# DrägerSensor® Dual IR Ex/$CO_2$ HC

**Order no. 68 00 276**

| Used in | Plug & Play | Replaceable | Guaranty | Expected sensor life |
|---|---|---|---|---|
| Dräger X-am 8000 | no | yes | 5 years | > 5 years |

## MARKET SEGMENTS

Mining, landfills, biogas plants

## TECHNICAL SPECIFICATIONS

| | |
|---|---|
| **Detection limit:** | 1 % LEL for IR Ex (when calibrated with $CH_4$)<br>0.2 Vol.-% $CO_2$ for IR $CO_2$ |
| **Resolution:** | 1 % UEG for Ex<br>0.1 Vol.-% $CO_2$ |
| **Measurement range:** | 0 to 100 % UEG/ 0 to 100 Vol.-%<br>(depending on the respective target gas)<br>0 to 100 Vol.-% $CO_2$ |
| **Ambient conditions** | |
| Temperature: | (-20 to 50 °C (-4 to 122 °F) |
| Humidity: | 0 to 90 % RH |
| Pressure: | (800 to 1100) hPa (in potentially explosive atmospheres)<br>(700 to 1300) hPa |
| **Warm-up time:** | ≤ 3 minutes |

## TYPICAL MEASURING PROPERTIES FOR THE MEASUREMENT RANGE 0 TO 100 % LEL OR 0 TO 4.4 VOL.% $CH_4$ WHEN CALIBRATED WITH 2.5 VOL.% METHANE IN AIR:

| | | |
|---|---|---|
| **Response time:** | Diffusion mode ($t_{50}$) | ≤ 10 seconds |
| | Diffusion mode ($t_{90}$) | ≤ 21 seconds |
| | Pump mode ($t_{50}$) | ≤ 9 seconds |
| | Pump mode ($t_{90}$) | ≤ 11 seconds |
| **Precision** | | |
| Zero point: | ≤ ± 1.0 % LEL | |
| Sensitivity: | ≤ ± 2 % LEL at 50 % LEL | |
| **Linearity error:** | ≤ ± 4 % of mesaured value or<br>≤ ± 1.5 % of the end of measurement range<br>(the larger value applies in each case) | |
| **Influence of temperature (-20 to 50 °C)** | | |
| Zero point: | ≤ ± 0.02 % LEL/K | |
| Sensitivity: | ≤ ± 0.1 % LEL/K at 50 % LEL | |
| **Influence of humidity, at 40 °C (104 °F) (0 to 95 % RH, non-condensing)** | | |
| Zero point: | ≤ ± 0.01 % LEL/% RH | |
| **Influence of pressure of the respective measured value/hPa** | | |
| Zero point: | ≤ ± 0.06 % (compensated) | |
| **Long-term drift** | | |
| Zero point: | ≤ ± 1 % LEL/month | |
| Sensitivity: | ≤ ± 3 % LEL/month at 50 % LEL | |

## TYPICAL MEASURING PROPERTIES FOR THE MEASUREMENT RANGE 0 TO 100 % LEL OR 0 TO 1.7 VOL.% $C_3H_8$ WHEN CALIBRATED WITH 0.9 VOL.% PROPANE IN AIR:

| | | |
|---|---|---|
| **Response time:** | Diffusion mode ($t_{50}$) | ≤ 14 seconds |
| | Diffusion mode ($t_{90}$) | ≤ 57 seconds |
| | Pump mode ($t_{50}$) | ≤ 10 seconds |
| | Pump mode ($t_{90}$) | ≤ 15 seconds |
| **Precision** | | |
| Zero point: | ≤ ± 1.0 % LEL | |
| Sensitivity: | ≤ ± 2 % LEL at 50 % LEL | |
| **Linearity error:** | ≤ ± 3.0 % of mesaured value or<br>≤ ± 1.0 % of the end of measurement range<br>(the larger value applies in each case) | |
| **Influence of temperature (-20 to 50 °C)** | | |
| Zero point: | ≤ ± 0.06 % LEL/K | |
| Sensitivity: | ≤ ± 0.13 % LEL/K at 50 % LEL | |
| **Influence of humidity, at 40 °C (104 °F) (0 to 95 % RH, non-condensing)** | | |
| Zero point: | ≤ ± 0.01 % LEL/% RH | |
| **Influence of pressure of the respective measured value/hPa** | | |
| Zero point: | ≤ ± 0.06 % (compensated) | |
| **Long-term drift** | | |
| Zero point: | ≤ ± 3 % LEL/month | |
| Sensitivity: | ≤ ± 4 % LEL/month at 50 % LEL | |

