



Notes on the Practical Work

for Subject No. 7

**LIGHT REPAIRS
AND ADJUSTMENT WORK
ON ENGINE**

VOLKSWAGENWERK AG · SERVICE SCHOOL

518 107 20 / January 68

C O N T E N T S

Subject	Page
Lubrication system	1
Crankshaft pulley	3
Removal and installation of fuel pump	4
Distributor - drive pinion	5
Cylinder head, intake manifold	7
Thermostat	7
Oil bath air cleaner	8
Fan housing, generator	8
Flywheel	9
Clutch	11
Valve gear	18
Ignition	21
Carburetor	25

LUBRICATION SYSTEM

Initial filling and refilling quantity 2.5 l

Type of oil HD-Branded oil
HD = Heavy duty

Viscosity

Viscosity is the value for the internal friction of a fluid (light or heavy fluids).

The viscosity of engine oil is strongly influenced by temperature and pressure.

The Society of Automotive Engineers (SAE) has drawn up a classification of viscosity code which is used internationally.

Temperature °C	Viscosity class
over 0	SAE 30
from + 20 to - 15	SAE 20 W/20
from + 5 to - 30	SAE 10 W
from - 5 to - 40	SAE 5 W

These viscosities are valid for VW engines of all types and years of manufacture.

Classification

HD oil is a collective term for engine oils that are blended to varying degrees. In order to more exactly differentiate between the individual oil the American Petroleum Institute (API) introduced a system that is used internationally.

Example:

MM = Moderate Medium (HD oil for engines with medium power weight ratio and moderate to high revolutions, rarely in city traffic).

MS = Most Severe (HD oil for engines with special lubricant requirements, high power weight ratio and higher up to highest revolutions, frequently in city traffic).

Oil pressure relief valve

Check the oil pressure relief valve when disturbances in the oil circulation occur, especially if the oil cooler leaks. If the plunger sticks at the top when the oil is thick, there is a danger of the oil cooler leaking. If the plunger sticks at the bottom the oil will flow directly back to the sump.

Since Aug. 66 a modified pressure relief valve piston with an annular groove has been installed in all engines (except 34 bhp). These pistons were previously installed in the 54 bhp engine. Subsequent installation is possible.

Oil cooler

When removing the oil cooler from engines with a vertical fan the following must be noted: with passenger cars the engine need not be removed, it is sufficient to remove the engine compartment lid.

1 - Versions with throttle ring (up to Aug. 64)

Unhook spring on throttle ring, release two M 6 screws on throttle ring, undo and take out the two slotted screws on the sides of the fan housing. Release the generator pulley, so that the vee belt can be taken off. Undo the generator strap, loosen the accelerator cable and pull it out, disconnect the ignition coil leads, lift the fan housing upwards.

When removing the oil cooler unscrew the attachment nuts with the VW 109 box wrench. The rubber seals must always be renewed.

Check the oil cooler for leaks and also check that the attachment studs are tight: Test pressure 85 psi (6 atü), Test appliance: VW 661/2 (local manufacture).

2 - Versions without throttle ring (from Aug. 64)

With these vehicles the thermostat must be screwed off the connecting rod.

Oil pump

Since July 67 the oil pump has been attached by 4 studs M 8 - previously M 6. At the same time the washers and nuts were replaced by M 8 sealing nuts with a plastic ring.

When removing the oil pump unscrew the nuts on the cover and take off cover together with gasket.

Take out the gears.

Slacken the M 8 nuts on the crankcase above and below the oil pump, remove oil pump body with extractor VW 201.

The gaskets must always be renewed.

Since Dec. 1966 a plastic gasket has been installed between the crankcase and the oil pump.

When installing the pump body insert the oil pump pilot VW 665, turn camshaft 360°. This will center the pump body opposite the slot in the camshaft.

Width of oil pump gear wheels:
 25, 30, 30 reinforced, 34 bhp (up to 8.65) 17 mm
 34 bhp (from 8.65) and all 1.3, 1.5 and 1.6 l engines 21 mm

Assembly:

Ensure that lubrication groove is clean, do not use sealing compound. Soak gear wheels in oil so that the pump sucks immediately.

CRANKSHAFT PULLEY

Removal

- 1 - Take off fan belt
- 2 - Take out bolt on crankshaft pulley
- 3 - Remove crankshaft pulley by using fan pulley extractor VW 203 b and fan pulley thrust pad VW 203 d (the claws of the extractor must face inwards, as otherwise the pulley will become distorted).

Hub

Triple thread oil thrower (previously single thread). Hub diameter 49.92 mm. Minimum clearance 0.1 mm. In cases of loss of oil, pulleys with hub diameters at the upper tolerance limit can be installed. These pulleys are marked with a "G" on the end surface.

If the main bore in the crankcase has been reamed out to 0.5 mm oversize, a pulley with an oversize hub 50.5 mm dia. must be installed. This hub can be supplied for 25,30,34,40 and 44 bhp/Type 2 engines. Crankcases, the main bearing bores of which have been reamed out by 0.5 mm (oversize), are marked with "O" near the engine number.

