DYNAMENT GOLD SERIES — DYNAMENT — TAKING INVENTIVE STEPS IN INFRARED

Technical data sheet TDS0050

PREMIER SENSOR RELATIVE RESPONSE CALCULATIONS

This data sheet provides the necessary formulae and data to indicate a response to gases other than the original gas for which the sensor has been characterised.

Cross-referral to other gases increases the flexibility of a gas detector. Cross reference factors can be stored by the host instrument and can be used to offer a menu of different gas types.

It is important to be aware that the sensor is not gas-specific. Choosing the sensor to be linearised, and calibrated, for a particular gas does not mean that it will respond only to this particular gas. If a mixture of gases is present then the gas reading becomes indeterminate as it is not possible to discern the contribution to the reading from each individual gas.

Note that the temperature compensation is based upon the original calibration gas, and there may be errors in the cross-referred readings at temperatures away from the calibration temperature.

The data is presented in the form of a response graph and the associated formula required to linearise the response. Some gases can be cross referred by using a linear multiplication factor; others require the use of a “curve-fit” formula.

This data is based on sample sensors; Dynament recommends that users verify the accuracy of their instruments using test gases wherever possible. Cross-referred measurements should be used as a guide only, not as absolute values.

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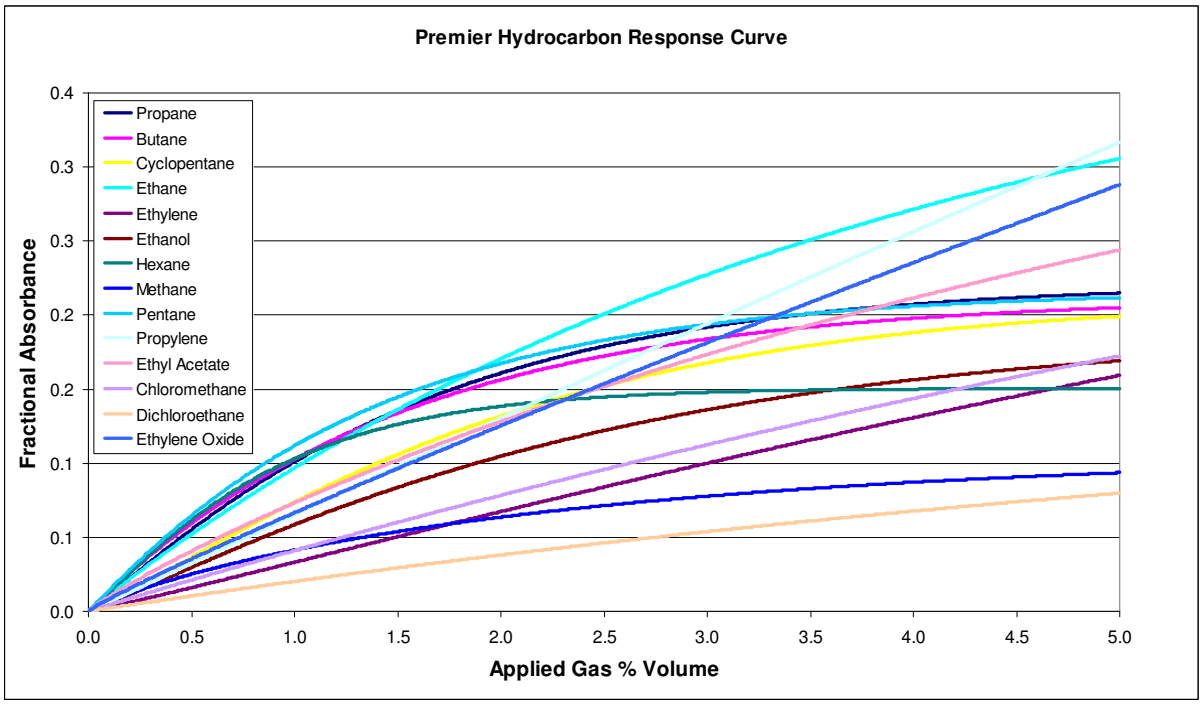
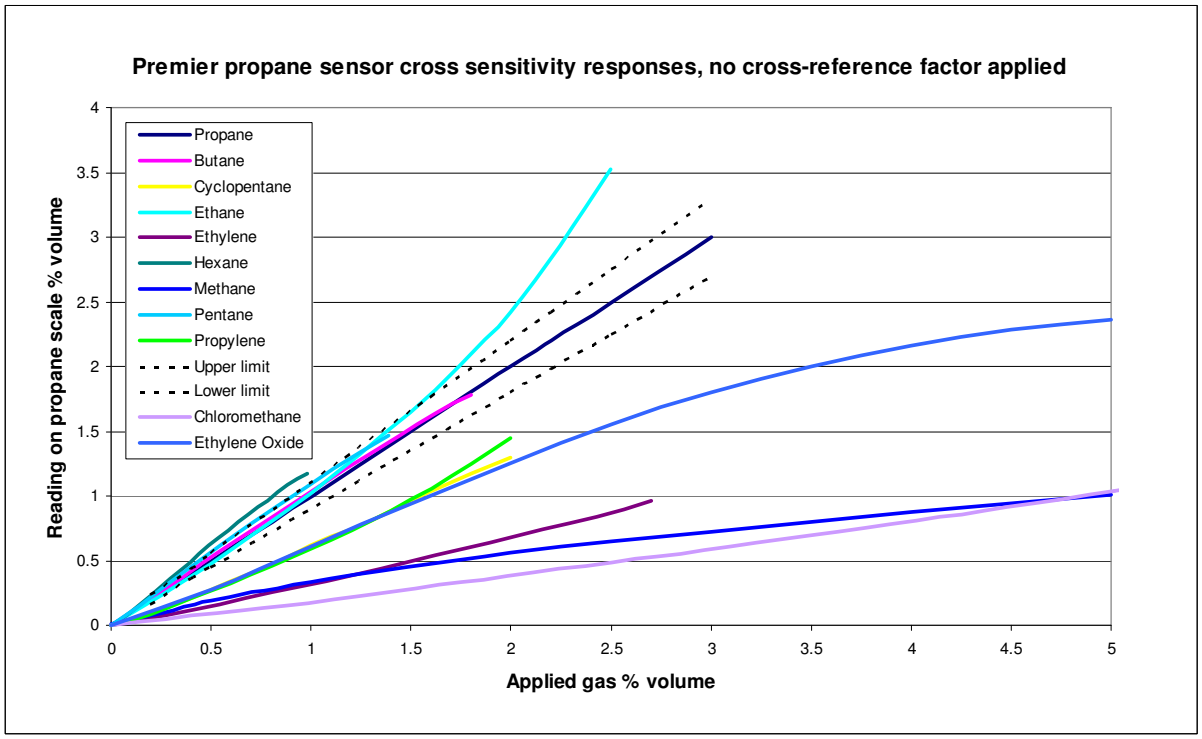
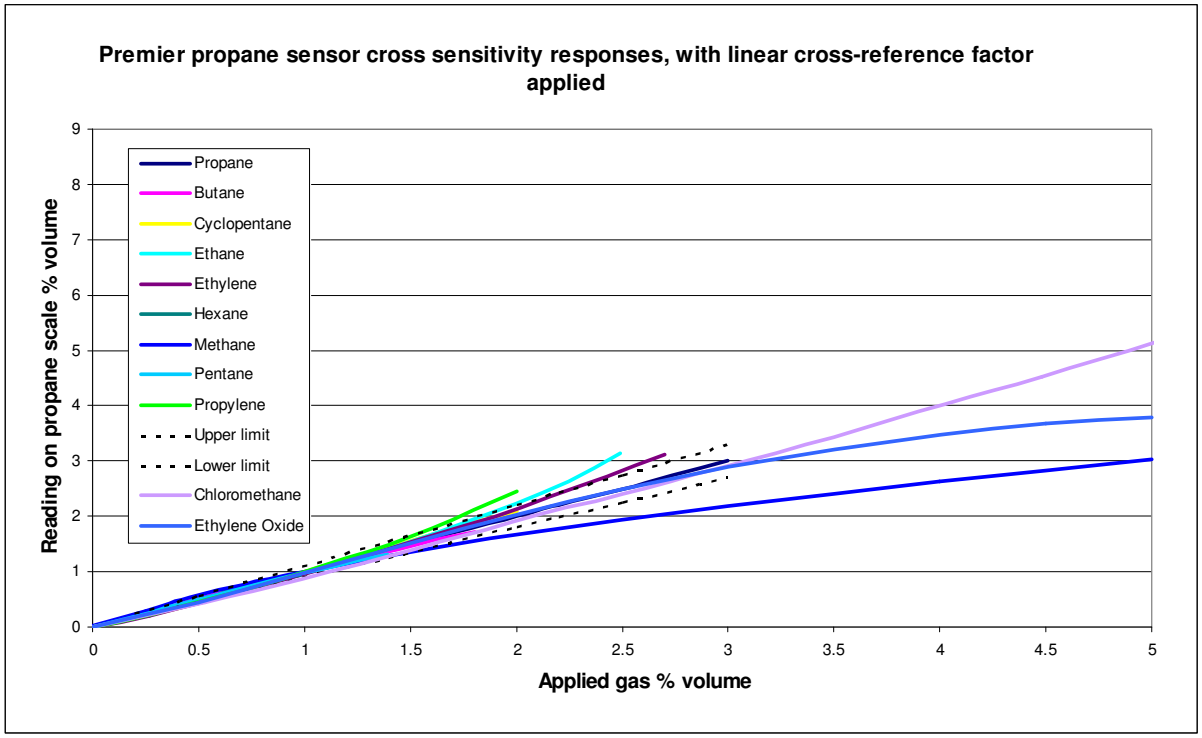


