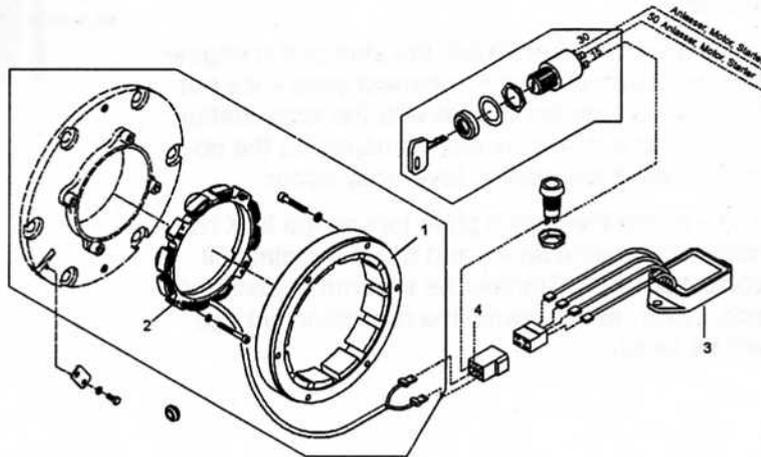


7. Electrical system

7.1 Flywheel – dynamo / Regulator

Operation:

The permanent magnets in the magnet holder (1) on the fly-wheel side induce an alternating voltage in the coils of the stator (2); this voltage is proportional to speed (RPMs). The alternating voltage is rectified in the regulator (3) and continuously regulated to approximately 14.2 - 14.5 V.



Connections to the Governor:

- 2x yellow | Generator coils, input, interchangeable
- 1x red | Output, charging current
- 1x brown | Charge control, Terminal 15, ignition lock

Connection to earth is made via the assembly surface.

7.2 Function Tests:

a) Alternating voltage at the coil output

Disconnect the connecting plug (4).

The voltage proportional to speed is measured on the two phases (2x black).

Set values: Graph A, "Idling Voltage without Governor Cut-Out"

b) Coils = single phase to earth

c) Charging current, governor output

Connect a suitable ammeter ($I_{max}=30A$) into the charging circuit (red cable).

The charging current depends on the speed and the state of the battery charge. Graph B, "Charging Current".

d) Charge control circuit

If the electrical system is intact, the charge control indicator must go out in the speed range from 600-800 revolutions/min.

Operating Conditions:

- Permissible operating temperatures: -20 to 70°C (measured on the governor surface)
- An intact earth connection must exist between the governor and the engine, and also between the governor and directly attached external construction (no painted or enamelled assembly surfaces).

