This handbook is intended to be a reference for the users of portable gas detection. However, each individual case of application must be considered more closely. The information has been compiled to the best of our knowledge. However, the Dräger organization is not responsible for any consequence or accident which may occur as the result of misuse or misinterpretation of the information contained in this handbook.

The instructions for use may not always correspond to the data given in this book. For a full understanding of the performance characteristics of the measurement devices and for the use of Dräger products, only the instructions of use enclosed with the product shall apply and any inconsistencies between this handbook and the instructions for use shall be resolved in favour of the instructions for use. The user should carefully read and fully understand the instructions for use prior to the use of the measurement devices.

The use of descriptive names, trade names, trademarks, etc., even if not explicitly marked, does not justify the assumption that such names are exempt from trademark and brand protection and therefore may be used freely by anyone.

Technical data is subject to modifications.

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<td>5.13</td>
<td>Dräger CC-Vision Basic</td>
<td>296</td>
</tr>
<tr>
<td>5.14</td>
<td>Dräger GasVision</td>
<td>296</td>
</tr>
</tbody>
</table>
1 Introduction

Dear readers,
Sensors and instruments in the portfolio of the Dräger portable gas detection technology are constantly developed. The objective has been and still is to improve durability, reliability, comprehensibility and operating costs of our products.

An additional focus will be on the proper interaction of all system components and accessories, the administration of an instrument fleet, financing and availability, data analyses and documentation. We are pleased to accept the challenge to master the increasingly complex measurement and monitoring tasks with new instruments, process-supporting software and individual service packages.

With the 4th edition of the DrägerSensor & Portable Instruments Handbook we want to provide a reference book, which will support you at your work and gives notes for the best possible use of Dräger products. This includes among others
- the new single-gas instruments Pac 6x00 and 8x00 partly with electrochemical dual sensors
- the new multi-gas instrument X-am 8000 with new PID sensors and many useful functions
- and new accessory like the X-am Pump.

Finally yet importantly, we removed small mistakes, which attentive readers reported us. Thank you for this and for the many positive feedbacks! Of course, we welcome criticism and suggestions for improvement.

We wish you every success for your measurement tasks!

Your Product Management for Portable Gas Detection
2 Properties of dangerous gases and vapors

Flammable and toxic gases and vapors occur in many areas. It is important to recognize the danger they pose – and that is the purpose of gas detection and warning devices. This handbook is meant to give a basic introduction to gas detection technology, measuring principles and safety concerns.

2.1 Gases – what is a gaseous matter?

Matter at a temperature above its boiling point is referred to as a gas. In terms of the normal human environment, this means that all those substances whose boiling points at normal atmospheric pressure are below 20°C (68°F), are gases. The lightest gas is hydrogen (H₂, fourteen times lighter than air), the heaviest gas (around ten times heavier than air) is tungsten hexafluoride (WF₆).

Under normal conditions, one cubic centimeter of gas contains thirty trillion molecules, whose average distance from one another is only around 3 nanometers. They move through space at between several hundred and several thousand meters per second but, at the same time, they collide with other molecules many billions of times each second. With the result that they only cover around 50–100 nanometers between impacts, and they continuously change their direction and transfer energy to the other molecules with which they collide.

The result is a completely random molecular motion which in macroscopic terms can be measured as temperature (average kinetic energy of all the molecules) and pressure (the average force exerted on a surface by all the molecules hitting it), as well as volume (spatial extent). Pressure, temperature, and volume are always in a fixed relationship to one another, which is governed by external conditions. In an ideal situation, they obey what is known as the “ideal gas law,” namely:

- At a constant pressure, their volume changes in proportion to their temperature – their volume increases when heated;
- If the volume remains the same (for example, in a closed container), then their pressure changes in proportion to their temperature – for example, the pressure inside a container increases when heated;
- At a constant temperature, pressure changes inversely proportion to volume – for instance, the interior pressure rises when gas is compressed.

The extremely fast random movement of gas molecules is also the reason why they mix freely with other gases, never to become separated again. This molecular behavior also explains the tendency of molecules to become less concentrated (diffusion), something which plays an important role in gas detection technology. Generally speaking, these processes become faster, the more quickly the molecules move (in other words, the hotter the gas is) and the lighter the molecules are (in other words, the lighter the gas is).
2.2 Vapors – aren’t they gases, too?

Unlike gas – of which there are only perhaps between 200 to 300 – the word vapor is used to describe the gaseous state of a material below its boiling point. Vapor is always in equilibrium with its fluid (and sometimes solid) phase – it condenses and vaporizes according to the temperature. This is most familiar to us with water; when moist air near the ground cools down at night, ground mist forms (condensation) – but the warmth of the morning sun dissipates the mist (evaporation).

In a closed container, a maximum vapor concentration always exists above the surface of a liquid, and this concentration is dependent on the temperature of the liquid. On a microscopic level, the vapor is a result of the random movement of the liquid’s molecules combined with their ability to overcome the surface tension and mix with the air molecules above the surface.

Every liquid has a certain characteristic vapor pressure, which depends on its temperature and reaches atmospheric pressure when the liquid reaches its boiling point. A graphic depiction of this relationship is known as a vapor pressure curve, and it shows the maximum possible vapor concentration at any given temperature.

Vapor pressure curve of liquid n-hexane

If you divide the maximum possible vapor pressure by the ambient pressure, you are given the saturation concentration in Vol.-% (volume percent). Hexane gas at 20°C or 68°F (vapor pressure 162 hPa or 2.35 psi) and an ambient pressure of 1,000 hPa (14.5 psi) has a maximum possible concentration of 16.2 Vol.-%.
2.3 Our atmosphere

Our atmosphere extends far out into space, getting less dense the more it stretches. The blue color of the sky is caused by the scattering of the sun's rays on the air molecules in the atmosphere. The sky is actually already black by the time you reach a height of around 21 km (13 miles). If you were to subject the entire atmosphere to an even pressure of 1013 hPa (14.7 psi), then it would only be 8 km (5 miles) high, and the UV-absorbing stratospheric ozone layer would be a mere 3 mm (0.11 in.) high.

Typical composition of the earth's atmosphere in ppm:

<table>
<thead>
<tr>
<th>Gas</th>
<th>Composition</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dry</td>
<td>humid</td>
<td></td>
</tr>
<tr>
<td>Principal gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N₂ – nitrogen</td>
<td>780,840</td>
<td>768,543</td>
<td></td>
</tr>
<tr>
<td>O₂ – oxygen</td>
<td>209,450</td>
<td>206,152</td>
<td></td>
</tr>
<tr>
<td>H₂O – water vapor</td>
<td>0</td>
<td>15,748</td>
<td></td>
</tr>
<tr>
<td>Ar – argon</td>
<td>9,340</td>
<td>9,193</td>
<td></td>
</tr>
<tr>
<td>CO₂ – carbon dioxide</td>
<td>340</td>
<td>335</td>
<td></td>
</tr>
<tr>
<td>Trace gases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ne – neon</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>He – helium</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>CH₄ – methane</td>
<td>1.8</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Kr – krypton</td>
<td>1.1</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>H₂ – hydrogen</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>N₂O – nitrous oxide</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>CO – carbon monoxide</td>
<td>0.09</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Xe – xenon</td>
<td>0.09</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>O₃ – ozone</td>
<td>0.07</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Other trace gases</td>
<td>3.05</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td><strong>1,000,000</strong></td>
<td><strong>1,000,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

1 Vol.-% = 10,000 ppm; assumption for humid air: 68% r.h. at 20°C (68°F)

The earth's atmosphere has a mass of around 5 quadrillion metric tons (5.235 × 10¹⁸ kg), which weighs down on an area on the earth's surface of 0.507 × 10¹⁵ m². This creates an atmospheric pressure on the earth's surface of 10,325 kg/m², which corresponds to normal atmospheric pressure: 1,013 hPa (14.7 psi). Atmospheric pressure decreases with increasing altitude:
The number of molecules in a given volume decreases with decreasing atmospheric pressure, which means that the results produced by partial pressure-measuring sensors are always dependent on the atmospheric pressure.

More than 78 Vol.-% of the earth’s atmosphere is nitrogen, which is fully inert, and although available in excess, can not even be used as a much-needed fertilizer for plants. In contrast, highly reactive oxygen is fundamental to our breathing – more than that: it is the foundation of almost all life.

Just under 21 Vol.-% of the atmosphere is oxygen. A lack of oxygen is life-threatening – and cannot be perceived by the human senses.

**Oxygen deficiency** is generally caused by the release of an inert gas, which then in turn displace oxygen. Since the atmosphere is only around one fifth oxygen, the oxygen concentration is only reduced by around one fifth of the concentration of the inert gas. For example, if 10 Vol.-% of helium is released into the air then oxygen is reduced by 2 Vol.-% and the level of nitrogen by 8 Vol.-%. Because liquid nitrogen (−196°C or −321°F) is frequently used in industry, its evaporation can quickly cause a dangerous oxygen deficiency.

**Oxygen enrichment** (e.g. more than 25 Vol.-%) cannot be perceived by humans, but have severe consequences with respect to the flammability of materials, and may even cause autoignition. This is why explosion protection relates exclusively to atmospheric oxygen concentration.
At what level does it become dangerous?

<table>
<thead>
<tr>
<th>Oxygen concentration in Vol.-%</th>
<th>Oxygen partial pressure in hPa/psi</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 17</td>
<td>Less than 170/2.5</td>
<td>Early stage of danger due to oxygen deficiency</td>
</tr>
<tr>
<td>11 to 14</td>
<td>110 to 140/1.6 to 2.0</td>
<td>Unnoticed decrease in physical and mental performance</td>
</tr>
<tr>
<td>8 to 11</td>
<td>80 to 110/1.2 to 2.0</td>
<td>Possible sudden loss of consciousness without warning after a certain period of exposure</td>
</tr>
<tr>
<td>6 to 8</td>
<td>60 to 80/0.9 to 1.2</td>
<td>Loss of consciousness within a few minutes – resuscitation possible if performed instantly</td>
</tr>
<tr>
<td>Less than 6</td>
<td>Less than 60/0.9</td>
<td>Immediate loss of consciousness</td>
</tr>
</tbody>
</table>

2.4 Ex, Ox, Tox – gas hazards!

Gases and vapors are almost always dangerous. If gases are not present in the atmospheric composition to which we are accustomed and which we can breathe, then safe breathing is threatened. Furthermore, all gases are potentially dangerous in their liquid, compressed, or normal state – the decisive factor is their concentration.

There are basically three categories of risk:

- **Risk of explosion (ex)** caused by flammable gases
- **Oxygen (ox)**
  - Risk of suffocation through oxygen deficiency
  - Risk of increased flammability due to oxygen enrichment
- **Risk of poisoning (tox)** by toxic gases

Without equipment to assist, mankind is not in a position to detect these risks early enough to enable preventative steps from being taken. And, with a few exceptions, our nose has proven an extremely unreliable warning instrument.

For example, hydrogen sulfide can be detected in low concentrations because it smells of rotten eggs. However, the nose can no longer perceive the lethal, high concentrations of hydrogen sulfide. Many fatal accidents have occurred because people have fled into what they thought was the safe, odour-free area.
Even harmless gases such as argon, helium or nitrogen can also become dangerous if they are suddenly released, displacing the oxygen that is essential to life. Then there is risk of suffocation. An oxygen concentration of less than six Vol.-% is deadly. An excess of oxygen increases the risk of fire, and can even cause flammable materials to self-ignite. By igniting, flammable gases and vapors can not only cause considerable damage to industrial plants and equipment, they can also threaten people’s lives.

Therefore, it is essential to be able to detect Ex, Ox and Tox risks reliably, and to protect human life, industrial plants and equipment, as well as the environment by taking the appropriate measures. Whether Dräger-Tubes® or portable gas detectors, Dräger offers you individual solutions that meet your needs and enable you to counter gas risks professionally.

### 2.5 Toxic gases and vapors

The toxicity of gases and vapors used in industrial processes is defined in laboratory experiments by determining the LC\textsubscript{50} rate. On that basis, and together with other scientific tests and experiments relating to occupational health at the workplace, authorized commissions in several countries make recommendations of limit values, which are legally binding. In Germany, this is the Federal Institute for Occupational safety and Health (BAuA).

This maximum allowable concentration in the air means that workers will not suffer any detrimental affects to their health if they spend their entire working lives breathing in gas concentrations, which do not exceed that level. This, however, must be assured.

<table>
<thead>
<tr>
<th>Limit value</th>
<th>Selected substances to which this limit value applies</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,000 ppm</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>1,000 ppm</td>
<td>propane, butane</td>
</tr>
<tr>
<td>500 ppm</td>
<td>acetone</td>
</tr>
<tr>
<td>200 ppm</td>
<td>methyl ethyl ketone (MEK)</td>
</tr>
<tr>
<td>100 ppm</td>
<td>butanol</td>
</tr>
<tr>
<td>50 ppm</td>
<td>n-hexane, toluene</td>
</tr>
<tr>
<td>20 ppm</td>
<td>acetonitrile</td>
</tr>
<tr>
<td>10 ppm</td>
<td>chlorobenzene</td>
</tr>
<tr>
<td>5 ppm</td>
<td>diethylamine</td>
</tr>
<tr>
<td>1 ppm</td>
<td>1,1,2,2-tetrachloroethane</td>
</tr>
<tr>
<td>500 ppb</td>
<td>chlorine</td>
</tr>
<tr>
<td>200 ppb</td>
<td>methyl chlorformate</td>
</tr>
<tr>
<td>100 ppb</td>
<td>chlorine dioxide</td>
</tr>
<tr>
<td>50 ppb</td>
<td>glutaraldehyde</td>
</tr>
<tr>
<td>10 ppb</td>
<td>methyl isocyanate</td>
</tr>
</tbody>
</table>

Status 2010, according to TRGS 900 (Germany)
Properties of dangerous gases and vapors

**T+ Very toxic**  \( \text{LC}_{50} < 0.5 \text{ g/m}^3 \)

Arsine, boron trichloride, boron trifluoride, bromine, diborane, fluorine, hydrogen cyanide, hydrogen fluoride, hydrogen phosphide, hydrogen sulfide, nitrogen dioxide, nitrogen monoxide, ozone, phosgene, sulfur tetrafluoride, tungsten hexafluoride

**T Toxic**  \( \text{LC}_{50} = 0.5 ... 2.0 \text{ g/m}^3 \)

Acetonitrile, ammonia, benzene, carbon disulfide, carbon monoxide, chlorine, cyanogen, hydrogen chloride, methanol, methyl bromide, nitrogen trifluoride, sulfur dioxide

\( \text{LC}_{50} \) (LC stands for "lethal concentration") is the gas concentration in air, which – when inhaled over a given time period (usually four hours) – kills 50% of experimental animals (normally white laboratory rats).

### 2.6 Flammable gases and vapors

Flammable gases become more dangerous when they have a relatively low LEL (lower explosion limit) or flash point. The flash point is defined by the liquid’s temperature-dependent vapor pressure and it’s LEL.*

<table>
<thead>
<tr>
<th>Vapor</th>
<th>LEL ( \text{Vol.}% )</th>
<th>LEL ( \text{g/m}^3 )</th>
<th>Flash point in °C/°F</th>
<th>Vapor pressure at 20°C ((68° \text{ F})) in mbar</th>
<th>Ignition temp. in °C/°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetone</td>
<td>2.5</td>
<td>60.5</td>
<td>&lt; –20/–4</td>
<td>246</td>
<td>535/995</td>
</tr>
<tr>
<td>acrylonitrile</td>
<td>2.8</td>
<td>61.9</td>
<td>–5/23</td>
<td>117</td>
<td>480/896</td>
</tr>
<tr>
<td>benzene</td>
<td>1.2</td>
<td>39.1</td>
<td>–11/12</td>
<td>100</td>
<td>555/1031</td>
</tr>
<tr>
<td>n-butanol</td>
<td>1.4</td>
<td>52.5</td>
<td>35/95</td>
<td>7</td>
<td>325/617</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>1.2</td>
<td>58.1</td>
<td>27/81</td>
<td>11</td>
<td>390/734</td>
</tr>
<tr>
<td>n-butyl acrylate</td>
<td>1.2</td>
<td>64.1</td>
<td>37/99</td>
<td>5</td>
<td>275/527</td>
</tr>
<tr>
<td>chlorobenzene</td>
<td>1.3</td>
<td>61.0</td>
<td>28/82</td>
<td>12</td>
<td>590/1094</td>
</tr>
<tr>
<td>cyclohexane</td>
<td>1.0</td>
<td>35.1</td>
<td>–18/–0.4</td>
<td>104</td>
<td>260/500</td>
</tr>
<tr>
<td>cyclopentane</td>
<td>1.4</td>
<td>40.9</td>
<td>37–60</td>
<td>346</td>
<td>320/608</td>
</tr>
<tr>
<td>1,2-dichloroethane (EDC)</td>
<td>4.2</td>
<td>255.7</td>
<td>13/55</td>
<td>87</td>
<td>440/824</td>
</tr>
<tr>
<td>diethyl ether</td>
<td>1.7</td>
<td>52.5</td>
<td>–45/–40</td>
<td>586</td>
<td>175/374</td>
</tr>
<tr>
<td>1,4-dioxane</td>
<td>1.4</td>
<td>69.7</td>
<td>11/52</td>
<td>38</td>
<td>375/707</td>
</tr>
<tr>
<td>epichlorhydrin</td>
<td>2.3</td>
<td>88.6</td>
<td>28/82</td>
<td>16</td>
<td>385/725</td>
</tr>
<tr>
<td>ethanol</td>
<td>3.1</td>
<td>59.5</td>
<td>12/54</td>
<td>58</td>
<td>400/752</td>
</tr>
<tr>
<td>ethyl acetate</td>
<td>2.0</td>
<td>73.4</td>
<td>–4/25</td>
<td>98</td>
<td>470/878</td>
</tr>
<tr>
<td>ethylbenzene</td>
<td>1.0</td>
<td>44.3</td>
<td>23/73</td>
<td>10</td>
<td>430/806</td>
</tr>
<tr>
<td>n-hexane</td>
<td>1.0</td>
<td>35.9</td>
<td>–22/–8</td>
<td>160</td>
<td>230/464</td>
</tr>
<tr>
<td>methanol</td>
<td>6.0</td>
<td>80.0</td>
<td>9/48</td>
<td>129</td>
<td>440/824</td>
</tr>
<tr>
<td>1-methoxy-2-propanol</td>
<td>1.8</td>
<td>67.6</td>
<td>32/90</td>
<td>13</td>
<td>270/518</td>
</tr>
<tr>
<td>methyl ethyl ketone (MEK)</td>
<td>1.5</td>
<td>45.1</td>
<td>–10/14</td>
<td>105</td>
<td>475/887</td>
</tr>
<tr>
<td>methyl methacrylate</td>
<td>1.7</td>
<td>70.9</td>
<td>10/50</td>
<td>40</td>
<td>430/806</td>
</tr>
<tr>
<td>n-nonane</td>
<td>0.7</td>
<td>37.4</td>
<td>31/88</td>
<td>5</td>
<td>205/401</td>
</tr>
<tr>
<td>n-octane</td>
<td>0.8</td>
<td>38.1</td>
<td>12/54</td>
<td>14</td>
<td>205/401</td>
</tr>
<tr>
<td>n-pentane</td>
<td>1.1</td>
<td>42.1</td>
<td>–40/–40</td>
<td>562</td>
<td>260/500</td>
</tr>
</tbody>
</table>

* LEL values may differ regionally. The operator has to ensure to use the relevant value.
<table>
<thead>
<tr>
<th>Vapor</th>
<th>LEL Vol.-%</th>
<th>LEL g/m³</th>
<th>Flash point in °C/°F</th>
<th>Vapor pressure at 20°C in mbar</th>
<th>Ignition temperature in °C/°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>i-propanol (IPA)</td>
<td>2.0</td>
<td>50.1</td>
<td>12/54</td>
<td>43</td>
<td>425/797</td>
</tr>
<tr>
<td>propylene oxide</td>
<td>1.9</td>
<td>46.0</td>
<td>–37/–35</td>
<td>588</td>
<td>430/806</td>
</tr>
<tr>
<td>styrol</td>
<td>1.0</td>
<td>43.4</td>
<td>32/90</td>
<td>7</td>
<td>490/914</td>
</tr>
<tr>
<td>tetrahydrofuran (THF)</td>
<td>1.5</td>
<td>45.1</td>
<td>–20/–4</td>
<td>173</td>
<td>230/446</td>
</tr>
<tr>
<td>toluene</td>
<td>1.0</td>
<td>38.3</td>
<td>6/43</td>
<td>29</td>
<td>535/995</td>
</tr>
<tr>
<td>xylene (isomer mixture)</td>
<td>1.0</td>
<td>44.3</td>
<td>30/77</td>
<td>7</td>
<td>465/869</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gas</th>
<th>LEL Vol.-%</th>
<th>LEL g/m³</th>
<th>Ignition temperature in °C/°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetylene</td>
<td>2.3</td>
<td>24.9</td>
<td>305/581</td>
</tr>
<tr>
<td>ammonia</td>
<td>15.4</td>
<td>109.1</td>
<td>630/1166</td>
</tr>
<tr>
<td>1,3-butadiene</td>
<td>1.4</td>
<td>31.6</td>
<td>415/779</td>
</tr>
<tr>
<td>i-butane</td>
<td>1.5</td>
<td>36.3</td>
<td>460/860</td>
</tr>
<tr>
<td>n-butane</td>
<td>1.4</td>
<td>33.9</td>
<td>365/689</td>
</tr>
<tr>
<td>n-butene (butylene)</td>
<td>1.5</td>
<td>28.1</td>
<td>360/680</td>
</tr>
<tr>
<td>dimethyl ether</td>
<td>2.7</td>
<td>51.9</td>
<td>240/464</td>
</tr>
<tr>
<td>ethene (ethylene)</td>
<td>2.4</td>
<td>28.1</td>
<td>440/824</td>
</tr>
<tr>
<td>ethylene oxide</td>
<td>2.6</td>
<td>47.8</td>
<td>435/815</td>
</tr>
<tr>
<td>hydrogen</td>
<td>4.0</td>
<td>3.3</td>
<td>560/1040</td>
</tr>
<tr>
<td>methane</td>
<td>4.4</td>
<td>29.3</td>
<td>595/1103</td>
</tr>
<tr>
<td>methyl chloride</td>
<td>7.6</td>
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<td>625/1157</td>
</tr>
<tr>
<td>propane</td>
<td>1.7</td>
<td>31.2</td>
<td>470/878</td>
</tr>
<tr>
<td>propene (propylene)</td>
<td>2.0</td>
<td>35.0</td>
<td>485/905</td>
</tr>
</tbody>
</table>

Source: PTB list from the Physikalisch-Technische Bundesanstalt (PTB is the national metrology institute providing scientific and technical services). Values from NIOSH, IEC and others may differ. Please consider regional regulations.

Only flammable liquids have a flash point.
By definition, flammable gases do not have a flash point.
2.7 LEL and preventative explosion protection

Flammable gases and vapors can form ignitable mixtures when combined with air, but the ratio of flammable gas to oxygen (or air) must lie within certain limits.

The lower explosion limit (LEL) is defined as the concentration of combustion gas (stated in Vol.-%) at which, under standardized conditions, the gas-air mixture can be ignited and will continue to burn on its own accord. The LEL of all known flammable gases and vapors lies in a range of approximately 0.5 to 15 Vol.-%. The LEL of hydrogen in air, for instance, is 4 Vol.-%. Accordingly, a gas sample containing 2 Vol.-% of hydrogen in air can definitely not be ignited.

Concentration limitation

This behavior of gases and vapors has important consequences for practical explosion protection. If a flammable gas cannot be ignited below its LEL, then we can protect people against explosions by measuring the gas concentrations continuously and using appropriate measures to ensure that concentrations never exceed a level such as half the LEL (50% LEL).

This method of preventative explosion protection is often referred to as a primary measure. What is prevented is not the ignition of the gas, but the very formation of an atmosphere which can explode. The preferred method of measuring these concentrations is to use infrared or catalytic bead sensors, which, when used for this purpose, must fulfill certain safety requirements.
2.8 Flash point of flammable liquids

Although we speak of flammable liquids, in fact, the liquid state is not flammable. It is the vapor, which can form a flammable mixture together with the oxygen in the air. Both the volatility of this vapor and its lower explosion limit (LEL) comprise the measure of its potential danger. This is described by what is known as the flash point.

To be able to ignite at all, the concentration of vapor above the surface of the liquid must exceed the LEL. Whether it does so or not depends on how much vapor is produced. This, in turn, depends on what is known as the vapor pressure, which depends upon the temperature of the liquid. In safety terms, this is described by defining a flash point (F). The flash point is the temperature at which sufficient vapor forms to create a vapor-air mixture, which can be ignited in a standardized apparatus. If a flammable liquid’s flash point is above 50°C (122°F), then it definitely cannot be ignited at a temperature of 30°C (86°F).

Therefore, the lower the flash point of a flammable liquid, the more dangerous it is. Because the vapor of a flammable liquid is not ignitable below its flash point, preventative explosion protection can consist of using liquids whose flash points are significantly higher than the ambient temperature. This is often done in practice, but it does have the disadvantage – when using such liquids as solvents – that large amounts of energy are required to evaporate them. Gases by definition do not have a flash point, because under normal conditions they do not exist in liquid form.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Flash Point (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclohexanol</td>
<td>60</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>50</td>
</tr>
<tr>
<td>Trimethylbenzene</td>
<td>40</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>30</td>
</tr>
<tr>
<td>n-Butanol</td>
<td>20</td>
</tr>
<tr>
<td>Nonane</td>
<td>10</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>-10</td>
</tr>
<tr>
<td>Ethyl benzene</td>
<td>-20</td>
</tr>
<tr>
<td>i-Butyl acetate</td>
<td>-30</td>
</tr>
<tr>
<td>Ethanol</td>
<td>-30</td>
</tr>
<tr>
<td>Methanol</td>
<td>-30</td>
</tr>
<tr>
<td>Toluene</td>
<td>-30</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>-30</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>-30</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>-30</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>-30</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>-30</td>
</tr>
<tr>
<td>Allylamine</td>
<td>-30</td>
</tr>
</tbody>
</table>

You cannot ignite diesel (F > 55°C) using a match, but you can ignite gasoline with one (F < -20°C)!
2.9 Concentration and their calculation

Concentration is defined as the content of a substance within a reference substance. When measuring harmful substances in the air, the quantity of that substance is defined in terms of a concentration in relation to the air. The right units must be chosen to produce useful figures for defining the concentration. High concentration is generally given as Vol.-% – in other words, one part of a substance to 100 parts of air. Air, for example, consists of 21% Vol.-% oxygen, which means that 100 parts of air contain 21 parts of oxygen. Lower concentration levels are measured in ppm = parts per million (mL/m³), or ppb = parts per billion (µL/m³). A concentration of one ppm means there is one part of a substance in one million parts of air (the rough equivalent to one sugar cube inside a gasoline tanker). A concentration of one ppb refers to one part of a substance in one billion parts of air (equivalent to five people out of the entire population of the earth). Converting these very low concentrations into Vol.-% produces the following simple relationship:

1 Vol.-% = 10,000 ppm = 10,000,000 ppb

Alongside gaseous components, the air can also contain ‘dissolved’ solid or liquid substances, known as aerosols. The size of droplets or particles borne by the air is very small, which means that measuring them in terms of volume is not very useful. Aerosol concentrations are therefore measured in mg/m³.

### Conversion Table

<table>
<thead>
<tr>
<th>Vol.-%</th>
<th>ppm</th>
<th>ppb</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 L/m³</td>
<td>1</td>
<td>10⁷</td>
</tr>
<tr>
<td>1 cL/L</td>
<td>10⁴</td>
<td></td>
</tr>
<tr>
<td>ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mL/m³</td>
<td>10⁻⁴</td>
<td>1</td>
</tr>
<tr>
<td>µL/L</td>
<td></td>
<td>10³</td>
</tr>
<tr>
<td>ppb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>µL/m³</td>
<td>10⁻⁷</td>
<td></td>
</tr>
<tr>
<td>nL/L</td>
<td>10⁻³</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>g/L</th>
<th>mg/L</th>
<th>mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 L/m³</td>
<td>1</td>
<td>10⁶</td>
</tr>
<tr>
<td>1 cL/L</td>
<td>10⁴</td>
<td></td>
</tr>
<tr>
<td>mg/L</td>
<td></td>
<td>10³</td>
</tr>
<tr>
<td>mL/m³</td>
<td>10⁻³</td>
<td></td>
</tr>
<tr>
<td>µL/L</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>mg/m³</td>
<td></td>
<td>10⁻⁶</td>
</tr>
<tr>
<td>µL/m³</td>
<td></td>
<td>10⁻³</td>
</tr>
<tr>
<td>nL/L</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Converting mg/m³ into ppm

\[
C_{[\text{ppm}]} = \frac{\text{Molar volume}}{\text{Molar mass}} \times C
\]

The molar volume of any gas is 24.1 L/mol at 20°C (68° F) and 1,013 hPa (14.7 psi); the molar mass of a specific gas should be adapted dependent on that gas.
3 Introduction to portable instruments

In the beginning, there was the canary. These little finches would warn miners about dangerous gases underground: if they stopped singing, the miners had to get out quick. Crude and inaccurate methods of determining gas concentrations in the atmosphere like this one have long been consigned to history.

Nowadays, precise measuring instruments monitor the concentration of dangerous gases and flammable vapors. The latest of these are compact, small, robust and flexible single-gas and multi-gas units. Gases and vapors are not always necessarily harmful; after all, the earth’s atmosphere is made of them. It is not until their concentration exceeds critical levels (risk of poisoning and explosion) or drops below certain levels (risk of suffocation through oxygen deficiency) that they can become a threat. This is why portable gas detection devices are used in all kinds of ways throughout many branches of industry. Scenarios range from individual employees and small groups of workers – all the way to large-scale operations such as the industrial shutdown of an entire petrochemical plant. Instruments measuring the various dangerous gases have to perform reliably under changing conditions. This can place great demands on reliability, durability, and flexibility, because in the end the detection equipment is directly responsible for the safety and health of workers. Not every unit may be used in every working environment. Before a device is used, you have to determine whether its specifications are sufficient. These requirements are all laid down in various standards and directives.

3.1 Application areas for portable gas detection

Portable gas detection instruments are subject to very diverse requirements. Different application areas require solutions tailored to the measurement task, which also take into account the respective ambient conditions.

It is generally possible to distinguish between the following application areas:

Personal monitoring
- These devices are designed to warn the wearer about gas risks in the immediate vicinity. For this reason, they are usually worn on work clothing. The basic requirements that these units therefore have to fulfill are wearing comfort, durability, and reliability. Continuously measuring single-gas and multi-gas instruments are suitable for this kind of work.
Area monitoring
– In contrast to the personal gas detector area monitors will be placed at central or critical locations to monitor workspaces optimally and independently from persons.

– For this, the basic requirements are robustness, stability and excellent alarm awareness (optical and acoustic) as well as a longest possible battery runtime. Increased security level can be achieved by connecting the area monitors to wireless alarm chains and by transferring the measurement values from instrument to instrument as well as to mobile terminals.

Confined space entry
– Maintenance and repair work often require people to climb into confined spaces. These areas of work can be especially dangerous because of the lack of space, the lack of ventilation, and the presence or development of hazardous substances. A clearance measurement is required before entry. Multi-gas instruments are used together with corresponding pumps and accessories such as hoses and probes. After a successful measurement where no hazards have been found, the same instruments can be used for continuous personal monitoring while working in the confined space.
Leak detection

– Leakages can occur wherever gases or liquids are stored or transported. It is important to identify leakages quickly so that the appropriate measures can be taken to avert harm to people, the environment, and the facility. Detection devices combined with corresponding pumps must be able to respond quickly so as to detect small changes in concentration. High levels of reliability are another minimum requirement for these measuring instruments.

3.2 Requirements for gas detection instruments

As safety products, gas detection devices for industrial use must fulfill the statutory requirements (explosion protection, electromagnetic compatibility), as well as other requirements, so that their quality and reliability remains assured even under tough conditions.

Explosion protection standards:
Design stipulations ensure that the gas measuring instrument does not become a source of ignition itself. Globally accepted standards include CENELEC (ATEX), CSA, UL, EAC, etc.

Protection ratings as defined by EN 60529 (IP Code)
The IP code provides information about the degree to which a casing provides protection against foreign objects and water.
**IP = International Protection/Ingress Protection**

Extract based on DIN EN 60529:

<table>
<thead>
<tr>
<th>First index number</th>
<th>Protection against solid foreign objects</th>
<th>Second index number</th>
<th>Protection against water</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Protection against contact. Protection against interior dust deposits</td>
<td>5</td>
<td>Protection against projected water from any angle</td>
</tr>
<tr>
<td>6</td>
<td>Complete protection against touch. Protection against dust penetration</td>
<td>6</td>
<td>Protection against penetrating water during temporary flooding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Protection against penetrating water during temporary immersion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Protection against penetrating water during prolonged submersion</td>
</tr>
</tbody>
</table>

Protection class IP 67 provides a high degree of robustness, although this can have negative consequences in terms of vapor permeability. The MEWAGG research group ("Mess- und Warngeräte für gefährliche Gase") – part of BG Chemie (Germany’s statutory employment accident insurance fund for the chemical industry) – therefore advises users who need to detect not only gases like methane and propane, but also higher hydrocarbons and solvents, to check the suitability of equipment with the manufacturer. This can, for example, involve a detection equipment assessment under ATEX.

**Quality of measurement functions**

Maintaining a predefined detection quality, even under extreme ambient conditions (temperature, pressure, wind, moisture, vibration, and so on)

- EN 45 544 – for toxic gases and vapors
- EN 50 104 – for oxygen
- EN 60 079-29-1 – for flammable gases and vapors

**Electromagnetic compatibility as defined by EN 50270**

Electrical and electronic devices should not be influenced or interfered with by other electrical, magnetic, or electromagnetic fields – and vice versa. For instance, this means that using a mobile phone or a radio in the immediate vicinity of gas detection devices should not interfere with the instrument’s detection signal, nor should the instrument interfere with the phone. EMC guidelines and standards define means of proving and confirming a device’s insensitivity to interference and low level of interference output. Simply complying with the requirements of a standard or guideline may not be sufficient depending on the various
operating and ambient conditions. Rugged industrial applications require much more robust devices. Dräger pays special attention to these requirements, for example, with an additional in-house "robustness test."

**RoHS and REACH**

The requirements for materials and substances used must also be considered during the development and production of gas detection equipment. The European RoHS (Restriction of Hazardous Substances) Directive requires that six particularly dangerous substances may not be contained in electrical and electronic devices. The REACH Regulation (Registration, Evaluation, Authorization, and Restriction of Chemicals) requires that the presence of particularly hazardous materials in products must be disclosed. Dräger seeks to avoid such substances as far as possible within the scope of technical conditions and meets the relevant directives and regulations in this regard.

### 3.3 Explosion protection

Industrial processes very often involve flammable substances, including sometimes flammable particles. In these areas, flammable gases and vapors can sometimes be released on a process-related basis (such as relief valves) or by unforeseen incidents (breakdowns). As a means of prevention, areas such as these are designated EX areas ("zones") in which only equipment which is reliably protected against ignition may be used.

Explosion protection is standardized worldwide; IEC (international), CENELEC (European) and NEC 505 North American standards are similar, and based on the three-zone concept which is rapidly gaining acceptance in the USA.

<table>
<thead>
<tr>
<th>Zone in IEC, NEC 505 and CENELEC</th>
<th>Dangerous, explosive atmosphere exists ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 0</td>
<td>constantly, regularly or long-term</td>
</tr>
<tr>
<td>Zone 1</td>
<td>occasionally</td>
</tr>
<tr>
<td>Zone 2</td>
<td>rarely and for short periods</td>
</tr>
</tbody>
</table>

American explosion protection compliant with NEC 500 is still typically based on the dual division concept:

<table>
<thead>
<tr>
<th>Division in NEC 500</th>
<th>Dangerous explosive atmosphere exists ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division 1</td>
<td>constantly or occasionally</td>
</tr>
<tr>
<td>Division 2</td>
<td>rarely and for short periods</td>
</tr>
</tbody>
</table>
3.4 ATEX 137 – directive 1999/92/EC

ATEX stands for ATmospheres EXplosibles. This directive has been binding on all systems since July 30, 2006, and is addressed to employers. It describes minimum requirements for the protection of employees’ health and safety in areas at risk of explosion.

The directive pursues the following targets:
- Prevent the formation of explosive atmospheres; if this is not possible
- Prevent the ignition of explosive atmospheres; if this is not possible
- Reduce the harmful effects of an explosion to a tolerable minimum.

Employers are obliged to assess the risk of explosion in the relevant areas. Zone categories are defined by answering the question: how likely is it that an explosive atmosphere (gas, vapor, dust) will form in the areas concerned?

ZONE DEFINITIONS IN ATEX 137, ANNEX I, 2

<table>
<thead>
<tr>
<th>Zone</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 0</td>
<td>Area in which explosive atmospheres comprising mixtures of air and flammable gases, vapors, and aerosols are present constantly, frequently, or over long periods of time.</td>
</tr>
<tr>
<td>Zone 1</td>
<td>Area in which, under normal operation, an explosive atmosphere can occasionally form as a mixture of air and flammable gases, vapors, or aerosols.</td>
</tr>
<tr>
<td>Zone 2</td>
<td>Area in which, under normal operation, an explosive atmosphere consisting of a mixture of air and flammable gases, vapors, or aerosols normally does not form – or, if so, only briefly.</td>
</tr>
<tr>
<td>Zone 20</td>
<td>Area in which explosive atmospheres in the form of clouds of combustible dust in the air are present constantly, frequently, or over long periods of time.</td>
</tr>
<tr>
<td>Zone 21</td>
<td>Area in which, under normal operation, an explosive atmosphere can occasionally form as clouds of combustible dust in the air.</td>
</tr>
<tr>
<td>Zone 22</td>
<td>Area in which, under normal operation, an explosive atmosphere in the form of a cloud of combustible dust in the air normally does not form – or, if so, only briefly.</td>
</tr>
</tbody>
</table>
Depending on the zone identified, only certain gas measuring instruments may be used there (this table links the categories of ATEX 95 with the zones in ATEX 137):

<table>
<thead>
<tr>
<th>Permitted use</th>
<th>Gas, vapor (G)</th>
<th>Dust (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruments in category 1</td>
<td>Zone 0, 1, 2</td>
<td>Zone 20, 21, 22</td>
</tr>
<tr>
<td>Instruments in category 2</td>
<td>Zone 1, 2</td>
<td>Zone 21, 22</td>
</tr>
<tr>
<td>Instruments in category 3</td>
<td>Zone 2</td>
<td>Zone 22</td>
</tr>
</tbody>
</table>

(For instrument categories, see section 3.5 ATEX 95)

The instrument group and temperature category requirements are then determined by defining the flammable gases, vapors, aerosols, and dusts used, along with their ignition temperatures.

Extract from section 2.6 “Flammable gases and vapors”

<table>
<thead>
<tr>
<th>Gas</th>
<th>LEL Vol.-%</th>
<th>LEL g/m³</th>
<th>Flash point in °C/°F</th>
<th>Vapor pressure at 20°C (68°F) in mbar</th>
<th>Ignition temperature in °C/°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetylene</td>
<td>2.3</td>
<td>24.9</td>
<td></td>
<td></td>
<td>305/581</td>
</tr>
<tr>
<td>ammonia</td>
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<tr>
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<td>dimethyl ether</td>
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<td>3.3</td>
<td></td>
<td></td>
<td>560/1040</td>
</tr>
<tr>
<td>i-butane</td>
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<tr>
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<tr>
<td>n-butane</td>
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<td>33.9</td>
<td></td>
<td></td>
<td>365/689</td>
</tr>
<tr>
<td>n-butene (butylene)</td>
<td>1.2</td>
<td>28.1</td>
<td></td>
<td></td>
<td>360/680</td>
</tr>
<tr>
<td>propane</td>
<td>1.7</td>
<td>31.2</td>
<td></td>
<td></td>
<td>470/878</td>
</tr>
<tr>
<td>propene (propylene)</td>
<td>2.0</td>
<td>35.0</td>
<td></td>
<td></td>
<td>485/905</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vapor</th>
<th>LEL Vol.-%</th>
<th>LEL g/m³</th>
<th>Flash point in °C/°F</th>
<th>Vapor pressure at 20°C (68°F) in mbar</th>
<th>Ignition temperature in °C/°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>isopropyl alcohol (IPA)</td>
<td>2.0</td>
<td>50.1</td>
<td>12/54</td>
<td>43</td>
<td>425/797</td>
</tr>
<tr>
<td>propylene oxide</td>
<td>1.9</td>
<td>46.0</td>
<td>–37/–35</td>
<td>588</td>
<td>430/806</td>
</tr>
<tr>
<td>styrol</td>
<td>1.0</td>
<td>43.4</td>
<td>32/90</td>
<td>7</td>
<td>490/914</td>
</tr>
<tr>
<td>tetrahydrofuran (THF)</td>
<td>1.5</td>
<td>45.1</td>
<td>–20/–4</td>
<td>200</td>
<td>230/446</td>
</tr>
<tr>
<td>toluene</td>
<td>1.0</td>
<td>38.3</td>
<td>6/43</td>
<td>29</td>
<td>535/995</td>
</tr>
<tr>
<td>xylol (isomer mixture)</td>
<td>1.0</td>
<td>44.3</td>
<td>25/77</td>
<td>7</td>
<td>465/869</td>
</tr>
</tbody>
</table>
3.5 ATEX 95 – directive 94/9/EC

This directive applies to, among others, the manufacturers of gas detection and warning instruments. It describes the requirements that must be fulfilled by gas detection devices used in areas at risk of explosion, and which incorporate their own potential ignition sources.

The CE symbol of conformity – coupled with information about the equipment category (described the zones of the area at risk of explosion in which the gas warning instrument may be used as an electrical device) may look like this:

Markings as defined by 94/9/EC (ATEX 95)

Notified body concerning quality control of production
Conforms with EU requirements

Markings (as defined by ATEX):

Complies with directive 94/9/EC

Equipment groups I and II indicate in which area the device may be used:
I = Mining
II = Industry

Information then follows about which equipment category the gas detection device satisfies:

| Category 1 | Very high level of safety, sufficient safety provided by two protective measures or in the event of two faults |
| Category 2 | Sufficient safety in the event of frequent equipment faults or one breakdown |
| Category 3 | Sufficient safety if operation is fault-free |

Finally, the atmosphere is indicated (G: gas, vapor, aerosol or D: conductive and non-conductive combustible dusts).
The designation indicates the zones in which the instrument may be used (example for industry).

<table>
<thead>
<tr>
<th>Ex area:</th>
<th>Zone 0</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 20</th>
<th>Zone 21</th>
<th>Zone 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex atmosphere:</td>
<td>constantly, long-term or frequently</td>
<td>occasionally</td>
<td>normally</td>
<td>constantly</td>
<td>occasionally</td>
<td>normally</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>not or only short-term</td>
<td>long-term</td>
<td>or frequently</td>
<td>not or only short-term</td>
</tr>
<tr>
<td>II 1 G</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>II 2 G</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>II 3 G</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>II 1 D</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>II 2 D</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>II 3 D</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

**MINING**

<table>
<thead>
<tr>
<th>Instrument category</th>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>I M1</td>
<td>Very high level of safety, may remain in operation at high methane concentrations</td>
</tr>
<tr>
<td>I M2</td>
<td>High level of safety, must be switched off at high methane concentrations</td>
</tr>
</tbody>
</table>

Explosion protection marking in EN 60079

**Ex dia IIC T4 Gb** — a = Zone 0; b = Zone 1; c = Zone 2

- **EPL** (Equipment Protection Level) G = gas; D = dust
  - Ex d ia IIC T4 Gb
  - i = Intrinsic safety
  - a = covers 2 faults
  - b = covers 1 fault
  - c = covers normal operation

- Explosion group I: mining,
- II: everything except mining
- Subgroups IIA, IIB, and IIC: categorization of gases depending on their ignitibility
- Ignition protection: Pressure-resistant encapsulation

Explosion protected equipment

The requirements for electrical equipment to be used in hazardous areas are outlined in the standard series EN 60079. In addition to the requirements, markings are defined as well. A marking according to ATEX as well as a marking to indicate the equipment protection level (EPL = Equipment Protection Level) is required. With the introduction of the EPL, it is now possible to allocate which device may be used in which explosive atmosphere or area outside of Europe as well.
Ignition protection types provide information about the protective measures incorporated into a device:

### Ignition protection types and CENELEC standards

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>CENELEC standard</th>
<th>Ignition protection type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex</td>
<td>EN 60079-0</td>
<td>General requirements</td>
</tr>
<tr>
<td>Ex o</td>
<td>EN 60079-6</td>
<td>Oil immersion</td>
</tr>
<tr>
<td>Ex p</td>
<td>EN 60079-2</td>
<td>Pressurized encapsulation</td>
</tr>
<tr>
<td>Ex m</td>
<td>EN 60079-18</td>
<td>Encapsulation</td>
</tr>
<tr>
<td>Ex q</td>
<td>EN 60079-5</td>
<td>Powder / Sand filling</td>
</tr>
<tr>
<td>Ex d</td>
<td>EN 60079-1</td>
<td>Explosion/Flame-proof encapsulation</td>
</tr>
<tr>
<td>Ex e</td>
<td>EN 60079-7</td>
<td>Increased safety</td>
</tr>
<tr>
<td>Ex ia</td>
<td>EN 60079-11</td>
<td>Intrinsic safety (also for dust) ia required for Zone 0 &amp; 20</td>
</tr>
<tr>
<td>Ex ib</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ec ic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dust</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex ta</td>
<td>EN 60079-31</td>
<td>ta required for Zone 0</td>
</tr>
<tr>
<td>Ex tb</td>
<td></td>
<td>tb required for Zone 1</td>
</tr>
<tr>
<td>Ex tc</td>
<td></td>
<td>tc required for Zone 2</td>
</tr>
</tbody>
</table>

### Comparison: Designation according to IEC (2007) / CENELEC (2009) and EU directive 94/9/EG (ATEX)

<table>
<thead>
<tr>
<th>EPL (Equipment Protection Level)</th>
<th>according to IEC / CENELEC</th>
<th>according to EU directive 94/9/EG</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ma</td>
<td>M1</td>
<td>Mining</td>
<td></td>
</tr>
<tr>
<td>Mb</td>
<td>M2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ga</td>
<td>1G</td>
<td>explosive gas atmospheres</td>
<td></td>
</tr>
<tr>
<td>Gb</td>
<td>2G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gc</td>
<td>3G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Da</td>
<td>1D</td>
<td>area with combustible dust</td>
<td></td>
</tr>
<tr>
<td>Db</td>
<td>2D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dc</td>
<td>3D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Explosion group

Explosion group I encompasses equipment used for mining (coal dust and methane atmospheres). Explosion group II applies to all other areas (all other gases). For the ignition types “explosion/flame-proof encapsulation” and “intrinsic safety,” explosion group II is subdivided into IIA, IIB, and IIC. This subdivision relates to the different levels of ignitability in terms of ignition penetration and electrical sparks. Explosion group IIC covers all gases and vapors. In the future, we will also see explosion group III for flammable dusts, and this in turn will be subdivided in three other groups (IIIA: flammable fibers, IIIB: non-conductive dust, IIIC: conductive dust).
**CATEGORIZATION OF GASES AND VAPORS**

<table>
<thead>
<tr>
<th>Explosion group</th>
<th>Temperature category (max. permissible surface temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1 (450°C)</td>
</tr>
<tr>
<td>Ignition temp.</td>
<td>&gt; 450°C</td>
</tr>
<tr>
<td></td>
<td>&gt; 842°F</td>
</tr>
<tr>
<td>I</td>
<td>methanol</td>
</tr>
<tr>
<td>Ignition energy</td>
<td>more than 0.18 mJ</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>IIA</td>
<td>hydrogen cyanide</td>
</tr>
<tr>
<td>Ignition energy</td>
<td>0.06 to 0.18 mJ</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>IIC</td>
<td>hydrogen</td>
</tr>
<tr>
<td>Ignition energy</td>
<td>less than 0.06 mJ</td>
</tr>
</tbody>
</table>

**Temperature category**

Electrical equipment in group II is categorized according to the maximum surface temperatures that are allowed to come into contact with explosive atmospheres. The ignition temperature of the gas must be greater than the maximum surface temperature. T6 covers all gases and vapors. For dust explosion protection, the maximum surface temperature is specified in °C, e.g. T130 °C (266 °F).

The last part of the designation, the EC construction type certificate, shows among other things which testing station tested the equipment and when the first time.

**EC construction type certification:**

**BVS 10 ATEX E 080X**

X: Special conditions

U: Ex-component

Number of certificate

Complies with European Directive 94/9/EC

Year of EC certificate’s publication

Notified body having type-approved equipment
3.6 Laws and regulations in USA, Canada, and Mexico

Laws and regulations in most municipalities, states, and provinces in North America require certain products to be tested to a specific standard or group of standards by a Nationally Recognized Testing Laboratory (NRTL). There are a number of third party approval agencies in the US – UL, FM, ETL and many others. They all provide listings or classifications for explosion protection and provide some performance testing. They do not have any regulatory or legal status. They are primarily a certification to verify the safety of a product for insurance purposes and to minimize liability. Most of the NRTL are also recognized for certifications for Canada.

Underwriters Laboratories Inc. (UL)
is a private third party product safety certification organization. UL develops standards and test procedures for products, materials, components, assemblies, tools and equipment, chiefly dealing with product safety. UL is one of several companies approved for such testing by the U.S. federal agency OSHA (Occupational Safety and Health Administration). OSHA maintains a list of approved NRTL's.

UL develops standards for safety, often based on American National Standards (ANSI) and evaluates many types of products. A typical standard for electronic products includes not only requirements for electrical safety, but also risk of fire and mechanical hazards. UL evaluates products for compliance with specific safety requirements. UL develops its Standards to correlate with the requirements of installation codes, such as the National Electrical Code (NEC).

As one method of protection, UL evaluates instruments for Intrinsic Safety (IS) for use in hazardous areas. The IS rating means that the instrument will not be the source of ignition in a potentially explosive environment. The areas are defined by the type of hazard that may exist (Class), the possibility of a hazard being present in the area (Division) and the specific hazards that may be encountered (Group). UL 913 is the applicable Standard for Safety for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.
Hazardous Location:
An area where the possibility of explosion and fire is created by the presence of flammable gases, vapors, dusts, fibers or filings.

| Class I | Those areas in which flammable gases or vapors may be present in the air in sufficient quantities to be explosive or ignitable. |
| Class II | Those areas made hazardous by the presence of combustible dust. |
| Class III | Those areas in which there are easily ignitable fibers or filings present, due to type of material being handled, stored or processed. |

| Division 1 | In which ignitable concentrations of hazards exists under normal operation conditions and/or where hazard is caused by frequent maintenance or repair work or frequent equipment failure. |
| Division 2 | In which ignitable concentrations of hazards are handled, processed or used, but which are normally in closed containers or closed systems from which they can only escape through accidental rupture or breakdown of such containers or systems. |

Groups
The gases and vapors of Class I locations are broken into four groups by the codes A, B, C and D. These materials are grouped according to the ignition temperature of the substance, its explosion pressure and other flammable characteristics.

