Technical data sheet TDS0020

HIGH RANGE CARBON DIOXIDE INFRARED SENSOR TEMPERATURE COMPENSATED CERTIFIED VERSION TYPE MSH-HCO2

PATENT NUMBER: GB 2372099B; US 6,753,967 B2

FEATURES

- High % volume CO_2
- Standard sensor size
- Fast Response
- Internal temperature signal
- Gas diffusion sampling
- Temperature compensated detector elements
- Wide operating temperature range
- Low power

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

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 and an integral thermistor to monitor the internal temperature. The infrared source should be driven externally with a constant voltage supply switched at a fixed frequency with a 50% duty cycle. The dual pyroelectric detector produces two output signals in response to pulsed incident radiation from the source:

- An active signal which decreases in the presence of target gas
- A reference signal which is used to monitor the intensity of the source

Both signals are composed of a DC offset voltage (typically 0.7V – 1.0V) with a small superimposed response signal alternating in sympathy with the source drive voltage. The alternating signal must be extracted and amplified in order to obtain a measure of the peak to peak value for both the active and reference. The ratio of active to reference peak to peak signals is essentially independent of variations in source intensity over time and this ratio reduces in the presence of target gas. It is the reduction in this ratio that is used to determine the target gas concentration. The reduction in ratio is non-linear and the gas concentration can be extracted using the expression:

$$[\text{concentration}] = (-(\ln (1 - (1 - \text{Ratio}/\boldsymbol{zero})/\boldsymbol{span})) / \boldsymbol{a})^{\wedge} (1/\boldsymbol{b})$$

Where ***zero*** is the ratio in the absence of target gas, ***span*** is determined during calibration & the constants ***a*** and ***b*** are:

a = 0.14578, ***b*** = 0.66972 and typical ***span*** = 0.22 for a range of 0-100% volume carbon dioxide.

The internal temperature signal is used to measure the temperature inside the sensor. This temperature measurement is used to correct for the ideal gas law and also to correct for any optical filter effects on zero and span as a function of temperature. The internal temperature is typically 10°C higher than ambient at 20°C due to the heat generated from the infrared source. This internal heating beneficially reduces the probability of water condensing within the optical cavity.

Further details on the sensor, interfacing circuitry, signal extraction and relative responses to other hydrocarbons can be found in the Dynament application notes on the Dynament web site or by contacting Dynament directly.

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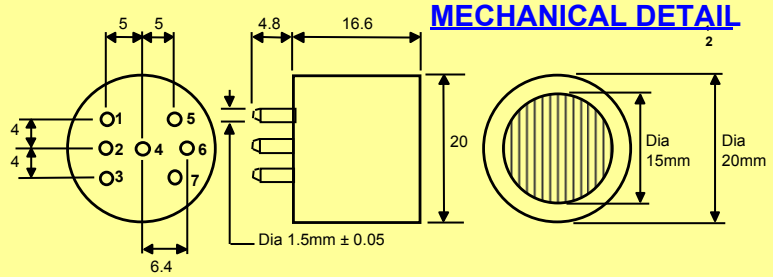
SPECIFICATION

Maximum lamp Power Requirements:	5V d.c. 60mA max. (50% duty cycle source drive)
Minimum operating voltage:	3.0V d.c. (50% duty cycle source drive)
Source drive frequency :	2.0Hz minimum, 3.0 Hz typical, 4.0 Hz maximum
Active mV pk-pk output in N_2:	9.0mV typical @ 3Hz, 50% duty cycle
Reference mV pk-pk output in N_2:	6.0mV typical @ 3Hz, 50% duty cycle
Sensitivity (reduction in active signal) at 20°C, 3Hz, 50% duty cycle:	19% typical @ 50% volume carbon dioxide
Carbon dioxide measuring range:	0 - 5% volume up to 0 - 100% volume maximum
Resolution:	1% of measuring range
Warm up time:	To final zero ± 2% full scale : <20s @20°C (68°F) ambient To specification: < 30 minutes @20°C (68°F) ambient
Response Time T_{90}:	<30s @20°C (68°F) ambient
Zero Repeatability:	± 1% full scale @20°C (68°F) ambient
Span Repeatability:	± 2% full scale @20°C (68°F) ambient
Long term zero drift:	± 1% full scale per month @20°C (68°F) ambient
Operating temperature 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.
MTBF:	> 5 years
Temperature signal:	Integral thermistor for temperature monitoring
Weight:	17 grams

Refer to Technical Data Sheet TDS0022 – General Description for further information

