8.4 Low Generator-Output Voltage

If the produced alternating voltage is too low, switch the load off, in order to relieve the generator. Mostly the problem already solved. If the output voltage is still too low, even if all load is switched off, the generator runs without load, you can assume one or more condensers are defective.

8.4.1 Discharge the capacitors

ATTENTION! Never work at the electrical cabinet, when the generator is running! Do not contact the capacitor. Before working on the system read the section "Safety Precautions" on Page vii.

1) Switch off generator

2) Disconnect starter battery

3) Open the sound cover

4) Remove the caps of the capacitors

The capacitors are discharged, by short circuit the two contacts. In addition use the cone end of an isolated screwdriver.

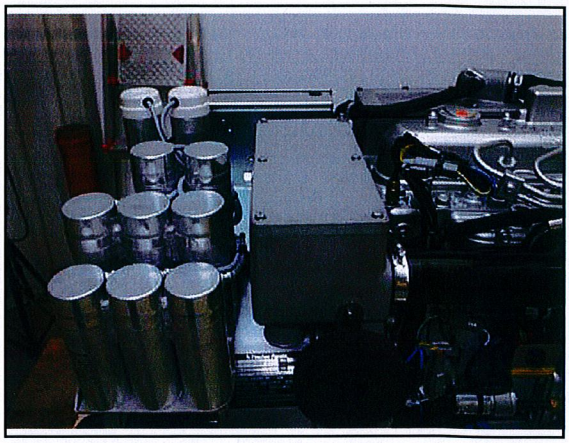


Fig. 8.10: Discharge capacitors

8.4.2 Checking the capacitors

If the capacitors are to be checked, it is to be made certain that the capacitors will be discharged before touching.

Already a visual check can give information on whether the capacitors are defective:

- Leaks dielectric?

- did the capacitor became longer?

The capacitors can be tested with a multimeter. Switch the measuring instrument to "pass" and connect both connections of the capacitor with the connections at the measuring instrument.

Touch with the test prods the two contacts of the capacitor. By the internal battery a charge transfer in the capacitor should take place now.

If changes the poles of the capacitor with the test prods, again a short "beep" should have to be heard. This short sound is only an indication for the fact that the capacitor is not defective.

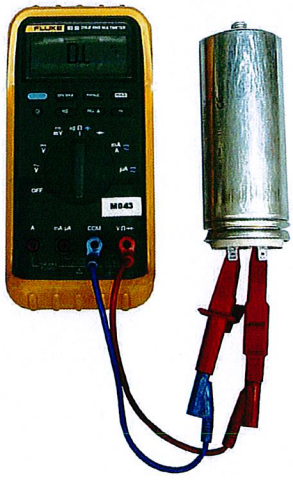


Fig. 8.11: Checking capacitors

Should a steady sound or no sound have to be heard, the capacitor is defective and must be replaced.

In order to go surely that the capacitor has still its full capacity, use a capacity measuring instrument.

The capacitors, which not achieve the imprinted capacity value at this measurement, should be exchanged as fast as possible. If all capacitors are still functional, must be checked whether the connection to the strip is correct.

Checking the electrical connections to the capacitors

It must be ensured that the electrical connections to the capacitor are always tight fitting. Loose connections with transitional resistance can mean that the contact surfaces will become heated externally. This can lead to faster deterioration of the capacitors.

8.4.3 Checking the generator voltage

In order to test, whether the fixed winding produces enough voltage, proceed in such a way:

1. Guarantee that the connection to the electrical system is interrupted.
2. Remove all conductions in the power terminal box of the generator.
3. Starter battery must be connected with the generator.
4. Start the generator start.
5. Measure with a voltmeter the votage between the phase(s) and N. If the measured values are under the substantially values in Table 1, “Voltage values stator coil,” on Page 155, a coil damage is to be accepted.