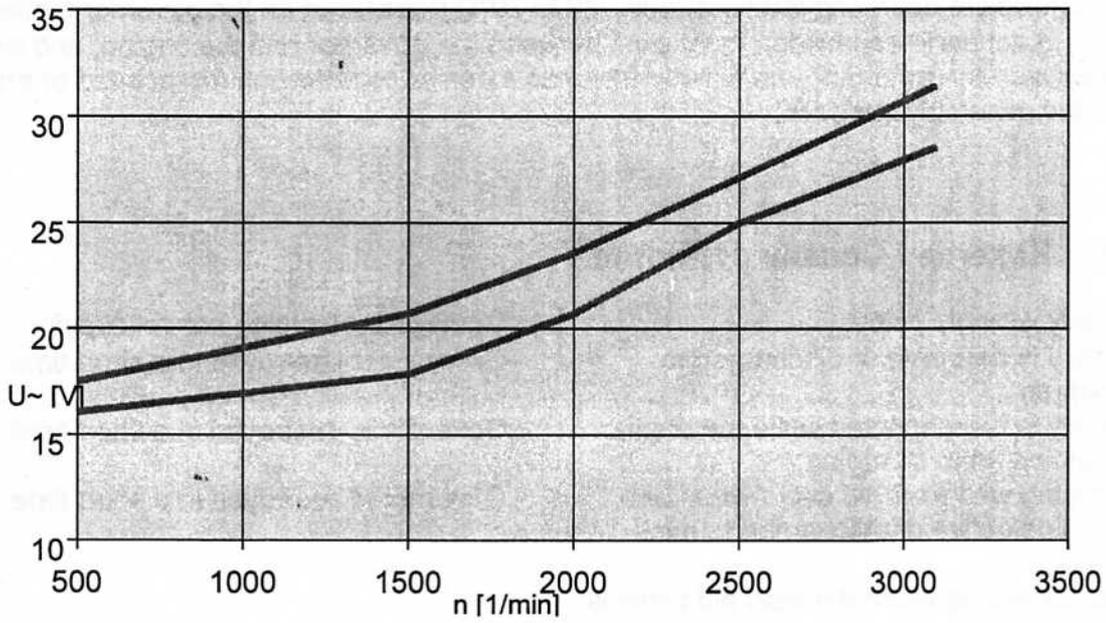
7.3 Hazards / Causes of Failure

Battery wrongly poled		Damage to charging control circuit
Battery is defective or discharged to minimum		Governor is destroyed in a short time.
Battery is disconnected while the engine is running (load shedding)		Governor is destroyed in a short time.
Charging with start aid cable when battery is defective or discharged to minimum		Governor is destroyed in a short time.
Load shedding when the start aid cable is removed.		
Welding work on the equipment (loosen all plug connections and battery cables beforehand)		Governor is destroyed in a short time.
Manual start with battery disconnected		Governor is destroyed in a short time.
Interruption of the earth connection between the governor housing and the engine		Governor is destroyed over a long period.