Class II – dust locations – groups E, F & G. These groups are classified according to the ignition temperature and the conductivity of the hazardous substance.

| Group A | Acetylene |
| Group B | Hydrogen |
| Group C | Ethyl-Ether, Ethylene, Cycle Propane |
| Group D | Gasoline, Hexane, Naphtha, Benzene, Butane, Propane, Alcohol, Lacquer Solvent Vapors, Natural Gas |
| Group E | Metal Dust |
| Group F | Carbon Black, Coal, Coke Dust |
| Group G | Flour, Starch, Grain Dust |
### Operating Temperature Codes

<table>
<thead>
<tr>
<th>Maximum Temperature</th>
<th>NEC 500 CSA/UL Codes</th>
<th>IEC, ATEX NEC 505 Codes</th>
<th>Degrees C</th>
<th>Degrees F</th>
<th>Temperature Codes</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>450</td>
<td>842</td>
<td>T1</td>
<td>T1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>572</td>
<td>T2</td>
<td>T2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td>536</td>
<td>T2A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>500</td>
<td>T2B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>446</td>
<td>T2C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>215</td>
<td>419</td>
<td>T2D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>392</td>
<td>T3</td>
<td>T3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>356</td>
<td>T3A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>329</td>
<td>T3B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>320</td>
<td>T3C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>275</td>
<td>T4</td>
<td>T4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>248</td>
<td>T4A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>212</td>
<td>T5</td>
<td>T5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>185</td>
<td>T6</td>
<td>T6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These are simplified definitions – refer to National Electrical Code (NEC), Article 500 for complete definitions.

**Notes**

1) T1 through T2D not applicable to Class II location.
2) T2A through T2D, Class I Group D only.

**A typical UL classification would look like this:**

Only as to intrinsic safety for use in hazardous locations

**Class I&II, Div.1, Grps A,B,C,D,E,F,G**

Safe in atmospheres containing the gases listed in the chart above

Use in areas where the hazard could exist at any time

For use in potentially explosive gas or dust atmospheres
As part of a global harmonization effort, the Zone classification system can be used in North America on a voluntary basis (refer to article 505 of the NEC).

<table>
<thead>
<tr>
<th>NEC 500 CSA/UL Codes</th>
<th>IEC, ATEX NEC 505 Codes</th>
</tr>
</thead>
</table>
| **Division 1:** Where ignitable concentrations of flammable gases, vapors or liquids:  
  – Are likely to exist under normal operating conditions  
  – Exist frequently because of maintenance/repair work or frequent equipment failure | **Zone 0:** Where ignitable concentrations of flammable gases, vapors or liquids are present continuously or for long periods of time under normal operating conditions. |
| **Division 2:** Where ignitable concentrations of flammable gases, vapors or liquids:  
  – Are not likely to exist under normal operation conditions  
  – Are normally in closed containers where the hazard can only escape through accidental rupture or breakdown of such containers or in case of abnormal operation of equipment. | **Zone 1:** Where ignitable concentrations of flammable gases, vapors or liquids:  
  – Are likely to exist under normal operating conditions  
  – May exist frequently because of repair, maintenance operations or leakage |
| **Zone 2:** Where ignitable concentrations of flammable gases, vapors or liquids:  
  – Are not likely to exist under normal operation conditions  
  – Occur for only a short period of time  
  – Become hazardous only in case of an accident or some unusual operating condition |

**US Mine Safety Health Administration (MSHA)**

In the United States, equipment for use in mines must be approved by the US Mine Safety Health Administration (MSHA). MSHA maintains its own test facilities and has specific standards for electrical equipment being used in mines. MSHA defines and enforces safety regulations for all types of mining operations as legislated by the US Congress. This includes both underground and above ground coal mines, metal/nonmetal mines and large tunneling operations. The MSHA approval process is a legal requirement for use of equipment in a mine. MSHA considers all underground operations as hazardous locations. An MSHA approval reads a bit differently than a UL approval label:

**Permissible Gas Monitor**

Tested for intrinsic safety in Methane-Air mixtures only
The Canadian Standards Association (CSA)
The Canadian Standards Association (CSA) is a not-for-profit association composed of representatives from government, industry, and consumer groups. They are involved with many diverse areas of specialization such as climate change, business management and safety and performance standards, including those for electrical and electronic equipment, industrial equipment, boilers and pressure vessels, compressed gas handling appliances, environmental protection, and construction materials. CSA also provides advisory services, training materials and print and electronic published standard documents. Currently forty percent of all the standards issued by CSA are referenced in Canadian legislation.

CSA developed the CAN/CSA Z299 series of quality assurance standards still in use today. They are an alternative to the ISO 9000 series of quality standards.

They do all of the review and testing for Intrinsic Safety and conduct performance testing. They propose standards which are often codified into law or become de facto standards in Canada. CSA is a recognized NRTL for testing and safety, not only for Canada but also for the US.

Mexican Safety and Health
Mexican Safety and Health is controlled by the Norma Official Mexicana (NOM) regulations. Nom -005-STPS-1998 is very comparable to 29 CFR 1910.1200, the basic OSHA regulation in the US. While using US OSHA regulations as a basis, the Mexican government has implemented local requirements. They accept the testing and standards of any of the Nationally Recognized Testing Labs.
# HAZARDOUS LOCATIONS CLASSIFICATIONS

<table>
<thead>
<tr>
<th>Classification</th>
<th>IEC, ATEX NEC 505 Codes</th>
<th>NEC 500 CSA/UL Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas &amp; Vapors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetylene</td>
<td>Group IIC</td>
<td>Class I/ Group A</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>Group IIB</td>
<td>Class I/ Group B</td>
</tr>
<tr>
<td>Ethylene</td>
<td>Group IIB</td>
<td>Class I/ Group C</td>
</tr>
<tr>
<td>Propane</td>
<td>Group IIA</td>
<td>Class I/ Group D</td>
</tr>
<tr>
<td>Methane</td>
<td>Group I or IIA</td>
<td>Class I/ Group D</td>
</tr>
<tr>
<td><strong>Dust</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal</td>
<td>Group IIC</td>
<td>Class II/ Group E</td>
</tr>
<tr>
<td>Coal</td>
<td>Group I or III C</td>
<td>Class II/ Group F</td>
</tr>
<tr>
<td>Grain</td>
<td>Group III B</td>
<td>Class II/ Group G</td>
</tr>
<tr>
<td>Fibers (All)</td>
<td>Group III A</td>
<td>Class III</td>
</tr>
</tbody>
</table>
If the danger of toxic gases or vapors can be narrowed down to a single gas or conductive component, then single-gas measuring and warning devices are the ideal solution for personal monitoring in the workplace. They are small, robust, and ergonomic. These devices are usually attached to the work clothing near the breathing area, but do not limit the movement of workers. They monitor the ambient air continuously and produce an alarm (visual, acoustic, and by vibration) if the gas concentration exceeds an alarm limit preset in the device. This enables employees to respond immediately to dangers if accidents occur during normal operation, or if unforeseen events occur during maintenance and repair work.
Dräger Pac Family

Each instrument of the Pac family is equipped with one XXS sensor. These miniaturized electrochemical sensors enable a small, ergonomic instrument design. The sensor sits right behind a replaceable dust and water filter which protects it from outside influences. A powerful battery and the extended application range from -40°C to +55°C for the Pac 6x00/8x00 series provide more safety even in extreme environments. Additional sensors, like ozone and phosgene, or the use of dual sensors, like CO LC / O₂ and the hydrogen compensated CO sensor (CO H₂-CP), extend the range of application of the handy single gas detectors. The green illuminating D-Light shows the device is tested and ready. Alarm thresholds are stored in the instrument (A₁ = pre-alarm/A₂ = main alarm). Instruments with an oxygen sensor provide the possibility of alarming with a pre- and a main alarm for both rising and falling concentrations. If the gas concentrations exceed or fall below these alarm thresholds, the instrument sets off an audible, visual, and vibrating alarm. A large non-verbal display indicates important information such as the respective gas concentration or remaining operating time and battery capacity. Durability and explosion protection are two other important factors when choosing the right gas detection device. Accessories like the Bump Test Station or X-dock Module can be easily used for the entire instrument family.

Dräger X-am 5100

The Dräger X-am 5100 is designed for the measurement of the gases / vapors hydrazine, hydrogen peroxide, hydrogen chloride and hydrogen fluoride. These special gas hazards are difficult to detect because they adsorb to different surfaces. The open gas inlet projecting from the device prevents that adsorbing surfaces are between the gas and the gas sensor. A rapid response of the proven XS sensors is thus also ensured for these special gases.
Dräger Pac 3500/5500/7000

Small and robust, economical and powerful. The compact Dräger Pac family is equipped with the latest sensor technology and a multitude of features, and is tailor-made for the diverse demands of industry.

OTHER BENEFITS

- Robust: water- and dust-protection compliant with IP 68
- Ideal solution for functional testing and adjustment
- Flexible alarm and warning features
- Long sensor and device life time at Dräger Pac 5500 and 7000
- Reliable gas entry from both sides

Personal monitoring
ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS

<table>
<thead>
<tr>
<th>Personal monitoring</th>
<th>Robust, IP 68</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reliable gas inlets from both sides</td>
</tr>
<tr>
<td></td>
<td>Response time of 10 seconds</td>
</tr>
</tbody>
</table>

The impact-resistant housing is covered with protective rubber, which makes it resistant to corrosive chemicals. A strong, rotating crocodile clip made from stainless steel allows the unit to be fixed securely to clothing or belt.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>84 × 64 × 25 mm; 3.3 x 2.5 x 1.0 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>120 g; 3.8 oz.</td>
</tr>
<tr>
<td>Ambient conditions:</td>
<td>-30 to +50°C; -20 to +120°F</td>
</tr>
<tr>
<td>Temperature</td>
<td>700 to 1,300 hPa</td>
</tr>
<tr>
<td>Pressure</td>
<td>10 to 90% r.h.</td>
</tr>
<tr>
<td>Humidity</td>
<td>IP 68</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>360°</td>
</tr>
<tr>
<td>Alarms:</td>
<td>Multi-tone alarm &gt; 90 dB in 30 cm (1 ft.)</td>
</tr>
<tr>
<td>Visual</td>
<td>yes</td>
</tr>
<tr>
<td>Acoustic</td>
<td>Replaceable lithium battery</td>
</tr>
<tr>
<td>Vibration</td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td></td>
</tr>
</tbody>
</table>
# Dräger Pac 3500/5500/7000

## FEATURES COMPARISON

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dräger Pac 3500</th>
<th>Dräger Pac 5500</th>
<th>Dräger Pac 7000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compatible sensors:</strong></td>
<td>O₂, CO, H₂S-LC</td>
<td>O₂, CO, H₂S-LC</td>
<td>O₂, CO, CO-LC, H₂S-LC, CO₂, Cl₂, HCN, HCN PC, NH₃, NO, NO₂, PH₃, SO₂, H₂S, OV; OV-A</td>
</tr>
<tr>
<td><strong>Operation time</strong></td>
<td>2 years</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Data logger:</strong></td>
<td>Events saved with date and time (up to 60 events)</td>
<td>Events saved with date and time (up to 60 events)</td>
<td>Concentrations and events saved together with date and time (up to 120 hours at 1 data set per minute).</td>
</tr>
<tr>
<td><strong>Battery life CO, H₂S</strong></td>
<td>8 hours/day, 2 years (1 minute alarm per day)</td>
<td>8 hours/day, 2 years (1 minute alarm per day)</td>
<td>24 hours/day &gt; 5,500 hours (1 minute alarm per day)</td>
</tr>
<tr>
<td><strong>Battery life O₂</strong></td>
<td>8 hours/day, 1 year (1 minute alarm per day)</td>
<td>8 hours/day, 1 year (1 minute alarm per day)</td>
<td>24 hours/day &gt; 2,700 hours (1 minute alarm per day)</td>
</tr>
<tr>
<td><strong>Bump test</strong></td>
<td>Pushing the OK-button 3 times</td>
<td>Pushing the OK-button 3 times</td>
<td>Automatic</td>
</tr>
<tr>
<td><strong>Approvals:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ATEX</strong></td>
<td>ATEX I M1 / II 1G Ex ia I/IIC T4</td>
<td>ATEX I M1 / II 1G Ex ia I/IIC T4</td>
<td>ATEX I M1 / II 1G Ex ia I/IIC T4</td>
</tr>
<tr>
<td><strong>cULus</strong></td>
<td>Ex ia II CT4</td>
<td>Ex ia II CT4</td>
<td>Ex ia II CT4</td>
</tr>
<tr>
<td><strong>IECEEx</strong></td>
<td>PO Ex ia I X</td>
<td>PO Ex ia I X</td>
<td>PO Ex ia I X</td>
</tr>
<tr>
<td><strong>EAC/Ex approval</strong></td>
<td>0 Ex ia IIC T4 X</td>
<td>0 Ex ia IIC T4 X</td>
<td>0 Ex ia IIC T4 X</td>
</tr>
<tr>
<td><strong>RUS – Pattern Approval</strong></td>
<td>XXS EC sensors: O₂, H₂S, CO</td>
<td>XXS EC sensors: O₂, H₂S, CO</td>
<td>XXS EC sensors: O₂, H₂S, CO, CO LC, H₂S LC, Cl₂, CO₂, HCN, HCN PC, PH₃, NH₃, NO₂, SO₂, OV, OV-A</td>
</tr>
<tr>
<td><strong>Certificate of measuring instruments</strong></td>
<td>-</td>
<td>-</td>
<td>96/98/EC</td>
</tr>
<tr>
<td><strong>MED</strong></td>
<td>-</td>
<td>-</td>
<td>Electromagnetic compatibility (Directive 2014/30/EU)</td>
</tr>
<tr>
<td><strong>CE mark</strong></td>
<td>-</td>
<td>-</td>
<td>Electromagnetic compatibility (Directive 2014/30/EU)</td>
</tr>
</tbody>
</table>

Electromagnetic compatibility (Directive 2014/30/EU)
### ACCESSORIES

**Calibration accessories**

- Dräger Bump Test Station
- Dräger X-dock

**Communication accessories:**

Dräger CC-Vision Basic, free of charge

in the internet [www.draeger.com](http://www.draeger.com)

---

<table>
<thead>
<tr>
<th>Dräger Bump Test Station</th>
<th>Dräger X-dock Pac 5300</th>
<th>Communication cradle</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-401-2005</td>
<td>D-4780-2012</td>
<td>D-77485-2013</td>
</tr>
</tbody>
</table>
Dräger Pac 6000/6500 and Dräger Pac 8000/8500

Reliable and precise even in harsh conditions. Quick sensor response times and a powerful battery ensure additional safety. With the broad measurement spectrum the Pac family can be used in a variety of applications including in applications with special gases such as ozone and phosgene. The instrument can be equipped with a hydrogen-compensated CO sensor or with a Dräger dual sensor. This enables the detection of two gases in one measurement, either H₂S with CO or O₂ with CO.

OTHER BENEFITS

- Compliance-Signal (D-Light) for more safety
- Extended application range due to a wide temperature range and additional sensors
- Cost-efficient because of durable sensors and powerful battery
- Clear reading due to white backlight
- Optimal monitoring of oxygen concentrations (saturation or deficiency) with respective pre and main alarms
- Ready for use again quickly, due to easy changeable dust filter in case of pollution
**TECHNICAL SPECIFICATIONS**

**Dimensions (B x H x T) (mm)**
- 64 x 84 x 20 without clip
- approx. 106 (113 with clip)

**Typ. battery life:**
- 24 months at 24 h usage/day, 1 min alarm/day
- O₂ sensor: 10 months
- Dual sensors (w/o O₂): 22 months

**Ambient conditions:**
- Temperature: -30 to +55 / -22 to 131 °F
- Pressure (hPa): 700 to 1300
- Humidity (% r. h. non-condensing): 10 to 90
- Ingress protection: IP 68

**Alarms:**
- Visual: 360°
- Acoustic (dB): Multi-tone > 90 in 30 cm (1ft.)
- Vibration: yes

**Power supply:**
- Replaceable lithium thionyl chloride battery

The Pac 6x00/8x00 is protected against water, dust and other foreign bodies by a special membrane filter. When the filter becomes heavily soiled in use, you quickly and easily can replace it yourself. The device is then ready to use again right away. Thanks to the powerful battery, Pac instruments with H₂S or CO sensors can be used for two years at a 24/7 usage and one alarm minute per day without having to change the battery.

**ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS**

<table>
<thead>
<tr>
<th>Personal monitoring</th>
<th>Clear sensor identification by colored instrument marking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alarm display is configurable as “not acknowledge-able”</td>
</tr>
<tr>
<td></td>
<td>More applications because of extended sensor portfolio including dual XXS sensors</td>
</tr>
<tr>
<td></td>
<td>Increased resilience to environmental influences, for example usage up to -40°C</td>
</tr>
<tr>
<td></td>
<td>Third alarm threshold for CO monitoring</td>
</tr>
<tr>
<td></td>
<td>Same accessories as for Pac 3500-7000 family</td>
</tr>
</tbody>
</table>

**Specially suited for the following applications:**

- Personal monitoring
- Clear sensor identification by colored instrument marking
- Alarm display is configurable as “not acknowledge-able”
- More applications because of extended sensor portfolio including dual XXS sensors
- Increased resilience to environmental influences, for example usage up to -40°C
- Third alarm threshold for CO monitoring
- Same accessories as for Pac 3500-7000 family
## FEATURES COMPARISON

<table>
<thead>
<tr>
<th>Compatible sensors</th>
<th>Dräger Pac 6000</th>
<th>Dräger Pac 6500</th>
<th>Dräger Pac 8000</th>
<th>Dräger Pac 8500</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXS EC Sensors</td>
<td>CO LC, O₂, H₂S LC, SO₂</td>
<td>CO LC, O₂, H₂S LC, SO₂</td>
<td>NO, CO₂, Cl₂, HCN, NH₃, PH₃, OV, OV-A, NO₂ LC, Ozone, Phosgene</td>
<td>CO H₂-CP, CO LC/H₂S LC, CO LC/O₂</td>
</tr>
<tr>
<td>Operation time</td>
<td>2 Years</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Event logger/Data logger:</td>
<td>Storage of peak or average values and events with date and time</td>
<td>Storage of peak or average values and events with date and time</td>
<td>Storage of peak or average values and events with date and time</td>
<td>Storage of peak or average values and events with date and time</td>
</tr>
<tr>
<td>Battery life (under standard conditions)</td>
<td>24 months</td>
<td>24 months</td>
<td>24 months</td>
<td>24 months</td>
</tr>
<tr>
<td>24 h usage/day, 1 min alarm/day</td>
<td>O₂ sensor: 10 months</td>
<td>O₂ sensor: 10 months</td>
<td>O₂ sensor: 10 months</td>
<td>O₂ sensor: 10 months</td>
</tr>
<tr>
<td>Approvals:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATEX</td>
<td>SIRA 16 ATEX 2362</td>
<td>SIRA 16 ATEX 2362</td>
<td>SIRA 16 ATEX 2362</td>
<td>SIRA 16 ATEX 2362</td>
</tr>
<tr>
<td>CSAₜₜₜ</td>
<td>Class I, Zone 0, Ga</td>
<td>Class I, Zone 0, Ga</td>
<td>Class I, Zone 0, Ga</td>
<td>Class I, Zone 0, Ga</td>
</tr>
<tr>
<td>Temp Code T₄</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IECEEx</td>
<td>IECEEx CSA 16.0054</td>
<td>IECEEx CSA 16.0054</td>
<td>IECEEx CSA 16.0054</td>
<td>IECEEx CSA 16.0054</td>
</tr>
<tr>
<td>Ex ia I Ma</td>
<td>Ex ia I Ma</td>
<td>Ex ia I Ma</td>
<td>Ex ia I Ma</td>
<td>Ex ia I Ma</td>
</tr>
<tr>
<td>Ex ia IIC T₄ Ga</td>
<td>Ex ia IIC T₄ Ga</td>
<td>Ex ia IIC T₄ Ga</td>
<td>Ex ia IIC T₄ Ga</td>
<td>Ex ia IIC T₄ Ga</td>
</tr>
<tr>
<td>CE mark</td>
<td>Electromagnetic compatibility (Direction 2014/30/EU)</td>
<td>Electromagnetic compatibility (Direction 2014/30/EU)</td>
<td>Electromagnetic compatibility (Direction 2014/30/EU)</td>
<td>Electromagnetic compatibility (Direction 2014/30/EU)</td>
</tr>
</tbody>
</table>
## ACCESSORIES

<table>
<thead>
<tr>
<th>Calibration accessories</th>
<th>Communication accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Bump Test Station</td>
<td>Dräger CC-Vision Basic, free of charge in the internet <a href="http://www.draeger.com">www.draeger.com</a></td>
</tr>
<tr>
<td>Dräger X-dock 5300 Pac Series</td>
<td></td>
</tr>
</tbody>
</table>

### Images:
- **Dräger Bump Test Station**
- **Dräger X-dock Pac 5300**
- **Communication-cradle**
- **Sensor grid black**
- **Sensor grid silver**
Dräger X-am 5100

The Dräger X-am 5100 is designed for the measurement of the gases / vapors hydrazine, hydrogen peroxide, hydrogen chloride and hydrogen fluoride. These special gas hazards are difficult to detect because they adsorb to different surfaces. The open gas inlet projecting from the device prevents that adsorbing surfaces are between the gas and the gas sensor. A rapid response of the proven XS sensors is thus also ensured for these special gases. Dräger X-am 5100 can only be operated in diffusion mode.

OTHER BENEFITS

Usage in industrial area – Ex approved
Measurement performance of the sensors are independent of the device

ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS

Personal monitoring

- small and light
- rapid respond time of the Dräger XS Sensors
- Battery life > 200 hours
**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>47 x 129 x 55 mm; 1.85 x 5.08 x 2.17 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>ca. 220 g; 7 oz.</td>
</tr>
<tr>
<td>Ambient conditions:</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>-20 to +50; -4 to +120°F</td>
</tr>
<tr>
<td>Pressure</td>
<td>700 to 1300</td>
</tr>
<tr>
<td>Humidity</td>
<td>10 to 95 % r.H.</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP 54</td>
</tr>
<tr>
<td>Alarms:</td>
<td></td>
</tr>
<tr>
<td>Visual</td>
<td>180°</td>
</tr>
<tr>
<td>Acoustic</td>
<td>Multi-tone alarm &gt; 90 dB in 30 cm (1 ft.)</td>
</tr>
<tr>
<td>Vibration</td>
<td>yes</td>
</tr>
<tr>
<td>Power supply</td>
<td></td>
</tr>
<tr>
<td>Battery life (h)</td>
<td>&gt; 200</td>
</tr>
<tr>
<td>Charging time (h)</td>
<td>&lt; 4</td>
</tr>
<tr>
<td>Compatible sensors</td>
<td>XS Sensors XS H₂O₂, XS Hydrazine, XS HF/HCL unlimited</td>
</tr>
<tr>
<td>Operation time</td>
<td>can be read out via IR &gt; 1000 h at a recording interval of 1 value per minute</td>
</tr>
<tr>
<td>Data logger</td>
<td></td>
</tr>
<tr>
<td>Approvals:</td>
<td></td>
</tr>
<tr>
<td>ATEX</td>
<td>I M1 Ex ia I Ma</td>
</tr>
<tr>
<td>IECEx</td>
<td>II 1G Ex ia IIC T4/T3 Ga</td>
</tr>
<tr>
<td>c CSA us</td>
<td>Ex ia I Ma</td>
</tr>
<tr>
<td>CE mark</td>
<td>Ex ia IIC T4/T3 Ga</td>
</tr>
<tr>
<td></td>
<td>Class I, Div. 1, Groups A,B,C,D TC T4/T3</td>
</tr>
<tr>
<td></td>
<td>Class I, Zone 0, A/Ex ia IIC T4/T3 /Ga</td>
</tr>
<tr>
<td></td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td></td>
<td>(Directive 2014/30/EU)</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

| General accessories | Charging module                             |
|                    | Car charging connection cable 12V/24V       |
| Calibration accessories | Communication accessories:             |
3.8 Multi-gas measuring instruments
If hazardous substances (Ex-Ox-Tox) occur in the work place, then it is advisable to use continuous multi-gas measuring instruments. These enable different measuring approaches be used (infrared, catalytic bead, PID, and electrochemical sensors) in one device, thus drawing on the strengths of the measurement principles.

The constellation of the sensors depends on the application. Up to 7 gases can be detected in real-time and continuously. As well as being used for personal monitoring and area monitoring, multi-gas measuring instruments can also be used for clearance monitorings and leak detection with the help of optional accessories. Multi-gas measuring instruments include the Dräger X-am 2500, X-am 5000, X-am 5600, X-am 7000, and X-am 8000.

**DRÄGER X-AM 8000 - THE ALLROUNDER**

- Glowing green D-light indicates: tested and ready for use
- 1 sensor slot for CatEx or IR sensors
- 3 electrochemical sensor slots: A selection of electrochemical XXS sensors, including dual sensors
- Powerful internal pump
- Warning function Visual and 100dB multi-tone alarms
- Loud horn
- Colour display with zoom
Dräger offers a complete product series for the simultaneous measurement of different gases. The Dräger X-am 2500/5000/5600 family is the latest instrument generation of Dräger's gas detection technology. Its practical design, cell-phone size, low weight, and the long-life of the electrochemical XXS sensors make this family the perfect companion for personal monitoring. Combined with an optional external pump and hose or probe, they are perfect for confined space entry measurements. The Dräger X-zone 5500 extends the application of these instruments to innovative area monitoring instruments with various application possibilities (does not apply to X-am 2500).

**OTHER BENEFITS**
- Robust: water and dust protection compliant with IP 67
- Reliable gas inlets from both sides
- Precise, vapor-sensitive Ex monitoring
- Ideal solution for functional testing and calibration
  (automatic testing and calibration station – Dräger X-dock & Dräger Bump Test Station)

![Personal monitoring](image1)

![Confined space entry](image2)

![Leak detection](image3)

![Area Monitoring](image4)
**ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS**

<table>
<thead>
<tr>
<th>Personal monitoring</th>
<th>Durable, IP 67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confined space entry</td>
<td>High level of flexibility using external pump (with 45 m or 148 ft. tube), adaptable to various probes</td>
</tr>
<tr>
<td>Leak detection</td>
<td>Catalytic sensors and XXS sensors respond quickly</td>
</tr>
<tr>
<td>Area Monitoring</td>
<td>Wireless fenceline, available for use in Zone 0</td>
</tr>
</tbody>
</table>

An optional external pump, which can be operated using a hose of up to 45 meters (148 ft.) long, is an ideal solution for applications involving the confined space entry measurements in tanks, pipelines, etc. When the instrument is placed in the cradle, the pump automatically starts. The daily bump test of the instruments is easier and more comfortable than ever before: With the Dräger Bump Test Station no power is necessary and the instruments can be tested fast and easily.

The Dräger X-dock offers complete comfort, easy operation and central documentation and all with reduced gas consumption. Thus, Dräger's test stations support safety on the highest level and this is time and cost-effectively.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>47 × 129 × 31 mm; 1.8 x 5.1 x 1.2 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>220 g; 8.8 oz.</td>
</tr>
<tr>
<td>Ambient conditions:</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>-20 to +50°C; -4 to +122°F</td>
</tr>
<tr>
<td></td>
<td>15 minutes to -40°C; -40°F</td>
</tr>
<tr>
<td>Pressure</td>
<td>700 to 1,300 hPa</td>
</tr>
<tr>
<td>Humidity</td>
<td>10 to 95% r.h.</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP 67</td>
</tr>
<tr>
<td>Alarms:</td>
<td>180°</td>
</tr>
<tr>
<td>Visual</td>
<td>Multi-tone &gt; 90 dB in 30 cm (1 ft.)</td>
</tr>
<tr>
<td>Acoustic</td>
<td>yes</td>
</tr>
<tr>
<td>Vibration</td>
<td>Alkaline, rechargeable NiMH for alkaline pack, T4 rechargeable battery pack</td>
</tr>
<tr>
<td>Power supply</td>
<td>approx. 10</td>
</tr>
<tr>
<td>Operating period (h)</td>
<td>&lt; 4</td>
</tr>
<tr>
<td>Charging time (h)</td>
<td>Maximum hose length 45 m; 148 ft.</td>
</tr>
<tr>
<td>Pump mode</td>
<td>(Dräger X-am Pump)</td>
</tr>
</tbody>
</table>
Dräger X-am 2500/5000/5600

FEATURES COMPARISON

**Compatible sensors**

<table>
<thead>
<tr>
<th>Dräger X-am 2500</th>
<th>Dräger X-am 5000</th>
<th>Dräger X-am 5600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible 1 - 4 sensors. One catalytic sensor and XXS EC sensors (see XXS EC sensors)</td>
<td>Flexible from 1 to 4 sensors. One catalytic sensor and 3 XXS EC sensors (see XXS EC sensors)</td>
<td>Flexible from 1 to 4 sensors One IR sensor and 3 XXS EC sensors (see XXS EC sensors)</td>
</tr>
</tbody>
</table>

**XXS EC sensors**


**Catalytic sensors**

| Cat Ex 125 PR | 0–100% LEL 0–5 Vol.% CH4 | 0–100% LEL 0–100 Vol.% CH4 Special calibration for organic vapors is possible |
| Cat Ex 125 Mining PR | 0–100% LEL 0–100 Vol.% CH4 | |

**Infrared sensors**

| IR Ex | IR CO2 | IR CO2/Ex |
| Can be read out via Infrared > 1000 hours with 4 gases and a recording interval of 1 value per minute | Can be read out via Infrared > 1000 hours with 5 gases and a recording interval of 1 value per minute | Can be read out via Infrared > 1000 hours with 6 gases and a recording interval of 1 value per minute |

**Data logger**

| II 1G Ex da ia IIC T4/T3 Ga | II 1G Ex da ia IIC T4/T3 Ga |
| I M1 Ex da ia I Ma | I M1 Ex da ia I Ma |

**Approveds:**

| ATEX | Measurement performance certificate | c CSA us |
| II 1G Ex da ia IIC T4/T3 Ga I M1 Ex da ia I Ma | for O2 according to EN 50104/CO and H2S according to EN 45544/Methane to Nonane according to EN 60079 and EN 50271 | Div.1, Class I, Groups A,B,C,D T4/T3 Class II, Groups E,F,G A/Ex da ia IIC T4/T3/Gb |

| II 1G Ex ia IIC T4/T3 Ga I M1 Ex ia I Ma | for O2 according to EN 50104/CO and H2S according to EN 45544/Methane to Nonane according to EN 60079 and EN 50271 | Div.1, Class I, Groups A,B,C,D T4/T3 Class II, Groups E,F,G A/Ex ia IIC T4/T3/Ga |
### FEATURES COMPARISON

<table>
<thead>
<tr>
<th>IECEx</th>
<th>Dräger X-am 2500</th>
<th>Dräger X-am 5000</th>
<th>Dräger X-am 5600</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ex da ia I Ma</td>
<td>Ex da ia I Ma</td>
<td>Ex ia I Ma</td>
</tr>
<tr>
<td></td>
<td>Ex da ia IIC T4/T3</td>
<td>Ex da ia IIC T4/T3</td>
<td>Ex ia IIC T4/T3 Ga</td>
</tr>
<tr>
<td>MED</td>
<td>MED 96/98/EG</td>
<td>MED 96/98/EG</td>
<td>MED 96/98/EG</td>
</tr>
<tr>
<td>MSHA</td>
<td>according the requirement &quot;Title 30 Code of Federal Regulations, Part 22 for use in gassy underground mines&quot;</td>
<td>according the requirement &quot;Title 30 Code of Federal Regulations, Part 22 for use in gassy underground mines&quot;</td>
<td>-</td>
</tr>
<tr>
<td>EAC Ex</td>
<td>PO Ex ia 1X / 0 Ex ia IIC T3 X oder PB Ex d ia 1X / 1 Ex d ia IIC T4/T3 X</td>
<td>PO Ex ia 1X / 0 Ex ia IIC T3 X oder PB Ex d ia 1X / 1 Ex d ia IIC T4/T3 X</td>
<td>PO Ex ia 1X / 0 Ex ia IIC T4/T3 X</td>
</tr>
</tbody>
</table>

### ACCESSORIES

#### General accessories
- Charging module
- Car charging connection cable 12V/24V

#### Calibration accessories
- Dräger Bump Test Station
- Dräger X-dock
- Dräger CC-Vision Basic, free of charge on www.draeger.com
- Nonane tester (for function tests)

#### Pump accessories
- Dräger X-am Pump
- Hoses of various lengths
- Probes

#### Area Monitoring
- Dräger X-zone 5500 (for Dräger X-am 5000/5100/5600)
Dräger X-Zone 5500

State-of-the-art area monitoring – in combination with the gas detectors Dräger X-am 5000, 5100 and 5600 the Dräger X-zone 5500 is suitable for the measurement of one to six gases. The easy transportable, robust and waterproof X-zone expands the mobile gas detection to a unique system with various different application possibilities.

OTHER BENEFITS

<table>
<thead>
<tr>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP 67 and Zone 0 approval for industrial applications</td>
</tr>
<tr>
<td>Wireless communication of X-zone’s for frequency: 868 MHz, 915 MHz, 433 MHz and 430 MHz</td>
</tr>
<tr>
<td>Robust and trouble-free connection up to 100m between two X-zone</td>
</tr>
<tr>
<td>Robust and simple to be used induction wireless charging technology available</td>
</tr>
<tr>
<td>PowerOff-function: via the potential-free alarm contact external equipment can be switched off during an alarm occur.</td>
</tr>
</tbody>
</table>

ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Monitoring</td>
<td>Up to 25 Dräger X-zone 5500 can be automatically interconnected to form a wireless fenceline. This allows a continuous monitoring of larger areas, e.g. pipelines or industrial tanks during industrial shutdowns, up to 120 hours.</td>
</tr>
<tr>
<td>Confined space entry</td>
<td>An optional integrated pump allows the continuous monitoring of confined space entry or locations which are difficult to access, for a distance of up to 45 m.</td>
</tr>
</tbody>
</table>
The Dräger X-zone 5500 transforms the Dräger personal gas detection instruments Dräger X-am 5000/5100/5600 into innovative area monitoring devices for a wide range of applications. A patented solution for more safety.

With the flexible sensor equipping of the Dräger X-am 5000, X-am 5100 and X-am 5600 the fields of application of the Dräger X-zone 5500 are manifold. Just insert a different Dräger X-am 5x00, which is equipped with an alternative sensor setup, and the Dräger X-zone 5500 is ready for a different application. The modern induction charger is simple to use, comfortable and has no issues with dirty charging contacts, so the device is easy to maintain.

The Dräger X-zone 5500 affords a new portable safety concept. Up to 25 Dräger X-zones can be automatically interconnected to form a wireless fenceline. This interconnection of the area monitoring devices allows the rapid safeguarding of larger areas, e.g. of pipelines or industrial tanks during industrial shutdowns. In the event of a gas alarm, the device transmits the alarm signal to all units that are part of the fenceline, which then signal a daughter alarm. The daughter alarm is, in contrast to the red master alarm, displayed green/red by the illuminated LED ring, thus allowing and providing a fast and easy recognition of the alarm itself as well as of the alarm-trigging devices. With the 360° alarm signalization, the acoustic and optical alarm can be recognized from all sides. This ensures an easy and clear evacuation alarm and alerting.

With the help of a potential-free alarm contact on the Dräger X-zone 5500 external devices such as horns, lamps or traffic lights can be switched. Alternatively, the signal from the alarm chain can be forwarded to a variety of evaluation devices via the Modbus interface:

The X-zone Com enables wireless access to the data of the Dräger X-zone 5500 via the GSM network. Status queries and alarms via SMS, periodical sending of data via e-mail or presentation in a cloud service - the X-zone Com sends all relevant data such as gas name, gas type, gas concentration, alarms and faults directly to the device of your choice.

For a local representation of the measured values, the Dräger X-zone 5500 can be connected to the Visualisation Panel. This allows gas concentrations to be displayed online via a table or a trend diagram. Via the web interface, the Visualisation Panel can be easily integrated into the local network and can be accessed and operated via a web browser. Both the X-zone Com and the Visualization Panel are designed in such a way that they can be put into operation with minimal installation effort.

As an alternative to these solutions, it is also possible to pass the Modbus signals of the Dräger X-zone 5500 directly to a control room. By this a direct connection to a PLC can be realized.
## TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>480 x 300 x 300 mm; 19 x 12 x 12 in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>10 kg; 353 oz. (24 Ah battery)</td>
</tr>
</tbody>
</table>

### Ambient conditions:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>-20 to +50; -4 to +122°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>700 to 1,300 hPa</td>
</tr>
<tr>
<td>Humidity</td>
<td>10 to 95 % r.h.</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP 67</td>
</tr>
</tbody>
</table>

### Alarms:

<table>
<thead>
<tr>
<th>Visual</th>
<th>360° LED (illuminated ring)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic</td>
<td>multi-tone: &gt; 108 in 1m (3.3 ft.)</td>
</tr>
<tr>
<td></td>
<td>&gt; 120 in 30 cm (1 ft.)</td>
</tr>
</tbody>
</table>

### Alarm output

Potential-free alarm contact for intrinsically safe circuits (6 pole); < 20 V to 0.25 A (0.15 A constant current); resistive load

### Radio transmission

Worldwide licencse-free ISM frequencies

Digital radio, robust and interference-free transmission up to 100 m.

### RF approval

- 868 MHz (EU, Norway, Switzerland, Turkey, South Africa, Singapore)
- 868.1 MHz (Malaysia)
- 915 MHz (USA, Canada, India, Australia), 922 MHz (Japan), 433 MHz (Russia)

### Power supply

Pb-Akku

### Operation period

Up to 120 h with a fully equipped Dräger X-am 5000/5600, up to 400 h with tox sensors and 30 minutes alarm per day

### Charging period

< 14 h, flexibke power supply;

External 100 - 240V charger (worldwide) or inductive wireless charging

### Pump mode

Internal pump / hose length: max 45 m

### Approval

<table>
<thead>
<tr>
<th>ATEX</th>
<th>I M1 Ex ia I Ma</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II 1G Ex ia IIC T3 Ga</td>
</tr>
<tr>
<td></td>
<td>II 2G Ex ia d IIC T4 Gb</td>
</tr>
<tr>
<td>c CSA us</td>
<td>Class I, Zone 0, AEEx ia IIC T3 Ga</td>
</tr>
<tr>
<td></td>
<td>Class I, Zone 1, AEEx ia d IIC T4 Gb</td>
</tr>
<tr>
<td>IECEx</td>
<td>Ex ia I Ma</td>
</tr>
<tr>
<td></td>
<td>Ex ia IIC T3 Ga</td>
</tr>
<tr>
<td></td>
<td>Ex ia d IIC T4 Gb</td>
</tr>
<tr>
<td>CE-mark</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td></td>
<td>(Directive 2014/30/EU) /</td>
</tr>
<tr>
<td></td>
<td>R&amp;TTE (Directive 99/005/EG)</td>
</tr>
<tr>
<td></td>
<td>ATEX (Directive 94/9 EC)</td>
</tr>
</tbody>
</table>
## ACCESSORIES

### General accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductive charger</td>
<td>Allowing easy charging</td>
</tr>
<tr>
<td>Plug-in charger</td>
<td></td>
</tr>
<tr>
<td>Pb-battery (24 Ah)</td>
<td></td>
</tr>
<tr>
<td>Socket, 30 cm high; for measurement of light gases</td>
<td></td>
</tr>
<tr>
<td>Alarm damper, for use within bump tests</td>
<td></td>
</tr>
<tr>
<td>X-zone Com, Holder X-am 5100</td>
<td></td>
</tr>
</tbody>
</table>

### Calibration accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bump Test adapter for function tests</td>
<td></td>
</tr>
<tr>
<td>Cover plate with diffusion adapter</td>
<td></td>
</tr>
<tr>
<td>Communication accessories:</td>
<td></td>
</tr>
<tr>
<td>Dräger CC-Vision Basic, free of charge on <a href="http://www.draeger.com">www.draeger.com</a></td>
<td></td>
</tr>
<tr>
<td>USB DIRA with USB cable</td>
<td></td>
</tr>
</tbody>
</table>

### Pump accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover plate with pump adapter</td>
<td></td>
</tr>
<tr>
<td>different measuring probes</td>
<td></td>
</tr>
<tr>
<td>extension hose, different length</td>
<td></td>
</tr>
</tbody>
</table>

---

### Images

- **Inductive charger**: Allowing easy charging
- **Socket**: For measurements of light gases
- **Cover plate**: With diffusion adapter
- **Set holder**: Dräger X-am 5100
- **Calibration and communication accessory**: USB DIRA with USB cable
- **Alarm damper**: For use within bump tests
- **X-zone Com**: |
- **Visualisation Panel**: |
Dräger X-am 7000

Multi-purpose: the Dräger X-am 7000 is the innovative solution for the simultaneous and continuous measurement of up to five gases. A combination of more than 25 sensors allows flexible solutions to individual monitoring tasks. The X-am 7000 can be equipped with three electrochemical and two infrared, catalytic bead sensors or photoionization sensors. It is the ideal companion in a variety of applications where the reliable detection of oxygen, toxic and combustible gases and vapors is necessary.

OTHER BENEFITS

- Integrated water- and dust-filter, and immersion-proof, as defined in IP 67
- Clearly structured, scratch-resistant display
- Very loud acoustic multi-tone alarm and 360° all-round visual alarm
- Intelligent charge management
- Intuitive software functions

Area monitoring   Confined space entry   Leak detection
ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS

<table>
<thead>
<tr>
<th>Area monitoring</th>
<th>Durable, IP 67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confined space entry</td>
<td>Built-in high-performance pump makes it possible to sample gas using a hose up to 45 m/150 ft. long.</td>
</tr>
<tr>
<td>Leak detection</td>
<td>Extensive portfolio of over 25 different DrägerSensors enables the detection of more than 100 gases and vapors.</td>
</tr>
</tbody>
</table>

Smart CatEx PR sensors enable the detection of flammable gases and vapors, and can be calibrated to as many as five different sensitivity levels. The unit can be switched automatically from % LEL to 100 Vol.-% in full-range mode. Leakages are reliably detected, visually in bar-graph mode and audibly in tracking mode.

The PID sensor detects organic vapors in very low concentrations. An integrated library of 20 substances, three user-adaptable channels, and an easy switch to leak detection mode makes the instrument flexible enough to meet your specific needs.

With the help of Dräger CC-Vision Basic software, up to 5 different detection applications can be saved within the instrument. By doing so, the use of different instrument configurations can be set for that specific application. During operation, a simple change between these set parameters can be done via the instrument's menu.

In addition to the electrochemical sensors, the catalytic and infrared sensors are automatically recognized by the instrument upon insertion. All sensors are pre-calibrated, and therefore a reconfiguration of the Dräger X-am 7000 can be done by simply changing the sensor. No additional service or maintenance is necessary.
## TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Dimensions (W × H × D)</th>
<th>150 × 140 × 75 mm; 5.9 x 5.6 x 3 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>600 g; 21 oz. (basic unit)</td>
</tr>
<tr>
<td></td>
<td>490 g; 17 oz. (rechargeable battery 3.0 Ah)</td>
</tr>
<tr>
<td></td>
<td>730 g; 26 oz. (rechargeable battery 6.0 Ah)</td>
</tr>
</tbody>
</table>

### Ambient conditions:

| Temperature | -20 to +55 °C, short-term, -40 to +60 °C, -5 to +130 °F, short-term -40 to +140 °F |
| Pressure    | 700 to 1,300 hPa |
| Humidity    | 10 to 95% r.h. |
| Ingress protection | IP 67 |

### Alarms:

| Visual | 360° |
| Acoustic | Multi-tone > 100 dB in 30 cm (1 ft.) |
| Vibration | no |

### Power supply

| Alkaline, rechargeable NiMH |

### Battery life (h)

| Alkaline: > 20 |
| NiMH: > 9 (4.8 V/3.0 Ah) |
| > 20 (4.8 V/6.0 Ah) |
| (complete with all sensors and 20 % of the time in pumped mode) |

### Charging time (h)

| 3.5 to 7, dependent on battery type |
| 100 h |

### Data logger

| Maximum hose length of 45 m (150 ft.) |

### Pump mode

| II 2G Ex ia IIC T4 Gb; -20 ≤ Ta ≤ + 60 °C |
| I M2 Ex ia I Mb |

### Approvals:

| Measurement performance certificate |
| EN 60079-29-1 |
| UL |
| Class I Div. 1 Group A, B, C, D, Temp. Code T4 |
| -20 ≤ Ta ≤ + 60 °C (NiMH); -20 ≤ Ta ≤ +40 °C (Alkaline) |
| CSA |
| Class I Div. 1 Group A, B, C, D, Temp. Code T4 |
| -20 ≤ Ta ≤ + 60 °C (NiMH); -20 ≤ Ta ≤ +40 °C (Alkaline) |
| IECEx |
| Ex ia I/IIC T4; -20 ≤ Ta ≤ + 60 °C |
| MED |
| MED 96/98/EC |
| CE mark |
| Electromagnetic compatibility (Directive 2014/30/EU) |
| ATEX (Directive 94/9EC) |
## ACCESSORIES

<table>
<thead>
<tr>
<th>General accessories</th>
<th>Calibration accessories</th>
<th>Pump accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging module</td>
<td>Dräger Bump Test Station</td>
<td>Pump adapter</td>
</tr>
<tr>
<td>Power supply for charging module</td>
<td>Dräger E-Cal</td>
<td>Pump membrane set</td>
</tr>
<tr>
<td>Power supply for vehicles</td>
<td>Communication accessories:</td>
<td>Probes</td>
</tr>
<tr>
<td>Car mounting kit</td>
<td>Dräger CC-Vision Basic, free of charge on</td>
<td>Hoses</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.draeger.com">www.draeger.com</a></td>
<td></td>
</tr>
</tbody>
</table>

---

### Images

- **ST-7491-2005** Dräger Bump Test Station
- **ST-551-2005** Dräger E-Cal
- **ST-4990-2005** Pump adapter
- **ST-14991-2008** Charging module

---
The Dräger X-am 8000 is a modern gas detector with a build-in, high performance pump for a simultaneous and continuous monitoring of up to seven gases. The instrument is optimized for confined space entry measurements on a professional basis before entering and working in confined spaces and containers and also for leak searches. With five sensor ports and a substantial number of different sensors, including dual sensors for the measurement of two gases on only one sensor port, a flexible adaption to individual measurement tasks is ensured.

One of the slots takes an infrared or photoionization sensor and a further slot takes an infrared or a catalytic bead sensor. Additionally, the instrument has 3 slots for electrochemical sensors in the XXS design for the measurement of oxygen and toxic gases. Despite the instrument’s manifold performance capability, the operation of the instrument is very simple and sets new standards. Especially the colour display, the operation with the three large buttons and the flexible change between diffusion and pump mode contribute to this.

**OTHER BENEFITS**

- Built-in high performance pump allowing a measurement with a hose up to 45 m
- Inductive charging of the power supply
- Use in Ex Zone 0, temperature class T4 in every assembly version
- High performance catalytic bead and infrared sensors and photoionization sensors with low detection limits

Wizards for different measurement tasks:

- Confined space entry measurements: Calculation of the necessary hose flooding time depending on the probe length, set measurement gas and temperature limit
- Leak search: visual and audible display of the gas concentration
- Use of pre-tubes with the PID sensor: benzene-selective measurement

Event report including impact detection
**ESPECIALLY SUITED FOR THE FOLLOWING APPLICATIONS**

<table>
<thead>
<tr>
<th>Confined space entry:</th>
<th>Wizard for confined space entry measurements, built-in, high performance pump, extensive probe portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak detection:</td>
<td>Wizard for leak detection, extensive assortment of DrägerSensors for the measurement of &gt; 100 different gases</td>
</tr>
<tr>
<td>Area monitoring:</td>
<td>IP67, accessory: base for placing the instrument upright, particularly loud horn (100 dB @ 30 cm / 1 ft.)</td>
</tr>
</tbody>
</table>

A Bluetooth® module enables the x-am 8000 to communicate with other systems and exchange data. This saves time and helps to manage the measurement tasks more efficiently.

An additional useful tool is the **Mobile Solution (Android App and Cloud)**, specially designed for the X-am 8000. It allows, for example, the readout of measurement values away from the point of sampling on the smartphone and thus support particularly confined space entry measurements. You also can easily and conveniently use the app to create and administer measurement reports.

To measure hard-to-detect hydrocarbons, you can fit the Dräger X-am 8000 with one of two high-performance PID sensors. Two different types are available: The PID HC covers a measurement range of 0 to 2,000 ppm (isobutylene). The PID LC ppb is particularly suited for a measurement range of 0 to 10 ppm (isobutylene) with a low resolution in the range below 1 ppm.

For benzene-specific measurements, the X-am 8000 can be used with a pre-tube. The advantage: you only need one measuring device for this application, which significantly reduces the costs of purchasing, maintaining and transporting devices in use. A built-in assistant supports the use of the pre-tubes.
TECHNISCHEN DATEN

<table>
<thead>
<tr>
<th>Dimension (B x H x T) (mm)</th>
<th>Approx. 179 x 77 x 42 mm; 70 x 30 x 16 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (g)</td>
<td>Approx. 495 g, depending on sensor selection, without transport belt, without pump</td>
</tr>
<tr>
<td></td>
<td>Approx. 550 g, depending on sensor selection, without transport belt, with pump</td>
</tr>
</tbody>
</table>

Ambient conditions:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>-20 to +50 °C; -4 to +122 °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure (hPa)</td>
<td>700 to 1300</td>
</tr>
<tr>
<td>Humidity (% r.h.)</td>
<td>10 to 90 % (to 95 % intermittent)</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP67</td>
</tr>
<tr>
<td>Display</td>
<td>High-contrast colour display</td>
</tr>
</tbody>
</table>

Alarms:

<table>
<thead>
<tr>
<th>Visual</th>
<th>3 LEDs &gt;red&lt; (gas alarms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic (dB)</td>
<td>Multi-tone typical 100 dB (A) at a distance of 30 cm (1 ft.)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Yes</td>
</tr>
<tr>
<td>Power supply</td>
<td>Lithium ion battery pack, inductively rechargeable</td>
</tr>
<tr>
<td>Operation time (h) diffusion</td>
<td>Typical 24 h(^\circ) (equipped with CatEx and 3 EC sensors)</td>
</tr>
<tr>
<td>Charging time (h)</td>
<td>Typical 4 h after use for one shift, maximum 10 h</td>
</tr>
</tbody>
</table>

Data logger

12 MB, e.g. 10 minutes per hour gas exposition with changing measurement values every second on all 7 channels = 210 h

Pump mode

Maximum hose length 45 m

\(^\circ\) Nominal runtime of the gas detector at ambient conditions 20 to 25 °C, 1013 hPa, less than 1 % of the time alarming, display energy save mode activated. The actual runtime varies by the ambient temperature and pressure, battery and alarm conditions.

