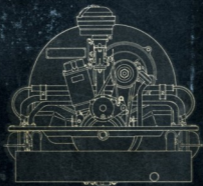


Instruction Manual



Industrial Engine

FEBRUARY 1956



Industrial Engine

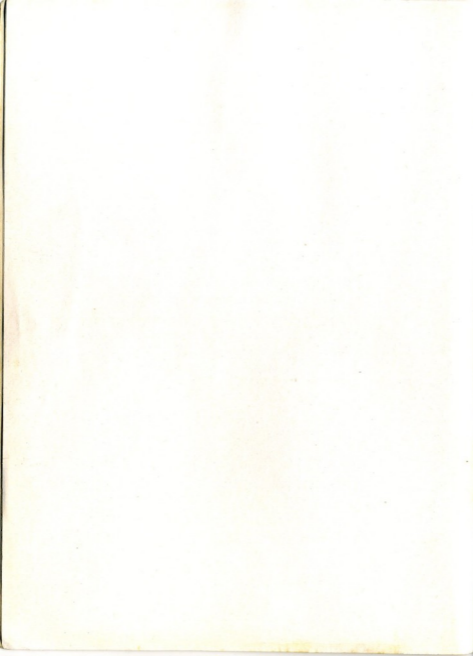
Instruction Manual

VOLKSWAGENWERK GMBH · WOLFSBURG
(GERMANY)



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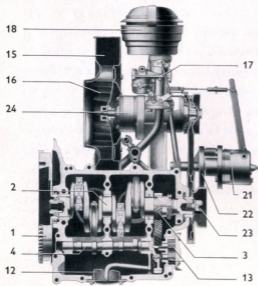
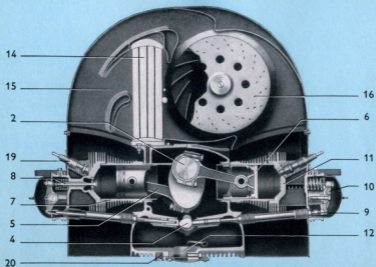


PREFACE

The VW Industrial Engine has been designed to meet the increasing demand for a robust and reliable, yet economical power unit in agricultural and industrial fields of use. The constructional features of the VW Industrial Engine are identical with those of the proven VOLKSWAGEN Engine. The VW Industrial Engine is provided with magneto ignition, speed governor, and oil-bath type air cleaner to meet the special operating conditions.

We are sure that you will obtain the utmost service and satisfaction from your VW Industrial Engine, if attention is paid to the care and maintenance set forth in the ensuing pages. You will find in this booklet everything pertaining to the operation and maintenance of your engine. In addition to such information, you will find all kinds of interesting facts and a recapitulation of the technical data. Occasions may arise when advice is required which is beyond the scope of this book. Approved service agencies throughout the world, staffed by VW trained technicians, are ready to attend to your needs. The VW Service Stations will be readily recognized by the familiar blue VW SERVICE sign. These service shops are in closest contact with the Volkswagenwerk through our field engineers, thus providing skillful and expert performance of any job to be done.

V O L K S W A G E N W E R K G M B H



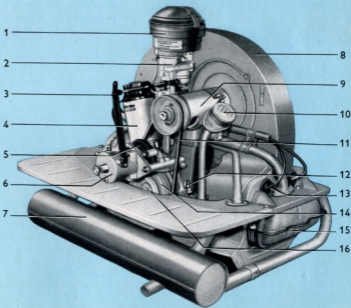
- 1 - Flywheel
- 2 - Crankshaft
- 3 - Crankshaft Timing Gear
- 4 - Camshaft
- 5 - Connecting Rod
- 6 - Piston
- 7 - Cylinder
- 8 - Valve
- 9 - Valve Push Rod
- 10 - Rocker Arm
- 11 - Cylinder Head
- 12 - Oil Strainer
- 13 - Oil Pump
- 14 - Oil Cooler
- 15 - Fan Housing
- 16 - Fan
- 17 - Carburetor
- 18 - Oil Bath Air Cleaner
- 19 - Spark Plug
- 20 - Oil Drain Plug
- 21 - Speed Governor
- 22 - Friction Wheel
- 23 - Starter Dog
- 24 - Fan Bearing

GENERAL DESCRIPTION

The air-cooled VW Industrial Engine is of the 4-cylinder, 4-cycle type. Two pairs of cylinders are horizontally opposed (flat four). Each pair has one mutual cylinder head made of light-metal alloy. The overhead valves are located in the cylinder heads and are operated by the camshaft via push rods and rocker arms. The short and counter-balanced crankshaft rests in four bearings and is heat-treated at its four points of support. It drives the camshaft through helical gears. The connecting rods are fitted with lead-bronze bearings. The light-metal alloy pistons are provided with steel reinforcements.

A downdraft carburetor produces the fuel-air mixture to supply the cylinders. The standard engine is equipped with a magneto ignition system. The engine speed required for the type of service is controlled by a governor.

