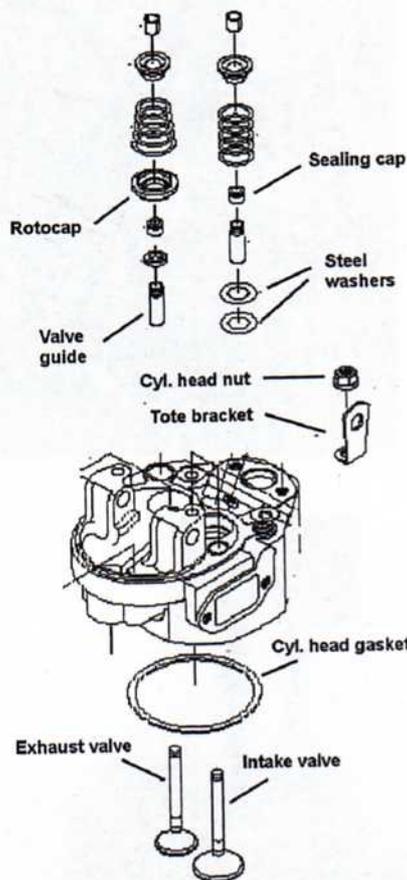


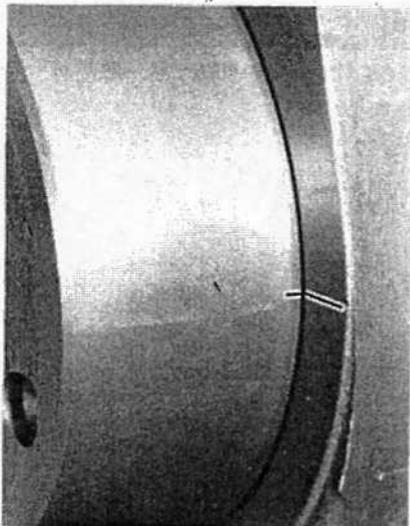
Attention

Model 15W doesn't have any cylinder head gasket.

At this stage don't torque down the cylinder head nuts as the rocker arms and push rods still have to be assembled at a later stage !

Recommended torque at this stage : 5 Nm





## 12. Gear end cover

To install the gear end cover, first bring the piston to TDC ( Top dead center ) position by aligning the flywheel timing mark with the TDC mark stamped on the crankcase.

Insert the governor pin into the bore in the governor. Use grease to keep the pin in place.

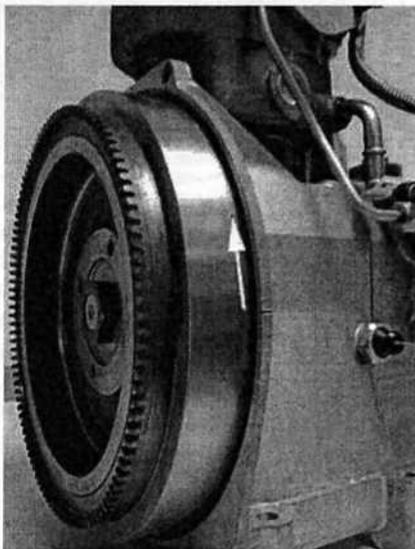


Line up the timing mark on the camshaft gear with the mark on the gear end cover.

Install the gear end cover onto the crankcase being careful not to move the camshaft gear. Remember to place the gasket !

After the cover is installed check the timing marks on the flywheel side. If both marks are within +/- 2mm lining up the timing is correct.

Insert the governor pin into the bore in the governor. Use grease to keep the pin in place.



Occasionally, however, the governor will tighten onto the crankshaft in position that makes it difficult to install the gear end cover. If this happens use the following procedure to install the cover :

Turn the flywheel until its timing mark aligns with approx. 1 o'clock position.

## REASSEMBLY PROCEDURES

Move the timing mark on the camshaft gear exactly 3 teeth to the left.

Install the gear end cover. Align the flywheel mark and the crankcase timing mark.

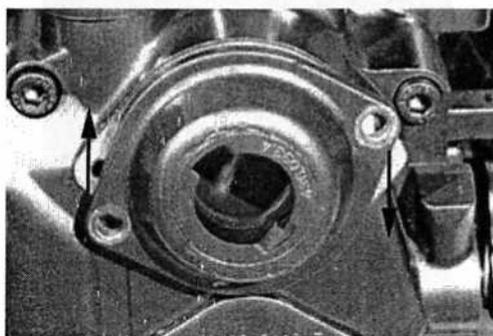
Check timing marks on camshaft gear and gear end cover. The timing is acceptable if these are within 0 – 2 mm to the left side !

