

Operating Troubles and Elimination of same

Job No.

0-10

Change: x

1. During Starting

Trouble	Cause	Remedy
<p>Glow control light does not light up when starting switch is in the preheating position "1" or Starter does not rotate when starting switch is in the cranking position "2".</p>	Key not inserted in junction box.	<p>Charge battery through separate power source. Thoroughly clean battery terminals and cable clamps, so that they are metallic bright. Have it repaired. Check glow plugs (see Job No. 15-32). Replace faulty glow plugs. Replace resistor or glow control light.</p>
	Capacity of battery insufficient.	
	Poor contact at the battery terminals.	
	Failure of starter.	
	Faulty glow plugs.	
<p>Engine fails to start, even though starter rotates and glow control light burns.</p>	Faulty series resistance or glow control light.	<p>Repeat starting procedure. Charge battery through separate power source. Measure opening pressure of by-pass valve when fuel main filter is empty (see Job No. 00-9). In addition, check transfer pipe (11) and throttle of 1 mm dia. (see Job No. 09-3/5). Top up fuel in filter and in tank: Bleed fuel system (see Job No. 00-10). Take measures for winter operation (see Job No. 0-7). Bleed fuel system. (See Job No. 00-10). During this operation it can also be determined if the fuel lines are tight and the filter is not too dirty. Clean fuel filter and replace seals. Retighten all hose clips of fuel supply line leading from fuel tank to injection pump. Check by-pass valve (see Job No. 09-3). Correctly adjust cable stop. (See Job No. 00-13). Check glow plug system; remove injection nozzles, preglow, and check the installed glow plugs for perfect glowing. Check whether one or several glow plugs have a short-circuit (at prechamber etc.), or whether they are wet or sooted. Replace glow plug (see Job No. 15-32 and 15-31). Remove glow plugs, connect and ground them. Then repeat starting procedure watching the glow plugs at the same time; if necessary, replace glow control light. Measure compression pressure when the engine is cold (see Job. No. 00-5). If necessary grind valves and/or replace pistons. Check feed begin and adjust correctly (see Job No. 00-6).</p>
	Pre-heating too short.	
	Battery charge insufficient. The starter speed should be min. 100 r.p.m.	
	No fuel or wrong fuel in tank, or fuel main filter has run empty overnight due to leaky by-pass valve.	
	Engine is too cold.	
	Air in fuel system. (Air is sucked in by leaky fuel supply line and continuous flow filter between fuel tank and injection pump).	
	Adjusting lever fails to go to starting volume.	
	No ignition in one or more cylinders, meaning the respective glow plug is short-circuited and does not glow.	
	The glow plugs do not continue to glow during cranking of the starter. (Cannot be observed at glow control light while starter is switched on).	
	Insufficient compression.	
Injection pump incorrectly adjusted.		

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Engine fails to start, even though starter rotates and glow control light burns.	Faulty injection nozzles. Faulty pre-combustion chambers. Pump plunger or tappet of feed pump sticks. Control rod sticks. Pump plunger of injection pump heavily worn. Gum formation on pump and governor components after long inoperation of engine. Valves seat too deeply.	Repair injection nozzles or replace them (see Job No. 07-18). Remove and check pre-combustion chambers (see Job No. 01-1). Replace or repair feed pump. Restore operating ease of control rod. Check discharge pressure with peak pressure tester (see Job No. 07-18, Fig. 07-18/12). Restore operating ease of pump and governor parts. Remachine separating surface of cylinder head (see Job No. 01-5), or with model OM 621: insert new valve seat rings (see Job No. 01-7).
Engine stops after starting.	Air in injection pump. Fuel filter obstructed. Ventilation of fuel tank obstructed.	Bleed fuel system (see Job No. 00-10). Clean filter element (see Job No. 09-3). Remove obstruction - clean.
Short, but dense emission of smoke when starting.	Starting injection too big. Valves seat too deeply.	Reduce volume of starting injection by adjusting choke control. For engines in fork lifts starting quantity is not necessary if starting is accompanied by a short but dense smoke emission. In such cases remove cable control and install simple linkage which makes stopping of engine possible (see Job No. 00-13). Remachine separating surface of cylinder head (see Job No. 01-5), or with model OM 621: insert new valve seat rings (see Job No. 01-7).
Engine runs in opposite direction, which is noticed by dense smoke emitted underneath engine hood, or by air filter, respectively.	The diesel engine can rotate in the wrong direction if the following operating mistakes are made: 1. If the engine is cranked in the wrong direction. This condition is given if the reverse gear is engaged during forward coasting and clutching or the engine stalls through overload and is subsequently started in the opposite direction by the load. 2. The engine can also be brought into reverse motion if the driver has tried to start the engine without preheating and after finding out that the engine is still too cold to start brings the switch from starting position to the pre-heating position . In this case the beginning of the preheating can unfortunately coincide with the oscillations of the engine that an extremely early ignition takes place, which starts the engine in the wrong direction. After an abortive trial to start without pre-heating the starting switch must therefore be returned to the stop position and maintained there until the engine has stopped completely, before starting of the engine by employing pre-heating is tried again.	If the engine runs in the opposite direction and cannot be stopped in spite of the fully opened throttle valve actuated by the adjusting lever due to the exhaust pressure on the governor diaphragm, the engine is best stopped by engaging the gear. If this is hard to do, e. g. because the vehicle is not equipped with synchronized gear, the exhaust pipe (now intake pipe) must be closed or the bleeder screws in the injection pump must be removed quickly and completely. In any case act quickly, because first the air filter will burn and finally, after minutes of reverse operation, damages can be caused through lack of oil. Engines with centrifugal governors can also run backwards due to operating mistakes, however, without increase of the adjusting forces, meaning, they can be easily stopped. (Also see Job No. 07-4, Section V.) Note: In order to prevent any similar trouble, we recommend the subsequent installation of a flap with the by-pass valve (see Job No. 07-02, Section c).

