

## Oxygen sensor fault (56 & 76)

**Date of issue:**

23-05-2015

**Reason :**

Clarification possible causes of O2 sensor fault message

Both O2 sensor faults indicate that the sensor reading is outside the expected range.

- Fault 56 flags an out of limits situation during the start phase.
- Fault 76 flags an out of limits situation during engine shutdown.

**Possible causes:**

1. Faulty oxygen sensor
2. Carbon deposits inside evaporator or burner
3. Faulty electronics
4. Bad connections
5. Blocked condensate drain

**Normal operation:**

The oxygen sensor is mounted in the exhaust gas heat exchanger and measures the oxygen content in the combustion gases. The measured value is compared with a pre-set value and the fuel/air mixture is corrected accordingly.

Engine start-up

After the start demand the glow plug is switched on to heat-up the evaporator. This might take a few minutes and the fan will be running at 10% of max speed to stop any back flow of fumes. Once the pre-heat is completed, the fan will run at 100% to purge the combustion chamber with fresh air before the fuel pump is switched on. During this purge phase the oxygen sensor will take a fresh air reading to check if the sensor is functioning. If OK, the fan speed will reduce to 25% and the fuel pump is switched on. After ignition the system will be running with a fixed fuel /air mixture for a few minutes. After this flame stabilisation period the oxygen sensor is in control. The fan speed will steadily increase and the amount of fuel is controlled accordingly to maintain the correct mixture. The amount of fuel is based on the oxygen reading in the exhaust gases.

A normal oxygen reading during the purge cycle is around 1900. A value outside the range 1300-2500 is deemed a defect oxygen sensor, resulting in "Fault 56".

Engine shutdown

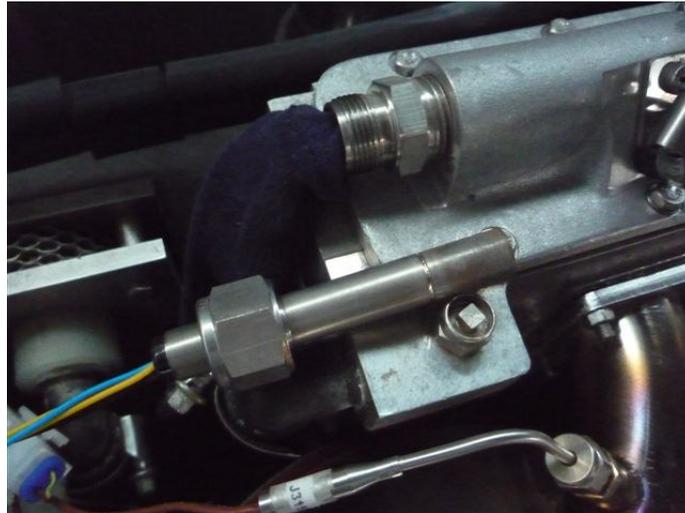
To shutdown the engine, the fuel supply is simply cut-off. Any remaining fuel in the evaporator will evaporate and the combustion process will end. The fan speed will increase to 100% to cool down the burner and cylinder heads. During this cool-off phase the oxygen reading is monitored.

A sensor reading indicating an oxygen content lower than expected will result in "Fault 76" as the oxygen sensor is deemed defective.

### **Oxygen sensor Test (WhisperGen in standby)**

The sensor functionality can be easily tested by placing it in open air and activating it to take a reading. The procedure is as follow:

- remove sensor from the exhaust heat exchanger (see below)
- plug the opening with a rag
- start the Coolant-1 Pump (Installation Menu) which also activates the oxygen sensor
- The oxygen sensor is now functional and the reading can be verified in the "Extra Information Menu".
- The expected fresh-air reading is in the order of 1800-2000.



Note; the tip of the oxygen sensor contains a heating element and can be very hot!

### **Other fault triggers**

Practice shows that although an oxygen sensor can pass the above test, in certain conditions it can still trigger a fault 56 or 76.