7.4 12 V Flywheel – dynamo / regulator, GRAPHS

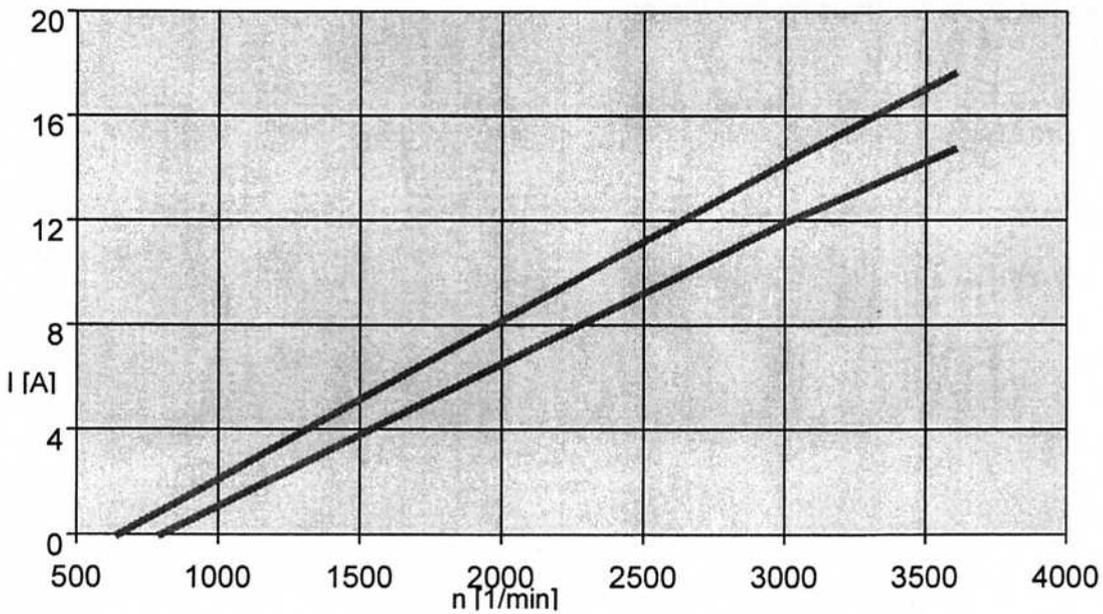
Idling Voltage without Governor

Graph A



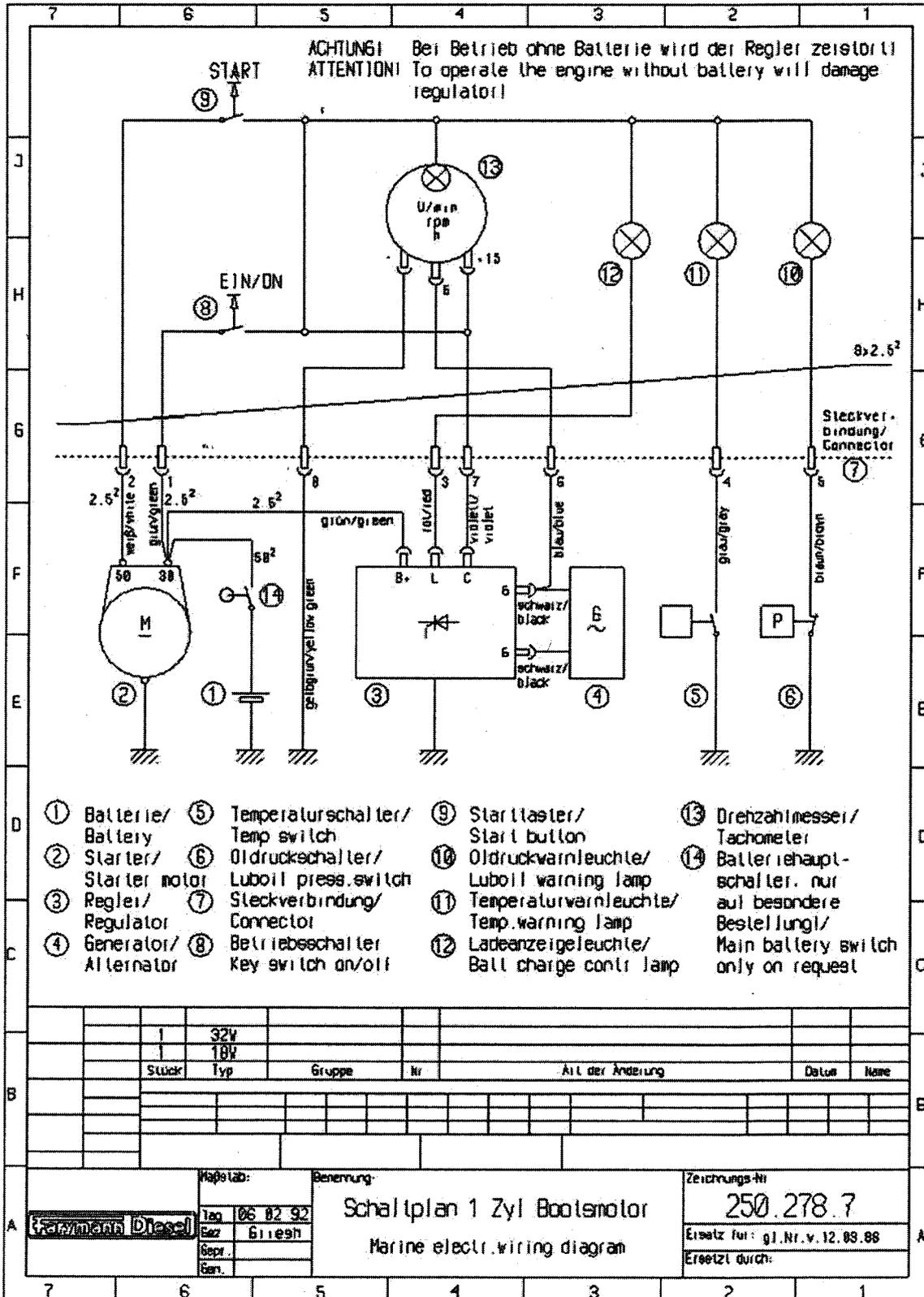
Charging Current

Graph B

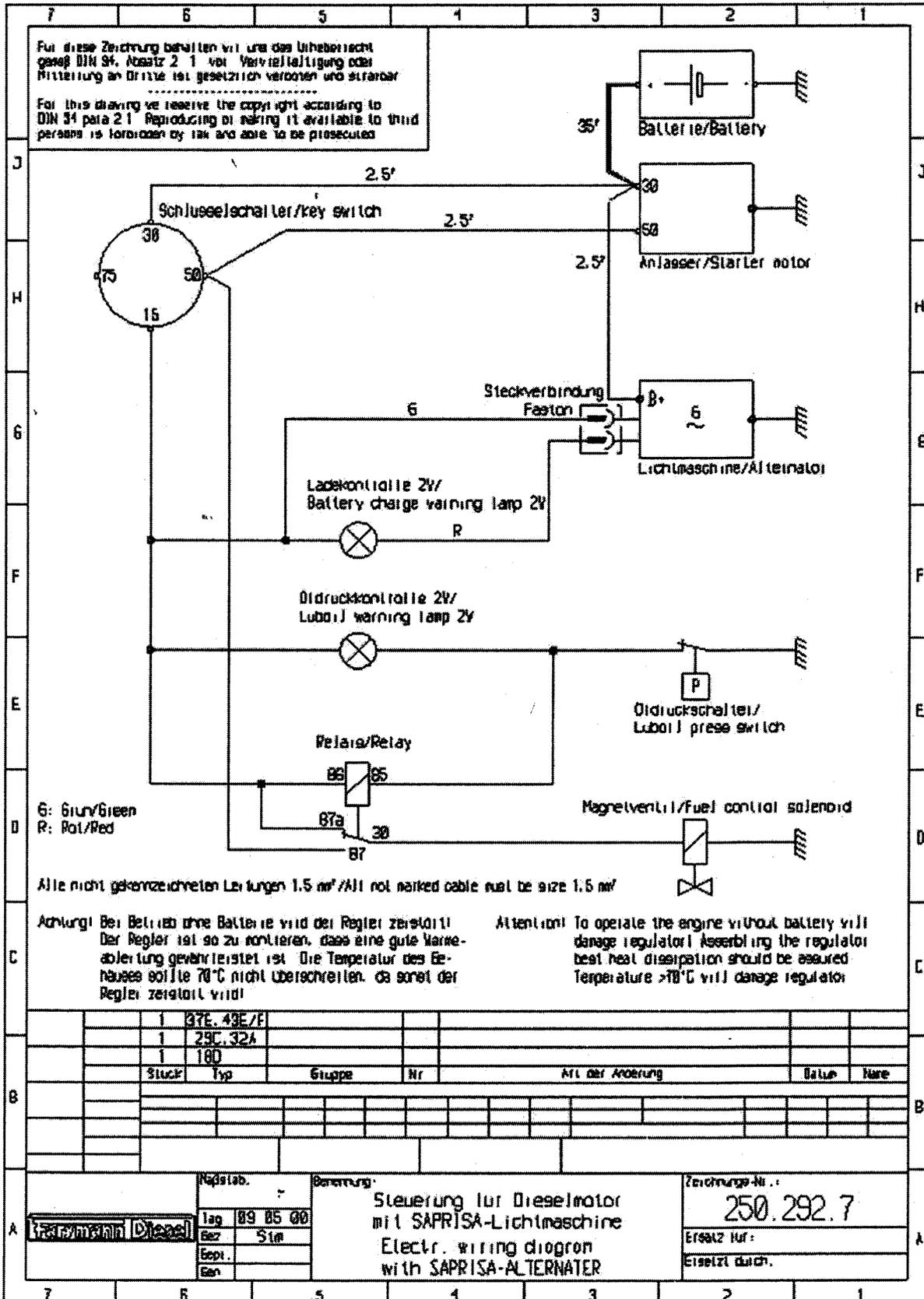


7.5 WIRING DIAGRAMS

7.5.1 Diagram 1

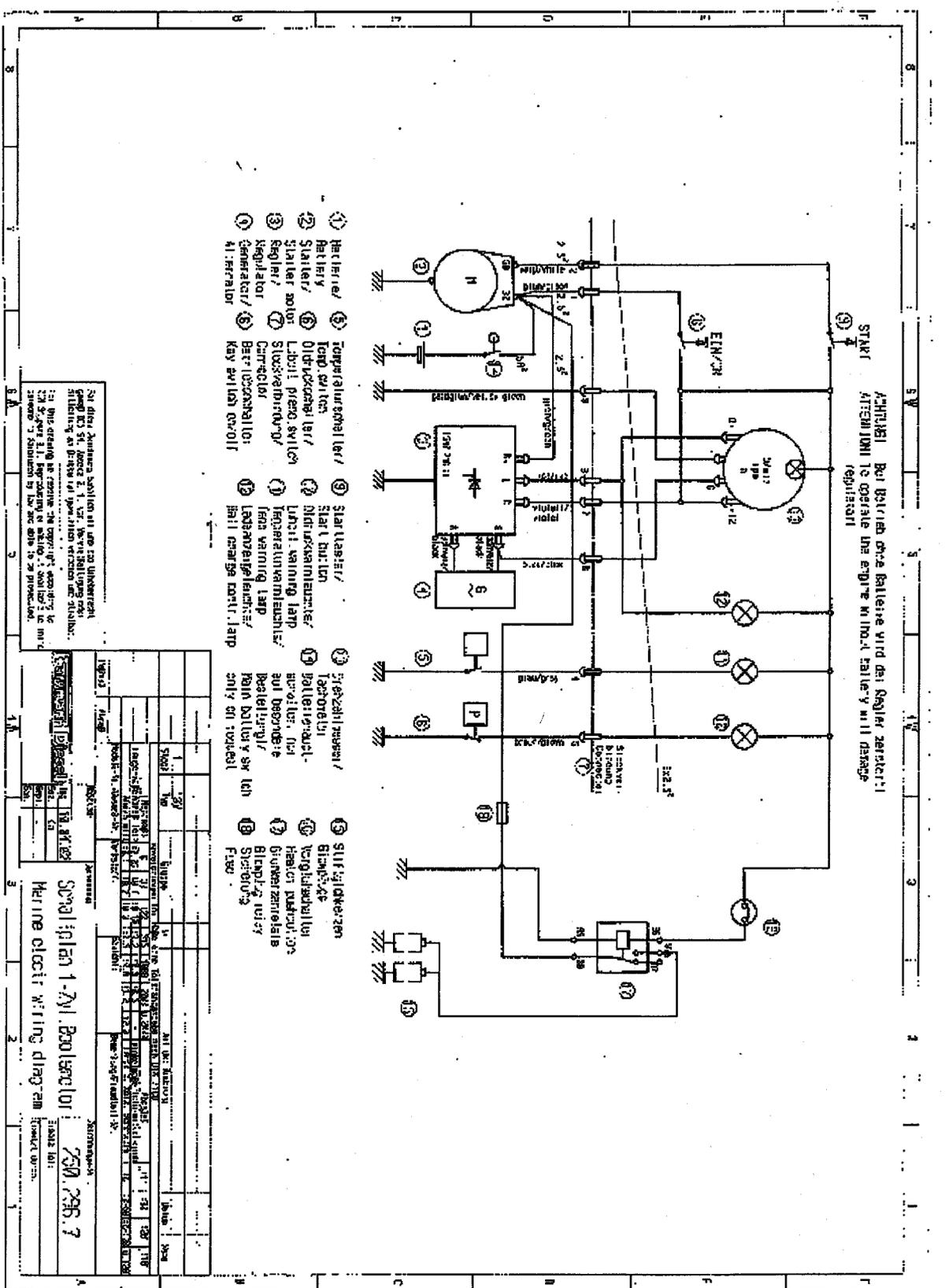


7.5.3 DIAGRAM 3



ELECTRICAL SYSTEM

7.5.4 DIAGRAM 4



8. TROUBLESHOOTING

This section aims to suggest possible causes and remedies for faults. Please note that this list can never be complete. Whenever there is a fault, the guiding principle should be: "Think Before You Act".

8.1 Engine will not start

Reason	Causes	Remedy