Trouble	Cause	Remedy
<p>Engine runs in opposite direction, which is noticed by dense smoke emitted underneath engine hood, or by air filter, respectively.</p>	<p>3. The engine can also run in the opposite direction, e.g. industrial engines which have exhaust flame traps and or spark arresting devices, which are so finely meshed that the passage is too small or becomes small through sooting, so that an excessive exhaust backpressure is formed which causes the engine to run in the opposite direction when it comes to a stand-still, during change to idling, and already during starting, respectively.</p>	<p>If the engine can be put out of operation for a while, the following work can be done with the customer's approval and the engine can be operated again with the usual reservations.</p> <ol style="list-style-type: none"> 1. To test bearings and pistons, rotate crankshaft manually. 2. Measure compression pressure of the individual cylinders. 3. When items 1 and 2 are in good order, replace engine oil, oil filter element, air or filter of oil bath air filter and check butterfly throttle in flap for smooth run. 4. With the engine running, check oil pressure and drive the vehicle on a test run.
<p>Engine runs irregularly.</p>	<p>Air or dirt in the fuel system. Fuel line leaks. Fuel filter fouled. Delivery of fuel feed pump is insufficient. Pressure valves and or springs of same in injection pump damaged or broken plunger spring. Leaking injection nozzles or irregular injection caused by fouling. Great difference in compression pressure due to faulty pistons or valves. Retainer on adjusting sleeve has become loose and changed feed volume. Gum formation on pump and governor parts after longer inoperation of the engine. Non-return valve wobbles because of excessive play.</p>	<p>Bleed fuel system (see Job No. 00-10). Tighten connections of fuel lines, if necessary replace damaged fuel lines. Clean fuel filter (see Job No. 09-3). Measure suction and pressure action of the fuel feed pump (see Job No. 00-9, and check fuel pump, see Job No. 07-14). Use screwdriver to determine (at the individual pump elements) faulty pressure valves and replace same (see Job No. 07-4, Section II). Repair nozzles (see Job No. 07-18). Check individual cylinders with compression tester (see Job No. 00-5). If necessary, grind valves or replace pistons. Check retainer for tight fit on the adjusting sleeve. The markings should coincide (see Job No. 07-5, Fig. 07-5/10). Clean pump and governor parts. Adjust non-return valve by adding a washer to the compression spring on shaft end of non-return valve (see Job No. 07-23).</p>
<p>Engine does not reach full power output.</p>	<p>Injection pump controls too early. Butterfly throttle not sufficiently opened. Air filter fouled. (Causes leanness). Injection rate too low. Heavily worn pump plungers. Insufficient fuel pressure.</p>	<p>Clean non-return valve and lubricate for smooth run. Measure max. speed, unloaded, and adjust, if required (see Job No. 00-12). Check adjustment of butterfly throttle (see Job No. 00-12). Clean air filter. Adjust full load stop and or check control rod travel (see Job No. 07-8, Section II). If possible, test pump on test stand. Check discharge pressure (see Job No. 07-18, last paragraph). Remove, clean and if necessary replace by-pass valve. Check feed pump (see Job No. 00-9).</p>