The above graph demonstrates the hydrocarbon sensor's fundamental response to a selection of gases, before any linearisation is applied.

The graph below shows some of the gas readings for a **propane** sensor; refer to the graph on page 6 for more cross sensitivity data.



It is possible to apply a linear cross reference factor to the output of a sensor characterised for propane and achieve the results shown in the graph below. Reasonable accuracy is maintained to at least the 50% LEL equivalent values of the cross-referred gases.
Note: Methane has been included on the graph in order to show that its response is not sufficiently similar to propane to make a cross referral.



Use the following multiplying factors to cross-refer to the propane reading:

GAS	Multiplication factor
Butane	0.97
Pentane	0.89
Hexane	0.80
Ethylene	3.43
Propylene	1.69
Ethane	1.01
Cyclopentane	1.62
Chloromethane	4.97
Ethylene Oxide	0.845

These factors only apply to gas concentrations expressed in % volume terms.

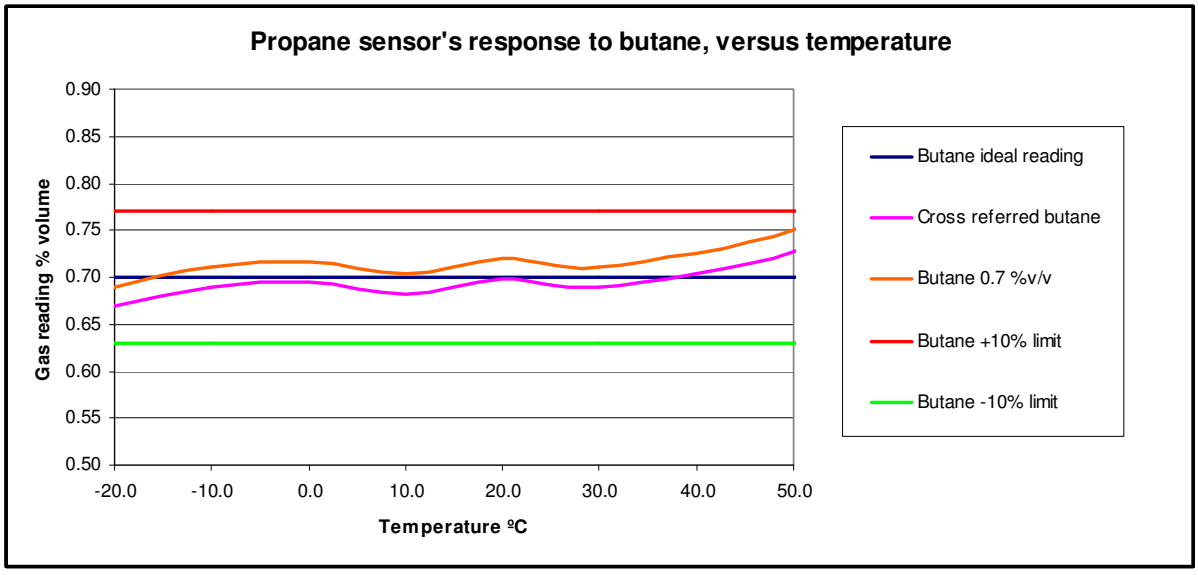