- 1 - Oil Bath Air Cleaner
- 2 - Carburetor
- 3 - Control Linkage
- 4 - Magneto
- 5 - Friction Wheel
- 6 - Speed Governor
- 7 - Muffler
- 8 - Fan Housing
- 9 - Fan Bearing
- 10 - Oil Filler and Breather
- 11 - Fan Belt
- 12 - Dipstick
- 13 - Spark Plug Connector
- 14 - Fan Pulley
- 15 - Cylinder Head Cover
- 16 - Starter Dog



The oil pump of the pressure feed lubrication is driven by the camshaft and sucks the oil from the crankcase sump through a strainer, from where it will reach the points of lubrication via an oil cooler. In cold weather, when the oil is of higher viscosity, an oil pressure relief valve makes it possible for the engine to be lubricated direct, that is, by avoiding the oil cooling system. The air cooling of the engine is done by means of a fan, which is connected to the crankshaft by an adjustable V-belt and driven at twice the engine speed. The fan sucks in air through an opening in the fan housing, and the air cools the engine by passing through the cylinder fins.

OPERATING INSTRUCTIONS

Before you start the engine, check oil level, tension of fan belt, and quantity of fuel.

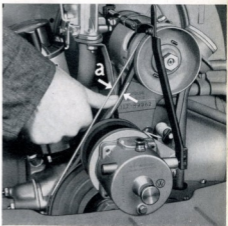
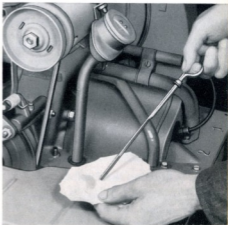
Engine Oil Level

The oil level should be checked with the engine at rest. The oil level is satisfactory when it is between the two marks on the oil level dipstick, but it should never be permitted to drop below the lower mark. To make an accurate check, it is best to wipe the dipstick with a clean rag before. With the engine continuously operating, it is advisable to check the oil level every 10 hours. If necessary, replenish with oil of the proper specification. Select a HD Oil from well-known and dependable brands right at the beginning, and stick to it!

It would be wrong to fill in HD Oil and Regular Oil at random, or even to mix these two types of oil.

Fan Belt

The fan belt drives the cooling system. Perfect condition and correct tension of the belt insure its long life and adequate cooling of the engine. Checking is very simple: The belt, when slightly pressed with the thumb, must yield approximately 2 cm. (approx. 1"). No traces of excess use, such as frayed edges, should be perceptible.



a = 2 cm. (approx. 1")

The Fuel Quantity

should be checked before putting the engine into operation. This will avoid annoying interruptions. It is recommended to provide the fuel tank with a reserve tap. If the engine begins to "stutter", as a result of fuel starvation, just switch the tap to the reserve position.

The design of the VW Industrial Engine allows an operation on all proven trade-mark fuels. Trade-mark fuels, including gasoline-benzol blends, comprise such characteristics as constant physical properties, sufficient anti-knock qualities and freedom from objectionable constituents.

The selection of a grade and brand of fuel is therefore left entirely to the customer's discretion.

Special care should be taken when filling the tank from cans to avoid dirt and foreign matter entering the tank. It is recommended to filter the fuel through a clean piece of chamois or a fine strainer.

Starting the Engine

is easy if you follow the instructions given below. Please note the two different procedures to start the engine. With the engine already having attained operating temperature, the procedure given in the next page should be applied. The engine is started by means of the choke and throttle controls.

The choke control

operates the choke, which, when closed, enriches the mixture.

The throttle control

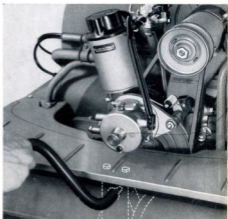
actuates the throttle of the carburetor, allowing to alter the speed of the engine independently of the automatic governor in the range from the idling speed to the limit fixed by the governor.

To start the engine when cold

- 1 - Open the fuel tap.
- 2 - Switch on the ignition.
- 3 - Fully close the choke.
- 4 - Shift the throttle control linkage to the idling position.

- 5 - Crank the engine or press the starter button.
- 6 - As soon as the engine fires, slowly open the choke. Let the engine run at a fast idle speed for about one minute to allow the oil to warm up (push the throttle control linkage somewhat towards the operating position).
- 7 - Slowly shift throttle control linkage to full operating position. The speed governor then begins to work.

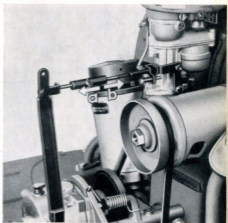
The linkages for operating the throttle and choke of the carburetor are not shown in the illustration. The arrangement of these linkages depends on the particular operating conditions.



To start the engine when hot

- 1 - Switch on the ignition.
 - 2 - Shift the throttle control linkage to the idling position (do not close the choke).
 - 3 - Start the engine. If the engine does not fire immediately because it is still too hot, push the throttle control linkage to the operating position and repeat the starting. As soon as the engine fires, push the control linkage back to the idling position and then again slowly to the operating position.
- Avoid a repeated opening and closing of the throttle, if the carburetor is equipped with an accelerator pump.

a = Operating position b = Idling position



Caution! Be careful when starting the engine inside closed rooms. See to it that the door and windows are open so that the exhaust fumes can escape. They contain the colorless, tasteless and odorless, yet extremely poisonous carbon monoxide gas.

How to stop the engine

- 1 - Shift the throttle operating linkage to the idling position and allow the engine to cool down by letting it run at idling speed for half a minute.
- 2 - Turn off the ignition.
- 3 - Shut the fuel tap.

Warning Lamps

If the power systems which incorporate generator and battery are equipped with an oil pressure contact, a warning lamp lights up when the ignition is switched on. The light will go out when the engine is started and the oil pressure increases.