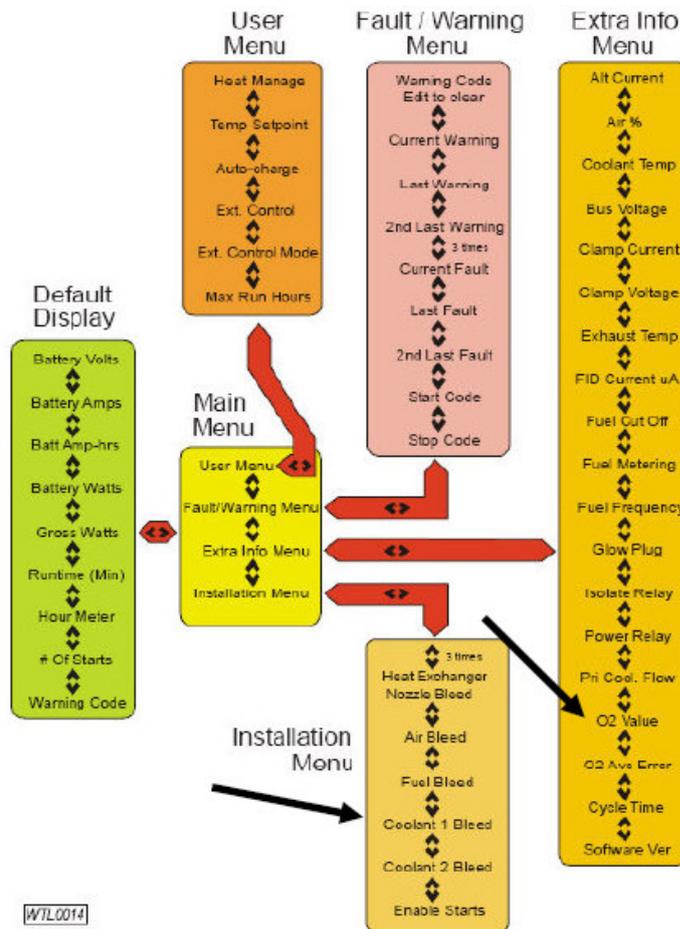
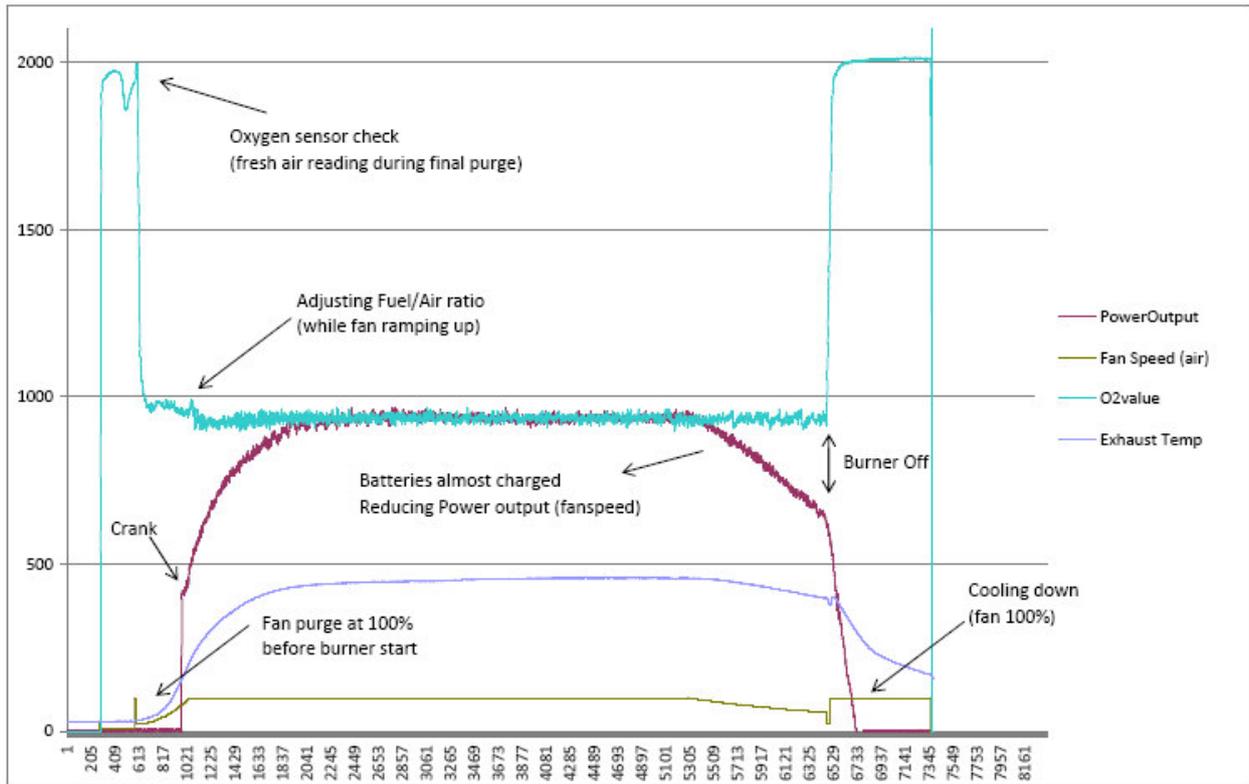
If a fuel evaporator contains carbon deposits, then these will be heated by the glow plug during the pre-heat phase as the WhisperGen is started. This can result in the combustion chamber being filled up with fumes that cannot be removed quickly during the purge cycle. As a result the oxygen sensor will show a lower than expected oxygen content and the sensor is assumed faulty.

A blocked condensate drain can lead to a blocked heat exchanger and result in similar symptoms.

A similar situation can arise during the cool down cycle. A repeated number of faulty burner starts will result in fuel deposits in the evaporator and burner as the combustion chamber has not been hot enough to burn these away. As a result the oxygen sensor will show an unexpected low oxygen reading.

For the first three minutes after burner start the system is operating with a fixed fuel/air ratio and the oxygen sensor reading is not used for control. Removing the sensor and starting the WhisperGen might help to burn any excess fuel and solve the fault situation. (Note; this will not clear heavy deposits in the evaporator)

# WhisperGen Typical Run – Oxygen sensor readings



WTL0014