MECHANICAL DETAIL



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

PIN OUT

1 LAMP RETURN
2 LAMP +5V
3 +5V PYRO SUPPLY
4 DETECTOR OUTPUT
5 REFERENCE OUTPUT
6 THERMISTOR OUTPUT
7 0V PYRO SUPPLY AND CASE CONNECTION

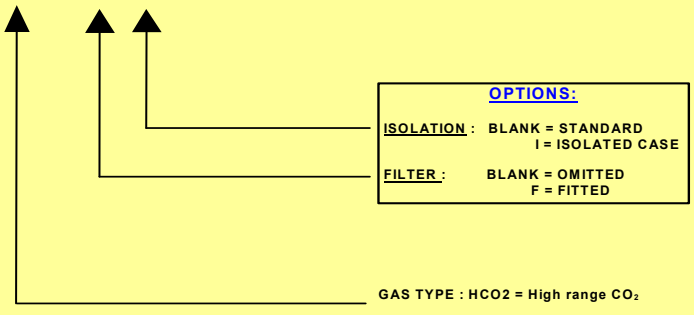
Available sensor options:

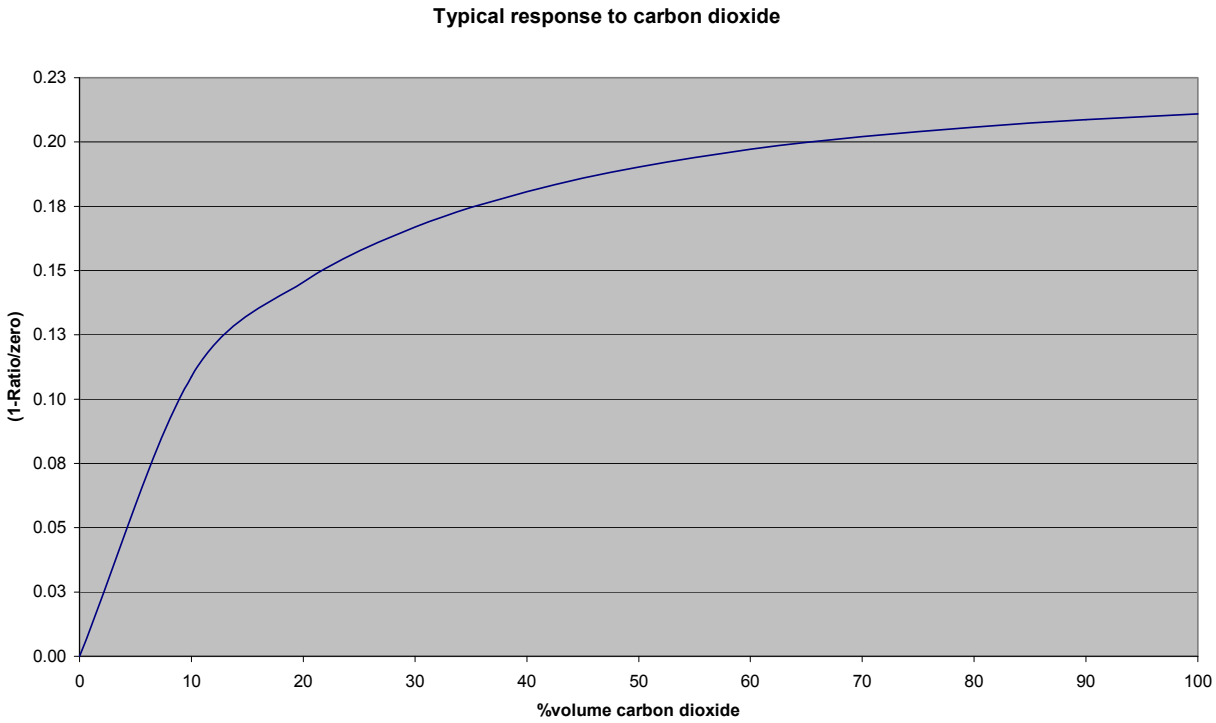
F = Replaceable, self adhesive, microporous PTFE filter

I = Case isolated from 0V pin

EXAMPLE OF ORDER CODES

MSH – HCO2 / F / I





Warranty information

All Dynament Standard sensors carry a two year warranty against defects in materials and workmanship. The warranty is invalidated if the sensors are used under conditions other than those specified in this data sheet.
Particular attention should be paid to the following criteria:

- **Observe the correct supply polarity**
- **Do not exceed the maximum rated lamp supply voltage of 5V**
- **Do not solder directly to the sensor pins**
- **Do not expose the sensor to corrosive gases**
- **Do not allow liquids to enter the sensor**