FEATURES

Possible sensor selection

Flexible 1 – 5 sensors,
Slot 1: PID or IR sensor
Slot 2: IR or CatEx sensor
Slot 3 – 5: electrochemical sensors XXS design

XXS EC sensors

Amine, O\(_2\), O\(_2\) 100, CO LC, CO HC, COCl\(_2\), H\(_2\)S LC, H\(_2\)S HC, CO\(_2\), Cl\(_2\), HCN, HCN PC, NH\(_3\), NO, NO\(_2\), NO\(_2\) LC, Ozone, PH\(_3\), PH\(_3\) HC, SO\(_2\), OV, OV-A, CO H\(_2\)-CP (H\(_2\) compensated), H\(_2\), H\(_2\) HC, Odorant, O\(_2\) /CO LC, H\(_2\)S LC/CO LC

Catalytic bead sensors

CatEx 125 PR

0 – 100 % LEL
0 – 100 Vol.% CH\(_4\): optional automatic measurement range switch, Special calibration for organic vapours possible

CatEx 125 PR Gas

0 – 100 % LWL for CH\(_4\), C\(_2\)H\(_6\), C\(_2\)H\(_4\), C\(_2\)H\(_2\), C\(_3\)H\(_6\), C\(_3\)H\(_6\), C\(_4\)H\(_10\), H\(_2\)
0 – 100 Vol.% CH\(_4\): optional automatic measurement range switch
FEATURES

Infrared sensors
IR Ex
IR CO₂
IR Ex / CO₂

PID sensors
PID HC
PID LC ppb

Approvals:
CE mark

ATEX / IEC Ex
Measurement performance certificate (pending)
cULus (pending)

PERFORMANCE

0 – 100 % LEL
0 – 100 Vol.-% CH₄ / C₄H₁₀ / C₂H₄ / LPG
0 – 5 Vol.-% CO₂
0 – 100 % LEL
0 – 100 Vol.-% CH₄ / C₄H₁₀ / C₂H₄ / LPG
0 – 5 Vol.-% CO₂

0 – 2,000 ppm isobutylene
0 – 10 ppm Isobutylene

Electromagnetic compatibility
(Directive 2014/30/EU)
ATEX (Directive 2014/34/EU)

0 – 100 % LEL
0 – 100 Vol.-% CH₄ / C₄H₁₀ / C₂H₄ / LPG
0 – 5 Vol.-% CO₂

0 – 2,000 ppm isobutylene
0 – 10 ppm Isobutylene

 Divider 1, Class I, Groups A,B,C,D T4/T3

ACCESSORIES

Charging accessories
Charging module for inductive charging of the instrument
Power supply for vehicles 12V/24V

Calibration accessories
Dräger X-dock, Nonane tester

Communication accessories
Dräger CC-Vision Basic, free of charge on www.draeger.com

Pump accessories
Pump adapter

Area monitoring
Base to place the instrument upright for the area monitoring

Benzene-specific measurement
PID benzene pre-tube

Dräger X-am 8000 with base
Inductive power supply
Holder for labels
Pump adapter
4 Introduction to sensor technology

The heart of every measuring instrument is its sensor. The sensor is crucial in determining the quality of measurements, and therefore it has a fundamental influence on the safety of the user. The development and production of sensors is part of Dräger’s core competence.
4.1 Selecting the proper measurement method

Selecting the correct measuring principle is essential when detecting dangerous gases. Every measuring principle has its own strengths and limits, and each is better for particular groups of gases (flammable/toxic gases and oxygen). For this reason, it is important to ask which gases/vapors occur in the workplace. Generally speaking, we differentiate between the following gas risks:

Risk of explosion
- Wherever flammable gases and vapors occur, there is an increased risk of explosion. Typical areas for this include mining, refineries, the chemical industry, and many others. Infrared and catalytic bead sensors are used to detect this type of risk. These sensors usually detect gas concentrations in the LEL (lower explosion level) range, but some of them can also be used for the 100 Vol.-% range.

Lack or excess of oxygen
- A lack of oxygen is life-threatening. An excess of oxygen can affect the flammability of materials and can even cause auto-ignition. Electrochemical sensors are used to measure oxygen. Their measuring range is from between 0 and 25 Vol.-% all the way up to 100 Vol.-%.

Toxicity
- Poisonous substances can occur anywhere – in industrial production and processing, in transport (rail, road, ship), in the case of incomplete combustion (CO), and also as a result of completely naturally processes such as rotting and decomposition of biomass. Electrochemical and PID sensors are used to detect toxic gases.

The decision about which sensor type is the right one for a particular application also depends on other factors such as:
- What other hazardous material are present (cross-sensitivity)?
- Is it necessary to measure hazardous material selectively, or is it more sensible to measure a complete parameter?
# 4.2 Overview of detectable vapors and gases

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- XS OV
- XS OVA
- XS EC Organic Vapors
- XS EC Organic Vapors A
- XS EC Odorant
- XS Cl₂
- XS OV

**PID**
- SMART
- IR-EX
- IR-CO
- DUAL IR-EX/CO₂

**IR**
- SMART
- PID
- HC
- LC
- PPB

**CAT EX**
- SMART CAT EX (HC PR)
- SMART CAT EX (FR PR)
- CAT EX 125 PR
- CAT EX 125 PR-GAS

**SENSITIVITY**
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XS H₂ HC 68 11 365
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- Sensitivity data known
- Sensitivity not yet determined

XXS OV 68 11 530
XXS Amine 68 12 545
XXS Amine 68 12 545
XXS EC Hydrazine 68 09 190
XXS NO₂ 68 10 884
XXS NO₂ LC 68 12 600
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<td>Pentylalcohol</td>
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■ Sensitivity data known  □ Sensitivity not yet determined
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<th>CHEMICAL DESIGNATION</th>
<th>CAS NO.</th>
<th>CAT EX</th>
<th>IR</th>
<th>PID</th>
<th>EC</th>
<th>ORDER NO.</th>
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<tbody>
<tr>
<td>Petrol (Gasoline)</td>
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<td>Phenol</td>
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<td>Phosgene</td>
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<td>Phosphorous trichloride</td>
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- **Sensitivity**: Sensitivity of the chemical for the sensor.  
- **Sensitivity not yet determined**: Sensitivity not yet determined.
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<th>CHEMICAL DESIGNATION</th>
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<tr>
<td>Propene (Propylene)</td>
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<td>Propylene Oxide (1,2 Epoxy propane)</td>
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<td>Tetrahydrofuran</td>
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- Sensitivity
- Sensitivity not yet determined
- Data known
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<td>Tetrahydrothiophene</td>
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<td>o-Toluidine</td>
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<td>2,4-Toluene diisocyanate</td>
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<td>Trichloroethylene</td>
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<td>Triethylamine</td>
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<td>Trimethylamine</td>
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<tr>
<td>1,3,5-Trimethylbenzene</td>
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<td>Vinyl acetate</td>
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<td>Vinyl bromide</td>
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- ■ Sensitivity data known
- □ Sensitivity not yet determined
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<th>CHEMICAL DESIGNATION</th>
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<tr>
<td>Vinyl chloride (Chloroethylene)</td>
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<td>Vinlyliden chloride (1,1-DCE)</td>
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<td>o-Xylene</td>
<td>95-47-6</td>
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Under certain circumstances, flammable gases and vapors can be oxidized using the oxygen in the ambient air, causing heat of the reaction to be released. Typically, this is achieved through the use of special and suitably heated catalyst material, which slightly increases its temperature through the resulting heat of reaction. This slight increase in temperature is a measure of the gas concentration.
A small platinum coil is embedded in a porous ceramic bead with a diameter of less than 1 mm (0.04 in.). A current flows through the platinum coil, heating the pellistor to several hundred degrees. If the pellistor contains a suitable catalytic material, then its temperature will increase in the presence of flammable gases, which in turn causes the resistance of the platinum coil to increase. This change in resistance can then be evaluated electronically. The oxygen required for the combustion comes from the ambient air. This sensor works on the basis of the catalytic bead principle.

In order to eliminate changes in the ambient temperature, a second pellistor is used with almost the same structure, but which does not react to gas (it may, for example, contain no catalytic material). Coupled by a Wheatstone bridge, the two pellistors then form a sensor circuit, which is largely independent of the ambient temperature, and which can detect the presence of flammable gases and vapors. Because a catalytic bead sensor contains hot pellistors, it can – if the lower exposure level (LEL) is exceeded – become a source of ignition in its own right. This is prevented using a metal flame arrester. If an ignition occurs in the interior of the catalytic bead sensor, then the sensor's housing withstands the explosion pressure and the flame is cooled to below the ignition temperature of the gas by the flame arrester disk. This ensures that the flame does not penetrate through to the outside of the sensor. If the device is adjusted and calibrated accordingly, then the thermal conduction signal can be used to determine the gas concentration of methane between 0 and 100 Vol.-%.
**DrägerSensor® Smart CatEx (HC PR)**  
Order no. 68 12 970

<table>
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<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
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<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
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**MARKET SEGMENTS**
Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

**TECHNICAL SPECIFICATIONS**

**Detection limit:** 2% LEL

**Resolution:**
- 1.0% LEL for the measuring range 0 to 100% LEL
- 0.02 Vol.-% for the measuring range 0 to 5 Vol.-% CH₄ (methane)
- 1 Vol.-% for the measuring range 5 to 100 Vol.-% CH₄ (methane)

**Measurement range:**
- 0 to 100% LEL or
- 0 to 100 Vol.-% CH₄ (methane)

**General technical specifications**

**Ambient conditions**

- **Temperature:** (-20 to 55)°C (-4 to 131)°F
- **Humidity:** (10 to 95)% RH
- **Pressure:** (700 to 1,300) hPa
- **Warm-up time:** ≤ 5 minutes

**FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH METHANE IN AIR:**

**Response time:**
- ≤ 15 seconds (T₅₀)
- ≤ 25 seconds (T₉₀)

**Measurement accuracy**

- Sensitivity: ≤ ± 2.5% of measured value
- Linearity error: ≤ ± 2% LEL (0–40% LEL), ≤ ± 5% of measured value (40–100% LEL)

**Long-term drift**

- Zero point: ≤ ± 1% LEL/month
- Sensitivity: ≤ ± 2% LEL/month

**Influence of temperature**

- Zero point: ≤ ± 0.1% LEL/K at (-20 to 40)°C (-4 to 104)°F
- Sensitivity: ≤ ± 0.3% of measured value/K at (-20 to 40)°C (-4 to 104)°F

**Influence of humidity**

- Zero point: ≤ ± 0.03% LEL/% RH
- Sensitivity: ≤ ± 0.1% of measured value/% RH

**Effect of sensor poisons:**

- Hydrogen sulfide H₂S 1000 ppmh ≤ ± 5 % of measured value
- Hexamethyldisiloxane HMDS 10 ppmh ≤ ± 5 % of measured value
- Hexamethyldisiloxane HMDS 30 ppmh ≤ ± 20 % of measured value

After an exposure of 10 ppm HDMS for 5 hours, the sensitivity loss is less than 50 %. Halogenated hydrocarbons, heavy metals, substances containing silicone or sulfur, or substances that can polymerize → potential poisoning.

**Test gas:**

approx. 2 Vol.-% or 50 Vol.-% CH₄ test gas
### FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH PROPANE IN AIR:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 20 seconds (T50)</td>
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<tr>
<td></td>
<td>≤ 40 seconds (T90)</td>
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<tr>
<td><strong>Measurement accuracy</strong></td>
<td>≤ ± 1% LEL</td>
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<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 2.5% of measured value</td>
</tr>
<tr>
<td><strong>Linearity error:</strong></td>
<td>≤ ± 4% LEL (0–40% LEL)</td>
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<tr>
<td></td>
<td>≤ ± 10% of measured value (40–100% LEL)</td>
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<tr>
<td><strong>Long-term drift</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 4% LEL/month</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 1% LEL/month</td>
</tr>
<tr>
<td><strong>Influence of temperature</strong></td>
<td>typ. values for X-am 7000 ≤ ± 1% LEL/month</td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 0.1% LEL/K at (–20 to 40)°C (–4 to 104)°F</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 0.3% of measured value/K at (–20 to 40)°C (–4 to 104)°F</td>
</tr>
<tr>
<td><strong>Influence of humidity</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 0.04% LEL/% RH</td>
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<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 0.1% of measured value/% RH</td>
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### FOR THE MEASUREMENT RANGE 0 TO 100 VOL.-% CH₄:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 35 seconds at 0 to 5 Vol.-% (T90)</td>
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<tr>
<td><strong>Measurement accuracy</strong></td>
<td>1 Vol.-% CH₄</td>
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<tr>
<td><strong>Linearity error:</strong></td>
<td>≤ ± 5 Vol.-%</td>
</tr>
<tr>
<td></td>
<td>≤ ± 10% of measured value</td>
</tr>
<tr>
<td><strong>Long-term drift</strong></td>
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<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 3 Vol.-%/month</td>
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<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 3 Vol.-%/month</td>
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<tr>
<td><strong>Influence of temperature</strong></td>
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</tr>
<tr>
<td><strong>Sensitivity 0 to 50 Vol.-%</strong></td>
<td>≤ ± 0.2 Vol.-%/K at (–20 to 40)°C (–4 to 104)°F</td>
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<tr>
<td><strong>Sensitivity 50 to 100 Vol.-%</strong></td>
<td>≤ ± 0.3% of measured value/K at (–20 to 40)°C (–4 to 104)°F</td>
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<tr>
<td><strong>Influence of humidity</strong></td>
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<tr>
<td><strong>Sensitivity 0 to 50 Vol.-%</strong></td>
<td>≤ ± 0.15 Vol.-%/% RH</td>
</tr>
<tr>
<td><strong>Sensitivity 50 to 100 Vol.-%</strong></td>
<td>≤ ± 0.2% of measured value/% RH</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

The DrägerSensor® Smart CatEx (HC PR) is used to detect flammable gases and vapors in the ambient air: LEL monitoring or, in the case of methane, also Vol.-% monitoring. It has an excellent poison resistance against hydrogen sulfide, siloxiane and other sensor poisons. These sensors have been tested according to EN 61779-1 and EN 61779-4 for methane, propane, and nonane for 0–100% LEL, and for 0–100 Vol.-% for methane in accordance with EN 61779-1 and EN 61779-5. Substance-specific data is stored in the data memory for 35 different gases and vapors.

DETECTING OTHER GASES AND VAPORS

Through the use of cross sensitivities for the measurement range of 0 to 100% LEL. The figures given are typical readings when calibrated with methane (CH₄) and apply to new sensors without additional diffusion barriers. A LEL of 4.4 Vol.-% was used for methane. If an LEL of 5.0 Vol.-% is used, then the figures in the table must be multiplied by a factor of 0.88. The table does not claim to be complete. The sensor may also be sensitive to other gases and vapors.

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Displayed reading in % LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1.25</td>
<td>31</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>1.15</td>
<td>34</td>
</tr>
<tr>
<td>1,3-butadiene</td>
<td>CH₂CHCHCH₂</td>
<td>0.70</td>
<td>26</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>3.00</td>
<td>23</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>7.70</td>
<td>58</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.60</td>
<td>22</td>
</tr>
<tr>
<td>Butane</td>
<td>C₄H₁₀</td>
<td>0.70</td>
<td>27</td>
</tr>
<tr>
<td>Butanone</td>
<td>CH₃COC₂H₅</td>
<td>0.75</td>
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<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>5.45</td>
<td>41</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>C₆H₁₂</td>
<td>0.50</td>
<td>21</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>C₅H₁₀</td>
<td>0.70</td>
<td>27</td>
</tr>
<tr>
<td>Gas/vapor</td>
<td>Chem. symbol</td>
<td>Test gas concentration in Vol.%</td>
<td>Displayed reading in % LEL</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>(C₂H₅)₂O</td>
<td>0.85</td>
<td>24</td>
</tr>
<tr>
<td>Diethylamine</td>
<td>(C₂H₅)₂NH</td>
<td>0.85</td>
<td>26</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.20</td>
<td>34</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>1.55</td>
<td>31</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1.20</td>
<td>36</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>1.00</td>
<td>24</td>
</tr>
<tr>
<td>Heptane</td>
<td>C₇H₁₆</td>
<td>0.40</td>
<td>18</td>
</tr>
<tr>
<td>Hexane</td>
<td>C₆H₁₄</td>
<td>0.50</td>
<td>21</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>2.00</td>
<td>48</td>
</tr>
<tr>
<td>1-Methoxy-Propanol-2</td>
<td>C₄H₁₀O₂</td>
<td>0.90</td>
<td>22</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2.20</td>
<td>50</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>3.00</td>
<td>39</td>
</tr>
<tr>
<td>Methyl tert-butyl ether (MTBE)</td>
<td>CH₃OC(CH₃)₃</td>
<td>0.80</td>
<td>27</td>
</tr>
<tr>
<td>n-butanol</td>
<td>C₄H₁₀O₂</td>
<td>0.70</td>
<td>19</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>CH₃COOC₄H₉</td>
<td>0.60</td>
<td>17</td>
</tr>
<tr>
<td>Nonane</td>
<td>C₅H₂₀</td>
<td>0.35</td>
<td>13</td>
</tr>
<tr>
<td>Octane</td>
<td>C₈H₁₈</td>
<td>0.40</td>
<td>17</td>
</tr>
<tr>
<td>Pentane</td>
<td>C₅H₁₂</td>
<td>0.55</td>
<td>21</td>
</tr>
<tr>
<td>Pentanol</td>
<td>C₅H₁₀OH</td>
<td>0.60</td>
<td>19</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₆</td>
<td>0.85</td>
<td>28</td>
</tr>
<tr>
<td>Propanol</td>
<td>C₃H₇OH</td>
<td>1.00</td>
<td>26</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>1.00</td>
<td>32</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>C₃H₆O</td>
<td>0.95</td>
<td>23</td>
</tr>
<tr>
<td>Styrol</td>
<td>C₆H₁₂CH₇CH₂</td>
<td>0.50</td>
<td>15</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₈H₁₀CH₃</td>
<td>0.50</td>
<td>19</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.55</td>
<td>19</td>
</tr>
</tbody>
</table>

The given values may fluctuate by ±30 %.

The table does not claim to be complete. The sensor may also be sensitive to other gases and vapours. Poisoning of the sensor may also alter the relative sensitivities for certain gases and vapours. The specified test gas concentrations correspond to 50 % of the lower explosion limit of each test gas (source: E. Brandes, W. Möller: Sicherheitstechnische Kenngrößen, PTB, ISBN 978-3-86509-811-5, edition 2008).
DrägerSensor® Smart CatEx (PR)  
Order no. 68 12 980

**MARKET SEGMENTS**
Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>2% LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1.0% LEL for the measuring range 0 to 100% LEL, 0.02 Vol.-% for the measuring range 0 to 5 Vol.-% CH₄ (methane)</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 100% LEL</td>
</tr>
</tbody>
</table>

**Ambient conditions**

| Temperature: | (-20 to 55)°C (-4 to 131)°F |
| Humidity: | (10 to 95)% RH |
| Pressure: | (700 to 1,300) hPa |
| Warm-up time: | ≤ 5 minutes |

**FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH METHANE IN AIR:**

| Response time: | ≤ 15 seconds (T₅₀) ≤ 25 seconds (T₉₀) |
| Measurement accuracy | ≤ ± 2.5% of measured value |
| Sensitivity: | ≤ ± 2% LEL (0–40% LEL) ≤ ± 5% of measured value (40–100% LEL) |
| Long-term drift | ≤ ± 1% LEL/month ≤ ± 2% LEL/month typ. values for X-am 7000 ≤ ± 1% LEL/month |
| Influence of temperature | ≤ ± 0.1% LEL/K at (-20 to 40)°C (-4 to 104)°F ≤ ± 0.3% of measured value/K at (-20 to 40)°C (-4 to 104)°F |
| Influence of humidity | ≤ ± 0.03% LEL/% RH ≤ ± 0.1% of measured value/% RH |
| Effect of sensor poisons: | Hydrogen sulfide H₂S 1000 ppmh ≤ ± 5% of measured value Hexamethyldisiloxane HMDS 10 ppmh ≤ ± 20% of measured value After an exposure of 10 ppm HDMS for 5 hours, the sensitivity loss is less than 50%. Halogenated hydrocarbons, heavy metals, substances containing silicone or sulfur, or substances that can polymerize → potential poisoning. approx. 2 Vol.-% CH₄ test gas |
### FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH PROPANE IN AIR:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 20 seconds ($T_{50}$)</td>
</tr>
<tr>
<td></td>
<td>≤ 40 seconds ($T_{90}$)</td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td>≤ ± 2.5% of measured value</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 4% LEL (0–40% LEL)</td>
</tr>
<tr>
<td><strong>Linearity error:</strong></td>
<td>≤ ± 10% of measured value (40–100% LEL)</td>
</tr>
<tr>
<td><strong>Long-term drift</strong></td>
<td>≤ ± 4% LEL/month</td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 1% LEL/month</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>typ. values for X-am 7000 ≤ ± 1% LEL/month</td>
</tr>
<tr>
<td><strong>Influence of temperature</strong></td>
<td>≤ ± 0.1% LEL/K at (-20 to 40)°C (-4 to 104)°F</td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 0.3% of measured value/K at (-20 to 40)°C (-4 to 104)°F</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 0.04% LEL/% RH</td>
</tr>
<tr>
<td><strong>Influence of humidity</strong></td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
</tbody>
</table>

### FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH NONANE IN AIR:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time, rising:</strong></td>
<td>≤ 60 seconds ($T_{50}$)</td>
</tr>
<tr>
<td></td>
<td>≤ 320 seconds ($T_{90}$)</td>
</tr>
<tr>
<td><strong>Response time, declining:</strong></td>
<td>≤ 130 seconds ($T_{50}$)</td>
</tr>
<tr>
<td></td>
<td>≤ 1000 seconds ($T_{90}$)</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS
The DrägerSensor® Smart CatEx (PR) is used to detect flammable gases and vapors around the LEL in the ambient air. It has an excellent poison resistance against hydrogen sulfide, siloxiane and other sensor poisons. These sensors have been tested according to EN 61779-1 and EN 61779-4 for methane, propane, and nonane for a range of 0–100% LEL. Substance-specific data is stored in the data memory for 35 different gases and vapors.

DETECTING OTHER GASES AND VAPORS
Through the use of cross sensitivities for the measurement range of 0 to 100% LEL. The figures given are typical readings when calibrated with methane (CH₄) and apply to new sensors without additional diffusion barriers. A LEL of 4.4 Vol.-% was used for methane. If a LEL of 5.0 Vol.-% is used, then the figures in the table must be multiplied by a factor of 0.88. The table does not claim to be complete. The sensor may also be sensitive to other gases and vapors.

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Displayed reading in % LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1.25</td>
<td>31</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
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<td>34</td>
</tr>
<tr>
<td>1,3-butadiene</td>
<td>C₂H₂CH₂</td>
<td>0.70</td>
<td>26</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>3.00</td>
<td>23</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>7.70</td>
<td>58</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.60</td>
<td>22</td>
</tr>
<tr>
<td>Butane</td>
<td>C₄H₁₀</td>
<td>0.70</td>
<td>27</td>
</tr>
<tr>
<td>Butanone</td>
<td>CH₃COC₂H₅</td>
<td>0.75</td>
<td>22</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>5.45</td>
<td>41</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>C₆H₁₂</td>
<td>0.50</td>
<td>21</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>C₅H₁₀</td>
<td>0.70</td>
<td>27</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>(C₂H₅)₂O</td>
<td>0.85</td>
<td>24</td>
</tr>
<tr>
<td>Diethylamine</td>
<td>(C₂H₅)₂NH</td>
<td>0.85</td>
<td>26</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.20</td>
<td>34</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>1.55</td>
<td>31</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1.20</td>
<td>36</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>1.00</td>
<td>24</td>
</tr>
<tr>
<td>Heptane</td>
<td>C₇H₁₆</td>
<td>0.40</td>
<td>18</td>
</tr>
<tr>
<td>Hexane</td>
<td>C₆H₁₄</td>
<td>0.50</td>
<td>21</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>2.00</td>
<td>48</td>
</tr>
<tr>
<td>1-Methoxy-Propanol-2</td>
<td>C₆H₁₀O₂</td>
<td>0.90</td>
<td>22</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2.20</td>
<td>50</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>3.00</td>
<td>39</td>
</tr>
<tr>
<td>Methyl tert-butyl ether (MTBE)</td>
<td>CH₃OC(CH₃)₃</td>
<td>0.80</td>
<td>27</td>
</tr>
<tr>
<td>n-butanol</td>
<td>C₄H₉OH</td>
<td>0.70</td>
<td>19</td>
</tr>
<tr>
<td>Gas/vapor</td>
<td>Chem. symbol</td>
<td>Test gas concentration in Vol.-%</td>
<td>Displayed reading in % LEL</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------</td>
<td>---------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>CH₃COOC₄H₉</td>
<td>0.60</td>
<td>17</td>
</tr>
<tr>
<td>Nonane</td>
<td>C₉H₂₀</td>
<td>0.35</td>
<td>13</td>
</tr>
<tr>
<td>Octane</td>
<td>C₈H₁₈</td>
<td>0.40</td>
<td>17</td>
</tr>
<tr>
<td>Pentane</td>
<td>C₅H₁₂</td>
<td>0.55</td>
<td>21</td>
</tr>
<tr>
<td>Pentanol</td>
<td>C₅H₁₁OH</td>
<td>0.60</td>
<td>19</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>0.85</td>
<td>28</td>
</tr>
<tr>
<td>Propanol</td>
<td>C₃H₇OH</td>
<td>1.00</td>
<td>26</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>1.00</td>
<td>32</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>C₃H₆O</td>
<td>0.95</td>
<td>23</td>
</tr>
<tr>
<td>Styrol</td>
<td>C₆H₄(CH₃)</td>
<td>0.50</td>
<td>15</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₄CH₃</td>
<td>0.50</td>
<td>19</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.55</td>
<td>19</td>
</tr>
</tbody>
</table>

The given values may fluctuate by ±30%.

The table does not claim to be complete. The sensor may also be sensitive to other gases and vapours. Poisoning of the sensor may also alter the relative sensitivities for certain gases and vapours. The specified test gas concentrations correspond to 50% of the lower explosion limit of each test gas (source: E. Brandes, W. Möller: Sicherheitstechnische Kenngrößen, PTB, ISBN 978-3-86509-811-5, edition 2008).
**DrägerSensor® Smart CatEx (FR PR)**

**MARKET SEGMENTS**

Gas supply companies (methane leak detection), telecommunications, shipping, sewage, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

**TECHNICAL SPECIFICATIONS**

**Detection limit:** 2% LEL

**Resolution:**
- 1.0% LEL for the measuring range 0 to 100% LEL
- 0.02 Vol.-% for the measuring range 0 to 5 Vol.-% CH₄ (methane)
- 1 Vol.-% for the measuring range 5 to 100 Vol.-% CH₄ (methane)

**Measurement range:**
- 0 to 100% LEL or
- 0 to 100 Vol.-% CH₄ (methane)

**Ambient conditions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>(–20 to 55)°C (–4 to 131)°F</td>
</tr>
<tr>
<td>Humidity</td>
<td>(10 to 95)% RH</td>
</tr>
<tr>
<td>Pressure</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>≤ 5 minutes</td>
</tr>
</tbody>
</table>

**FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH METHANE IN AIR:**

**Response time:**
- ≤ 7 seconds (T₅₀)
- ≤ 9 seconds (T₉₀)

**Measurement accuracy**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>≤ ± 2.5% of measured value</td>
</tr>
<tr>
<td>Linearity error</td>
<td>≤ ± 4% LEL (0–40% LEL)</td>
</tr>
<tr>
<td>Long-term drift</td>
<td>≤ ± 10% of measured value (40–100% LEL)</td>
</tr>
</tbody>
</table>

**Zero point:**
- ≤ ± 3% LEL/month
- typ. values for X-am 7000 ≤ ± 1% LEL/month

**Sensitivity:**
- ≤ ± 3% LEL/month
- typ. values for X-am 7000 ≤ ± 1% LEL/month

**Influence of temperature**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.1% LEL/K at (–20 to 40)°C (–4 to 104)°F</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.2% of measured value/K at (–20 to 40)°C (–4 to 104)°F</td>
</tr>
</tbody>
</table>

**Influence of humidity**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.05% LEL/% RH</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.3% of measured value/% RH</td>
</tr>
</tbody>
</table>

**Effect of sensor poisons:**

- Hydrogen sulfide H₂S 1000 ppmh ≤ ± 10% of measured value
- Hexamethyldisiloxane HMDS 10 ppmh ≤ ± 5% of measured value
- After an exposure of 10 ppm HDMS for 5 hours, the sensitivity loss is less than 50%. Halogenated hydrocarbons, heavy metals, substances containing silicone or sulfur, or substances that can polymerize potential poisoning.
FOR THE MEASUREMENT RANGE 0 TO 100 VOL.-% CH₄:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 18 seconds (T₉₀) at 0 to 5 Vol.-%</td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td>≤ ± 2.5% of measured value</td>
</tr>
<tr>
<td><strong>Linearity error</strong></td>
<td></td>
</tr>
<tr>
<td>0 to 50 Vol.-%</td>
<td>≤ ± 5 Vol.-%</td>
</tr>
<tr>
<td>50 to 100 Vol.-%</td>
<td>≤ ± 10% of measured value</td>
</tr>
<tr>
<td><strong>Long-term drift</strong></td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 3 Vol.-%/month</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 3 Vol.-%/month</td>
</tr>
<tr>
<td><strong>Influence of temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Sensitivity 0 to 50 Vol.-%</td>
<td>≤ ± 0.2 Vol.-%/K at (−20 to 40)°C (−4 to 104)°F</td>
</tr>
<tr>
<td>Sensitivity 50 to 100 Vol.-%</td>
<td>≤ ± 0.3% of measured value/K at (−20 to 40)°C (−4 to 104)°F</td>
</tr>
<tr>
<td><strong>Influence of humidity</strong></td>
<td></td>
</tr>
<tr>
<td>Sensitivity 0 to 50 Vol.-%</td>
<td>≤ ± 5 Vol.-%/%RH</td>
</tr>
<tr>
<td>Sensitivity 50 to 100 Vol.-%</td>
<td>≤ ± 0.2% of measured value/% RH</td>
</tr>
<tr>
<td><strong>Test gas:</strong></td>
<td>approx. 2 Vol.-% or 50 Vol.-% CH₄ test gas</td>
</tr>
</tbody>
</table>

SPECIAL CHARACTERISTICS

The DrägerSensor® Smart CatEx (FR PR) is especially suitable for detecting leaks on account of its fast response time (T₉₀) of less than 9 seconds for methane. It has an excellent poison resistance against hydrogen sulfide, siloxiane and other sensor poisons.
Dräger Sensor® CatEx 125 PR

MARKET SEGMENTS
Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, sewage treatment plants, tunneling.

TECHNICAL SPECIFICATIONS

Detection limit:
2% LEL

Resolution:
1.0% LEL for measuring range 0 to 100% LEL,
0.1 Vol.-% for measuring range 0 to 5 Vol.-% CH₄ (methane)

Measurement range:
0 to 100% LEL in Dräger X-am 2500/5000 or
0 to 100 Vol.% CH₄ (methane) in Dräger X-am 5000

Ambient conditions
Temperature: (-20 to 55)°C (-4 to 131)°F
Humidity: (10 to 95)% RH
Pressure: (700 to 1,300) hPa
Warm-up time: ≤ 3 minutes

FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH METHANE IN AIR:

Response time:
≤ 17 seconds (T₉₀) at 25 °C (77 °F)
≤ 7 seconds (T₅₀) at 25 °C (77 °F)
typical values for X-am 2500 T₉₀ at 25 °C (77 °F) ≤ 12 seconds
typical values for X-am 5000 T₉₀ at 25 °C (77 °F) ≤ 10 seconds

Measurement accuracy:
≤ ± 1% LEL

Long-term drift
Zero point:
≤ ± 2% LEL/month
typical value in X-am 2500/5000 ≤ 1 % LEL/month

Sensitivity:
≤ ± 2% LEL/month
typical value in X-am 2500/5000 ≤ 1 % LEL/month

Influence of temperature
Zero point:
≤ ± 0.1% LEL/K at (~-20 to 40)°C (~-4 to 104)°F

Sensitivity:
≤ ± 0.1% of measured value/K at (~-20 to 40)°C (~-4 to 104)°F

Influence of humidity
Zero point:
≤ ± 1% LEL

Sensitivity:
≤ ± 2% LEL (test gas 50% LEL), effect of humidity when calibrating at 0% relative humidity in the range of 10–90 % at 40°C

Effect of sensor poisons:
Hydrogen sulfide H₂S, 1000 ppmh ≤ ±2% of the measured value
Hexamethyldisiloxane HMDS 10 ppmh ≤ ±5 % of the measured value
Hexamethyldisiloxane HMDS 30 ppmh ≤ ±20 % of the measured value. After an exposure to HMDS of 10 ppm for 5 hours, the loss of sensitivity is less than 50%. Halogenated hydrocarbons, volatile substances containing sulphur, heavy metals and silicon, or substances capable of polymerisation: poisoning possible.
FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH PROPAINE IN AIR:

| Response time: | \( \leq 10 \) seconds \( (T_{50}) \) at 25 °C (77 °F)  
| | \( \leq 32 \) seconds \( (T_{90}) \) at 25 °C (77 °F)  
| | typical values for X-am 2500 \( T_{90} \) at 25 °C (77 °F) \( \leq 24 \) seconds  
| | typical values for X-am 5000 \( T_{90} \) at 25 °C (77 °F) \( \leq 14 \) seconds  
| Measurement accuracy: | \( \leq 1 \) % LEL  
| Long-term drift |  
| Zero point: | \( \leq \pm 2\) % LEL/month  
| Sensitivity: | \( \leq \pm 2\) % LEL/month  
| Influence of temperature |  
| Zero point: | \( \leq \pm 0.1\) % LEL/K at \((-20 \text{ to } 40)\)°C \((-4 \text{ to } 104)\)°F  
| Sensitivity: | \( \leq \pm 0.1\) % of measured value/K at \((-20 \text{ to } 40)\)°C \((-4 \text{ to } 104)\)°F  
| Influence of humidity |  
| Zero point: | \( \leq \pm 1\) % LEL  
| Sensitivity: | \( \leq \pm 2\) % LEL  
| | (test gas 50% LEL), effect of humidity when calibrating at 0% relative humidity in the range of 10 - 90% at 40°C.

FOR THE MEASUREMENT RANGE 0 TO 100 VOL.-% CH₄:

| Response time: | \( \leq 30 \) seconds \( (T_{90}) \) at 5 to 100 Vol.-% at 25 °C (77 °F)  
| Measurement accuracy | \( \leq \pm 1 \) % LEL  
| Linearity error: |  
| 0 to 50 Vol.-% | \( \leq \pm 5 \) Vol.-%  
| 50 to 100 Vol.-% | \( \leq \pm 10 \) % of measured value  
| Long-term drift |  
| Zero point: | \( \leq \pm 3 \) Vol.-%/month  
| Sensitivity: | \( \leq \pm 3 \) Vol.-%/month  
| Influence of temperature: | \( \leq \pm 0.15 \) Vol.-%\%/K at \((-20 \text{ to } 40)\)°C \((-4 \text{ to } 104)\)°F  
| Influence of humidity: | \( \leq \pm 0.15 \) Vol.-%\%/ %RH at 40°C / 104°F  
| Test gas: | approx. 2 Vol.-% or 50 Vol.-% CH₄ test gas

This setting is not suitable for the monitoring of explosive mixtures in the measuring range of 0 to 100% LEL.
SPECIAL CHARACTERISTICS
The DrägerSensor® CatEx 125 PR (Poison Resistant) is used to detect flammable gases and vapors. The detection of hydrocarbons from methane to nonane is certified by a measurement performance certificates for use in the Dräger X-am 1/2/5000 series in accordance with EN 60079-29-1 and EN 50271. It also has a small long-term drift, few influence of humidity and excellent poison resistance against hydrogen sulfide, siloxane and other sensor poisons.

DETECTING OTHER GASES AND VAPORS
Through the use of cross sensitivities for the measurement range of 0 to 100% LEL. The figures given are typical readings when calibrated with methane (CH₄) and apply to new sensors without additional diffusion barriers. A LEL of 4.4 Vol.-% was used for methane. If a LEL of 5.0 Vol.-% is used, then the figures in the table must be multiplied by a factor of 0.88. The table does not claim to be complete. The sensor may also be sensitive to other gases and vapors.

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Displayed reading in % LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1.25</td>
<td>31</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>3.0</td>
<td>23</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>1.15</td>
<td>36</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>7.7</td>
<td>57</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6</td>
<td>25</td>
</tr>
<tr>
<td>Butadiene -1,3</td>
<td>CH₂CHCHCH₂</td>
<td>0.7</td>
<td>27</td>
</tr>
<tr>
<td>Butane</td>
<td>C₄H₁₀</td>
<td>0.7</td>
<td>26</td>
</tr>
<tr>
<td>n-butanol</td>
<td>C₄H₉OH</td>
<td>0.7</td>
<td>20</td>
</tr>
<tr>
<td>Butanone</td>
<td>CH₃COC₂H₅</td>
<td>0.75</td>
<td>22</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>CH₃COOC₄H₉</td>
<td>0.6</td>
<td>17</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>5.45</td>
<td>32</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>C₆H₁₂</td>
<td>0.5</td>
<td>20</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>C₅H₁₀</td>
<td>0.7</td>
<td>27</td>
</tr>
<tr>
<td>Diethylamine</td>
<td>(C₂H₅)₂NH</td>
<td>0.85</td>
<td>28</td>
</tr>
<tr>
<td>Gas/vapor</td>
<td>Chem. symbol</td>
<td>Test gas concentration in Vol.-%</td>
<td>Displayed reading in % LEL</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>(C$_2$H$_5$)$_2$O</td>
<td>0.85</td>
<td>27</td>
</tr>
<tr>
<td>Ethane</td>
<td>C$_2$H$_6$</td>
<td>1.2</td>
<td>35</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C$_2$H$_5$OH</td>
<td>1.55</td>
<td>33</td>
</tr>
<tr>
<td>Ethene</td>
<td>C$_2$H$_4$</td>
<td>1.2</td>
<td>36</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH$_3$COOC$_2$H$_5$</td>
<td>1.0</td>
<td>25</td>
</tr>
<tr>
<td>Heptane</td>
<td>C$<em>7$H$</em>{16}$</td>
<td>0.4</td>
<td>17</td>
</tr>
<tr>
<td>Hexane</td>
<td>C$<em>6$H$</em>{14}$</td>
<td>0.5</td>
<td>20</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H$_2$</td>
<td>2.0</td>
<td>49</td>
</tr>
<tr>
<td>Methane</td>
<td>CH$_4$</td>
<td>2.2</td>
<td>50</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH$_3$OH</td>
<td>3.0</td>
<td>40</td>
</tr>
<tr>
<td>Methyl tert-butyl ether (MTBE)</td>
<td>CH$_3$OC(CH$_3$)$_3$</td>
<td>0.8</td>
<td>25</td>
</tr>
<tr>
<td>Nonane</td>
<td>C$<em>9$H$</em>{20}$</td>
<td>0.35</td>
<td>14</td>
</tr>
<tr>
<td>1-Methoxy-Propanol-2-</td>
<td>C$<em>4$H$</em>{10}$O$_2$</td>
<td>0.9</td>
<td>21</td>
</tr>
<tr>
<td>Octane</td>
<td>C$<em>8$H$</em>{18}$</td>
<td>0.4</td>
<td>17</td>
</tr>
<tr>
<td>Pentane</td>
<td>C$<em>5$H$</em>{12}$</td>
<td>0.55</td>
<td>21</td>
</tr>
<tr>
<td>Pentanol</td>
<td>C$<em>5$H$</em>{11}$OH</td>
<td>0.6</td>
<td>19</td>
</tr>
<tr>
<td>Propane</td>
<td>C$_3$H$_6$</td>
<td>0.85</td>
<td>29</td>
</tr>
<tr>
<td>Propanol</td>
<td>C$_3$H$_7$OH</td>
<td>1.00</td>
<td>27</td>
</tr>
<tr>
<td>Propene</td>
<td>C$_3$H$_6$</td>
<td>1.00</td>
<td>35</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>C$_3$H$_6$O</td>
<td>0.95</td>
<td>25</td>
</tr>
<tr>
<td>Styrene</td>
<td>C$_6$H$_6$CHCH$_2$</td>
<td>0.5</td>
<td>11</td>
</tr>
<tr>
<td>Toluene</td>
<td>C$_8$H$_5$CH$_3$</td>
<td>0.5</td>
<td>20</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>C$_8$H$_4$(CH$_3$)$_2$</td>
<td>0.55</td>
<td>22</td>
</tr>
</tbody>
</table>

The given values may fluctuate by ±30 %.

The table does not claim to be complete. The sensor may also be sensitive to other gases and vapours. Poisoning of the sensor may also alter the relative sensitivities for certain gases and vapours. After overstepping the measuring range there could be increased readings in the measuring range 0 to 100 %LEL. Calibrate the sensor, if necessary. The given test gas concentrations correspond to 50% of the lower explosion limit of each test gas (source: E. Brandes, W. Möller:Technical safety data, PTB, ISBN 978-3-86509-811-5, edition 2008).
DrägerSensor® CatEx 125 PR-Gas

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 2500</td>
<td>–</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 3 years</td>
<td>–</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>–</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 3 years</td>
<td>–</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>–</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 3 years</td>
<td>–</td>
</tr>
</tbody>
</table>

MARKET SEGMENTS

Mining, telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, landfills, biogas plants, sewage treatment plants, tunneling.

TECHNICAL SPECIFICATIONS

Detection limit: 2% LEL
Resolution: 1.0% LEL for measuring range 0 to 100% LEL or 1.0 Vol.-% for measuring range 0 to 100 Vol.-% CH₄ (methane)
Measurement range: 0 to 100% LEL or 0 to 100 Vol.-% CH₄ (methane)
Ambient conditions:
Temperature: (-20 to 55)°C (-4 to 131)°F
Humidity: (10 to 95)% RH
Pressure: (700 to 1,300) hPa
Warm-up time: ≤ 5 minutes

FOR THE MEASUREMENT RANGE 0 TO 100% LEL WHEN CALIBRATED WITH METHANE IN AIR:

Response time: ≤ 7 seconds (T₅₀) at 25 °C (77 °F)
≤ 10 seconds (T₉₀) at 25 °C (77 °F)
Measurement accuracy: ≤ ± 1% LEL
Long-term drift:
Zero point: ≤ ± 3% LEL/month
Sensitivity: ≤ ± 3% LEL/month
Influence of temperature:
Zero point: ≤ ± 0.1% LEL/K
Sensitivity: ≤ ± 0.2% of measured value/K
Influence of humidity:
Zero point: ≤ ± 1% LEL
Sensitivity: ≤ ± 2% LEL (test gas 50% LEL), effect of humidity when calibrating at 0% relative humidity in the range of 10 to 90 % at 40°C.
**FOR THE MEASUREMENT RANGE 0 TO 100 VOL.-% CH₄:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 35 seconds (T₉₀) at 0 to 100 Vol.-% at 25 °C (77 °F)</td>
</tr>
<tr>
<td><strong>Measurement accuracy:</strong></td>
<td>≤ ± 1 Vol.-%</td>
</tr>
<tr>
<td><strong>Linearity error:</strong></td>
<td></td>
</tr>
<tr>
<td>0 to 50 Vol.-%</td>
<td>≤ ± 5 Vol.-%</td>
</tr>
<tr>
<td>50 to 100 Vol.-%</td>
<td>≤ 10% of measured value</td>
</tr>
<tr>
<td><strong>Long-term drift</strong></td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 3 Vol.-%/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 3 Vol.-%/month</td>
</tr>
<tr>
<td><strong>Influence of temperature</strong></td>
<td></td>
</tr>
<tr>
<td>0 to 50 Vol.-%</td>
<td>≤ ± 0.15 Vol.-%/K at (–20 to 40)°C (–4 to 104)°F</td>
</tr>
<tr>
<td>50 to 100 Vol.-%</td>
<td>≤ ± 0.3% of measured value/K at (–20 to 40)°C (–4 to 104)°F</td>
</tr>
<tr>
<td><strong>Influence of humidity</strong></td>
<td></td>
</tr>
<tr>
<td>0 to 50 Vol.-%</td>
<td>≤ ± 0.1 Vol.-%/RH.</td>
</tr>
<tr>
<td>50 to 100 Vol.-%</td>
<td>≤ ± 0.2% of measured value/% RH</td>
</tr>
<tr>
<td><strong>Test gas:</strong></td>
<td>approx. 2 Vol.-% or 50 Vol.-% CH₄ test gas</td>
</tr>
<tr>
<td><strong>Effect of sensor contaminants:</strong></td>
<td>Hydrogen sulfide H₂S, 1000 ppmh ≤ ±2% of the measured value</td>
</tr>
<tr>
<td></td>
<td>Hexamethyldisiloxane HMDS 10 ppmh ≤ ±5% of the measured value</td>
</tr>
<tr>
<td></td>
<td>Hexamethyldisiloxane HMDS 30 ppmh ≤ ±20% of the measured value</td>
</tr>
<tr>
<td></td>
<td>After an exposure to HMDS of 10 ppm for 5 hours, the loss of sensitivity is less than 50%.</td>
</tr>
<tr>
<td></td>
<td>Halogenated hydrocarbons, volatile substances containing sulphur, heavy metals and silicon, or substances capable of polymerisation: poisoning possible</td>
</tr>
</tbody>
</table>

**SPECIAL CHARACTERISTICS**

This sensor is optimized for the detection of methane. It has a response time (T₉₀) of less than 10 seconds. The pellistors are impact-protected, which makes the sensor especially shock-proof. In conjunction with this sensor, the Dräger X-am 5000 is approved for Zone 0/T4 worldwide. The LEL and the Vol.-% measuring range can be used in the Dräger X-am 5000.

Response time of DrägerSensor CatEx 125 Mining PR in X-am 5000

![Graph showing response time](image-url)
DETECTING OTHER GASES AND VAPORS

Through the use of cross sensitivities for the measurement range of 0 to 100% LEL. The figures given are typical readings when calibrated with methane (CH₄) and apply to new sensors without additional diffusion barriers. A LEL of 4.4 Vol.-% was used for methane. If a LEL of 5.0 Vol.-% is used, then the figures in the table must be multiplied by a factor of 0.88. The table does not claim to be complete. The sensor may also be sensitive to other gases and vapors.

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Displayed reading in % LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>1.15</td>
<td>32</td>
</tr>
<tr>
<td>Butane</td>
<td>C₄H₁₀</td>
<td>0.70</td>
<td>27</td>
</tr>
<tr>
<td>Butene</td>
<td>C₄H₈</td>
<td>0.75</td>
<td>33</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.20</td>
<td>33</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1.20</td>
<td>30</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>2.00</td>
<td>44</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2.20</td>
<td>50</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>0.85</td>
<td>28</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>1.00</td>
<td>32</td>
</tr>
</tbody>
</table>

The given values may fluctuate by ±30%.

The table does not claim to be complete. The sensor may also be sensitive to other gases and vapours. Poisoning of the sensor may also alter the relative sensitivities for certain gases and vapours. After exceeding the measuring range there could be increased readings in the measuring range 0 to 100% LEL. If necessary the sensor should be adjusted. The specified test gas concentrations correspond to 50% of the lower explosion limit of each test gas. Database GESTIS material database contains information for the safe handling of chemical substances at work. Important physico-chemical data on approx. 8,000 substances. The data is maintained in close temporal proximity to the publication of regulations and rules or when new scientific evidence has come to light:

www.dguv.de → Medien/Datenbanken → Datenbanken.
Every gas absorbs light in a particular way; some even absorb visible light (wavelength of 0.4 to 0.8 micrometers), which is why chlorine is yellowish green, bromine and nitrogen dioxide are brown, iodine vapor is violet, and so on – but unfortunately they are only visible in high (deadly) concentrations.
Hydrocarbons and carbon dioxide, on the other hand, absorb light in a certain wavelength range, (hydrocarbons 3.3 to 3.5 µm; CO₂ approx. 4 µm) – and that can be utilized for detection purposes, since the main components of air (oxygen, nitrogen, and argon) do not absorb radiation in that range. In a container containing gaseous hydrocarbons such as methane or propane or carbon dioxide, the intensity of an incoming infrared light will be weakened, and the degree of this weakening is dependent on the concentration of gas. With the DrägerSensor Dual IR Ex / CO₂ a simultaneous measurement is possible.

**Air:** infrared light passes through without weakening – intensity remains the same

**Gas (e.g. methane):** infrared light becomes weaker as it passes through – intensity drops in relation to the concentration of methane. This is the principle of an infrared measuring instrument that utilizes Dräger IR sensors. Flammable gases and vapors are mostly hydrocarbons, and hydrocarbons are almost always detectable by means of their typical IR absorption levels.