Caution! If the lamp lights up during the operation, the chances are that the oil circulation has been interrupted, which means that the lubrication of the engine has ceased. Stop the engine at once and check the oil level before you consult a service station. An occasional flashing of the lamp with the engine warm and at low speed does not indicate trouble, if the light extinguishes as the speed increases.

If a manometer is fitted, the lowest pressure indicated on the dial should be 0.5 atm. (7 lbs./sq. in.), after the engine has attained operating temperature.

If the engine is equipped with a generator, a warning lamp is provided. The light will go on when the ignition is switched on and when the engine is idling. The light will go out when the speed increases.

Caution! If the warning lamp lights up while the engine is operating, the fan belt may be broken. Stop the engine and find out what is wrong, for when the fan belt is broken, the cooling is disrupted and the generator no longer charges.

Note:

With engines which are equipped with a generator only, the light shows up continuously during operation and goes out when the engine comes to a standstill or when the fan belt is broken.

LUBRICATION

Proper Lubrication is of Vital Importance

The extra time spent in following these recommendations will be amply rewarded in the long run by your engine's efficient performance. It is up to you to maintain its standard of safety, and to insure the long life and good service which you have the right to expect from this highly economical engine!

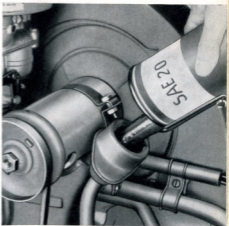
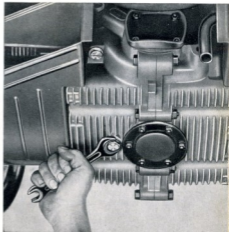
To lubricate correctly means to lubricate amply and at prescribed intervals!

Therefore, do not shy at the work connected with the regular lubrication service. A Lubrication Chart can be found in page 31, indicating the respective intervals at which to lubricate.

Changing Oil

The change of oil at prescribed intervals is necessary even if the very best trademark oils are used. Diluted and dirty oil in your engine simply means a greater strain and a shorter period of life for your engine.

The oil is drained by removing the plug at the bottom of the crankcase. To insure complete draining, it is important that the operation be performed while the engine is warm.

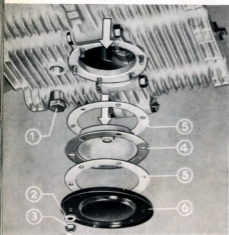


The engine is refilled with 2 $\frac{1}{2}$ liters of HD oil (5.3 U.S. pints, 4.4 Imp. pints). The constant use of HD oil renders a flushing of the engine unnecessary.

If, however, being compelled to use a regular engine oil not having the detergent-dispersant characteristics of HD oil, the engine should be allowed to idle while being flushed thoroughly with one liter (1 quart) of the same type of oil which you use afterwards for filling. This assures a better cleaning of the complete lubrication system.

Under no circumstances a so-called flushing oil, or even kerosene, should be used for flushing the engine. The residue of the flushing agent, which would remain in the crankcase and especially in the oil cooler, is liable to decrease the lubricating efficiency of the fresh oil.

Never allow a haphazard changing from HD oil to Regular oil and vice versa. Prior to filling the engine with oil, cover the governor drive wheels to prevent them from getting into contact with oil.



The Oil Strainer

retains foreign matter and should be taken out and cleaned according to the Lubrication Chart. When the strainer is inserted again, the lower side should lie beneath the oil suction pipe. The two gaskets should be renewed.

- | | |
|--------------------|------------------|
| 1 - Oil drain plug | 4 - Oil strainer |
| 2 - Lockwasher | 5 - Gasket |
| 3 - Hex. nut | 6 - Bottom plate |

Types of Lubricant and Recommended Usage

The advantages of using a **trade-mark HD engine oil** are quite evident.

Regular oils, i. e., non-additive oils, do not combat the formation of sludge and deposits and the wear-increasing bearing corrosion when the engine is operated for short periods and during cold weather. HD oil is an oil having proved oxidation stability, bearing corrosion preventive properties and detergent-dispersant characteristics which tend to hold in suspension foreign contaminants which would normally deposit on engine parts. These foreign contaminants will drain out with the oil at the periodical oil changes. The detergent properties of HD oil will make the fresh oil darker already after a short time of operation. This is quite natural and there is no reason whatsoever to change the oil earlier than called for in the Lubrication Chart.

Upper lubricants and other agents, as colloidal graphite, etc., should never be added to HD oil.

Changing from One Type of Oil to Another

If possible, HD type oils should be used for all new VW Industrial Engines right from the beginning. If, for any reason, the engine has operated with Regular engine oil for a longer period, the following should be heeded when changing to HD oil:

- If engine has performed less than 100 hours

no precautions are necessary when changing to HD oil.

- If engine has performed more than 100 hours

or if you are not quite sure what type of oil had been filled into the engine at earlier oil changes, precautions must be taken to thoroughly clean the engine. The VW Service personnel is fully conversant with this job and will be glad to advise you.

Some More Information on Engine Oils

It is left to your discretion to select an oil from well-known and dependable brands, being of the proper viscosity to suit the requirements. In cases of doubt, refer to your authorized VW Dealer who will be glad to help you with your lubrication problems. It is recommended that you select "your" oil right at the beginning and stick to it at all future service oil changes. Viscosity of the lubricant is an indication of its resistance to flow at a given temperature. The SAE numbers classify lubricants in terms of viscosity, but with no reference to other characteristics or properties.