For customers that utilise the *Premier Sensor Configuration Unit*, and have signed the Agreement document authorising its use to re-configure the sensor, it is possible to enter an alternative “curve-fit” for these gases so that the output is linear over the full operating range.

Below is a table of the “EI” and “Power terms” required to linearise the output of any Premier hydrocarbon sensor to other gases. Again, it should be noted that the temperature compensation is based upon the original target gas of the sensor, and there may be errors at temperatures away from the calibration temperature.

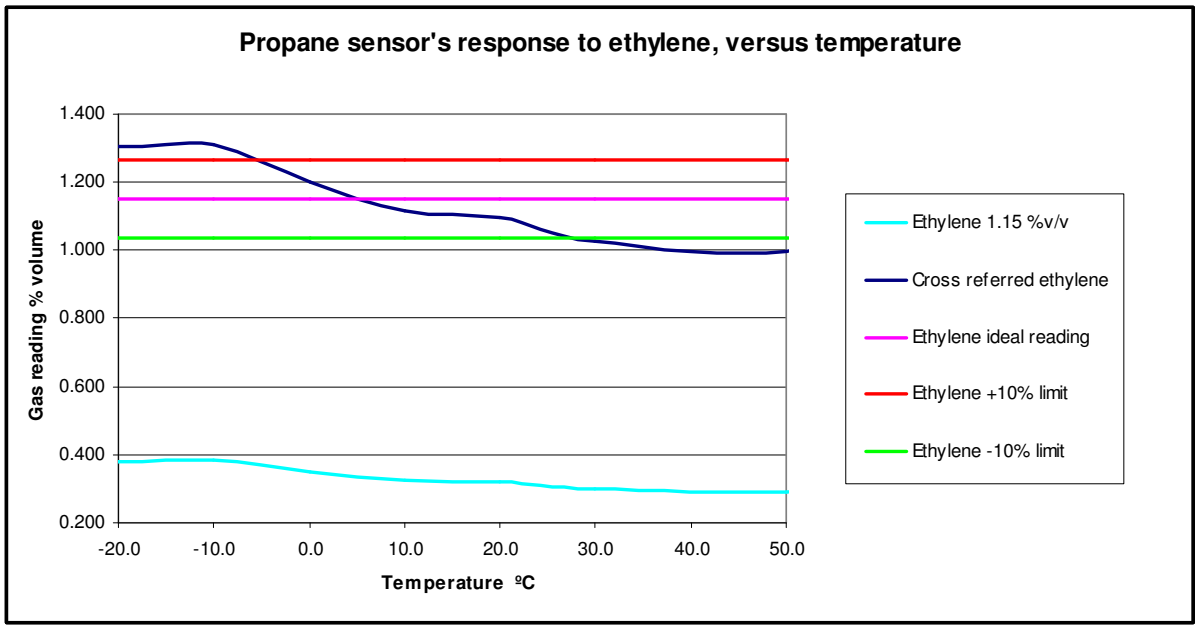
GAS	V/V range	LEL	EI	Power Term
Butane	0-2%	1.4% v/v	-0.633	1.03
Pentane	0-2%	1.1% v/v	-0.825	1.05
Hexane	0-1%	1.0% v/v	-0.855	1.01
Ethanol	0-5%	3.1% v/v	-0.370	1.13
Ethylene	0-3%	2.3% v/v	-0.040	0.96
Propylene	0-2%	2.0% v/v	-0.045	0.95
Ethane	0-3%	2.4% v/v	-0.195	0.932
Cyclopentane	0-2%	1.4% v/v	-0.522	1.267
Chloromethane	0-8%	7.6% v/v	-0.054	0.996
Ethylene Oxide	0-3%	2.6% v/v	-0.458	1.28