**Functional principle:** the ambient air to be monitored passes into the measuring cuvette by means of diffusion or through the use of a pump. The infrared transmitter produces broad-band radiation that passes through a window into the cuvette, where it is reflected off the mirrored walls and passes through another window, falling onto the double detector. This double detector consists of a measurement and a reference detector. If the gas mixture contains a percentage of e.g. hydrocarbons, then some of the radiation is absorbed and the measurement detector produces a reduced electrical signal. The signal from the reference detector remains unchanged. Fluctuations in the performance of the infrared transmitter, dirt on the mirror and windows, and interference from dust or aerosols in the ambient air have the same effect on both sensors, and are fully compensated.
DrägerSensor® Smart IR Ex

Order no. 68 10 460

**TECHNICAL SPECIFICATIONS**

**Detection limit:**
3% LEL/0.1 Vol.-%

**Resolution:**
0.5% LEL

**Measurement range:**
0 to 100% LEL/0 to 100 Vol.-%
Depending on the gas being measured

**Ambient conditions**

- **Temperature:**
  -20 to 60°C (-4 to 140)°F

- **Humidity:**
  10 to 95% RH

- **Pressure:**
  700 to 1,300 hPa

- **Warm-up time:**
  ≤ 4 minutes

**MARKET SEGMENTS**

Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

**FOR THE MEASUREMENT RANGE 0 TO 100% LEL OR 0 TO 4.4 VOL.-% CH4 WHEN CALIBRATED WITH METHANE IN AIR:**

**Response time:**
- Diffusion mode ≤ 20 seconds (T50)
- Diffusion mode ≤ 50 seconds (T90)
- Pump mode ≤ 20 seconds (T50)
- Pump mode ≤ 41 seconds (T90)

**Measurement accuracy**

- **Sensitivity:**
  ≤ ± 2.0% LEL methane at 50% LEL
- **Linearity error, typical:**
  ≤ ± 5% of measured value
- **Long-term drift**
  - Zero point:
    ≤ ± 2.5% LEL methane/month
  - Sensitivity:
    ≤ ± 2.5% LEL methane/month at 50% LEL
- **Influence of temperature**
  - Zero point:
    ≤ ± 0.05% LEL methane/K at (-20 to 60)°C (-4 to 140)°F
  - Sensitivity:
    ≤ ± 0.15% LEL methane/K at 50% LEL and (-20 to 60)°C (-4 to 140)°F
- **Effect of humidity, at 40°C (104 °F) (0 to 95% RH, non-condensing)**
  - Zero point:
    ≤ ± 0.05% LEL methane/% RH

**Used in**

<table>
<thead>
<tr>
<th></th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
</tbody>
</table>

**Used in Plug & Play Replaceable Guarantee Expected sensor life Selective filter**

Technical specifications for DrägerSensor® Smart IR Ex include detection limits, resolutions, measurement ranges, ambient conditions, and technical performance metrics. Market segments include telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, and tunneling. For specific measurement ranges and calibrations, performance metrics such as response times, measurement accuracies, and influences of temperature and humidity are provided.
FOR THE MEASUREMENT RANGE 0 TO 100% LEL OR 0 TO 1.7 VOL.-% C₃H₈ WHEN CALIBRATED WITH PROPANE IN AIR:

<table>
<thead>
<tr>
<th>Measurement accuracy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>≤ ± 1.0% LEL propane at 50% LEL</td>
</tr>
<tr>
<td>Linearity error, typical:</td>
<td>≤ ± 4.0% of measured value</td>
</tr>
<tr>
<td>Long-term drift</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 1.0% LEL propane/month</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 2.0% LEL propane/month at 50% LEL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Influence of temperature</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.03% LEL propane/K</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 0.08% LEL propane/K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect of humidity, at 40°C (104 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0 to 95% RH, non-condensing)</td>
</tr>
<tr>
<td>Zero point:</td>
</tr>
<tr>
<td>Test gas:</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**SPECIAL CHARACTERISTICS**

This sensor can be used for LEL monitoring and Vol.-% monitoring for some gases. The sensor’s database can contain up to 50 different gases. It is also the ideal sensor for measuring hydrocarbons in an inert atmosphere, since its measuring method does not depend on the presence of oxygen. This sensor also has a very long life time, and there is no risk of poisoning from sulfurous or silicone compounds.

LEL figures depend on country-specific standards.
COMPATIBLE GASES AND MEASUREMENT RANGES:

Sensor precalibration

The sensor can be delivered with all the necessary calibration data available. The sensor’s database can contain up to 50 different gases. The zero point and sensitivity are precalibrated in the sensor for methane (0 to 100% LEL) and propane (0 to 100% LEL). The Vol.-% and % LEL readings are differentiated by displaying the measured gas in upper- and lower-case letters (e.g. ch₄ for 0 to 100% LEL and CH₄ for 0 to 100 Vol.-%).

<table>
<thead>
<tr>
<th>Gas</th>
<th>Data set name</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-butane</td>
<td>buta</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>n-BUTANE</td>
<td>BUTA</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Ethene</td>
<td>c₂h₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>ETHENE</td>
<td>C₂H₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Ethanol</td>
<td>EtOH</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Ex</td>
<td>Ex</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Liquid petroleum gas</td>
<td>LPG</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td></td>
<td>(50% propane + 50% butane)³</td>
<td>0 to 100% LEL / 0 to 100% LEL</td>
</tr>
<tr>
<td>JetFuel</td>
<td>JetF</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Methane</td>
<td>ch₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>METHANE</td>
<td>CH₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>n-nonane</td>
<td>Nona</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>n-pentane</td>
<td>Pent</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Propane</td>
<td>c₃h₈</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>PROPANE</td>
<td>C₃H₈</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Toluene</td>
<td>Tolu</td>
<td>0 to 100% LEL</td>
</tr>
</tbody>
</table>

²) LEL figures depend on country-specific standards.
³) The figures in the table assume a composition of 50% propane and 50% butane.

In practice, the composition of LPG fluctuates, which can lead to increased measurement errors.
DETECTION OF OTHER GASES AND VAPORS FOR THE MEASUREMENT RANGE 0 TO 100% LEL:

Through the use of cross sensitivities when calibrated with propane (C₃H₈, 100% LEL = 1.7 Vol.-%). The sensor can be used to detect the gases and vapors listed in the following table. The sensor must be configured to “Ex” measurement gas in the instrument. For example: if the instrument is subjected to 1.25 Vol.-% acetone (50% LEL), the instrument will show a reading of 19% LEL if configured to “Ex” measurement gas (calibration using 50% LEL / = 0.85 Vol.-% propane). Calibration using the target gas is preferable to calibration using a replacement gas.

<table>
<thead>
<tr>
<th>Gas/vapor gas</th>
<th>Chemical symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Reading displayed in % LEL (if calibrated to 0.85 Vol.-% propane)</th>
<th>Cross-sensitivity factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1.25</td>
<td>19</td>
<td>2.63</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>–</td>
<td>not possible</td>
<td>–</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6</td>
<td>11</td>
<td>4.44</td>
</tr>
<tr>
<td>Butadiene -1,3</td>
<td>CH₂CHCHCH₂</td>
<td>0.7</td>
<td>13</td>
<td>3.85</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>C₆H₁₂</td>
<td>–</td>
<td>on request</td>
<td>–</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>C₅H₁₀</td>
<td>0.7</td>
<td>52</td>
<td>0.96</td>
</tr>
<tr>
<td>Dimethyl ether</td>
<td>(C₂H₅)₂O</td>
<td>1.35</td>
<td>62</td>
<td>0.81</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.35</td>
<td>76</td>
<td>0.66</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>1.75</td>
<td>64</td>
<td>0.78</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1.15</td>
<td>9</td>
<td>5.56</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>1.05</td>
<td>35</td>
<td>1.43</td>
</tr>
<tr>
<td>Ethyl acrylate</td>
<td>C₄H₈O₂</td>
<td>0.85</td>
<td>23</td>
<td>2.17</td>
</tr>
<tr>
<td>i-butane</td>
<td>C₄H₁₀</td>
<td>0.9</td>
<td>49</td>
<td>1.02</td>
</tr>
<tr>
<td>i-butene</td>
<td>C₄H₈</td>
<td>0.8</td>
<td>32</td>
<td>1.56</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₄O</td>
<td>2.75</td>
<td>93</td>
<td>0.54</td>
</tr>
<tr>
<td>Methyl chloride</td>
<td>CH₃Cl</td>
<td>3.8</td>
<td>42</td>
<td>1.19</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>CH₂Cl₂</td>
<td>6.5</td>
<td>13</td>
<td>3.85</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>C₄H₈O</td>
<td>0.9</td>
<td>28</td>
<td>1.79</td>
</tr>
<tr>
<td>n-heptane</td>
<td>C₇H₁₆</td>
<td>0.55</td>
<td>45</td>
<td>1.11</td>
</tr>
<tr>
<td>n-hexane</td>
<td>C₆H₁₄</td>
<td>0.5</td>
<td>42</td>
<td>1.19</td>
</tr>
<tr>
<td>n-nonane</td>
<td>C₉H₂₀</td>
<td>–</td>
<td>on request</td>
<td>–</td>
</tr>
<tr>
<td>n-octane</td>
<td>C₈H₁₈</td>
<td>0.4</td>
<td>32</td>
<td>1.56</td>
</tr>
<tr>
<td>n-pentane</td>
<td>C₅H₁₂</td>
<td>0.7</td>
<td>54</td>
<td>0.93</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>0.85</td>
<td>50</td>
<td>1.00</td>
</tr>
<tr>
<td>n-propanol</td>
<td>C₃H₇OH</td>
<td>0.6</td>
<td>40</td>
<td>1.25</td>
</tr>
<tr>
<td>o-xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5</td>
<td>13</td>
<td>3.85</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>0.6</td>
<td>19</td>
<td>2.63</td>
</tr>
</tbody>
</table>

The specified values may deviate by up to ±30 %.

Calibration for a gas or vapor may result in increased linearity errors. The specified test-gas concentration corresponds to approximately 50 % of the lower explosion limit for the test gas in question. (Source: E. Brandes, W. Möller: Sicherheitstechnische Kenngrößen, PTB, ISBN 3-89701-745-8, Edition 2003)
# DrägerSensor® IR EX

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5600</td>
<td>–</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>–</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
</tbody>
</table>

## MARKET SEGMENTS
Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

## TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>1% LEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1% LEL/0.1 Vol.-% (dependent on measuring range)</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 100% LEL/0 to 100 Vol.-% depending on the gas being measured</td>
</tr>
</tbody>
</table>

### Ambient conditions

| Temperature: | (-20 to 50)°C (-4 to 122)°F |
| Humidity:    | (10 to 95)% RH |
| Pressure:    | (700 to 1,300) hPa |
| Warm-up time: | ≤ 5 minutes |

### FOR THE MEASUREMENT RANGE 0 TO 100% LEL OR 0 TO 4.4 VOL.-% CH₄ WHEN CALIBRATED WITH METHANE IN AIR:

<table>
<thead>
<tr>
<th>Response time:</th>
<th>X-am 5600</th>
<th>X-am 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion mode (T₉₀)</td>
<td>≤ 10 seconds</td>
<td>≤ 10 seconds</td>
</tr>
<tr>
<td>Diffusion mode (T₉₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 20 seconds</td>
</tr>
<tr>
<td>Pump mode (T₅₀)</td>
<td>≤ 10 seconds</td>
<td>≤ 10 seconds</td>
</tr>
<tr>
<td>Pump mode (T₉₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 12 seconds</td>
</tr>
</tbody>
</table>

### Measurement accuracy

#### Sensitivity:

≤ ± 1.5% LEL methane at 50% LEL

#### Linearity error, typical:

≤ ± 3.5% of measured value or ≤ ± 1.5% of the end of measurement range (whichever is higher)

### Long-term drift

#### Zero point:

≤ ± 0.2% LEL methane/month

#### Sensitivity:

≤ ± 4.5% LEL methane/6 months at 50% LEL

### Influence of temperature

#### Zero point:

≤ ± 0.015% LEL methane/K at (-20 to 50)°C (-4 to 122)°F

#### Sensitivity:

≤ ± 0.03% LEL methane/K at 50% LEL and (-20 to 50)°C (-4 to 122)°F

### Effect of humidity, at 40°C (104 °F)

(0 to 95% RH, non-condensing)

#### Zero point:

≤ ± 0.005% LEL methane/% RH
FOR THE MEASUREMENT RANGE 0 TO 100% LEL OR 0 TO 1.7 VOL.-% C₃H₈
WHEN CALIBRATED WITH PROPANE IN AIR:

Response time:

<table>
<thead>
<tr>
<th></th>
<th>X-am 5600</th>
<th>X-am 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion mode (T₅₀)</td>
<td>≤ 12 seconds</td>
<td>≤ 15 seconds</td>
</tr>
<tr>
<td>Diffusion mode (T₉₀)</td>
<td>≤ 40 seconds</td>
<td>≤ 58 seconds</td>
</tr>
<tr>
<td>Pump mode (T₅₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 10 seconds</td>
</tr>
<tr>
<td>Pump mode (T₉₀)</td>
<td>≤ 20 seconds</td>
<td>≤ 15 seconds</td>
</tr>
</tbody>
</table>

Measurement accuracy

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>≤ ± 1.25% LEL propane</td>
</tr>
<tr>
<td>Linearity error, typical</td>
<td>≤ ± 3.0% of measured value or ≤ ± 1.0% of the end of measurement range ( whichever is higher )</td>
</tr>
</tbody>
</table>

Long-term drift

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.3% LEL propane/month</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 3.0% LEL propane/6 months</td>
</tr>
</tbody>
</table>

Influence of temperature

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.02% LEL propane/K</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 0.025% LEL propane/K</td>
</tr>
</tbody>
</table>

Effect of humidity, at 40°C (104 °F) (0 to 95% RH, non-condensing)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.008% LEL propane/% RH</td>
</tr>
</tbody>
</table>

Test gas:

<table>
<thead>
<tr>
<th>Test gas</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Vol.-% CH₄ or 50 Vol.-% CH₄</td>
<td></td>
</tr>
<tr>
<td>0.9 Vol.-% C₃H₈</td>
<td></td>
</tr>
</tbody>
</table>

SPECIAL CHARACTERISTICS

This sensor can be used for LEL monitoring, and Vol.-% monitoring for some gases. It is also the ideal sensor for measuring hydrocarbons in an inert atmosphere, since its measuring method does not depend on the presence of oxygen. This sensor also has a very long life time, and there is no risk of poisoning from sulfurous or silicone compounds.

COMPATIBLE GASES AND MEASURING RANGES:

<table>
<thead>
<tr>
<th>Gas</th>
<th>Data set name</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-butane</td>
<td>buta</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>n-BUTANE</td>
<td>BUTA</td>
<td>0 to 100 Vol.-%</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>ETHENE</td>
<td>C₂H₄</td>
<td>0 to 100 Vol.-%</td>
</tr>
<tr>
<td>Ethanol</td>
<td>EtOH</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Ex</td>
<td>Ex</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>JetFuel</td>
<td>JetF</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Methane</td>
<td>ch₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>METHANE</td>
<td>CH₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>n-nonane</td>
<td>Nona</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>n-pentane</td>
<td>Pent</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₄</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>PROPANE</td>
<td>C₃H₈</td>
<td>0 to 100% LEL</td>
</tr>
<tr>
<td>Toluene</td>
<td>Tolu</td>
<td>0 to 100% LEL</td>
</tr>
</tbody>
</table>

²) LEL figures depend on country-specific standards.
### DETECTION OF OTHER GASES AND VAPORS FOR THE MEASURING RANGE
#### 0 TO 100% LEL

<table>
<thead>
<tr>
<th>Gas/vapor gas</th>
<th>Chemical symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Reading displayed in % LEL (if calibrated to 0.85 Vol.-% propane)</th>
<th>Cross-sensitivity factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>C₃H₆O</td>
<td>1.25</td>
<td>18</td>
<td>2.78</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>–</td>
<td>not possible</td>
<td>–</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6</td>
<td>20</td>
<td>2.50</td>
</tr>
<tr>
<td>Butadiene -1,3</td>
<td>C₄H₆</td>
<td>0.7</td>
<td>20</td>
<td>2.50</td>
</tr>
<tr>
<td>i-Butane</td>
<td>(CH₃)₂CH</td>
<td>0.75</td>
<td>41</td>
<td>1.22</td>
</tr>
<tr>
<td>n-Butane</td>
<td>C₄H₁₀</td>
<td>0.7</td>
<td>42</td>
<td>1.19</td>
</tr>
<tr>
<td>i-Butene</td>
<td>(CH₃)₂C=CH₂</td>
<td>0.8</td>
<td>31</td>
<td>1.61</td>
</tr>
<tr>
<td>n-Butanol</td>
<td>C₄H₁₀O</td>
<td>0.85</td>
<td>25</td>
<td>2.0</td>
</tr>
<tr>
<td>2-Butanone (MEK)</td>
<td>C₄H₈O</td>
<td>0.75</td>
<td>22</td>
<td>2.27</td>
</tr>
<tr>
<td>Butyl Acetate</td>
<td>C₆H₁₂O₂</td>
<td>0.60</td>
<td>20</td>
<td>2.5</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>C₆H₁₂</td>
<td>0.50</td>
<td>15</td>
<td>3.33</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>C₅H₁₀</td>
<td>0.7</td>
<td>47</td>
<td>1.06</td>
</tr>
<tr>
<td>Dimethyl Aether</td>
<td>C₂H₅O</td>
<td>1.35</td>
<td>51</td>
<td>0.98</td>
</tr>
<tr>
<td>Diethylamine</td>
<td>C₄H₁₁N</td>
<td>0.85</td>
<td>44</td>
<td>1.14</td>
</tr>
<tr>
<td>Diethyl Acetate</td>
<td>(C₂H₅)₂O</td>
<td>0.85</td>
<td>46</td>
<td>1.09</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.2</td>
<td>65</td>
<td>0.77</td>
</tr>
<tr>
<td>Ethylalcohol</td>
<td>C₂H₆O</td>
<td>1.55</td>
<td>41</td>
<td>1.22</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1.2</td>
<td>15</td>
<td>3.33</td>
</tr>
<tr>
<td>Ethylacetate</td>
<td>C₄H₈O₂</td>
<td>1.0</td>
<td>35</td>
<td>1.43</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>C₅H₈O₂</td>
<td>0.85</td>
<td>26</td>
<td>1.92</td>
</tr>
<tr>
<td>n-Heptane</td>
<td>C₇H₁₄</td>
<td>0.55</td>
<td>36</td>
<td>1.39</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>C₆H₁₄</td>
<td>0.5</td>
<td>34</td>
<td>1.47</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2.2</td>
<td>37</td>
<td>1.35</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃O</td>
<td>3.0</td>
<td>92</td>
<td>0.54</td>
</tr>
<tr>
<td>n-Methoxy-2-Propanol</td>
<td>C₈H₁₆O₂</td>
<td>0.9</td>
<td>26</td>
<td>1.92</td>
</tr>
<tr>
<td>Methyl-tert-butyl aether</td>
<td>C₅H₁₂O</td>
<td>0.80</td>
<td>59</td>
<td>0.85</td>
</tr>
<tr>
<td>Methyl chloride</td>
<td>CH₃Cl</td>
<td>3.8</td>
<td>47</td>
<td>1.06</td>
</tr>
<tr>
<td>Methylen chlorid</td>
<td>CH₂Cl₂</td>
<td>6.5</td>
<td>on request</td>
<td>–</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>C₈H₁₆</td>
<td>0.35</td>
<td>on request</td>
<td>–</td>
</tr>
<tr>
<td>n-Octane</td>
<td>C₈H₁₈</td>
<td>0.40</td>
<td>20</td>
<td>2.50</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>C₅H₁₂</td>
<td>0.55</td>
<td>36</td>
<td>1.39</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>0.85</td>
<td>50</td>
<td>1.00</td>
</tr>
<tr>
<td>n-Propylalcohol</td>
<td>C₃H₇OH</td>
<td>1.05</td>
<td>40</td>
<td>1.25</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>0.90</td>
<td>31</td>
<td>1.61</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>C₃H₆O</td>
<td>0.95</td>
<td>49</td>
<td>1.02</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>0.50</td>
<td>19</td>
<td>2.63</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5</td>
<td>11</td>
<td>4.55</td>
</tr>
</tbody>
</table>

Specifications relate to the respective test gas concentration and the corresponding LEL. The specified values apply to 20°C and may vary by ±30%.
DrägerSensor® IR Ex
DrägerSensor® Smart IR CO₂

Order no. 68 10 590

MARKET SEGMENTS
Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

TECHNICAL SPECIFICATIONS

| For the measurement range 0 to 5 Vol.-% CO₂ |
|---|---|
| **Detection limit:** | 0.01 Vol.-% |
| **Resolution:** | 0.01 Vol.-% CO₂ |
| **Measurement range:** | 0 to 5 Vol.-% CO₂ |
| **Ambient conditions** | |
| Temperature: | (–20 to 60)°C (–4 to 140)°F |
| Humidity: | (10 to 95)% RH |
| Pressure: | (700 to 1,300) hPa |
| **Warm-up time:** | ≤ 4 minutes |

<table>
<thead>
<tr>
<th><strong>Response time</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion mode</td>
<td>≤ 20 seconds (T₅₀)</td>
</tr>
<tr>
<td>Diffusion mode</td>
<td>≤ 45 seconds (T₉₀/T₁₀)</td>
</tr>
<tr>
<td>Pump mode</td>
<td>≤ 20 seconds (T₅₀)</td>
</tr>
<tr>
<td>Pump mode</td>
<td>≤ 50 seconds (T₉₀/T₁₀)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Measurement accuracy</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 0.06 Vol.-% CO₂ at 2.5 Vol.-%</td>
</tr>
<tr>
<td><strong>Linearity error, typical:</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 0 to ≤ 1 Vol.-% CO₂</td>
<td>&lt;± 1 % of end of measuring range</td>
</tr>
<tr>
<td>&gt; 1 to ≤ 4 Vol.-% CO₂</td>
<td>&lt;± 5 % of the measured value</td>
</tr>
<tr>
<td>&gt; 4 to ≤ 5 Vol.-% CO₂</td>
<td>&lt;± 10 % of end of measuring range</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Long-term drift</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 0.004 Vol.-% CO₂/month</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 3% of measured value/month at 2.5 Vol.-%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Influence of temperature</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 0.002 Vol.-% CO₂/K at (–20 to 60)°C (–4 to 140)°F</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 0.4% of measured value/K at 2.5 Vol.-% and (–20 to 60)°C (–4 to 140)°F</td>
</tr>
</tbody>
</table>

| **Effect of humidity, at 40°C (104 °F)** |
|---|---|
| **Zero point:** | ≤ ± 0.02 Vol.-% CO₂ |

<table>
<thead>
<tr>
<th><strong>Plug &amp; Play</strong></th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replaceable</strong></td>
<td>yes</td>
</tr>
<tr>
<td><strong>Guaranty</strong></td>
<td>5 years</td>
</tr>
<tr>
<td><strong>Expected sensor life</strong></td>
<td>&gt; 5 years</td>
</tr>
<tr>
<td><strong>Selective filter</strong></td>
<td>–</td>
</tr>
</tbody>
</table>

Used in
Dräger X-am 7000

Dräger infrared sensors
SPECIAL CHARACTERISTICS

With its extremely low drift and low detection limit, this sensor is ideal for measuring carbon dioxide inside closed spaces, and for monitoring CO₂ in the workplace. As with all other IR sensors, it requires little maintenance and has a high level of long-term stability.
Dräger infrared sensors

MARKET SEGMENTS
Biogas, process gas

TECHNICAL SPECIFICATIONS

| Detection limit: | 0.4 Vol.-% |
| Resolution: | 0.2 Vol.-% CO₂ |
| Measurement range: | 0 to 100 Vol.-% CO₂ |

Ambient conditions

| Temperature: | (–20 to 60)°C (–4 to 140)°F |
| Humidity: | (10 to 95)% RH |
| Pressure: | (700 to 1,300) hPa |
| Warm-up time: | ≤ 4 minutes |

FOR THE MEASUREMENT RANGE 0 TO 100 VOL.-% CO₂

| Response time: | Diffusion mode ≤ 20 seconds (T₅₀) |
| | Diffusion mode ≤ 65 seconds (T₉₀) |
| | Pump mode ≤ 20 seconds (T₅₀) |
| | Pump mode ≤ 65 seconds (T₉₀) |

Measurement accuracy

| Sensitivity: | ≤ ± 2.0 Vol.-% CO₂ at 50 Vol.-% |
| Linearity error, typical: | ≤ ± 1 Vol.-% CO₂ or ≤ ± 5% of measured value (whichever is higher) |

Long-term drift

| Zero point: | ≤ ± 0.2 Vol.-% CO₂/month |
| Sensitivity: | ≤ ± 3% of measured value/month at 50 Vol.-% |

Influence of temperature

| Zero point: | ≤ ± 0.004 Vol.-% CO₂/K at (–20 to 60)°C (–4 to 140)°F |
| Sensitivity: | ≤ ± 0.4% of measured value/K at 50 Vol.-% and (–20 to 60)°C (–4 to 140)°F |

Effect of humidity, at 40°C (104 °F) (0 to 95% RH, non-condensing)

| Zero point: | ≤ ± 0.5 Vol.-% CO₂ |
| Test gas: | 50 Vol.-% CO₂ |
SPECIAL CHARACTERISTICS
This sensor is especially suitable if you need to measure high concentrations of CO₂ in process gas, for example. CO₂ concentrations of up to 100 Vol.-% can be detected reliably with this sensor. Other qualities that distinguish this sensor are low cross-sensitivities, long-term stability, and minimal maintenance.
### DrägerSensor® IR CO₂

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5600</td>
<td>–</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>–</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
</tbody>
</table>

### MARKET SEGMENTS

Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

### TECHNICAL SPECIFICATIONS

#### Detection limit:
0.01 Vol.% CO₂

#### Resolution:
0.01 Vol.% CO₂ or 50 ppm CO₂ (dependent on measuring range)

#### Measurement range:
0 to 5 Vol.% CO₂

#### Ambient conditions

| Temperature:  | (-20 to 50)°C (-4 to 122)°F |
| Humidity:     | (10 to 95)% RH               |
| Pressure:     | (700 to 1,300) hPa           |

#### Warm-up time:
≤ 5 minutes

### FOR THE MEASUREMENT RANGE 0 TO 5 VOL.% CO₂

<table>
<thead>
<tr>
<th>Response time:</th>
<th>X-am 5600</th>
<th>X-am 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion mode (T₅₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 12 seconds</td>
</tr>
<tr>
<td>Diffusion mode (T₉₀)</td>
<td>≤ 31 seconds</td>
<td>≤ 50 seconds</td>
</tr>
<tr>
<td>Pump mode (T₅₀)</td>
<td>≤ 10 seconds</td>
<td>≤ 10 seconds</td>
</tr>
<tr>
<td>Pump mode (T₉₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 15 seconds</td>
</tr>
</tbody>
</table>

#### Measurement accuracy

| Sensitivity:                  | ≤ ± 0.08 Vol.% CO₂ at 2.5 Vol.% |
| Linearity error, typical:    | ≤ ± 3.5% of measured value or ≤ ± 1.5% of the end of measurement range (whichever is higher) |

#### Long-term drift

| Zero point:                  | ≤ ± 0.005 Vol.% CO₂/month |
| Sensitivity:                 | ≤ ± 0.1 Vol.% CO₂ /6 months at 2.5 Vol.% CO₂ |

#### Influence of temperature

| Zero point:                  | ≤ ± 0.0002 Vol.% CO₂/K at (-20 to 50)°C (-4 to 122)°F |
| Sensitivity:                 | ≤ ± 0.0015 Vol.% CO₂/K at 2.5 Vol.% and (-20 to 50)°C (-4 to 122)°F |

#### Effect of humidity, at 40°C (104 °F) (0 to 95% RH, non-condensing)

| Zero point:                  | ≤ ± 0.0001 Vol.% CO₂/% RH |
| Test gas:                    | 2.5 Vol.% CO₂ |
SPECIAL CHARACTERISTICS

With its extremely low drift and low detection limit, this sensor is ideal for measuring carbon dioxide inside closed spaces, and for monitoring CO₂ in the workplace. As with all other IR sensors, it requires little maintenance and has a high level of long-term stability.
DrägerSensor® DUAL IR Ex/CO₂

Order no. 68 11 960

MARKET SEGMENTS
Telecommunications, shipping, sewage, gas supply companies, refineries, chemical industry, mining, landfills, biogas plants, tunneling.

TECHNICAL SPECIFICATIONS

| Detection limit: | 1% LEL for IR Ex  
| Resolution: | 0.01 Vol.-% CO₂ for IR CO₂  
| Measurement range: | 0% to 100% LEL/0–100 Vol.-% CH₄  
| Ambient conditions: | Temperature: (~20 to 50)°C (~4 to 122)°F  
| Humidity: | (10 to 95)% RH  
| Pressure: | (700 to 1,300) hPa  
| Warm-up time: | ≤ 5 minutes

FOR THE MEASUREMENT RANGE 0 TO 100% LEL OR 0 TO 4.4 VOL.-% CH₄ WHEN CALIBRATED WITH METHANE IN AIR:

| Response time: | Diffusion mode (T₅₀) ≤ 10 seconds  
| Pump mode (T₅₀) ≤ 10 seconds  
| Diffusion mode (T₉₀) ≤ 15 seconds  
| Pump mode (T₉₀) ≤ 15 seconds

Measurement accuracy
Sensitivity: ≤ ± 1.5% LEL methane at 50% LEL
Linearity error, typical: ≤ ± 3.5% of measured value or ≤ ± 1.5% of the end of measurement range (whichever is higher)

Long-term drift
Zero point: ≤ ± 0.2% LEL methane/month
Sensitivity: ≤ ± 4.5% LEL methane/6 months at 50% LEL

Influence of temperature
Zero point: ≤ ± 0.015% LEL methane/K at (~20 to 50)°C (~4 to 122)°F
Sensitivity: ≤ ± 0.03% LEL methane/K at 50% LEL and
(–20 to 50)°C (~4 to 122)°F

Effect of humidity, at 40°C (104 °F)
(0 to 95% RH, non-condensing)
Zero point: ≤ ± 0.005% LEL methane/% RH

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranteed</th>
<th>Expected sensor life</th>
<th>Selectable filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5600</td>
<td>–</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>–</td>
<td>yes</td>
<td>5 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
</tbody>
</table>
FOR THE MEASUREMENT RANGE 0 TO 100% LEL OR 0 TO 1.7 VOL.-% C₃H₈
WHEN CALIBRATED WITH PROPA NE IN AIR

<table>
<thead>
<tr>
<th>Response time:</th>
<th>X-am 5600</th>
<th>X-am 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion mode (T₅₀)</td>
<td>≤ 12 seconds</td>
<td>≤ 15 seconds</td>
</tr>
<tr>
<td>Diffusion mode (T₉₀)</td>
<td>≤ 40 seconds</td>
<td>≤ 58 seconds</td>
</tr>
<tr>
<td>Pump mode (T₅₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 10 seconds</td>
</tr>
<tr>
<td>Pump mode (T₉₀)</td>
<td>≤ 20 seconds</td>
<td>≤ 15 seconds</td>
</tr>
</tbody>
</table>

Measurement accuracy

| Sensitivity: | ≤ ± 1.25% LEL propane |
| Linearity error, typical: | ≤ ± 3.0% of measured value or ≤ ± 1.0% of highest measuring range figure (whichever is higher) |

Long-term drift

| Zero point: | ≤ ± 0.3% LEL propane/month |
| Sensitivity: | ≤ ± 3.0% LEL propane/6 months |

Influence of temperature

| Zero point: | ≤ ± 0.02% LEL propane/K |
| Sensitivity: | ≤ ± 0.025% LEL propane/K |

Effect of humidity, at 40°C (104 °F)
(0 to 95% RH, non-condensing)

| Zero point: | ≤ ± 0.008% LEL propane/% RH |

FOR THE MEASUREMENT RANGE 0 TO 5 VOL.-% CO₂

<table>
<thead>
<tr>
<th>Response time:</th>
<th>X-am 5600</th>
<th>X-am 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffusion mode (T₅₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 12 seconds</td>
</tr>
<tr>
<td>Diffusion mode (T₉₀)</td>
<td>≤ 31 seconds</td>
<td>≤ 50 seconds</td>
</tr>
<tr>
<td>Pump mode (T₅₀)</td>
<td>≤ 10 seconds</td>
<td>≤ 10 seconds</td>
</tr>
<tr>
<td>Pump mode (T₉₀)</td>
<td>≤ 15 seconds</td>
<td>≤ 15 seconds</td>
</tr>
</tbody>
</table>

Measurement accuracy

| Sensitivity: | ≤ ± 0.08 Vol.-% CO₂ at 2.5 Vol.-% |
| Linearity error, typical: | ≤ ± 3.5% of measured value or ≤ ± 1.5% of the end of measurement (whichever is higher) |

Long-term drift

| Zero point: | ≤ ± 0.005 Vol.-% CO₂/month |
| Sensitivity: | ≤ ± 0.1 Vol.-% CO₂/6 months at 2.5 Vol.-% CO₂ |

Influence of temperature

| Zero point: | ≤ ± 0.0002 Vol.-% CO₂/K at (–20 to 50)°C (–4 to 122)°F |
| Sensitivity: | ≤ ± 0.0015% Vol.-% CO₂/K at 2.5 Vol.-% and (–20 to 50)°C (–4 to 122)°F |

Effect of humidity, at 40°C (104 °F)
(0 to 95% RH, non-condensing)

| Zero point: | ≤ ± 0.0001 Vol.-% CO₂/% RH |
| Test gas: | 2 Vol.-% CH₄ or 50 Vol.-% CH₄ |
| | 2.5 Vol.-% CO₂ |
**SPECIAL CHARACTERISTICS**

This sensor enables flammable gases and carbon dioxide to be measured 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.

**COMPATIBLE GASES AND MEASURING RANGES:**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Data set name</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethene</td>
<td>c2h4</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>ETHENE</td>
<td>C2H4</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>EtOH</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>Ex</td>
<td>Ex</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>JetFuel</td>
<td>JetF</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>Methane</td>
<td>ch4</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>METHANE</td>
<td>CH4</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>n-butane</td>
<td>buta</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>n-BUTANE</td>
<td>BUTA</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>n-nonane</td>
<td>Nona</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>n-pentane</td>
<td>Pent</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>Propane</td>
<td>c3h4</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>PROPANE</td>
<td>C3H8</td>
<td>0 to 100% LEL 2)</td>
</tr>
<tr>
<td>Toluene</td>
<td>Tolu</td>
<td>0 to 100% LEL 2)</td>
</tr>
</tbody>
</table>

**DETECTION OF OTHER GASES AND VAPORS FOR THE MEASUREMENT RANGE 0 TO 100% LEL:**

Through metrologically utilisable cross sensitivities when adjusting with propane (C3H8, 100% LEL = 1.7% by vol., compulsory for this application). The sensor can be used for detecting gases and vapors listed in the table below. For this, the sensor must be configured in the unit for the gas “Ex”. The sensor may also be sensitive to other gases and vapors.

<table>
<thead>
<tr>
<th>Gas/vapor gas</th>
<th>Chemical symbol</th>
<th>Test gas concentration in % LEL</th>
<th>Reading displayed in % LEL (if calibrated to 0.85 % LEL in propane)</th>
<th>Cross-sensitivity factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>C3H6O</td>
<td>1.25</td>
<td>18 not possible</td>
<td>2.78</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C2H2</td>
<td>–</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>Benzene</td>
<td>C6H6</td>
<td>0.6</td>
<td>20</td>
<td>2.50</td>
</tr>
<tr>
<td>Butadiene -1,3</td>
<td>C4H6</td>
<td>0.7</td>
<td>41</td>
<td>2.50</td>
</tr>
<tr>
<td>i-Butane</td>
<td>(CH3)2CH</td>
<td>0.75</td>
<td>42</td>
<td>1.22</td>
</tr>
<tr>
<td>n-Butane</td>
<td>C4H10</td>
<td>0.7</td>
<td>42</td>
<td>1.19</td>
</tr>
<tr>
<td>i-Butene</td>
<td>(CH3)2C=CH2</td>
<td>0.8</td>
<td>31</td>
<td>1.61</td>
</tr>
<tr>
<td>n-Butanol</td>
<td>C4H10O</td>
<td>0.85</td>
<td>25</td>
<td>2.0</td>
</tr>
</tbody>
</table>

2) LEL figures depend on country-specific standards.
## DETECTION OF OTHER GASES AND VAPORS FOR THE MEASURING RANGE
### 0 TO 100% LEL

<table>
<thead>
<tr>
<th>Gas/vapor gas</th>
<th>Chemical symbol</th>
<th>Test gas concentration in Vol.-%</th>
<th>Reading displayed in % LEL (if calibrated to 0.85 Vol.-% propane)</th>
<th>Cross-sensitivity factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Butanone (MEK)</td>
<td>C₄H₈O</td>
<td>0.75</td>
<td>22</td>
<td>2.27</td>
</tr>
<tr>
<td>Butyl Acetate</td>
<td>C₆H₁₂O₂</td>
<td>0.60</td>
<td>20</td>
<td>2.5</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>C₆H₁₂</td>
<td>0.50</td>
<td>15</td>
<td>3.33</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>C₅H₁₀</td>
<td>0.7</td>
<td>47</td>
<td>1.06</td>
</tr>
<tr>
<td>Dimethyl Aether</td>
<td>C₂H₆O</td>
<td>1.35</td>
<td>51</td>
<td>0.98</td>
</tr>
<tr>
<td>Diethylamine</td>
<td>C₄H₉N</td>
<td>0.85</td>
<td>44</td>
<td>1.14</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>(C₂H₅)₂O</td>
<td>0.85</td>
<td>46</td>
<td>1.09</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.2</td>
<td>65</td>
<td>0.77</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>C₂H₆O</td>
<td>1.55</td>
<td>41</td>
<td>1.22</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1.2</td>
<td>15</td>
<td>3.33</td>
</tr>
<tr>
<td>Ethylacetate</td>
<td>C₄H₉O₂</td>
<td>1.0</td>
<td>35</td>
<td>1.43</td>
</tr>
<tr>
<td>Ethyl acrylate</td>
<td>C₅H₁₀O₂</td>
<td>0.85</td>
<td>26</td>
<td>1.92</td>
</tr>
<tr>
<td>n-Heptane</td>
<td>C₇H₁₆</td>
<td>0.55</td>
<td>36</td>
<td>1.39</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>C₆H₁₄</td>
<td>0.5</td>
<td>34</td>
<td>1.47</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2.2</td>
<td>37</td>
<td>1.35</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₄O</td>
<td>3.0</td>
<td>92</td>
<td>0.54</td>
</tr>
<tr>
<td>n-Methoxy-2-Propanol</td>
<td>C₄H₁₀O₂</td>
<td>0.9</td>
<td>26</td>
<td>1.92</td>
</tr>
<tr>
<td>Methyl-tert-butyl aether</td>
<td>C₅H₁₂O₂</td>
<td>0.80</td>
<td>59</td>
<td>0.85</td>
</tr>
<tr>
<td>Methyl chloride</td>
<td>CH₃Cl</td>
<td>3.8</td>
<td>47</td>
<td>1.06</td>
</tr>
<tr>
<td>Methylene chlorid</td>
<td>CH₂Cl₂</td>
<td>6.5</td>
<td>on request</td>
<td>–</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>C₉H₂₀</td>
<td>0.35</td>
<td>on request</td>
<td>–</td>
</tr>
<tr>
<td>n-Octane</td>
<td>C₈H₁₈</td>
<td>0.40</td>
<td>20</td>
<td>2.50</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>C₅H₁₂</td>
<td>0.55</td>
<td>36</td>
<td>1.39</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>0.85</td>
<td>50</td>
<td>1.00</td>
</tr>
<tr>
<td>n-Propylalcohol</td>
<td>C₃H₇OH</td>
<td>1.05</td>
<td>40</td>
<td>1.25</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>0.90</td>
<td>31</td>
<td>1.61</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>C₃H₈O</td>
<td>0.95</td>
<td>49</td>
<td>1.02</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>0.50</td>
<td>19</td>
<td>2.63</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5</td>
<td>11</td>
<td>4.55</td>
</tr>
</tbody>
</table>

Specifications relate to the respective test gas concentration and the corresponding LEL. The specified values apply to 20°C and may vary by ±30%.
Many flammable gases and vapors are toxic to humans long before they reach the lower explosion limit (LEL). For this reason, personal protection in the workplace ideally includes the additional measurement of ppm levels of volatile organic substances using a PID sensor.
The air is drawn into the measuring chamber through the gas inlet. In the chamber, a UV lamp produces photons, which ionize certain molecules within the flow of gas. A relatively high amount of energy is required to ionize the air’s permanent gases such as noble gases, nitrogen, oxygen, carbon dioxide, and water vapor. For this reason, these gases do not interfere with the measurement of the harmful substances. Most of the organic substances recognized as dangerous (such as hydrocarbons) are ionized and subjected to the electrical field between the electrodes in the measuring chamber. The strength of the resulting current is directly proportional to the concentration of ionized molecules inside the chamber. This makes it possible to determine the concentration of harmful substance in the air.

Ionization energy and UV lamps
Ionization energy is measured in electron volts (eV) and defines the amount of energy required to bring a molecule into the ionized (charged) state. Ionization energy is something specific to each material, like the boiling point and vapor pressure. For a substance to be ionized, its ionization energy must be lower than the photon energy from the lamp used in the PID. Common is the lamp type 10.6 eV lamp. This enables a PID to detect whole groups of harmful substances, while it can also be used to measure single substances if calibrated accordingly.

Calibration and response factors
Isobutylene is used to calibrate a PID, unless the actual substance being measured can be used. The relative sensitivity to other substances is then expressed in terms of response factors. If a substance is detected with greater sensitivity than isobutylene, then its response factor is less than one. Substances that are detected with less sensitivity than isobutylene have a response factor greater than one.

**FOR EXAMPLE:**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Ionization energy</th>
<th>Response factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>9.25 eV</td>
<td>0.5</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>9.98 eV</td>
<td>1.3</td>
</tr>
</tbody>
</table>
**DrägerSensor® PID HC**

**Order no. 68 13 475**

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>UV lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year¹</td>
<td>2 years</td>
<td>10.6 eV</td>
</tr>
</tbody>
</table>

**MARKET SEGMENTS**

Chemical industry, painters, storage and use of fuels (e.g. gas stations)

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:*</th>
<th>0.3 ppm isobutylene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:*</td>
<td>0-20 ppm 100 ppb</td>
</tr>
<tr>
<td>(valid for isobutylene)</td>
<td>&gt; 20-50 ppm 200 ppb</td>
</tr>
<tr>
<td></td>
<td>&gt; 50-100 ppm 500 ppb</td>
</tr>
<tr>
<td></td>
<td>&gt; 100-200 ppm 1 ppm</td>
</tr>
<tr>
<td></td>
<td>&gt; 200-500 ppm 2 ppm</td>
</tr>
<tr>
<td></td>
<td>&gt; 500-1.000 ppm 5 ppm</td>
</tr>
<tr>
<td></td>
<td>&gt; 1,000-2,000 ppm 10 ppm</td>
</tr>
</tbody>
</table>

**Measurement range:**

0 to 2,000 ppm isobutylene

**Ambient conditions**

**Temperature:**

(-20 to 60)°C (-4 to 140)°F

**Humidity:**

(10 to 95)% RH

**Pressure:**

(700 to 1,300) hPa

**Warm-up time:**

2 minutes ready for measurement (warm-up 1)

2 minutes ready for calibration (warm-up 2)

**FOR THE MEASUREMENT RANGE 0 TO 2,000 PPM WHEN CALIBRATED WITH ISOBUTYLENE IN AIR:**

**Response time:**

Diffusion mode ≤ 5 seconds \(T_{20}\)

Diffusion mode ≤ 10 seconds \(T_{90}\)

Pump mode ≤ 5 seconds \(T_{20}\)

Pump mode ≤ 10 seconds \(T_{90}\)

**Repeatability**

at 100 ppm isobutylene:

≤ ± 2% of measured value; at zero point ≤ ±0.3 ppm isobutylene

Linearity error, typical:

≤ ± 5% of measured value; A calibration in the range of the expected concentration will give a higher accuracy at the measuring point.

**Pressure effect**

Effect of humidity, at 20 °C (68 °F)

(0 to 90% RH, non-condensing)

Zero point:

≤ ± 0.05 ppm isobutylene/% RH

at 100 ppm isobutylene:

≤ ± 0.15 ppm isobutylene/% RH

**Test gas:**

approx. 100 ppm i-C₄H₈ (isobutylene)

¹ Depends on the response factor of the measured gas

² At a run time of max. 2,500 hours

³ Sudden temperature and humidity changes influence the measurement signal. When sudden temperature and humidity changes are expected, it is recommended to use a humidity pre-tube (81 03 531) for the measurement.
**SPECIAL CHARACTERISTICS**

The PID can be used to detect numerous volatile organic compounds (VOCs). More than 20 of the VOCs most commonly used in industry are stored in its data memory. Other gases can be added to the memory on the customer’s request.

---

### GASES STORED IN THE MEMORY

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>CAS no.</th>
<th>Data set name</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Butadiene</td>
<td>106-99-0</td>
<td>BTD1</td>
<td>0 - 1400 ppm</td>
</tr>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>Acet</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>alpha-pinene</td>
<td>2437-95-8</td>
<td>aPIN</td>
<td>0 - 800 ppm</td>
</tr>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>C₆H₆</td>
<td>0 - 1000 ppm</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>108-90-7</td>
<td>ClBz</td>
<td>0 - 1000 ppm</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>Chex</td>
<td>0 - 2500 ppm</td>
</tr>
<tr>
<td>Diesel</td>
<td>68476-34-6</td>
<td>Desl</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>141-78-6</td>
<td>Etat</td>
<td>0 - 8000 ppm</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>EtBz</td>
<td>0 - 1000 ppm</td>
</tr>
<tr>
<td>Gasoline</td>
<td>8006-61-9</td>
<td>Gaso</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>115-11-7</td>
<td>iBut</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>Jet fuel</td>
<td>8008-20-6</td>
<td>JetF</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>78-93-3</td>
<td>MEK</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>Methylbromide</td>
<td>74-83-9</td>
<td>MeBr</td>
<td>0 - 4000 ppm</td>
</tr>
<tr>
<td>Methyl-tert-Butylether</td>
<td>1634-04-4</td>
<td>MTBE</td>
<td>0 - 2000 ppm</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>111-84-2</td>
<td>Nona</td>
<td>0 - 3000 ppm</td>
</tr>
<tr>
<td>n-Octane</td>
<td>111-65-9</td>
<td>Octa</td>
<td>0 - 4000 ppm</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>95-47-6</td>
<td>Xyol</td>
<td>0 - 1000 ppm</td>
</tr>
<tr>
<td>Styrene</td>
<td>100-42-5</td>
<td>Styr</td>
<td>0 - 800 ppm</td>
</tr>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>Tolu</td>
<td>0 - 1000 ppm</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>79-01-6</td>
<td>TCE</td>
<td>0 - 1000 ppm</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>75-01-4</td>
<td>VC</td>
<td>0 - 4000 ppm</td>
</tr>
</tbody>
</table>

The standard gas is: Isobutylene.
DrägerSensor® PID LC ppb

MARKET SEGMENTS
Chemical industry, painters, storage and use of fuels (e.g. gas stations), benzene specific measurements

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:*</th>
<th>0.03 ppm / benzene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:*</td>
<td>0-2 ppm 10 ppb</td>
</tr>
<tr>
<td>(valid for isobutylene and benzene)</td>
<td>&gt; 2-5 ppm 20 ppb</td>
</tr>
<tr>
<td>&gt; 5-10 ppm 50 ppb</td>
<td></td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 10 ppm isobutylene / 0 to 5 ppm benzene</td>
</tr>
<tr>
<td>General technical specifications</td>
<td></td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature: 2)</td>
<td>(–20 to 60)°C (–4 to 140)°F</td>
</tr>
<tr>
<td>Humidity: 2)</td>
<td>(10 to 95)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>1 minute ready for measurement (warm-up 1)</td>
</tr>
<tr>
<td></td>
<td>5 minutes ready for calibration (warm-up 2)</td>
</tr>
</tbody>
</table>

FOR THE MEASUREMENT RANGE 0 TO 10 PPM WHEN CALIBRATED WITH ISOBUTYLENE IN AIR:

Response time:
- Diffusion mode ≤ 5 seconds (T20)
- Diffusion mode ≤ 15 seconds (T90)
- Pump mode ≤ 5 seconds (T20)
- Pump mode ≤ 15 seconds (T90)

Repeatability
at 5 ppm isobutylene:
- ≤ ± 2% of measured value; at zero point ≤ ± 0.05 ppm isobutylene

Linearity error, typical:
- ≤ ± 5% of measured value; A calibration in the range of the expected concentration will give a higher accuracy at the measuring point, compensated

Pressure effect
Effect of humidity, at 20 °C (68 °F)
(0 to 90% RH, non-condensing)
- Zero point:
  - ≤ ± 0.005 ppm isobutylene/% RH
- at 5 ppm isobutylene:
  - ≤ ± 0.02 ppm isobutylene/% RH
- Test gas:
  - approx. 5 ppm i-C4H8 (isobutylene)

* Depends on the response factor of the measured gas
1) At a run time of max. 2,500 hours
2) Sudden temperature and humidity changes influence the measurement signal. When sudden temperature and humidity changes are expected, it is recommended to use a humidity pre-tube (81 03 531) for the measurement.
SPECIAL CHARACTERISTICS

Apart from the detection of a variety of volatile organic compounds (VOC) this sensor is suitable for a benzene specific measurement in the ppb range. Using the prefilter benzene (81 03 511) tube concurrent hydrocarbons will be filtered.

GASES STORED IN THE MEMORY

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>CAS no.</th>
<th>Data set name</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Butadiene</td>
<td>106-99-0</td>
<td>BTD1</td>
<td>0 - 10 ppm</td>
</tr>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>Acet</td>
<td>0 - 18 ppm</td>
</tr>
<tr>
<td>alpha-pinene</td>
<td>2437-95-8</td>
<td>aPIN</td>
<td>0 - 8 ppm</td>
</tr>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>C₆H₆</td>
<td>0 - 5 ppm</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>108-90-7</td>
<td>ClBz</td>
<td>0 - 12 ppm</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>Chex</td>
<td>0 - 24 ppm</td>
</tr>
<tr>
<td>Diesel</td>
<td>68476-34-6</td>
<td>Desl</td>
<td>0 - 15 ppm</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>141-78-6</td>
<td>Etat</td>
<td>0 - 75 ppm</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>EtBz</td>
<td>0 - 14 ppm</td>
</tr>
<tr>
<td>Gasoline</td>
<td>8006-61-9</td>
<td>Gaso</td>
<td>0 - 15 ppm</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>115-11-7</td>
<td>iBut</td>
<td>0 - 10 ppm</td>
</tr>
<tr>
<td>Jet fuel</td>
<td>8008-20-6</td>
<td>JetF</td>
<td>0 - 15 ppm</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>78-93-3</td>
<td>MEK</td>
<td>0 - 16 ppm</td>
</tr>
<tr>
<td>Methylbromide</td>
<td>74-83-9</td>
<td>MeBr</td>
<td>0 - 32 ppm</td>
</tr>
<tr>
<td>Methyl-tert-Butylether</td>
<td>1634-04-4</td>
<td>MTBE</td>
<td>0 - 16 ppm</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>111-84-2</td>
<td>Nona</td>
<td>0 - 32 ppm</td>
</tr>
<tr>
<td>n-Octane</td>
<td>111-65-9</td>
<td>Octa</td>
<td>0 - 32 ppm</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>95-47-6</td>
<td>Xyol</td>
<td>0 - 12 ppm</td>
</tr>
<tr>
<td>Styrene</td>
<td>100-42-5</td>
<td>Styr</td>
<td>0 - 12 ppm</td>
</tr>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>Tolu</td>
<td>0 - 15 ppm</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>79-01-6</td>
<td>TCE</td>
<td>0 - 14 ppm</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>75-01-4</td>
<td>VC</td>
<td>0 - 32 ppm</td>
</tr>
</tbody>
</table>

The standard gas is: Isobutylene

Other gases can be added to the memory on the customer’s request.
MARKET SEGMENTS
Chemical industry, painters, storage and use of fuels (e.g. gas stations)

TECHNICAL SPECIFICATIONS

| Detection limit: | 2 ppm isobutylene |
| Resolution: | 1 ppm up to 100 ppm |
| | 2 ppm from 100 to 250 ppm |
| | 5 ppm from 250 ppm upwards |
| Measurement range: | 0 to 2,000 ppm isobutylene |
| General technical specifications |
| Ambient conditions |
| Temperature: | (–20 to 60)°C (–4 to 140)°F |
| Humidity: | (10 to 95)% RH |
| Pressure: | (700 to 1,300) hPa |
| Warm-up time: | 4 minutes |

FOR THE MEASUREMENT RANGE 1 TO 2,000 PPM WHEN CALIBRATED WITH ISOBUTYLENE IN AIR:

| Response time: |
| Diffusion mode ≤ 15 seconds ($T_{20}$) |
| Diffusion mode ≤ 50 seconds ($T_{90}$) |
| Pump mode ≤ 10 seconds ($T_{20}$) |
| Pump mode ≤ 25 seconds ($T_{90}$) |
| Repeatability |
| at 100 ppm isobutylene: | ≤ ± 2 ppm isobutylene |
| Linearity error, typical: | ≤ ± 5% of measured value |
| Pressure effect |
| Effect of humidity, at 40°C (104 °F) (0 to 90% RH, non-condensing) |
| Zero point: | ≤ ± 0.06 ppm isobutylene/% RH |
| at 100 ppm isobutylene: | ≤ ± 0.15 ppm isobutylene/% RH |
| Test gas: | approx. 100 ppm i-C₄H₈ (isobutylene) |
SPECIAL CHARACTERISTICS

The PID can be used to detect numerous volatile organic compounds (VOCs). More than 20 of the VOCs most commonly used in industry are stored in its data memory. Other gases can be added to the memory on the customer’s request.

