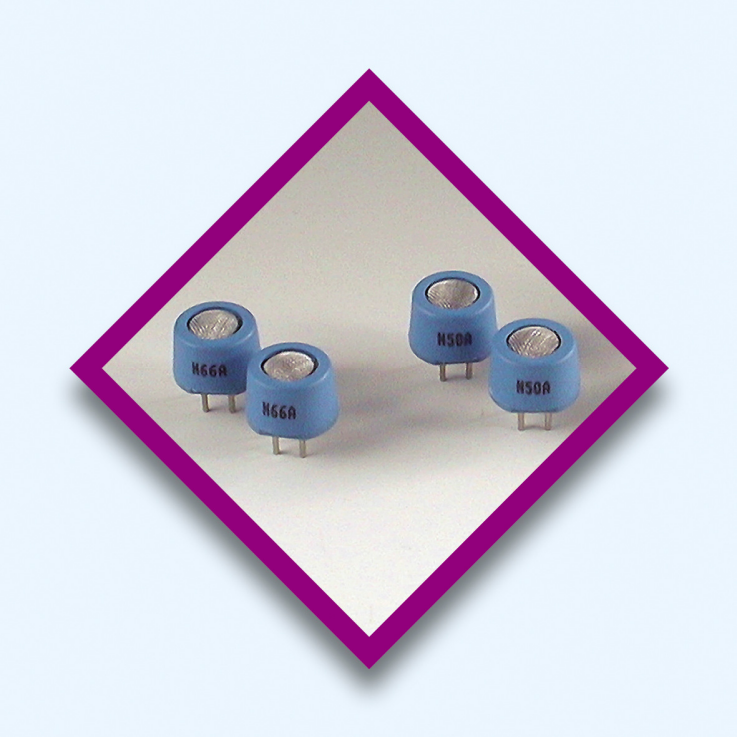
CHARACTERISATION DATA

NAP-50A & NAP-55A CATALYTIC PELLISTOR GAS SENSORS



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NAP50-55CD.Doc, issue 2, May 2008

Introduction

The Nemoto NAP-50A and NAP55A are catalytic (pellistor) type flammable gas sensors supplied as matched pairs of catalytic elements mounted on a single header enclosed in a plastic housing and protected by a metal mesh. Designed as a flammable gas sensor for use in **Domestic (Residential) Gas Detectors**, the sensor detects and measures the presence of flammable gases and vapours in air, in the range 0-50% of the Lower Explosive Limit (LEL) of the gas or vapour being measured.

