NEMOTO

Technical Note: The use of Nemoto Catalytic Gas Sensors for monitoring Hydrogen and Ammonia

This Technical Note applies to the following Nemoto gas sensor part numbers:

NAP-55A NAP-56A NCP-180 NCP-180S NCP-180S-6S

Catalytic (Pellistor) gas sensors respond to, and measure concentrations of, the vast majority of flammable gases and vapours encountered in industry, with the notable exception of gases which poison catalytic oxidation catalysts, such as silicones and many sulphur bearing chemicals (see the separate technical note on this subject).

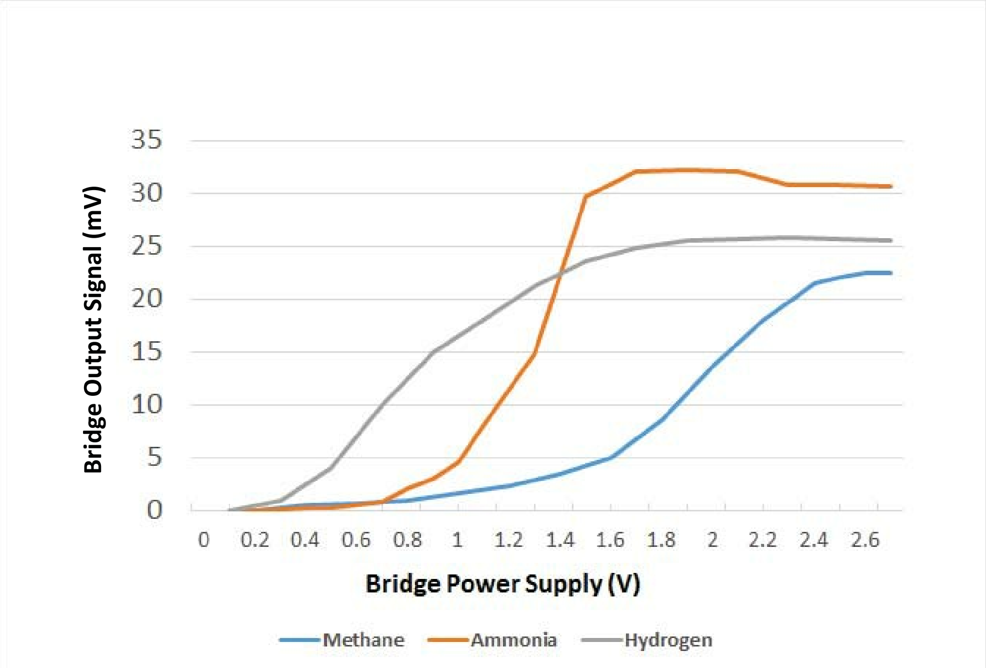
The signal output of a pellistor in the presence of any flammable gas depends on the power supply of the sensor applied across its Wheatstone Bridge circuit, and most pellistor type gas sensors are specified for a supply voltage which maximises and optimises it's output when exposed to Methane. The technical documentation supporting the sensor will often include a table of "Relative Responses", giving rough guidance about the output of the sensor when exposed to a variety of other gases, as a percentage of the output signal for Methane. There are three main reasons why Methane is used as a benchmark in this way:

1) The vast majority of applications in industry is for the detection of Methane.

2) Methane is the easiest and cheapest gas to obtain as a calibration gas, so it is common practice to use methane as a calibration gas in the field, using a relative response factor if the sensor is to be used to detect a different gas.

3) Methane requires a higher catalyst temperature for efficient catalytic oxidation to take place than virtually any other gas; so if a sensor is powered optimally for the detection of Methane, then it may be used for all other flammable gases at that same power supply. If the sensor were powered optimally for another gas, then it may not operate satisfactorily when detecting methane and other gases.

This is illustrated in the diagram below, which shows the typical signal output of a NAP-56A sensor as a function of its bridge power supply (voltage), for Methane, Hydrogen and Ammonia (all at 8% LEL).



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Contact Information:	Website	email	Telephone
Europe & Africa Area	www.nemoto.eu	eusensor@nemoto.co.jp	+44 (0)1799 543968
Asia Area	www.nemoto.co.jp	sensor2@nemoto.co.jp	+81 3 3333 2760
Americas Area	www.nemoto.eu	nasensor@nemoto.co.jp	+1 604 761 7363

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The recommended power supply for all the following Nemoto Sensors, NAP-55A, NAP-56A, NCP-180, NCP-180S and NCP-180S-6S is **2.5V**, since all of these sensors utilise the same internal detecting element. The diagram illustrates the reason for this: It's the voltage for which the signal output when exposed to methane is at its highest. The sensor is said to have "peaked" for methane output at 2.5V

However, it can also be seen that for other gases such as Hydrogen and Ammonia, the sensor signal reaches its peak at a significantly lower voltage, and indeed at 2.5V the signal is just beginning to reduce - or "over peak".

For the majority of applications involving Ammonia or Hydrogen, this "over-peaking" presents no performance problems at all, and Nemoto suggests that the recommended voltage of 2.5V should be used, making use of the relative response data provided by Nemoto to facilitate calibration.

However, there are some applications where the alarm level required is very low, for example refrigeration applications where the alarm level for an Ammonia monitoring system can be required to be as low as 3% LEL. There are also some applications where the sensor is required to monitor Hydrogen or Ammonia, whilst keeping the cross-interference by methane as low as possible.

In applications such as these, slightly better performance can be obtained by using a slightly lower power supply than the standard 2.5V.

Nemoto suggests that in these special applications a supply voltage of between **1.7V and 1.9V** is suitable for either Hydrogen or Ammonia. At these supply voltages, the sensor will benefit from lower noise levels and be slightly less effected by environmental changes such as swings in ambient temperature and humidity, which will allow lower alarm levels to be set without fear of false alarms (However, remember that it is not only the sensor which can cause false alarms in the field - the overall stability of the system will also depend on the performance of the measuring circuitry and installation).

The sensor will also draw slightly lower current, and have a significantly reduced signal output in the presence of Methane.

Contact Information: Website email Telephone