Firing point markings

Engine (bhp)	Degrees before TDC
25	5
30	7.5
34,40,42,44	7.5; 10
45 up to Aug. 62 (Engine No. 0066631)	7.5; 10
45, 54	7.5; 10; 12.5
47	0°; 7.5; 10
44 (selector automatic), 44, 47 (Exhaust control system)	0°; 7.5; 10
54 (fuel injection system)	0°; 7.5; 10; 12.5

On the circumference of the pulley the measurement for 2.5° is:
 about 3.8 mm - Type 1 and 2; about 4.5 mm - Type 3.

REMOVING and INSTALLING FUEL PUMP

- Removal
- 1 - Disconnect fuel line and hose from pump
 - 2 - Unscrew nuts at flange with wrench VW 126 b
 - 3 - Take pump off
 - 4 - Remove push rod, intermediate flange and gaskets

Installation

Install the intermediate flange before inserting push rod as otherwise there is a danger that it may slip through the flange into the crankcase.

Adjusting the pump stroke

- 1 - When installing the push rod the rounded end of the push rod should be towards the distributor drive shaft. The gaskets between the crankcase and intermediate flange and fuel pump must be inserted.
- 2 - Measure push rod stroke from the pump contact surface on the intermediate flange (including gaskets) with a depth gauge. The stroke should be about .16" (4 mm).

The stroke is correctly set if the push rod stroke moves within the necessary limits.

Horizontally operated pumps:

B.D.C.	29.0 mm
T.D.C.	34.0 mm

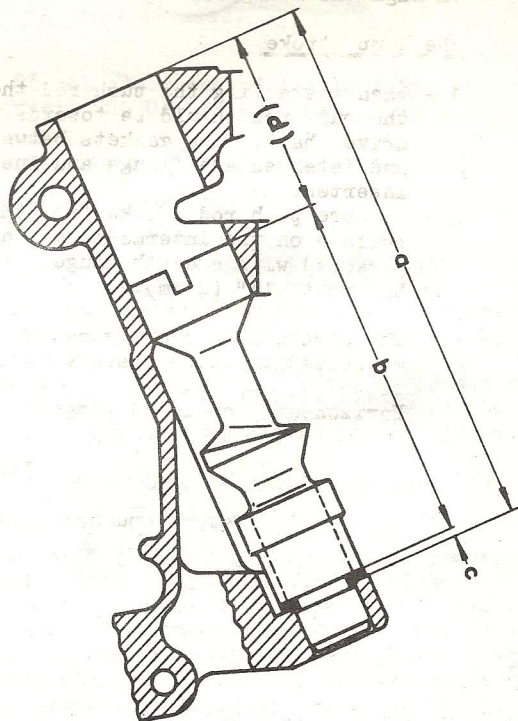
Vertically operated pumps;

B.D.C.	8.0 mm
T.D.C.	13.0 mm

Under the dimension B.D.C. and T.D.C., one understands the distance from the end of the push rod to the intermediate flange (including the gaskets) with the push rod in the respective end position.

DISTRIBUTOR DRIVE SHAFT

Due to various modifications in production and reworking of the hole for the distributor drive shaft in the unit reconditioning, several combinations between crank-cases, distributor drive shafts and shims have resulted. The correct pairing of parts is of importance especially for the assembly of short engines that are supplied without distributor drive shafts and shims. Details are given in the following table:

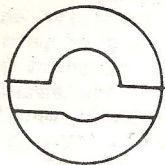


a - Depth of hole for the distributor drive shaft in mm	126.1	126.8	131.1	133.5	
b - Length of distributor drive shaft up to shoulder in mm	80.3	80.3	80.3	85.3	85.3
c - Thickness of upper shims in mm	0.6	0.6	6.3	0.6	0.6
lower	0.6	1.25	-	0.6	3.0
c - Control dimension (mm)		44.6			

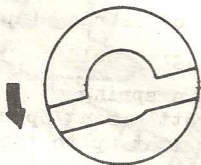
Installation position

Prerequisite: No. 1 piston at firing point

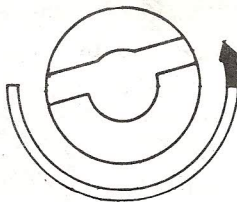
- 1 - Slot at right angles to driving direction for 25-, 30-, 34-, 40-, 42-, 44-, and 47 bhp engines.



- 2 - Slot offset by one tooth for 30 bhp engine with ZV/PAU 4R1 and ZV/PAU 4R2 distributors.



- 3 - Slot offset by one tooth (the smaller segment points towards the front) for flat engine (45 and 54 bhp)



Assembly

VW 228 a or b Starter bush extractor

The distributor drive shaft can be easily removed and installed with the starter bush extractor VW 228 a or b.

CYLINDER HEAD, INTAKE MANIFOLD

In Aug. 1962 the diameter of the intake manifold of the 34 bhp engine was enlarged from 25 mm to 27 mm. At the same time the outer diameter of the sealing surface in the cylinder head was enlarged from 32 mm to 34 mm. The sealing washer No. 138234 from the 45 bhp engine is used as a seal between the intake pipe and the cylinder head.

If the new type intake manifold is to be installed together with the old type cylinder head, sealing washer 113 129 707 must be used.

THERMOSTAT

Adjusting

Type 1 and 2:

Engines with throttle ring (up to Aug. 64).

Prerequisite: Engine cold

- 1 - Detach return spring
- 2 - Release throttle ring operating lever
- 3 - Raise thermostat up to the upper stop of the support
- 4 - Adjust the throttle ring so that it opens 20 mm
- 5 - Tighten operating lever and connect return spring

With the engine at operating temperature and the thermostat fully expanded, the opening between the throttle ring and the fan housing should be 25 - 30 mm.