## TYPICAL MEASURING PROPERTIES FOR THE MEASUREMENT RANGE 0 TO 100 VOL.-% $CO_2$ WHEN CALIBRATED WITH MIT 50 VOL.-% CARBON DIOXIDE IN NITROGEN:

| | | |
|---|---|---|
| **Response time:** | Diffusion mode ($t_{50}$) | ≤ 15 seconds |
| | Diffusion mode ($t_{90}$) | ≤ 55 seconds |
| | Pump mode ($t_{50}$) | ≤ 13 seconds |
| | Pump mode ($t_{90}$) | ≤ 20 seconds |
| **Precision** | | |
| Zero point: | ≤ ± 0.05 Vol.-% | |
| Sensitivity: | ≤ ± 0.5 Vol.-% at 50 Vol.-% | |
| **Linearity error:** | ≤ ± 1.0 Vol.-% or ≤ ± 5 % of the end of measurement range<br>(the larger value applies in each case) | |
| **Influence of temperature (-20 to 50 °C)** | | |
| Zero point: | ≤ ± 0.008 Vol.-%/K | |
| Sensitivity: | ≤ ± 0.4 % Vol.-%/K at 50 Vol.-% | |
| **Influence of humidity, at 40 °C (104 °F) (0 to 95 % RH, non-condensing)** | | |
| Zero point: | ≤ ± 0.001 Vol.-%/ % RH | |
| **Influence of pressure of the respective measured value/hPa** | | |
| Zero point: | ≤ ± 0.09 % (compensated) | |
| **Long-term drift** | | |
| Zero point: | ≤ ± 0.05 Vol.-%/month | |
| Sensitivity: | ≤ ± 2 Vol.-%/month at 50 Vol.-% | |

| | |
|---|---|
| **Test gases** | 2.5 Vol.-% $CH_4$ for measurement range up to 100 %LEL<br>50 Vol.-% $CH_4$ for measurement range up to Vol.-% $CH_4$<br>0.9 Vol.-% $C_3H_8$ for measurement range up to 100 %LEL<br>50 Vol.-% $CO_2$ for measurement range up to 100 Vol.-% $CO_2$<br>Biogas 60 Vol.-% $CH_4$/40 Vol.-% $CO_2$ |

## SPECIAL CHARACTERISTICS

This sensor allows a measurement of hydrocarbons (gases and vapors) and carbon dioxide simultaneously with just one sensor. As with all other IR sensors, it requires little maintenance, has a high level of long-term stability, and is highly resistant to poisoning. $CO_2$ concentrations of up to 100% by volume can be reliably detected with this sensor. As with all other IR sensors, it requires little maintenance, has a high level of long-term stability, and is highly resistant to poisoning.

| Gas | Data set name | Measurement range ** |
|---|---|---|
| n-Butane | buta | 0 to 100 % LEL [1)] |
| n-BUTANE | BUTA | 0 to 100 Vol.-% |
| Ethene | c2h4 | 0 to 100 % LEL [1)] |
| ETHENE | C2H4 | 0 to 100 Vol.-% |
| Ethanol | EtOH | 0 to 100 % LEL [1)] |
| Ex | Ex | 0 to 100 % LEL |
| JetFuel | JetF | 0 to 100 % LEL [1)] |
| Liquid Petroleum Gas *** | LPG | 0 to 100 Vol.-% |
| Methane | ch4 | 0 to 100 % LEL [1)] |
| METHANE | CH4 | 0 to 100 Vol.-% |
| n-Nonane | Nona | 0 to 100 % LEL [1)] |
| n-Pentane | Pent | 0 to 100 % LEL [1)] |
| Propane | c3h8 | 0 to 100 % LEL [1)] |
| PROPANE | C3H8 | 0 to 100 Vol.-% |
| Toluene | Tolu | 0 to 100 % LEL [1)] |

** The LEL information is dependent on the applicable country-specific standards.

*** The values in the table are based on 50% propane and 50% butane. In practice, the composition of LPG can fluctuate, which may lead to increased measuring errors.

## DETECTING OTHER GASES AND VAPORS

Detection of other gases and vapors for the measuring range 0% to 100% LEL with the DrägerSensor Dual IR Ex/$CO_2$ HC via cross-sensitivities used for technical measurements when calibrated with propane ($C_3H_8$, 100 % LEL = 1.7 Vol.%. Always observe these values for this application). The sensor can be used to detect the gases and vapors mentioned in the table. For this purpose, the sensor in the device must be configured to the target gas „Ex“. The specified values apply to 20 °C and may vary by ± 30 %. Calibration to the gas or the vapor can cause increased linearity errors.

