PLATINUM IR SENSOR USER MANUAL

FIRMWARE VERSION 7.17.XXU

Certified (Exd)-Black text on Silver background

Low Power Certified (Exd)-Black text on White background

Non-Certified (Exd)-Blue text on Silver background

Low Power Non-Certified (Exd)-Blue text on White background

SIL1 Certified (Exd) – Red text on Silver background

Low Power SIL1 Certified (Exd) – Red text on White background

SIL1 Non-Certified (Exd) – Purple text on Silver background

Low Power SIL1 Non-Certified (Exd) – Purple text on White background

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Safety Information – Read First

Read and understand this manual in conjunction with the relevant data sheet before using the Platinum sensor.

Known Bugs

Integer live data

The live data can be transmitted in either floating point format or integer format. When the integer format is selected the live reading is split into two integers, one value is the gas reading while the other is a multiplier. The multiplier is taken from the sensor range to maximise the accuracy of the reading.

The bug is that range 1 is always selected irrespective of the actual ranges of the sensor. Thus if range 2 is enabled, usually 100, the maximum gas reading is about 15.

Only use the integer format when range 1 is selected.

Platinum Sensor

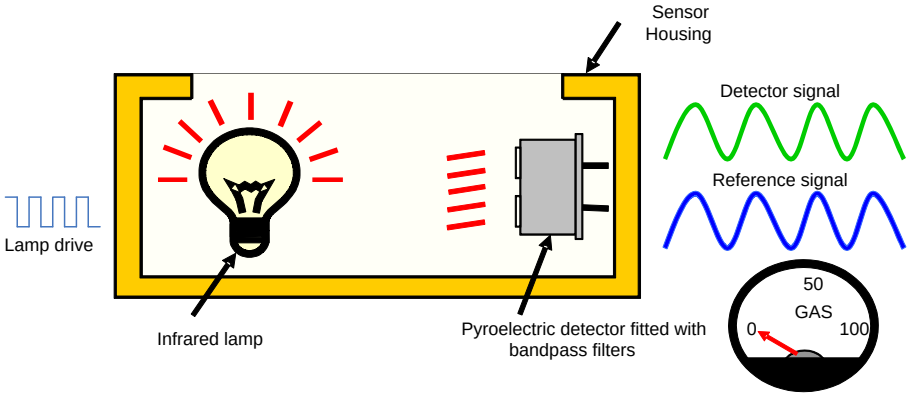
Description

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

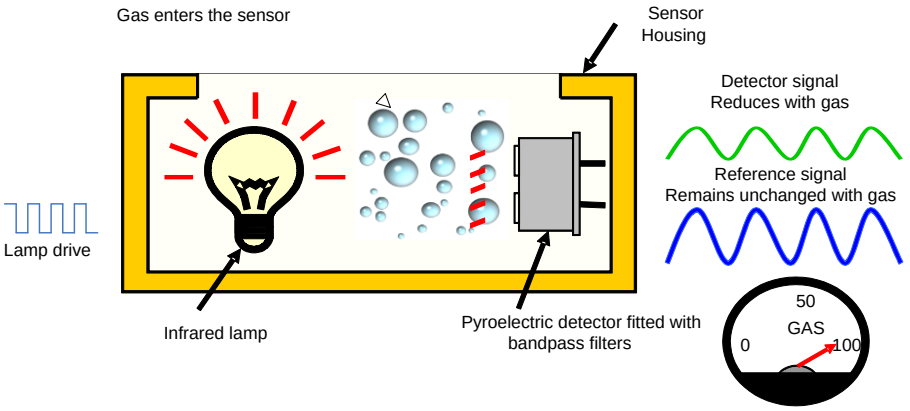
The sensor uses a digital output for direct communications with instrument electronics. The digital output is a UART format comprising 8 data bits, 1 stop bit and no parity. Refer to specification for available baud rates.

Basic operation

The sensor has an infrared lamp that is switched on and off at a rate of typically 2 times a second. This results in the pyroelectric device producing a sinusoidal signal for both the detector and reference devices.



The detector sinusoidal signal reduces in size as the gas enters the sensor, the reference signal is unchanged.



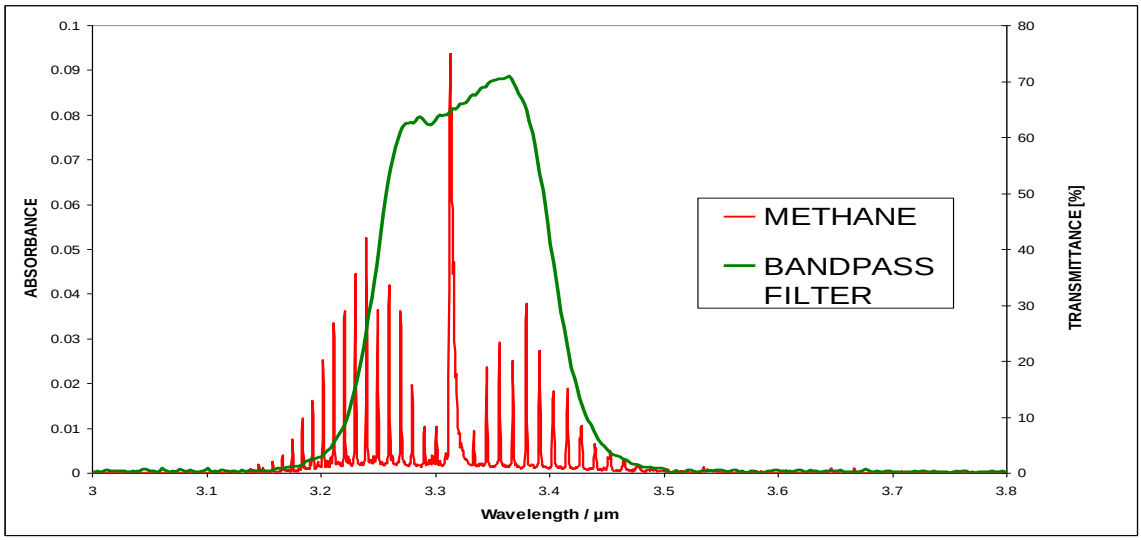
The gas concentration is calculated by measuring the difference in the ratio of the detector and reference signals in zero gas and with gas. The reference signal is used to compensate the gas readings for effects like temperature and lamp ageing.

Target gases

The infrared sensor detects a particular gas by means of an optical filter. The optical filter is chosen for a given type of gas.