GASES STORED IN THE MEMORY

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>CAS no.</th>
<th>Data set name</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>ACTO</td>
<td>0–2,000 ppm</td>
</tr>
<tr>
<td>alpha-pinene</td>
<td>2437-95-8</td>
<td>aPIN</td>
<td>0–1,000 ppm</td>
</tr>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>BENZ</td>
<td>0–1,000 ppm</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>108-90-7</td>
<td>CLBZ</td>
<td>0–1,500 ppm</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>CYHE</td>
<td>0–3,000 ppm</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>141-78-6</td>
<td>ETAC</td>
<td>0–7,000 ppm</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>ETBZ</td>
<td>0–1,500 ppm</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>115-11-7</td>
<td>IBUT</td>
<td>0–2,000 ppm</td>
</tr>
<tr>
<td>Methyl bromide</td>
<td>74-83-9</td>
<td>MEBR</td>
<td>0–4,000 ppm</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>78-93-3</td>
<td>MEK</td>
<td>0–1,000 ppm</td>
</tr>
<tr>
<td>Methyl tert-butyl ether (MTBE)</td>
<td>1634-04-4</td>
<td>MTBE</td>
<td>0–2,000 ppm</td>
</tr>
<tr>
<td>n-nonane</td>
<td>111-84-2</td>
<td>NONA</td>
<td>0–3,000 ppm</td>
</tr>
<tr>
<td>n-octane</td>
<td>111-65-9</td>
<td>OCTA</td>
<td>0–5,000 ppm</td>
</tr>
<tr>
<td>Styrene</td>
<td>100-42-5</td>
<td>STYR</td>
<td>0–1,500 ppm</td>
</tr>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>TOLU</td>
<td>0–1,500 ppm</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>79-01-6</td>
<td>TCE</td>
<td>0–1,500 ppm</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>75-01-4</td>
<td>VC</td>
<td>0–3,000 ppm</td>
</tr>
<tr>
<td>o-Xylene</td>
<td>95-47-6</td>
<td>XYLE</td>
<td>0–1,500 ppm</td>
</tr>
<tr>
<td>Diesel</td>
<td></td>
<td>DESL</td>
<td>0–2,000 ppm</td>
</tr>
<tr>
<td>Gasoline</td>
<td></td>
<td>GASO</td>
<td>0–2,000 ppm</td>
</tr>
<tr>
<td>Jet fuel</td>
<td></td>
<td>JP8</td>
<td>0–2,000 ppm</td>
</tr>
</tbody>
</table>

The standard gas is: Isobutylene
Many toxic gases are highly reactive and can change their chemical composition under certain conditions. An electrochemical sensor is a micro-reactor, which produces a very small but measurable current when reactive gases are present. As in a normal household battery, this involves an electrochemical process, since the chemical transformation produces electrons.
The basic principle behind an electrochemical sensor involves at least two electrodes (a measuring electrode and a counter-electrode), which have contact with each other in two ways: first, through an electrically conductive medium (electrolyte, meaning a fluid that conducts ions) and, second, through an external electrical circuit (electron conductor). The electrodes are made of a special material that also has catalytic characteristics so that certain chemical reactions take place at what is known as the three-phase zone where gas, solid catalyst, and liquid electrolyte meet. A dual-electrode sensor (measuring and counter-electrode) does, however, have many drawbacks. For instance, if high concentrations of gas occur, this leads to higher currents in the sensor and, therefore, to a drop in voltage. The drop in voltage, in turn, changes the preset sensor voltage. This can lead to unusable readings or, in the worst case, it can cause the chemical reaction inside the sensor to come to a halt during the measurement process.

For this reason, the Dräger XS and XXS sensors contain a third electrode known as the reference electrode, which does not have a current passing through it, and whose potential therefore remains constant. It continuously measures the sensor voltage at the measuring electrode, which can be corrected using the sensor’s control enhancement. This produces a considerably improved measuring quality (e.g. in terms of linearity and selectivity) and a longer life time.

The Dräger XS sensors are known as "smart" sensors and contain their own EEPROM. This memory module contains all of the sensor’s relevant data, which, when plugged into Dräger X-am 7000 is retrieved. The device then automatically adjusts itself to these figures (e.g. calibration figures, alarm level). This "plug & play" function enables sensors to be swapped between devices without performing operations such as a re-calibration. XXS sensors are used in the following devices: Dräger Pac family and Dräger X-am 2500/5000/5600 and Dräger X-am 8000. In this case, the sensor-relevant data is stored in the device. When a sensor is changed, this information is transferred using a software application.
General Instructions for DrägerSensors® XS, XS R, XS 2 and XXS

1 Intended Use
For use in Dräger gas monitors in accordance with the Instructions for Use of the individual sensor.

2 Readiness for Operation of a new Sensor
The sensor has an internal data memory (EEPROM) which is evaluated by an appropriate Dräger gas monitor.

**XS, XS R and XS 2:**
New sensors are supplied with calibration data and certain default settings already stored in the data memory. The default settings, such as measuring range, alarm thresholds and calibration intervals can be adjusted by the user in some of the Dräger gas monitors. If a sensor is replaced by another of the same type (with the same order number), the new settings entered by the user are retained.

**XXS:**
Calibration should be carried out before using the sensor for the first time and when replacing the sensor.

3 Sensor Calibration / Adjustment

**Calibration / adjustment interval:**
Recommended interval see Instructions for Use of the sensor in use. For critical applications: perform a test of zero point and sensitivity with the sensor fitted in the Dräger gas monitor in accordance with local regulations.

**Calibration / adjustment of zero point:**
Apply zero gas (nitrogen or synthetic air) with a flow of 0.5 litres per minute to the sensor. Waiting time for measured value to stabilize = up to 3 minutes.

**Checking zero point for O₂ sensors (optional test):**
For test gas use pure nitrogen.
In order to prevent return diffusion: fit the second outlet socket of the calibration adapter with a piece of tubing of at least 10 cm length. 3 minutes following commencement of exposure, the measured value display must be lower than 0.6% O₂ by vol. for N₂.

**Calibration / adjustment of sensitivity:**
Only use hoses made of polytetrafluoroethylene (PTFE) and fluoroelastomer (FKM). Keep tubing as short as possible, calibration gas may partly be adsorbed in the tubing. Regardless of the chosen measuring range use commercial calibration gas (see Instructions for Use of the respective sensor) with a concentration between 40% of the set full scale value and up to 100% of the highest adjustable full scale value. Calibration gas is available from gas suppliers. Apply calibration gas with a flow of 0.5 litres per minute to the sensor. Waiting time for measured value to stabilize = up to 5 minutes.
Calibration of sensitivity with test gas ampoules

The use of test gas ampoules can lead to an additional calibration error of up to ±35%. Observe the "Instructions for Use" of the calibration bottle (order no. 68 03 407) and the respective test gas ampoules (see sensor data sheet). Approx. 3 minutes after shattering the ampoule: calibrate instrument.

4 Measurements with hose probe (pump operation)

Follow the information contained in the Dräger gas monitor instructions for use. Some gases may be adsorbed on surfaces. Only use approved hoses. For more information, please contact your local Dräger offices or e-mail: mmt.applic@draeger.com.

5 Replacing Selective Filter

To increase the selectivity of the sensors, some sensors are provided with a replaceable selective filter as standard (see Instructions for Use of the sensor in use). The following points should be observed when using the filter:

- Remove filter with a peaked object.
- Insert new filter.
- Due to changed sensitivity, the instrument must be calibrated whenever the selective filter is replaced.

All other properties of the sensor remain unaffected by the use of the filter. For service life of the filter see Instructions for Use of the respective sensor. How often the selective filter needs to be replaced depends on the amount and type of hazardous substances it is exposed to.
### Usage of electrochemical sensors in inert atmospheres

Generally, it is no problem to use an electrochemical sensor in inert atmospheres (atmosphere with < 8 % by volume oxygen). A maximum usage time of 10 hours should not be exceeded. Additionally, the sensor should be stored when not used (e.g. overnight) in a normal ambient conditions (20.9 % by volume oxygen).

### APPLICABLE SENSORS

**DrägerSensors**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXS Amine</td>
<td>68 12 545</td>
</tr>
<tr>
<td>XXS Cl₂</td>
<td>68 10 890</td>
</tr>
<tr>
<td>XXS CO</td>
<td>68 10 882</td>
</tr>
<tr>
<td>XXS CO LC</td>
<td>68 13 210</td>
</tr>
<tr>
<td>XXS E CO</td>
<td>68 12 212</td>
</tr>
<tr>
<td>XXS CO H₂-CP</td>
<td>68 11 950</td>
</tr>
<tr>
<td>XXS CO HC</td>
<td>68 12 010</td>
</tr>
<tr>
<td>XXS CO/H₂S</td>
<td>68 11 410</td>
</tr>
<tr>
<td>XXS CO₂</td>
<td>68 10 889</td>
</tr>
<tr>
<td>XXS COCl₂</td>
<td>68 12 005</td>
</tr>
<tr>
<td>XXS H₂ HC</td>
<td>68 12 025</td>
</tr>
<tr>
<td>XXS H₂S</td>
<td>68 10 883</td>
</tr>
<tr>
<td>XXS E H₂S</td>
<td>68 12 213</td>
</tr>
<tr>
<td>XXS H₂S HC</td>
<td>68 12 015</td>
</tr>
<tr>
<td>XXS H₂S LC</td>
<td>68 11 525</td>
</tr>
<tr>
<td>XXS HCN</td>
<td>68 10 887</td>
</tr>
<tr>
<td>XXS HCN PC</td>
<td>68 13 165</td>
</tr>
<tr>
<td>XXS NH₃</td>
<td>68 10 888</td>
</tr>
<tr>
<td>XXS NO</td>
<td>68 11 545</td>
</tr>
<tr>
<td>XXS NO₂</td>
<td>68 10 884</td>
</tr>
<tr>
<td>XXS NO₂ LC</td>
<td>68 12 600</td>
</tr>
<tr>
<td>XXS O₂</td>
<td>68 10 881</td>
</tr>
<tr>
<td>XXS E O₂</td>
<td>68 12 211</td>
</tr>
<tr>
<td>XXS O₂ 100</td>
<td>68 12 385</td>
</tr>
<tr>
<td>XXS Odorant</td>
<td>68 12 535</td>
</tr>
<tr>
<td>XXS OV</td>
<td>68 11 530</td>
</tr>
<tr>
<td>XXS OV-A</td>
<td>68 11 535</td>
</tr>
<tr>
<td>XXS O₃</td>
<td>68 11 540</td>
</tr>
<tr>
<td>XXS PH₃</td>
<td>68 10 886</td>
</tr>
<tr>
<td>XXS PH₃ HC</td>
<td>68 12 020</td>
</tr>
<tr>
<td>XXS SO₂</td>
<td>68 10 885</td>
</tr>
<tr>
<td>XXS O₂/CO LC</td>
<td>68 13 275</td>
</tr>
<tr>
<td>XXS H₂S-LC/CO LC</td>
<td>68 13 280</td>
</tr>
</tbody>
</table>

**DrägerSensors XS EC**

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XS EC Amine</td>
<td>68 09 545</td>
</tr>
<tr>
<td>XS EC Cl₂</td>
<td>68 09 165</td>
</tr>
<tr>
<td>XS EC ClO₂</td>
<td>68 11 360</td>
</tr>
<tr>
<td>XS EC CO</td>
<td>68 09 105</td>
</tr>
<tr>
<td>XS R CO</td>
<td>68 10 258</td>
</tr>
<tr>
<td>XS-2 CO</td>
<td>68 10 365</td>
</tr>
<tr>
<td>XS EC CO HC</td>
<td>68 09 120</td>
</tr>
<tr>
<td>XS EC CO₂</td>
<td>68 09 175</td>
</tr>
<tr>
<td>XS EC COCl₂</td>
<td>68 08 582</td>
</tr>
<tr>
<td>XS EC H₂ HC</td>
<td>68 11 365</td>
</tr>
<tr>
<td>XS EC H₂O₂</td>
<td>68 09 170</td>
</tr>
<tr>
<td>XS EC H₂S 100</td>
<td>68 09 110</td>
</tr>
<tr>
<td>XS R H₂S</td>
<td>68 10 260</td>
</tr>
<tr>
<td>XS-2 H₂S</td>
<td>68 10 370</td>
</tr>
<tr>
<td>XS EC H₂S HC</td>
<td>68 09 180</td>
</tr>
<tr>
<td>XS EC HCN</td>
<td>68 09 150</td>
</tr>
<tr>
<td>XS EC HF/HCl</td>
<td>68 09 140</td>
</tr>
<tr>
<td>XS EC Hydrazine</td>
<td>68 09 190</td>
</tr>
<tr>
<td>XS EC Hydride</td>
<td>68 09 135</td>
</tr>
<tr>
<td>XS EC NH₃</td>
<td>68 09 145</td>
</tr>
<tr>
<td>XS EC NO</td>
<td>68 09 125</td>
</tr>
<tr>
<td>XS EC NO₂</td>
<td>68 09 155</td>
</tr>
<tr>
<td>XS EC O₂</td>
<td>68 09 130</td>
</tr>
<tr>
<td>XS R O₂</td>
<td>68 10 262</td>
</tr>
<tr>
<td>XS-2 O₂</td>
<td>68 10 375</td>
</tr>
<tr>
<td>XS EC O₂ 100</td>
<td>68 09 550</td>
</tr>
<tr>
<td>XS EC Odorant</td>
<td>68 09 200</td>
</tr>
<tr>
<td>XS EC OV</td>
<td>68 09 115</td>
</tr>
<tr>
<td>XS EC OV-A</td>
<td>68 09 522</td>
</tr>
<tr>
<td>XS EC PH₃ HC</td>
<td>68 09 535</td>
</tr>
<tr>
<td>XS EC SO₂</td>
<td>68 09 160</td>
</tr>
<tr>
<td>XS Sensors</td>
<td>Chemical name (synonym)</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>XS EC Amine</td>
<td>amine like methylamine, ethylamine, dimethylamine etc.</td>
</tr>
<tr>
<td>XS EC Cl₂</td>
<td>chlorine</td>
</tr>
<tr>
<td>XS EC ClO₂</td>
<td>chlorine dioxide</td>
</tr>
<tr>
<td>XS EC CO</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>XS 2 CO</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>XS R CO</td>
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<tr>
<td>XS EC CO HC</td>
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<tr>
<td>XS EC CO₂</td>
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<td>phosgene</td>
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<tr>
<td>XS EC H₂</td>
<td>hydrogen</td>
</tr>
<tr>
<td>XS EC H₂ HC</td>
<td>hydrogen</td>
</tr>
<tr>
<td>XS EC HCN</td>
<td>hydrogen cyanide</td>
</tr>
<tr>
<td>XS EC HF/HCl</td>
<td>hydrogen chloride / hydrogen fluoride</td>
</tr>
<tr>
<td>XS EC H₂S</td>
<td>hydrogen sulfide</td>
</tr>
<tr>
<td>XS 2 H₂S</td>
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</tr>
<tr>
<td>XS EC H₂S HC</td>
<td>hydrogen sulfide</td>
</tr>
<tr>
<td>XS EC H₂O₂</td>
<td>hydrogen peroxide</td>
</tr>
<tr>
<td>XS EC Hydrazine</td>
<td>hydrazine</td>
</tr>
<tr>
<td>XS EC Hydride</td>
<td>hydride like hydrogen phosphide, phosphine, arsine etc.</td>
</tr>
<tr>
<td>XS EC NH₃</td>
<td>ammonia</td>
</tr>
<tr>
<td>XS EC NO</td>
<td>nitrogen monoxide</td>
</tr>
<tr>
<td>XS EC NO₂</td>
<td>nitrogen dioxide</td>
</tr>
<tr>
<td>XS EC Odorant</td>
<td>sulfur compounds like tetrahydrothiophene, methylmercaptan, ethylmercaptan etc.</td>
</tr>
<tr>
<td>XS EC OV</td>
<td>organic gases and vapors like ethylene oxide, ethene, propene etc.</td>
</tr>
<tr>
<td>XS EC OV-A</td>
<td>organic gases and vapors like ethylene oxide, styrene isobutylene etc.</td>
</tr>
<tr>
<td>XS EC O₂-LS</td>
<td>oxygen</td>
</tr>
<tr>
<td>XS 2 O₂</td>
<td>oxygen</td>
</tr>
<tr>
<td>XS R O₂</td>
<td>oxygen</td>
</tr>
<tr>
<td>XS EC O₂ 100</td>
<td>oxygen</td>
</tr>
<tr>
<td>XS EC PH₃ HC</td>
<td>hydrogen phosphide, phosphine</td>
</tr>
<tr>
<td>XS EC SO₂</td>
<td>sulfur dioxide</td>
</tr>
</tbody>
</table>
**DrägerSensor® XS EC Amine**

**Order no. 68 09 545**

**MARKET SEGMENTS**

Foundries, refineries, power plants

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>2 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Measurement range/</td>
<td>0 to 100 ppm CH₃NH₂ (methylamine) 0.70</td>
</tr>
<tr>
<td>Relative sensitivity</td>
<td>0 to 100 ppm (CH₃)₂NH (dimethylamine) 0.50</td>
</tr>
<tr>
<td></td>
<td>0 to 100 ppm (CH₃)₃N (trimethylamine) 0.50</td>
</tr>
<tr>
<td></td>
<td>0 to 100 ppm C₂H₅NH₂ (ethylamine) 0.70</td>
</tr>
<tr>
<td></td>
<td>0 to 100 ppm (C₂H₅)₂NH (diethylamine) 0.50</td>
</tr>
<tr>
<td></td>
<td>0 to 100 ppm (C₂H₅)₃N (triethylamine) 0.50</td>
</tr>
<tr>
<td></td>
<td>0 to 100 ppm NH₃ (ammonia)* 1.00</td>
</tr>
</tbody>
</table>

| Response time: | ≤ 30 seconds (T₅₀) |
| Measurement accuracy: | ≤ ± 3% of measured value |

| Sensitivity: | ≤ ± 2 ppm/month |
| Sensitivity: | ≤ ± 3% of measured value/month |
| Warm-up time: | ≤ 12 hours |

**Ambient conditions**

| Temperature: | (−40 to 50)°C (−40 to 122)°F |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |

**Influence of temperature**

| Zero point: | ≤ ± 5 ppm |
| Sensitivity: | ≤ ± 5% of measured value |

**Influence of humidity**

| Zero point: | ≤ ± 0.1 ppm/% RH |
| Sensitivity: | ≤ ± 0.2% of measured value/% RH |

**Test gas:**

- approx. 5 to 100 ppm NH₃, or one of the other target gases: C H₃NH₂, (CH₃)₂NH, (CH₃)₃N, C₂H₅NH₂, (C₂H₅)₂NH, (C₂H₅)₃N

* lead compound
SPECIAL CHARACTERISTICS

Six different amines can be detected using this sensor. It is sufficient to calibrate it using an ammonia test gas. By doing so, all of the other amines are then automatically calibrated.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of amine. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1,5 Vol. %</td>
<td>≤ 5(–)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>25 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol. %</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 10(–)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>10 ppm</td>
<td>≤ 10</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
**MARKET SEGMENTS**
Food and beverage, inorganic chemicals, manufacture of plastics, measuring hazardous material, pulp and paper, power generation, sewage plants water treatment.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.1 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.05 ppm</td>
</tr>
<tr>
<td>Measurement range/Relative sensitivity</td>
<td>0 to 20 ppm Cl₂ (chlorine) 1.00</td>
</tr>
<tr>
<td></td>
<td>0 to 20 ppm F₂ (fluorine) 1.00</td>
</tr>
<tr>
<td></td>
<td>0 to 20 ppm Br₂ (bromine) 1.00</td>
</tr>
<tr>
<td></td>
<td>0 to 20 ppm ClO₂ (chlorine dioxide) 0.60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response time:</th>
<th>≤ 30 seconds (T₉₀)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Measurement accuracy</th>
<th>≤ ± 2% of measured value</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Long-term drift, at 20°C (68°F)</th>
<th>≤ ± 0.2 ppm/year</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Zero point:</th>
<th>≤ ± 2% of measured value/month</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Warm-up time:</th>
<th>≤ 1 hour</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Ambient conditions</th>
<th>Temperature: (-40 to 50)°C (-40 to 122)°F</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Humidity:</th>
<th>(10 to 90)% RH</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pressure:</th>
<th>(700 to 1,300) hPa</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Influence of temperature</th>
<th>Zero point:</th>
<th>≤ ± 0.1 ppm</th>
</tr>
</thead>
</table>

| Sensitivity: | ≤ ± 5% of measured value |

<table>
<thead>
<tr>
<th>Influence of humidity</th>
<th>Zero point:</th>
<th>No effect</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sensitivity:</th>
<th>≤ ± 0.4% of measured value/% RH</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Test gas:</th>
<th>approx. 2 to 20 ppm Cl₂ or one of the other target gases: F₂, Br₂, ClO₂</th>
</tr>
</thead>
</table>

**DrägerSensor® XS EC Cl₂**

Order no. 68 09 165

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
<td>–</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor is suitable for monitoring concentrations of chlorine, bromine, fluorine, and chlorine dioxide in the ambient air. It is sufficient to calibrate the sensor using a chlorine test gas; by doing so, all of the other target gases are then automatically calibrated.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of chlorine. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm Cl₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>≤ 0.5(–)</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>20 ppm</td>
<td>≤ 0.1(–)</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 0.1(–)</td>
</tr>
<tr>
<td>i-propanol</td>
<td>(CH₃)₂CHOH</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>4 Vol. %</td>
<td>≤ 0.3(–)</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>4 Vol. %</td>
<td>≤ 0.2</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>≤ 0.2</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
MARKET SEGMENTS
Food and beverage, breweries, waste water treatment, swimming pools, industrial gases, pulp and paper.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.02 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.01 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 20 ppm ClO₂ (chlorine dioxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 20 seconds (T₅₀)</td>
</tr>
<tr>
<td>Measurement accuracy:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F):</td>
<td>≤ ± 0.03 ppm/year</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 12 hours</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(–20 to 50)°C (–4 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.02 ppm</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>test gas 1 to 20 ppm ClO₂</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

The chlorine dioxide sensor is especially selective (see cross sensitivity table) and has a particularly low cross sensitivity to chlorine.

Sensor reaction to ClO₂ at 20 °C / 68 °F
Flow = 0.5 l/min, with 0.1 ppm ClO₂

![Graph showing sensor reaction to ClO₂](image)

The values given in the table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to other gases (for information contact Dräger). Gas mixtures can be displayed as the sum of all components. Gases with negative sensitivity may displace a positive display of chlorine dioxide. A check should be carried out to see if mixtures of gases are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm ClO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>1 ppm</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 0.02</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>1 Vol. %</td>
<td>≤ 0.5(−)</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
MARKET SEGMENTS
Waste disposal, metal processing, petrochemicals, fertilizer production, mining and tunneling, shipping, inorganic chemicals, steel, organic chemicals, oil and gas, hazmat, biogas.

TECHNICAL SPECIFICATIONS

| Detection limit: | 2 ppm for XS EC / XS 2 / XS R |
| Resolution: | 1 ppm |
| Measurement range: | 0 to 2,000 ppm CO (carbon monoxide) |
| Response time: | ≤ 35 seconds (T<sub>90</sub>) – XS EC |
| | ≤ 20 seconds (T<sub>90</sub>) – XS 2 |
| | ≤ 30 seconds (T<sub>90</sub>) – XS R |
| Measurement accuracy | ≤ ± 1% of measured value – XS EC / XS 2 / XS R |
| Sensitivity: | ≤ ± 1 ppm/month – XS EC / XS 2 |
| | ≤ ± 1% of measured value/month |
| | ≤ 12 hours – XS EC / XS 2 / XS R |
| Ambient conditions | Temperature: (−20 to 50) °C (−4 to 122) °F – XS EC |
| | | (−40 to 50) °C (−40 to 122) °F – XS 2 / XS R |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |
| Influence of temperature | Zero point: ≤ ± 5 ppm |
| | Sensitivity: ≤ ± 0.4% of measured value/K |
| Influence of humidity | Zero point: ≤ ± 0.02 ppm/% RH – XS EC |
| | No effect – XS 2 / XS R |
| Sensitivity: ≤ ± 0.1% of measured value/% RH – XS EC / XS 2 |
| | ≤ ± 0.05% of measured value/% RH – XS R |
| Test gas: | approx. 10 to 2,000 ppm CO test gas |
**SPECIAL CHARACTERISTICS**

In addition to an outstanding linearity and a quick response time, these CO sensors are highly selective. Internal selective filters, some of which are replaceable, filter out the majority of accompanying gases such as alcohol and acidic gases like H₂S, SO₂.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of carbon monoxide. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS EC CO – 68 09 105

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO without selective filter</th>
<th>Display in ppm CO with selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 20</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 500</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol. %</td>
<td>No effect</td>
<td>≤ 1(⁻)</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>CH₂Cl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>0.2 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>10 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₂COOC₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 25</td>
<td>No effect</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCHO</td>
<td>20 ppm</td>
<td>≤ 150</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol. %</td>
<td>≤ 30</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>≤ 90</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>≤ 6</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>≤ 10</td>
<td>≤ 1(⁻)</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>≤ 120</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>175 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>≤ 150</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>25 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>No effect</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>CCl₂ CCl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₈H₈CH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCL₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(⁻) Indicates negative deviation
### RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS R CO – 68 10 258

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO without selective filter</th>
<th>Display in ppm CO with selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 20</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 500</td>
<td>≤ 300</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>CH₂Cl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>0.2 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₆OH</td>
<td>200 ppm</td>
<td>≤ 400</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>10 ppm</td>
<td>≤ 25</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 150</td>
<td>No effect</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCHO</td>
<td>20 ppm</td>
<td>≤ 10</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol. %</td>
<td>≤ 6</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>≤ 10</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>≤ 120</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>≤ 6</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>175 ppm</td>
<td>≤ 150</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>25 ppm</td>
<td>≤ 50</td>
<td>≤ 6</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 20</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>≤ 25</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>CCl₂ ClCl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Gas/vapor</td>
<td>Chem. symbol</td>
<td>Concentration</td>
<td>Display in ppm CO without selective filter</td>
<td>Display in ppm CO with selective filter</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------</td>
<td>---------------</td>
<td>---------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Acetone</td>
<td>( \text{CH}_3\text{COCH}_3 )</td>
<td>1,000 ppm</td>
<td>( \leq 20 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>( \text{C}_2\text{H}_2 )</td>
<td>200 ppm</td>
<td>( \leq 500 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>( \text{NH}_3 )</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>( \text{CO}_2 )</td>
<td>30 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>( \text{Cl}_2 )</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>( \text{CH}_2\text{Cl}_2 )</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>( \text{C}_2\text{H}_6 )</td>
<td>0.2 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>( \text{C}_2\text{H}_5\text{OH} )</td>
<td>200 ppm</td>
<td>No effect for ( \leq 400 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>( \text{C}_2\text{H}_4 )</td>
<td>50 ppm</td>
<td>No effect for ( \leq 25 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>( \text{CH}_2\text{COOC}_2\text{H}_4 )</td>
<td>1,000 ppm</td>
<td>No effect for ( \leq 150 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>( \text{HCHO} )</td>
<td>20 ppm</td>
<td>No effect for ( \leq 30 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>( \text{H}_2 )</td>
<td>0.1 Vol. %</td>
<td>No effect for ( \leq 90 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>( \text{HCl} )</td>
<td>40 ppm</td>
<td>No effect for ( \leq 6 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>( \text{HCN} )</td>
<td>50 ppm</td>
<td>No effect for ( \leq 10 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>( \text{H}_2\text{S} )</td>
<td>30 ppm</td>
<td>No effect for ( \leq 120 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>( \text{CH}_4 )</td>
<td>5 Vol. %</td>
<td>No effect for ( \leq 150 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>( \text{CH}_3\text{OH} )</td>
<td>175 ppm</td>
<td>No effect for ( \leq 50 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>( \text{NO}_2 )</td>
<td>20 ppm</td>
<td>No effect for ( \leq 20 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>( \text{NO} )</td>
<td>25 ppm</td>
<td>No effect for ( \leq 25 )</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosgene</td>
<td>( \text{COCL}_2 )</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>( \text{PH}_3 )</td>
<td>5 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>( \text{C}_3\text{H}_8 )</td>
<td>1 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>( \text{SO}_2 )</td>
<td>25 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>( \text{CCl}_2\text{CCl}_2 )</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>( \text{C}_4\text{H}_8\text{S} )</td>
<td>5 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>( \text{C}_2\text{H}_5\text{CH}_3 )</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>( \text{CHCICCl}_2 )</td>
<td>1,000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
</tbody>
</table>
## DrägerSensor® XS EC CO HC

**Order no. 68 09 120**

### MARKET SEGMENTS
Waste disposal, metal processing, petrochemicals, fertilizer production, mining and tunneling, shipping, inorganic chemicals, steel, organic chemicals, oil and gas, hazmat, biogas.

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>10 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 10,000 ppm CO (carbon monoxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 10 seconds (T_{90})</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 1% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F):</td>
<td>≤ ± 2 ppm/month</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ 12 hours</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td></td>
</tr>
</tbody>
</table>

**Ambient conditions**

- **Temperature:** (–40 to 50)°C (–40 to 122)°F
- **Humidity:** (10 to 90)% RH
- **Pressure:** (700 to 1,300) hPa

**Influence of temperature**

- **Zero point:** ≤ ± 10 ppm
- **Sensitivity:** ≤ ± 0.3% of measured value/K

**Influence of humidity**

- **Zero point:** No effect
- **Sensitivity:** ≤ ± 0.05% of measured value/% RH

**Test gas:**

- 50 to 10,000 ppm CO test gas
SPECIAL CHARACTERISTICS
Because of its excellent linearity, this sensor (measurement range 10,000 ppm) can be calibrated at the lower levels of its measurement range. It also offers very stable measurements, even at high concentrations and over long periods of time.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of carbon monoxide. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 30</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>≤ 8(−)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>200 ppm</td>
<td>≤ 400</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>20 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol. %</td>
<td>≤ 400</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>≤ 80</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₆S</td>
<td>10 ppm</td>
<td>≤ 4</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
### DrägerSensor® XS EC CO₂

#### Used in
| Dräger X-am 7000 |

#### Plug & Play
| yes |

#### Replaceable
| yes |

#### Guaranty
| 1 year |

#### Expected sensor life
| > 1.25 years |

#### Selective filter
| – |

### MARKET SEGMENTS
Waste disposal, Food and beverage, breweries, metal processing, petrochemicals, fertilizer production, sewage, police, customs and rescue services, mining and tunneling, shipping and transport, power generation.

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection limit</td>
<td>0.2 Vol. %</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 Vol. %</td>
</tr>
<tr>
<td>Measurement range</td>
<td>0 to 5 Vol. % CO₂ (carbon dioxide)</td>
</tr>
<tr>
<td>Response time</td>
<td>≤ 45 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 20% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 0.1 Vol. %/month</td>
</tr>
<tr>
<td>Zero point</td>
<td>≤ ± 15% of measured value/month</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 0.1 Vol. %/month</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>≤ 12 hours</td>
</tr>
<tr>
<td>Temperature</td>
<td>(–20 to 40)°C (–4 to 104)°F</td>
</tr>
<tr>
<td>Humidity</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td>≤ ± 0.01 Vol. %/K</td>
</tr>
<tr>
<td>Zero point</td>
<td>≤ ± 2% of measured value/K</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 2% of measured value/K</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td>≤ ± 0.005 Vol. %/% RH</td>
</tr>
<tr>
<td>Zero point</td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>approx. 0.5 to 4 Vol. % CO₂ test gas</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS
This sensor is highly sensitive (see cross-sensitivity list) and offers an economical alternative to infrared sensors, if you need to warn against CO₂ concentrations in the ambient air.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of dioxide. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Boron trichloride</td>
<td>BCl₃</td>
<td>15 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>5 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>130 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>50 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Hydrogen phosphide</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>30 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 0.1(−)</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
DrägerSensor® XS EC COCl₂

**MARKET SEGMENTS**
Production of plastics, insecticides production, dyes.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection limit</td>
<td>0.01 ppm</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 ppm</td>
</tr>
<tr>
<td>Measurement range</td>
<td>0 to 10 ppm COCl₂ (phosgene)</td>
</tr>
<tr>
<td>Response time</td>
<td>( \leq 20 \text{ seconds (} T_{20} \text{) } )</td>
</tr>
<tr>
<td></td>
<td>( \leq 40 \text{ seconds (} T_{50} \text{) } )</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>( \leq \pm 10% \text{ of measured value} )</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>( \leq \pm 0.01 \text{ ppm/month} )</td>
</tr>
<tr>
<td>Zero point</td>
<td>( \leq \pm 2% \text{ of measured value/month} )</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>( \leq 1 \text{ hour} )</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>((-20 \text{ to } 40)\text{°C (} -4 \text{ to } 104)\text{°F} )</td>
</tr>
<tr>
<td>Humidity</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td>( \leq \pm 0.001 \text{ ppm/K} )</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td>( \leq \pm 1% \text{ of measured value/K} )</td>
</tr>
<tr>
<td>Test gas</td>
<td>3 to 10 ppm COCl₂</td>
</tr>
</tbody>
</table>

**Used in**
Dräger X-am 7000

**Plug & Play**
Yes

**Replaceable**
Yes

**Guaranty**
6 months

**Expected sensor life**
> 1 year

**Selective filter**
–

Order no. 68 08 582
SPECIAL CHARACTERISTICS
The XS Phosgene sensor is highly selective, especially against hydrogen chloride (HCl).

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of phosgene. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm COCl₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>0.5 ppm</td>
<td>≤ 0.2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>260 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>8,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>0.5 ppm</td>
<td>≤ 0.7</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>H₂O₂</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>1 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>1 ppm</td>
<td>≤ 0.1(–)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.3 ppm</td>
<td>≤ 0.05(–)</td>
</tr>
<tr>
<td>Propanol</td>
<td>C₃H₇OH</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>2 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XS EC H₂

MARKET SEGMENTS
Chemical, petrochemical, rocket fuel, leakages, production of plastics, metal processing, industrial gases, fertilizer production

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection limit</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Resolution</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Measurement range</td>
<td>0 to 2,000 ppm H₂ (hydrogen)</td>
</tr>
<tr>
<td>Response time</td>
<td>≤ 20 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 1% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td></td>
</tr>
<tr>
<td>Zero point</td>
<td>≤ ± 4 ppm/month</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 4% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>≤ 1 hour</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>(–20 to 50)°C (–4 to 122)°F</td>
</tr>
<tr>
<td>Humidity</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point</td>
<td>≤ ± 10 ppm</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 1 ppm/K</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ± 0.15% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas</td>
<td>approx. 200 to 1,800 ppm H₂ test gas</td>
</tr>
</tbody>
</table>

Used in
Dräger X-am 7000

Plug & Play | Replaceable | Guaranty | Expected sensor life | Selective filter
--- | --- | --- | --- | ---
yes | yes | 1 year | > 2 years | –

Order no. 68 09 185
SPECIAL CHARACTERISTICS

This sensor enables ppm concentrations of H₂ (hydrogen) to be measured in the ambient air. It has a very fast response time and is therefore especially suited to detect leakages.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 700</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>Cl₂</td>
<td>100 ppm</td>
<td>≤ 130</td>
</tr>
<tr>
<td>Chlorine</td>
<td>C₂H₄</td>
<td>5 ppm</td>
<td>≤ 5(–)</td>
</tr>
<tr>
<td>Ethene</td>
<td>HCl</td>
<td>1,000 ppm</td>
<td>≤ 1800</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCN</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>CH₄</td>
<td>20 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₃OH</td>
<td>50 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>NO₂</td>
<td>500 ppm</td>
<td>≤ 750</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 15(–)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>COCl₂</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Phosgene</td>
<td>PH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>C₄H₈S</td>
<td>20 ppm</td>
<td>≤ 15</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
MARKET SEGMENTS
Ammonia synthesis, fuel refinement (hydrocracking), sulfur elimination, chemical, rocket fuel, leakage inspection, metal processing, industrial gases, fertilizer production, battery chargers, fuel cells.

**DrägerSensor® XS EC H₂ HC**

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>–</td>
</tr>
</tbody>
</table>

**TECHNICAL SPECIFICATIONS**

- **Detection limit:** 0.02 Vol. %
- **Resolution:** 0.01 Vol. %
- **Measurement range:** 0 to 4 Vol. % H₂ (hydrogen)
- **Response time:** ≤ 20 seconds (T₅₀)
- **Measurement accuracy**
  - Sensitivity: ≤ ± 2% of measured value
  - **Long-term drift, at 20°C (68°F)**
    - Zero point: ≤ ± 0.05 Vol. %/year
    - Sensitivity: ≤ ± 3% of measured value/month
    - Warm-up time: ≤ 1 hour
- **Ambient conditions**
  - **Temperature:** (-20 to 50)°C (-4 to 122)°F
  - **Humidity:** (10 to 90)% RH
  - **Pressure:** (700 to 1,300) hPa
- **Influence of temperature**
  - Zero point: ≤ ± 0.05 Vol. %
  - Sensitivity: ≤ ± 5% of measured value
- **Influence of humidity**
  - Zero point: No effect
  - Sensitivity: ≤ ± 0.1% of measured value/% RH
- **Test gas:** 0.2 to 4 Vol. % H₂ test gas
**SPECIAL CHARACTERISTICS**

This sensor covers the entire range of LELs up to 4 Vol. % H₂, and is therefore the ideal addition when using IR technology in the Dräger X-am 7000 to measure for explosion risks. The sensor also offers high selectivity (see cross-sensitivity specifications) and linearity.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol. % H₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 0.02</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethylene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 0.02</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XS EC HCN

MARKET SEGMENTS
Metal processing, mining, fumigation and pest control, chemical war agent (blood agents).

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
<td>–</td>
</tr>
</tbody>
</table>

Detection limit: 0.5 ppm
Resolution: 0.1 ppm
Measurement range: 0 to 50 ppm HCN (hydrogen cyanide)
Response time: ≤ 10 seconds (T₅₀)
Measurement accuracy:
Sensitivity: ≤ ± 5% of measured value
Long-term drift, at 20°C (68°F):
Zero point: ≤ ± 1 ppm/month
Sensitivity: ≤ ± 5% of measured value/month
Warm-up time: ≤ 15 minutes
Ambient conditions:
Temperature: (-20 to 50)°C (-4 to 122)°F
Humidity: (10 to 90)% RH
Pressure: (700 to 1,300) hPa
Influence of temperature:
Zero point: ≤ ± 1 ppm
Sensitivity: ≤ ± 5% of measured value
Influence of humidity:
Zero point: No effect
Sensitivity: ≤ ± 0.1% of measured value/% RH
Test gas:
3 to 50 ppm HCN
After long periods of exposure > 10 ppm HCN/hour, the sensor should be recalibrated.
**SPECIAL CHARACTERISTICS**

The extremely quick response time of this sensor provides a fast and reliable warning against prussic acid (hydrogen cyanide).

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of hydrogen cyanide. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm HCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>C₂H₆O</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCHO</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1.6 Vol. %</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>i-propanol</td>
<td>(CH₃)₂CHOH</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>20 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>175 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>10 ppm</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>10 ppm</td>
<td>≤ 0.5</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XS EC HF/HCl

Detection limit: 1 ppm
Resolution: 0.1 ppm
Measurement range/relative sensitivity
- 0 to 30 ppm HCl (hydrogen chloride) 1.00
- 0 to 30 ppm HNO₃ (nitric acid) 1.00
- 0 to 30 ppm HBr (hydrogen bromide) 1.00
- 0 to 30 ppm POCl₃ (phosphoryl trichloride) 1.00
- 0 to 30 ppm PCl₃ (phosphorous trichloride) 3.00
- 0 to 30 ppm HF (hydrogen fluoride) 0.66
Response time: ≤ 60 seconds (T₅₀)
Measurement accuracy
Sensitivity: ≤ ± 15% of measured value
Long-term drift, at 20°C (68°F)
Zero point: ≤ ± 0.5 ppm/month
Sensitivity: ≤ ± 5% of measured value/month
Warm-up time: ≤ 1 hour
Ambient conditions
Temperature: (-20 to 40)°C (-4 to 104)°F
Humidity: (30 to 90)% RH
Pressure: (700 to 1,300) hPa
Influence of temperature
Zero point: ≤ ± 0.5 ppm
Sensitivity: ≤ ± 10% of measured value
Influence of humidity
Zero point: No effect
Sensitivity: ≤ ± 2% of measured value/% RH
Test gas: HCl test gas between 3 to 30 ppm; or one of the other target gases HNO₃, HBr, POCl₃, PCl₃, HF. Every time the sensor is used, the following function test should be performed beforehand. Procedure: hold the unit over a container containing a (9 ± 0.5) mol of acetic acid, at room temperature. Evaluation: after 30 seconds, the figure displayed should be greater than 0.5 ppm HCl. If the figure is less than 0.5 ppm, then the sensitivity must be calibrated. A function test can also be performed using the test gas.
SPECIAL CHARACTERISTICS

This sensor is used exclusively in the Dräger X-am 5100. This sensor can be used to monitor concentrations of hydrogen chloride (HCl), nitric acid (HNO₃), hydrogen bromide (HBr), phosphoryl trichloride (POCl₃), phosphorous trichloride (PCl₃) and HF (hydrogen fluoride) in the ambient air.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of HCl/HF. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm HCl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia*</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>150 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1.5 Vol. %</td>
<td>≤ 22</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>H₂O₂</td>
<td>20 ppm</td>
<td>≤ 9</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>i-propanol</td>
<td>(CH₃)₂CHOH</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2 Vol. %</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 0.8</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
</tbody>
</table>

* Volatile alkaline substances (such as NH₃, amines) can impair the function of the sensor. If in doubt, perform a function test.
MARKET SEGMENTS
Waste disposal, petrochemical, fertilizer production, sewage, mining and tunneling, shipping, inorganic chemicals, steel industry, pulp and paper, organic chemicals, oil and gas, hazmat, biogas.

TECHNICAL SPECIFICATIONS

Detection limit: 1 ppm for XS EC / XS 2 / XS R
Resolution: 0.1 ppm for XS EC / XS 2 / XS R
Measurement range: 0 to 100 ppm H₂S (hydrogen sulfide)
Response time:
- ≤ 20 seconds (T₉₀) - XS R
- ≤ 25 seconds (T₉₀) - XS EC
- ≤ 30 seconds (T₉₀) - XS 2

Measurement accuracy
Sensitivity:
- ≤ ± 2% of measured value - XS EC / XS R
- ≤ ± 1% of measured value - XS 2

Long-term drift, at 20°C (68°F)
Zero point:
- ≤ ± 1 ppm/year - XS EC / XS R
- ≤ ± 1 ppm/month - XS 2

Sensitivity:
- ≤ ± 1% of measured value/month

Warm-up time:
- ≤ 12 hours - XS EC / XS 2 / XS R

Ambient conditions
Temperature*:
- (–20 to 50)°C (–4 to 122)°F - XS EC
- (–40 to 50)°C (–40 to 122)°F - XS 2 / XS R

Humidity*:
- (10 to 90)% RH

Pressure:
- (700 to 1,300) hPa

Influence of temperature
Zero point:
- ≤ ± 5 ppm - XS EC / XS microPac, ≤ ± 2 ppm - XS 2 / XS R

Sensitivity:
- ≤ ± 5% of measured value - XS EC / XS 2 / XS R

Influence of humidity
Zero point:
- ≤ ± 0.02 ppm/% RH - XS EC / XS 2, no effect - XS R

Sensitivity:
- ≤ ± 0.05% of measured value/% RH - XS EC / XS 2 / XS R

Test gas:
approx. 5 to 100 ppm H₂S test gas

* Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.
**SPECIAL CHARACTERISTICS**

These sensor’s advantages include fast response times and excellent linearity. At concentrations up to 20 ppm, sulfur dioxide only has a minor effect on hydrogen sulfide readings. This, therefore, enables the selective measurement of hydrogen sulfide alongside sulfur dioxide.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ±30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂S. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS EC H₂S**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.6 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>≤ 1 (−)</td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td>CS₂</td>
<td>15 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>≤ 20 ppm</td>
<td>≤ 2 (−)</td>
</tr>
<tr>
<td>Dimethyldisulfide</td>
<td>CH₃SSCH₃</td>
<td>≤ 4</td>
<td>≤ 13</td>
</tr>
<tr>
<td>Dimethylsulfide</td>
<td>(CH₃)₂S</td>
<td>≤ 3</td>
<td>≤ 6</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>≤ 200 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Ethanethiol</td>
<td>C₂H₅SH</td>
<td>≤ 20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₆H₄</td>
<td>1,000 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>FAM regular gasoline (DIN 51635, DIN 51557)</td>
<td>–</td>
<td>0.55 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Hexane</td>
<td>C₆H₁₄</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Methylmercaptane</td>
<td>CH₃SH</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Octane</td>
<td>CH₃H₁₈</td>
<td>0.4 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>0.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>≤ 4</td>
<td>≤ 4</td>
</tr>
<tr>
<td>sec-Butylmercaptan</td>
<td>C₄H₁₀SH</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₅S</td>
<td>20 ppm</td>
<td>≤ 7</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₇H₈CH₃</td>
<td>0.6 Vol. %</td>
<td>≤ 4</td>
</tr>
<tr>
<td>tert-Butylmercaptane</td>
<td>(CH₃)₃CШ</td>
<td>20 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Xylol</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5 Vol. %</td>
<td>≤ 4</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
### RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS 2 H₂S

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤4</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.6 Vol. %</td>
<td>≤10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td>CS₂</td>
<td>15 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>≤3</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>≤2⁻¹</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>0.2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>200 ppm</td>
<td>≤2</td>
</tr>
<tr>
<td>Ethanethiol</td>
<td>C₂H₅SH</td>
<td>10 ppm</td>
<td>≤5</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤10</td>
</tr>
<tr>
<td>Hexane</td>
<td>C₆H₁₄</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1 Vol. %</td>
<td>≤10</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>≤10</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤10</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCL₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤5</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤4</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₆S</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₂H₅CH₃</td>
<td>0.6 Vol. %</td>
<td>≤4</td>
</tr>
<tr>
<td>Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5 Vol. %</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation
<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.6 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td>CS₂</td>
<td>15 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>8 ppm</td>
<td>≤ 2(−)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>200 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Ethanethiol</td>
<td>C₂H₅SH</td>
<td>10 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>FAM regular gasoline</td>
<td>−</td>
<td>0.55 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>(DIN 51635, DIN 51557)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexane</td>
<td>C₆H₁₄</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Octane</td>
<td>C₈H₁₈</td>
<td>0.4 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>0.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₆S</td>
<td>10 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₇H₈CH₃</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5 Vol. %</td>
<td>≤ 4</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
DrägerSensor® XS EC H₂S HC

**MARKET SEGMENTS**
Waste disposal, petrochemical, fertilizer production, sewage, mining and tunneling, shipping, inorganic chemicals, steel industry, pulp and paper, organic chemicals, oil and gas, hazmat, biogas.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>5 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 1,000 ppm H₂S (hydrogen sulfide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 20 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 3 ppm/month</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 3% of measured value/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.1 ppm/% RH</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 12 hours</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature*:</td>
<td>(–40 to 50)°C (–40 to 122)°F</td>
</tr>
<tr>
<td>Humidity*:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 5 ppm</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.1 ppm/% RH</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>15 to 1,000 ppm H₂S test gas</td>
</tr>
</tbody>
</table>

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.*
SPECIAL CHARACTERISTICS

Because of its excellent linearity, this sensor can be calibrated in its lower measurement range using a hydrogen sulfide test gas without compromising on accuracy in its upper measurement range. It also offers a fast response time and good selectivity.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂S. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.6 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td>CS₂</td>
<td>15 ppm</td>
<td>≤ 2 (−)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>8 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>200 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>10 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>FAM regular gasoline</td>
<td>(DIN 51635, DIN 51557)</td>
<td>-</td>
<td>No effect</td>
</tr>
<tr>
<td>Hexane</td>
<td>C₆H₁₄</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol. %</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Octane</td>
<td>C₈H₁₈</td>
<td>0.4 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>0.5 Vol. %</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>10 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Xylool</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.5 Vol. %</td>
<td>≤ 4</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
DrägerSensor® XS EC H₂O₂

**MARKET SEGMENTS**
Disinfection and sterilization, bleaching, decontaminating interior spaces.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detection limit:</strong></td>
<td>0.1 ppm</td>
</tr>
<tr>
<td><strong>Resolution:</strong></td>
<td>0.1 ppm</td>
</tr>
<tr>
<td><strong>Measurement range:</strong></td>
<td>0 to 20 ppm H₂O₂ (hydrogen peroxide)</td>
</tr>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 60 seconds (T₉₀)</td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td>≤ ± 10% of measured value</td>
</tr>
<tr>
<td><strong>Long-term drift, at 20°C (68°F)</strong></td>
<td>≤ ± 1 ppm/year</td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td><strong>Warm-up time:</strong></td>
<td>≤ 12 hours</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature:</strong></td>
<td>(0 to 50)°C (32 to 122)°F</td>
</tr>
<tr>
<td><strong>Humidity:</strong></td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td><strong>Pressure:</strong></td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td><strong>Influence of temperature</strong></td>
<td>≤ ± 1 ppm</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td>≤ ± 0.5% of measured value/K</td>
</tr>
<tr>
<td><strong>Influence of humidity</strong></td>
<td>≤ ± 0.01 ppm/% RH</td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
<tr>
<td><strong>Sensitivity:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Test gas:</strong></td>
<td>H₂O₂ test gas between 1 to 10 ppm</td>
</tr>
<tr>
<td></td>
<td>Alternatively, the sensor can be calibrated using SO₂ test gas (10 ppm). But a higher measurement uncertainty must be expected.</td>
</tr>
</tbody>
</table>
**SPECIAL CHARACTERISTICS**

This sensor is used in the Dräger X-am 5100 to monitor the $\text{H}_2\text{O}_2$ (hydrogen peroxide) concentration in the ambient air. It offers high sensitivity (see cross-sensitivity table).