When the above factors have been programmed into the sensor it is necessary to perform a zero and span operation using a suitable calibration gas.

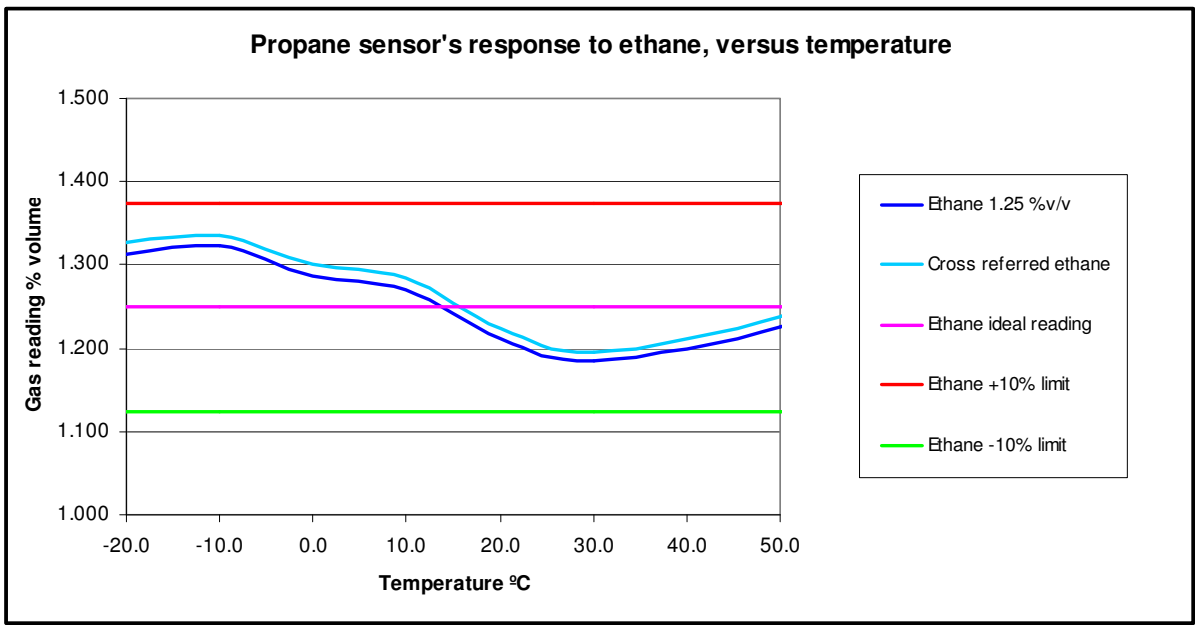
Note that when using a linear cross reference factor, or an alternative curve-fit, the temperature compensation is based upon propane, and there may be errors at temperatures away from the calibration temperature. The following graphs indicate the typical behaviour of a propane sensor, over temperature, with cross-referred gases.