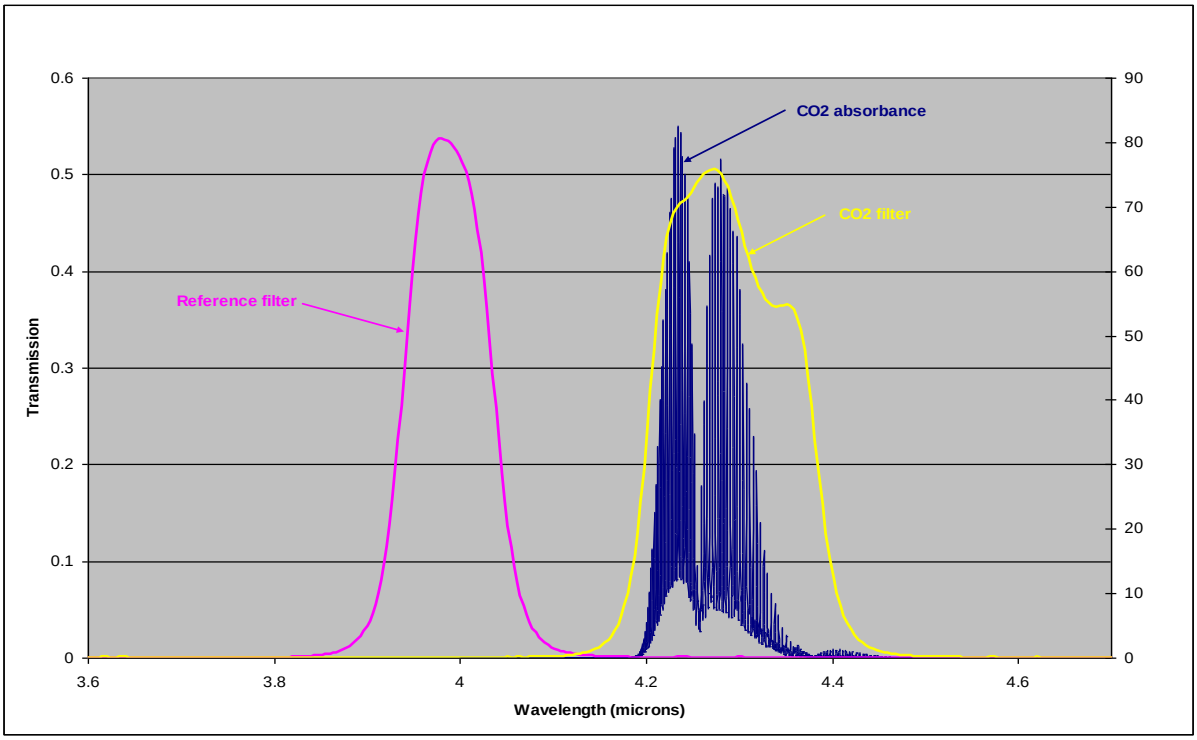
Methane

ABSORPTION SPECTRUM FOR METHANE



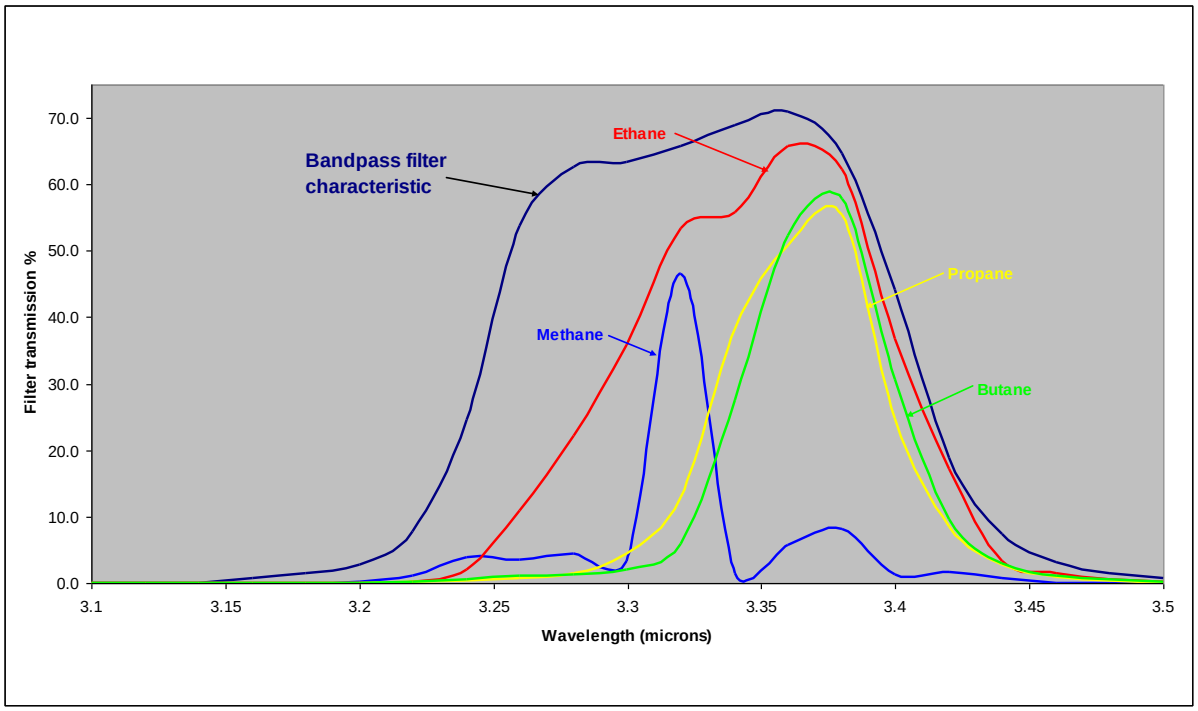
THE BANDPASS FILTER ONLY ALLOWS ENERGY INTO THE DETECTOR AT THE WAVELENGTH

Carbon dioxide



General hydrocarbons

Some gases have a similar response to other gases which results in the detector responding to a given filter making the sensor non-selective.



The Platinum Sensor housing is available in two formats

1) Exd
2) Non-Exd

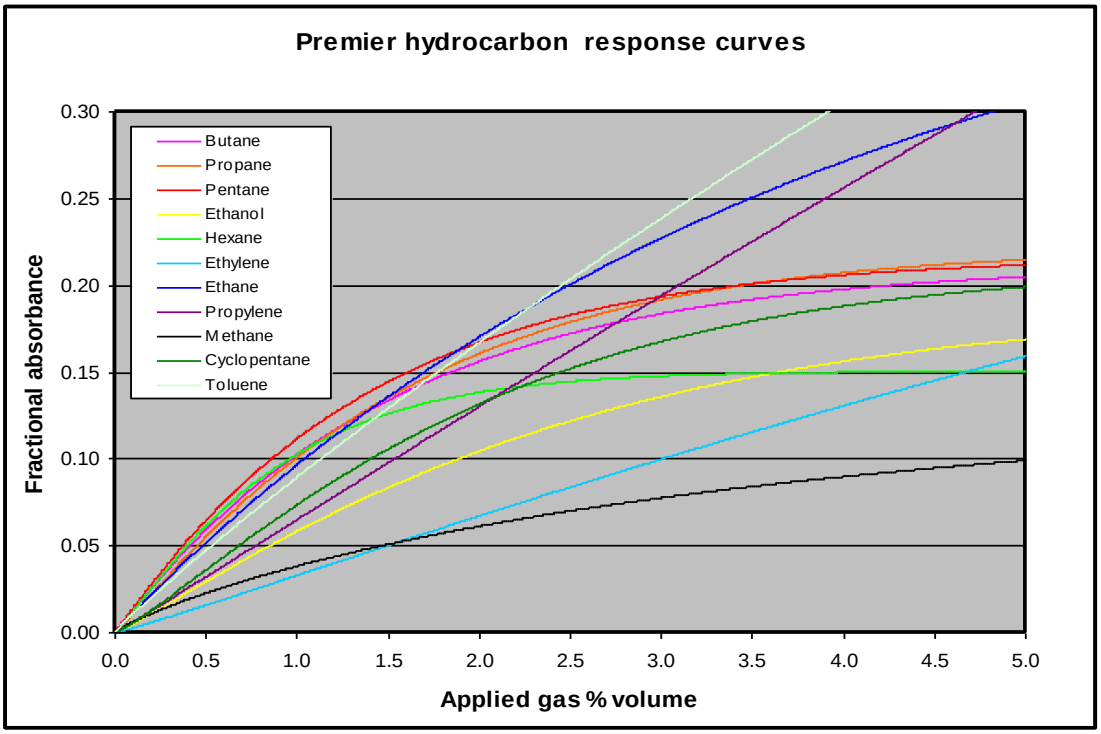
Exd versions of the Platinum IR sensor use the Exd method of protection in order to comply with European ATEX Certification, International IECEx Certification and North American Certification. The limitations shall be based on the standard's guidelines.

It is the responsibility of the end user to provide a suitable method of protection for the non-Exd versions of the sensor when the sensor is to be operated in a potentially hazardous area.

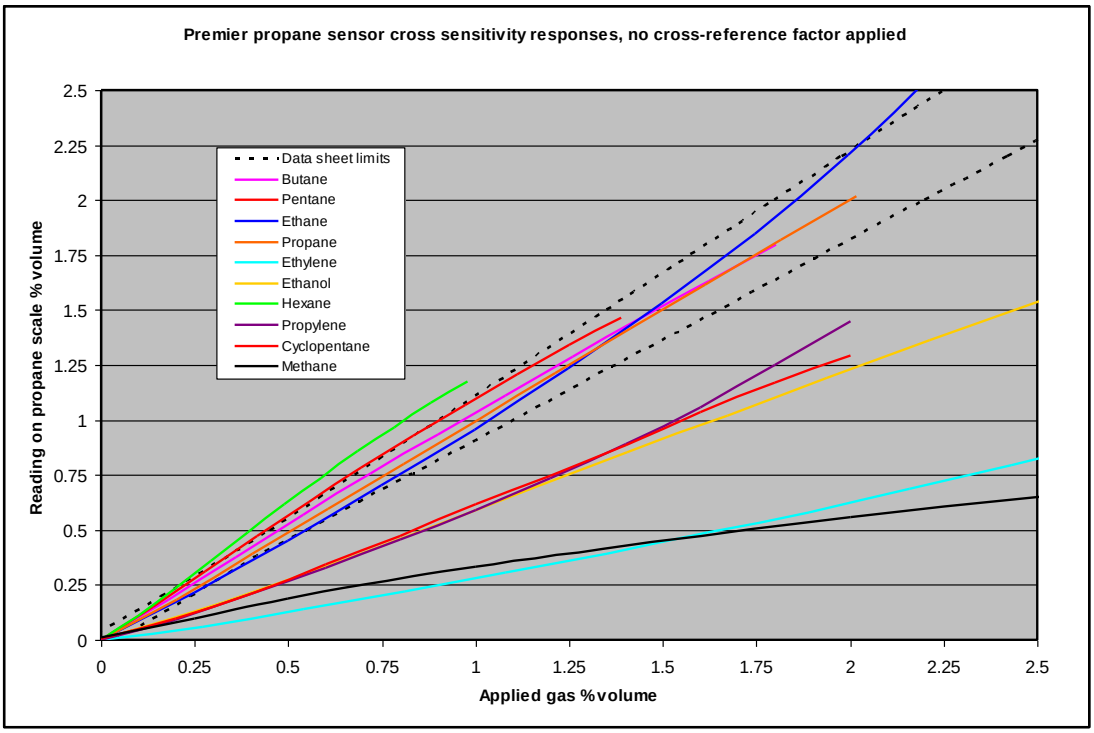
Refer to individual data sheets for more information, see related documents section in this document.

Hydrocarbon sensor response to gases

The hydrocarbon version of the Infrared sensor responds to a wide variety of hydrocarbon gases. Each gas has its own non-linear response to gas. The following graph shows typical responses to some of the gases:

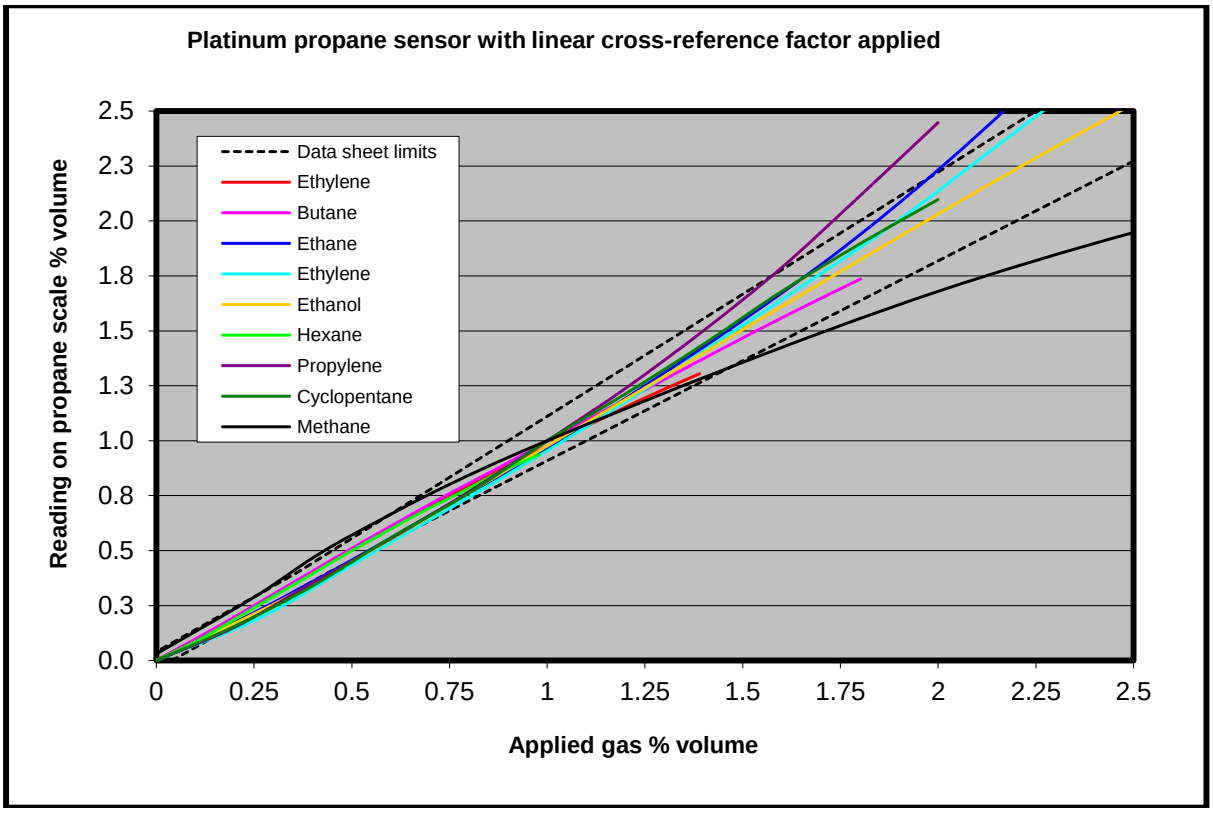


The sensor can be linearised by applying a curve fit equation. The following diagram shows a sensor that has been linearised to propane.



It can be seen from the previous diagram that some of the gases give a near linear response over a limited gas range.

This allows us to apply a correction factor to make a propane sensor measure other gas types. This can be seen in the following diagram.



The following table shows typical multiplication factors that can be applied to a propane sensor to give readings for other gas types.

GAS	Multiplication factor
Butane	0.97
Pentane	0.89
Hexane	0.80
Ethanol	1.65
Ethylene	3.43
Propylene	1.69
Ethane	1.01
Cyclopentane	1.62

Note: It is up to the user to verify if the application of correction factors gives accurate readings.

Related Documents

This document should be used in conjunction with the following documents:
Platinum_IR_Sensor_Configuration (PC Application)

The document is supplied with PC Application or on request.

Tds0045 Premier Sensor Communications protocol (Full-access).doc

The document is available on request.

Certified (Exd) sensors Certified (Exd) sensors

Certified (Exd) sensors

SIL1 Certified (Exd) sensors

Tds0117 Platinum Dual Gas Sensor (Certified) Data Sheet.doc
Tds0118 Platinum Triple Range hydrocarbon Sensor (Certified) Data Sheet.doc
Tds0119 Platinum Triple Range carbon dioxide Sensor (Certified) Data Sheet.doc
Tds0121 Platinum Dual Biogas Sensor (Certified) Data Sheet.doc

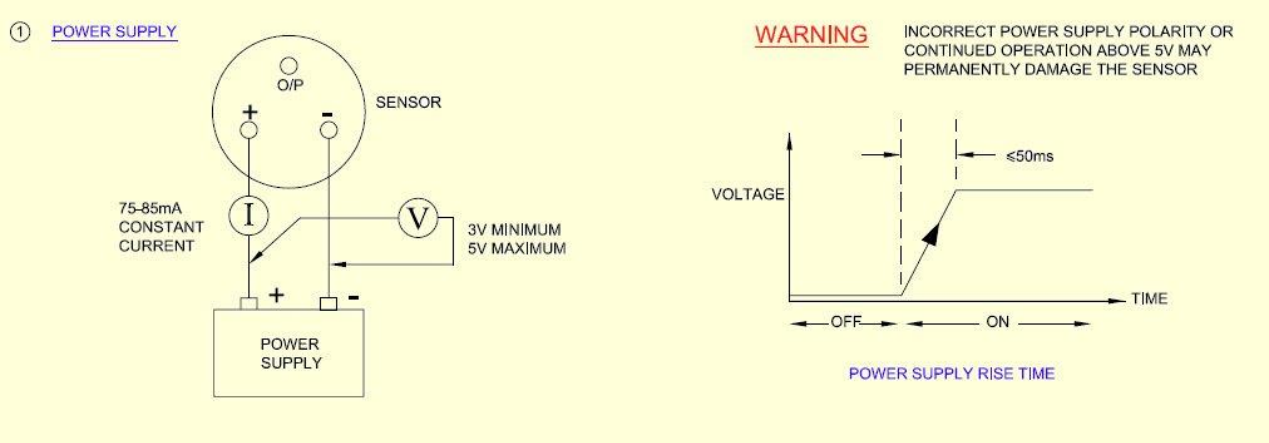
Non-Certified sensors

SIL1 Non-Certified sensors

Tds0123 Platinum Triple Range hydrocarbon Sensor (Non-Certified) Data Sheet.doc
Tds0124 Platinum Triple Range carbon dioxide Sensor (Non-Certified) Data Sheet.doc
Tds0125 Platinum Dual Biogas Sensor (Non-Certified) Data Sheet.doc
Tds0126 Platinum Dual Gas Sensor (Non-Certified) Data Sheet.doc

Power Supply

The Platinum sensor is designed to operate with a supply voltage of between 3 and 5V as shown below. The current requirement is up to 85 mA.



POWER SUPPLY

POWER SUPPLY

Sensor warm-up

The sensor takes approximately 45 seconds to warm up after power is supplied. The sensor goes through several processes during this warm-up period. These are as follows:

1) Output the power-up value to the DAC.
2) Wait for 5 seconds for serial data to see if a program update is taking place.
3) After 5 seconds the main program runs.
4) Outputs the warm-up voltage to the DAC.
5) Allows normal serial communications, however the gas reading will be showing -250% FSD and the status flags reflect the internal operations.
6) After the warm-up time, 45 seconds minimum, the analogue output is driven according to the gas readings and internal conditions. The serial data also reflects the gas readings and internal conditions.

Serial communications

The sensor has a UART interface allowing it to communicate with a range of devices in a serial manner.

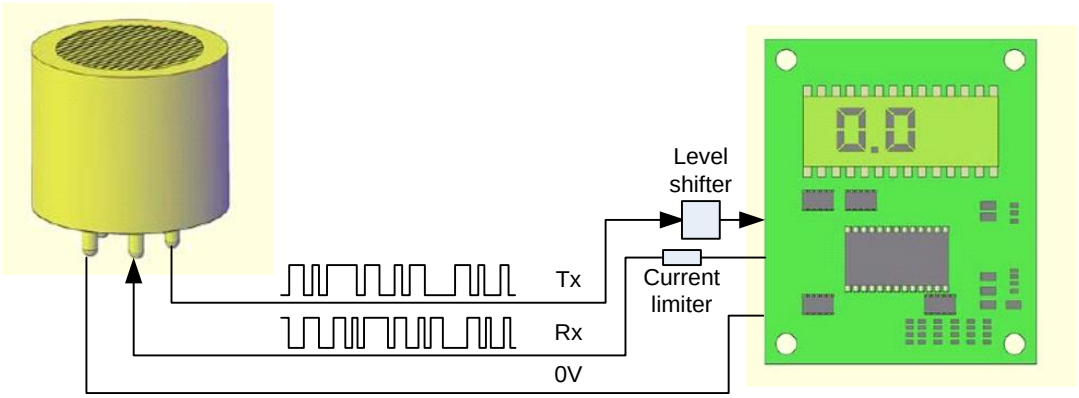
The serial interface allows the user to view gas levels, temperature and other parameters. It also allows the sensor to be calibrated and perform configuration options.

The communications protocol is supplied by Dynament.

The sensor can be configured to operate at 4 different baud rates – 38400, 19200, 9600 and 4800. 38400 baud is the default setting.

Logic levels

The senor electronics operates at 2.8V for a supply voltage of 3 to 5V. Care must be taken when connecting the sensor to electronics that are above 2.8V. You may need a level shifter for the Tx pin and a current limiting resistor, approximately 3K.

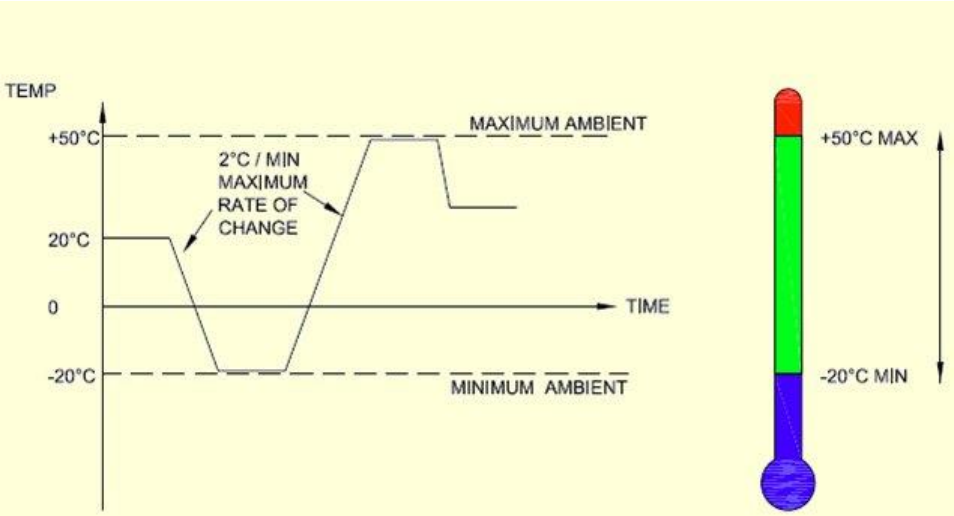


The Platinum sensor has been designed to operate over the temperature range of -20°C to + 50°C. There are variants that will operate over the range of -40°C to + 75°C. Each sensor is individually compensated for zero and gas readings typically at mid-scale.