SAE 30 This oil is satisfactory in tropical climates where the temperature range will frequently rise above 30° C (86° F).

SAE 20/20 W This oil should be used within the wide temperature range between + 30° C and - 15° C (+ 86° F and + 5° F). If temperatures temporarily exceed these limits, there is no need to change to another grade.

SAE 10 W Engine oil of this viscosity should be used for all types of operation where the temperature will fall below - 15° C (+ 5° F). However, it should already be filled in when temperatures are expected to fall below - 15° C (+ 5° F) before the next regular oil change is due. Oil of this viscosity may also be used in the warmer temperature range with safety.

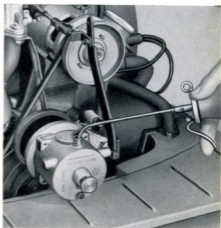
SAE 5 W This extremely light oil is for use in arctic climates only.

Apart from the oils mentioned above there are so-called multi-grade oils. These oils cover the range of several SAE viscosity grades, for example, SAE 10 W, 20 and 30. Thus, an SAE 10 W—20 motor oil can be used both in severe cold and in summer.

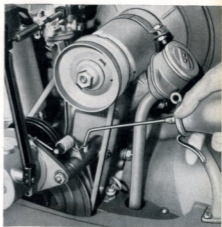
In some countries API Classification is applied (API = American Petroleum Institute). According to this classification, the oils suitable for the VW Industrial Engine are referred to as "For Service MS".

The Speed Governor

should be oiled at intervals indicated in the Lubrication Chart. Screw out the oil level control screw at the governor front face and fill in oil until the oil level reaches the lower edge of the control screw hole. After having completed the lubrication, make sure that the cap of the lubrication fitting is properly closed, as dirt and grit in the governor will cause premature wear.

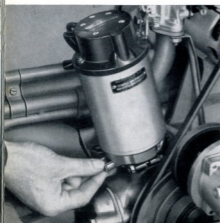


The spring-loaded mounting bracket as well as the control linkage should be lubricated daily by applying a few drops of oil. Prior to lubricating, carefully clean the lubrication fittings with a rag to avoid any dirt or foreign matter entering the lubrication points.



The Magneto

is lubricated by turning the threaded greaser cap at the bottom of the magneto clockwise. When the greaser cap is screwed right home, it should be removed and refilled with grease. Lubrication of the contact breaker cams is done by



a grease-soaked felt, which is spring-loaded to bear against the cams. Apply a coat of grease (1 mm. thick) and rub it into the felt. It is advisable to use Scintilla Grease Type G or Special Grease VW-A 051 for the above purposes.

Ignition Distributor (Battery Ignition)

The breaker arm fiber block should, if necessary, be provided with Universal Grease at the prescribed intervals. In accordance with the Lubrication Chart, apply 4 or 5 drops of oil to the felt in the cam bearing after the rotor is removed.

Engine Storage

If the engine is out of use for a prolonged period, it must be protected from rust and corrosion.

- 1 - Drain the oil.
- 2 - Fill in 1 $\frac{1}{2}$ ltrs. (1 $\frac{1}{2}$ quarts) of corrosion fighting oil.
- 3 - Start the engine and allow it to run at fast idling speed for half a minute.
- 4 - Remove the air cleaner and slowly pour 30 c. c. (1.8 cu. ins.) corrosion fighting oil into the carburetor, while the engine is running.
- 5 - Switch off the ignition.
- 6 - Reinstall the air cleaner and plug up the exhaust pipe to prevent ingress of dust and dirt.
- 7 - Spray the exterior of the engine with corrosion fighting oil.

The specifications of the oil to be used will be given by every VW Service Station. Before again putting the engine into use, drain the corrosion fighting oil and refill with 2.5 ltrs. (5.3 U.S. Pints, 4.4 Imp. Pints) of engine oil SAE 20.

MAINTENANCE

The VOLKSWAGEN SERVICE ORGANISATION has made available for you an extensive network of Authorised VW Service Stations, staffed with well trained and experienced men, and equipped with all the required special tools and appliances to service your engine.

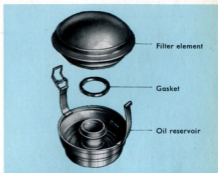
In the case you can't contact an Authorised VW Service Station in time, we are giving you some information which, if needed, will help you to carry out normal maintenance work.

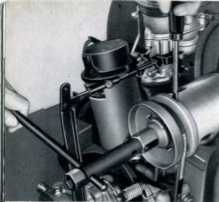
However, repair jobs which are beyond your capacity should only be performed by your next VW Service Station. This will save you time, inconvenience, and money.

Servicing Air Cleaner

The air cleaner filters particles of dirt and grit from the air. Regular servicing is especially important in dusty areas. A dirty air cleaner is responsible for frictional wear, decreasing operating efficiency, and increasing fuel consumption. If the engine is mainly operating under extreme conditions of dust-laden atmosphere, it should be cleaned daily. The air cleaner must always be cleaned, if there is no longer thin oil above the sludge at the bottom of the oil reservoir. Detailed instructions as to the intervals of cleaning, depending on the operating conditions, are generally given by the manufacturer of the cleaner. When cleaning, detach cleaner from carburetor, release the clamping strap and disassemble the cleaner. Remove dirty oil from oil reservoir and refill with fresh engine oil SAE 20 up to the mark (approx. 0.25 liter / 0.5 pint). The filter element should be rinsed in fuel, kerosene, or any other degreasing solution and then dried.