Engines without throttle ring (from Aug. 64)

Prerequisite: Engine cold

- 1 - Screw thermostat up to stop on the connecting rod
- 2 - Loosen thermostat bracket on housing
- 3 - Press the thermostat upwards (simulating warm position), so that the flaps stay in the open position
- 4 - Move the thermostat bracket until the thermostat is touching the upper part of the bracket (the thermostat bracket is provided with an elongated hole for attaching it to the crankcase)
- 5 - Tighten up the bracket and the thermostat

Note: When removing the fan housing the thermostat must be screwed off, as the connecting rod is fixed in the fan housing.

Opening temperature:

up to Oct. 61: 75 - 80°C

from Oct. 61: 60 - 70°C

With the introduction of the new thermostat the thermostat bracket was also reinforced (new frame shape previously forked shape).

If a new thermostat is subsequently installed the new bracket must also be installed at the same time.

OIL BATH AIR CLEANER with WARM AIR CONTROL FLAP

Types 1/1500 and 2 (from Aug. 67)

Basic setting (Engine cold):

- 1 - Push outer cable into the retainer on the cooling fan housing or on the air cleaner pipe as far as it will go and secure
- 2 - Push inner wire into clamp on the warm air flap lever as far as it will go and secure
- 3 - With closed cooling air regulator and closed warm air control flap (opening for fresh air closed), push inner wire into clamp on cooling air regulator lever and secure it so that the spring coils on the warm air control lever are just about to be pulled apart.

The outer and inner parts of the Bowden cable must be disconnected to remove the air cleaner.

Adjusting when air cleaner has been removed (independent of engine temperature):

- 1 - Push outer cable into retainer as far as it will go and secure
- 2 - Push the inner cable into clamp as far as it will go and secure.
(The position of the warm air control flap then varies automatically according to the engine temperature).

FAN HOUSING, GENERATOR

With the introduction of the new pressure ventilated generator (105 mm dia. previously 90 mm dia.) all engines with vertical fan housings have a new fan - 131 119 031 - in which the holes have been discontinued. At the same time the generator support, cooling fan housing and fan cover were modified. When installing the generator in the fan housing, the cooling air intake slots in the fan cover must point downwards.

The fan must not catch on the fan cover; it is adjusted by means of three washers.

Tightening torque for special nut: 6 ± 0.5 mkg.

FLYWHEEL

All exchange flywheels (also in exchange engines) which are identified by a ring of approx. 100 mm (4 in.) dia. which is machined into the surface on the engine side, are relieved on the contact surface for the crankshaft, are only to be assembled with a metal gasket. All other exchange flywheels, which have no rubber sealing ring inserted, must be assembled with a paper gasket.

Crankshaft end play

The end play is .0027 - .005" (0.07 - 0.13 mm) Wear limit .006 (0.15 mm).

The end play is measured with the engine assembled and the flywheel installed.

- 1 - Install the flywheel together with two shims and the paper or metal gasket - however without the seal.
- 2 - Bolt dial gauge bracket VW 659/1 (local manufacture) together with the dial gauge onto the crankcase.
- 3 - Rock the crankshaft back and forth.
Read off end play from the dial gauge.
- 4 - Calculate the thickness of the third shim:
Reading - 0.10 (average end play) = 3rd shim.
- 5 - Remove flywheel
- 6 - Insert the seal
- 7 - Install flywheel, all three shims and a new paper or metal gasket
- 8 - Check end play again

Shims of the following thicknesses are available:
0.24; 0.30; 0.32; 0.34; 0.36 mm
(0.38 mm only for use in production)

For flywheels with rubber sealing ring (from April 66) there are adjustment shims with a smaller inner diameter.

53.6 + 0.2 mm (previously 55.1 + 0.2 mm).

CLUTCH

Construction feature

Single dry plate clutch - in drive between engine and transmission - as coil spring or diaphragm clutch - bolted to flywheel.

Clutch cover with pressure plate

Distinguishing features

Type 1/1200

111 141 025 A/B (180 mm. friction surface dia.).
The pressure has been reduced to 315 - 340 kg on the version with the square holes as compared to a pressure of about 345 kg on the version with the round holes.

Since June 67 the clutch lever bolts - new 111 141 133 B - have two flats on the end of the thread and the adjusting nuts, - new 111 141 137 B - have a wider shoulder. These nuts are secured by squeezing the shoulders.

111 141 025 C (180 mm. friction surface dia.).
From Nov. 64 a reinforced clutch has been fitted. It differs externally in that the spring caps have a shoulder at the top and have a round hole. The thrust pressure is 320 - 345 kg. Clutch springs: dark and light brown.

In cases of replacement dark and light blue clutch springs are to be installed in alternate sequence.

111 141 025 D (180 mm. friction surface dia.).
From Nov. 65 the clutch from Type 1/1300 was also installed in the 1.2 l engine.
Clutch springs: dark and light blue

Type 1/1300

111 141 025 D (180 mm. friction surface dia.).
In Nov. 65 these clutches were equipped with a modified clutch release lever (the F + S sign is stamped in the longitudinal direction) on which the mounting was improved.

Clutch springs: dark and light blue
In the event of repair, all pink coloured.