### Note :

If the camshaft mark is in right side position the valves will come in contact with the piston ( hot engine ).



Place new o-ring in the flute of the crankhandle support. Lubricate the camshaft and the sealing lips of the oil sealing ring. Don't push the guide straight onto the gear end cover. Instead use a light twisting motion until the guide seats itself. Tighten the screws to specified torque.



### 13. Decompression device

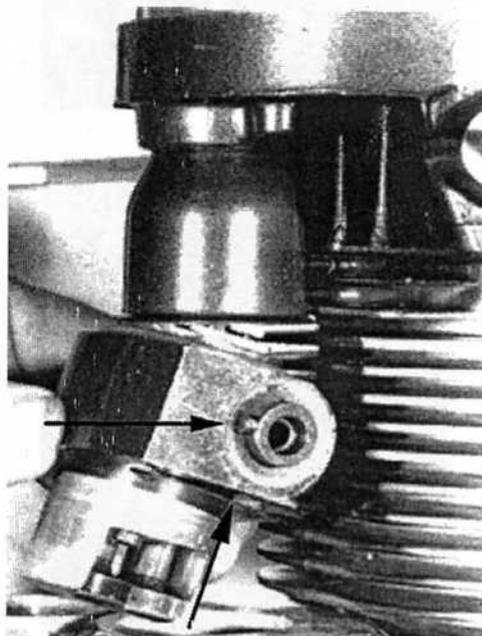
Slide the pushrod tube up into the ist hole in the cylinder head as far as possible. Remember to install a new o-ring in the cylinder head. To grease will help to assemble the tube.

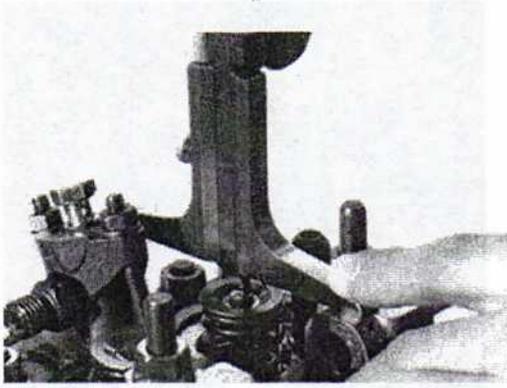
Assemble the decompression device with new o-ring and gasket.



Attention

Before reinstalling the decompression device check if the retaining pin for the shaft is still in place ( see arrow ).





When a new decompression device is installed the correct function must be checked. To do so install the decompression device with the 0,4 mm thick gasket. Continue with steps 14, 15 and 16. Turn the flywheel approx. 1/8 revolution before TDC and measure with a depth gauge the distance between bracket of the rocker arm shaft and spring collar of the intake valve. Next activate the decompression device and measure the distance again. There must be a difference between the two measurements of about 0,7 – 0,9 mm. If it is less than 0,7 mm you've to disassemble the deco device and replace the 0,4 mm gasket with two 0,3 mm gaskets ( all included in the joint set ). Carry out the two measurements again.

If the tolerance is more than 1,0 mm replace the 0,4 mm gasket with a 0,3 mm gasket. Carry out the two measurements.

#### 14. Push rods and protection tube

Slide the protection tube down onto the decompression device. Assemble the retaining spring exactly as shown.

Don't tighten the nut yet.

Insert the push rods through the protection tube into top of the decompression device. Both push rods are alike. Intake push rod has to be placed into tapped top hole closest to cylinder.

#### 15. Rocker arms

Place piston to TDC position. Line up rocker arms and push rods.

Oil rocker arm bolt before installing it into the support.



Attention

To prevent damage of push rods while torquing the cylinder head nuts, ensure sufficient clearance between setting screws and push rods. Tighten cylinder head nuts in 3 steps to specified torque.

## 16. Valve setting

Check that the decompression device is in operating position ( pin on 9 o'clock ). Set piston on TDC compression stroke. Use a 0,2 mm feeler gauge to control and reset the valve clearance of both valves. ( Insert feeler gauge between valve stem and rocker arm ). Open the lock nuts of the setting screws to reset clearance. Tighten the nuts while counterhold the setting screws with a screwdriver. Recheck clearance when finished.