The rate of change of the sensor should be limited to 2°C per minute to avoid spurious readings.

The sensor will still operate outside the normal range but only those sensors that have been fully characterized will give accurate readings.

TEMPERATURE LIMITS

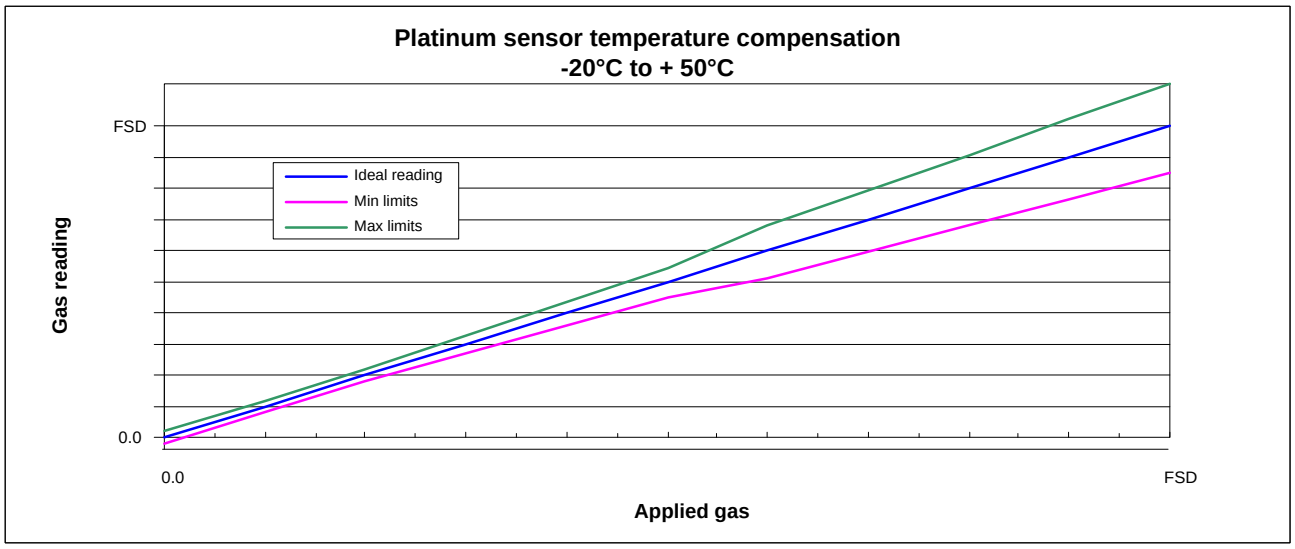


TEMPERATURE TRANSIENT LIMITS

OPERATING TEMPERATURE LIMITS

Temperature compensated sensors have the following characteristics

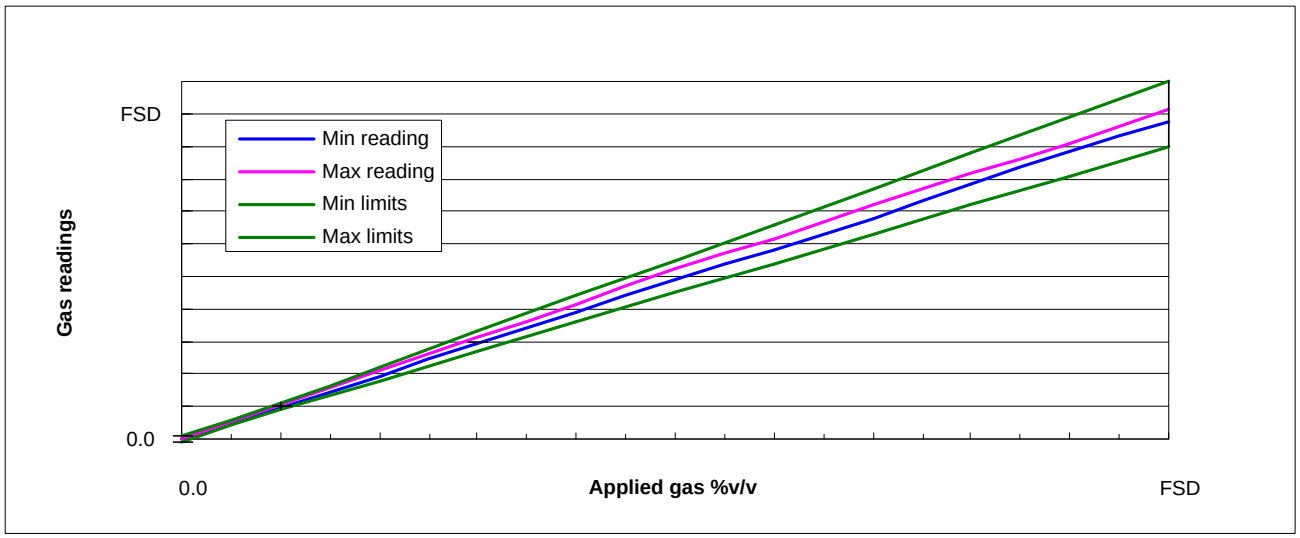
TEMPERATURE PERFORMANCE



The variation in the output over temperature is ± 2% of the full-scale or ± 10% of the applied gas up to 50% full-scale and ± 15% of the applied gas from 50% to 100% full-scale, whichever is greater.

The Premier sensor linearity at ambient temperature is ± 2% full-scale or ± 10% of the applied gas whichever is greater.

LINEARITY PERFORMANCE



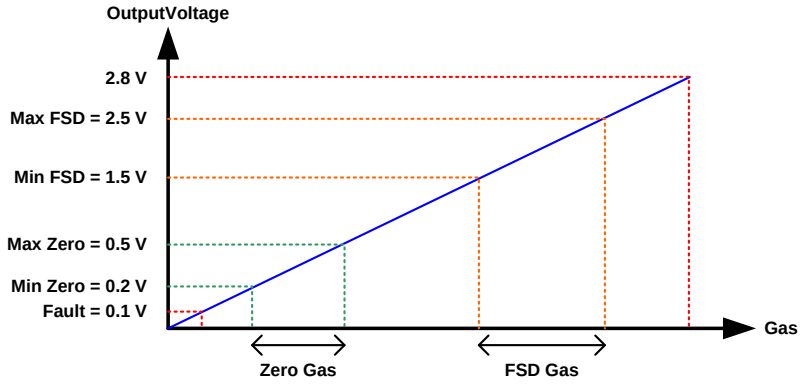
High range CO2 sensors, 0-100%v/v, exhibit a bigger non-linearity from 80 to 100% v/v.
The linearity is ± 15% of the applied gas from 80% to 100%.

Analogue output

The analogue output of the sensor is directly proportional to the measured gas level. The analogue output can be configured to be a straight forward voltage or a bridge type configuration. This configuration is carried out during manufacture and thus cannot be changed afterwards.

Voltage

The typical setting for the analogue output is 0.4 to 2.0V for zero gas to FSD. The user can select the output for zero gas to be in the range of 0.2V to 0.5V and for FSD in the range of 1.5 to 2.5V. This is shown in the following diagram.



The table below shows the analogue output for a sensor that is configured as follows.
Zero = 0.4, FSD = 2.0V FSD = 100.

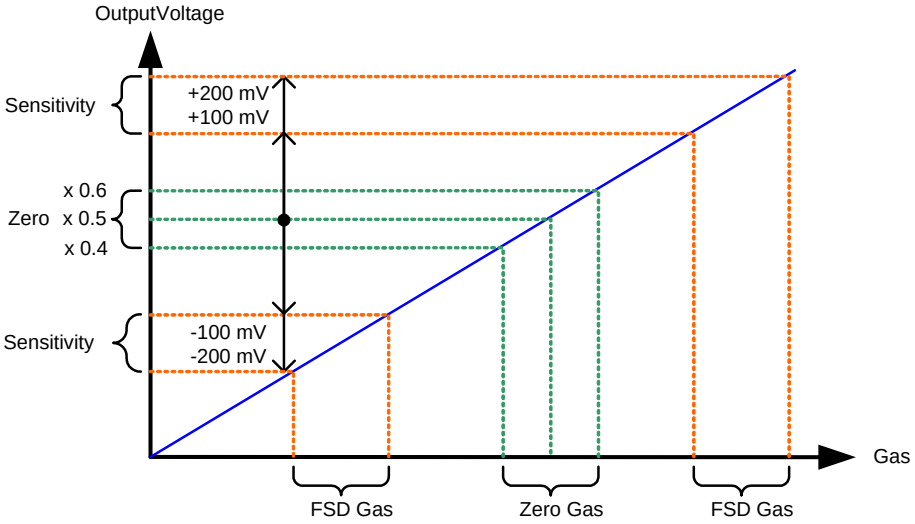
The sensor output is as follows:

Condition	Digital output	Analogue output (V)
Zero gas	0	0.400
10% gas	10	0.560
50% gas	50	1.200
100% gas	100	2.000
125% gas	125	2.400
150% gas	150	2.500
200% gas	200	2.500
-10% gas	-10	0.240
-50% gas	-50	0.200
-100% gas	-100	0.200
-125% gas	-125	0.200
-150% gas	-150	0.200
-200% gas	-200	0.200
Fault	-250	0.100

Bridge

The bridge output configuration is typically used as a pellistor replacement and is configured to be ½ of a Wheatstone bridge. The analogue output is typically set to ½ the supply voltage with the output rising by 100 mV (at the FSD) for a negative supply voltage or the output falling by 100 mV (at the FSD) for a positive supply voltage.

This is shown in the diagram below.



The user can configure the zero to be between 0.4 and 0.6 times the supply voltage. The FSD can be configured to be up to 0-200mV in either direction of the zero point.