Type 1/1500

113 141 025 A (200 mm. friction surface dia.).
Standard production: Coil spring clutch and clutch plate with single lining spring.
Clutch springs: 6 white

3 red with gold-bronze mark
Spare part: Diaphragm spring clutch and clutch plate with double lining spring.

Flywheel and Drive plate
Distinguishing features

Type, Model Engine bhp	Part No.	Series	Clutch dia. (mm)	No. of teeth	Gasket
25, 30	111 105 271	-	180	109	paper
34, 45	113 105 271 A	up to 10.61	180	109	paper
1/1200, 11 & 15/1300		up to 4.66			
14/1300	113 105 271 B	up to 11.65	180	109	metal
2/1200, 45		up to 7.62			
34, 11 & 15/1300	113 105 271 C*	4.66 - 8.66	180	109	rubber
14/1300	141 105 271 A	11.65 - 4.66	180	130	metal
14/1300	141 105 271 *	from 4.66	180	130	rubber
34, 11 & 15/1300		from 8.66			
Type 2 and 3	211 105 271	8.62 - 4.66	200	109	metal
Type 2 and 3	211 105 271 C	4.66 - 8.66	200	109	rubber
Type 1/1500, 2 and 3, 147	311 105 271	from 8.66	200	130	rubber
Type 1/1500 VW Automatic	113 105 323	from 9.67	-	-	rubber
Type 3/1600	311 105 323	from 9.67	-	-	rubber

* except vehicles with Saxomat (still with metal gasket)

Type 2

211 141 025 D (180 mm. friction surface dia.).
Thrust spring clutch up to Aug. 62
6 spring caps with round holes, however each is equipped with 2 clutch springs: Thrust pressure 360-390 kg.

211 141 025 A (200 mm friction surface dia.).
Thrust spring clutch from Aug. 62 up to June 66
9 spring caps with 9 white thrust springs;
Thrust pressure: 380 - 420 kg.

211 141 025 B (200 mm. friction surface dia.).
Diaphragm from June 66
Clutches from two suppliers were installed intermittently.

- 1 - Fa. Luk (211 141 025 B)
- 2 - Fa. Fichtel and Sachs (this clutch is marked with 211 141 025 C)

Clutch from both manufacturers are supplied intermittently under the same Part No. 211 141 025 B. Diaphragm spring clutches require less pedal pressure and engage and disengage with a shorter pedal travel.

Diaphragm spring clutches are to be combined with clutch plate 311 141 031 B (double lining springs)

Type 3

311 141 025 (180 mm. friction surface dia.)
Thrust spring clutch up to Aug. 62
9 spring caps; swivelling type adjustment screw.

211 141 025 A (200 mm. friction surface dia.).
Thrust spring clutch from Aug. 62 up to May 65.
(as for Type 2 from Aug. 62).

211 141 025 B (200 mm. friction surface dia.).
Diaphragm spring clutch from May 65
(as for Type 2 from June 66).

Checking and adjusting

The following values are valid when adjusting and checking clutches (180 and 200 mm. friction surface dia.):

1 - Clutch removed (exact check)

Distance from flywheel to release ring: 26.7-27.3 mm
Release ring runout 0.3 mm

2 - Clutch installed (an exact check is not possible)

Distance from flywheel to release ring: 26.7-30.0 mm
Release ring runout max. 0.6 mm

The difference between the values for a clutch which is removed and one which is installed occurs because the thickness of the new clutch plate can deviate by up to 0.5 mm and the relieved depth of the flywheel can vary by up to 0.2 mm.

The adjustment of a clutch which is installed in the engine can be checked with the following appliances:

- VW 782 Measuring bridge and clutch cranking handle
or
VW 254 a Clutch measuring appliance (magnetic bridge)

If there are deviations from the values given, the clutch must be removed and checked with the adjustment appliance and if necessary, readjusted.

- VW 254 b Clutch adjustment and repair appliance.
or Clutch checking and adjustment appliance (Workshop equipment M 22).

Assembly

- VW 657 Pressure plate compressing tool (Local manufacture)

Tension the clutch with the pressure plate compressing tool: Centre clutch plate by means of the drive shaft (or mandrel); tighten up the bolts evenly in a cross-wise sequence.

Clutch plate

From April 58 the clutch plates with riveted on lining springs have been fitted in standard production. The previous version was slotted in the region of the clutch lining and offset alternately to either side.

Type 2 from June 66 up to Aug. 67

Type 3 from Sept. 65

The clutch plate was made with a double lining spring (also as spare part for Type 1/1500). When relining use the special rivets.

Type 1/1300 from June 67.

A torsion spring clutch plate - 111 141 031 F - has been installed. These clutch plates can be subsequently installed in all 1.2 l and 1.3 l engines. When installing the previous type of torsion spring plate, the one piece finger return spring, Part No. 111 141 141 A - must be used.

Type 2 from Aug. 67

The 1.6 l engine has a torsion spring clutch plate with a double lining spring - 311 141 031 D. The previous type torsion spring clutch plate - 311 141 031 A - which was supplied as a spare part was equipped with a single lining spring. The torsion spring clutch plate - 311 141 031 D - can be installed in all engines with a 200 mm. dia. clutch.