During the measurement in the 60Hz version both partial coils must be interconnected, i.e. a connection must be provided between line 1 and line 3. (see wiring diagram)

(notes: the voltage results from the remainder magnetism of the rotor, which induced a voltage in the coil.)

8.4.4 Measuring the coil resistance

For this a measuring instrument must be used that is suitable for low impedance values.

- Adjust the measuring instrument to resistance test. If hold the poles of the measuring instrument hold together, 0.00 ohms should be indicated. If the poles are isolated, the display should indicate an overflow. Please implement this test, in order to examine the equipment.
- Measure of the resistance within the individual windings.

If strong deviations in the individual coils are measured, must assumed that there is a coil short-circuit in a coil. This leads to the fact that the generator does not excite itself any longer.

The actual values between the coils and ground are not to be determined exactly. It depends primarily on the fact that the values of all three measurements are close to the same. Deviations among themselves refer to a coil short-circuit. In this case the generator must be wound again by a specialist.

8.4.5 Checking the coil(s) to short-circuit

In order to check the coils for short-circuit, first all lines, which lead to the electrical system, must be interrupted. This happens on the power terminal box of the generator or, if available, in the electrical system junction box. Guarantee that no voltage lies at the lines, before they are interrupted (see Fig. 8.10, “Discharge capacitors,” on Page 143).

Now remove the bridge between "N" and "PE", so that coils and housing are electrically separate from each other.

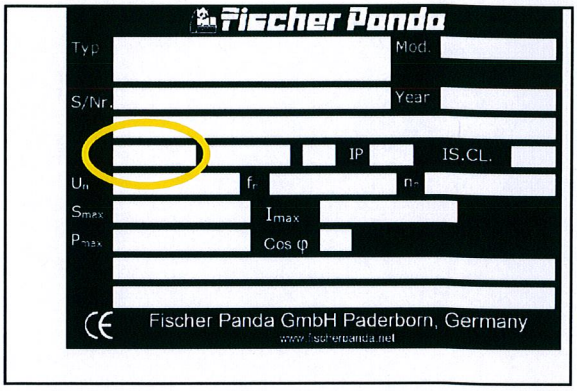
Check with a circuit indicator (multimeter) in the power terminal box if between the individual connection points of the coil and the housing (PE) a pass exists.

The contacts which can be measured depend on the type of the generator (see identification plate):

HP1 - 60Hz: L, Z

HP3 - 60Hz:: L1, L2, L3, 1, 2, 3 , 4

DVS - 60Hz : L1, L2, L3, L1’, 1, 2, 3, 4



If a pass (beep) should be determined, the generator must be returned for examination in the plant, or it can also be wound again locally. For this coil datas can be requested.

Fig. 8.12: Identification plate

8.4.6 Measuring the inductive resistance

Unfortunately the checking of the ohmic resistance permits still no reliable statement about the condition of the coil. If the ohmic resistance values arise inequalities between the coils, that is a safe indication for the fact that the coil is defective. To be exactly sure the inductive resistance of the coil have to be measured. For this a special measuring instrument is necessary, which measures the inductance of a coil.

Inductance is measured in the same way as the ohmic resistance, i.e. the coils are compared. The value is indicated in mH (milli Henry).

The arranging value for the inductive resistance can take from the section 9.2, “Technical data” on page 156.

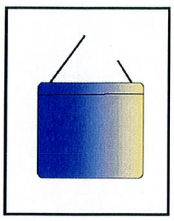
Note: These values depends strongly from the measuring method (kind of the measuring instrument)

8.5 Generator provides no Voltage

8.5.1 Rotor Magnetism Loss and "Re-magnetizing"

.ATTENTION! See "Safety Precautions" on Page vii.

With asynchronous generators it can be the fact that the generator can not build up independently voltage after longer service lives, or, if it were switched off under full load. The cause lies in the fact that the rotor lost its remainder magnetism.



This remainder magnetism can be restored in a simple manner by a DC battery. In addition the „shore power" must be switched off and any connection to a AC-source must be interrupted.