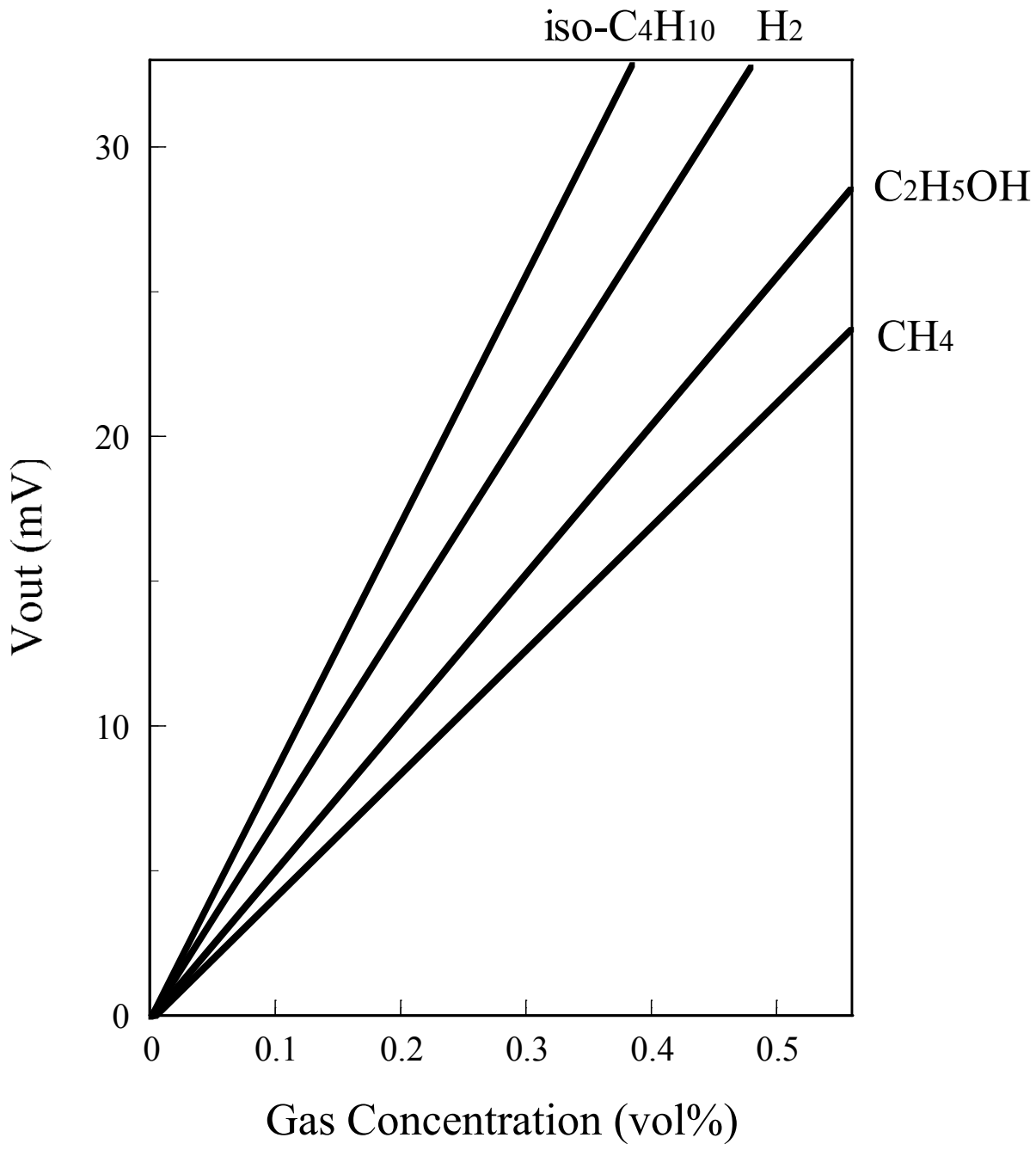
The two variants of this sensor (NAP-50A and NAP-55A) are very similar in performance: The NAP50A is a slightly modified version of the original NAP55A sensor, to reduce the effect of potential cross sensitive gases likely to be encountered in domestic premises, particularly Ethanol, in compliance with the European standard for domestic gas detectors EN 50194. In nearly all other respects, the performance of the two variants is identical. As such, the data supplied in this characterisation document applies equally to either variant, unless specifically stated otherwise.

