DYNAMENT

TAKING INVENTIVE STEPS IN INFRARED….

TECHNICAL DATA SHEET

Premier
Range of InfraRed Gas Sensors

HYDROCARBON INFRARED SENSOR

CERTIFIED VERSION

TYPE MSH-P-HC

Patent Numbers

Great Britain	GB 2 401 432 & GB 2 403 291
Europe	EP 1544603 & EP 1818667-Pending
France	EP [FR] 1544603
Germany	EP [DE] 1544603
Italy	EP [I] I1544603
Switzerland	EP [CH]1544603
USA	7, 244, 939

Other World Patents Pending

ATEX Certificate No. SIRA 04ATEX1357U, Ex I M2 EExd I and Ex II 2 G EEx d IIC

IECEx Certificate No. SIR 05.0053U, Ex d I and/or Ex d IIC

UL recognised Class 1,Groups A, B, C and D, T4 with 60°C ambient

FEATURES

- ★ Contains all the necessary optics, electronics and firmware to provide a linearized, temperature-compensated output.
- ★ Choice of output format – direct pellistor replacement, industry standard 0.4 to 2 volts dc or digital.
- ★ Instantly converts existing compatible pellistor-based instruments to infrared.
- ★ Sensors can be factory configured to customer specification.
- ★ All sensor types are user configurable using configuration equipment available from Dynament.
- ★ Fast track route for original equipment manufacturers to introduce the latest infrared technology – without any specialist knowledge.
- ★ Internal Flash memory allowing sensor firmware updates via configuration equipment.

Dynament Limited
Premier House · The Village · South Normanton · Derbyshire · DE55 2DS · UK.
Tel: 44 (0)1773 864580 · Fax: 44 (0)1773 864599
email: sales@dynament.com · www.dynament.com

DESCRIPTION

Dynament infrared sensors operate by using the NDIR principle to monitor the presence of target gas. The sensor contains a long life tungsten filament infrared light source, an optical cavity into which gas diffuses, a dual temperature compensated pyroelectric infrared detector, an integral semiconductor temperature sensor and electronics to process the signals from the pyroelectric detector .

Two versions are available:-

3 Pin Version - Pellistor Replacement Infrared

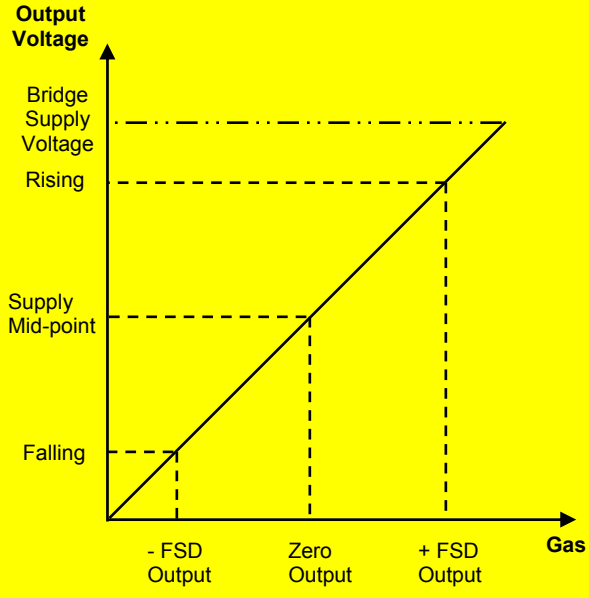
These sensors provide a pellistor style linearized, temperature-compensated output as shown in Graph 1.
They can either be supplied pre-set to customer specification or may be configured by the user by means of a configuration unit available from Dynament Ltd. The output signal can be set to rise or fall with increase in the gas level.