Output Voltage = (Zero * Supply Voltage) + (Sensitivity * (Gas Level / FSD))

Examples

Example 1:
Supply voltage = 5Volts
Sensitivity = 0.1V
Zero = 0.5
Gas level = 2.5% v/v
FSD = 5% v/v

Output Voltage = (0.5 * 5) + (0.1 * 2.5 / 5)) = 2.55 Volts

Example 2:
Supply voltage = 3Volts
Sensitivity = 0.1V
Zero = 0.5
Gas level = 2.5% v/v
FSD = 5% v/v

Output Voltage = (0.5 * 3) + (0.1 * 2.5 / 5)) = 1.55 Volts

Example 3:
Supply voltage = 5Volts
Sensitivity = 0.1V
Zero = 0.4
Gas level = 50% v/v
FSD = 5% v/v

Output Voltage = (0.4 * 5) + (0.1 * 2.5 / 5)) = 2.05 Volts

Example 4:
Supply voltage = 3Volts
Sensitivity = 0.1V
Zero = 0.4
Gas level = 50% v/v
FSD = 5% v/v

Output Voltage = (0.4 * 3) + (0.1 * 2.5 / 5)) = 1.25 Volts

Example 5:
Supply voltage = 5Volts
Sensitivity = 0.1V
Zero = 0.5
Gas level = -12.5% v/v (fault level -250% FSD)
FSD = 5% v/v

Output Voltage = (0.5 * 5) + (0.1 * -12.5 / 5)) = 2.25 Volts

Example 6:
Supply voltage = 3Volts
Sensitivity = 0.1V
Zero = 0.6
Gas level = -12.5% v/v (fault level -250% FSD)
FSD = 5% v/v

Output Voltage = (0.6 * 3) + (0.1 * -12.5 / 5)) = 1.55 Volts

Example 7:
Supply voltage = 3Volts
Sensitivity = -0.2V
Zero = 0.6
Gas level = -12.5% v/v (fault level -250% FSD)
FSD = 5% v/v

Output Voltage = (0.6 * 3) + (-0.2 * -12.5 / 5)) = 2.30 Volts

Tables

The tables below shows the analogue output for a sensor that is configured as follows.

100 mV FSD, Zero at 0.5 times the supply voltage

Condition	Digital Output	Analogue output (V)			
		5V supply FSD = 0.1	3V supply FSD = 0.1	5V supply FSD = -0.1	3V supply FSD = -0.1
Zero gas	0	2.500	1.500	2.500	1.500
10% gas	10	2.510	1.510	2.490	1.490
50% gas	50	2.550	1.550	2.450	1.450
100% gas	100	2.600	1.600	2.400	1.400
125% gas	125	2.625	1.625	2.375	1.375
150% gas	150	2.650	1.650	2.350	1.350
200% gas	200	2.700	1.700	2.300	1.300
-10% gas	-10	2.490	1.490	2.510	1.510
-50% gas	-50	2.450	1.450	2.550	1.550
-100% gas	-100	2.400	1.400	2.600	1.600
-200% gas	-200	2.300	1.300	2.700	1.700
Fault	-250	2.250	1.250	2.750	1.750

200 mV FSD, Zero at 0.5 times the supply voltage

Condition	Digital Output	Analogue output (V)			
		5V supply FSD = 0.2	3V supply FSD = 0.2	5V supply FSD = -0.2	3V supply FSD = -0.2
Zero gas	0	2.500	1.500	2.500	1.500
10% gas	10	2.520	1.520	2.480	1.480
50% gas	50	2.600	1.600	2.400	1.400
100% gas	100	2.700	1.700	2.300	1.300
125% gas	125	2.750	1.750	2.250	1.250
150% gas	150	2.800	1.800	2.200	1.200
200% gas	200	2.900	1.900	2.100	1.100
-10% gas	-10	2.480	1.480	2.520	1.520
-50% gas	-50	2.400	1.400	2.600	1.600
-100% gas	-100	2.300	1.300	2.700	1.700
-200% gas	-200	2.100	1.100	2.900	1.900
Fault	-250	2.000	1.000	3.000	2.000

Response Times

The response time of the sensor is the time taken for the sensor to reach a certain value. T100, the time taken to reach 100% of the reading may never be reached. Thus typical times are set for T50, the time taken to reach 50% of the applied gas and T90, the time taken to reach 90% of the applied gas.

T50 / T90

The following table illustrates some typical values.

Gas range	Gas level %v/v	T50 (typical) Seconds	T90 (typical) Seconds	T90 (max) Seconds
0-5% CH4 (methane)	2.5	10	20	30
0-100% CH4 (methane)	100	12	25	30
0-2% C3H8 (propane)	1.1	12	25	30
Single CO2 sensor 0-5% CO2 (carbon dioxide)	2.0	14	27	30
Dual CO2 / HC sensor 0-5% CO2 (carbon dioxide)	2.0	10	20	30
0-100% CO2 (carbon dioxide)	100	12	20	30

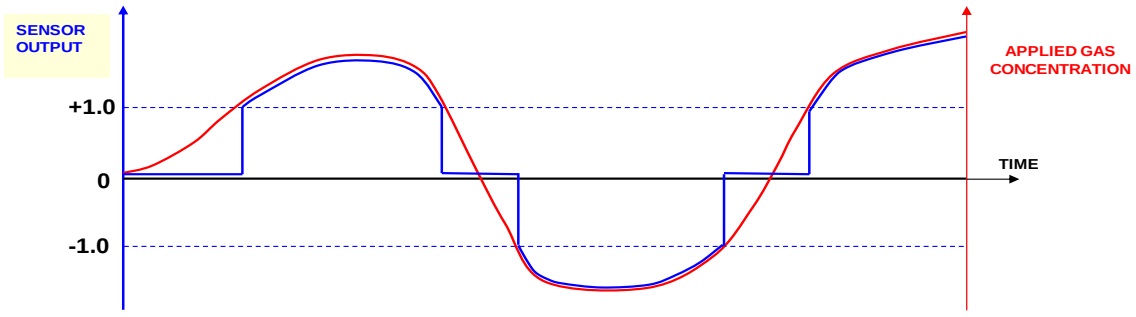
Note: the maximum T90 times are derived from the performance standard EN60079

Zero Suppression

The sensor can be configured to ‘hide’ positive and negative reading about the zero level. If the values are set to zero then the output always reflect the calculated readings.

Positive and negative values are expressed as a percentage of the FSD setting. The limits are 0 to 5%, thus for a 0 to 5% v/v methane sensor this equates to 0 to 0.25% v/v gas reading.

The example below shows that the sensor output will always be zero for values between -0.05 to +0.05% for a 5% v/v sensor. When the gas level exceeds the threshold, in either direction, the true output is given, see diagram below.

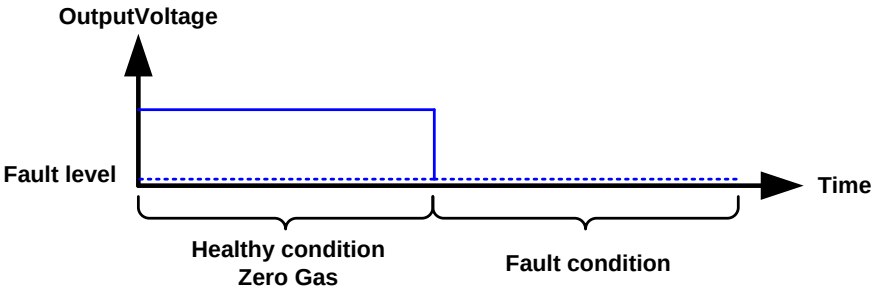


Graph showing the effects of zero suppression.

Fault indication

The analogue output is driven to the fault level when an internal fault is detected. This is shown in the following diagrams.

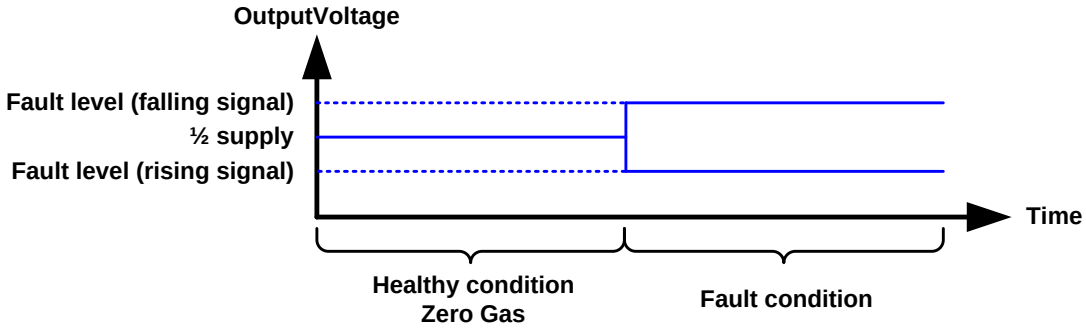
Voltage output



Bridge output

The bridge output is driven to a level depending upon the sensor configuration. The direction is positive for negative supply sensors and negative for positive supply sensors.

The following diagram shows the output for a sensor that is configured for an FSD of 100 mV.



Serial Data

The gas readings in the live data are set to -250% FSD of the range during fault conditions.
The status flags are set according to the actual fault.

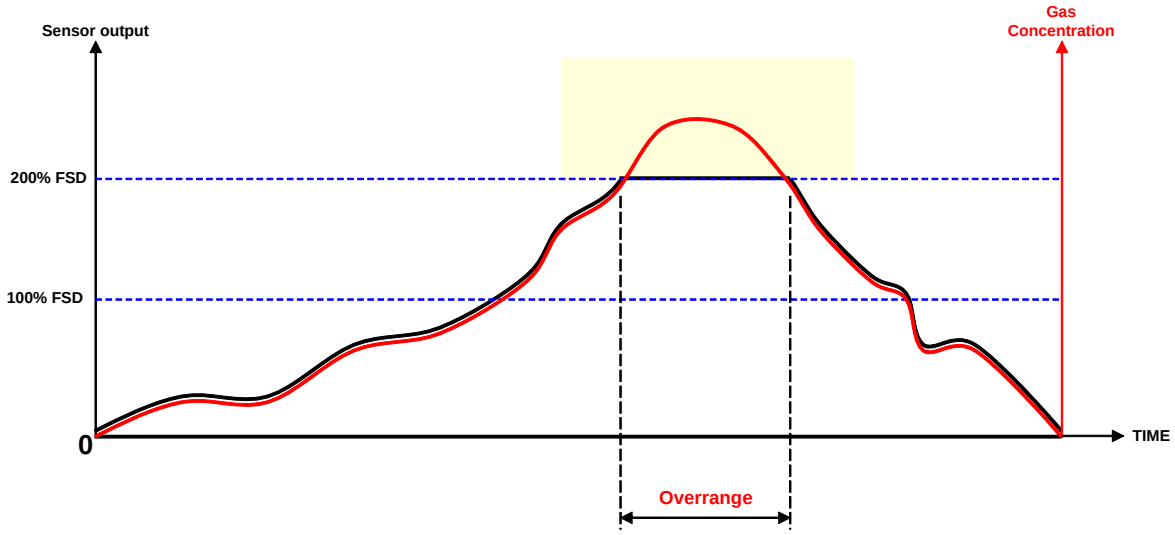
Refer to the latest TDS0045 document available by contacting Dynament.