Clutch lining

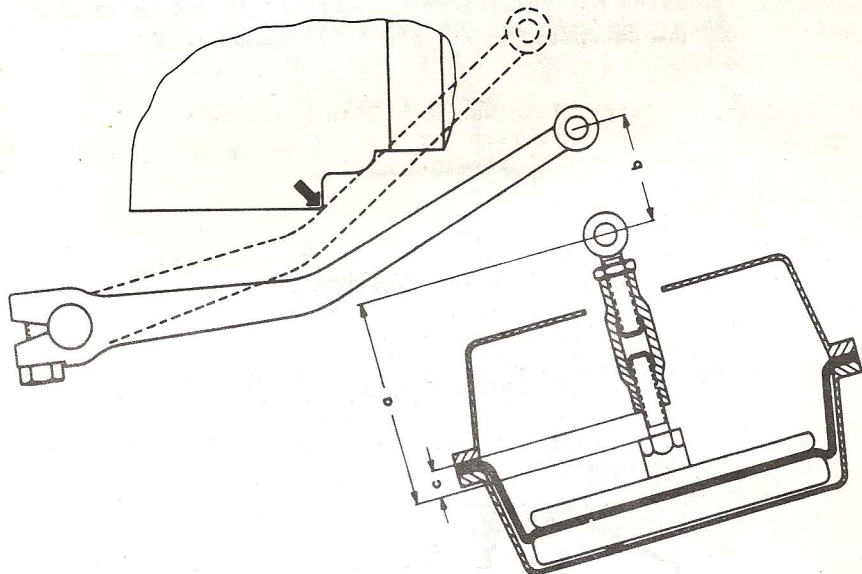
Lining thickness: 3.7 - 3.9 mm. wear limit 2.35 mm
Overall thickness: 9.1 - 9.6 mm, wear limit 6.5 mm
Runout: max. 0.8 mm

The most favourable frictional matching of the clutch lining to the different materials of the flywheel and clutch pressure plate is obtained by using a combination of the following types of clutch linings:

Flywheel side:	Beral (green black)
	Jurid (light brown)
Clutch side:	Textar (light yellow)

Basic adjustment of the clutch linkage (VW Selector Automatic)

It is only necessary if a new clutch plate has been installed in the gearshift clutch.



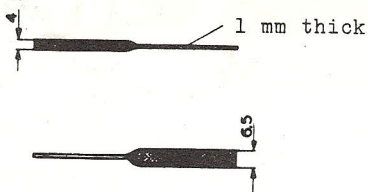
- 1 - Turn the clutch lever shaft to the right up to the stop and push on the clutch lever. The clutch lever (arrow) should bear against the clutch housing.
Lightly tighten the clamping bolt.
- 2 - Pull the piston rod out of the servo and set the dimension "a" = 75 mm (while doing this the dimension "c" = 8.5 mm must be taken into consideration).
- 3 - Push the piston rod into the stop and turn the clutch lever on the clutch lever shaft in the direction of the servo until the dimension "b" = 40 mm between the eyes of clutch lever and the piston rod is obtained.
Tighten the clamping bolt of the clutch lever to a torque of 2.5 mkg (18.1 lbs.ft.)
- 4 - Connect the clutch lever with the servo piston rod (install plastic sleeve, insert the connecting bolt from above, install washer and secure with cotter pin).

Clutch adjustment

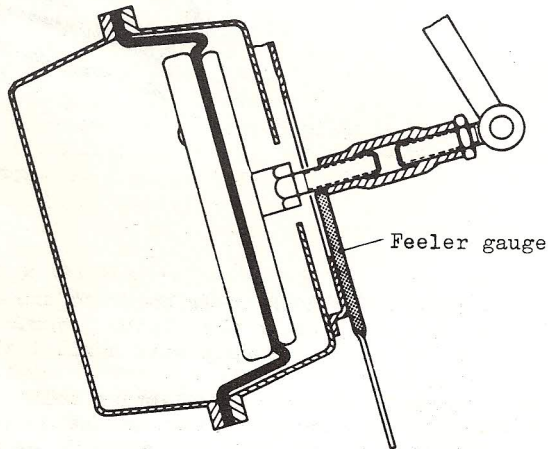
Due to wear of the clutch linings the play, set during the basic adjustment, is reduced. There must always be a certain amount of play present so that the clutch can fully engage and not slip.

A gauge must be made from sheet metal (1 mm thick) for carrying out the measuring. One end of the gauge must be 4.0 mm wide and the other end 6.5 mm wide.

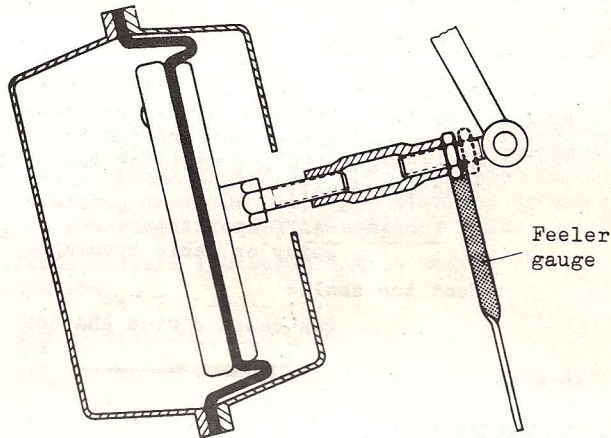
Feeler gauge



- 1 - Pull off vacuum hose. Measure the distance from the upper edge of the bracket to the lower edge of the adjustment nut with the 4.0 mm end of the gauge. If the dimension is 4 mm or more, the clutch must be readjusted.