5 Pin Version - Multi-Purpose Range

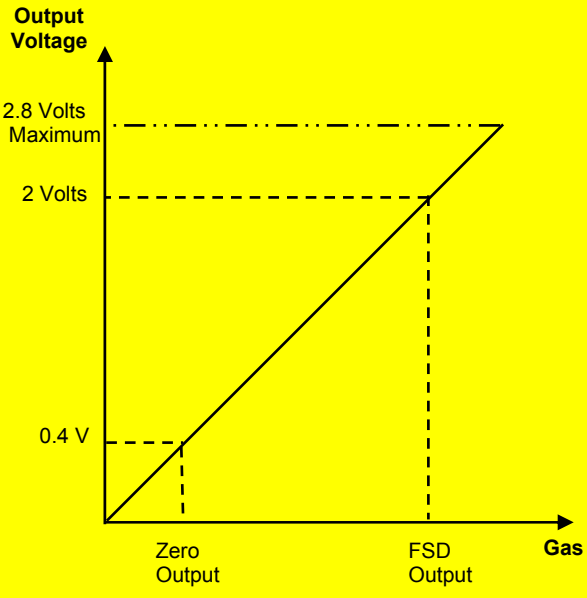
This version of the sensor provides maximum user flexibility by providing the following output options:-

- ★ Industry Standard 0.4 to 2 volt linearized, temperature-compensated output as shown in Graph 2, or alternative voltages for zero and FSD outputs.
- ★ Digital output for direct communications with instrument electronics.
- ★ Rising or falling output with increasing gas level.

The digital output is a UART format comprising 8 data bits, 1 stop bit and no parity.
Refer to specification for available baud rates.



Graph 1
Pellistor Replacement Output Characteristic



Graph 2
0.4 – 2 Volt Output Characteristic

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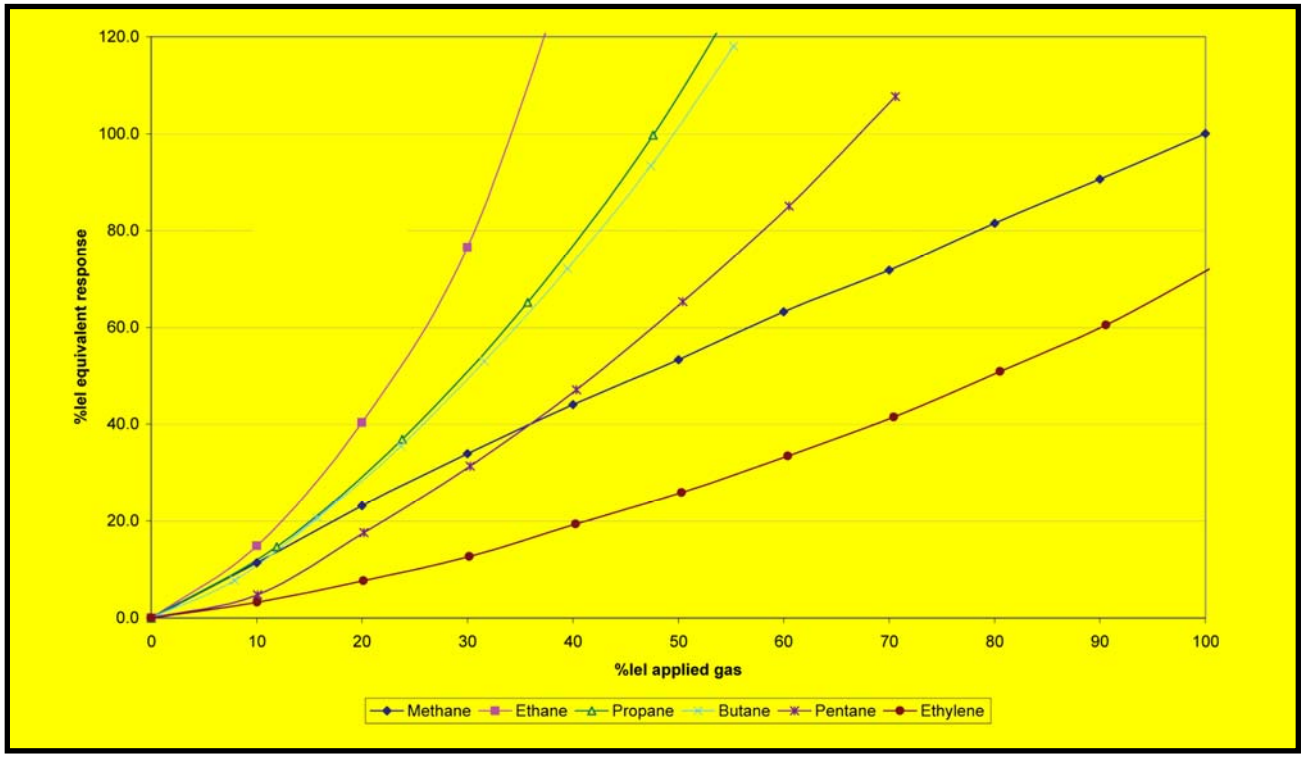
Hydrocarbon Response Characteristics