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by $\pm$ 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of $\text{H}_2\text{O}_2$. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm $\text{H}_2\text{O}_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>$\text{CH}_3\text{COCH}_3$</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>$\text{C}_2\text{H}_2$</td>
<td>200 ppm</td>
<td>$\leq$ 35</td>
</tr>
<tr>
<td>Ammonia</td>
<td>$\text{NH}_3$</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>$\text{CO}_2$</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>$\text{CO}$</td>
<td>125 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>$\text{Cl}_2$</td>
<td>5 ppm</td>
<td>$\leq$ 35</td>
</tr>
<tr>
<td>Ethene</td>
<td>$\text{C}_2\text{H}_4$</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>$\text{H}_2$</td>
<td>1.5 Vol. %</td>
<td>$\leq$ 35</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>$\text{HCl}$</td>
<td>15 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>$\text{HCN}$</td>
<td>25 ppm</td>
<td>$\leq$ 7</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>$\text{H}_2\text{S}$</td>
<td>20 ppm</td>
<td>$\leq$ 80</td>
</tr>
<tr>
<td>i-Propanol</td>
<td>$(\text{CH}_3)\text{CHOH}$</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>$\text{CH}_4$</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>$\text{CH}_3\text{OH}$</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>$\text{NO}_2$</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>$\text{NO}$</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>$\text{PH}_3$</td>
<td>5 ppm</td>
<td>$\leq$ 15</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>$\text{SO}_2$</td>
<td>20 ppm</td>
<td>$\leq$ 12</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>$\text{C}_4\text{H}_8\text{S}$</td>
<td>10 ppm</td>
<td>$\leq$ 5</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
### DrägerSensor® XS EC Hydrazine

**MARKET SEGMENTS**
Rocket fuel, aircraft fuel (e.g. F-16), fuel for emergency power generators, for electrochemical power generation in secondary cells or in alkaline fuel cells, especially in space travel, submarines, and other military equipment.

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detection limit:</strong></td>
<td>0.02 ppm</td>
</tr>
<tr>
<td><strong>Resolution:</strong></td>
<td>0.01 ppm</td>
</tr>
<tr>
<td><strong>Measurement range:</strong></td>
<td>0 to 5 ppm N₂H₄ (hydrazine) 0 to 5 ppm CH₃NH-NH₂ (methyl hydrazine) 0 to 5 ppm (CH₃)₂N-NH₂ (dimethylhydrazine)</td>
</tr>
<tr>
<td><strong>Response time:</strong></td>
<td>≤ 180 seconds (T₉₀)</td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td><strong>Long-term drift, at 20°C (68°F)</strong></td>
<td>≤ ± 0.01 ppm/month</td>
</tr>
<tr>
<td><strong>Zero point:</strong></td>
<td>≤ ± 5% of measured value/month</td>
</tr>
<tr>
<td><strong>Warm-up time:</strong></td>
<td>≤ 1 hour</td>
</tr>
</tbody>
</table>

#### Ambient conditions
- **Temperature:** (-20 to 50°C (-4 to 122°F)
- **Humidity:** (15 to 95)% RH
- **Pressure:** (700 to 1,300) hPa

#### Influence of temperature
- **Zero point:** No effect
- **Sensitivity:** ≤ ± 5% of measured value

#### Influence of humidity
- **Zero point:** No effect
- **Sensitivity:** ≤ ± 0.1% of measured value/% RH

**Test gas:** 0.1 to 3 ppm N₂H₄, CH₃NH-NH₂, (CH₃)₂N-NH₂
SPECIAL CHARACTERISTICS
This sensor is used exclusively in the Dräger X-am 5100 for monitoring concentrations of hydrazine (N₂H₄), methyl hydrazine (CH₃NH-NH₂), and dimethylhydrazine ((CH₃)₂N-NH₂).

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of hydrazine. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm N₂H₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>250 ppm</td>
<td>≤ 2.5</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>100 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 0.1(–)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>130 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 0.25</td>
</tr>
<tr>
<td>i-propanol</td>
<td>(CH₃)₂CHOH</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>3 Vol. %</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>25 ppm</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
**MARKET SEGMENTS**
Inorganic chemicals, industry, fumigation, pre entry measurement.

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**DrägerSensor® XS EC Hydride**

**Order no. 68 09 135**

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**TECHNICAL SPECIFICATIONS**

- **Detection limit:** 0.02 ppm
- **Resolution:** 0.01 ppm

**Measurement range:**

- 0 to 20 ppm PH₃ (hydrogen phosphide)
- 0 to 20 ppm AsH₃ (arsine)
- 0 to 1 ppm B₂H₆ (diborane)
- 0 to 20 ppm GeH₄ (germanium tetrahydride)
- 0 to 50 ppm SiH₄ (silane)
- 0 to 10 ppm H₂Se (hydrogen selenide)*

**Response time:**

- ≤ 10 seconds (T₉₀) for PH₃, B₂H₆, SiH₄
- ≤ 20 seconds (T₉₀) for AsH₃, GeH₄, H₂Se

**Measurement accuracy**

- Sensitivity: ≤ ± 2% of measured value
- Long-term drift, at 20°C (68°F)
  - Zero point: ≤ ± 0.02 ppm/month
  - Sensitivity: ≤ ± 2% of measured value/month for PH₃, AsH₃
  - ≤ ± 3% of measured value/month for SiH₄
  - ≤ ± 5% of measured value/month for B₂H₆, GeH₄, H₂Se

**Warm-up time:**

- ≤ 15 minutes

**Ambient conditions**

- Temperature: (-20 to 50)°C (-4 to 122)°F
  (0 to 40)°C (32 to 104)°F for H₂Se
- Humidity: (10 to 90)% RH
- Pressure: (700 to 1,300) hPa

**Influence of temperature**

- Zero point: ≤ ± 0.02 ppm
- Sensitivity: ≤ ± 5% of measured value

**Influence of humidity**

- Zero point: ≤ ± 0.02 ppm
- Sensitivity: ≤ ± 0.05% of measured value/% RH

**Test gas:**

- 0.2 to 10 ppm H₂Se
- 0.2 to 20 ppm PH₃, AsH₃ or GeH₄
- 0.2 to 50 ppm SiH₄
- 0.1 to 1 ppm B₂H₆

---

*with limited temperature range: 0 to 40°C dry test gas*
SPECIAL CHARACTERISTICS

This sensor can be used to monitor the concentration of PH₃ (hydrogen phosphide), AsH₃ (arsine), B₂H₆ (diborane), GeH₄ (germanium tetrahydride) or SiH₄ (silane) in the ambient air. It is sufficient to calibrate the sensor using a PH₃ test gas; by doing so all of the other target gases are then automatically calibrated.

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of hydride. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm PH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 12</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>150 ppm</td>
<td>≤ 0.2</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 0.15</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 2(−)</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCHO</td>
<td>50 ppm</td>
<td>≤ 0.25</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>i-propanol</td>
<td>(CH₃)₂CHOH</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>4 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₂OH</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 5(−)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>≤ 2</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
DrägerSensor® XS EC NH₃

MARKET SEGMENTS
Food and beverage, poultry farming, power generation, inorganic chemicals, fertilizer production, analysis of chemical war agents, hazmat, fumigation, metal processing, petrochemicals, pulp and paper.

TECHNICAL SPECIFICATIONS

| Detection limit: | 3 ppm |
| Resolution: | 1 ppm |
| Measurement range: | 0 to 300 ppm NH₃ (ammonia) |
| Response time: | ≤ 20 seconds (Tₕ₀) |
| Measurement accuracy |
| Sensitivity: | ≤ ± 3% of measured value |
| Long-term drift, at 20°C (68°F) |
| Zero point: | ≤ ± 2 ppm/month |
| Sensitivity: | ≤ ± 2% of measured value/month |
| Warm-up time: | ≤ 12 hours |
| Ambient conditions |
| Temperature*: | (–40 to 50)°C (–40 to 122)°F |
| Humidity*: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |
| Influence of temperature |
| Zero point: | ≤ ± 5 ppm |
| Sensitivity: | ≤ ± 5% of measured value |
| Influence of humidity |
| Zero point: | ≤ ± 0.1 ppm/% RH |
| Sensitivity: | ≤ ± 0.2% of measured value/% RH |
| Test gas: | approx. 10 to 150 ppm NH₃ |

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.
SPECIAL CHARACTERISTICS
The quick response time of this sensor provides a fast and reliable warning against ammonia.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NH₃. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>≤ 5(−)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 20(−)</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>25 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol. %</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>≤ 10(−)</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>10 ppm</td>
<td>≤ 10</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
MARKET SEGMENTS
Power plants, district heating plants

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>1 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 200 ppm NO (nitrogen monoxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 30 seconds (T\textsubscript{90})</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 3% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 1 ppm/month</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 3% of measured value/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 18 hours</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(–40 to 50)°C (–40 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td>≤ ± 0.01 ppm/K</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.2% of measured value/K</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Influence of humidity</td>
<td>≤ ± 0.01 ppm/% RH</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.05% of measured value/% RH</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 1 to 200 ppm NO test gas</td>
</tr>
</tbody>
</table>
**SPECIAL CHARACTERISTICS**

This sensor enables a selective measurement of NO. It also offers a very fast response time and excellent linearity across its entire measurement range.

---

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NO. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.8 Vol. %</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>0.1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>2 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>CCl₂ CCl₂</td>
<td>0.6 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCL₂</td>
<td></td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XS EC NO₂

MARKET SEGMENTS
Inorganic chemicals, metal processing, oil and gas, petrochemicals, steel, shipping, rocket engineering, mining and tunneling.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.5 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 50 ppm NO₂ (nitrogen dioxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 15 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 1 ppm/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 15 minutes</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(-40 to 50)°C (-40 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 1 ppm</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.2% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 1 to 50 ppm NO₂ test gas</td>
</tr>
</tbody>
</table>

ORDER NO 68 09 155

<table>
<thead>
<tr>
<th>Used in</th>
<th>Dräger X-am 7000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug &amp; Play</td>
<td>yes</td>
</tr>
<tr>
<td>Replaceable</td>
<td>yes</td>
</tr>
<tr>
<td>Guaranty</td>
<td>1 year</td>
</tr>
<tr>
<td>Expected sensor life</td>
<td>&gt; 2 years</td>
</tr>
<tr>
<td>Selective filter</td>
<td>–</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor offers a fast response time and stable readings, even after experiencing high concentrations of nitrogen dioxide.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NO₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>CH₃CHO</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 60(–)</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>2.5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>1,000 ppm</td>
<td>≤ 1(–)</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCHO</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 2(–)</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>≤ 10(–)</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 100(–)</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>175 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 25(–)</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>≤ 50(–)</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>10 ppm</td>
<td>≤ 5(–)</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XS EC Odorant

Order no. 68 09 200

**MARKET SEGMENTS**

Gas supply companies

**TECHNICAL SPECIFICATIONS**

| Detection limit: | 1 ppm |
| Resolution: | 0.5 ppm |
| Measurement range | 0 to 40 ppm C₄H₈S (tetrahydrothiophene) |
| | 0 to 40 ppm (CH₃)₃CSH (t-butyl mercaptan) |
| | 0 to 40 ppm C₂H₅CH(CH₃)SH (sec-butyl mercaptan) |
| | 0 to 40 ppm CH₃SH (methyl mercaptan) |
| | 0 to 40 ppm C₂H₅SH (ethyl mercaptan) |
| | 0 to 100 ppm (CH₃)₂S (dimethyl sulfide) |
| | 0 to 40 ppm CH₃SSCH₃ (dimethyl disulfide) |
| Relative sensitivity | ≤ 0.01 ppm/% RH |
| Sensitivity: | ≤ ± 0.1% of measured value/% RH |
| Long-term drift, at 20°C (68°F) | ≤ ± 3% of measured value/month |
| Warm-up time: | ≤ 12 hours |
| Ambient conditions: | Temperature*: (-20 to 50)°C (~4 to 122)°F for THT, TBM, SBM |
| | (5 to 40)°C (32 to 104)°F for MeM, EtM, DMS, DMDS |
| | Humidity*: (0 to 90)% RH |
| | Pressure: (700 to 1,300) hPa |
| Influence of temperature: Zero point: | ≤ ± 1 ppm |
| Sensitivity: | ≤ ± 5% of measured value |
| Influence of humidity: Zero point: | ≤ ± 0.01 ppm/% RH |
| Sensitivity: | ≤ ± 0.1% of measured value/% RH |
| Test gas: 2 to 20 ppm THT or of one of the other target gases: (CH₃)₃CSH, C₂H₅CH(CH₃)SH, CH₃SH, C₂H₅SH, (CH₃)₂S, CH₃SSCH₃ |

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.*
SPECIAL CHARACTERISTICS
This sensor can be used to monitor seven different odorants in the ambient air or (for short periods) in natural gas. It is sufficient to calibrate the sensor using a THT test gas. By doing so, all of the other target gases are then automatically calibrated.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ±30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of THT. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm THT without selective filter</th>
<th>Display in ppm THT with selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 3</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>≤ 3</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>8 ppm</td>
<td>≤ 3(−)</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 2</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>10 ppm</td>
<td>≤ 30</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>100 Vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>175 ppm</td>
<td>≤ 8</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 2</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 30</td>
<td>≤ 30</td>
</tr>
<tr>
<td>n-propyl mercaptan</td>
<td>C₃H₇SH</td>
<td>6 ppm</td>
<td>≤ 4</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 15</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
**DrägerSensor® XS EC OV**

**MARKET SEGMENTS**
Production of plastics, painter, chemical industry, disinfection, pest control.

**TECHNICAL SPECIFICATIONS**

**Detection limit:**
1 ppm

**Resolution:**
0.5 ppm

**Measurement range/**

<table>
<thead>
<tr>
<th>Measurement range</th>
<th>Relative sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 200 ppm C₂H₄O (ethylene oxide)</td>
<td>1.00</td>
</tr>
<tr>
<td>0 to 200 ppm C₃H₆O (propylene oxide)</td>
<td>0.80</td>
</tr>
<tr>
<td>0 to 100 ppm C₂H₄ (ethene)</td>
<td>1.10</td>
</tr>
<tr>
<td>0 to 100 ppm C₃H₆ (propene)</td>
<td>0.70</td>
</tr>
<tr>
<td>0 to 100 ppm C₂H₃Cl (vinyl chloride)</td>
<td>0.80</td>
</tr>
<tr>
<td>0 to 200 ppm CH₃OH (methanol)</td>
<td>1.20</td>
</tr>
<tr>
<td>0 to 300 ppm C₂H₅OH (ethanol)</td>
<td>0.60</td>
</tr>
<tr>
<td>0 to 200 ppm CH₃CHO (acetaldehyde)</td>
<td>0.30</td>
</tr>
<tr>
<td>0 to 100 ppm CH₂CHCHCH₂ (butadiene)</td>
<td>1.20</td>
</tr>
<tr>
<td>0 to 100 ppm HCHO (formaldehyde)</td>
<td>1.00</td>
</tr>
<tr>
<td>0 to 100 ppm CH₃COOC₂H₃ (vinyl acetate)</td>
<td>0.80</td>
</tr>
<tr>
<td>0 to 300 ppm (H₃C)₂CHOH (isopropanol)</td>
<td>0.30</td>
</tr>
</tbody>
</table>

**Response time:**
≤ 90 seconds (T₅₀)

**Measurement accuracy**

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Measurement accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ ± 5% of measured value</td>
<td></td>
</tr>
</tbody>
</table>

**Long-term drift, at 20°C (68°F)**

<table>
<thead>
<tr>
<th>Zero point</th>
<th>Sensitivity</th>
<th>Warm-up time</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ ± 2 ppm/month</td>
<td>≤ ± 5% of measured value/month</td>
<td>≤ 18 hours</td>
</tr>
</tbody>
</table>

**Ambient conditions**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Humidity</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(–20 to 50)°C (–4 to 122)°F</td>
<td>(10 to 90)% RH</td>
<td>(700 to 1,300) hPa</td>
</tr>
</tbody>
</table>

**Influence of temperature**

<table>
<thead>
<tr>
<th>Zero point</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ ± 0.1 ppm/K at (–20 to 40)°C (–4 to 104)°F</td>
<td>≤ ± 1% of measured value/K</td>
</tr>
</tbody>
</table>

**Influence of humidity**

<table>
<thead>
<tr>
<th>Zero point</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>No effect</td>
<td>≤ ± 0.2% of measured value/% RH</td>
</tr>
</tbody>
</table>

**Test gas:**

<table>
<thead>
<tr>
<th>Test gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 100 ppm C₂H₄, C₃H₆, C₂H₅Cl, CH₂CHCHCH₂, HCHO, CH₃COOC₂H₃</td>
</tr>
<tr>
<td>5 to 200 ppm C₂H₄O, C₃H₆O, CH₃OH</td>
</tr>
<tr>
<td>10 to 200 ppm CH₃CHO</td>
</tr>
<tr>
<td>20 to 300 ppm C₂H₅OH, (H₃C)₂CHOH</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor is especially suited to detect leakages of numerous organic gases and vapors. Although it does not detect as broad a spectrum of gases as a PID, it has the key advantage of being almost completely insensitive to moisture. It also does not need to be calibrated every day, having instead a six-month calibration interval typical of electrochemical sensors. Furthermore, for the majority of gases it is enough to calibrate it using ethylene oxide, whereby all other gases are automatically calibrated as well. The exceptions are ethyne, tetrahydrofuran, and diethyl ether, which have to be calibrated using the target gas.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of ethylene oxide. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm C2H4O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>CH3COOH</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetone</td>
<td>CH3COCH3</td>
<td>1,000 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH3</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C6H6</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO2</td>
<td>30 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>100 ppm</td>
<td>≤ 56</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl2</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>C6H5Cl</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>CH2Cl2</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethyl sulfide</td>
<td>(CH3)2S</td>
<td>50 ppm</td>
<td>≤ 65</td>
</tr>
<tr>
<td>Dimethyl sulfide</td>
<td>(CH3)2S</td>
<td>50 ppm</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Dimethyformamide</td>
<td>HCON(CH3)2</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C2H6</td>
<td>0.2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH3COOC2H5</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Gasoline, F 50</td>
<td>–</td>
<td>700 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Gasoline, FAM regular gasoline</td>
<td>–</td>
<td>0.5 Vol. %</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Gasoline, premium unleaded</td>
<td>–</td>
<td>700 ppm</td>
<td>≤ 70</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H2</td>
<td>5,000 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>20 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H2S</td>
<td>10 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Methane</td>
<td>CH4</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanethiol</td>
<td>CH3SH</td>
<td>50 ppm</td>
<td>≤ 75</td>
</tr>
<tr>
<td>Methyl isobutyl ketone</td>
<td>(CH3)2CHCH2COCH3</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO2</td>
<td>50 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>25 ppm</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Phenol</td>
<td>C6H5OH</td>
<td>30 ppm</td>
<td>≤ 6</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl2</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C3H8</td>
<td>1 Vol. %</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO2</td>
<td>10 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>CCl2 CCl2</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C6H5CH3</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCL2</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Xylol</td>
<td>C6H4(CH3)2</td>
<td>0.2 Vol. %</td>
<td>No effect</td>
</tr>
</tbody>
</table>

This sensor is not suitable for monitoring the limit values of ethylene oxide, propylene oxide, butadiene, formaldehyde, vinyl acetate or vinyl chloride.
MARKET SEGMENTS
Production of plastics, disinfection, painter, chemical industry.

TECHNICAL SPECIFICATIONS

| Detection limit: | 5 ppm |
| Resolution: | 0.5 ppm |
| Measurement range/relative sensitivity | 0 to 100 ppm C₂H₄O (ethylene oxide) 1.00 |
| | 0 to 100 ppm H₂CCHCN (acrylonitrile) 0.10 |
| | 0 to 100 ppm C₆H₅CHCH₂ (styrene) 0.50 |
| | 0 to 100 ppm H₂CC(CH₃)COOCH₃ (methyl methacrylate) 0.30 |
| | 0 to 300 ppm (CH₃)₂CCH₂ (isobutylene) 0.70 |
| | 0 to 100 ppm C₂H₃OCH₂Cl (epichlorohydrin) 0.45 |
| Response time: | ≤ 90 seconds (T₅₀) for EO, iBut, ClPO |
| | ≤ 300 seconds (T₅₀) for ACN, MMA, Styr |
| Measurement accuracy | ≤ ± 20% of measured value |
| Long-term drift, at 20°C (68°F) | ≤ ± 2 ppm/month |
| Zero point: | ≤ ± 10% of measured value/month |
| Sensitivity: | ≤ 18 hours |
| Warm-up time: | ≤ 18 hours |
| Ambient conditions | Temperature: (-20 to 55)°C (−4 to 131)°F for EO, iBut, Styr, ClPO |
| | (5 to 40)°C (41 to 104)°F for ACN, MMA |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |
| Influence of temperature | Zero point: ≤ ± 0.2 ppm/K |
| Sensitivity: | ≤ ± 1% of measured value/K |
| Influence of humidity | Zero point: ≤ ± 0.1 ppm/% RH |
| Sensitivity: | ≤ ± 0.2% of measured value/% RH |
| Test gas: | 5 to 200 ppm C₂H₄O, C₂H₅OCH₂ |
| | 10 to 100 ppm H₂CCHCN, C₆H₅CHCH₂, H₂CC(CH₃)COOCH₃, |
| | 20 to 300 ppm (CH₃)₂CCH₂ |
SPECIAL CHARACTERISTICS

The DrägerSensor® XS OV-A has the same excellent insensitivity to moisture that the other Dräger-Sensor® XS OVs have, but it has also been optimized for other organic gases and vapors. Target gas calibration is required for all gases.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of ethylene oxide. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm C₂H₄O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₅</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>30 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>C₆H₅Cl</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>CH₂Cl₂</td>
<td>1,000 ppm</td>
<td>≤ 65</td>
</tr>
<tr>
<td>Dimethyl disulfide</td>
<td>(CH₃)₂S₂</td>
<td>50 ppm</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Dimethyl sulfide</td>
<td>(CH₃)₂S</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>HCON(CH₃)₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Gasoline, F 50</td>
<td>–</td>
<td>700 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>5,000 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>20 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>10 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanethiol</td>
<td>CH₃SH</td>
<td>50 ppm</td>
<td>≤ 75</td>
</tr>
<tr>
<td>Methyl isobutyl ketone</td>
<td>(CH₃)₂CH₂CH₂COCH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>25 ppm</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Phenol</td>
<td>CeH₅OH</td>
<td>30 ppm</td>
<td>≤ 6</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
**DrägerSensor® XS EC O₂-LS**
Order no. 68 09 130

**DrägerSensor® XS 2 O₂**
68 10 375

**DrägerSensor® XS R O₂**
68 10 262

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**MARKET SEGMENTS**
Sewage, mining and tunneling, fumigation, biogas, measuring hazmat, industrial gases.

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**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.1 Vol. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.1 Vol. %</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 25 Vol. % O₂ (oxygen)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 25 seconds (T₉₀) – XS EC</td>
</tr>
<tr>
<td></td>
<td>≤ 20 seconds (T₉₀) – XS 2 / XS R</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td></td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 1% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.5 Vol. %/year</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 1% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 1 hour</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(–40 to 50)°C (–40 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.4 Vol. % XS EC</td>
</tr>
<tr>
<td></td>
<td>≤ ± 0.2 Vol. % XS 2 / XS R</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value XS EC</td>
</tr>
<tr>
<td></td>
<td>≤ ± 1% of measured value XS R / XS 2</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.002 Vol. %/% RH – XS EC</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>N₂ (zero gas)</td>
</tr>
<tr>
<td></td>
<td>11.5 to 23.0 Vol. % O₂</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty*</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>XS EC: 3 years</td>
<td>&gt; 5 years</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>XS 2: 2 years</td>
<td>&gt; 3 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>XS R: 5 years</td>
<td>= 5 years</td>
<td></td>
</tr>
</tbody>
</table>

(continued on next page)

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*Expected sensor life includes limited operation time.
SPECIAL CHARACTERISTICS

DrägerSensor® XS oxygen sensors are lead-free, thus complying with Directive 2002/95/EC (RoHS). Because they are non-consuming sensors, they have a much longer life spans than sensors that are consuming.

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of O₂. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS EC O₂ LS

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol. % O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.5 Vol. %</td>
<td>≤ 0.2(−)</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>0.5 Vol. %</td>
<td>≤ 0.3(−)</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>1 Vol. %</td>
<td>≤ 0.2(−)</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>2 Vol. %</td>
<td>≤ 0.5(−)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1 Vol. %</td>
<td>≤ 1.6(−)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(−) Indicates negative deviation
### RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS 2 O₂

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol. % O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.5 Vol. %</td>
<td>≤ 0.2⁻(⁻)</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>0.5 Vol. %</td>
<td>≤ 0.3⁻(⁻)</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>1 Vol. %</td>
<td>≤ 0.2⁻(⁻)</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>2 Vol. %</td>
<td>≤ 0.5⁻(⁻)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1 Vol. %</td>
<td>≤ 1.6⁻(⁻)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation

### RELEVANT CROSS-SENSITIVITIES DrägerSensor® XS R O₂

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol. % O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0.5 Vol. %</td>
<td>≤ 0.2⁻(⁻)</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>0.5 Vol. %</td>
<td>≤ 0.3⁻(⁻)</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>5 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>1 Vol. %</td>
<td>≤ 0.2⁻(⁻)</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>2 Vol. %</td>
<td>≤ 0.5⁻(⁻)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1 Vol. %</td>
<td>≤ 1.6⁻(⁻)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation
MARKET SEGMENTS

Sewage, mining and tunneling, fumigation, biogas, hazmat, industrial gases.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detection limit</strong></td>
<td>0.5 Vol. %</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0.5 Vol. %</td>
</tr>
<tr>
<td><strong>Measurement range</strong></td>
<td>0 to 100 Vol. % O₂ (oxygen)</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>≤ 5 seconds (T₉₀)</td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>≤ ± 1% of measured value</td>
</tr>
<tr>
<td><strong>Long-term drift, at 20°C (68°F)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Zero point</strong></td>
<td>≤ ± 0.5 Vol. %/year</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>≤ ± 3% of measured value/month</td>
</tr>
<tr>
<td><strong>Warm-up time</strong></td>
<td>≤ 1 hour</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>(0 to 45)°C (32 to 133)°F</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td><strong>Pressure</strong></td>
<td>(700 to 1,100) hPa</td>
</tr>
<tr>
<td><strong>Influence of temperature</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Zero point</strong></td>
<td>No effect</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td><strong>Influence of humidity</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Zero point</strong></td>
<td>No effect</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>≤ ± 0.01% of measured value/% RH</td>
</tr>
<tr>
<td><strong>Test gas</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N₂ (zero gas)</td>
</tr>
<tr>
<td></td>
<td>10 to 100 Vol. % O₂</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS
This sensor can be used for measuring oxygen concentrations of up to 100 Vol. % O₂ in the ambient air. The principle upon which the sensor is based is the measurement of the partial oxygen pressure, which means it can also measure oxygen in inert gases like nitrogen, argon, and helium.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of O₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol. %O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol. %</td>
<td>≤ 1(–)</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Helium</td>
<td>He</td>
<td>50 Vol. %</td>
<td>≤ 1(–)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>0.05 Vol. %</td>
<td>≤ 1(–)</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XS EC PH₃ HC

**MARKET SEGMENTS**
Inorganic chemicals, industry, fumigation, pre entry measurements.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection limit:</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Resolution:</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 1,000 ppm PH₃ (phosphine)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 10 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 3% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 1 ppm/month</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 3% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 15 minutes</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(–40 to 50)°C (–40 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.05% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 4 to 1,000 ppm PH₃</td>
</tr>
</tbody>
</table>

**Order no. 68 09 535**

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>1 year</td>
<td>3 years</td>
<td>–</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor demonstrates excellent linearity across the whole measurement range even if calibrated in the lower levels of that range, and it also provides a stable reading even at high concentrations over long periods of time.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of phosphine. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm PH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1.25 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Arsine</td>
<td>AsH₃</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>300 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Diborane</td>
<td>B₂H₆</td>
<td>5 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Germanium tetrahydride</td>
<td>GeH₄</td>
<td>5 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen selenide</td>
<td>H₂Se</td>
<td>5 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 20</td>
</tr>
<tr>
<td>i-propanol</td>
<td>(CH₃)CHOH</td>
<td>1 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>4 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>4 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Silane</td>
<td>SiH₄</td>
<td>20 ppm</td>
<td>≤ 5(−)</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>1 Vol. %</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Trimethylboron</td>
<td>B(CH₃)₃</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation
DrägerSensor® XS

DrägerSensor® XS EC SO₂
Order no. 68 09 160

**MARKET SEGMENTS**
Food industry, pest control, mining, oil and gas, petrochemicals, pulp and paper, shipping, steel

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th></th>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>yes</td>
<td>yes</td>
<td>1 year</td>
<td></td>
<td>&gt; 2 years</td>
</tr>
</tbody>
</table>

**Selective filter**
K1T, 68 09 163 – replaceable
Eliminates cross-sensitivity to hydrogen sulfide (H₂S).
The filter’s service life can be calculated as follows: 2,000 ppm x hours of contaminant gas. Example: Given constant concentration of 1 ppm H₂S will be: Service life = 2,000 ppm x hours / 1 ppm = 2,000 hours.
The measurement value response time increases after the installation of the filter.

**Detection limit:**
0.5 ppm

**Resolution:**
0.1 ppm

**Measurement range:**
0 to 100 ppm SO₂ (sulfur dioxide)

**Response time:**
≤ 20 seconds (T₉₀)

**Measurement accuracy**

**Sensitivity:**
≤ ± 2% of measured value

**Long-term drift, at 20°C (68°F)**

**Zero point:**
≤ ± 1 ppm/month

**Sensitivity:**
≤ ± 2% of measured value/month

**Warm-up time:**
≤ 15 minutes

**Ambient conditions**

**Temperature:**
(–40 to 50)°C (–40 to 122)°F

**Humidity:**
(10 to 90)% RH

**Pressure:**
(700 to 1,300) hPa

**Influence of temperature**

**Zero point:**
≤ ± 1 ppm

**Sensitivity:**
≤ ± 5% of measured value

**Influence of humidity**

**Zero point:**
≤ ± 0.002 ppm/% RH

**Sensitivity:**
≤ ± 0.2% of measured value/% RH

**Test gas:**
approx. 1 to 100 ppm SO₂ test gas
SPECIAL CHARACTERISTICS

In addition to a fast response time and excellent linearity, this sensor is highly selective if the selective filter is used. The K1T selective filter (order no. 68 09 163) is an accessory for the DrägerSensor® XS EC SO2 and eliminates the sensor’s cross-sensitivity to hydrogen sulfide. The filter has a lifetime of 2,000 ppm × hours, which means that at a hydrogen sulfide concentration of 1 ppm it can be used for 2,000 hours.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of SO2. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm SO2 without selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>CH₃CHO</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetone</td>
<td>CH₃COCH₃</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>200 ppm</td>
<td>≤ 60</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol. %</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>50 ppm</td>
<td>≤ 5 (–)</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCHO</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>1,000 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>20 ppm</td>
<td>≤ 100</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>175 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 20 (–)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>10 ppm</td>
<td>≤ 5</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
<table>
<thead>
<tr>
<th>DrägerSensor® XXS</th>
<th>Chemical name (synonym)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXS Amine</td>
<td>amine like methylamine, ethylamine, dimethylamine etc.</td>
</tr>
<tr>
<td>XXS Cl₂</td>
<td>chlorine</td>
</tr>
<tr>
<td>XXS CO</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>XXS E CO</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>XXS CO LC</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>XXS CO HC</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>XXS CO₂-H₂-CP</td>
<td>carbon monoxide / hydrogen</td>
</tr>
<tr>
<td>XXS CO₂</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>XXS COCl₂</td>
<td>phosgene</td>
</tr>
<tr>
<td>XXS H₂</td>
<td>hydrogen</td>
</tr>
<tr>
<td>XXS H₂-HC</td>
<td>hydrogen</td>
</tr>
<tr>
<td>XXS HCN</td>
<td>hydrogen cyanide</td>
</tr>
<tr>
<td>XXS HCN PC</td>
<td>hydrogen cyanide</td>
</tr>
<tr>
<td>XXS H₂S</td>
<td>hydrogen sulfide</td>
</tr>
<tr>
<td>XXS H₂S-H₂S</td>
<td>hydrogen sulfide</td>
</tr>
<tr>
<td>XXS H₂S-HC</td>
<td>hydrogen sulfide</td>
</tr>
<tr>
<td>XXS H₂S-LC</td>
<td>hydrogen sulfide</td>
</tr>
<tr>
<td>XXS H₂S / CO</td>
<td>hydrogen sulfide / carbon monoxide</td>
</tr>
<tr>
<td>XXS H₂S-LC / CO-LC</td>
<td>hydrogen sulfide / carbon monoxide</td>
</tr>
<tr>
<td>XXS NH₃</td>
<td>ammonia</td>
</tr>
<tr>
<td>XXX NO</td>
<td>nitrogen monoxide</td>
</tr>
<tr>
<td>XXX NO₂</td>
<td>nitrogen dioxide</td>
</tr>
<tr>
<td>XXS NO₂-LC</td>
<td>nitrogen dioxide</td>
</tr>
<tr>
<td>XXS OV</td>
<td>organic vapors like ethylene oxide, ethene, propene, styrene etc.</td>
</tr>
<tr>
<td>XXS OV-A</td>
<td>organic vapors like acrylonitrile, vinyl acetate etc.</td>
</tr>
<tr>
<td>XXS O₂</td>
<td>oxygen</td>
</tr>
<tr>
<td>XXS E O₂</td>
<td>oxygen</td>
</tr>
<tr>
<td>XXS O₂ / CO-LC</td>
<td>oxygen / carbon monoxide</td>
</tr>
<tr>
<td>XXS O₂ / H₂S-LC</td>
<td>oxygen / hydrogen sulfide</td>
</tr>
<tr>
<td>XXS O₂ 100</td>
<td>oxygen</td>
</tr>
<tr>
<td>XXS Odorant</td>
<td>sulfur compounds like THT, mercaptans</td>
</tr>
<tr>
<td>XXS Ozone</td>
<td>Ozone</td>
</tr>
<tr>
<td>XXS PH₃</td>
<td>hydrogen phosphide, arsine, diborane, silane</td>
</tr>
<tr>
<td>XXS PH₃-HC</td>
<td>hydrogen phosphide</td>
</tr>
<tr>
<td>XXS SO₂</td>
<td>sulfur dioxide</td>
</tr>
</tbody>
</table>
**DrägerSensor® XXS Amine**

**Order no. 68 12 545**

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
<td>no</td>
</tr>
</tbody>
</table>

**MARKET SEGMENTS**
Foundries, refineries, power plants

**TECHNICAL SPECIFICATIONS**

| Detection limit:     | 2 ppm       |
| Resolution:          | 1 ppm       |
| Measurement range/   |             |
| relative sensitivity |             |
|                      | 0 - 100 ppm CH₃NH₂ (methylamine) | 0.70 |
|                      | 0 - 100 ppm (CH₃)₂NH (dimethylamine) | 0.50 |
|                      | 0 - 100 ppm (CH₃)₃N (trimethylamine) | 0.50 |
|                      | 0 - 100 ppm C₂H₅NH₂ (ethylamine) | 0.70 |
|                      | 0 - 100 ppm (C₂H₅)₂NH (diethylamine) | 0.50 |
|                      | 0 - 100 ppm (C₂H₅)₃N (triethylamine) | 0.50 |
|                      | 0 – 100 ppm NH₃ (ammonia)* | 1.00 |

| Response time:       | ≤ 30 seconds (T₉₀) |
| Measurement accuracy | ≤ ± 5 % of measured value |
| Sensitivity:         | ≤ ± 2 ppm/month |
| Long-term drift, at 20°C (68°F) | ≤ ± 3 % of measured value/month |
| Zero point:          | ≤ ± 5 ppm |
| Sensitivity:         | ≤ ± 5 % of measured value |
| Warm-up time:        | ≤ 12 hours |
| Ambient conditions   |             |
| Temperature:         | (-40 to 50)°C (-40 to 122)°F |
| Humidity:            | (10 to 90) % RH. |
| Pressure:            | (700 to 1300) hPa |
| Influence of temperature |             |
| Zero point:          | ≤ ± 5 ppm |
| Sensitivity:         | ≤ ± 5 % of measured value |
| Influence of humidity|             |
| Zero point:          | ≤ ± 0.1 ppm / % RH |
| Sensitivity:         | ≤ ± 0.2 % of measured value/% RH |
| Test gas:            | approx. 5 to 90 ppm NH₃ |

* lead compound
SPECIAL CHARACTERISTICS

This sensor is suitable for monitoring concentration of six different amines in ambient air. A fast response time and excellent repeatability are just two examples of this sensor's special characteristics.

Reproducibility of Amine sensors
purged with 48 ppm methyl amine average of five sensors

Typical gas response of Amine at 20 °C
flow = 0.5 l/min, purged with 48 ppm methyl amine

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of \( \text{NH}_3 \). To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm ( \text{NH}_3 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>( \text{CH}_3\text{COCH}_3 )</td>
<td>1000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>( \text{C}_2\text{H}_2 )</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>( \text{CO}_2 )</td>
<td>1.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>( \text{CO} )</td>
<td>200 ppm</td>
<td>≤5 ppm (–)</td>
</tr>
<tr>
<td>Chlorine</td>
<td>( \text{Cl}_2 )</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>( \text{C}_2\text{H}_4 )</td>
<td>1000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>( \text{H}_2 )</td>
<td>1000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>( \text{HCN} )</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>( \text{H}_2\text{S} )</td>
<td>20 ppm</td>
<td>≤5 ppm (–)</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(( \text{CH}_3 ))(_2\text{CCH}_2 )</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>( \text{CH}_4 )</td>
<td>10 Vol.-%</td>
<td>≤5 ppm (–)</td>
</tr>
<tr>
<td>Methanol</td>
<td>( \text{CH}_3\text{OH} )</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>( \text{NO}_2 )</td>
<td>20 ppm</td>
<td>≤5 ppm (–)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>( \text{NO} )</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>( \text{PH}_3 )</td>
<td>5 ppm</td>
<td>≤8 ppm</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>( \text{SO}_2 )</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>( \text{C}_4\text{H}_6\text{S} )</td>
<td>10 ppm</td>
<td>≤10 ppm</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
## DrägerSensor® XXS Cl₂

**Order no. 68 10 890**

### MARKET SEGMENTS

Food and beverage, inorganic chemicals, manufacture of plastics, measuring dangerous substances, pulp and paper, power generation, sewage plants, water treatment.

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>Resolution:</th>
<th>Measurement range/relative sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 ppm</td>
<td>0.05 ppm</td>
<td>0 to 20 ppm Cl₂ (chlorine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 20 ppm F₂ (fluorine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 20 ppm Br₂ (bromine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 20 ppm ClO₂ (chlorine dioxide)</td>
</tr>
</tbody>
</table>

### Response time:

- ≤ 30 seconds (T₉₀)

### Measurement accuracy

- ≤ ± 2% of measured value

### Long-term drift, at 20°C (68°F)

- ≤ ± 0.2 ppm/year
- ≤ ± 2% of measured value/month
- ≤ 30 minutes

### Ambient conditions

- Temperature: (-40 to 50)°C (-40 to 122)°F
- Humidity: (10 to 90)% RH
- Pressure: (700 to 1,300) hPa

### Influence of temperature

- Zero point: ≤ ± 0.05 ppm
- Sensitivity: ≤ ± 5% of measured value

### Influence of humidity

- Zero point: No effect
- Sensitivity: ≤ ± 0.4% of measured value/% RH

### Test gas:

- approx. 1 to 18 ppm Cl₂

### Used in

<table>
<thead>
<tr>
<th>Device</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor is suitable for monitoring concentrations of chlorine, bromine, fluorine, and chlorine dioxide in the ambient air. These sensors’ advantages include excellent linearity and fast response times.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm Cl₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>60 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>0.9 Vol.-%</td>
<td>≤ 0.6</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>≤ 1 (-)</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation
MARKET SEGMENTS

Waste disposal industry, metal processing, petrochemical, fertilizer production, mining and tunneling, shipping, inorganic chemicals, steel, organic chemicals, oil and gas, measuring dangerous substances, biogas.

TECHNICAL SPECIFICATIONS

| Detection limit: | 6 ppm |
| Resolution: | 2 ppm |
| Measurement range: | 0 to 2,000 ppm CO (carbon monoxide) |
| Response time: | ≤ 15 seconds (T<sub>90</sub>) |
| Measurement accuracy | ≤ ± 2% of measured value |
| Sensitivity: | ≤ ± 2 ppm/year |
| Long-term drift, at 20°C (68°F) | ≤ ± 3% of measured value/year |
| Ambient conditions | ≤ 5 minutes |
| Temperature: | (–40 to 50)°C (–40 to 122)°F |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |
| Influence of temperature | ≤ ± 5 ppm |
| Zero point: | ≤ ± 0.3% of measured value/K |
| Sensitivity: | ≤ ± 0.02% of measured value/% RH |
| Influence of humidity | No effect |
| Test gas: | approx. 20 to 1800 ppm CO |
| Internal selective filter. | |
| Cross sensitivities to alcohol and acid gases (H<sub>2</sub>S, SO<sub>2</sub>) are eliminated. | |
| The filter's service life can be calculated as follows: 25,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H<sub>2</sub>S will be: Service life = 25,000 ppm x hours / 10 ppm = 2,500 hours. | |
SPECIAL CHARACTERISTICS

In addition to an outstanding linearity and a quick response time, these CO sensors are highly selective. An internal selective filter, which is fitted to the sensor as standard, filters out most associated gases such as alcohol and acid gases H₂S, SO₂.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS CO

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol.-%</td>
<td>≤ 350</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
# Relevant Cross-Sensitivities DrägerSensor® XXS E CO

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol.-%</td>
<td>≤ 350</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XXS CO
DrägerSensor® XXS CO LC

 MARKET SEGMENTS
Waste disposal industry, metal processing, petrochemical, fertilizer production, mining and tunneling, shipping, inorganic chemicals, steel, organic chemicals, oil and gas, measuring dangerous substances, biogas.

TECHNICAL SPECIFICATIONS

| Detection limit: | 1 ppm |
| Resolution: | 1 ppm |
| Measurement range: | 0 to 2,000 ppm CO (carbon monoxide) |
| Response time: | ≤ 15 seconds (T₉₀) |
| Measurement accuracy: | ≤ ± 2% of measured value |
| Sensitivity: | ≤ ± 2 ppm/year |
| Long-term drift, at 20°C (68°F): | ≤ ± 3% of measured value/year |
| Zero point: | ≤ ± 3% of measured value/year |
| Sensitivity: | ≤ 30 minutes |
| Warm-up time: | ≤ 30 minutes |
| Ambient conditions: | ≤ ± 5 ppm |
| Temperature: | ≤ ± 0.3% of measured value/K |
| Humidity: | No effect |
| Pressure: | ≤ ± 0.02% of measured value/% RH |
| Test gas: | approx. 20 to 1800 ppm CO |

Selective filter
Internal selective filter.
Cross sensitivities to alcohol and acid gases (H₂S, SO₂) are eliminated.
The filter’s service life can be calculated as follows: 10,000 ppm x hours of contaminant gas. Example:
Given constant concentration of 10 ppm H₂S will be: Service life = 10,000 ppm x hours / 10 ppm = 1,000 hours.
SPECIAL CHARACTERISTICS

In addition to an outstanding linearity and a quick response time, these CO sensors are highly selective. An internal selective filter, which is fitted to the sensor as standard, filters out most associated gases such as alcohol and acid gases H₂S, SO₂.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol.-%</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XXS CO HC

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
</tr>
</tbody>
</table>

**Selective filter**

Internal selective filter.

Cross sensitivities to alcohol and acid gases (H₂S, SO₂) are eliminated.

The filter's service life can be calculated as follows: 5,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 5,000 ppm x hours / 10 ppm = 500 hours.

**MARKET SEGMENTS**

Waste disposal industry, metal processing, petrochemical, fertilizer production, mining and tunneling (in particular monitoring high CO concentrations during rescue operations), shipping, inorganic chemicals, biogas, hazmat, steel industry, oil and gas, organic chemicals.

**TECHNICAL SPECIFICATIONS**

| Detection limit: | 10 ppm |
| Resolution:      | 5 ppm  |
| Measurement range: | 0 to 10,000 ppm CO (carbon monoxide) |
| Response time:   | ≤ 25 seconds (T₉₀) |
| Measurement accuracy |
| Sensitivity:     | ≤ ± 2% of measured value |
| Long-term drift, at 20°C (68°F) |
| Zero point:      | ≤ ± 5 ppm/year |
| Sensitivity:     | ≤ ± 1% of measured value/month |
| Warm-up time:    | ≤ 5 minutes |
| Ambient conditions |
| Temperature:     | (-40 to 50)°C (--40 to 122)°F |
| Humidity:        | (10 to 90)% RH |
| Pressure:        | (700 to 1,300) hPa |
| Influence of temperature |
| Zero point:      | No effect |
| Sensitivity:     | ≤ ± 0.3% of measured value/K |
| Influence of humidity |
| Zero point:      | No effect |
| Sensitivity:     | ≤ ± 0.02% of measured value/% RH |
| Test gas:        | approx. 100 to 9,000 ppm CO |
SPECIAL CHARACTERISTICS

This sensor demonstrates excellent linearity across the whole measurement range even if calibrated in the lower reaches of that range, and it also provides a stable reading even at high concentrations over long periods of time.

![Graph showing sensor reaction to CO HC at 20 °C/68 °F](image1)

![Graph showing linearity of CO HC sensor calibrated with 100 ppm CO](image2)

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C_2H_2</td>
<td>100 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH_3</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO_2</td>
<td>30 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl_2</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C_2H_5OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H_2</td>
<td>0.1 Vol.-%</td>
<td>≤ 350</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H_2S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH_3)_2CCH_2</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO_2</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH_4</td>
<td>5 Vol.-%</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propane</td>
<td>C_3H_8</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO_2</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XXS CO H₂-CP

MARKET SEGMENTS
Steel industry, refineries, sewage treatment plants

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>6 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 2,000 ppm CO (carbon monoxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 25 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td></td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 2 ppm/year</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 1% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 12 hours</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(-20 to 50) °C (-4 to 122) °F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 5 ppm</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.3% of measured value/K</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.02% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 20 to 1,800 ppm CO and 1,000 ppm H₂</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

Carbon monoxide and hydrogen can occur simultaneously in many areas of work such as in the steel industry, refineries, and sewage treatment plants. Hydrogen affects the CO signal in conventional sensors, which leads to many false alarms. The DrägerSensor® XXS CO H2-CP uses two measuring electrodes – one of which measures CO and H2, the other only H2. The CO level is calculated and displayed on the basis of the difference between the two signals. A hydrogen concentration of 1,000 ppm (2.5% LEL) causes a maximum displayed concentration of only 15 ppm CO, which does not activate the CO alarm.

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO. To be sure, please check if gas mixtures are present.

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C2H2</td>
<td>100 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH3</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO2</td>
<td>30 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl2</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C2H5OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H2</td>
<td>0.1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H2S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH3)2CCH2</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH4</td>
<td>5 Vol.-%</td>
<td>≤ 15 (−)</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO2</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C3H8</td>
<td>1 Vol.-%</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO2</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(−) after compensation
**DrägerSensor® XXS CO₂**

**MARKET SEGMENTS**

Waste disposal, Food and beverage (breweries), metal processing, petrochemical, fertilizer production, sewage, police, customs and rescue services, mining and tunneling, shipping and transport, power generation.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guarantee</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.25 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.25 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.25 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.25 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.25 years</td>
<td>no</td>
</tr>
</tbody>
</table>

**Detection limit:**

0.3 Vol.-%

**Resolution:**

0.1 Vol.-%

**Measurement range:**

0 to 5 Vol.-% CO₂ (carbon dioxide)

**Response time:**

≤ 30 seconds (T₅₀)

**Measurement accuracy**

≤ ± 20% of measured value

**Sensitivity:**

≤ ± 0.2 Vol.-%/year

**Long-term drift, at 20°C (68°F)**

≤ ± 15% of measured value/month

**Zero point:**

≤ ± 12 hours

**Ambient conditions**

**Temperature:**

(-20 to 40)°C (-4 to 104)°F

**Humidity:**

(10 to 90)% RH

**Pressure:**

(700 to 1,300) hPa

**Influence of temperature**

≤ ± 0.01 Vol.-%/K

**Zero point:**

≤ ± 2% of measured value/K

**Sensitivity:**

No effect

**Influence of humidity**

≤ ± 0.1% of measured value/% RH

**Zero point:**

≤ ± 0.1% of measured value/% RH

**Sensitivity:**

1 to 4 Vol.-% CO₂

**Test gas:**

1 to 4 Vol.-% CO₂
**SPECIAL CHARACTERISTICS**

This sensor is highly sensitive (see cross-sensitivity list) and offers an economical alternative to infrared sensors if you need to warn against CO₂ concentrations in the ambient air.

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO₂. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1.6 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>60 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>0.9 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>1.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
### DrägerSensor® XXS COCl₂

#### MARKTSEGMENTE

Manufacture of plastics, chemical industry, insecticides production, dyes, military

#### TECHNISCHE DATEN

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0,01 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0,01 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 bis 10 ppm COCl₂ (Phosgene)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 20 seconds (T₂₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0,01 ppm/year</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 1% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 1 hour</td>
</tr>
</tbody>
</table>

**Ambient conditions**

| Temperature:              | (-20 to 35) °C (-4 to 99) °F |
| Humidity:                 | (10 to 90)% RH                |
| Pressure:                 | (700 to 1300) hPa             |

**Influence of temperature**

| Zero point:               | no effect                  |
| Sensitivity:              | ≤ ± 0,2% of measured value/K|

**Influence of humidity**

| Zero point:               | no effect                  |
| Sensitivity:              | ≤ ± 0,05% of measured value/RH|

**Test gas:**

COCl₂ test gas between 3.8 to 9 ppm (not in Dräger's portfolio)
SPECIAL CHARACTERISTICS

This sensor’s advantages include a very low detection limit, excellent linearity and high signal stability.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of COCl₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. Symbol</th>
<th>Concentration</th>
<th>Reading in ppm COCl₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>0.5 ppm</td>
<td>≤ 0.2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>260 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>8000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>0.5 ppm</td>
<td>≤ 0.7</td>
</tr>
<tr>
<td>Hydrogen fluoride</td>
<td>HF</td>
<td>0.4 ppm</td>
<td>≤ 0.1 ppm</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>H₂O₂</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>1 ppm</td>
<td>≤ 1)</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>1 ppm</td>
<td>≤ 0.1(-)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.3 ppm</td>
<td>≤ 0.05(-)</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>0.5 ppm</td>
<td>≤ 0.1 ppm</td>
</tr>
<tr>
<td>Propanol</td>
<td>C₃H₇OH</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>2 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation

1) Permanent exposure to H₂S can result in a reduction of sensitivity.
DrägerSensor® XXS H₂

Order no. 68 12 370

MARKET SEGMENTS
Leak detection, chemical, petrochemical, rocket fuel, production of plastics, steel production, industrial gases, fertilizer, battery charging stations, fuel cells.