The NAP-55A should therefore be used where maximum sensitivity to all flammable gases is required, whereas the NAP-50A should be selected if high sensitivity to natural gas or LPG (ie domestic fuel gases) only is required, and the lowest cross sensitivity to other flammable gases and vapours is desirable.

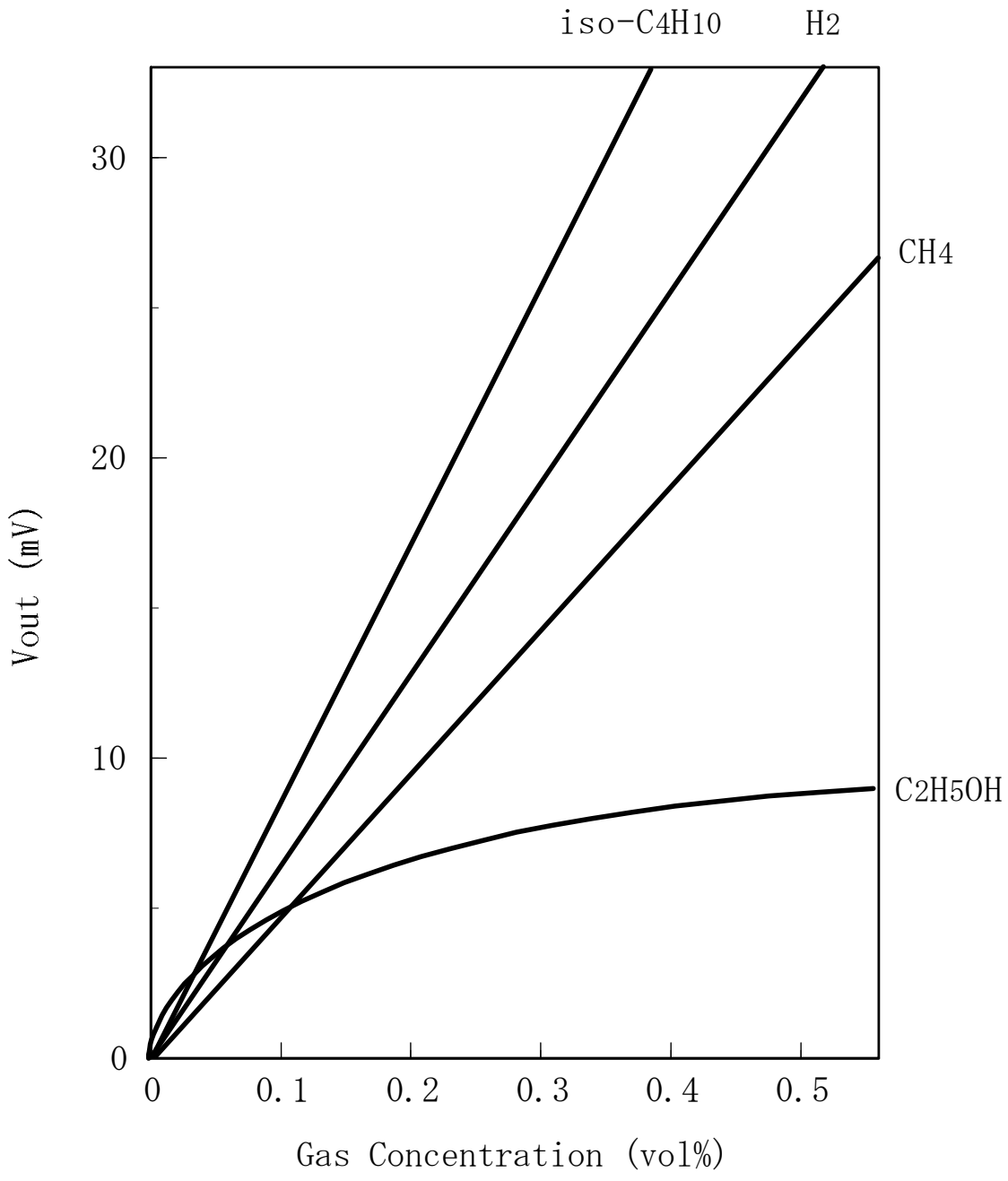
This characterisation document does not constitute a specification but is intended as a guide, informing the instrument designer of the performance characteristics of the sensor which were observed by Nemoto's Engineers.