In some special cases, the cleaner is used as a wet air cleaner. The filter element should be rinsed in fuel, kerosene, or any other degreasing solution and then dried. The filter element is

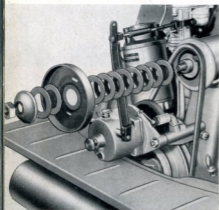




then saturated with a diluted engine oil. It is recommended to use a mixture of two parts oil and one part fuel. Allow the surplus oil to drain off prior to assembling the cleaner.

Adjusting the Fan Belt

To adjust the fan belt, remove nut and outer half of the upper pulley. When loosening or tightening nut, insert a screwdriver in the slot cut into the inner half of the pulley, and support it against the upper bolt of the fan bearing (generator housing). The adjustment of the fan belt tension is effected by means of spacer washers situated between the two pulley halves. Belt slackness is taken up by removing one or more washers. If the belt is in too much tension, one or more washers should be added. The fan belt should not be too slack, nor should it be too tight.



Newly installed belts will stretch to some extent and should, therefore, be checked and, if necessary, adjusted after the first hour of operation.

Carburetors 26 VFIS and 28 PCI

Cleaning the Carburetor

To clean the carburetor, remove the bowl cover.



Removal

- 1 - Remove the air cleaner.
- 2 - Close the fuel tap.
- 3 - Disconnect the fuel line at the carburetor.
- 4 - Remove the three screws that attach the cover to the carburetor bowl.
- 5 - Remove the carburetor bowl cover.

Cleaning

- 1 - Remove float.
- 2 - Remove the main jet plug and clean the main jet.
- 3 - Clean the float bowl.
- 4 - Clean pilot jet air bleed.
- 5 - Clean pilot jet.
- 6 - Clean air correction jet and emulsion tube.
- 7 - Clean the float needle valve.

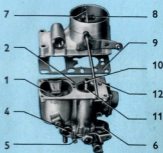
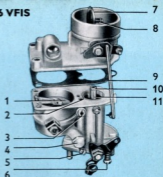
Applicable to Carburetor 28 PCI only:

- 8 - Clean accelerator pump discharge passage.
- 9 - Clean passage between float bowl and accelerator pump.

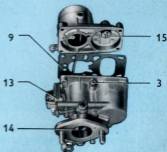
To re-assemble the unit, proceed in reverse order. Install a new gasket and be sure of its proper position between bowl and bowl cover.

Blow out the jets with compressed air! Never use a pin or a piece of wire, as this will damage the jets.

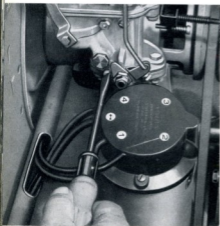
26 VFIS



28 PCI



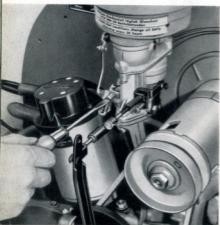
- | | |
|--------------------------|-------------------------|
| 1 - Float | 8 - Poppet valve |
| 2 - Pilot jet air bleed | 9 - Gasket |
| 3 - Pilot jet | 10 - Air correction jet |
| 4 - Main jet | 11 - Emulsion tube |
| 5 - Volume control screw | 12 - Pump pipe fitting |
| 6 - Idle adjusting screw | 13 - Accelerator pump |
| 7 - Choke | 14 - Throttle |
| | 15 - Float needle valve |



Adjustment

The carburetor is tested at the factory and properly adjusted to operate on trade-mark fuels. Do not alter this adjustment by exchanging the jets, or by changing the venturi for other than the prescribed sizes. This would be detrimental under normal operating conditions and may result in hard starting, excessive fuel consumption or unsatisfactory performance.

Only an idling adjustment will be necessary from time to time. Before attempting to adjust the carburetor, make sure the engine is at normal operating temperature.



- 1 - Turn the volume control screw in until it seats lightly, then back it off approximately $\frac{3}{4}$ turn (see picture at the top).
- 2 - Turn the idling adjusting screw in or out until the approximate idling speed is attained (see picture to the left).
- 3 - Turn the volume control screw in or out until the engine rhythm is most regular.
- 4 - Finally re-adjust the idling adjusting screw until the engine runs at normal idling speed.

The adjustment is perfect if the engine does not stall after the throttle either is suddenly opened or suddenly shut.

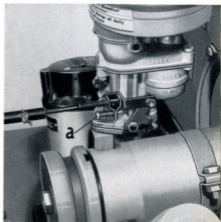
Poor idling may also be the result of damaged gaskets, intake manifold flanges not sufficiently tightened, faulty ignition or leaky valves. Skilled hands and experience are required to check and adjust the carburetor. For this reason you should leave this job to an Authorised VW Service Station.

Adjusting Stop Screw of Governor Push Rod

A "surging" (continued rapid rise and fall of engine speed) can be eliminated by means of the spring-loaded stop screw located at the carburetor end of the push rod. The adjustment should be carried out with the engine having attained operating temperature.

- 1 - Allow the engine to run under the lowest possible load.
- 2 - Steady the rhythmically moving governor linkage with your hand.
- 3 - When the engine runs steadily, turn the push rod stop screw (a) until there is a clearance of 0.1 mm. (.004") between the screw and the carburetor body.