Likewise the genset must be switched off, i.e. also the starter may not be operated. The power source selector is switched to "generator". Only the plug socket must be connected with the generator.

Now the two poles of a 9V battery are connected with the plug socket or held to the appropriate contacts in the on-board current distribution. Use not a battery bank or the generator starter battery, this could damage the coil. The DC voltage may be applied only for a short time (1-2 seconds). In the coil the remainder magnetism is restored by the short current pulse, and the generator can be normally started.

8.6 Starting Problems

8.6.1 Stop solenoid

There are two different variations:

A. Energized to stop

By pressing the „OFF"-button on the remote control panel the stop solenoid is supplied with voltage and operate, through this the injection nozzles resets to zero position and the generator stops.

B. Energized to run

This version is equipped with two solenoids an actuating and a stop solenoid. After being fed with current, the actuating solenoid attracts the adjusting lever of the fuel injection pump, through which the fuel can flow. The actuating solenoid is switched off once the final position has been reached, which is maintained by the stop solenoid for as long as the generator is running

.ATTENTIONT

When starting the "START"-button may not be pressed longer than 5 sec., because the stop solenoid pulls too much current over the starter. Otherwise the stop solenoid must be disconnected.

Stop solenoid

sample picture

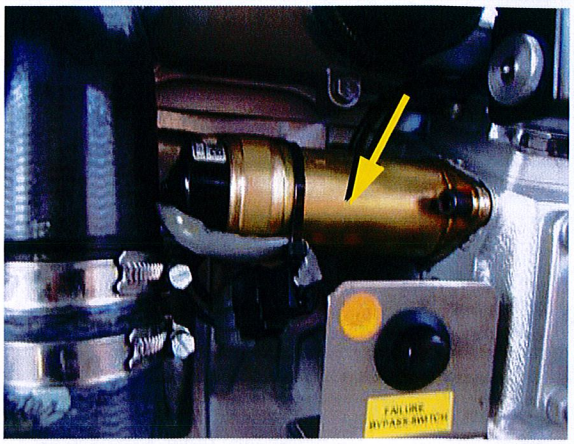


Fig. 8.13: Stop solenoid

Damage to starter motor

The starter is fitted with a free wheel or axial rotating spring cog, which prevents the starter being driven externally by means of the motor. The free wheel will be heavily worn, if the starter still operates, thereby causing damage to the springs, roller bearings or cog teeth. This could lead to complete destruction of the starter.

It is important that every person who operates the generator is informed of this situation. This is practically the only handling error that can be made on board that can lead to fatal consequences for both generator and operator.

8.6.2 Dirty fuel filter

If the fuel filter is dirty change the filter element.

For replacing the filter element see section 7.4.2, “Replacing fuel filter” on page 118.

01. Fuel filter element

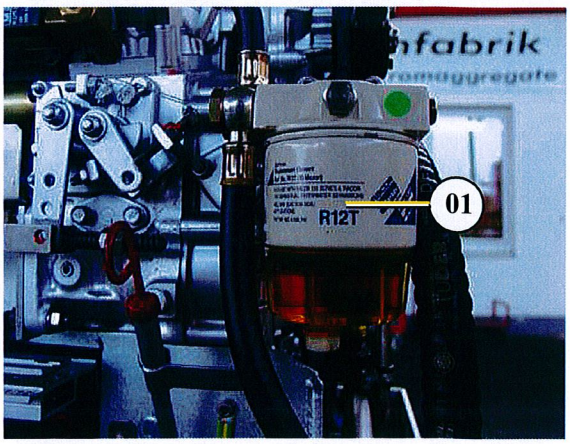
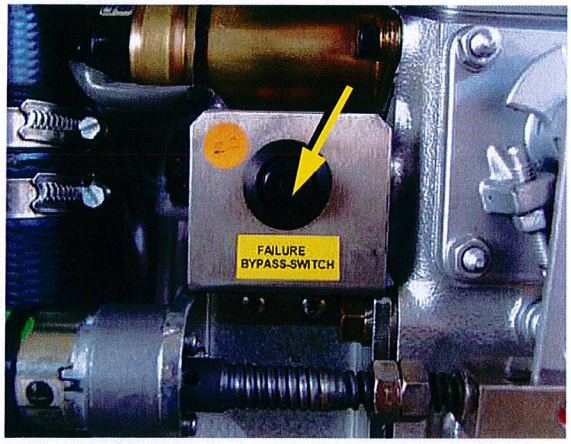