- 2 - Just loosen the lock nut of the adjustment nut and leave it where it is.
- 3 - Screw the adjustment nut off the eye bolt until there is a space of 6.5 mm between the lock nut and the adjustment nut (5 - 5.5 turns of the adjustment nut approximately corresponds to this distance). The distance is measured with the 6.5 mm wide end of the gauge.



- 4 - Screw the lock nut down to the adjustment nut and pull up tight. Reconnect the vacuum tube and tighten hose clip.
- 5 - Check the adjustment by road testing: The clutch is correctly adjusted if the reverse gear can be engaged without making a noise.

If the clutch has already been readjusted and the clutch lever bears on the clutch housing, a readjustment is no longer possible. That is an indication that the clutch plate is worn.

Clutch release bearing

Since Oct. 64 a ball bearing type release bearing with a plastic ring - 111 141 167 C - has been installed in all models. In the event of repair, only these bearings are to be used.

Since April 67 the plastic ring of the release bearing was given a rough surface by machining so that the lubricant film of a molybdenum-disulphide base can adhere better.

If a clutch release bearing occasionally makes a whistling noise the surface of the plastic ring can be treated with a molybdenum-disulphide based lubricant. (Before doing this, roughen the plastic ring with coarse emery cloth).

Under no circumstances should the release bearing be washed out.

In vehicles with a Saxomat clutch the graphite type clutch release bearing must still be used.

Type 1/1200

Since March 67, instead of the clutch release ball bearing - 111 141 167 C - the clutch release bearing with graphite ring - 111 141 165 - has been installed. This made it necessary to use a larger clutch release ring on the 180 mm dia. clutch (61 mm dia. instead of 54 mm).

Clutch cable guide tube

The clutch cable guide tube should bend 25 - 45 mm/1 to 1.8"; it can when necessary be corrected by inserting washers between the bracket on the transmission and the end piece of the guide tube.
Bend too great:

Stiff operation
Noisy or cable breakage

Bent too small:

Can cause clutch chatter

VALVE GEAR

Valve clearance

Adjust only when engine is cold, up to a max. oil temperature of 50°C.

Cylinder head with rectangular supports and short studs:

Inlet valve: 0.1 mm

Exhaust valve: 0.1 mm

Cylinder head with round supports and long studs:

Inlet valve: 0.2 mm

Exhaust valve: 0.3 mm

With cylinder heads with round supports, which have been converted for short studs and are marked by a metal tag "0.1", the valve clearance is to be set at 0.1 mm. In addition, the engines are provided with a sticker which is stuck onto the cooling air intake housing.

Valve clearance too small:

Burning and distortion of the valves. Uneven running of the engine. Alteration of the valve timing. Poor output due to insufficient charge.

Valve clearance too great:

Excessive noise. Uneven running of the engine. Alteration of the valve timing. Poor output due to insufficient charge.

The valve adjustment is correct when the appropriate feeler gauge can just be pushed through between the valve adjustment screw and the end of the valve shaft. After tightening up the lock nut on the valve adjustment screw, the clearance must be checked again.

Nuts for the rocker shaft

When assembling the rocker shaft only M 8 nuts of 8 G quality class may be used. These nuts can be recognized from the others by the copper coating.

Valve spring

Modifications

34 bhp Engine:

1.5 l Engine up to July 64:

From May 62 progressively, coil valve springs (113 109 623 A) were installed. These valve springs can be subsequently installed in sets or separately. Ensure when installing that the closely coiled end of the spring is pointing towards the cylinder head.

Recognition colours (coloured line): white, blue, green, yellow

1.5 l Engine from July 64:

Since July 64 valve springs (113 109 623 C) which have other characteristics have been installed. At the same time the valve spring seats (New: 113 109 641 B) were made with thicker walls and sharply defined guide shoulders.

The valve springs from July 64 may only be installed together with the reinforced valve spring seats.

The valve springs supplied as spare parts (113 109 623 C) are marked with a silver grey or violet paint line.

1.3 l and 1.6 l Engine:

The valve springs and valve spring seats for the 1.5 l engine from July 64 were also installed in all 1.3 l and 1.6 l engines.

Checking

Engine	Length tensioned	Loading in kg
25 & 30 bhp	28 mm	33.4 \pm 1.7
30 bhp reinforced 34 bhp, 45 bhp up to May 62	34.3 mm	46.3 \pm 3
34 bhp from May 62	33.4 mm	43.8 \pm 3
1.5 l May 62-Aug.64	33.4 mm	43.8 \pm 3
1.5 l from 8.64 1.3 l and 1.6 l	31.0 mm	57.2 \pm 4

With a spring testing appliance or as a comparison measurement in a vice. During the comparison measuring the difference from the test length should not be greater than 1.5 mm.

- VW 699 Oil deflector fitting sleeve
Install the valves springs with the close pitched coils at the cylinder head end.
- VW 653/2 Valve spring compressing tool
(for removing and installing the valve springs with the cylinder head installed).