Over-range conditions

The sensor can be configured to clamp its output reading at 100%, 125%, 150% and 200% of the selected range.

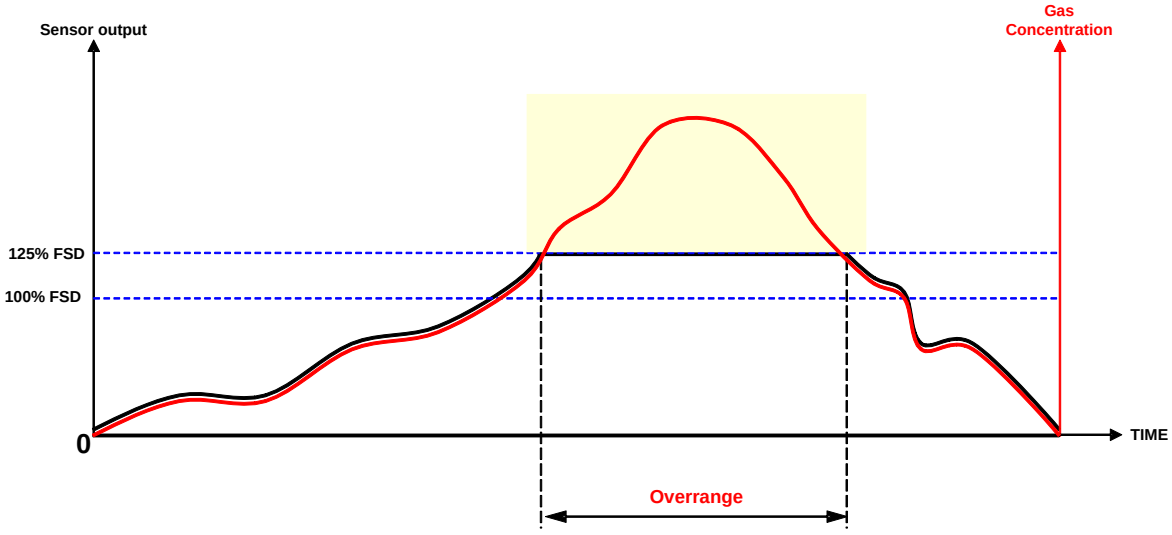
Selecting a clamp value above the sensor range can be used to get an indication of approximately how high the gas level is.

The following diagram shows the clamping action at 200%, readings above 200% are held at 200%:



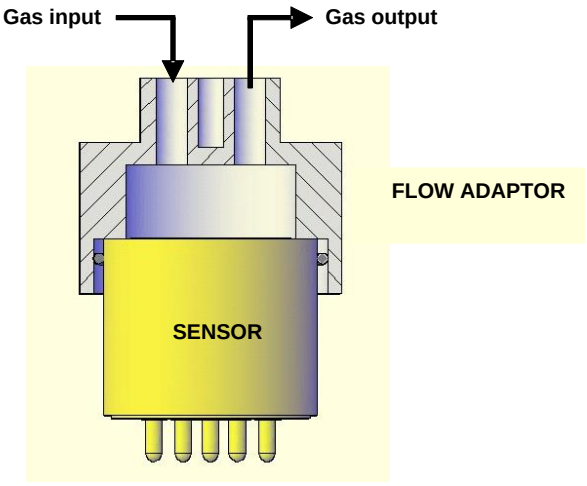
Note: the accuracy of the output is only guaranteed up to 100% of the range.

The following diagram shows the same signals clamped at 125%, readings above 125% are held at 125%:



Flow considerations

The sensor operates in diffusion mode and as such care must be taken not to pressurize the sensor during gas sampling. The flow rate should be between 300 and 600 cc/min.



Note: Avoid rapid changes in flow rate. Excessive flow rates will temporarily ‘freeze’ the gas reading updates.

Applying pressure to the sensor will result in inaccurate readings.

Make sure the output side of the sampling adaptor is not restricted and vents freely to atmosphere.

The maximum interval of 12 months between calibration checks is required to maintain certification to SIL1, see the Safety Integrity Level section

A small amount of zero drift can be accomodated by re-zeroing the gas detector against the sensor. The degree of drift that is acceptable should be determined by the user. Note that the subsequent change in gas reading will be greater than the change in zero reading.

The Single HC Gas sensor has three ranges in all, typically:

Range 1	0-5% volume methane
Range 2	0-100% volume methane
Range 3	0-2% volume propane

The Single CO2 Gas sensor has two ranges in all, typically:

Range 1	0-5% volume carbon dioxide
Range 3	0-5000ppm carbon dioxide

The Dual Gas sensor has four ranges in all, typically:

Range 1	0-5% volume methane.
Range 2	0-100% volume methane.
Range 3	0-2% volume propane.
Range 4	0-5% volume carbon dioxide

Calibration options

Dynament recommends a maximum interval of 12 months between calibration checks. A small amount of zero drift can be accomodated by re-zeroing the gas detector against the sensor. The degree of drift that is acceptable should be determined by the user. Note that the subsequent change in gas reading will be greater than the change in zero reading. If the sensor requires either a "***Zero***" or "***Span***" adjustment, there are three methods that can be used:

1. By using the "Premier Configuration Unit"
   When used in conjunction with dedicated PC software, this device uses the data communication pins on the sensor to provide a means of calibration.
   Refer to data sheet TDS0130 "Platinum_IR_Sensor_Configuration" and TDS0129 "Platinum Sensor User Manual" for additional information.

2. By using the data communications pins and software written in accordance with the communications protocol supplied by Dynament. "TDS0045".

3. By using the "Manual Calibration" feature available with firmware version **Regular** and **Low Power** sensors. This feature is not available for **Low Power 2** sensors.
   "***Zero***" and "***Span***" operations can be performed by momentarily connecting the data communication pins to the negative supply pin. Refer to data sheet TDS0064 for full instructions. The "Manual Calibration" option must be specified when the sensors are ordered.

In all cases ensure that the sensor has been powered long enough for the temperature to have stabilised before starting the calibration. This time will vary in accordance with the way in which the sensor is mounted.

Zero

Always perform a ***Zero*** operation before a ***Span*** operation, in most cases once the zero has been restored the span value will also be restored. Ensure the sensor is in a zero-gas environment before using the ***Zero*** command .

- Carbon dioxide sensors cannot be zeroed in air due to the background levels of CO_2 present. These sensors must be zeroed whilst being exposed to 100% nitrogen.
- Ambient air can be used to ***Zero*** hydrocarbon sensors provided that it is known that there is no target gas present.
- Use a flow rate of between 200 cc/min and 600 cc/min. Allow sufficient time for the sensor to be purged. Some sensor types can take longer than others to reach a stable zero condition with no target gas left within the sensor. For example, it can take at least 10 minutes to remove all the CO_2 from a ppm range CO_2 sensor.
- The ***Zero*** command can be used repeatedly until there is no further change in the observed zero value.

Span

The default gas concentration for a **Span** operation is listed below.

Gas range	Ideal Calibration Gas Level
0-5% vol. CO_2	5% vol. CO_2
0-5000ppm CO_2	5000ppm CO_2
0-100% vol. CO_2	50% vol. CO_2
0-5% vol. CH_4	2.5% vol. CH_4
0-100% vol. CH_4	100% vol. CH_4
0-2% vol. C_3H_8	1.1% vol. C_3H_8
0-100% vol. C_3H_8	100% vol. C_3H_8

This will provide the optimum linearity over the full operating range. If the best accuracy is required at a specific gas level, for example 25% of full scale value, then a Span operation can be performed using this value instead of the half scale value.
Note than when using the "Manual Calibration" feature, the span gas concentration must match the value specified within the sensors calibration gas field. This can be found on the calibration certificate for each sensor.

- Use a flow rate of between 200 cc/min and 600 cc/min. Allow sufficient time for the gas to completely enter the sensor before finalising the Span operation.

The Span command can be used repeatedly until there is no further change in the observed gas value.

Note 1: a zero calibration must always be carried out before a span calibration.
Note 2: the linearity will be impaired if the sensor's zero offset is repeatedly nulled-out at the instrument, as opposed to performing a true sensor-zero.

Vibration

The Platinum sensor has been tested for vibration effects giving satisfactory results. The certificate number is ET2597, issued by Ferranti Technologies.

FERRANTI TECHNOLOGIES

UKAS TESTING
0499

CERTIFICATE OF TEST

CERTIFICATE NUMBER ET2574

Approved by: P.M. Taylor (Technical Manager (UKAS))

Date of issue: 02 April 2012 Issue N° 1 Page 1 of 4

UKAS Testing Accreditation Number 0499

Issued by: Environmental Test Laboratory, Ferranti Technologies Ltd, Waterhead, Oldham, OL4 3JA
Telephone 0161 624 0281, Fax 0161 624 5244

Tests marked 'Not UKAS Accredited' in this Certificate are not included in the UKAS accreditation schedule for our laboratory. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Customer Name:	Dynament Ltd
Customer Address:	Premier House The Village South Normanton Derbyshire DE55 2DS
Order Number:	40802
Test Item Received:	13th March 2012
Test Date:	13th and 20th March 2012

Test Item Description:

Gas Detection Sensor, 24 off, part number CO2/NC/B/N, serial numbers:

B1301N19, B1301N54 – B1301N65, B1301N67, B1301N68, B1301N70 – B1301N78

Test Performed:

A total of 24 Gas Detection Sensors, mounted onto a test bed provided by the customer and clamped onto FTLs' vibration system were initially subjected to swept sinusoidal vibration in accordance with BS60079-29-1:2007 Paragraph 5.4.13 (Procedure 1) and generally in accordance with BSEN60068-2-6:2008. Test conditions were then varied at the customers request as detailed below.
The test items were monitored during vibration by the customer representative. All tests were performed at ambient temperature.