Unless otherwise specified, the Premier Range of Hydrocarbon infrared sensors are calibrated to provide an output signal linearized for methane (CH_4) during manufacture.

However, the sensor will also respond to a range of hydrocarbon gases. The characteristics shown in Graph 3 demonstrate the relative response to some of the common hydrocarbons.

If the expected target gas is other than methane, or a general response is required, then the characteristics can be used as a guide to setting up the associated instrument alarm levels.



Note – Refer to data sheet tds0050 for additional cross reference data

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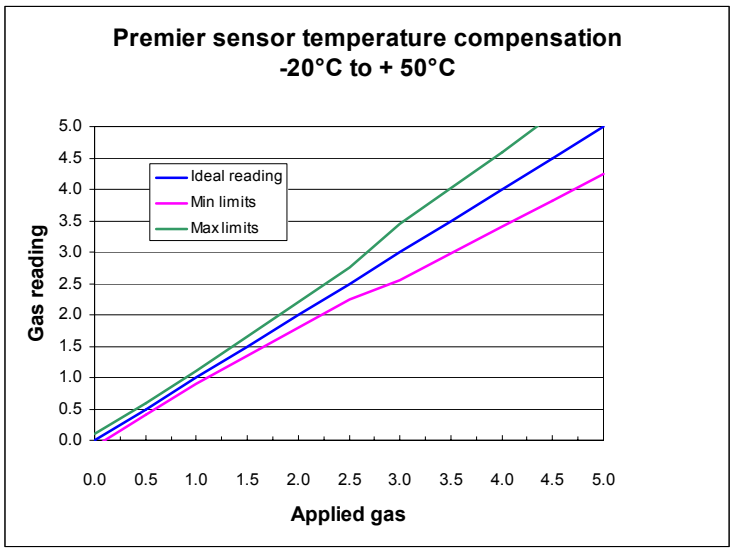
Hydrocarbon Temperature Compensation

The Premier sensor is temperature compensated over the range of -20°C to +50°C.
The output variation is ± 2% FSD or 10% of the reading up to 50% FSD and ± 15% of the reading from 50% to 100% FSD, which ever is greater.

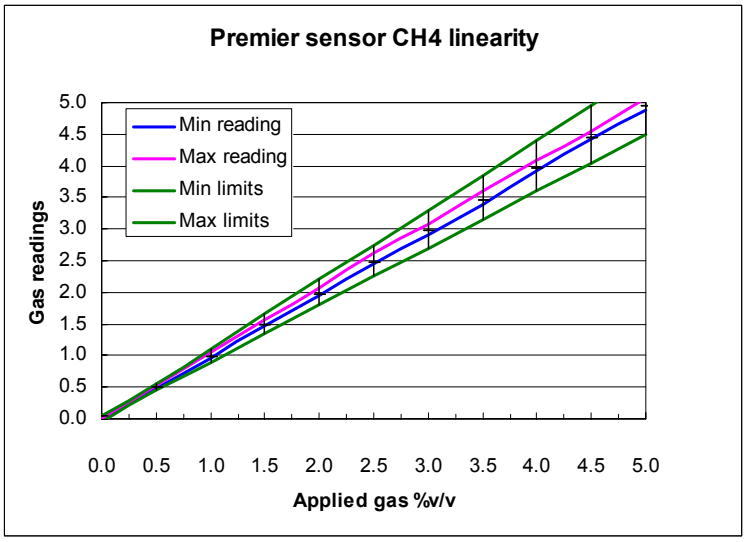
The following graph is based on the hydrocarbon sensor being characterised for methane.