Push rods

Engine (bhp)	Length (mm)	Outer dia. (mm)	Remarks
30 reinforced	270	8.1	discontinued as spare part
34 up to 6.63	269	8.1	also as spare part for 30 bhp reinforced
42 and 45 up to 6.63	279	8.1	
34 from 6.63	271	8.1	knurling
42 and 45 from 6.63 - 40, 44 and 45	281	8.1	knurling
34 from 6.66	* 271.8	9.0	knurling
40, 44, 45 and 54, from 6.66	* 271.8	9.0	knurling

* Standard: these push rods can be subsequently installed, either singly or in sets, in engines produced since June 63.

Rocker arm Distinguishing features.

The subsequent installation of the rocker arm with 2 oil drillings (from Jan. 64 standard) is only permissible with 1.5 l engines if their cylinder heads have a valve inclination of 9° 30' (from June 63 standard).
With the 34 bhp engine, these rocker arms can be subsequently installed without difficulty.
In both cases however, the valve guides must be shortened by 1 mm to 20.0 - 0.5 mm, measured from the end of the guide up to the contact surface of the valve spring, oil deflector rings must also be fitted.

Support for rocker shaft

Since June 63 a support marked "TOP" has been installed in all VW engines (except 25 and 30 bhp), the marking "TOP" must face outwards.
With the introduction of the new cylinder head (0.1 mm valve clearance, square boss), the slotted support must be so fitted that the slot faces upwards.

IGNITION

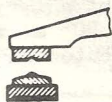
Contact breaker points

The contact breaker in battery ignition system interrupts direct current. This flow of current in one direction causes the contact material of the plus point to erode and transfers it to the minus point.

Deformation of the contact surfaces, due to burning, results in the contact resistance being very great when the points are closed. In addition, a double interruption can result when the points are opening.

If the points are badly burnt, the contact breaker arm and contact breaker plate must both be replaced.

Assessing condition of points



still permissible

no longer permissible

(the above diagrams are only approximate and are intended as an aid).

- | | |
|--|--|
| 1 - Pitting - built up
with clean contact surfaces: | normal wear |
| 2 - Grey discolouration of
the contact surfaces: | Insufficient clearance
between points. Insuf-
ficient contact press-
ure
(approx. 400-600 g)
Breaker arm sticking |
| 3 - Blue discolouration of
contact surfaces: | Ignition coil or
condenser defective. |
| 4 - Yellow or black porous
scars: | Dirty (grease, oil or
dust). Poor ventilati-
on of distributor hou-
sing |

With excessive wear and discolouration of the contact points the condenser and ignition coil must be checked.

When installing new contact points, the bearing and fiber block must be lubricated with multi-purpose grease (Lithium grease). Avoid getting oil or grease on the contact surfaces as this results in premature burning of the points and misfiring. The points are to be aligned so that the contact surfaces are parallel to one another.

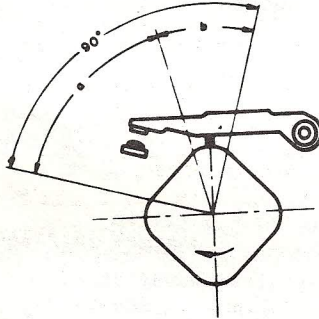
The breaker point gap is 0.4 mm (0.016")

After the breaker points have been adjusted the firing point must be reset. An alteration of 0.1 mm (0.04") to the contact breaker gap represents an alteration to the firing point of about 3° crankshaft angle.

A more exact check of the contact breaker points is possible, if, with the engine running, the opening and closing time is measured with a dwell angle measuring appliance.

Dwell angle

One revolution of the distributor shaft is 360°. The size of the angle available for each cylinder is determined by the number of cylinders. The dwell angles and opening angles of a 4 cylinder engine added together are $360^\circ \div 4 = 90^\circ$ as measured on the circumference of the distributor shaft.

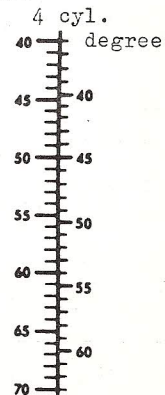


(large breaker gap = small dwell angle)
 (small breaker gap = large dwell angle)

The dwell angle is set with the aid of a dwell angle setting appliance, the readings of which are given in degrees or percent according to the make of the appliance. For converting angular degrees to percent or vice versa, see example or conversion scale:

$$\text{Dwell angle (\%)} = \frac{\text{Dwell angle (}^\circ\text{)} \times 100\%}{90^\circ}$$

$$\text{Dwell angle (}^\circ\text{)} = \frac{\text{Dwell angle (\%)} \times 90^\circ}{100\%}$$



Firing point

Every engine has a basic setting, which determines the firing point when starting the angle. It is given in crankshaft angle degrees before T.D.C.

If the firing point is set too early, the piston must operate against the combustion pressure. Big end and crankshaft bearings are then put under excessive stress.

If the firing point is set too late, the piston has already passed over top dead centre and is moving downwards. In both cases the engine output falls off considerably and in addition the engine overheats.

Setting the firing point

It can be carried out with a test lamp or stroboscopic lamp.

See Technical Bulletin M 1 issue 66 for setting values, introduction into standard production and information about the interchangeability of the various distributors.

From Aug. 64 all VW engines have been with a modified distributor. The contact breaker cam lobe for the third cylinder has been offset about 2° distributor angle in the retard direction.

The firing point on these engines may only be set from No. 1 cylinder. The firing point of No. 3 cylinder is then 4° crank angle later than that of No. 1 cylinder.

It is also recommended, for the purpose of uniformity, to use the aforementioned method of adjustment for engines produced before Aug. 64.