4100-0038-06

Registered Office: Cairo House, Waterhead, Oldham OL4 3JA, England.
Registered in England Number 2968071

EMC

The Platinum sensor has been tested for EMC effects giving satisfactory results. The certificate numbers are 11377TR1.pdf and 11378TR1.pdf, issued by York EMC Services Ltd.

Note: The user must provide a suitable enclosure and carry out an EMC test on the complete instrument to comply with the EMC directive.

York EMC Services

Test Report (pdf copy)

EMC Testing of

Platinum Infrared Gas Sensor with screen not connected to 0V

For Dynament Ltd

Document number 11378/TR/1

Project number C1453

Author: .....
Mr D Horry
EMC Technician

Checked: .....
M Render
Senior Engineer

Approved: .....
M Render
Senior Engineer

Issue	Description	Issue by	Date
1	Issue one	DH	8th April 2014

UKAS TESTING 1574
001
Instrumentation, Consultancy and Research, Training
A BIS designated Notified Body No 1892
Consultancy
INVESTORS IN PEOPLE
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T: +44 (0)1904 324440
F: +44 (0)1904 324434
E: enquiry@yorkemc.co.uk
www.yorkemc.co.uk
Registered in England and Wales
Company Reg No. 6848569
VAT Reg No. GB 947 2055 41

Test Report (pdf copy)

EMC Testing of

Platinum Infrared Gas Sensor with screen connected to 0V

For Dynament Ltd

Document number 11377/TR/1

Project number C1453

Author: .....
Mr D Horry
EMC Technician

Checked: .....
M Render
Senior Engineer

Approved: .....
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E: enquiry@yorkemc.co.uk
www.yorkemc.co.uk
Registered in England and Wales
Company Reg No. 6349389
VAT Reg No. GB 947 2053 41

Pressure dependency

The Premier range of infrared gas sensors exhibit a dependency on the pressure conditions under which they operate. The principle of operation is based upon the absorption of infrared energy by molecules of the target gas within the sensor. As the gas pressure in increased, the number of molecules within the sensor is increased. This leads to increased absorption, and so the calculated gas reading is increased. The opposite effect is true when the gas pressure is reduced.

Premier sensors are pre-calibrated at normal atmospheric pressure, and the accuracy of the reading will be adequate in most instances without the need for pressure compensation.

In cases where the sensors are operated at pressures significantly different from their original calibration pressure, for example high altitudes, the sensors should be recalibrated to restore accuracy. Alternatively, a compensation factor can be applied to the reading based on the pressure within the sensor.

For example when the sensor is used in process-monitoring applications at either elevated or reduced pressures, a pressure transducer can be incorporated into the gas flow and its output value can be used to determine the degree compensation to be applied.

Please refer to document TDS0102.pdf for further information

Dust

The sensor optics will become obscured if dust enters the sensor resulting in incorrect readings being given.

The sensor can be supplied with a PTFE filter to reduce the effects of dust entering the sensor.

It is recommended that if the sensor is used in dusty atmospheres with a PTFE filter that the sensor is checked at regular intervals to verify that it still responds to gas. The frequency will depend upon the actual conditions and must be assessed by the user.

Water

The sensor optics will become obscured if water enters the sensor resulting in incorrect readings being given.

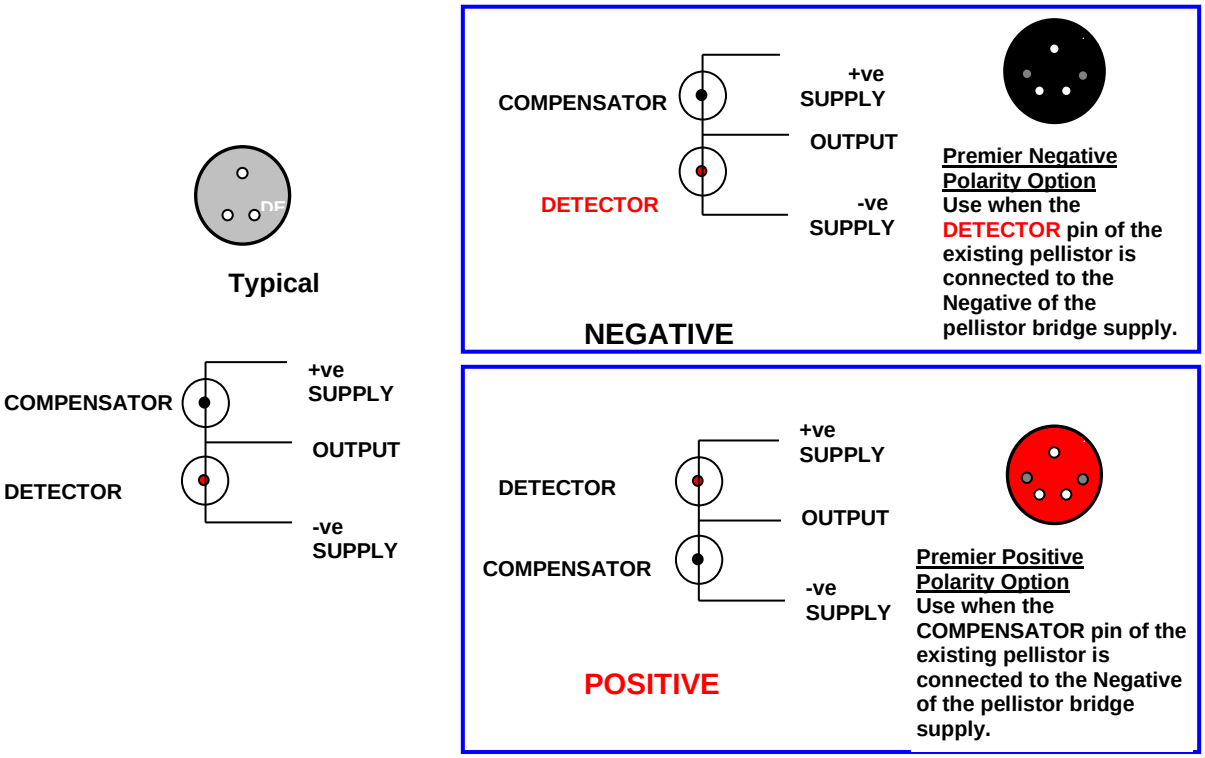
The sensor can be supplied with a PTFE filter to reduce the effects of water entering the sensor.

It is recommended that if the sensor is used in wet atmospheres with a PTFE filter that the sensor is checked at regular intervals to verify that it still responds to gas. The frequency will depend upon the actual conditions and must be assessed by the user.

The platinum sensor has been designed to replace catalytic sensors. The catalytic sensors are used in a Wheatstone bridge type circuit where the detector and reference beads can be in one of two positions.

The diagram below illustrates which Infrared sensor type should be used.

SELECTING POSITIVE OR NEGATIVE



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

Safety Integrity Level

The platinum sensor has been designed to achieve SIL1

Certificate No. Sira 04ATEX1357U (Exd sensor)
Certificate No. Sira FSP 14002/00 (Non-Exd sensor)

Safety Function:

To measure the concentration of gas by means of analogue and /or digital outputs so that:

Analogue output (SF): Output voltage < 0.2V or >2.5V reserved for revealed failures
Digital output (SF): < -200% and/or > 200% of gas concentration reserved for revealed failures
Output voltage ≥0.4V and ≤2.4V are for normal operating conditions
Digital output (SF): >-200% and < 200% of gas concentration for normal operating conditions
Notes:

For bridge type sensors configuration powered by 5V to 3V, the output Voltage Vo is configurable as defined in this equation:

Output Voltage (Vo) = (Zero * Supply Voltage) + (Sensitivity * (Gas Level / FSD))

Where, zero is = 0.5 (0.4 to 0.6), Supply Voltage (5V to 3V), Sensitivity (±0.1V to ±0.2V), Gas Level (any value between -200% to +200%), FSD (5% v/v)

(Sensitivity : 100mV)

a) 5V supply: Output voltage < 2.3V or >2.7 reserved for revealed failures and Output voltage ≥2.3V and ≤2.3 are for normal operating conditions

b) 3V supply: Output voltage < 1.3V or >1.7 reserved for revealed failures Output voltage ≥1.3V and ≤2.7 are for normal operating conditions

(Sensitivity : 200mV)

a) 5V supply: Output voltage < 2.1V or >2.9 reserved for revealed failures and Output voltage ≥2.1V and ≤2.9 are for normal operating conditions

b) 3V supply: Output voltage < 1.1V or >1.9 reserved for revealed failures Output voltage ≥1.1V and ≤1.9 are for normal operating conditions

Digital outputs (SF) conditions unchanged, their outputs as described above.

Summary of Clauses 2/7.4.2 and 2/7.4.4		**Single Channel**	**Dual Channel**	**Verdict**
Architectural constraints		**HFT=0**	**HFT=0**	**Type B**
Safe Failure Fraction (SFF)		**66%**	**67%**	**SIL 1**
Random hardware failures:[h-1] (dangerous)	λ_{DD} λ_{DU}	1.70E-07 9.20E-08	1.56E-07 8.81E-08	
Random hardware failures:[h-1] (safe)	λ_{SD} λ_{SU}	3.61E-09 7.59E-09	2.05E-09 2.19E-08	
Diagnostic Coverage (DC)		64%	64%	
Probability of failure on demand @ proof test interval = 8760 Hrs Mean time to restoration = 8 Hrs		4.05E-04	3.88E-04	SIL 3
Frequency of a Dangerous failure (High Demand – PFH) [h-1]		9.20E-08	8.81E-08	
Hardware safety integrity compliance		Route 1_H		
Systematic safety integrity compliance (HW)		Route 1_S		
Systematic safety integrity compliance (SW)		EN50271		
Systematic Capability (SC1, SC2, SC3, SC4)		SC1		
Overall SIL-capability achieved		SIL 1 due to Architectural constraints (SFF).		