## RELEVANT CROSS-SENSITIVITIES

| Gas/vapor | Chemical symbol | CAS No. | Test gas concentration in Vol.-% | Reading displayed in % LEL (if calibrated to 0.85 Vol% = 50 % LEL propane) | Cross-sensitivity factor f |
|---|---|---|---|---|---|
| Acetone | $C_3H_6O$ | 67-64-1 | 1.25 | 18 | 2.78 |
| Acetylene | $C_2H_2$ | 74-86-2 | – | not possible | – |
| Benzene | $C_6H_6$ | 71-43-2 | 0.60 | 20 | 2.50 |
| Butadiene -1,3 | $C_4H_6$ | 106-99-0 | 0.70 | 20 | 2.50 |
| i-Butane | $(CH_3)_3CH$ | 75-28-5 | 0.75 | 41 | 1.22 |
| n-Butane | $C_4H_{10}$ | 106-97-8 | 0.70 | 42 | 1.19 |
| n-Butanol | $C_4H_{10}O$ | 71-36-3 | 0.85 | 25 | 2.00 |
| 2-Butanon (MEK) | $C_4H_8O$ | 78-93-3 | 0.75 | 22 | 2.27 |
| i-Butene | $C_4H_8$ | 115-11-7 | 0.80 | 31 | 1.61 |
| n-Butyl acetate | $C_6H_{12}O_2$ | 123-86-4 | 0.60 | 20 | 2.50 |
| Cyclohexane | $C_6H_{12}$ | 110-82-7 | 0.50 | 15 | 3.33 |
| Cyclopentane | $C_5H_{10}$ | 287-92-3 | 0.70 | 47 | 1.06 |
| Diethylamine | $C_4H_{11}N$ | 109-89-7 | 0.85 | 44 | 1.14 |
| Diethyl ether | $(C_2H_5)_2O$ | 60-29-7 | 0.85 | 46 | 1.09 |
| Dimethyl ether | $C_2H_6O$ | 115-10-6 | 1.35 | 51 | 0.98 |
| Ethane | $C_2H_6$ | 74-84-0 | 1.20 | 65 | 0.77 |
| Ethanol | $C_2H_6O$ | 64-17-5 | 1.55 | 41 | 1.22 |
| Ethene | $C_2H_4$ | 74-85-1 | 1.20 | 15 | 3.33 |
| Ethyl acetate | $C_4H_8O_2$ | 141-78-6 | 1.00 | 35 | 1.43 |
| Ethyl acrylate | $C_5H_8O_2$ | 140-88-5 | 0.85 | 26 | 1.92 |
| n-Heptane | $C_7H_{16}$ | 142-82-5 | 0.55 | 36 | 1.39 |
| n-Hexane | $C_6H_{14}$ | 110-54-3 | 0.50 | 34 | 1.47 |
| Methane | $CH_4$ | 74-82-8 | 2.20 | 37 | 1.35 |
| Methanol | $CH_4O$ | 67-56-1 | 3.00 | 92 | 0.54 |
| n-Methoxy-2-Propanol | $C_4H_{10}O_2$ | 107-98-2 | 0.90 | 26 | 1.92 |
| Methyl choride | $CH_3Cl$ | 74-87-3 | 3.80 | 47 | 1.06 |
| Methylene chloride | $CH_2Cl_2$ | 75-09-2 | 6.50 | 20 | 2.50 |
| Methyl tert-butyl ether (MTBE) | $C_5H_{12}O$ | 1634-04-4 | 0.80 | 59 | 0.85 |
| n-Nonane | $C_9H_{20}$ | 111-84-2 | 0.35 | on request | – |
| n-Octane | $C_8H_{18}$ | 111-65-9 | 0.40 | 20 | 2.50 |
| n-Pentane | $C_5H1_2$ | 109-66-0 | 0.55 | 36 | 1.39 |
| Propane | $C_3H_8$ | 74-98-6 | 0.85 | 50 | 1.00 |
| n-Propanol | $C_3H_8O$ | 71-23-8 | 1.05 | 40 | 1.25 |
| Propene | $C_3H_6$ | 115-07-1 | 0.90 | 31 | 1.61 |
| Propylene oxide | $C_3H_6O$ | 75-56-9 | 0.95 | 49 | 1.02 |
| Toluene | $C_7H_8$ | 108-88-3 | 0.50 | 19 | 2.63 |
| o-Xylene | $C_8H_{10}$ | 95-47-6 | 0.50 | 11 | 4.55 |

f = Specifications relate to the respective test gas concentration and the corresponding LEL.

The table does not claim to be complete. The sensor may also be sensitive to other gases and vapors.