The engine idles when pressing the push rod against the spring-loaded stop screw.

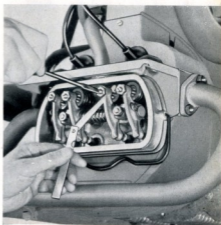


Valve Adjustment

The following procedure should be carried out only in such emergencies when it is impossible for you to reach a VW Service Station.

Valve clearance should be 0.10 mm. (.004") with the engine cold and at normal outside temperature.

The valve clearance increases when the engine warms up. For this reason, only adjust valve clearance when the engine is cold. Valve adjustment may be made in the following sequence: 1st - 2nd - 3rd - 4th cylinder. The arrangement of the cylinders is indicated by the numbers 1 to 4 on the cover plate. Adjust the valves when the piston of the corresponding cylinder is in top dead center position of the compression stroke. Starting with the 1st cylinder, crank the





engine over slowly to the left by the fan pulley, until both valves are in fully closed position and the timing mark on the pulley is in line with the vertical jointing faces of the crankcase.

Loosen the lock nut of the adjusting screw and turn the adjusting screw as required to obtain the proper clearance of 0.10 mm. (.004"), using a feeler gauge. Tighten the lock nut and re-check the clearance. Check and adjust the other valves to the proper clearance in this manner by turning the crankshaft anti-clockwise another 180° for each cylinder.

Checking the Spark Plugs

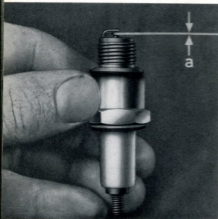
The spark plugs must be thoroughly maintained for easy starting and economical operation. Inspect and clean them and reset electrode gaps before installation in the engine. The exterior of the spark plugs gives evidence of the adjustments and the condition of the engine. Electrodes and insulator

intermediate-grey – good adjustment of carburetor and correct performance of spark plug,

black – mixture too rich,

lightgrey – mixture too lean,

oiled up – failure of spark plug or worn-out cylinder.



In the case of fuels containing lead-tetra-ethyl (anti-knock fuel), the insulator will show a grey color, provided the engine is correctly adjusted. Clean

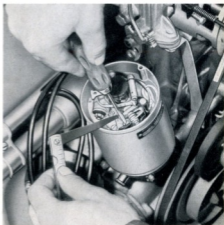
the spark plugs with a brush and a chip of wood and blow them out. Inspect the spark plugs for cracked insulators and burned or pitted electrodes. The insulator should be clean and dry inside and out to avoid short circuits. Check the electrode gap (0.4 to 0.5 mm.; battery ignition: 0.6 to 0.7 mm.; under

difficult cold starting conditions: 0.3 to 0.4 mm. with both ignition systems) and reset, if necessary, by bending the outer electrode. Look for a proper gasket before installing the plug. Generally speaking, you may count on a service life of the spark plugs up to 150 working hours.

Ignition and Timing

Particular attention should be attached to the importance of correct ignition timing. The engine operation will be seriously affected if the ignition breaker points are not properly timed and correctly spaced. In many cases poor performance, high fuel consumption and even severe damage to the engine are

the result of unskilled setting of the ignition. Normally, the adjustment should be carried out by an Authorized VW Service Station. A few practical hints are given herewith, however, because in our experience damage is apt to result if the technical facts and data are not known.



Adjusting Breaker Points

Remove distributor cap. The contact breaker points are adjusted by cranking the engine until the fiber block on the contact arm rests on the highest point of the cam lobe. Then loosen the stationary point locking screw and turn the contact plate (or eccentric adjusting screw, as the case may be) until the correct gap of 0.3 mm. to 0.4 mm. (.012" to .016") is obtained. Use a feeler gauge to check the gap. Tighten lock screw and recheck the gap. If the points are burned, rough, or pitted, replace them. Grease cam lobes slightly, if found necessary (see Lubrication Chart). The distributor cap should be clean and dry, inside and out, so as to avoid short circuits.

After the breaker points have been adjusted, it is absolutely necessary to check the ignition timing.

Ignition Timing

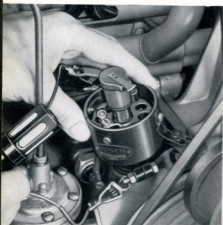
a - Magneto Ignition

Crank the engine until the mark of the crankshaft pulley lines up with the vertical crankcase jointing faces and the distributor rotor arm points to the



electrode for No. 1 cylinder. Loosen the clamp screw below the magneto base and rotate the magneto body clockwise until the points are closed. Then clamp a strip of tinfoil of 0.05 mm. (.002") between the breaker points and turn the magneto slowly counter-clockwise until the tinfoil can be easily withdrawn. This is the position when the breaker points just mark to open. Tighten clamp screw and replace distributor cap.

b - Battery Ignition



Crank the engine until the mark of the crankshaft pulley lines up with the vertical crankcase jointing faces and the distributor rotor arm is in the position for firing on the No. 1 cylinder (see mark on rim of distributor base). Loosen the lock screw below the distributor base and rotate the distributor body clockwise until the contact points are closed. Now switch on the ignition and rotate the distributor slowly counter-clockwise until the contact points just mark to open. This may be seen and heard, for a spark will jump from one point to the other.