Hydrocarbon Linearity

The Premier sensor linearity at ambient temperature is ± 2% FSD or 10% of the reading which ever is greater.

The following graph is based on the hydrocarbon sensor being characterised for methane, data based on 24 sensors.



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Sensor warm-up time

When power is first applied to the sensor, the voltage at the output pin is held at a pre-determined level. The default setting for this start-up value is the “zero gas” value. This condition is maintained for a default “warm-up” time of 15 seconds, after this time the output voltage represents the calculated gas value. Sensors can take up to 1 minute to indicate the correct gas reading.

Note: the sensor can output any reading from -100% FSD to +200% FSD in the first minute.
The output value that is read using the communications pins is always held at zero during the “warm-up” time.

Both the voltage at the output pin during the “warm-up” time, and the duration of the “warm-up” time can be pre-programmed to alternative values at the time of ordering sensors.

Sensor fault indication

The sensor constantly performs checks on the internal memory contents, the incoming supply voltage and the analogue signal values. These checks are used to ensure that the sensor is operating within its correct parameters, and that no internal faults have developed.

If a fault condition is detected, the output value is set to -100% FSD. In the case of a sensor with a voltage output that is scaled, 0.4 – 2.4V, for example, the output will be set to 0V under fault conditions

It is not recommended to choose an output voltage of 0V for zero-gas, because the fault condition cannot then be distinguished from the zero-gas condition.

The output value that is read when using the communications pins, instead of the voltage output pin, will be set to -100% FSD under fault conditions.

As mentioned in the “Sensor warm-up time” section above, the voltage at the output pin during the warm-up time can be specified when ordering sensors. It should be noted that if a start-up voltage is chosen that represents the zero-gas condition, then should a fault subsequently develop leaving the sensor unable to drive the output to -100% FSD, this condition cannot be detected by the host instrument.
The start-up voltage that is equivalent to zero-gas was chosen as the default setting because, in a large number of applications, the host instrument would otherwise indicate fault during the warm-up period.

Temperature transients and gas flow rates.

The Premier sensor employs a pyroelectric detector, the output from which can be disrupted by sudden changes in temperature. If there is an excessive change in the ambient temperature, gas sample temperature or flow rate, then the output signal will be momentarily frozen. Correct operation is restored when the effects of the transient have settled. Rates of change in the ambient temperature should be restricted to 2°C/minute and gas flow rates kept below 600 cc/minute.

Power supply considerations

The sensor power supply rise time must be less than 50 mS to ensure correct operation. Operation outside the range of 3 – 5 V dc will result in either fault indication, or the sensor will not function correctly.

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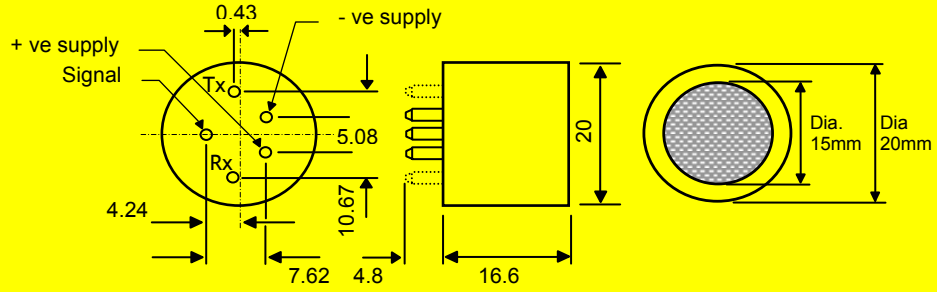
SPECIFICATION