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<p>Engine does not reach full power output.</p>	Control rod sticks.	Check ease of movement of control rod and ease.
	Pressure valve at injection pump leaks or spring broken.	Actuate pump plunger with screwdriver, if necessary replace valve (see Job No. 07-10 and 07-4, Section II).
	Faulty injection nozzles. Too much leakage through worn needles.	Repair or replace nozzles (see Job No. 07-18).
	Pump injects too early or too late.	Correct adjustment of injection pump (see Job No. 00-6).
	Engine mechanically at fault.	Determine through compression test whether valves and pistons are in order, grind valves or replace pistons, if necessary (see Job No. 00-5).
	Timing device sticks in idling position.	Restore operating ease of centrifugal weights (see Job No. 07-25 and 07-28).
	Air in fuel system. Infiltrated air is sucked into feed pump.	Bleed fuel system (see Job No. 00-10). Locate leaks by applying soapy water, particularly to the connections of the suction line and the joints of the suction hose at the fuel feed pump. (Also see Job No. 00-9.) Replace connecting hoses between fuel supply line.
x	Wrong setting of fuel feed beginning and timing by excessive chain length.	Correction of chain length (see Job No. 05-20 and 05-27). x
x	Non-return valve is not lying tight enough against stop.	Check linkage. Make non-return valve run smoothly, lubricate bearing points, remove washer underneath compression spring of non-return valve shaft. x
x	Starter pull controls are slightly depressed in stop position.	Correct starter pull controls. x
<p>Engine is sooting strongly, emits thick black clouds of smoke.</p>	Opening pressure of nozzles too low or needles stick.	Repair nozzles, replace if necessary (see Job No. 07-18). On industrial engines adjust opening pressure of nozzles to 150 atü (2134 psi), if necessary.
	Rate of injection too high.	Idling engines for hours causes relatively fast carbon formation at the injection nozzles. Therefore, care has to be taken that the engines are not operated in idling too long, especially when installed in fork lifts. Our starting mechanism permits repeated starting and stop engine, if possible, instead of unnecessary idling. Check control rod travel (see Job No. 07-8, Section II), if necessary reduce injection volume by adjusting full load stop. A 90 deg to 120 deg clockwise turn of the stop screw at the injection pump reduces the injection volume by approx. 2 mm ³ per stroke. Lead-seal injection pump again. Check injection pump governor for leaks, see Job No. 07-8, Section I, also check oil level in oil bath air filter. Adjust pump on injection pump test stand, if available.

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<p>Engine is sooting strongly, emits thick black clouds of smoke.</p>	<p>Injection pump injects too early or too late. Injection pump not in order.</p> <p>Retainer on the adjusting sleeve has become loose and changed feed volume. Compression pressure of individual cylinders is too low.</p> <p>Wrong fuel. Leaky governor diaphragm.</p> <p>Full load stop device worn after long operation of injection pump.</p> <p>Engine sucks infiltrated air.</p>	<p>Check adjustment of pump (see Job No. 00-6). Remove injection pump and check on test stand (see Job No. 07-5 and 07-11). Check retainer as described in Job No. 07-5, adjust as marked and tighten (see Figure 07-5/10). Measure with compression tester the individual cylinders (see Job No. 00-5). Grind valves or replace pistons, if necessary. Change fuel. Replace diaphragm (see Job No. 07-8, Section I). Adjust full load stop on injection pump and on flap socket (see Job No. 07-8, Section II). Tighten vacuum line leading from flap socket to injection pump governor at its connection points.</p>
<p>Engine knocks heavily.</p>	<p>Air in fuel system. Infiltrated air is sucked into feed pump.</p> <p>Faulty gasket of fuel filter cartridge (dirt in injection pump and nozzles)</p> <p>Depressed connectors of injection lines. Injection pump discharges too early or too late or timing device sticks. Wrong fuel. Injection nozzles fouled or opening pressure too low. Compression too low.</p> <p>Valves seat too deeply.</p> <p>Seals of pressure valves of injection pump leaky or fastening bolt of clamping jaws of tubular connections excessively tightened.</p>	<p>Bleed fuel system (see Job No. 00-10). Locate and repair leaks (see Job No. 00-9). Replace filter cartridge and gaskets. Use square felt plate element (see Job No. 09-3). Drill up connector to 2 mm (see Job No. 07-16). Adjust pump correctly. (See Job No. 00-6.) Change fuel. Repair or replace injection nozzles (see Job No. 07-18). Measure individual cylinders with compression tester (see Job No. 00-5). Remachine separating surface of cylinder head (see Job No. 01-5) or with model OM 621: insert new valve seat rings (see Job No. 01-7). Replace pressure valves of seals (see Job No. 07-10).</p>
<p>Engine all of a sudden starts to knock very heavily.</p>	<p>Injection nozzle sticks due to fouling.</p>	<p>Disengage clutch and accelerate engine several times from idling to full load. If the knocking happens repeatedly, remove, clean and test all or only the respective injection nozzle (see Job No. 07-18). Also clean the entire fuel system when convenient.</p>
<p>Ticking or knocking noise.</p>	<p>By-pass valve noisy.</p> <p>Tappet knocks against pump plunger due to extremely high pressure in the system or sticking pump plunger.</p>	<p>Check by-pass valve, install one or two silencers after by-pass valve, if required (between return line and fuel main filter) (see Job No. 00-9). Restore operating ease of pump plunger, or replace pump (see Job No. 00-9).</p>