The above graph shows the output of a propane sensor, both with and without a cross-reference factor applied, against ambient temperature when tested with 0.7% volume butane.

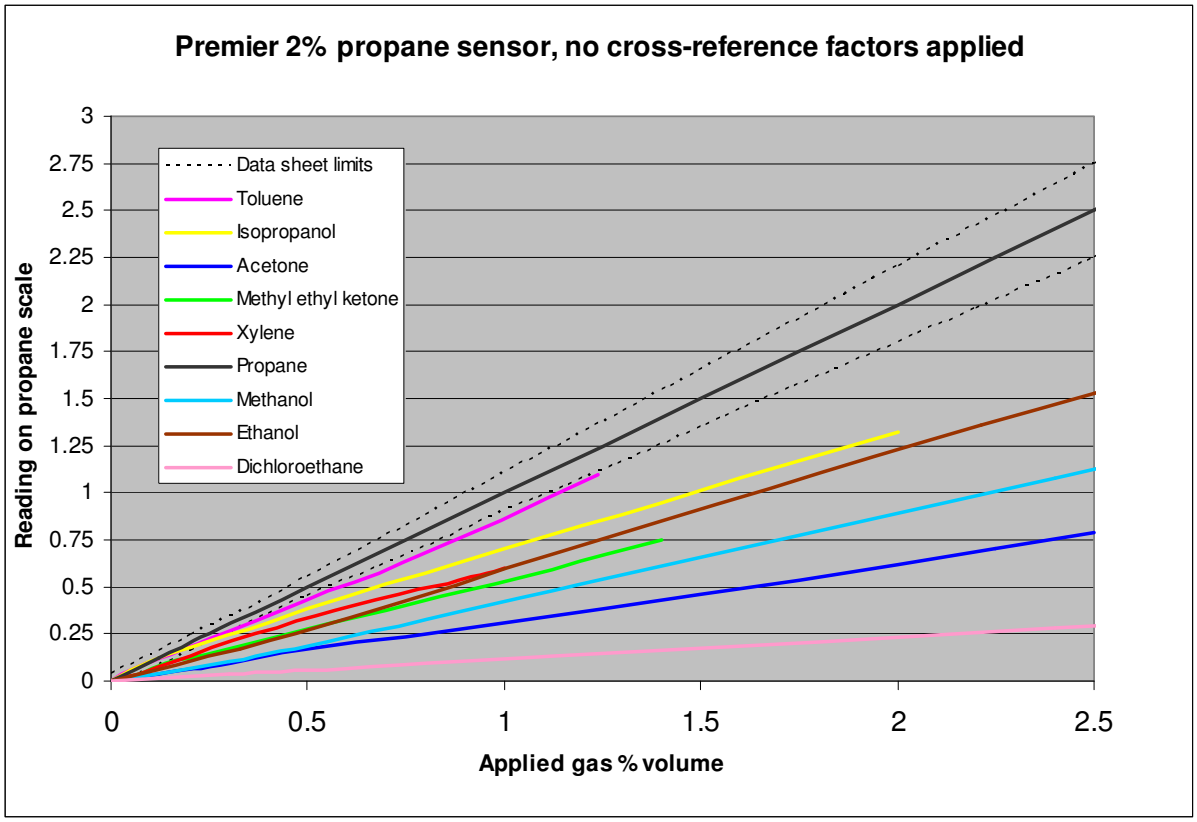


The above graph shows the output of a propane sensor, both with and without a cross-reference factor applied, against ambient temperature when tested with 1.15% volume ethylene.



The above graph shows the output of a propane sensor, both with and without a cross-reference factor applied, against ambient temperature when tested with 1.25% volume ethane.