Type 3 (twin carburetor engine)

On distributor (311 905 205 E) with the offset contact breaker cam, the mark on the edge of the distributor housing has been moved 110° from its previous position as the position of the rotor finger in relation to the driving dog has been altered.

Type/ Engine	Distributor	Basic setting	Remarks
1/1200 1/1300 1/1500	113 905 205 K 113 905 205 L	7.5° B.T.D.C.	Series unaltered
1/1500 2/1600	113 905 205 M	0° (T.D.C.)	Exhaust control system new
1/1500	113 905 205 P	0° (T.D.C.)	Automatic, Automatic M 157
2/1600	211 905 205 N	0° (T.D.C.)	Series new
3/1500	315 905 205	7.5° B.T.D.C.	Series unaltered
3/1600	311 905 205 G	7.5° B.T.D.C.	Series unaltered
	311 905 205 L	0° (T.D.C.)	Fuel injection syst- em new
3/1600	311 905 205 P	7.5° B.T.D.C.	Automatic trans- mission

A stroboscopic lamp (flash pistol) must be used when setting the basic firing point on all engines equipped with an exhaust control system or fuel injection system.

It is also recommended that a stroboscopic lamp is used when setting the ignition on all other engines. Through this method of adjustment a more exact basic setting is possible, as with the engine running the play in the distributor drive is eliminated.

As opposed to the details given previously in the Workshop Manuals the engine oil temperature must be between 20 and 70°C when making the basic ignition setting regardless of whether a stroboscopic lamp or normal test lamp is used.

CARBURETOR

Filling speed

Single carburetor engines: 700 - 800 rpm
Twin carburetor engines: 800 - 900 rpm

These idling speeds are the most suitable for driving in the ever increasing city traffic (continuous stopping and starting), and also for short journeys. In addition, the proportion of contents in the exhaust gases which are injurious to health is lower.

Volume control screw

Only undertake adjustment when the engine is at normal operating temperature. Turn volume control screw in slowly until the engine speed begins to drop; then slowly turn the screw out until the engine runs smoothly without the revolutions increasing. Finally set the idling speed of the engine to the prescribed value by means of the idling adjustment screw.

Automatic choke

The opening time for the choke valve with approx. +20° ambient temperature and with engine running at increased idling speed (generator voltage):

28 PICT	- 1	1.5 to 3.0 min.
30 PICT	- 1	1.5 to 3.0 min.
32 PHN		1.5 to 3.0 min.
32 PDSIT		1.0 to 2.5 min.

In spite of the markings on the cover and housing being correctly aligned the pre-load of the bimetal strip can occasionally be too great (opening time too long, over rich mixture). If this is the case the cover of the automatic choke should be turned about 4 - 5 mm to the right.

Experience has shown that a favourable setting can be obtained when, with a cold engine and an ambient temperature of +20°C, the air flap is set so that when looking down into the body of the carburetor the air correction jet can just be seen (except 32 PHN).

With the twin carburetor engine there is a difference between the left and cover of the automatic choke and they are marked with "LI" and "RE" accordingly. In Aug.65 the width of the bimetal strip was altered from 8 to 6 mm, in order to reduce the heating up time and at the same time the fast idling cam was modified to suit. When replacing note the distinguishing mark:

from Aug. 65
6 V = 4; 12 V = 5

up to Aug.65
6 V = X; 12 V = X

Manually operated choke:

Type 1 vehicle (except Model 14), that are operated mainly over short distances, with frequent short stops, can be subsequently equipped with a manually operated choke (Technical Recommendation K 12).

Adjustment of the twin carburetor system

In order that both carburetors operate evenly, a Synchro Tester with distance piece (VW 691) is provided for use when carrying out adjustments. With these pieces of equipment, the twin carburetors can both be set to the same air flow rate.

Preparatory work:

- 1 - Disconnect accelerator cable, take off right-hand connecting rod.
- 2 - Adjust the left-hand connecting rod to 342 ± 0.5 mm.
- 3 - Check both pull rods. If necessary adjust to 99 ± 0.2 mm (VW 691) and secure with lock nut.
- 4 - Switch on ignition, so that the automatic choke can warm up.
- 5 - Close the throttle valves on both carburetors, after that open the throttle valves by turning the idle adjustment screws about half a turn.
- 6 - Unscrew the volume control screw about one and a half turns.

Adjusting

- 1 - Warm up engine to operating temperature.
- 2 - Taking into consideration the even air flow rate *), set the idling adjustment screws so that an idling speed of 800 to 900 rpm is obtained.
- 3 - Volume control screws: Best possible setting, which may be up to a 1/4 of a turn on the rich side.
- 4 - Carry out operations as under 2 and 3 again.
- 5 - Fit right-hand connecting rod.
- 6 - Check air throughput at n 1200-1500 *). Only make corrections on the right-hand connecting rod.
- 7 - Check air throughput at idling speed, if necessary readjust at the idling adjustment screws.

*) Permissible variation between both carburetors as measured on the scale of the Synchro Tester: 10 mm.

It can occur, when measuring, that the piston in the Synchro test appliance pulses up and down. In this case a deviation of piston position of up to a maximum of 25 mm is permissible. If the piston fluctuation is particularly large, a check should be made to see if the engine is sucking air at some other point.

Only for internal use in accordance with the directives of VOLKSWAGENWERK AG