TECHNICAL SPECIFICATIONS

| Detection limit: | 10 ppm |
| Resolution: | 5 ppm |
| Measurement range: | 0 to 2,000 ppm H₂ (hydrogen) |
| Response time: | ≤ 10 seconds (T₉₀) |
| Measurement accuracy | ≤ ± 1% of measured value |
| Sensitivity: | ≤ ± 4 ppm/year |
| Long-term drift, at 20°C (68°F) | ≤ ± 4% of measured value/month |
| Zero point: | ≤ 1 hour |
| Ambient conditions | 
| Temperature: | (–20 to 50)°C (–4 to 122)°F |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |
| Influence of temperature | ≤ ± 10 ppm |
| Zero point: | ≤ ± 1 ppm/K |
| Influence of humidity | No effect |
| Zero point: | ≤ ± 0.15% of measured value/% RH |
| Test gas: | approx. 20 to 2,000 ppm H₂ |
SPECIAL CHARACTERISTICS

This sensor enables the detection of hydrogen concentrations in ppm. Its very fast response time makes it especially suitable for detecting leaks.

Sensor reaction to H₂ at 20 °C/68 °F
Flow = 0.5 l/min, 1000 ppm H₂

Linearity of H₂ sensors calibrated with 1045 ppm H₂

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>≤ 51</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XXS H₂ HC
Order no. 68 12 025

Selective filter
Internal selective filter.
Cross sensitivities to hydrogen sulfide (H₂S) and sulfur dioxide (SO₂) are eliminated.
The filter’s service life can be calculated as follows: 5,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 5,000 ppm x hours / 10 ppm = 500 hours.

MARKET SEGMENTS
Chemical industry, petrochemical industry, rocket fuel, leak detection, production of plastics, metal processing, industrial gases, fertilizer manufacturing, battery charging stations, fuel cells.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
</tr>
</tbody>
</table>

**Detection limit:** 0.02 Vol.-%

**Resolution:** 0.01 Vol.-%

**Measurement range:** 0 to 4 Vol.-% H₂ (hydrogen)

**Response time:** ≤ 20 seconds (T₉₀)

**Measurement accuracy**
- Sensitivity: ≤ ± 2% of measured value

**Long-term drift, at 20°C (68°F)**
- Zero point: ≤ ± 0.05 Vol.-%/year
- Sensitivity: ≤ ± 3% of measured value/month
- Warm-up time: ≤ 1 hour

**Ambient conditions**
- Temperature: (-20 to 50)°C (-4 to 122)°F
- Humidity: (10 to 90)% RH
- Pressure: (700 to 1,300) hPa

**Influence of temperature**
- Zero point: ≤ ± 0.05 Vol.-%
- Sensitivity: ≤ ± 5% of measured value

**Influence of humidity**
- Zero point: No effect
- Sensitivity: ≤ ± 0.01% of measured value/% RH
- Test gas: approx. 0.2 to 3.99 Vol.-% H₂
SPECIAL CHARACTERISTICS

This sensor is suitable for measuring hydrogen across the entire LEL range. If a Dräger X-am 5600 is fitted with an IR-Ex sensor, then this sensor is the ideal addition for detecting any risk of explosion caused by hydrogen. Like all Dräger sensors, this one offers very fast response times and excellent linearity.

Sensor reaction to XXS H₂ HC at 20 °C/68 °F
Flow = 0.5 l/min, with 1.63 Vol% H₂

Linearity of XXS H₂ HC sensors calibrated with 1.63 Vol% H₂

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol.-% H₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 0.02</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
Selective filter

B2X (6812424) – replaceable.

Cross sensitivities to hydrogen sulfide (H₂S) and sulfur dioxide (SO₂) are eliminated.

The filter's service life can be calculated as follows: 1,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 1,000 ppm x hours / 10 ppm = 100 hours.

Due to the change of sensitivity, a calibration is necessary after installation. The measurement value response time increases after the installation of the filter.

MARKET SEGMENTS

Metal processing, mining, fumigation and pest control, chemical warfare agent (blood agents).

TECHNICAL SPECIFICATIONS

| Detection limit: | 0.5 ppm |
| Resolution: | 0.1 ppm |
| Measurement range | 0 to 50 ppm HCN (hydrogen cyanide) |
| Response time: | ≤ 10 seconds (T₅₀) |
| Measurement accuracy | ≤ ± 5% of measured value |
| Long-term drift, at 20°C (68°F) | ≤ ± 2 ppm/year |
| Zero point: | ≤ ± 5% of measured value/month |
| Warm-up time: | ≤ 15 minutes |

Ambient conditions

| Temperature: | (−20 to 50)°C (−4 to 122)°F |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |

Influence of temperature

| Zero point: | ≤ ± 1 ppm |
| Sensitivity: | ≤ ± 5% of measured value |

Influence of humidity

| Zero point: | No effect |
| Sensitivity: | ≤ ± 0.1% of measured value/% RH |
| Test gas: | approx. 1 to 45 ppm HCN |

Used in

<table>
<thead>
<tr>
<th>Model</th>
<th>Plugin Play</th>
<th>Replaceable</th>
<th>Guaranteed life</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger Pac 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor’s extremely quick response time and excellent repeatability provides a fast and reliable warning against Prussic acid (hydrogen cyanide).

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm HCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>CI₂</td>
<td>10 ppm</td>
<td>≤ 10 (–)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>1 Vol.-%</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>10 ppm</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 1.5</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 8</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of HCN. To be sure, please check if gas mixtures are present.
DrägerSensor® XXS HCN PC
Order no. 68 13 165

**MARKET SEGMENTS**
Metal processing, mining, fumigation and pest control, chemical warfare agent (blood agents).

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DrägerSensor® XXS HCN PC
Order no. 68 13 165

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 1.5 years</td>
</tr>
</tbody>
</table>

**Selective filter**
B2X (6812424) – replaceable.
Cross sensitivities to hydrogen sulfide (H₂S) and sulfur dioxide (SO₂) are eliminated.
The filter’s service life can be calculated as follows: 1,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 1,000 ppm x hours / 10 ppm = 100 hours.
Due to the change of sensitivity, a calibration is necessary after installation. The measurement value response time increases after the installation of the filter.

**TECHNICAL SPECIFICATIONS**

| Detection limit: | 3 ppm |
| Resolution:      | 0.5 ppm |
| Measurement range: | 0 to 50 ppm HCN (hydrogen cyanide) |
| Response time:   | ≤ 10 seconds (T₅₀) |
| Measurement accuracy |
| Sensitivity:     | ≤ ± 5% of measured value |
| Long-term drift, at 20°C (68°F) |
| Zero point:      | ≤ ± 3 ppm/year |
| Sensitivity:     | ≤ ± 2% of measured value/month |
| Warm-up time:    | ≤ 15 minutes |
| Ambient conditions |
| Temperature:     | (-20 to 50)°C (-4 to 122)°F |
| Humidity:        | (10 to 90)% RH |
| Pressure:        | (700 to 1,300) hPa |
| Influence of temperature |
| Zero point:      | ≤ ± 3 ppm |
| Sensitivity:     | ≤ ± 5% of measured value |
| Influence of humidity |
| Zero point:      | No effect |
| Sensitivity:     | ≤ ± 0.1% of measured value/% RH |
| Test gas:        | approx. 7 to 45 ppm HCN |

*with limited temperature range: 0 to 40°C dry test gas*
SPECIAL CHARACTERISTICS

This sensor’s extremely quick response time and excellent repeatability provides a fast and reliable warning against Prussic acid (hydrogen cyanide).

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm HCN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>1 ppm</td>
<td>≤ 2</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XXS H₂S
DrägerSensor® XXS E H₂S

**MARKET SEGMENTS**
Waste disposal, petrochemical, fertilizer production, sewage, mining and tunneling, shipping, inorganic chemicals, steel, pulp and paper, organic chemicals, oil and gas, hazmat, biogas.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>2 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 200 ppm H₂S (hydrogen sulfide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 15 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 1 ppm/year</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 3% of measured value/year</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ 5 minutes</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>No effect</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>No effect</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Temperature*:</td>
<td>(-40 to 50)°C (-40 to 122)°F</td>
</tr>
<tr>
<td>Humidity*:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>approx. 5 to 180 ppm H₂S</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td>≤ ± 0.03% of measured value/% RH</td>
</tr>
</tbody>
</table>

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.*
SPECIAL CHARACTERISTICS

This sensor’s advantages include fast response times and excellent linearity. At concentrations up to 20 ppm, sulfur dioxide has hardly any effect on hydrogen sulfide readings. This enables the selective measurement of the gas concentration using the DrägerSensor® XXS SO₂ (with integrated selective filter) together with the DrägerSensor® XXS H₂S in a device such as a Dräger X-am 5000 or X-am 5600.

Sensor reaction to H₂S at 20 °C/68 °F
Flow = 0.5 l/min, with 10 ppm H₂S

Linearity of H₂S sensor calibrated with 20 ppm H₂S

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂S. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS H₂S

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 2(-)</td>
</tr>
<tr>
<td>Dimethyl disulfide</td>
<td>CH₃SSCH₃</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Dimethylsulfide</td>
<td>(CH₃)₂S</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl mercaptan</td>
<td>C₂H₅SH</td>
<td>20 ppm</td>
<td>≤ 12</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>2 Vol.-%</td>
<td>≤ 18</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>CH₃SH</td>
<td>20 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 5(-)</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation
## RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS H₂S

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>sec-Butyl mercaptan</td>
<td>C₄H₁₀S</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>tert-Butyl mercaptan</td>
<td>(CH₃)₃CSH</td>
<td>20 ppm</td>
<td>≤ 6</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>20 ppm</td>
<td>≤ 3</td>
</tr>
</tbody>
</table>

## RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS E H₂S

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 2 (–)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 5 (–)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 2</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XXS H₂S
DrägerSensor® XXS H₂S HC

Detection limit: 4 ppm
Resolution: 2 ppm
Measurement range: 0 to 1,000 ppm H₂S (hydrogen sulfide)
Response time: ≤ 15 seconds (T₉₀)
Measurement accuracy
Sensitivity: ≤ ± 2% of measured value
Long-term drift, at 20°C (68°F)
Zero point: ≤ ± 2 ppm/year
Sensitivity: ≤ ± 1% of measured value/month
Warm-up time: ≤ 5 minutes
Ambient conditions
Temperature*: (–40 to 50)°C (–40 to 122)°F
Humidity*: (10 to 90)% RH
Pressure: (700 to 1,300) hPa
Influence of temperature
Zero point: No effect
Sensitivity: ≤ ± 5% of measured value
Influence of humidity
Zero point: No effect
Sensitivity: ≤ ± 0.03% of measured value/% RH
Test gas: approx. 40 to 900 ppm H₂S

* Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.
SPECIAL CHARACTERISTICS

Because of its excellent linearity, this sensor can be calibrated in its lower measurement range using a hydrogen sulfide test gas without compromising on accuracy in its upper measurement range. It also offers a fast response time and good selectivity.

Sensor reaction to H₂S HC at 20 °C/68 °F
Flow = 0.5 l/min, with 505 ppm H₂S

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of H₂S. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen phosphide</td>
<td>P₃H₅</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>≤ 5⁽¹⁾</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 2</td>
</tr>
</tbody>
</table>

⁽¹⁾ Indicates negative deviation
DrägerSensor® XXS H₂S LC

**MARKET SEGMENTS**
Waste disposal, petrochemical, fertilizer production, sewage, mining and tunneling, shipping, inorganic chemicals, steel industry, pulp and paper, organic chemicals, oil and gas, hazmat, biogas.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 3500/5500</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 6000/6500</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 2500</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
</tbody>
</table>

**Detection limit:** 0.4 ppm

**Resolution:** 0.1 ppm

**Measurement range:** 0 to 100 ppm H₂S (hydrogen sulfide)

**Response time:** ≤ 15 seconds (T₉₀)

**Measurement accuracy**

**Long-term drift, at 20°C (68°F):** ≤ ± 5% of measured value/year

**Zero point:** ≤ ± 0.2 ppm/year

**Warm-up time:** ≤ 5 minutes

**Ambient conditions**

**Temperature:** (–40 to 50)°C (–40 to 122)°F

**Humidity:** (10 to 90)% RH

**Pressure:** (700 to 1,300) hPa

**Influence of temperature**

**Zero point:** No effect

**Sensitivity:** ≤ ± 5% of measured value

**Influence of humidity**

**Zero point:** No effect

**Sensitivity:** ≤ ± 0.1% of measured value/% RH

**Test gas:** approx. 5 to 90 ppm H₂S

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.*
SPECIAL CHARACTERISTICS

Combined with an excellent linearity and a fast response time, this sensor enables the selective measurement of hydrogen sulfide at below 1 ppm.

Sensor reaction to H$_2$S at 20 °C/68 °F
Flow = 0.5 l/min, with 0.55 ppm H$_2$S

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross-sensitivity may displace an existing concentration of H$_2$S. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H$_2$S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C$_2$H$_2$</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH$_3$</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO$_2$</td>
<td>5 Vol.%</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>500 ppm</td>
<td>≤ 1$^{(-)}$</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl$_2$</td>
<td>10 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Dimethyl disulfide</td>
<td>CH$_3$SSCH$_3$</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Dimethylsulfide</td>
<td>(CH$_3$)$_2$S</td>
<td>260 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C$_2$H$_5$OH</td>
<td>20 ppm</td>
<td>≤ 13</td>
</tr>
<tr>
<td>Ethyl mercaptan</td>
<td>C$_2$H$_6$SH</td>
<td>0.1 Vol.-%</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H$_2$</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH$_3$)$_2$CCH$_2$</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH$_4$</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>CH$_3$SH</td>
<td>20 ppm</td>
<td>≤ 16 ppm</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO$_2$</td>
<td>20 ppm</td>
<td>≤ 4$^{(-)}$</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C$_3$H$_8$</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>sec-Butyl mercaptan</td>
<td>C$<em>4$H$</em>{10}$S</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO$_2$</td>
<td>20 ppm</td>
<td>≤ 1.5</td>
</tr>
<tr>
<td>tert-Butyl mercaptan</td>
<td>(CH$_3$)$_3$CSH</td>
<td>20 ppm</td>
<td>≤ 4</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C$_4$H$_6$S</td>
<td>20 ppm</td>
<td>≤ 3</td>
</tr>
</tbody>
</table>

$^{(-)}$ Indicates negative deviation
DrägerSensor® XXS H₂S/CO

MARKET SEGMENTS
Waste disposal, metal processing, biogas, petrochemical, fertilizer production, sewage, mining and tunneling, shipping, inorganic chemicals, paper industry, hazmat, steel industry, oil and gas, organic chemicals.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>2 ppm (H₂S)/6 ppm (CO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1 ppm (H₂S)/2 ppm (CO)</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 200 ppm H₂S (hydrogen sulfide)</td>
</tr>
<tr>
<td></td>
<td>0 to 2,000 ppm CO (carbon monoxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 20 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 2 ppm/year</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 1% of measured value/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ 5 minutes</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td></td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature*:</td>
<td>(–40 to 50)°C (–40 to 122)°F</td>
</tr>
<tr>
<td>Humidity*:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 2 ppm (H₂S) ≤ ± 5 ppm (CO)</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 5% of measured value (H₂S) ≤ ± 0.3% of measured value/K (CO)</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.05% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 5 to 90 ppm H₂S</td>
</tr>
<tr>
<td></td>
<td>approx. 20 to 450 ppm CO</td>
</tr>
</tbody>
</table>

*Select filter
Internal selective filter for CO.
Cross sensitivities to alcohol and acid gases (H₂S, SO₂) are eliminated.
The filter's service life can be calculated as follows: 25,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 25,000 ppm x hours / 10 ppm = 2,500 hours.

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
</tbody>
</table>

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.
SPECIAL CHARACTERISTICS
Carbon monoxide and hydrogen sulfide occur together in many areas of work. This sensor can monitor both gases simultaneously.

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO or H₂S. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H₂S</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>≤ 2 (−)¹</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethyl disulfide</td>
<td>CH₃SSCH₃</td>
<td>20 ppm</td>
<td>≤ 11</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethylsulfide</td>
<td>(CH₃)₂S</td>
<td>20 ppm</td>
<td>≤ 5</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>C₂H₅OH</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl mercaptan</td>
<td>C₂H₅SH</td>
<td>20 ppm</td>
<td>≤ 13</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 vol. %</td>
<td>No effect</td>
<td>≤ 350</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>CH₃SH</td>
<td>20 ppm</td>
<td>≤ 16 ppm</td>
<td>≤ 16 ppm</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 5 (−)¹</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>sec-Butyl mercaptan</td>
<td>C₄H₁₀S</td>
<td>20 ppm</td>
<td>≤ 7</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO₂</td>
<td>25 ppm</td>
<td>≤ 2</td>
<td>No effect</td>
</tr>
<tr>
<td>tert-Butyl mercaptan</td>
<td>(CH₃)₃CSH</td>
<td>20 ppm</td>
<td>≤ 8</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>20 ppm</td>
<td>≤ 3</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(−)¹: negative reading
DrägerSensor® XXS H2S LC/CO LC

ORDER NO. 68 13 280

MARKET SEGMENTS
Waste disposal, metal processing, biogas, petrochemical, fertilizer production, sewage, mining and tunneling, shipping, inorganic chemicals, paper industry, hazmat, steel industry, oil and gas, organic chemicals.

TECHNICAL SPECIFICATIONS

| Detection limit: | 0.4 ppm (H2S)/1 ppm (CO) |
| Resolution: | 0.1 ppm (H2S)/1 ppm (CO) |
| Measurement range: | 0 to 100 ppm H2S (hydrogen sulfide) |
| | 0 to 2,000 ppm CO (carbon monoxide) |
| Response time: | ≤ 20 seconds (T90) |
| Measurement accuracy: | H2S: ≤ ± 5 % of measured value, CO: ≤ ± 2 % of measured value |
| Long-term drift, at 20°C (68°F): | H2S: ≤ ± 0.2 ppm/year, CO: ≤ ± 2 ppm/year |
| | H2S: ≤ ± 5 % of measured value/year, CO: ≤ ± 3 % of measured value/year |
| | H2S: ≤ 5 minutes, CO: ≤ 30 minutes |
| Ambient conditions: | H2S: no effect, CO: ≤ ± 5 ppm |
| Temperature*: | (–40 to 50)°C (–40 to 122)°F |
| Humidity*: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |
| Influence of temperature: | H2S: ≤ ± 5 % of measured value, CO: ≤ ± 0.3 % of measured value/K |
| Zero point: | No effect |
| Sensitivity: | H2S: ≤ ± 0.1 % of measured value/ %r.h., CO: ≤ ± 0.02 % of measured value/ %r.h. |
| Influence of humidity: | approx. 5 to 90 ppm H2S |
| Zero point: | approx. 20 to 1800 ppm CO |
| Sensitivity: | No effect |

* Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.
SPECIAL CHARACTERISTICS

Carbon monoxide and hydrogen sulfide occur together in many areas of work. This sensor can monitor both gases simultaneously. Because of the low detection limits, this sensor is suitable for the limit-value monitoring.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of CO or H$_2$S. To be sure, please check if gas mixtures are present. H$_2$S.

### RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm H$_2$S</th>
<th>Display in ppm CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C$_2$H$_2$</td>
<td>100 ppm</td>
<td>No effect</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH$_3$</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO$_2$</td>
<td>10 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>500 ppm</td>
<td>≤ 1</td>
<td>500</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl$_2$</td>
<td>10 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethyl disulfide</td>
<td>CH$_3$SSCH$_3$</td>
<td>20 ppm</td>
<td>≤ 5</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethylsulfide</td>
<td>(CH$_3$)$_2$S</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>C$_2$H$_5$OH</td>
<td>250 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl mercaptan</td>
<td>C$_2$H$_5$SH</td>
<td>20 ppm</td>
<td>≤ 13</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H$_2$</td>
<td>0.1 vol. %</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H$_2$S</td>
<td>30 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH$_3$)$_2$CCH$_2$</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH$_4$</td>
<td>5 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>CH$_3$SH</td>
<td>20 ppm</td>
<td>≤ 16 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO$_2$</td>
<td>20 ppm</td>
<td>≤ 4 (–)</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Propane</td>
<td>C$_3$H$_8$</td>
<td>1 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>sec-Butyl mercaptan</td>
<td>C$_4$H$_9$S</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO$_2$</td>
<td>20 ppm</td>
<td>≤ 1.5</td>
<td>No effect</td>
</tr>
<tr>
<td>tert-Butyl mercaptan</td>
<td>(CH$_3$)$_3$CSH</td>
<td>20 ppm</td>
<td>≤ 4</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C$_4$H$_8$S</td>
<td>20 ppm</td>
<td>≤ 3</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
**MARKET SEGMENTS**
Food and beverage, poultry farming, power generation, inorganic chemicals, fertilizer production, hazmat, fumigation, metal processing, petrochemical, pulp and paper.

### TECHNICAL SPECIFICATIONS

| Detection limit: | 4 ppm |
| Resolution: | 1 ppm |
| Measurement range: | 0–300 ppm NH₃ (ammonia) |
| Response time: | ≤ 10 seconds (T₅₀) |
| Measurement accuracy | ≤ ± 3% of measured value |
| Sensitivity: | ≤ ± 5 ppm/year |
| Long-term drift, at 20°C (68°F) | ≤ ± 2% of measured value/month |
| Warm-up time: | ≤ 12 hours |

#### Ambient conditions

- **Temperature***: (-40 to 50)°C (-40 to 122)°F
- **Humidity***: (10 to 90)% RH
- **Pressure**: (700 to 1,300) hPa

#### Influence of temperature

- **Zero point**: ≤ ± 5 ppm
- **Sensitivity**: ≤ ± 5% of measured value

#### Influence of humidity

- **Zero point**: ≤ ± 0.1 ppm/% RH
- **Sensitivity**: ≤ ± 0.2% of measured value/% RH

#### Test gas:
approx. 10 to 75 ppm NH₃

*Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.*
**SPECIAL CHARACTERISTICS**

A fast response time and excellent repeatability are just two examples of this sensor’s special characteristics.

Sensor reaction to NH₃ at 20 °C/68 °F
Flow = 0.5 l/min, 50 ppm NH₃

Repeatability of NH₃ Sensor with 50 ppm NH₃, average from five sensors

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NH₃. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 30 (-)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 15 (-)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>≤ 70</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>≤ 10 (-)</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>0.9 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(-) Indicates negative deviation
**MARKET SEGMENTS**

Power and district heating plants, chemical industry.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.3 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 200 ppm NO (nitrogen monoxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 10 seconds (T90)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 3% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 20 hours</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>(-40 to 50)°C (-40 to 122)°F</td>
</tr>
<tr>
<td>Temperature:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td>≤ ± 0.02 ppm/K</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.3% of measured value/K</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.05% of measured value/% RH</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ 3 to 175 ppm NO</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.05% of measured value/% RH</td>
</tr>
</tbody>
</table>
**SPECIAL CHARACTERISTICS**

This sensor enables a selective measurement of NO. NO$_2$ concentrations < 20 ppm have not effects. It also offers a very fast response time and excellent linearity across its entire measurement range.

Typical gas response of XXS NO at 20°C flow = 0.5 l/min, purging with 20 ppm NO

![Graph showing typical gas response and linearity of NO sensor](image)

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NO. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>CH$_3$COCH$_3$</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C$_2$H$_2$</td>
<td>0.8 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH$_3$</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C$_6$H$_5$</td>
<td>0.6 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO$_2$</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl$_2$</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C$_2$H$_5$OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C$_2$H$_4$</td>
<td>0.1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H$_2$</td>
<td>1.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H$_2$S</td>
<td>5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH$_3$)$_2$CCH$_2$</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH$_4$</td>
<td>2 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO$_2$</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH$_3$</td>
<td>2 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C$_3$H$_8$</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO$_2$</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>CCl$_2$ CCl$_2$</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C$_6$H$_5$CH$_3$</td>
<td>0.6 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCl$_2$</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>
## MARKET SEGMENTS
Inorganic chemicals, metal processing, oil and gas, petrochemical, steel industry, shipping, rocket engineering, mining and tunneling.

## TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.2 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 50 ppm NO₂ (nitrogen dioxide)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 15 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 1 ppm/year</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ 15 minutes</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td></td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(−30 to 50)°C (−22 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature:</td>
<td>≤ ± 1 ppm</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Influence of humidity:</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.2% of measured value/% RH</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 1 to 45 ppm NO₂</td>
</tr>
</tbody>
</table>

## DrägerSensor® XXS NO₂

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 2500</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor's advantages include a fast response time and excellent repeatability. This sensor enables a selective measurement of NO₂. NO concentrations < 20 ppm do not influence the measurement results, thus a selective NO₂ measurement is possible.

Sensor reaction to NO₂ at 20 °C/68 °F
Flow = 0.5 l/min, 4 ppm NO₂

Signal strength (%)

Indicated concentration (ppm)

Repeatability of NO₂ sensors with 4 ppm NO₂

The values shown in the following table are standard and apply to new sensors. The values maybe fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NO₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 10&lt;sup&gt;–1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>≤ 10&lt;sup&gt;–1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>60 ppm</td>
<td>≤ 10&lt;sup&gt;–1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 100&lt;sup&gt;–1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>≤ 0.8&lt;sup&gt;–&lt;/sup&gt;</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>≤ 4&lt;sup&gt;–&lt;/sup&gt;</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>1 ppm</td>
<td>≤ 20&lt;sup&gt;–&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XXS NO₂ LC

ORDER NO. 68 12 600

MARKET SEGMENTS
Mining and tunnelling (emissions from diesel-engined vehicles), inorganic chemistry, metal processing, oil & gas, petrochemical industry, shipping, rocket technology

TECHNICAL SPECIFICATIONS

- **Detection limit:** 0.04 ppm
- **Resolution:** 0.02 ppm
- **Measurement range:** 0 to 50 ppm NO₂ (nitrogen dioxide)
- **Response time:** ≤ 15 seconds (T₉₀)
- **Measurement accuracy**
  - Sensitivity: ≤ ± 3% of measured value
- **Long-term drift, at 20°C (68°F)**
  - Zero point: ≤ ± 0.04 ppm/year
  - Sensitivity: ≤ ± 2% of measured value/month
  - ≤ 120 minutes
- **Ambient conditions**
  - Temperature: (-30 to 50)°C (-22 to 122)°F
  - Humidity: (10 to 90)% RH
  - Pressure: (700 to 1,300) hPa
- **Influence of temperature**
  - Zero point: No effect
  - Sensitivity: ≤ ± 0.5% of measured value
- **Influence of humidity**
  - Zero point: No effect
  - Sensitivity: ≤ ± 0.1% of measured value/% RH
- **Test gas:** approx. 0.5 to 45 ppm NO₂

*A use or storage over a longer period below the specified relative humidity may cause a change of sensor sensitivity due to dehydration. This effect is reversible once the relative humidity increases. Please consider the storage conditions stated on the packaging or in the instruction for use.*
SPECIAL CHARACTERISTICS

Low cross sensitivities (e.g. against SO₂, H₂S, NO and CO), which allows a selective measurement of NO₂. With a detection limit of 0.04 ppm and a quick response time this sensor is excellent to measure around the limit values.

Typical gas response of XXS NO₂ LC at 20 °C
Flow = 0.5 l/min, 1 ppm NO₂

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NO₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm NO₂LC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Arsine</td>
<td>AsH₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>1 ppm</td>
<td>≤ 1.5</td>
</tr>
<tr>
<td>Chlorine dioxide</td>
<td>ClO₂</td>
<td>1 ppm</td>
<td>≤ 1.5</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>0.1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrazine</td>
<td>N₂H₄</td>
<td>1 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>0.1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>1 ppm</td>
<td>≤ 0.03(–)</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>1 ppm</td>
<td>≤ 0.12(–)</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XXS OV

Order no. 68 11 530

MARKET SEGMENTS
Production of plastics, disinfection, painter, chemical industry, pest control.

TECHNICAL SPECIFICATIONS

| Detection limit: | 0.5 ppm |
| Resolution: | 0.5 ppm |
| Measurement range/relative sensitivity: | 0 to 200 ppm C₂H₄O (ethylene oxide) 1.00 |
| | 0 to 200 ppm C₃H₆O (propylene oxide) 0.85 |
| | 0 to 100 ppm C₂H₄ (ethene) 0.60 |
| | 0 to 100 ppm C₃H₆ (propene) 0.65 |
| | 0 to 100 ppm C₂H₃Cl (vinyl chloride) 0.60 |
| | 0 to 200 ppm CH₃OH (methanol) 0.35 |
| | 0 to 100 ppm CH₂CHCH₂CH₂ (butadiene) 1.40 |
| | 0 to 100 ppm CH₃CHCH₂H (formaldehyde) 0.80 |
| | 0 to 300 ppm (H₃C)₂CHOH (isopropanol) 0.35 |
| | 0 to 200 ppm C₄H₈O (tetrahydrofuran) 1.00 |
| | 0 to 100 ppm C₅H₅CHCH₂ (styrene) 0.70 |
| | 0 to 100 ppm H₂CC(CH₃)COOCH₃ (methyl methacrylate) 0.40 |
| Response time: | ≤ 20 seconds (T₅₀) |
| Measurement accuracy: | ≤ ± 5% of measured value |
| Sensitivity: | ≤ ± 5 ppm/year |
| Sensitivity: | ≤ ± 2% of measured value/month |
| Warm-up time: | ≤ 18 hours |
| Ambient conditions: | Temperature: (–20 to 50)°C (–4 to 122)°F |
| | Humidity: (30 to 90)% RH |
| | Pressure: (700 to 1,300) hPa |
| Influence of temperature: | Zero point: ± 2 ppm at (–20 to 40)°C (–4 to 104)°F |
| | Zero point: ± 0.5 ppm/K at (40 to 50)°C (104 to 122)°F |
| | Sensitivity: ≤ ± 1% of measured value/K |
| Influence of humidity: | Zero point: No effect |
| Sensitivity: | ≤ ± 0.5% of measured value/% RH |

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
<td>no</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor is especially suited for detecting leakages of numerous organic gases and vapors. Although it does not detect as broad a spectrum of gases as a PID sensor, it has the key advantage of being almost completely insensitive to moisture. It also does not need to be calibrated every day, having instead a six-month calibration interval typical of electrochemical sensors.

TECHNICAL SPECIFICATIONS

Test gas: approx. 3 to 50 ppm C₂H₄O

The Dräger Sensor XXS OV has a defined cross-sensitivity to ethylene oxide (EO). It can be calibrated with EO as a replacement for all of its target gases. This replacement calibration using EO can produce an additional measuring error of up to 30%³. We recommend that devices are calibrated with the gas you intend to detect in actual operation. Calibration using the target gas is more accurate than replacement gas calibration.

Sensor reaction to C₂H₄O at 20 °C/68 °F

Flow = 0.5 l/min, with 20 ppm C₂H₄O

Influence of humidity on XXS OV sensors and PID sensors

1) Factors depend on serial numbers and are mentioned in the supplement to the sensor instructions for use (90 33 548).
2) A use or storage over a longer period below the specified relative humidity may cause a change of sensor sensitivity due to dehydration. This effect is reversible once the relative humidity increases. Please consider the storage conditions stated on the packaging or in the instruction for use.
3) only valid for use and storage in > 30 % r.h.
The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of ethylene oxide. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm C₂H₄O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>CH₃CHO</td>
<td>55 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 150</td>
</tr>
<tr>
<td>Acrylonitrile</td>
<td>H₂CCHCN</td>
<td>80 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Butyraldehyd</td>
<td>C₃H₇CHO</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>100 ppm</td>
<td>≤ 17 ppm</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>C₆H₅Cl</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>CH₂Cl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td>(C₆H₅)₂O</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>HCON(CH₃)₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>0.2 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>100 ppm</td>
<td>≤ 60</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>0.2 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>100 ppm</td>
<td>≤ 150</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>20 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Methyl isobutyl ketone</td>
<td>(CH₃)₂CHCH₂COCH₃</td>
<td>50 ppm</td>
<td>≤ 100</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>20 ppm</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>CCl₂CCl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCCl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Vinyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Xylene</td>
<td>C₆H₄(CH₃)₂</td>
<td>0.2 Vol.-%</td>
<td>No effect</td>
</tr>
</tbody>
</table>
DrägerSensor® XXS OV
DrägerSensor® XXS OV-A

**M A R K E T S E G M E N T S**

Production of plastics, disinfection, paintshops, chemical industry.

**T E C H N I C A L  S P E C I F I C A T I O N S**

**Detection limit:** 1 ppm

**Resolution:** 1 ppm

**Measurement range/relative sensitivity**

<table>
<thead>
<tr>
<th>Component</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2H4O1)</td>
<td>1.00</td>
</tr>
<tr>
<td>H2CCHCN (acrylonitrile)</td>
<td>0.15</td>
</tr>
<tr>
<td>(CH3)2CCH2 (isobutylene)</td>
<td>0.90</td>
</tr>
<tr>
<td>CH3COOC2H3 (vinyl acetate)</td>
<td>1.00</td>
</tr>
<tr>
<td>C2H5OH (ethanol)</td>
<td>0.55</td>
</tr>
<tr>
<td>CH3CHO (acetaldehyde)</td>
<td>0.35</td>
</tr>
<tr>
<td>(C2H5)2O (diethyl ether)</td>
<td>0.75</td>
</tr>
<tr>
<td>C2H2 (acetylene)</td>
<td>1.40</td>
</tr>
</tbody>
</table>

**Response time:** ≤ 40 seconds (T50)

**Measurement accuracy**

**Sensitivity:** ≤ ± 20% of measured value

**Long-term drift, at 20°C (68°F)**

**Zero point:** ≤ ± 5 ppm/year

**Sensitivity:** ≤ ± 3% of measured value/month

**Warm-up time:** ≤ 18 hours

**Ambient conditions**

**Temperature:** (-20 to 40)°C (-4 to 104)°F

**Humidity:** 30 to 90)% RH

**Pressure:** (700 to 1,300) hPa

**Influence of temperature**

**Zero point:** (-20 to 40)°C (-4 to 104)°F = ± 2 ppm

**Zero point:** (40 to 60)°C (104 to 140)°F = ± 0.5 ppm/K

**Sensitivity:** ≤ ± 1% of measured value/K

**Influence of humidity**

**Zero point:** No effect

**Sensitivity:** ≤ ± 0.5% of measured value/% RH
SPECIAL CHARACTERISTICS

The DrägerSensor® XXS OV-A has the same excellent characteristics as the DrägerSensor® XXS OV, but it has also been optimized for other organic gases and vapors. Just like the DrägerSensor® XXS OV, the DrägerSensor® XXS OV-A can be calibrated with EO as a replacement, although this may produce an additional measuring error of up to 30%. We recommend that devices are calibrated with the gas you intend to detect in actual operation. Calibration using the target gas is more accurate than replacement gas calibration.

TECHNICAL SPECIFICATIONS

Test gas:

approx. 3 to 50 ppm C₂H₄O

The Dräger Sensor XXS OV-A has a defined cross-sensitivity to ethylene oxide (EO). It can be calibrated with EO as a replacement for all of its target gases. This replacement calibration using EO can produce an additional measuring error of up to 30%. We recommend that devices are calibrated with the gas you intend to detect in actual operation. Calibration using the target gas is more accurate than replacement gas calibration.

Sensor reaction to C₂H₄O at 20 °C/68 °F
Flow = 0.5 l/min, with 20 ppm C₂H₄O

Influence of humidity on XXS OV-A sensors and PID sensors

1) Factors depend on serial numbers and are mentioned in the supplement to the sensor instructions for use (90 33 549).
2) A use or storage over a longer period below the specified relative humidity may cause a change of sensor sensitivity due to dehydration. This effect is reversible once the relative humidity increases. Please consider the storage conditions stated on the packaging or in the instruction for use.
The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of ethylene oxide. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES**

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<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm C₂H₄O</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-chloro-2, 3 epoxypropane</td>
<td>C₂H₃OCH₂Cl</td>
<td>25 ppm</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Benzene</td>
<td>C₆H₆</td>
<td>2,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Butadiene</td>
<td>CH₂=CHCH=CH₂</td>
<td>50 ppm</td>
<td>≤ 75</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>30 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>100 ppm</td>
<td>≤ 45</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>C₆H₅Cl</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>CH₂Cl₂</td>
<td>50 ppm</td>
<td>≤ 45</td>
</tr>
<tr>
<td>Dimethylformamide</td>
<td>HCON(CH₃)₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>50 ppm</td>
<td>≤ 45</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>CH₃COOC₂H₅</td>
<td>100 ppm</td>
<td>≤ 45</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>HCOH</td>
<td>40 ppm</td>
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</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>≤ 25</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
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<td>≤ 5</td>
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<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>20 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>20 ppm</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>(H₃C)₂CHOH</td>
<td>100 ppm</td>
<td>≤ 75</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>250 ppm</td>
<td>≤ 110</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methyl methacrylate</td>
<td>H₂CC(CH₃)COOCH₃</td>
<td>60 ppm</td>
<td>≤ 160</td>
</tr>
<tr>
<td>Methyl isobutyl ketone</td>
<td>(CH₃)₂CH₂CH₂COCH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤ 15</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propene</td>
<td>C₃H₆</td>
<td>50 ppm</td>
<td>≤ 35</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>C₃H₆O</td>
<td>50 ppm</td>
<td>≤ 45</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>≤ 9</td>
</tr>
<tr>
<td>Styrene</td>
<td>C₆H₅CHCH₂</td>
<td>35 ppm</td>
<td>≤ 35</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>C₄H₆O</td>
<td>60 ppm</td>
<td>≤ 55</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>CHClCICl₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>C₂H₃Cl</td>
<td>50 ppm</td>
<td>≤ 40</td>
</tr>
</tbody>
</table>
### MARKET SEGMENTS
Sewage, mining and tunneling, fumigation, biogas, hazmat, industrial gases.

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.1 Vol.-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.1 Vol.-%</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 25 Vol.-% O₂ (oxygen)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 10 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy:</td>
<td>≤ ± 1% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.5 Vol.-%/year</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F):</td>
<td>≤ ± 0.5 Vol.-%/year</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 1% of measured value/year</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 1% of measured value/year</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 15 minutes</td>
</tr>
<tr>
<td>Ambient conditions:</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(-40 to 50)°C (~-40 to 122)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature:</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.2 Vol.-%</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Influence of humidity:</td>
<td></td>
</tr>
<tr>
<td>Zero point:</td>
<td>No effect</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.1% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 12 to 20 Vol.-% O₂ in N₂</td>
</tr>
</tbody>
</table>

### Used in

<table>
<thead>
<tr>
<th>Device</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 3500/5500</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 6000/6500</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 2500</td>
<td>no</td>
<td>yes</td>
<td>3 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>3/5 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>3/5 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>3/5 years</td>
<td>&gt; 5 years</td>
<td>no</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

DrägerSensor® XXS oxygen sensors are lead-free, thus complying with Directive 2002/95/EC (RoHS). Because they are non-consuming sensors, they have much longer life times than sensors that are consuming. An extremely fast response time of less than ten seconds produces a reliable warning of any lack or excess of oxygen.

Sensor reaction to \( \text{O}_2 \) at 20 °C/68 °F
Flow = 0.5 l/min, with 100% N\(_2\)

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of \( \text{O}_2 \). To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS \( \text{O}_2 \)**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol.-% ( \text{O}_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C(_2)H(_2)</td>
<td>1 Vol.-%</td>
<td>≤ 0.5(^{(-)})</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH(_3)</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO(_2)</td>
<td>10 Vol.-%</td>
<td>≤ 0.4(^{(-)})</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>0.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl(_2)</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C(_2)H(_6)</td>
<td>1.0 Vol.-%</td>
<td>≤ 0.2(^{(-)})</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C(_2)H(_5)OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C(_2)H(_4)</td>
<td>2 Vol.-%</td>
<td>≤ 2(^{(-)})</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H(_2)</td>
<td>1.6 Vol.-%</td>
<td>≤ 2.5(^{(-)})</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H(_2)S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH(_3))(_2)CCH(_2)</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH(_4)</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO(_2)</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C(_3)H(_8)</td>
<td>2 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO(_2)</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

\(^{(-)}\) Indicates negative deviation
## Relevant Cross-Sensitivities DrägerSensor® XXS E O₂

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol.-% O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>1 Vol.-%</td>
<td>≤ 0.5(–)</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>500 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>≤ 0.4(–)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>0.5 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1.0 Vol.-%</td>
<td>≤ 0.2(–)</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>2 Vol.-%</td>
<td>≤ 2(–)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1.6 Vol.-%</td>
<td>≤ 2.5(–)</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(–) negative reading
DrägerSensor® XXS O₂
DrägerSensor® XXS O₂ / CO LC

MARKET SEGMENTS
Gas suppliers, oxygen cylinders (diving), submarines, nuclear power plants

TECHNICAL SPECIFICATIONS

### Detection limit:
0.1 Vol.-% O₂, 1 ppm CO

### Resolution:
0.1 Vol.-% O₂, 1 ppm CO

### Measurement range:
0 to 25 Vol.-% O₂ (oxygen), 0 to 2000 ppm CO

### Response time:
≤ 15 seconds (T₉₀)

### Measurement accuracy

#### Sensitivity:
O₂: ≤ ± 1 % of measured value, CO: ≤ ± 2 % of measured value

### Long-term drift, at 20°C (68°F)

#### Zero point:
O₂: ≤ ± 0.5 Vol.-% /year, CO: ≤ ± 2 ppm/year

#### Sensitivity:
O₂: ≤ ± 1 % of measured value/year, CO: ≤ ± 3 % of measured value/year

#### Warm-up time:
O₂: ≤ 15 minutes, CO: ≤ 30 minutes

### Ambient conditions

#### Temperature:
(-40 to 50)°C (-40 to 122)°F

#### Humidity:
(10 to 90)% RH

#### Pressure:
(700 to 1,300) hPa

### Influence of temperature

#### Zero point:
O₂: ≤ ± 0.2 Vol.-%
CO: ≤ ± 5 ppm

#### Sensitivity:
O₂: ≤ ± 2 % of measured value
CO: ≤ ± 0.3 % of measured value/K

### Influence of humidity

#### Zero point:
No effect

#### Sensitivity:
O₂: ≤ ± 0.1 % of measured value/%r.h.
CO: ≤ ± 0.02 % of measured value/%r.h.

### Test gas:
approx. 12 to 20 Vol.-% O₂
20 to 1800 ppm CO

Selective filter
Internal selective filter for CO.

Cross sensitivities to alcohol and acid gases (H₂S, SO₂) are eliminated.

The filter's service life can be calculated as follows: 25,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 25,000 ppm x hours / 10 ppm = 2,500 hours.

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac 8500</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
</tbody>
</table>

Used in Plug & Play Replaceable Guaranty Expected sensor life

Dräger Pac 8500 no yes 2 years > 3 years
Dräger X-am 5000 no yes 2 years > 3 years
Dräger X-am 5600 no yes 2 years > 3 years
Dräger X-am 8000 no yes 2 years > 3 years

Selective filter
Internal selective filter for CO.

Cross sensitivities to alcohol and acid gases (H₂S, SO₂) are eliminated.

The filter's service life can be calculated as follows: 25,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 25,000 ppm x hours / 10 ppm = 2,500 hours.

MARKET SEGMENTS
Gas suppliers, oxygen cylinders (diving), submarines, nuclear power plants

TECHNICAL SPECIFICATIONS

### Detection limit:
0.1 Vol.-% O₂, 1 ppm CO

### Resolution:
0.1 Vol.-% O₂, 1 ppm CO

### Measurement range:
0 to 25 Vol.-% O₂ (oxygen), 0 to 2000 ppm CO

### Response time:
≤ 15 seconds (T₉₀)

### Measurement accuracy

#### Sensitivity:
O₂: ≤ ± 1 % of measured value, CO: ≤ ± 2 % of measured value

### Long-term drift, at 20°C (68°F)

#### Zero point:
O₂: ≤ ± 0.5 Vol.-% /year, CO: ≤ ± 2 ppm/year

#### Sensitivity:
O₂: ≤ ± 1 % of measured value/year, CO: ≤ ± 3 % of measured value/year

#### Warm-up time:
O₂: ≤ 15 minutes, CO: ≤ 30 minutes

### Ambient conditions

#### Temperature:
(-40 to 50)°C (-40 to 122)°F

#### Humidity:
(10 to 90)% RH

#### Pressure:
(700 to 1,300) hPa

### Influence of temperature

#### Zero point:
O₂: ≤ ± 0.2 Vol.-%
CO: ≤ ± 5 ppm

#### Sensitivity:
O₂: ≤ ± 2 % of measured value
CO: ≤ ± 0.3 % of measured value/K

### Influence of humidity

#### Zero point:
No effect

#### Sensitivity:
O₂: ≤ ± 0.1 % of measured value/%r.h.
CO: ≤ ± 0.02 % of measured value/%r.h.

### Test gas:
approx. 12 to 20 Vol.-% O₂
20 to 1800 ppm CO

Selective filter
Internal selective filter for CO.

Cross sensitivities to alcohol and acid gases (H₂S, SO₂) are eliminated.

The filter's service life can be calculated as follows: 25,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 25,000 ppm x hours / 10 ppm = 2,500 hours.

MARKET SEGMENTS
Gas suppliers, oxygen cylinders (diving), submarines, nuclear power plants

### Detection limit:
0.1 Vol.-% O₂, 1 ppm CO

### Resolution:
0.1 Vol.-% O₂, 1 ppm CO

### Measurement range:
0 to 25 Vol.-% O₂ (oxygen), 0 to 2000 ppm CO

### Response time:
≤ 15 seconds (T₉₀)

### Measurement accuracy

#### Sensitivity:
O₂: ≤ ± 1 % of measured value, CO: ≤ ± 2 % of measured value

### Long-term drift, at 20°C (68°F)

#### Zero point:
O₂: ≤ ± 0.5 Vol.-% /year, CO: ≤ ± 2 ppm/year

#### Sensitivity:
O₂: ≤ ± 1 % of measured value/year, CO: ≤ ± 3 % of measured value/year

#### Warm-up time:
O₂: ≤ 15 minutes, CO: ≤ 30 minutes

### Ambient conditions

#### Temperature:
(-40 to 50)°C (-40 to 122)°F

#### Humidity:
(10 to 90)% RH

#### Pressure:
(700 to 1,300) hPa

### Influence of temperature

#### Zero point:
O₂: ≤ ± 0.2 Vol.-%
CO: ≤ ± 5 ppm

#### Sensitivity:
O₂: ≤ ± 2 % of measured value
CO: ≤ ± 0.3 % of measured value/K

### Influence of humidity

#### Zero point:
No effect

#### Sensitivity:
O₂: ≤ ± 0.1 % of measured value/%r.h.
CO: ≤ ± 0.02 % of measured value/%r.h.

### Test gas:
approx. 12 to 20 Vol.-% O₂
20 to 1800 ppm CO
SPECIAL CHARACTERISTICS

DrägerSensor® XXS oxygen sensors are lead-free, thus complying with Directive 2002/95/EC (RoHS). Because they are non-consuming sensors, they have much longer life times than sensors that are consuming. An extremely fast response time of less than ten seconds produces a reliable warning of any lack or excess of oxygen. The prominent feature of this sensor is the simultaneous measurement of % by vol. oxygen and ppm carbon monoxide in one sensor.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of O₂. To be sure, please check if gas mixtures are present.

**RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS O₂ /CO LC**

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm O₂</th>
<th>Display in ppm CO with selektive filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>1 Vol.-%</td>
<td>≤ 0.5⁽¹⁾</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>≤ 0.4⁽¹⁾</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>0.2 Vol.-%</td>
<td>No effect</td>
<td>2000</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>2 Vol.-%</td>
<td>≤ 2⁽¹⁾</td>
<td>≤ 250</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1.6 Vol.-%</td>
<td>≤ 2.5⁽¹⁾</td>
<td>≤ 200</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>i-C₄H₈</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
</tbody>
</table>

⁽¹⁾ Indicates negative deviation
MARKET SEGMENTS
Gas suppliers, waste disposal, petrochemical industry, sewage, mining and tunneling, shipping, inorganic chemicals, steel, organic chemicals, oil and as

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
</tbody>
</table>

Detection limit: 0.1 Vol.-% O₂, 0.4 ppm H₂S
Resolution: 0.1 Vol.-% O₂, 0.1 ppm H₂S
Measurement range: 0 to 25 Vol.-% O₂ (oxygen), 0 to 100 ppm H₂S (hydrogen sulfide)
Response time: O₂: ≤ 15 seconds, H₂S: ≤ 20 seconds (T₉₀)
Measurement accuracy:
O₂: ≤ ± 1 % of measured value, H₂S: ≤ ± 5 % of measured value
Long-term drift, at 20°C (68°F):
Zero point:
O₂: ≤ ± 0.5 Vol.-% /year, H₂S: ≤ ± 0.2 ppm/year
Sensitivity:
O₂: ≤ ± 1 % of measured value/year, H₂S: ≤ ± 5 % of measured value/year
Warm-up time:
O₂: ≤ 15 minutes, H₂S: ≤ 10 minutes
Ambient conditions:
Temperature: (-40 to 50)°C (-40 to 122)°F
Humidity: (10 to 90)% RH
Pressure: (700 to 1,300) hPa
Influence of temperature:
Zero point:
O₂: ≤ ± 0.2 Vol.-%
H₂S: No effect
Sensitivity:
O₂: ≤ ± 2 % of measured value
H₂S: ≤ ± 5% of measured value
Influence of humidity:
Zero point: No effect
Sensitivity:
O₂: ≤ ± 0.1 % of measured value/%r.h.
H₂S: ≤ ± 0.1 % of measured value/ %r.h.
Test gas:
approx. 12 to 20 Vol.-% O₂
approx. 5 to 90 ppm H₂S

SPECIAL CHARACTERISTICS
DrägerSensor® XXS oxygen sensors are lead-free, thus complying with Directive 2002/95/EC (RoHS). The prominent feature of this sensor is the simultaneous measurement of % by vol. oxygen and ppm hydrogen sulfide in one sensor.
The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of O₂. To be sure, please check if gas mixtures are present.