Fig. 8.14: Fuel filter

8.6.3 Failure Bypass Switch

The start-failure bypass switch enables an immediate restart facility of the generator, should it cut out, even if this was caused by over-heating. There is normally a requirement to wait until the motor has cooled down to the correct temperature. This can last for several hours in certain circumstances, since the generator is enclosed in a sound-insulated casing, which prevents heat loss.



Failure bypass switch

Fig. 8.15: Failure bypass switch

To prevent such a shut down period the generator can be started in the normal way while pressing the Failure bypass button is depressed. This by-passes any faults thus allowing the generator to run.

Before pressing the bypass button and starting the generator, a manual check of the engine oil level must be carried out as it is possible that the oil pressure switch caused the generator to cut out. Once it has been ascertained that the reason for the engine cutting out is over- heating and not lack of oil, the generator can be started and run for several minutes without load, so that the engine is returned to normal operating temperature.

CAUTION:

If temperature is the reason for the generator cutting out when it is running under load, then an immediate investigation should be made to determine the cause. It could be a fault with the internal cooling system, the fan, the radiator air-intake or dirty radiator.

Repeated use of the failure bypass switch should be avoided, if the generator repeatedly cuts out during operation without determining the cause of the engine cut-outs.

The generator should always be run without load for several minutes before being switched off, so that temperature stabilisation occurs. Residual heat can cause the generator to overheat, even after it has been switched off.

Should the overheating alarm be activated after the generator has been switched off, then this can also be bypassed using the switch.

8.6.4 Troubleshooting Table

For Troubleshooting see section 9.1, "Troubleshooting" on page 151.

9. Tables

9.1 Troubleshooting

GENERATOR OUTPUT VOLTAGE TOO LOW For 50Hz versions: less than 200V For 60Hz versions: less than 100V	
Cause	**Solution**
Generator is overloaded.	Reduce the electrical load. (Switch off load)
Motor is not reaching the rated rpm.	Refer to "motor faults" section.
Defective capacitor(s).	Check capacitors and replace if necessary.

GENERATOR VOLTAGE TOO HIGH (MORE THAN 240V-50Hz / 135V-60Hz) If the generator is providing excessively high voltage, the following potential causes should be investigated:	
Cause	**Solution**
Over-energizing due to wrong capacitors.	Check capacitors type and replace if necessary.
Measurering voltage on the VCS circuit board is missing.	Check VCS System, check cable connections.

GENERATOR VOLTAGE FLUCTUATES	
Cause	**Solution**
1. Disturbances on the electrical system/user side. 2. Motor disturbances.	1. Check if electrical load is fluctuating. 2. Refer to section: "Motor runs irregular".

GENERATOR NOT ABLE TO START ELECTRIC MOTOR	
Cause	**Solution**
If the generator is unable supply enough power to start an electric motor (120V-60Hz), it is usually because the motor draws too much current during starting process.	Check the motor's current draw required for starting (switch to 380V if possible). This could be remedied by providing stronger capacitors or installing an optional "Easy Start Booster Set". Enquire at your nearest Panda dealer or directly at the manufacturer.