It should be read in conjunction with Technical Information Sheet DS-NAP50/55.doc which includes the full technical specification for the NAP50A or NAP55A Gas Sensor.

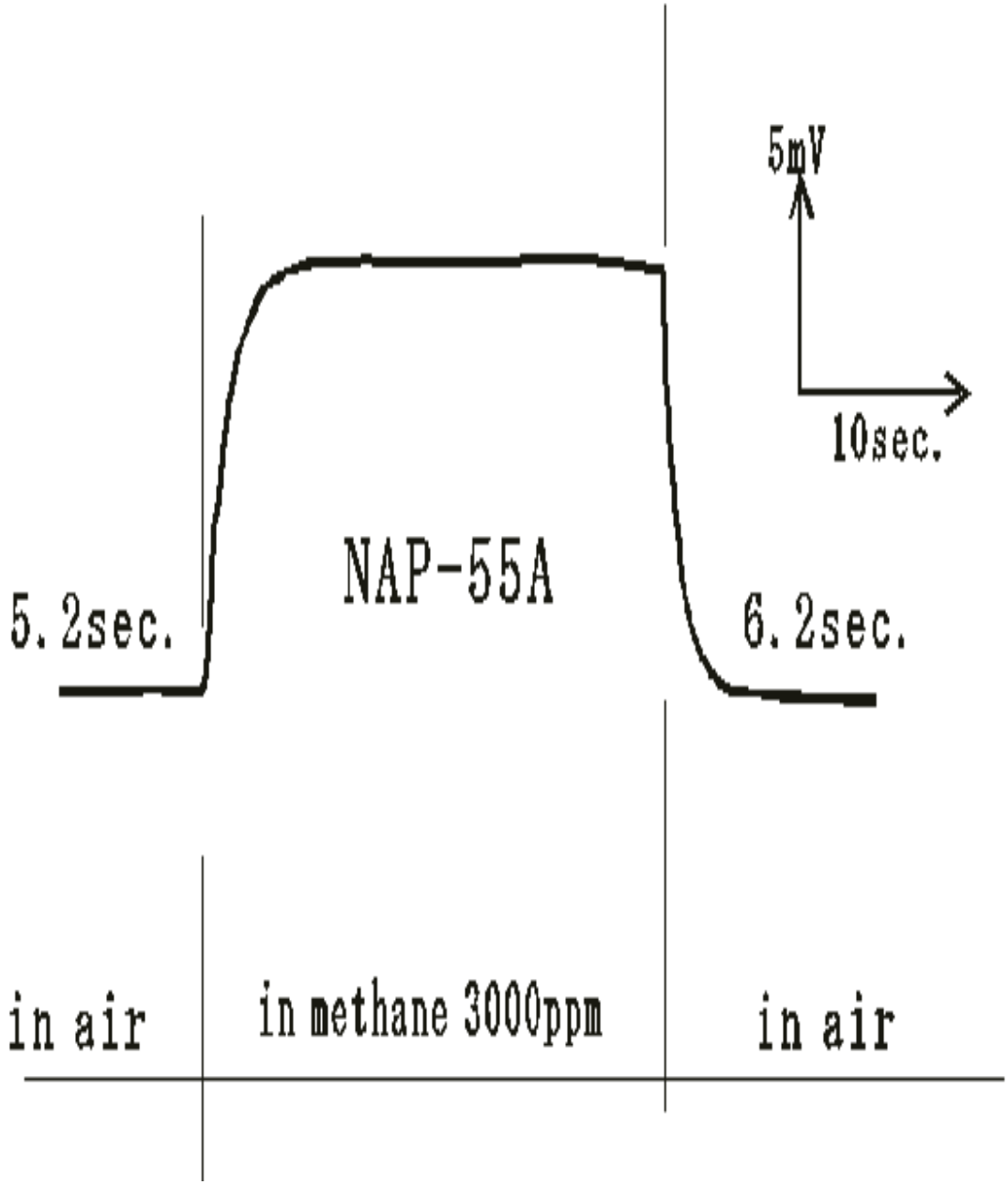
1A) Gas Sensitivity Characteristics for NAP-55A