Attention

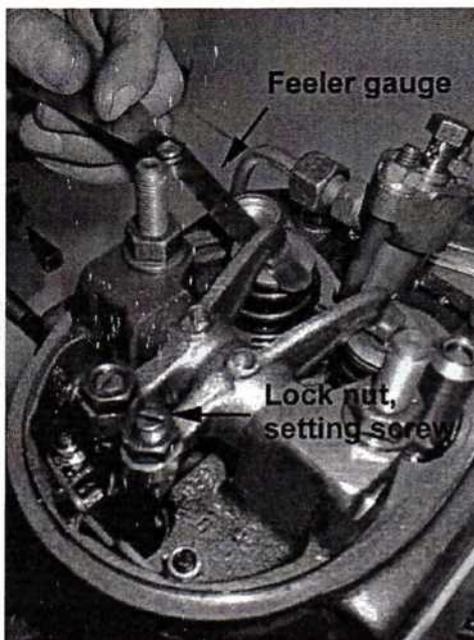
### Valve setting on installed engines :

Remove valve cover. Insert a crankhandle and rotate slowly to valve overlapping position.

Remove crankhandle and check drive pin inside the crankhandle guide => vertical position !

Insert crankhandle once again and turn around 1/2 rotation ( drive pin = vertical position again ! )

Check and reset the valves.



## 17. Oil filter => 32W engine, only

Fill up oilfilter with new oil.

Oil the rubber gasket and screw on oilfilter.



Attention

Hand tighten oilfilter only. Don't use tools.

Install oil drain flange ( oil screen assy ). Fill the engine with new oil up to dipstick mark between upper and lower position. Recheck oil level after first engine start.

## 18. Fuel injector

Replace the old copper washer located in the cylinder head injector seat.



Attention

Use one washer only !

Make sure that the old one has been removed. Install injector and clamp. Torque the two nuts as specified.

### NOTE :

Use only OEM oilfilter !

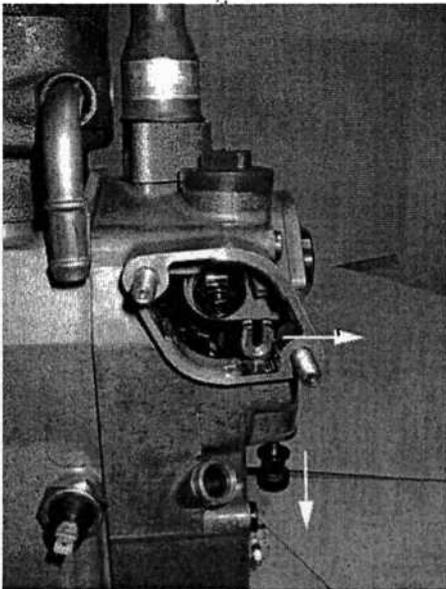
The recommended filter is special made to be high resistant against vibration shocks !

A special relief valve inside the oilfilter protects your engine against total damage !

### NOTE :

On used injectors you've to check the injector pressure and orifices !

If necessary reset pressure setting as specified in the technical tablets !



## 19. Injection pump

Place acceleration lever in full load (max speed) position and pull excess fuel button. Place rod of the fuel injection pump to max position. When sliding in the pump, the pin of the rod must grip into the yoke of the control lever. Reinstall the injection pump by using the same number and types of shims as were on the engine before.

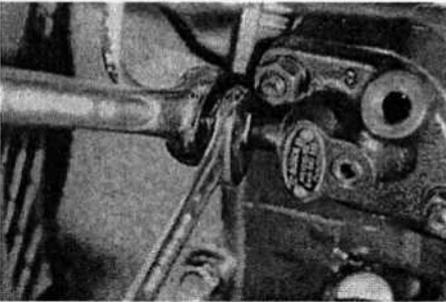
(See chapter -> injection timing !)

First install the paper gasket in any case.



**Attention**

To check correct assembly of the fuel injection pump turn the acceleration lever to stop-position. Excess fuel button must push back to normal operating position !



## 20 High pressure fuel line

Install the high pressure fuel line and tighten the union nuts on injector and pump. While tightening nut on injector and pump maintain counter parts with a 14 mm wrench.



## 21 Valve cover

Install the valve cover gasket and the valve cover taking care the gasket is properly seated on the cylinder head. Insert new plastic washers and tighten to specified torque.