Operating Voltage Range:	3.0 – 5.0 V d.c.
Operating Current:	Constant current operation, current range 75 – 85mA
Programmable Output Voltage Ranges:	Voltage Output Types – 0v to 2.8 volts d.c. Bridge Output Types – 0v to Bridge Supply Voltage
Methane measuring range:	0 ─ 5% volume up to 0 ─ 100% volume
Hydrocarbon measuring range	0 ─ 100% LEL equivalent
Resolution:	1% of measuring range for readings above 50% of range, 0.5% of measuring range for readings below 50% of range
Warm up time:	To final zero ± 2% FSD : 1 minute @20°C (68°F) ambient
Response Time T_{90}:	<30s @20°C (68°F) ambient
Zero Repeatability:	± 1% FSD @20°C (68°F) ambient
Span Repeatability:	± 2% FSD @20°C (68°F) ambient
Long term zero drift:	± 1% FSD per month @20°C (68°F) ambient, (max ± 3% FSD per year)
Operating temperature range:	-20°C to +50°C (-4°F to 122°F)
Temperature performance: * May not be applicable when using gas cross-reference factors	± 10% of reading up to 50% FSD, ± 15% of reading from 50% to 100% FSD, or 2% FSD whichever is greater over the range -20°C to +50°C (-4°F to 122°F)
Storage temperature range:	-20°C to +50°C (-4°F to 122°F)
Humidity range:	0 to 95% RH non-condensing.
Digital signal format:	8 data bits, 1 stop bit, no parity
Standard baud rates:	38,400, 19,200, 9600
User configurable parameters:	Zero output voltage FSD output voltage Positive or negative going output Sensor 'zero' function Sensor 'span' function
MTBF:	> 5 years
Weight :	15 grams

MECHANICAL DETAIL



Pins viewed from underside Diameter of pins = 1.5mm
Tx & Rx communication connections are available as either pads or pins

NOTES

1. DIMENSIONS W ITHOUT TOLERANCES ARE NOMINAL.
2. RECOMMENDED PCB SOCKET WEARNES CAMBION LTD CODE: 450-3326-01-06-00.
3. WEIGHT: 15g
4. USE ANTI-STATIC PRECAUTIONS WHEN HANDLING
5. DO NOT CUT PINS
6. DO NOT SOLDER DIRECTLY TO PINS

NOTE – The above pin configuration is shown for the POSITIVE version of the sensor. The NEGATIVE version has the +ve and –ve supply pin positions exchanged. See ordering details.

Dynament reserve the right to alter technical specifications without prior notice

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Ordering Details

In order to completely specify the type of sensor that is required, the customer needs to provide the following information:-

- An Order Code (see below) that specifies the sensors' basic physical and electrical characteristics.
- The sensor configuration requirements.

Available sensor options:

F = Replaceable, self adhesive microporous PTFE filter

EXAMPLE OF ORDER CODES

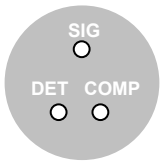
MSH – P / HC / 3 / B / P / F

- Option — FILTER : BLANK = OMITTED, F = FITTED
- SUPPLY POLARITY : P = Positive, N = Negative
- OUTPUT TYPE : B = Bridge, V = Voltage
- NUMBER OF PINS : 3 or 5
- GAS TYPE : HC = Hydrocarbon
- PREMIER SENSOR

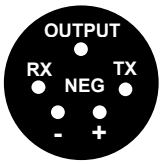
CONFIGURATION OPTIONS
(To be stated on customer order in addition to the Order Code)

1. Output voltage for zero.
2. Output voltage for span.
3. Rising or falling output voltage with increasing gas level.
4. Sensitivity e.g. 20 mV / % volume CH_4.
5. Communication speed – 38,400 baud (default), specify alternative rate if required.

Pellistor Replacement - Explanation of Positive & Negative Polarity

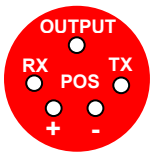


Typical Pellistor Pinout



Premier Negative Polarity Option

Use where the DET pin of the existing pellistor is connected to the Negative of the pellistor bridge supply.



Premier Positive Polarity Option

Use where DET pin of the existing pellistor is connected to the Positive of the pellistor bridge supply.

Note – On the 3 pin version of the sensor, the RX and TX connections are pads, not pins.

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