

Catalyst Monitoring Diagnostic

On NAS specification vehicles the catalysts are monitored both individually and simultaneously for emission pollutant conversion efficiency. The conversion efficiency of a catalyst is monitored by measuring the oxygen storage, since there is a direct relationship between these two factors. The closed loop lambda control fuelling oscillations produce pulses of oxygen upstream of the catalyst, as the catalyst efficiency deteriorates its ability to store oxygen is decreased. The amplitudes of the signals from the pre-catalytic and post-catalytic converter heated oxygen sensors are compared. As the oxygen storage decreases, the post-catalytic converter sensor begins to follow the oscillations of the pre-catalytic converter heated oxygen sensors. Under steady state conditions the amplitude ratio is monitored in different speed / load sites. There are three monitoring areas, and if the amplitude ratio exceeds a threshold in all three areas the catalyst conversion limit is exceeded; the catalyst fault is stored in the diagnostic memory and the MIL light is illuminated on the instrument pack. There is a reduced threshold value for both catalysts monitored as a pair. In either case, a defective catalyst requires replacement of the downpipe assembly.

In the case of a catalytic converter failure the following failure symptoms may be apparent:

- MIL light on after 2 driving cycles (NAS market only).
- High exhaust back pressure if catalyst partly melted.
- Excessive emissions
- Strong smell of H₂S (rotten eggs).

Oxygen sensor voltages can be monitored using TestBook/T4, the approximate output voltage from the heated oxygen sensors with a warm engine at idle and with closed loop fuelling active are shown in the table below:

Measurement	Normal catalyst	Defective catalyst
Pre-catalytic heated oxygen sensors	~ 100 to 900 mV switching @ ~ 0.5 Hz	~ 100 to 900 mV switching @ ~ 0.5 Hz
Post-catalytic heated oxygen sensors	~ 200 to 650 mV, static or slowly changing	~ 200 to 850 mV, changing up to same frequency as pre-catalytic heated oxygen sensors
Amplitude ratio (LH HO ₂ sensors & RH HO ₂ sensors)	<0.3 seconds	>0.6 seconds (needs to be approximately 0.75 seconds for single catalyst fault)
Number of speed/load monitoring areas exceeded (LH & RH)	0	>1 (needs to be 3 for fault storage)