<p>If the injection noise (rasping) cannot be heard:</p> <p>Fuel supply failure - turn the engine over by hand cranking, and listen for the characteristic rasping noise in the injector.</p> <p>If the rasping noise can be heard:</p>	<p>No fuel in tank. Acceleration lever at stop. Vent valve in tank cap blocked.</p> <p>Fuel line blocked. Fuel filter clogged. Broken fuel line or leaking connections. Vapor lock (fuel too hot). Paraffin precipitation in fuel (in cold seasons)</p> <p>Faulty injector nozzle. Faulty injector pump.</p> <p>Gasoline instead of diesel in tank.</p> <p>Air intake blocked.</p>	<p>Fill with fuel; no venting needed. Set lever to full load Renew cap</p> <p>Check lines. Renew filter. Renew pipe / tighten connections.</p> <p>Cool the fuel. Drain and flush system, renew fuel filter. Use winter fuel.</p> <p>Check / repair / renew nozzle. Check / repair / renew pump.</p> <p>Drain gasoline, flush and fill with diesel. Check intake system. Change filter insert.</p>
<p>Poor compression</p>	<p>Incorrect valve clearance. Decompression device defective.</p> <p>Leaky valves. Valves sticking. Leaky cylinder head/ cylinder head seal.</p> <p>Piston rings stuck in grooves. Worn cylinder and piston.</p>	<p>Adjust valve clearance. Check / renew decompression device. Check / repair / renew valves. Free valves. Tighten nuts / renew seal.</p> <p>Check / free / renew the rings. Overhaul the engine.</p>
<p>Difficult to crank start the engine</p>	<p>Starting load too high. Lubricating oil too thick. Bearings seized. Piston seized.</p>	<p>Reduce load. Change oil; use correct viscosity. Overhaul engine. Overhaul engine.</p>