To obtain a more accurate adjustment for maximum results, it is advisable to use a test lamp (6 volts) or an ignition timing light. The test lamp should be connected to the distributor primary lead terminal and to the ground. The lamp will light up as long as the contact points are kept open by one of the four cam lobes of the distributor shaft. After the adjustment is completed, tighten the lock screw, replace the rotor and clamp the cap on the distributor.

ENGINE TROUBLE CHECKING

Symptom	Cause	Remedy
Engine will not start	a — Fuel tap closed, Fuel filter clogged	a — Open fuel tap. Clean filter
	b — No fuel in tank	b — Replenish fuel supply
	c — Float needle valve dirty or sticking	c — Clean or renew needle valve
	d — Carburetor jets clogged	d — Remove and clean jets
	e — Choke poppet valve sticking or not closing	e — Check poppet valve and, if necessary, renew choke
	f — Ignition switched off	f — Switch on ignition
	g — Breaker points improperly spaced, dirty, or loose	g — Adjust, clean, or renew breaker points and adjust ignition timing
	h — Accumulation of moisture in distributor head	h — Carefully dry distributor head and rotor
	i — Wrongly connected high tension leads	i — Firing order 1-4-3-2
	k — Loose cable connections at magneto	k — Check cable connections
	l — High tension leads damaged or moist	l — Carefully dry high-tension leads, or, if necessary, renew them
	m — Moist spark plugs (condensed water)	m — Carefully dry spark plugs
	n — Fuel on spark plugs by excessive use of choke, sticking poppet valve, or carburetor flooding	n — Dry spark plugs and check fuel system for defects
o — In extremely cold weather, spark plug gap too large	o — Adjust spark plug gap	
Engine starts, but does not idle steadily	a — Carburetor idling adjustment incorrect (too rich or too lean a mixture)	a — Adjust idling until engine runs evenly and steadily
	b — No valve clearance or valves leaking	b — Adjust or grind-in valves. Renew, if necessary
	c — Air leaks at intake manifold flanges	c — Renew flange gaskets and check intake manifold for cracks
	d — Excessive clearance between pistons and cylinders	d — Renew pistons and cylinders
Engine idles erratically after having attained normal operating temperature	a — Choke closed	a — Fully open choke
	b — Carburetor idling adjustment too rich	b — Adjust idling until engine runs evenly and exhaust is free from soot
	c — Float needle valve dirty, sticking, or worn	c — Clean or renew needle valve

Symptom	Cause	Remedy
Engine missing	<ul style="list-style-type: none"> a — Loose high-tension lead b — Short circuits in high-tension lead or spark plug c — Spark plugs dirty or defective d — Valve leaking or sticking 	<ul style="list-style-type: none"> a — Check connections b — Check high-tension leads and spark plugs, renew as necessary c — Clean or renew spark plugs d — Grind-in or clean valve
Engine runs erratically or misfires	<ul style="list-style-type: none"> a — Spark plugs failing b — Short circuits at spark plug connectors c — Short circuits in high-tension leads d — Short circuits in distributor cap e — Governor defective f — Magneto defective g — Speed limiter (cut-out) mal-adjusted 	<ul style="list-style-type: none"> a — Check and clean spark plugs. Adjust gap. Renew spark plugs, if necessary b — Renew defective connectors (generally burned) c — Dry the moist high-tension leads and renew if damaged d — Inspect distributor cap for burned spots and replace as necessary. Remove any accumulated moisture e — Renew governor f — Renew magneto g — Correct the adjustment
Engine develops excessive heat and does not stop when switching off ignition	<ul style="list-style-type: none"> a — Insufficient fan belt tension, inadequate cooling b — Incorrect ignition timing c — Fuel/air mixture too lean d — Advance mechanism does not function properly e — Insufficient oil cooling by dirt accumulated between the oil cooler ribs 	<ul style="list-style-type: none"> a — Adjust fan belt tension. Renew excessively stretched fan belts b — Adjust breaker point gap and ignition timing c — Check and adjust carburetor d — Clean or recondition centrifugal weights e — Clean oil cooler by applying compressed air, if necessary, remove fan housing for better accessibility
Engine pinking under load at normal speed	<ul style="list-style-type: none"> a — Pre-ignition b — Insufficient fan belt tension, inadequate cooling c — Poor-quality fuel of low anti-knock rating d — Advance mechanism does not function properly e — Excessive carbon deposits in combustion chamber f — Heat range of spark plugs too low 	<ul style="list-style-type: none"> a — Properly adjust ignition timing b — Adjust fan belt tension. Renew excessively stretched fan belts c — Use trade-mark fuel d — Recondition advance mechanism e — Remove cylinder heads and decarbonize f — Use specified spark plugs. Note plug gaskets, one gasket for each plug

Due to reduced power output at 2050 r.p.m. when combine (Type 630-S) is working, fuel consumption 4,5 to 5,5 liters per hour, depending on condition of crop.