1B) Gas Sensitivity Characteristics for NAP-50A

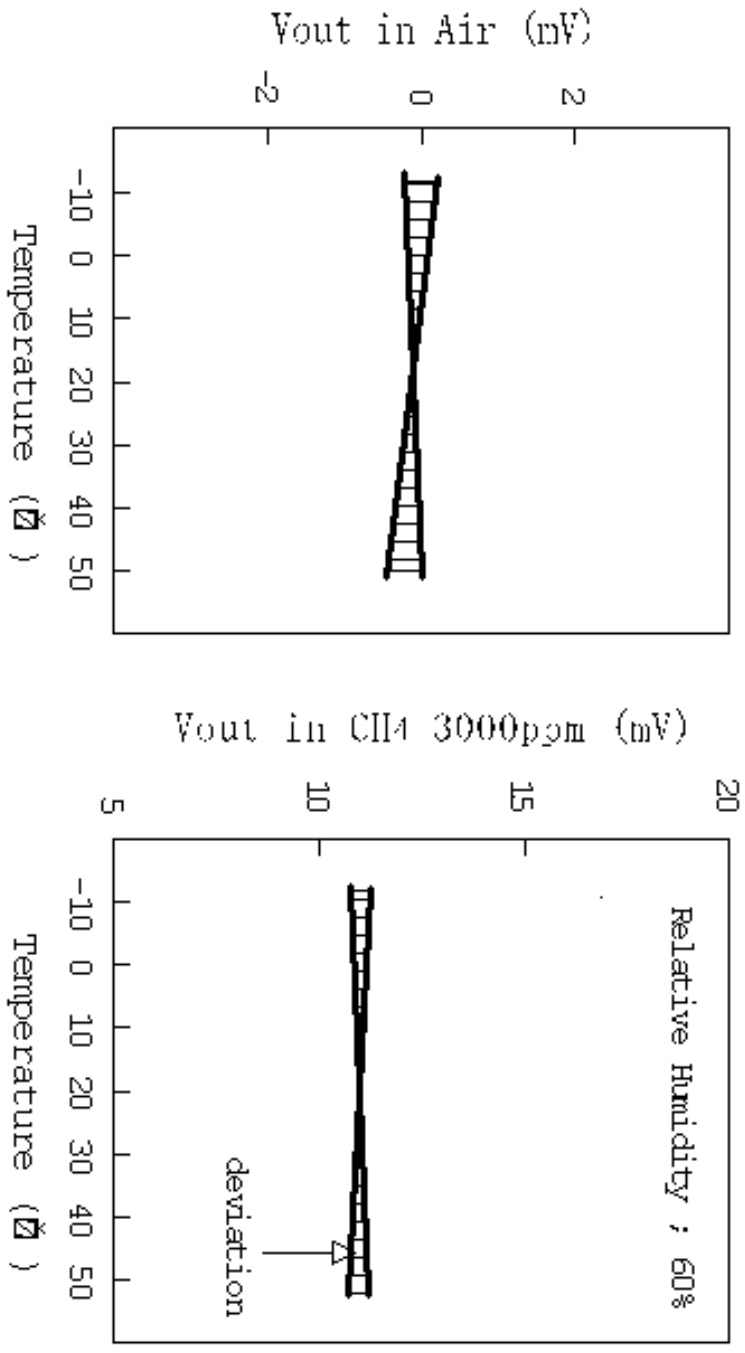


2) Response Characteristic

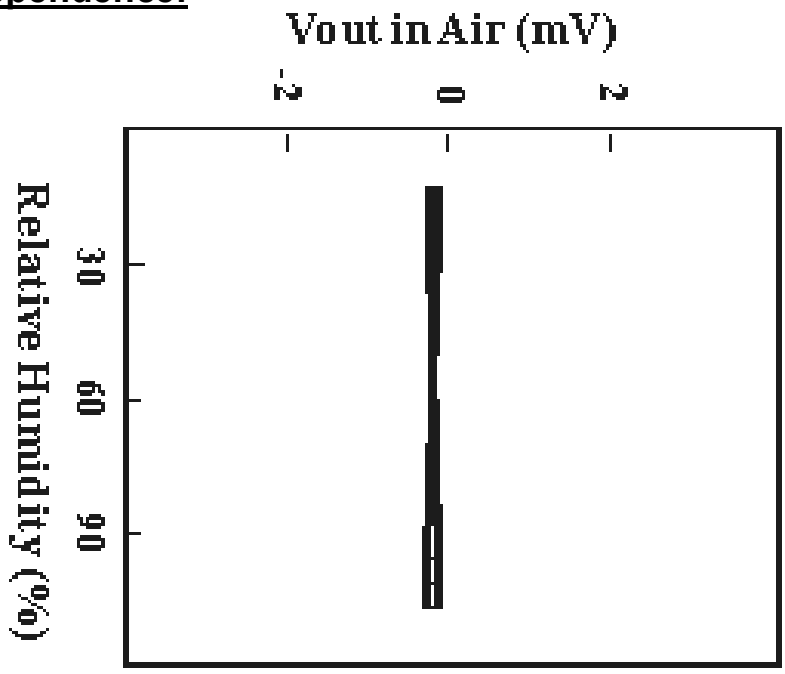


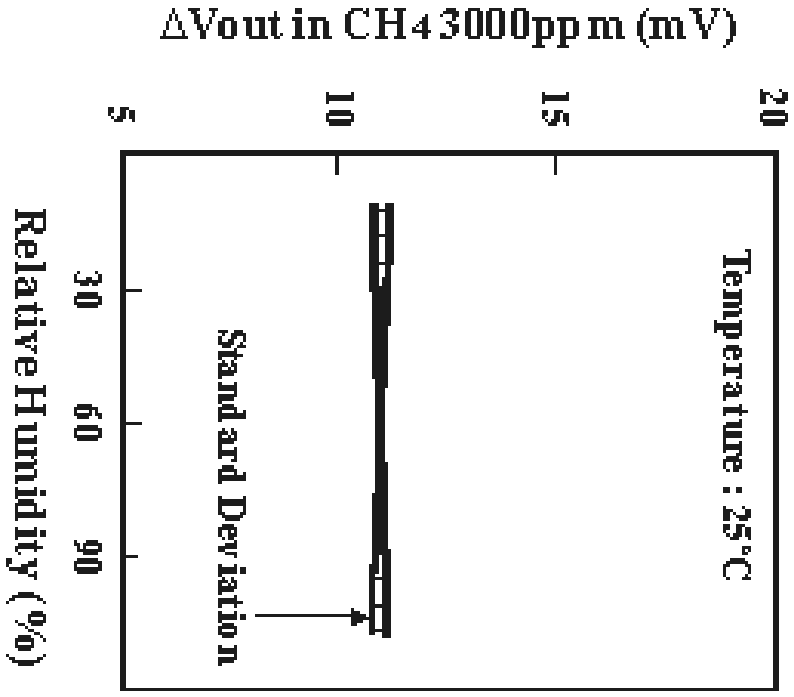
(Times stated are to 90% of final reading)

3) Temperature Dependence:

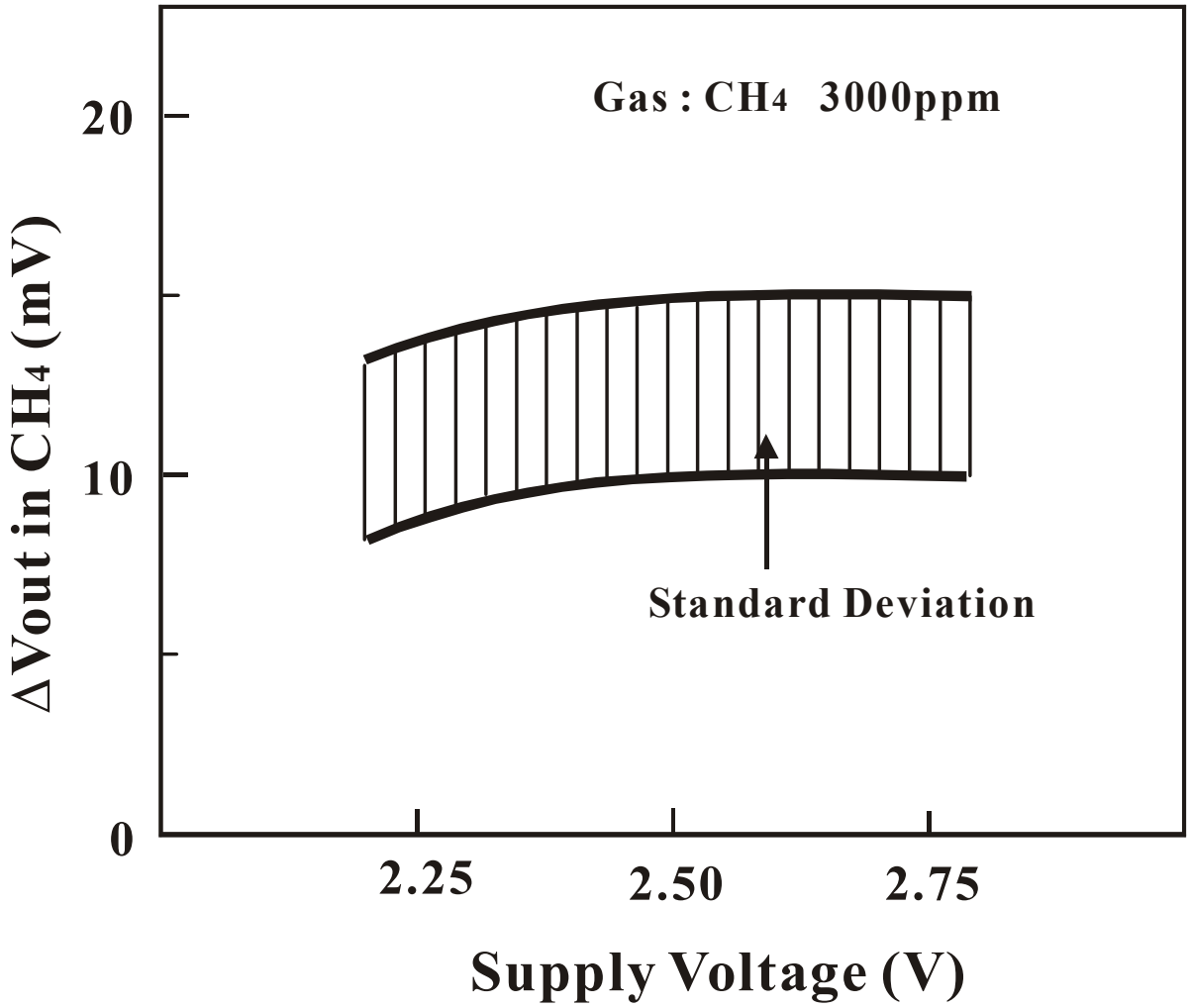


4) Humidity Dependence:

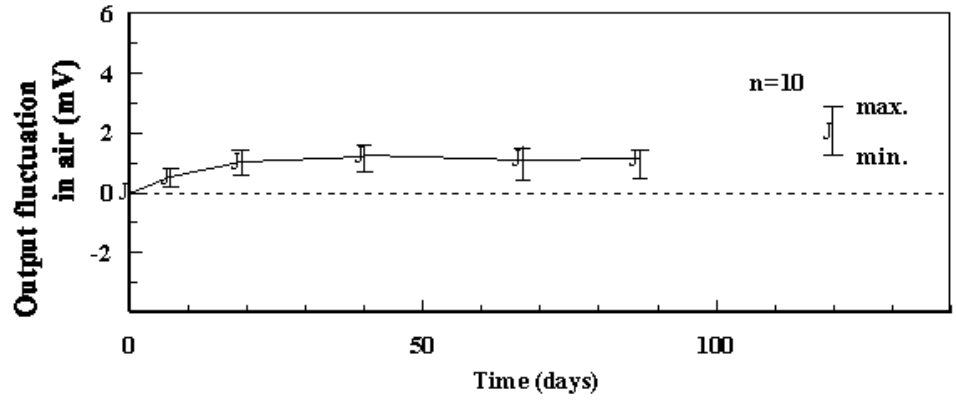


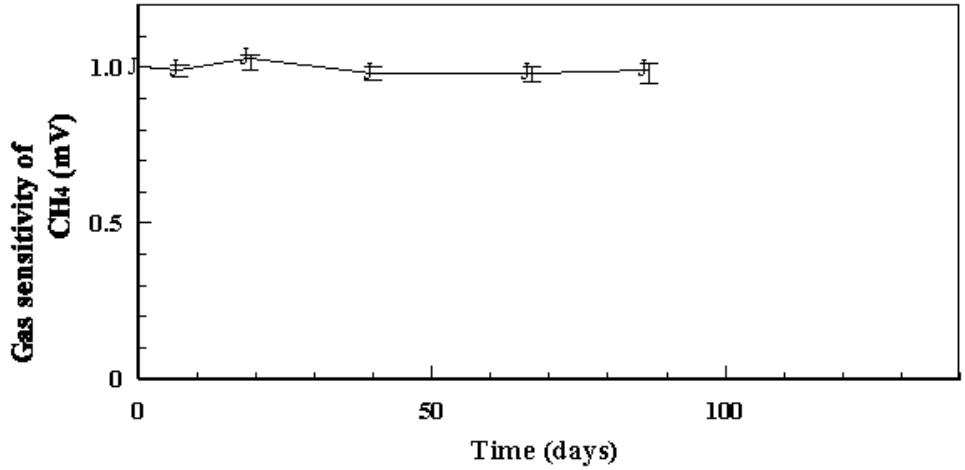


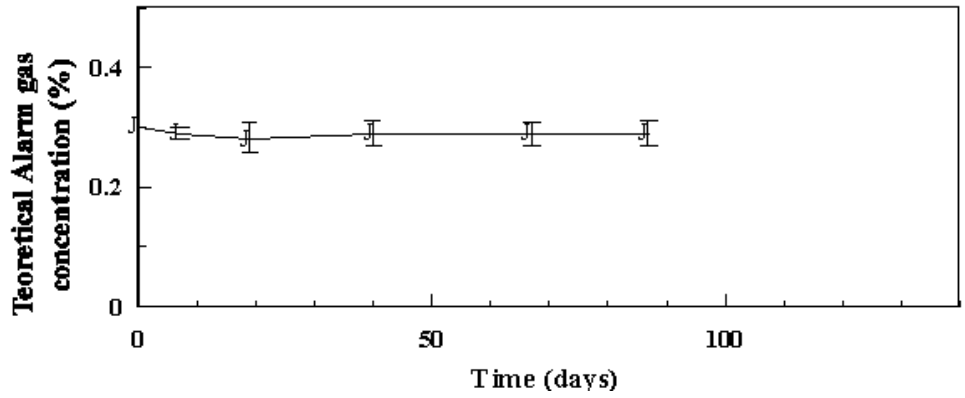
5) Applied Voltage Dependence



6a) Long Term Stability, 90 Days:







6b) Long Term Stability over 7 years:

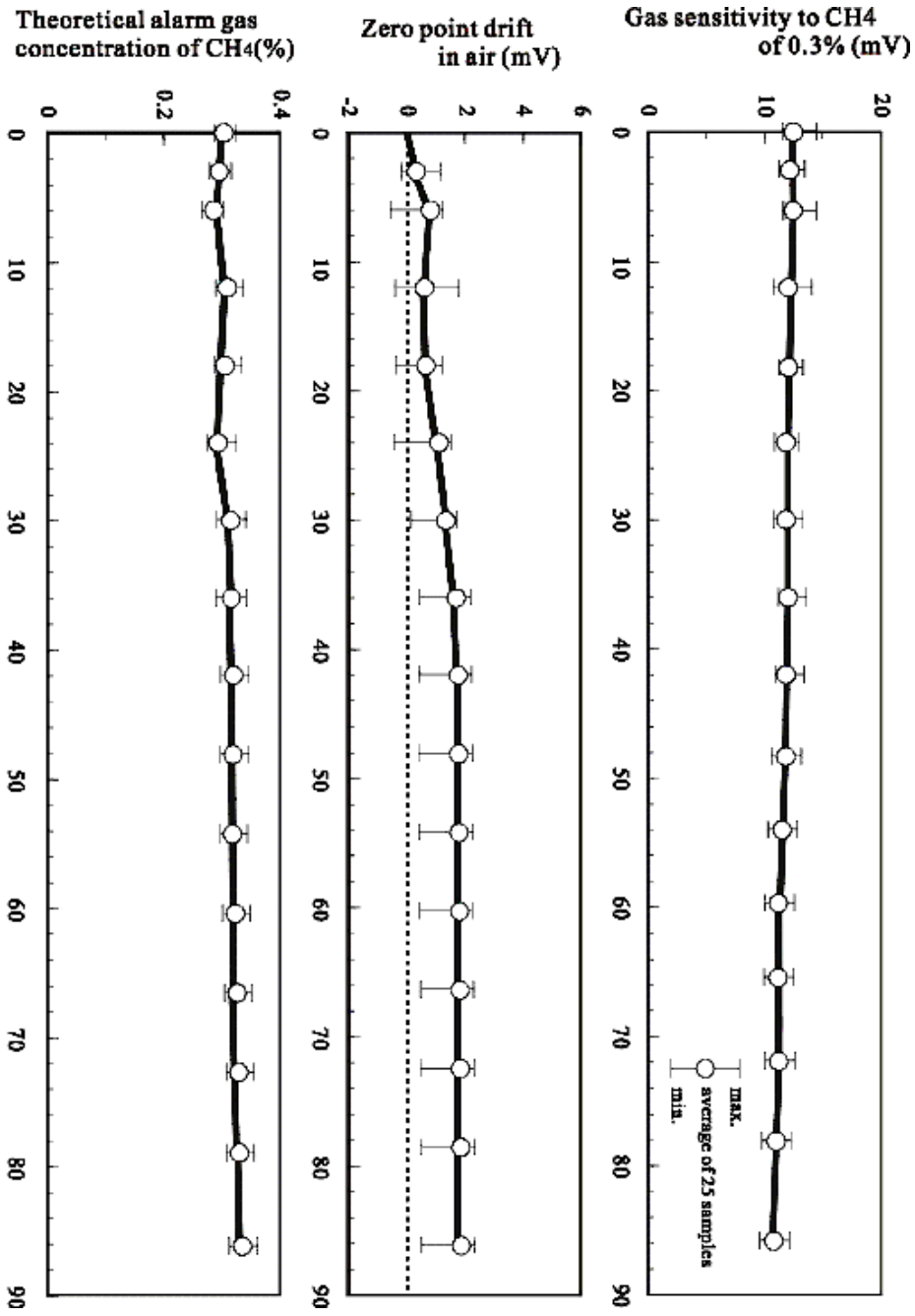


Fig. 11 Long term stability tests for NAP-55A

7) Environmental & Tolerance Tests

The NAP-50A and NAP55A Sensor has undergone intensive testing to ensure that it can tolerate rough treatment and environmental Extremes. Here is a selection of the tests, together with their results:

7a) Resistance to Catalytic Poisoning:

5 randomly selected sensors were exposed to 10ppm of HMDS (Hexamethyldisiloxane, a commonly encountered silicone, and a substance known to poison noble metal catalysts), whilst powered, for a period of 1 hour. The zero's and sensitivities to 3000ppm of methane/air was measured before and after exposure:

Sensor	Zero (mV)		Sensitivity to 3000ppm CH_4	
	Before Exposure	After Exposure	Before Exposure	After Exposure
1	-12.2	-12.1	12.2	9.2
2	-19.9	-19.8	13.1	8.9
3	-15.2	-15.0	12.8	8.4
4	+12.2	+12.1	12.7	8.6
5	+23.7	+23.8	12.8	8.8

7b) Impact (Drop) Tests

10 randomly selected sensors were dropped three times on to a rigid wooden surface from a height of 50cm. In each case the change in zero output was noted after each drop.

Sensor	Change in Zero after each drop (mV)		
	Drop 1	Drop 2	Drop 3
1	+1.0	+1.3	+1.0
2	-1.5	-0.8	+0.5
3	-1.1	-0.5	-1.2
4	+1.4	+0.5	-0.1
5	-0.3	-0.4	-0.8
6	+1.0	+0.5	+1.1
7	-1.6	-1.4	-1.2
8	+1.5	+1.0	+0.8
9	+0.5	+0.1	-0.4

7c) Wind Resistance Tests

Catalytic gas sensors work best when the elements are not exposed to mass transports of gas and are sampling the air around them by diffusion only. Hence sensor housings should

be designed to shield the sensor from the effects of wind as far as is possible, or an unstable and fluctuation zero will result due to the cooling effect of the turbulence at the sensor elements. The Instrument designer has a responsibility in this regard, of course, but these are the results of tests on bare sensors exposed to the elements. Sensors were tested with winds at various speeds and from various directions, and in each case the average fluctuation in zero output was noted.

Wind Direction	Wind Speed (m/sec)	Average zero Fluctuation (mV)
From Detector element side	1.5m/sec	-1.0
From detector element side	3.0 m/sec	-1.0
From Compensator Element side	3.0 m/sec	+1.0
Parallel to Detector and Compensator	3.0 m/sec	+/-1.0
From the top of the sensor	3.0 m/sec	+/-1.0