8.2 Engine starts but fires intermittently or dies

Poor fuel supply	Fuel filter choked. Fuel line blocked. Leaking fuel lines. Water in fuel. Faulty injector nozzle. Faulty injector pump.	Renew filter. Check lines. Check lines / tighten connections. Drain fuel, fill with clean diesel. Check / repair / renew nozzle. Check / repair / renew pump.
Poor compression	Incorrect valve clearance. Worn valves. Valves sticking. Piston rings stuck in grooves. Worn cylinder and piston.	Adjust valve clearance. Overhaul cylinder head. Free valves. Check / free / renew rings. Overhaul engine.
Faulty intake and exhaust system	Restricted / blocked intake. Restricted / blocked exhaust.	Check / clean / exchange intake system. Check / clean / exchange exhaust system.

8.3 Poor engine performance and / or black smoke

Operating conditions	Engine overloaded. Power reduction due to altitude, and/or increased intake temperature has been ignored.	Reduce load. Fault search on equipment. Better operating conditions.
Poor fuel supply	Gasket under injector nozzle missing, or too many installed. Fuel filter blocked. Faulty injector nozzle. Faulty injector pump.	Install gasket / Correct number of gaskets. Renew filter. Check / repair / renew nozzle. Check / repair / renew pump.
Out of adjustment	Incorrect valve clearance. Incorrect end of delivery. Incorrect valve control timings. Piston installed wrongly.	Adjust valve clearance. Adjust end of delivery. Check gear wheel setting mark. Correct piston installation.

8.4 Poor engine performance and/or black smoke

Dirty engine	Dirty air filter. Excessive oil carbon deposits on piston and cylinder head.	Clean / renew filter. Decoke components / change vent valve.
General Engine Condition	Worn piston rings. Worn piston and cylinder. Worn bearing.	Renew rings / check air filter. Overhaul engine. Overhaul engine.

8.5 Imperfect operating behaviour

Overheating	Engine overloaded. Cooling fins dirty. Cool air intake obstructed. Short circuit of cooling air. Oil level in crankcase is too high. Faulty injector nozzle.	Reduce load. Clean cooling fins. Remove obstruction. Improve cooling air flow (check engine installation). Drain to proper level. Check / repair / renew nozzle.
Knocking Noises	Oil carbon deposits on piston. Injector needle sticking. Advanced ignition. Broken piston rings. Worn piston and cylinder. Worn bearings. Loose flywheel. Gasoline mixture in tank.	Decoke. Fit new nozzle. Check/adjust end of delivery. Fit new rings. Overhaul engine. Overhaul engine. Tighten flywheel nut. Change fuel.
Major fluctuations in speed (RPMs)	Overheating. Air in fuel. Governor sticking or faulty. Fuel filter choked. Regulating lever sticking or faulty.	See above. Check the fuel system for leaks / check the return line. Check / repair / renew governor. Renew filter. Check / renew.
Engine stops suddenly.	Empty fuel tank. Vent valve in tank cap is blocked. Vapor lock (fuel too hot). Choked injection nozzle.	Fill with fuel. Renew tank cap. Cool fuel. Check / repair / renew nozzle.

8.5 Imperfect Operating Behaviour

Engine stops suddenly	Fuel pipe broken. Seized piston. Seized crankshaft bearing.	Renew pipe. Renew piston and cylinder. Repair / renew crankshaft and bearings.
Blue smoke from engine	Oil level in oil bath air filter too high. Faulty vent valve in cylinder head. Sealing ring damaged on intake valve guide. Worn valves / valve guide. Worn piston / cylinder.	Fill to proper level. Renew valve. Renew sealing ring. Overhaul engine. Renew.
White smoke from engine	Ignition too late. Injector nozzle is worn.	Check / adjust end of delivery. Renew nozzle.
Oil pressure warning light on	Oil pressure warning lamp is defective. Oil level is too low. Defective oil pressure switch.	Exchange warning lamp. Measure oil level; if necessary, top up oil. Exchange.
Oil pressure is too low	Overpressure valve is defective. Dirty ball seat in overpressure valve. Oil filter is clogged. Lubricating oil pump is faulty.	Check, clean, exchange if necessary. Check, clean, exchange if necessary. Exchange. Check, clean, exchange if necessary.
Cold starting problems	Acceleration lever not at maximum stop buffer. Lubrication oil too thick. Crank handle defective. Paraffin precipitation in fuel.	Adjust. Change to correct viscosity. Check crank handle. Use winter fuel / and/or drain and flush system. Renew fuel filter.