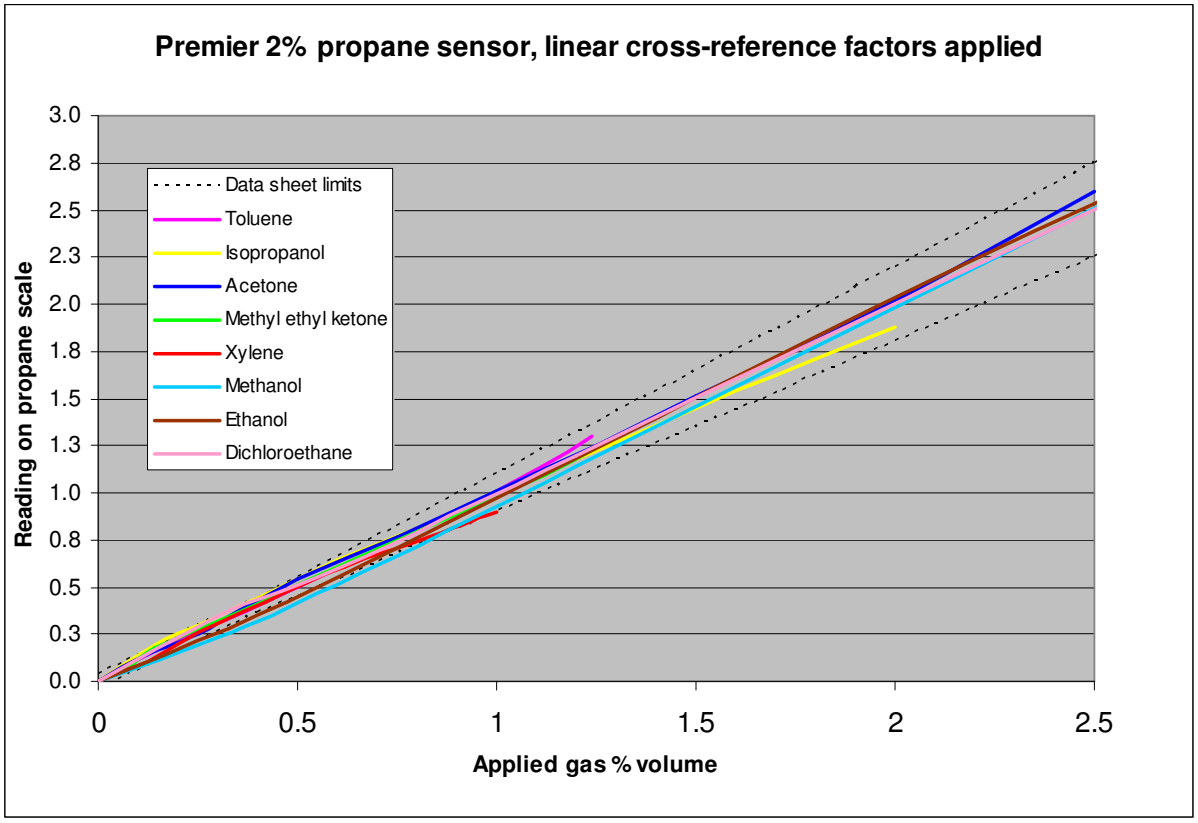
The following data applies to selected ketones, alcohols and benzenoids that are in liquid form at normal ambient temperature and pressure. There are experimental errors associated with the test method used to generate these vapours, this data is therefore provided for guidance only. This data has been gathered at 25ºC, the cross-sensitivity will vary with temperature.



Use the following multiplying factors to cross-refer to the propane reading:

GAS	Multiplication factor
Ethanol	1.65
Methanol	2.22
Toluene	1.18
Isopropanol	1.43
Acetone	3.28
Methyl ethyl ketone	1.87
Xylene	1.51
Ethyl Acetate	1.69
Dichloroethane	8.57

These factors only apply to gas concentrations expressed in % volume terms. The following graph shows the effect of applying the cross-reference factor.



Note that in all the above examples, the temperature compensation is based upon propane, and there may be errors at temperatures away from the calibration temperature.

Dynament recommends that users verify the accuracy of their instruments using test gases wherever possible. Cross-referred measurements should be used as a guide only, not as absolute values.