TECHNICAL DATA

Type.....	122
Design	4 Cylinder, 4 Cycle, O.H.V.-Type
Arrangement of Cylinders	Horizontally opposed (Flat four)
Bore	77 mm. (3.031")
Stroke	64 mm. (2.520")
Capacity	1192 c. c.
Compression Ratio	6.6
Fuel Consumption	8.7 Liters p. h. at sustained 3000 r. p. m. and 25 brake horsepower
Oil Consumption	35 to 45 c. c. per hour at 3000 r. p. m. (with engine continuously operating)
Weight of engine, ready for use	85 kg. (187 lbs.)
Turning direction (flywheel) ..	Anti-clockwise
Crankcase	Electron chill mould casting
Crankshaft support	Four plain bearings of aluminum alloy
Valve actuating mechanism....	Push rods and rocker arms
Valves	Overhead, one intake and one exhaust for each cylinder
Valve clearance	Intake 0.10 mm. (.004") } to be adjusted Exhaust 0.10 mm. (.004") } with engine cold
Pistons	Light-metal alloy with steel reinforcements
Piston speed	6.4 m./s. at 3000 r. p. m. (1263 ft. per min.)
Cylinders	Single cylinders of special grey cast iron
Cylinder heads	Light-metal alloy, one head for two cylinders
Cooling	Radial blower driven by V-belt
Blower speed	Approx. 6000 r. p. m. at 3000 r. p. m. of engine
Amount of cooling air	Approx. 450 Liters/sec. at 3000 r. p. m. of engine
Lubrication	Force feed by gear pump
Oil capacity	Metric - 2.5 Liters U. S. - 5.3 Pints Imp. - 4.4 Pints
Oil cooling	Oil cooler (hollow ribs) situated in air stream
Fuel supply.....	Gravity feed; pump should be used if des-cension is less than 200 mm. (7.9")
Fuel	Octane rating 76 (Res. F 1), regular grade pump fuel
Carburetor.....	Downdraught SOLEX

Air cleaner for carburetor	Oil-bath type	
Ignition	High-tension magneto with speed limiter (Battery ignition on request)	
Firing Order	1 - 4 - 3 - 2	
Spark timing (Magneto)	7.5° before T. D. C.	
Spark plugs	Bosch W 225 T 1 EA 0.5 F.P. Beru 225/14, gap 0.4-0.5 mm. (.016" to .02")	
Spark plug gap	0.4 to 0.5 mm. (.016" to .02")	
Breaker point gap	0.3 to 0.4 mm. (.012" to .016")	
Battery ignition system		
Ignition	Ignition distributor Bosch V J 4 BR 8 mk. Coil Bosch TE 6 A 3	
Spark plugs	Bosch W 225 T 1 Beru K 225/14 u 2 Lodge H 14 or HN Champion L 10 S AC F 10 KLG F 70 Auto-Lite AEG or AER 6	} 14 mm.
Spark timing	7.5° before T. D. C.	
Spark plug gap	0.6 to 0.7 mm. (.024" to .027")	
Breaker point gap	0.4 mm. (.016")	
Governor	Centrifugal governor, acting on the carburetor throttle	
Starting system	Starting handle (Starter motor on request)	
Starter	Bosch EED 0,4/6 L 4	
Generator	Bosch LJ/REF 160/6/2500 L 17	
Clutch	Single disc, dry - Fichtel & Sachs K 10	

The data printed in blue refers to the equipment which is not fitted to the standard type engine 122.

MAINTENANCE CHART

Running-in period (Operating hours)			Operation	Every (Operating hours)
10	30	50		
			Clean air cleaner *)	50
			Check and adjust fan belt tension	
			Clean carburetor	
			Check and adjust carburetor adjustment	
			Check and adjust breaker points and ignition timing	
			Check and adjust valve clearance	
			Check and set spark plugs	
			Check governor for proper operation	
			Check generator	
			Check battery	
			Check thermostat-controlled cooling air intake	} if fitted
			Check tightness of nuts and bolts of engine, especially exhaust, carburetor and intake manifold	100

*) In dust-laden atmosphere once per day

LUBRICATION CHART

Running-in period (Operating hours)			Lubrication Points	Every (Operating hours)
10	30	50		
			Change oil	50
			Oil governor (governor mounting bracket, control linkage *)	
			Lubricate magneto by turning grease cap Grease ignition distributor cam in magneto	
			Grease breaker arm fiber block in distributor. Oil felt in distributor cam	100
			Clean oil strainer	

*) Apply some drops of oil daily

LUBRICANTS

Lubricant	Lubrication Points	Specifications			
		Temperature			
		°C	°F		
Engine oil	Engine, governor, governor linkage, carburetor controls, felt in distributor cam	above	+30	86	SAE 30
		from	-15	5	SAE 20 or
		up to	+30	86	SAE 20 W
		below	-15	5	SAE 10 W
Special Grease	Grease cap at magneto Distributor cam	High melting point grease according to VW specification A051 or Scintilla Grease Type G			
Universal Grease	Breaker arm fiber block in distributor	Anti-freeze water-repellent grease (VW-Sp. A-052)			

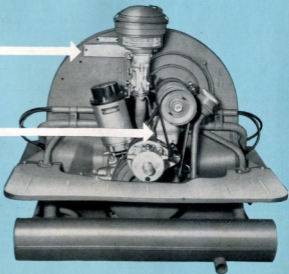
Delay and confusion can often be avoided, if the correct information is furnished on parts orders and correspondence.

The Identification Plate

is found on
the left-hand side
of the fan housing.

The Engine Number

is stamped
on the fan bearing
support.



Tools and accessories

- 1 Tool Bag
- 1 Spark Plug Wrench
- 1 Tommy Bar
- 1 Open End Wrench 10/14 mm.
- 1 Combination Pliers
- 1 Screwdriver 0.8 mm.
- 1 Socket Wrench 14 mm.
- 1 Starting Handle
- 1 Fan Belt

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