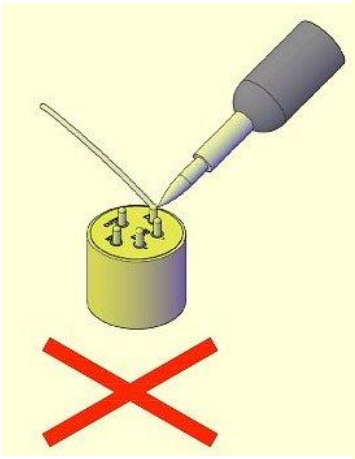
A yearly proof test must be carried out by the end user to validate the safety function.
If the sensor is out of specification then contact Dynament

Maintenance

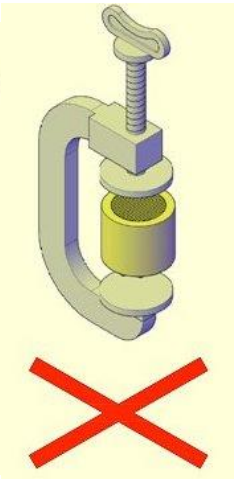
Dynament infrared sensors, like any other sensors, require regular maintenance in terms of inspection to prevent a build up of dust or dirt or any other contamination that might prevent gas from entering the sensor.

Maintenance should include cleaning of the housing within which the sensor is mounted, a good design will afford some level of protection for the bare sensor.

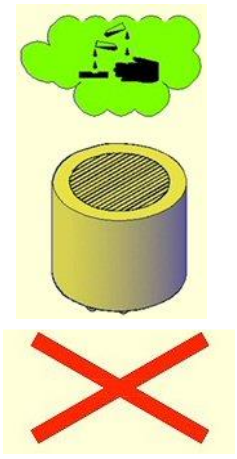
Handling precautions



DO NOT SOLDER



DO NOT APPLY ANY MECHANICAL PRESSURE



DO NOT EXPOSE TO CORROSIVE GASES

OBSERVE ANTISTATIC HANDLING PRECAUTIONS

Warranty

Infrared sensor warranty and lifetime are given in the sensor data sheet, a typical statement is as follows:

All Dynament Platinum sensors carry a ***five*** year warranty against defects in materials and workmanship. The warranty is invalidated if the sensors are used under conditions other than those specified in the relevant data sheet.

Particular attention should be paid to the following criteria:

- **Observe the correct supply polarity**
- **Do not exceed the maximum rated supply voltage of 5V**
- **Do not solder directly to the sensor pins**
- **Do not expose the sensor to corrosive gases such as hydrogen sulphide**
- **Do not allow condensation to take place within the sensor**

The following special conditions for safe use apply to all Ex'd certified reglar and high power sensors.

SPECIAL CONDITIONS FOR SAFE USE FOR ALL DYNAMENT CERTIFIED SENSORS TYPES MSH-XXX, MSHia-PXXX AND MSH-PXXX

It is a requirement of the IECEx & ATEX EC Type Examination Certification for all certified versions of the standard range of sensors types MSH-XXX and Premier sensors types MSH-PXXX that the following "Special Conditions for Safe Use" be made known to the end user of the product.

CERTIFICATE No.'s SIRA 04ATEX1357U, IECEx SIR 05.0053U, CSAE 22UKEX1379U

SPECIAL CONDITIONS FOR SAFE USE

1) The sensors have been assessed as suitable for use within an ambient temperature range of -20°C to +60°C, whilst producing a maximum external surface rise of 45 K in normal operation.

2) The devices shall be effectively protected from impact.

3) These devices are intended for use at atmospheric pressure and shall not be used in pressures exceeding 1.1 bar.

4) The connection pins shall be protected from dust and moisture by an enclosure with an Ingress Protection rating of at least IP 54 in accordance to EN/IEC 60079-0.

5) The devices shall not be installed or removed when an explosive gas atmosphere is present.

6) The sensor may be supplied with a metallic closing disc around the connection pins. This may need to be considered with respect to creepage and clearance distance when the device is incorporated into equipment.

7) The Type MSHia *** and Type MSHia-P *** shall be supplied by an intrinsically safe supply coded Ex ia with a maximum output voltage of 6.0 Vd.c. and a maximum output power of 0.8 W.

The following conditions apply when the Types MSH-P* and MSHia-P *** Gas Sensors are used as a SIL 1 safety related device as defined in EN 50271:2018**

1) The user shall comply with the requirements given in the manufacturer's user documentation regarding all relevant functional safety aspects such as application of use, installation out of hazardous areas, operation, maintenance, proof tests, maximum ratings, environmental conditions, and repair.

2) Selection of this equipment for use in safety functions, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing all the manufacturer's conditions and recommendations in the user documentation.

3) The safety related device must be functioning and powered independently of any control devices required for operation.

4) The recommended proof test interval for the safety functions is 1 year.

5) All information associated with any field failures of this product should be collected under a dependability management process (e.g., IEC 60300-3-2) and reported to the manufacturer.

6) The IR Platinum Series are only approved for software version (V7.17.00u B18).

7) The certified products series shall only be configured using Dynament "Status Scientifics' PC application v3.4.0 or later".

8) The serial communication bus shall only be used with the protocol developed by Dynament Ltd to exercise the safety function.

SPECIAL CONDITIONS FOR SAFE USE FOR DYNAMENT

CERTIFIED SENSORS TYPES MSH2 *** AND MSH2ia ***

The following instructions apply to Gas Sensors covered by certificate numbers **FTZU 14 ATEX 0213 U and IECEx FTZU 15.0002U**

The "***" contained within the type number MSH2 *** or MSH2ia *** is used to define the specific sensor variant.

THE FOLLOWING SPECIAL CONDITIONS FOR SAFE USE APPLY:

1) The sensors have been assessed as suitable for use within an ambient temperature range of -20ºC to +60 ºC, whilst producing a maximum external surface rise of 45K in normal operation.

2) The devices shall be effectively protected from impact.

3) These devices are intended for use at atmospheric pressure and should not be used in pressures exceeding 1.1 bar.

4) Unless subsequently protected by concepts that render the following conditions unnecessary:

a) The connection pins shall be protected from dust and moisture by an enclosure with an Ingress Protection rating of at least IP54.

b) The devices should not be installed/removed when an explosive gas atmosphere is present.

5) The sensor may be supplied with a metallic closing disc around the connection pins. This shall be considered with respect to creepage and clearance distance when the device is incorporated into equipment.

6) Type MSH2ia *** sensors shall be supplied by an intrinsically safe supply Ex ia with a maximum output voltage of 6.0 V and a maximum output power of 0.8W.

ADDITIONAL INFORMATION

1 Assembling and dismantling: - The sensor is supplied fully assembled. No dismantling is required, or possible. The sensor must not be unplugged when in use in a potentially explosive atmosphere.

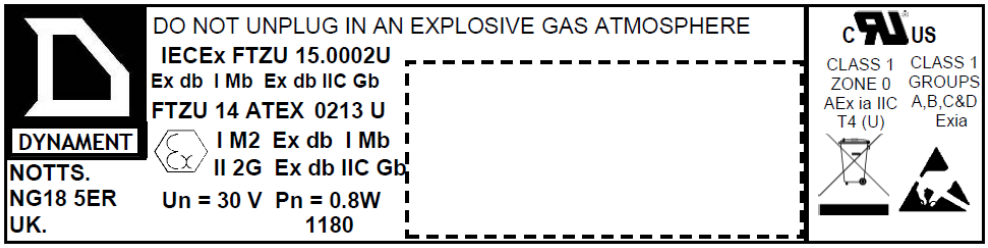
2 Maintenance: - The user should ensure that the sensor opening is kept free from blockages such as a build up of dust or dirt that would otherwise restrict gas flow.

3 Servicing: - The sensor does not require servicing, only maintenance as described above..

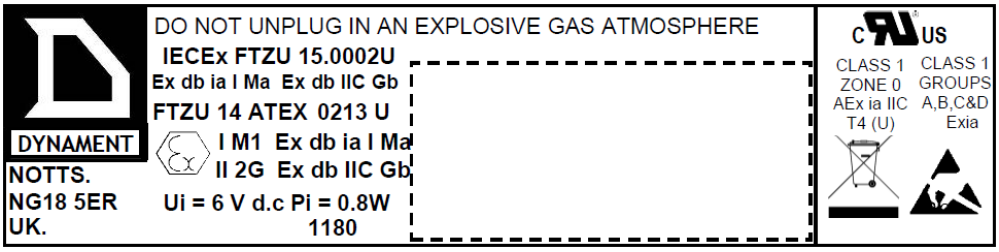
4 Emergency repairs: - The sensor is not an item to which emergency repairs can be made.

5 Adjustment: - Gas calibrations and changes to the configuration are possible on certain variants, refer to the relevant data sheets published at www.dynament.com

6 The MSH2 *** Gas Sensors carries the following certification marking:



The MSH2ia *** Gas Sensors carries the following certification marking:



Decommissioning

Sensors can be returned to Dynament for safe disposal.

Dynament
Hermitage Lane Industrial Estate,
Kings Mill Way
Mansfield
Nottinghamshire
NG18 5ER
UK.
www.dynament.com

Failures

The customer should provide the following information as a minimum for the return of faulty sensors.

Firmware

Customer order number
Firmware version.
Nature of fault.
Example of use when the fault occurs.

Hardware

Customer order number
Nature of fault.
Supply voltage.
Sensor housing details.
Conditions that cause the fault to be revealed.