DIESEL MOTOR FAILS TO START	
Cause	**Solution**
Starter battery switched "OFF".	Check position of battery switch and switch "ON" (if installed).
Starter battery voltage insufficient (battery too weak).	Inspect battery terminals and cables for a good electrical connection (Inspect against corrosion, tattered wires, etc.).
Starting current disrupted.	During the normal starting process, the battery voltage drops to 11V with a fully charged battery. If the voltage does not drop during starting, the electrical connection is faulty. If the battery voltage drops lower than 11V, then the battery has been discharged.

STARTER IS TURNING MOTOR, BUT FAILS TO START	
Cause	**Solution**
Fuel inlet solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram)
Fuel pump not working.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. Bleed air from fuel system (refer to section "Bleeding Air from Fuel System").
Fuel-filter blocked.	Replace fuel filter.

MOTOR DOES ACHIEVE ENOUGH SPEED DURING STARTING PROCESS	
Cause	**Solution**
Starter battery voltage insufficient.	Check battery.

Damaged bearing(s) piston (seized).	Repairs need to be carried out by Kubota-Service. (refer to Kubota motor-manual)
Cooling water in combustion chamber.	1. Turn generator "OFF" at control panel. 2. Remove the glow plug (see Kubota-manual). 3. Rotate the motor by hand carefully. 4. Check if there is water in the oil and change both oil and filter if necessary. 5. Determine cause for excess water in the combustion chamber. The excess water can be caused by a defective air vent in the cooling water system, which should be checked and cleaned, or replaced if faulty.

MOTOR RUNS IRREGULARLY	
Cause	**Solution**
Faulty centrifugal injector governor.	Have the centrifugal governor inspected by a Kubota-Service technician.
Too much air in fuel lines.	Bleed air from fuel system.

MOTOR SPEED DROPS	
Cause	**Solution**
Lack of fuel	Check fuel supply system: - fuel filter, renew if necessary - check fuel pump - check fuel lines (bleed if necessary)
Lack of intake air.	Check air intake paths. Check and clean air filter (and intake muffler if installed).
Generator overloaded by too many load.	Reduce the electrical load (switch off load).
Generator overloaded by over-energizing.	Check that the proper capacitor type is installed and that they are connected correctly.
Defective generator (windings, bearings, or other).	Generator must be sent to manufacturer for repair of damaged bearings or winding.
Damaged engine.	Repair of bearing damage, etc., by Kubota-Service.

MOTOR RUNS IN OFF POSITION	
Cause	**Solution**
Fuel inlet solenoid valve or throttle shut solenoid is not switching off.	Check wire connections to solenoid. Check valve functions as in the "Inlet Fuel Solenoid Valve" or in the trottle shut off solenoid sections. Replace if necessary.

MOTOR STOPS BY ITSELF	
Cause	**Solution**
Lack of fuel.	Check fuel supply system.
Excess heat in cooling system (thermo switch tripped)- lack of cooling water. Is indicated on the remote control panel.	Check cooling water system flow: water pump, inlet water filter, extra heat exchanger coolant flow.
Lack of oil (oil pressure sensor tripped). Is indicated on the remote control panel.	Check oil-level and if necessary top up. Check motor's oil-pressure and have repaired by Kubota-Service if necessary.

SOOTY, BLACK EXHAUST	
Cause	**Solution**
Generator is overloaded.	Check electrical load and switch off unnecessary load.
Insufficient intake air.	Check intake air filter; clean if necessary.
Fuel injector faulty.	Replace injector.
Valve clearance incorrect.	Readjust valve clearance to correct value (refer to Kubota-manual).
Poor fuel quality.	Use better quality diesel (recommended: 2-D Diesel).
Poor combustion.	Incorrect AFR (air/fuel ratio) due to motor timing adjustment. Have motor serviced by Kubota.

GENERATOR MUST BE SHUT OFF IMMEDIATELY IF:	
Cause	**Solution**
- motor rpm suddenly rises or drops - unusual noise comes from genset - exhaust colour suddenly becomes dark - leakage in the cooling water system.	Refer to respective section of manual and if necessary, have repaired by Kubota-Service, or Panda representative.