Trouble	Cause	Remedy
x Temperature fluctuations	<p>Formation of vapor bubbles caused by additional compensating line.</p> <p>Vapor lock by leaky cylinder head gasket or hair-line crack in cylinder head or cylinder crankcase.</p>	<p>Free hole of compensating line (see Job No. 01-3, item 28) and top up cooling water slowly with the engine running.</p> <p>Replace cylinder head gasket. Pressure-test cylinder head and cylinder crankcase when still warm, and replace, if required.</p>
x Oil pressure too low, or drops suddenly. (Permissible lube oil pressure for normal cooling water temperature, depending on oil viscosity and engine speed 2-8 kg/cm ² = 28-114 psi) Minimum oil pressure when idling 0.5 kg/cm ² (7.1 psi) with warm engine.	<p>Too little oil in oil pan.</p> <p>Leaky oil filter or line between engine casing and oil filter.</p> <p>Oil relief pressure valve on engine is dirty or leaky.</p> <p>Oil pressure gauge not in order.</p> <p>Engine damage: for example, oil pump defective; camshaft, main and connecting rod bearings have too much play, oil duct plug loose, oil in water, etc.</p>	<p>Top up with engine oil.</p> <p>Tighten screw connections. Check oil filter for leaks.</p> <p>Disassemble oil relief pressure valve and clean (see Job No. 18-5).</p> <p>Detach connecting line for pressure gauge on filter. If with the engine running oil comes out of the connection point, then the oil pressure itself or the pressure line is damaged and should be replaced.</p> <p>Remove engine, exchange or repair.</p>
x High oil consumption Note: Before disassembling the engine determine the actual oil consumption by a perfect analysis. Perm. oil consumption for vehicles is approx. 0.15 ltr./100 km, for the Unimog and for conversion engines approx. 0.12 kg/h	<p>Oil loss (too much oil filled-in)</p> <p>Damaged sealing rings of valve stem sealing.</p> <p>Excessive play between valve stem and valve guide.</p> <p>Oil is carried along from the air filter by excessive speeds.</p> <p>Excess pressure in cylinder crankcase.</p> <p>Cylinder holes out-of-round by incorrect tightening of cylinder head bolts.</p> <p>Broken piston ring or worn out-of-round cylinder holes, or pistons and cylinder holes are excessively worn.</p> <p>Engine insufficiently run in.</p>	<p>Check and repair: Cylinder head cover, oil lines, oil filter, plunger chamber cover, fabric seal of rear crankshaft seal.</p> <p>Replace sealing rings of valve stem sealing (see Job No. 05-16).</p> <p>Replace valve guides (see Job No. 01-6).</p> <p>Adjust max. speed when not loaded (see Job No. 00-12/1).</p> <p>In the event of oil losses at the oil dipstick the nozzle hole of the engine vent in throttle socket can be enlarged by 1/2 or 1 mm steps. When doing so, be careful, since with too large a hole the area behind the throttle valve (with closed valve) will be damaged, which might in turn change the vacuum (see Job No. 07-23).</p> <p>Tighten cylinder head bolts acc. to instructions (see Job No. 01-3, Fig. 01-3/3 and page 00-1/1).</p> <p>Disassemble engine, measure cylinder holes and replace broken piston ring, if required, or install new oil slot rings with Goetze corrugated spring washer (see Job No. 03-11 and Job No. 03-15).</p> <p>Wait until engine reaches a mileage of approx. 5000 miles (8000 km).</p>
x Oil in water	<p>Leaky cylinder head seal around transfer hole of oil duct leading from cylinder crankcase to cylinder head.</p> <p>Leaky spot or hair-line crack in the walls of main oil duct of cylinder crankcase.</p>	<p>Replace cylinder head seal.</p> <p>Remove engine and pressure-test cylinder crankcase when still warm, replace cylinder crankcase, if required.</p>

Trouble	Cause	Remedy
x Water in oil	Leaky cylinder head gasket. Parting line of cylinder head or cylinder crankcase rough or distorted. Leaky plug under camshaft bearing brackets. Leaky cylinder head (hair-line crack).	Replace cylinder head gasket. With excessive roughness surface-grind or mill the respective parting line (see Job No. 01-5 and 01-26). Seal plug. Pressure-test cylinder head when still warm, replace, if required.