### RELEVANT CROSS-SENSITIVITIES DRÄGERSENSOR® XXS O₂ / H₂S LC

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol.-% O₂</th>
<th>Display in ppm H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>0,5 Vol.-%</td>
<td>≤ 0,3&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>≤ 0,4&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>500 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethyl disulfide</td>
<td>CH₃SSCH₃</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Dimethyl sulfide</td>
<td>(CH₃)₂S</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>1,0 Vol.-%</td>
<td>≤ 0,2&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>≤ 11</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₆</td>
<td>1000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethyl mercaptan</td>
<td>C₂H₅SH</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,5 Vol.-%</td>
<td>≤ 2,5&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>i-C₄H₈</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>5 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methyl mercaptan</td>
<td>CH₃SH</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>≤ 16</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>No effect</td>
<td>≤ 4&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>1 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>sec-Butyl mercaptan</td>
<td>C₄H₁₀S</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>≤ 7</td>
</tr>
<tr>
<td>tert-Butyl mercaptan</td>
<td>(CH₃)₃CSH</td>
<td>20 ppm</td>
<td>No effect</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Tetrahydrothiophene</td>
<td>C₄H₈S</td>
<td>50 ppm</td>
<td>No effect</td>
<td>≤ 5</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> Indicates negative deviation
**MARKET SEGMENTS**
Gas suppliers, oxygen cylinders (diving), submarines, nuclear power plants

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.5 Vol.-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.5 Vol.-%</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 100 Vol.-% O₂ (oxygen)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 5 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>≤ ± 1% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F)</td>
<td>≤ ± 0.5 Vol.-%/year</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 3% of measured value/year</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ 15 minutes</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td></td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>(0 to 45)°C (32 to 113)°F</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Pressure:</td>
<td>(700 to 1,100) hPa</td>
</tr>
<tr>
<td>Influence of temperature</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td></td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Influence of humidity</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td></td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.01% of measured value/% RH</td>
</tr>
<tr>
<td>Test gas:</td>
<td>approx. 10 to 100 Vol.-% O₂ in N₂</td>
</tr>
</tbody>
</table>

**Used in**
- Dräger X-am 5000
- Dräger X-am 5600
- Dräger X-am 8000

<table>
<thead>
<tr>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS
DrägerSensor® XXS oxygen sensors are lead-free, thus complying with Directive 2002/95/EC (RoHS). The sensor’s measurement principle is based on the partial pressure measurement of oxygen. Therefore, this sensor is suitable for the oxygen monitoring during inertisation processes. The inert gas can be nitrogen, carbon dioxide, argon or helium.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of O₂. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES DRÄGERSensor® XXS O₂ 100

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in Vol.-% O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>5 vol.-%</td>
<td>≤ 1⁻¹</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Helium</td>
<td>He</td>
<td>50 vol.-%</td>
<td>≤ 1⁻¹</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>10 vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>0.05 vol.-%</td>
<td>≤ 1⁻¹</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>2 vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>SO₂</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(⁻) Indicates negative deviation
DrägerSensor® XXS Odorant

Order no. 68 12 535

<table>
<thead>
<tr>
<th>Used in</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 2 years</td>
</tr>
</tbody>
</table>

Selective filter
B2X (68 1242) – replaceable.

Cross sensitivities to hydrogen sulfide (H₂S) and sulfur dioxide (SO₂) are eliminated.

The filter’s service life can be calculated as follows: 1,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 1,000 ppm x hours / 10 ppm = 100 hours. Due to the change of sensitivity, a calibration is necessary after installation. The measurement value response time increases after the installation of the filter.

MARKET SEGMENTS
Gas supply companies

TECHNICAL SPECIFICATIONS

| Detection limit: | 1 ppm |
| Resolution:      | 0.5 ppm |
| Measurement range/relative sensitivity | 0 – 40 ppm THT (tetrahydrothiophene) |
|                  | 0 – 40 ppm (CH₃)₃CSH (tert.-butyl mercaptane) |
|                  | 0 – 40 ppm C₂H₅CH(CH₃)SH (sec.-butyl mercaptane) |
|                  | 0 – 40 ppm CH₃SH (methyl mercaptane) |
|                  | 0 – 40 ppm C₂H₅SH (ethyl mercaptane) |
|                  | 0 – 100 ppm (CH₃)₂S (dimethyl sulfide) |
|                  | 0 – 40 ppm CH₃SSCH₃ (dimethyl disulfide) |

Response time: ≤ 90 seconds (T₉₀)

Measurement accuracy
Sensitivity: ≤ ± 3 % measured value/month

Long-term drift, at 20°C (68°F)
Zero point: ≤ ± 2 ppm/year
Sensitivity: ≤ ± 2% measured value/month

Warm-up time: ≤ 12 hours

Ambient conditions
Temperature*: (-20 to 50)°C (-4 to 122) °F for THT, TBM, SBM
(5 to 40)°C (32 to 104) °F for MeM, EtM, DMS, DMDS
Humidity*: (10 to 90) % RH
Pressure: (700 to 1300) hPa

Influence of temperature
Zero point: ≤ ± 2 ppm
Sensitivity: ≤ ± 10 % of measured value

Influence of humidity
Zero point: ≤ ± 0,1 ppm / % RH
Sensitivity: ≤ ± 0,2 % of measured value / RH

Test gas:
THT test gas of approx. 2 to 18 ppm or an other of the target gases:
(CH₃)₃CSH, C₂H₅CH(CH₃)SH, CH₃SH, C₂H₅SH, (CH₃)₂S, CH₃SSCH₃

* Sudden temperature or humidity changes lead to dynamic effects (fluctuations). These dynamic effects decrease within 2 to 3 minutes.
SPECIAL CHARACTERISTICS

This sensor can be used to monitor seven different odorants in the ambient air or (for short periods) in natural gas. It is sufficient to calibrate the sensor using a THT test gas. By doing so, all of the other target gases are then automatically calibrated. In addition to a quick response time this Odorant sensor are highly selective. An internal, replaceable selective filter filters out most associated gases in natural gases like H₂S and SO₂.

Typical gas response of Odorant at 20 °C
flow = 0.5 l/min, purged with 10 ppm THT

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of NH₃. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm THT</th>
<th>Display in ppm THT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>without selective filter</td>
<td>with selective filter</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol.-%</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>125 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>8 ppm</td>
<td>≤3 ppm(1)</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethene</td>
<td>C₂H₄</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1000 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>10 ppm</td>
<td>≤30 ppm</td>
<td>≤3.5 ppm</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>100 Vol.-%</td>
<td>≤5 ppm</td>
<td>≤5 ppm</td>
</tr>
<tr>
<td>Methanol</td>
<td>CH₃OH</td>
<td>200 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>10 ppm</td>
<td>≤30 ppm</td>
<td>≤30 ppm</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>≤4 ppm</td>
<td>≤4 ppm</td>
</tr>
<tr>
<td>n-propyl mercaptan</td>
<td>C₃H₇SH</td>
<td>6 ppm</td>
<td>≤15 ppm</td>
<td>≤15 ppm</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>5 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>20 ppm</td>
<td>No effect</td>
<td>No effect</td>
</tr>
</tbody>
</table>

(1) Indicates negative deviation
## DrägerSensor® XXS Ozone

### MARKET SEGMENTS
Ozone generator manufacturer, coal-fired power plants, water treatment (drinking and industrial water), food and beverage industry, swimming pools, pulp and paper industry, pharmaceutical and cosmetics industry

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>0.02 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>0.01 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 10 ppm O₃ (Ozon)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 10 seconds (T₅₀)</td>
</tr>
<tr>
<td>Measurement accuracy:</td>
<td>≤ ± 3 % of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 0.02 ppm/year</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F):</td>
<td>≤ ± 2 % of measured value/month</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 120 minutes</td>
</tr>
</tbody>
</table>

### Ambient conditions

- **Temperature:** (-20 to 50) °C (-4 to 122) °F
- **Humidity:** (10 to 90) % RH
- **Pressure:** (700 to 1300) hPa

### Influence of temperature

- **Zero point:** No effect
- **Sensitivity:** ≤ ± 0.5 % of measured value/K

### Influence of humidity

- **Zero point:** No effect
- **Sensitivity:** ≤ ± 0.1 % of measured value/% RH

### Test gas:

- approx. 0.5 to 9 ppm O₃
- 5 ppm NO₂

The calibration and function test can be conducted both with the target gas O₃, as well as with the replacement test gas NO₂.

Surrogate calibration with NO₂ can lead to an additional measuring error of up to ± 10 %. When conducting a function test with 5 ppm NO₂ an indication of 2.2 ± 0.8 ppm O₃ is expected.

---

*A use or storage over a longer period below the specified relative humidity may cause a change of sensor sensitivity due to dehydration. This effect is reversible once the relative humidity increases. Please consider the storage conditions stated on the packaging or in the instruction for use.*
SPECIAL CHARACTERISTICS

A fast response time and excellent repeatability are just two examples of this sensor’s special characteristics. With a detection limit of 0.02 ppm and a resolution of 0.01 ppm, it is also optimally suited for limit value monitoring.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm Ozone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C2H2</td>
<td>100 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH3</td>
<td>30 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Arsenic</td>
<td>AsH3</td>
<td>0.5 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO2</td>
<td>5 Vol.-%</td>
<td>no effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>2000 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl2</td>
<td>1 ppm</td>
<td>≤ 0.8</td>
</tr>
<tr>
<td>Chlorine dioxide</td>
<td>ClO2</td>
<td>1 ppm</td>
<td>≤ 0.8</td>
</tr>
<tr>
<td>Ethane</td>
<td>C3H6</td>
<td>0.1 Vol.-%</td>
<td>no effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C2H5OH</td>
<td>250 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Hydrazine</td>
<td>N2H4</td>
<td>1 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H2</td>
<td>0.1 Vol.-%</td>
<td>no effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>40 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>50 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H2S</td>
<td>1 ppm</td>
<td>≤ 0.02 (–)</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH3)2CCH2</td>
<td>100 ppm</td>
<td>≤ 0.04</td>
</tr>
<tr>
<td>Methane</td>
<td>CH4</td>
<td>5 Vol.-%</td>
<td>no effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO2</td>
<td>1 ppm</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>30 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH3</td>
<td>0.5 ppm</td>
<td>no effect</td>
</tr>
<tr>
<td>Propane</td>
<td>C3H8</td>
<td>1 Vol.-%</td>
<td>no effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO2</td>
<td>1 ppm</td>
<td>≤ 0.06 (–)</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
**DrägerSensor® XXS PH₃**

**MARKET SEGMENTS**

Inorganic chemicals, fumigation, clearance measurements.

**TECHNICAL SPECIFICATIONS**

| Detection limit: | 0.02 ppm |
| Resolution: | 0.01 ppm |
| Measurement range/relative Sensitivity | 0 to 20 ppm PH₃ (phosphine) 1.00 |
| | 0 to 20 ppm AsH₃ (arsine) 0.90 |
| | 0 to 20 ppm B₂H₆ (diborane) 0.35 |
| | 0 to 20 ppm SiH₄ (silane) 0.85 |
| | 0 to 20 ppm H₂Se (selenium hydrogen)* 0.50 |

| Response time: | ≤ 10 seconds (T₉₀) |
| Measurement accuracy | ≤ ± 2% of measured value |
| Long-term drift, at 20°C (68°F) | ≤ ± 0.05 ppm/year |
| Zero point: | ≤ ± 2% of measured value/month |
| Warm-up time: | ≤ 15 minutes |

**Ambient conditions**

| Temperature: | PH₃, AsH₃, SiH₄: (-20 to 50°C (-4 to 122°F) |
| | B₂H₆: (0 to 50°C (32 to 122°F) |
| Humidity: | (10 to 90)% RH |
| Pressure: | (700 to 1,300) hPa |

**Influence of temperature**

| Zero point: | ≤ ± 0.02 ppm |
| Sensitivity: | ≤ ± 5% of measured value |

**Influence of humidity**

| Zero point: | No effect |
| Sensitivity: | ≤ ± 0.05% of measured value/% RH |

**Test gas:**

approx. 0.05 to 18 ppm PH₃

---

1) Selection of measuring gas in Pac 7000/8000 not possible, only phosphine

---

*With limited temperature range: 0 to 40°C dry test gas
SPECIAL CHARACTERISTICS

This sensor’s advantages include an extreme fast response time of less than 10 seconds for 90% of the measured signal, and its excellent linearity. It is suitable for monitoring concentrations of common hydrides such as phosphine, arsine, diborane, and silane in the ambient air.

Sensor reaction to PH₃ at 20 °C/68 °F
Flow = 0.5 l/min, with 0.1 ppm PH₃

Linearity of PH₃ sensor
calibrated with 1 ppm PH₃

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of PH₃. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm PH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>≤ 2 (–)</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>≤ 0.3</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>60 ppm</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>0.9 Vol.-%</td>
<td>≤ 20</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>≤ 1</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XXS PH₃ HC

**MARKET SEGMENTS**
Inorganic chemicals, industry, fumigation.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Detection limit:</th>
<th>2 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Measurement range:</td>
<td>0 to 2,000 ppm PH₃ (phosphine)</td>
</tr>
<tr>
<td>Response time:</td>
<td>≤ 10 seconds (T₉₀)</td>
</tr>
<tr>
<td>Measurement accuracy:</td>
<td>≤ ± 2% of measured value</td>
</tr>
<tr>
<td>Long-term drift, at 20°C (68°F):</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 2 ppm/year</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>≤ ± 2% of measured value/month</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>≤ 15 minutes</td>
</tr>
<tr>
<td>Ambient conditions:</td>
<td>(–20 to 50)°C (–4 to 122)°F</td>
</tr>
<tr>
<td>Temperature:</td>
<td>(10 to 90)% RH</td>
</tr>
<tr>
<td>Humidity:</td>
<td>(700 to 1,300) hPa</td>
</tr>
<tr>
<td>Influence of temperature:</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 5% of measured value</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
</tr>
<tr>
<td>Influence of humidity:</td>
<td>No effect</td>
</tr>
<tr>
<td>Zero point:</td>
<td>≤ ± 0.05% of measured value/% RH</td>
</tr>
<tr>
<td>Sensitivity:</td>
<td>approx. 4 to 1,800 ppm PH₃</td>
</tr>
</tbody>
</table>

**Used in**

<table>
<thead>
<tr>
<th>Device</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
<th>Selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>1 year</td>
<td>&gt; 3 years</td>
<td>no</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

This sensor demonstrates excellent linearity across the whole measurement range even if calibrated in the lower reaches of that range, and it also provides a stable reading even at high concentrations over long periods of time.

Sensor reaction to PH₃ HC at 20 °C/68 °F
Flow = 0.5 l/min, with 1.050 ppm PH₃

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm PH₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Arsine</td>
<td>AsH₃</td>
<td>5 ppm</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>10 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Diborane</td>
<td>B₂H₆</td>
<td>5 ppm</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>60 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>0.9 Vol.-%</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>≤ 5 (-)</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Silane</td>
<td>SiH₄</td>
<td>5 ppm</td>
<td>≤ 5</td>
</tr>
</tbody>
</table>

(–) Indicates negative deviation
DrägerSensor® XXS SO₂

**MARKET SEGMENTS**
Food industry, pest control, mining, oil and gas, petrochemical, paper manufacture, shipping, steel industry.

**TECHNICAL SPECIFICATIONS**

| Detection limit: | 0.1 ppm |
| Resolution: | 0.1 ppm |
| Measurement range: | 0 to 100 ppm SO₂ (sulfur dioxide) |
| Response time: | ≤ 15 seconds (T₉₀) |
| Measurement accuracy: | ≤ ± 2% of measured value |
| Sensitivity: | ≤ ± 1 ppm/year |
| Long-term drift, at 20°C (68°F): | ≤ ± 2% of measured value/month |
| Zero point: | ≤ 15 minutes |
| Ambient conditions: | Temperature: (-40 to 50)°C (-40 to 122)°F |
| | Humidity: (10 to 90)% RH |
| | Pressure: (700 to 1,300) hPa |
| Influence of temperature: | Zero point: ≤ ± 1 ppm |
| | Sensitivity: ≤ ± 5% of measured value |
| Influence of humidity: | Zero point: No effect |
| | Sensitivity: ≤ ± 0.1% of measured value/% RH |
| Test gas: | approx. 2 to 90 ppm SO₂ |

**Selective filter**
KX (68 11 344) replaceable.
Cross sensitivities to hydrogen sulfide (H₂S) are eliminated.
The filter’s service life can be calculated as follows: 1,000 ppm x hours of contaminant gas. Example: Given constant concentration of 10 ppm H₂S will be: Service life = 1,000 ppm x hours / 10 ppm = 100 hours.
Due to the change of sensitivity, a calibration is necessary after installation. The measurement value response time increases after the installation of the filter.

**Used in**

<table>
<thead>
<tr>
<th>Dräger Pac 6000/6500</th>
<th>Plug &amp; Play</th>
<th>Replaceable</th>
<th>Guaranty</th>
<th>Expected sensor life</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
<td></td>
</tr>
<tr>
<td>Dräger Pac 7000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 2500</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 5000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 5600</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>no</td>
<td>yes</td>
<td>2 years</td>
<td>&gt; 3 years</td>
</tr>
</tbody>
</table>
SPECIAL CHARACTERISTICS

As well as a fast response time and excellent linearity, this sensor is highly selective if the selective filter is used. The KX selective filter (order no. 68 11 344) is an accessory for the DrägerSensor® XXS EC SO₂ and eliminates the sensor’s cross-sensitivity to hydrogen sulfide. The filter has a lifetime of 1,000 ppm × hours, which means that at a hydrogen sulfide concentration of 1 ppm, it can be used for 1,000 hours.

The values shown in the following table are standard and apply to new sensors. The values may fluctuate by ± 30%. The sensor may also be sensitive to additional gases (for more information, please contact Dräger). Gas mixtures may be displayed as the sum of all components. Gases with a negative cross sensitivity may displace an existing concentration of SO₃. To be sure, please check if gas mixtures are present.

RELEVANT CROSS-SENSITIVITIES

<table>
<thead>
<tr>
<th>Gas/vapor</th>
<th>Chem. symbol</th>
<th>Concentration</th>
<th>Display in ppm SO₂ without selective filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C₂H₂</td>
<td>100 ppm</td>
<td>≤ 140</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>50 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1.5 Vol.%</td>
<td>No effect</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>200 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>10 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ethanol</td>
<td>C₂H₅OH</td>
<td>250 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>H₂</td>
<td>1,000 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>HCl</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Isobutylene</td>
<td>(CH₃)₂CCH₂</td>
<td>100 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Methane</td>
<td>CH₄</td>
<td>1 Vol.%</td>
<td>≤ 5</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>20 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Ozone</td>
<td>O₃</td>
<td>0.5 ppm</td>
<td>No effect</td>
</tr>
<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>1 ppm</td>
<td>≤ 6</td>
</tr>
</tbody>
</table>

(--) Indicates negative deviation
4.7 Explanatory notes – sensor data

**DRÄGERSENSOR**

Name and type of the sensor as well as the order number

<table>
<thead>
<tr>
<th>Used as follows:</th>
<th>Indicates the devices suitable for use with this sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug &amp; Play:</td>
<td>Indicates whether this sensor has plug &amp; play functionality</td>
</tr>
<tr>
<td>Replaceable:</td>
<td>Indicates whether the sensor in the device can be replaced</td>
</tr>
<tr>
<td>Guaranty:</td>
<td>Indicates the Manufacturer’s guaranty period for the sensor</td>
</tr>
</tbody>
</table>

**Limited manufacturer guarantee**

Dräger grants a limited manufacturer guarantee for products in this handbook within the specified guarantee period under the following conditions. Dräger guarantees to the End Customer a product lifetime for the guarantee period indicated in this handbook, beginning with the first use of the product, but not longer than the guarantee period indicated plus one year after manufacture of the product. End Customer is the person or legal entity that acquired the new and unused product for its own use and not for resale.

Dräger’s obligations and End Customer’s sole and exclusive remedy under the Limited Manufacturer Guarantee is limited to the replacement of the defective product with a new product. For any valid claim hereunder (as determined by Dräger in its sole discretion), Dräger will replace the product free of charge with a new unit of the same type and properties.

The End Customer must provide written notice of any claim under the Limited Manufacturer Guarantee within thirty (30) days of when the claim becomes known or should have been known and in any event within the stated guarantee period. Such notice must be provided to either Dräger or the dealer where he acquired the product.

The Limited Manufacturer Guarantee is valid only if the End Customer (i) performed all maintenance measures recommended by the manufacturer (in the published Product Specifications or instructions for use) or required by applicable law and (ii) did not use the product in any manner which is outside its intended use as provided in the Product Specifications or instructions for use. This Limited Manufacturer Guarantee excludes any damage caused to the product (a) due to any act or omission of End Customer or any other third party, or (b) caused by transport, installation, modifications to, or improper use of the product.
DRÄGER MAKES NO GUARANTEE FOR THE PRODUCT OTHER THAN THE ONE SET FORTH HEREIN OR THAT WHICH MAY BE PROVIDED IN A SEPARATE WARRANTY OR GUARANTEE COVERING THE PRODUCT. THIS GUARANTEE DOES NOT LIMIT ANY STATUTORY OR OTHER MANDATORY RIGHTS THE END CUSTOMER MAY BE ENTITLED TO.

The Limited Manufacturer Guarantee and its enforcement are subject to German substantive law to the exclusion of the UN Convention on the International Sale of Goods (CISG) and the conflict of laws rules. Place of performance is Lübeck, Germany. The courts of Lübeck, Germany shall have exclusive jurisdiction.

**Expected sensor life:** Indicates the typical lifespan of a sensor under normal operation conditions at 20°C (68°F), 50%r.h., 1013 hPa. This applies for the operation of the sensor (the date from which the sensor is plugged into the instrument).

**Selective filter:** Indicates whether this sensor has a selective filter, which could be a replaceable one. The filters eliminate the cross sensitivities of the indicated gases. Each filter has a specified service life calculated based on exposed ppm and duration.

**MARKET SEGMENTS**
A list of typical market segments in which this sensor is used. This list does not claim to be complete.

**TECHNICAL DATA**
Indicates the technical data for this sensor.

**SPECIAL FEATURES**
Description of the features that characterize this sensor and thus make it particularly interesting for various applications.

**RELEVANT CROSS-SENSITIVITIES**
Selection of gases, which may affect the sensor in typical applications. The effect of the filter is depicted in a separate column for sensors with selective filter.
### TECHNICAL DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection limit:</td>
<td>Indicates the smallest concentration other than zero depicted in the display. For example: At a detection limit of 2 ppm, the value 2 ppm is depicted in the display as the first concentration. Concentrations lower than 2 ppm are depicted as 0 ppm.</td>
</tr>
<tr>
<td>Resolution:</td>
<td>Indicates the concentration increments of the display. For example: With a detection limit of 2 ppm and a resolution of 1 ppm, the concentrations are depicted in the following increments: 2 ppm / 3 ppm / 4 ppm ...</td>
</tr>
<tr>
<td>Measurement Range:</td>
<td>Indicates the maximum measuring ranges of the sensor. All gases/vapors with their ranges are indicated if a sensor can be used for different gases and vapors.</td>
</tr>
<tr>
<td>Relative sensitivity:</td>
<td>Some sensors are suitable for the measurement of different target gases. The various cross sensitivities of these target gases are in general stated in the sensor information under the item measurement range. The sensitivity factor refers to a defined gas and is called relative sensitivity. With these sensitivity factors interferences (cross sensitivities) or calibration factors can be calculated.</td>
</tr>
<tr>
<td>Example XXS OV:</td>
<td>The defined gas for an XXS OV sensor is ethylene oxide (EO). The relative sensitivity of Vinyl chloride (VC) related to EO is 0.6. Meaning, an XXS OV sensor calibrated to EO will give a reading of 60 ppm when exposed to 100 ppm VC. The given values are guiding values and apply to new sensors. Gas mixtures may be displayed as the sum. Therefore, it should be examined whether gas mixtures are present. Gases with a negative sensitivity may offset the positive display of the calibration gas.</td>
</tr>
<tr>
<td>Response time:</td>
<td>Typically, the times listed here are T&lt;sub&gt;50&lt;/sub&gt; or T&lt;sub&gt;90&lt;/sub&gt; at 20°C (68°F), 50% r.h., 1013 mbar. These times indicate when 50 % or 90 % of the final signal has been reached.</td>
</tr>
<tr>
<td>Measurement accuracy:</td>
<td>The data presented here relate to the sensitivity: For example, if a measuring accuracy of ≤ ± 3 ppm of the measured value is indicated for the sensitivity, then the following can be said about the measuring accuracy: The concentration is between 97 and 103 ppm if 100 ppm is displayed.</td>
</tr>
<tr>
<td>Long-term drift:</td>
<td>This information indicates the typical drift of the sensor in the zero point and in the sensitivity across a longer period. This data may refer to a month or a year. The long-term drift data of ≤ ± 0.2 ppm/year at 20° C (68°F) states that this sensor drifts max. ≤ ±2 ppm per year. A value for the long-term drift of the sensitivity of ≤ ± 2 ppm/month, indicates that after two months with a display of 100 ppm, the gas concentration may be between 96 and 104 ppm at maximum.</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>The warm-up time indicates the amount of time needed before a newly installed sensor or a sensor, which was without electricity for a period of time and then is powered up again, can be calibrated. However, the sensor may be ready for use after only a few minutes. In this case, there may be a higher rate of measurement errors.</td>
</tr>
<tr>
<td><strong>Ambient conditions:</strong></td>
<td>Indicates the temperature, humidity and pressure range in which the sensor may be used. The indicated corrections do not apply with measurements outside of the permissible ambient conditions. Dräger is pleased to offer you additional advice on how to meet your specific requirements. Please contact the respective branch office if you require assistance. The addresses are listed on the rear cover page of this manual.</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Influence of temperature:** | The effect of temperature must be considered when the measurement temperature deviates from the temperature during the calibration.  
**Example 1:** Temperature effect on the sensitivity amounts to $\leq \pm 5\%$ of the measured value. This means that the max. deviation across the entire temperature range of the sensor (typically -40 to 50°C or -40 to 122°F) is expected to be $\leq \pm 5\%$. At an ambient temperature of, for example, -10°C (14°F) and a displayed value of 100 ppm, the gas concentration may be between 95 and 105 ppm at maximum. The temperature difference between the temperature of the measurement and the temperature of the calibration must be taken into account with some sensors.  
**Example 2:** The effect of temperature on the sensitivity is $\leq \pm 0.5\% \text{ of the measured value} / \text{K}$. The sensor was calibrated at 25°C (77°F), the measurement is taken at an ambient temperature of 35°C (95°F). The temperature difference is then 10°C (14°F) or 10 K. This yields the following calculation: $10 \times 0.5\% = 5\%$  
With an ambient temperature of 35°C (95°F) and a displayed value of 100 ppm, the gas concentration is between 95 and 105 ppm at maximum. |
| **Influence of humidity:** | The effects of humidity must be considered if the humidity during measurement deviates from the calibration humidity.  
**Example 1:** The effect of humidity on the sensitivity is $\leq \pm 0.5\%$ of the measured value. This means, that a deviation of maximum $\leq \pm 5\%$ over the entire humidity operating range (typically (10 to 90)% RH) must be taken into account.  
With an ambient humidity of 50%, for example, and a displayed value of 100 ppm, the gas concentration may be between 95 and 105 ppm at maximum. The humidity difference between the humidity of the measurement and the humidity of the calibration must be taken into account with some sensors.  
**Example 2:** The effect of humidity on the sensitivity is $\leq \pm 0.02\% \text{ of the measured value} / \text{% rel. humidity}$. The sensor was calibrated at 0% rel. humidity, the measurement is taken at an ambient rel. humidity of 50%. The difference of the rel. humidity is then 50%. This yields the following calculation: $50 \times 0.02\% = 1\%$  
With an ambient humidity of 50% and a displayed value of 100 ppm, the gas concentration is between 99 and 101 ppm at maximum. |
| **Test gas:** | Recommended test gas concentration for calibrating the sensor. |
5 Accessories
5.1 Introduction

Dräger offers a range of accessories to ensure that you can make optimal use of your gas detector for your specific application. We also help you maintain your device and make sure that it is kept ready for operation.

Safety
Measuring devices that are not operating correctly do not provide protection and can lead to accidents. Testing these devices (bump test) is the only way to guarantee reliable and correct measurement of and warning against gas hazards.

Enhanced functionality
Using the correct accessories can enhance the functionality of gas detectors. For example, a personal detection device can be converted into a leak detection or clearance measurement device in confined spaces by using an external pump, probe or an extension hose. It is important that you choose the accessory that is best suited for your application.

Configuration/Documentation/Archiving
Setting the parameters of the gas detectors always becomes important when limit values change or if the gas detector is used for another application. This is where we provide after-sales support: and the PC software helps you with the configuration. The documentation is also extremely important: Who performed which test and what was the result? Where have the calibration certificates been filed?
Our solutions also provide support in this area.

Evaluation
A data logger collects numerous measured values and results – but the data remains idle until it is evaluated. That's why we help you prepare the data: this includes graphic displays and easy navigation in the data logger – as well as automatic reports, e.g. if an alarm is triggered or a calibration interval is exceeded.
Solutions to make sure that you always stay on top of your process.
5.2 The bump test

Anyone looking for a definition of the bump test will struggle to find a clear and straightforward explanation. This important test is performed in a variety of different ways in practice. When designing the test system you need to ask: what significance do "I" expect from the bump test?

a) Does the device need to show that it works in principle and that "gas" is reaching the sensors to be checked (qualitative finding)?

b) Or do I need a quantitative finding, i.e. whether the device is still providing measurements that are "accurate enough"?

Dräger provides two different categories of the bump test:

**The quick bump test**
The quick bump test checks whether the relevant sensor exceeds the first alarm threshold after applying an "appropriate" test gas. Additional safety measures are available (e.g. the sensor may need to be above the alarm threshold for a certain amount of time) but, in principle, the test threshold is the alarm threshold configured in the device.

A test gas is "appropriate" if it is not "too far" above the first alarm threshold, as this would otherwise mean that the gas test would only fail after a dramatic loss of sensitivity. A limit must also be maintained in the event of a more qualitative test. Dräger provides recommended limits for these tests.

**The extended bump test**
The advanced bump test checks whether the tested sensor complies with the test gas concentration within a tolerance window after an "appropriate" test gas is applied. This test includes a quantitative finding and increases safety.

The sensor also has an impact on whether the test gas is "appropriate". A test close to the alarm thresholds is often advisable, but many sensors are also linear so that the permitted range is much larger than for the quick test, as the "test threshold" is always adjusted. This allows the accuracy to be determined at almost any point within the measuring range. However, the selection of a range that corresponds to the measuring task is advisable. Dräger also provides recommended ranges for the permitted test gas concentrations.

The CC-Vision software lists the permitted calibration ranges for every individual sensor (and every selected test gas) for both the quick and the extended bump test. In many cases the gas detector – or even the Dräger X-dock – does not accept concentrations outside this range.
Portable gas detectors are used for continuous measurement and support you in every application. As a result, it is important to check the devices for operational readiness by applying test gas and evaluating the result. This not only ensures that the sensors themselves are ready for measurement, but that the access to the sensor is not blocked by dust or dirt. An calibration should also take place at regular intervals, as factors such as environmental influences or ageing can have an impact on the sensor sensitivity.

National guidelines also prescribe bump tests and calibrations, such as information sheet T021 (gas warning devices for toxic gases/vapours) or T023 (gas warning devices for explosion protection) by the "Rohstoffe und chemische Industrie" (raw materials and chemicals industry) liability insurance association (BG RCI) in Germany. The applicable standard for the member states of the European Union, EN 60079-29-2 "Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen", also prescribes the implementation of a sensitivity test directly prior to use (international: IEC 60079-29-2).

### 5.3 Devices for calibration and functional testing

The following table helps you select the appropriate bump test for you:

<table>
<thead>
<tr>
<th>Test duration</th>
<th>Quick bump test</th>
<th>Extended bump test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas consumption</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Behaviour for &quot;special gases&quot; (high adsorption)</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Check for accuracy / residual sensitivity</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Behaviour when applying the incorrect gas (e.g. incorrect concentration set or undefined cross-sensitivity, as the incorrect test gas cylinder is connected; residual gas in the hose, etc.)</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Permitted test gas concentration range (minimum and maximum accepted concentration)</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Testing below A1 possible</td>
<td>⬤</td>
<td>⬤</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Inadequate</th>
<th>Above-average</th>
</tr>
</thead>
</table>

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### 5.4 Manual bump test

The simplest and most cost-effective option for testing the function of a portable gas detector is to perform a manual bump test with test gas. This only requires an appropriate test gas cylinder, a corresponding pressure reducer and a calibration adapter for the specific device. Briefly applying the test gas to the sensors triggers the instrument alarm. Make sure that an adequate test gas concentration is applied! Depending on the type of device, it can be calibrated – in the same arrangement – using the device software or a PC with the Dräger CC-Vision software. This software allows the user to configure and calibrate the devices in line with their individual requirements.

### 5.5 The Dräger Bump Test Station

The Dräger Bump Test Station facilitates the performance of an everyday bump test, as the test is evaluated by the devices themselves and the test gas is automatically applied on insertion. In addition, most devices are able to automatically identify the station and switch to bump test mode without having to perform any manual activities. Dräger devices Dräger Pac family, Dräger X-am 2500, 5000 and 5600 as well as the X-am 7000 are supported. The Dräger Bump Test Station does not require a power supply – the evaluation itself is performed by the gas detector. The documentation also takes place in the gas detector, within the data logger. The device must be configured for the type of bump test and the required test gas concentration.

The sensors’ rapid response time ensures a quick test in under 12 seconds in some cases. The lower gas consumption and time saving reduce the operating costs.
The Dräger X-dock automatic test and calibration station is the modular solution for the daily bump test as well as a workshop and fleet management solution.

The X-dock can be operated independently as an individual station – a PC is not required. This gives you the benefit of a range of options at every location: the X-dock can perform quick or advanced bump tests or even perform calibrations, readout the data logger and check the gas detector’s alarm elements or the sensors’ response times. These individual test steps can be configured – and the three most important objectives are always ensured:

1. **Ease of use:**
   The simplest test: insert and close the lid – the rest takes place automatically.

2. **Short test time:**
   An advanced pneumatics system provides extremely short test times.

3. **Low gas consumption:**
   The short test time as well as the gas flow, which has been reduced to 300ml/min, reduces the gas consumption significantly, which also helps to reduce costs. In addition, the X-dock immediately switches off valves once a test gas is no longer required for a certain test step and the device has completed the test.

This system combines ease of use with low operating costs – but with full documentation. Everything that the X-dock performs is stored in the internal database. If the station is used as an individual station, the results can be exported as a PDF or printed on any conventional postscript-enabled printer.

This means that the system is scalable: whether you use one or ten modules on a master is up to you.

The Dräger X-dock independently detects the test gases that are required. The touchscreen can be used to program the connected gas cylinders – the X-dock station performs everything else automatically. Up to six test gas cylinders can be connected to a master and these test gases can themselves consist of gas mixtures. This covers almost every application.

However, the highlight is a possible expansion: X-dock stations can be connected to a network. The data is synchronised and stored on a server.

The X-dock Manager PC software makes data evaluation as easy as pie:
Which calibrations are coming up or are even overdue? Has a device not been checked? Has an alarm been triggered in operation and when are the X-dock stations engaged? Questions that the X-dock Manager conveniently answers.

If you still need more, the X-dock also provides a range of special functions for your application: for example, the X-dock can be used as a charging station for X-am 125 devices – this function is ideally supplemented by the test planner function, which performs the set test on a pre-determined schedule (e.g. daily).

Take the time to find out what the Dräger X-dock can do for you!

<table>
<thead>
<tr>
<th>Geräte</th>
<th>Dräger Bump Test Station</th>
<th>Dräger X-dock Station</th>
<th>Basic test with gas</th>
<th>Dräger CC-Vision software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger Pac family</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dräger X-am 2500/5000/5600</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dräger X-am 5100</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dräger X-am 7000</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dräger X-am 8000</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.7 Test gases and accessories

Test gases are an essential part of the bump test. Only an **appropriate** test gas can verify a gas detector’s functionality and it is just as important for calibration.

A high standard of quality is required as test gases are a key element of the safety chain. Dräger test gases are produced pursuant to ISO 9001 and guarantee a globally valid quality standard. Single as well as mixed gases are available.

Once the test gas cylinders are completely empty they can be transported to a scrap metal facility and disposed of in an environmentally friendly manner, which means that customers do not have to pay any rental or transport costs.
5.8 Pressure reducer

The history of Dräger started with a patent for a pressure reducer – and every system that needs a test gas cylinder also needs a pressure reducer. The cylinders contain compressed gas. The pressure now needs to be reduced for the application (e.g. the bump test) – this requires a pressure reducer.

Some pressure reducers reduce the pressure to a set level (e.g. 0.5 bar). The flow rate is then determined by the line resistances or any flow control valves.

There are also pressure reducers that regulate a fixed volume flow – e.g. 0.5 l/min. In this case, the pressure is adapted according to the resistance in order to ensure a constant volume flow. The correct pressure reducer for the system needs to be selected. Pressure reducers can naturally also be reused. They have a screw thread and can be used for various test gas cylinders.

APPLICATION

For the quick functional test before devices are used
Manually pressing the trigger briefly applies test gas to the gas detector’s sensors. Raising the trigger fixes the control valve in the open position and provides a continuous gas flow of 0.5 l/min.

For devices without an internal pump
Standard pressure reducer with thumbwheel to manually open and close the gas outlet. Volume flow: 0.5 l/min.

For devices with an internal pump
The pump’s suction automatically opens the valve and can be used with devices with internal pumps. Volume flow: 0.5 l/min.
**APPLICATION**

**Regulator with adjustable volume flow**
Can be set to a number of fixed flow specific settings between 0 - 5 l/min (0 l/min; 0.5 l/min; 0.75 l/min; 1.0 l/min; 1.5 l/min; 2.0 l/min up to 5 l/min).

**Special stainless steel valve for aggressive gases**
This stainless steel valve is ideal for reactive gases, such as chlorine or ammonia. It is recommended to use a regulator for each single gas type. The valve is opened and closed using a thumbwheel.

**Constant pressure control valve for Dräger X-dock**
With a pre-set pressure of 0.5 bar, specifically designed for the use with the Dräger X-dock Station. Available as a nickel-plated version or in stainless steel for reactive gases, such as chlorine or ammonia. It is recommended to use one regulator for each single gas type.

**Constant pressure control valve with flowstop for Dräger X-dock**
With a pre-set pressure of 0.5 bar, specifically designed for the use with the Dräger X-dock Station. The installed flowstop prevents gas from accidentally escaping from the cylinder.
5.9 Pumps

In certain situations confined spaces and areas need to be checked and cleared before they can be accessed. In this case, the ambient air from the room needs to be fed into the measuring device while ensuring that the person using the device does not have to access the space. Pumps equipped with a hose and probe are ideal for performing a measurement from a safe distance.

A pump is also required for leak detection, in order to connect the corresponding probe to the gas detector.

The Dräger X-am 8000 can be equipped with an integrated high-performance pump.

In both cases, a corresponding adapter ensures that the device can be used as either a diffusion unit or a pump unit. You can use the device in diffusion mode (pump-free), even if you decide on an internal pump.

The external Dräger X-am Pump is available for the Dräger X-am 2500/5000 and 5600 product family. When the detector is inserted the pumping function starts automatically. The period of pump operation, flow test and the measurement results are stored in the X-am’s data logger. Like the X-am instrument family, the X-am Pump is approved for Ex Zone 0. The pump can be used with hoses up to 45 m (148 ft.) and is optimized for a hose diameter of 3 mm for short purging times. Via a Micro USB socket the pump’s battery pack can be charged with the charging cable of any mobile phone.

5.10 Probes

Pump-supporting measurements without probes are almost unimaginable as various tasks need to be fulfilled depending on the application.

Is selective suction required or does it need to be within a certain area? Is a rigid connection adequate or does the probe need to have a flexible neck? Is a telescopic probe required? How big is the opening available for the measurement?

We have the right probe in all of these cases.
<table>
<thead>
<tr>
<th>ORDER NUMBER</th>
<th>NAME</th>
<th>LENGTH</th>
<th>MATERIAL</th>
<th>FOR USE WITH GAS DETECTION DEVICES</th>
<th>USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>83 17 188</td>
<td>Bar probe 400</td>
<td>40 cm</td>
<td>Stainless-steel probe with an external diameter of 10 mm (0.4 in.)</td>
<td>X-am 7000</td>
<td>This probe is particularly durable. It is used for applications such as pre entry measurements in gas-filled containers, where it is necessary to obtain air samples through closed seals.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3 ft.</td>
<td></td>
<td>X-am 2500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 5000/5600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 8000*</td>
<td></td>
</tr>
<tr>
<td>64 08 160</td>
<td>GL probe (German Lloyd probe)</td>
<td>50 cm</td>
<td>Stainless-steel probe with an external diameter of 6 mm (0.24 in.)</td>
<td>X-am 7000</td>
<td>Measurements in hatchways on ships.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.6 ft.</td>
<td></td>
<td>X-am 2500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 5000/5600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 8000*</td>
<td></td>
</tr>
<tr>
<td>83 16 531</td>
<td>Leakage probe 70</td>
<td>70 cm</td>
<td>Flexible metal tube with an integrated FKM hose.</td>
<td>X-am 7000</td>
<td>This flexible probe can measure “round corners,” making it especially useful for difficult to reach places where there is a risk of explosion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3 ft.</td>
<td>External diameter of 10 mm (0.4 in.)</td>
<td>X-am 2500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tested for gases of the group IIC in the areas Zone 0 and Zone 1, test report BVS PB 18/13 (DEKRA/Exam).</td>
<td>X-am 5000/5600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 8000*</td>
<td></td>
</tr>
<tr>
<td>83 16 532</td>
<td>Bar probe 90</td>
<td>90 cm</td>
<td>Probe made from carbon-fiber reinforced plastic with an external diameter of 8 mm (0.3 in.)</td>
<td>X-am 7000</td>
<td>With its fixed length, this probe can be used for any applications involving distances of 90 cm (2.9 ft.) such as confined space entry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.0 ft.</td>
<td></td>
<td>X-am 2500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 5000/5600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 8000*</td>
<td></td>
</tr>
<tr>
<td>83 16 530</td>
<td>Telescopic probe 100</td>
<td>1 m</td>
<td>Metal probe with an integrated FKM hose.</td>
<td>X-am 7000</td>
<td>Extendable to lengths of up to 1 m (3.3 ft.). Suitable for areas where there is a risk of explosion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.3 ft.</td>
<td>External diameter of 12 mm (0.47 in.).</td>
<td>X-am 2500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tested for gases of the group IIC in the areas Zone 0 and Zone 1, test report BVS PB 18/13 (DEKRA/Exam).</td>
<td>X-am 5000/5600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X-am 8000*</td>
<td></td>
</tr>
</tbody>
</table>

* Connection with the Luer adapter from the spare set filter X-am 125 pump/X-dock (83 19 364)
<table>
<thead>
<tr>
<th>ORDER NUMBER</th>
<th>NAME</th>
<th>LENGTH</th>
<th>MATERIAL</th>
<th>FOR USE WITH GAS DETECTION DEVICES</th>
<th>USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>83 16 533</td>
<td>Telescopic probe ES 150</td>
<td>1.5 m</td>
<td>Stainless-steel probe with an integrated FKM hose. External diameter of 12 mm (0.5 in.). Tested for gases of the group IIC in the areas Zone 0 and Zone 1, test report BVS PB 18/13 (DEKRA/Exam).</td>
<td>X-am 7000</td>
<td>Extendable to lengths of up to 1.5 m (4.9 ft.). Suitable for areas where there is a risk of explosion; solvent-resistant.</td>
</tr>
<tr>
<td>64 08 239</td>
<td>Measurement probe</td>
<td>1.5 m</td>
<td>Aluminum probe with an integrated PVC hose. External diameter of 10 mm (0.4 in.).</td>
<td>X-am 7000</td>
<td>With its fixed length, this probe can be used for any applications involving distances of 1.5 m (4.9 ft.). The tip of the probe is perforated for the last 15 cm (0.5 ft), enabling sampling in media such as grain sacks and dry bulk solids.</td>
</tr>
<tr>
<td>68 01 954</td>
<td>Plugable telescopic probe</td>
<td>2 m</td>
<td>Plastic probe with an integrated rubber hose. External diameter of 13 mm (0.5 in.).</td>
<td>X-am 7000</td>
<td>A probe 2 m (6.6 ft.) in length whose plug-in system makes it compact and easy to carry. Universal usage.</td>
</tr>
<tr>
<td>83 18 371</td>
<td>Float probe incl. hose</td>
<td>5 m</td>
<td>Probe: Polycarbonate. FKM hose with external diameter of 8 mm (0.3 in.) + water and dust filter.</td>
<td>X-am 7000</td>
<td>For measurements in drainage and sewage systems. Solvent-resistant.</td>
</tr>
<tr>
<td>68 07 097</td>
<td>Float probe incl. hose</td>
<td>10 m</td>
<td>Probe: Polycarbonate. Tube: CR-NR [polychloroprene (CR) with natural rubber (NR)] with an external diameter of 9 mm (0.35 in.).</td>
<td>X-am 7000</td>
<td>Electrically conductive.</td>
</tr>
</tbody>
</table>

* Connection with the Luer adapter from the Spare set filter X-am 125 pump/X-dock (83 19 364)
<table>
<thead>
<tr>
<th>ORDER NUMBER</th>
<th>NAME</th>
<th>LENGTH</th>
<th>MATERIAL</th>
<th>FOR USE WITH GAS DETECTION DEVICES</th>
<th>USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>83 25 831</td>
<td>Float probe EPP incl. hose</td>
<td>3 m</td>
<td>Probe: EPP</td>
<td>X-am 8000</td>
<td>For measurements in drainage and sewage systems. Suitable for areas where there is a risk of explosion; solvent-resistant.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hose: FKM with inner diameter of 3.2 mm and Luer male adapter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83 25 832</td>
<td>Float probe EPP incl. hose</td>
<td>10 m</td>
<td>Probe: EPP</td>
<td>X-am 8000</td>
<td>For measurements in drainage and sewage systems. Suitable for areas where there is a risk of explosion; solvent-resistant.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hose: FKM with inner diameter of 3.2 mm and Luer male adapter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Connection with the Luer adapter from the Spare set filter X-am 125 pump/X-dock (83 19 364)
5.11 Hoses

An extension hose, together with pumps, is always required if the air quality has to be assessed from distant measuring points, such as at the base of a silo, a cargo chamber on a ship, or a sewer. Two points must be considered: the hose length and the hose material. The pumping capacity is critical when determining the length of the hose. The pumping capacity of the Dräger X-am 8000, X-zone 5500 and X-am Pump is designed for 45 m.

The adsorption behaviour of the gases to be measured on the surface of the hose must be considered when selecting the hose material.

Three different hose materials have proven themselves in practice and are suitable for certain gas families. The following table will help you choose the hose that is right for you.
## 5.12 Usage of Hoses

**HOSES WITH 5 MM INNER DIAMETER FOR THE USE WITH INSTRUMENTS:**

Dräger X-am 2500, 5000 and 5600 with the Dräger X-am 1/2/5000 external pump (p/n 83 19 400)

### PROPERTIES

<table>
<thead>
<tr>
<th>Material</th>
<th>Fluororubber 1203150</th>
<th>Tygon 8320766 E-3603</th>
<th>Rubber 1180681</th>
<th>Tygon with internal PTFE coating 4594679</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>FKM</td>
<td>PVC</td>
<td>CR-NR DWN 2715</td>
<td>PVC with PTFE</td>
</tr>
<tr>
<td></td>
<td>Fluorinated rubber</td>
<td>Polyvinyl chloride</td>
<td>Polychloroprene (CR) with natural rubber (NR)</td>
<td>Tygon shell and interior polytetra-fluoroethylene (PTFE) coating</td>
</tr>
<tr>
<td>Inner Ø</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>Outer Ø</td>
<td>8 mm</td>
<td>8 mm</td>
<td>9 mm</td>
<td>8 mm</td>
</tr>
<tr>
<td>Hardness</td>
<td>75 Shore A</td>
<td>56 Shore A</td>
<td>60 Shore A</td>
<td>Transparent</td>
</tr>
<tr>
<td>Colour</td>
<td>Black</td>
<td>Transparent</td>
<td>Black</td>
<td>Transparent</td>
</tr>
<tr>
<td>Benefit</td>
<td>Suitable for vapours</td>
<td>Phthalate-free</td>
<td>Conducts electricity</td>
<td>Specifically for aggressive gases such as chlorine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(plasticizer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>-15 °C to + 200 °C</td>
<td>-46°C to + 74 °C</td>
<td>-30°C to +134°C</td>
<td>-36°C to 74°C</td>
</tr>
<tr>
<td>Antistatic</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Use in explosion-hazard area</td>
<td>Suitable</td>
<td>Suitable</td>
<td>Suitable</td>
<td>Suitable</td>
</tr>
<tr>
<td>Further features</td>
<td>solvent resistant</td>
<td>flexible, no kinking</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## TEST RESULTS AND MEASUREMENT RECOMMENDATIONS

<table>
<thead>
<tr>
<th>GAS</th>
<th>FORMULA</th>
<th>DISPLAY 10 m FKM hose</th>
<th>Gassing / Rinsing time</th>
<th>DISPLAY 10 m Tygon E-3603 hose</th>
<th>Gassing / Rinsing time</th>
<th>DISPLAY Antistatic (rubber) hose</th>
<th>Gassing / Rinsing time</th>
<th>DISPLAY SE 200, PTFE lined Tygon hose 4594679</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>CO</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Oxygen</td>
<td>O₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>NO₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Cl₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>H₂S</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Phosgene</td>
<td>COCl₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Hydrogen cyanide</td>
<td>HCN</td>
<td>☑</td>
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<td>☑</td>
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<tr>
<td>Phosphine</td>
<td>PH₃</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Ammonia</td>
<td>NH₃</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
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<td>☑</td>
</tr>
<tr>
<td>Nitrogen monoxide</td>
<td>NO</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>SO₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
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<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Methane -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexane</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>C₆H₅CH₃</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Octane</td>
<td>C₈H₁₈</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>CH₃COOH</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>C₉H₂₀</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Styrene</td>
<td>C₆H₅CH=CH₂</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

- ☑: Suitable for the specified time limit.
- ☐: Limited suitable, longer rinsing time, tₚ₀ > 5 min.
- ☐: Not suitable.
### HOSES WITH 3 MM INNER DIAMETER FOR THE USE WITH THE INSTRUMENTS:

**Dräger X-am 8000 or**
**Dräger X-am 2500, 5000 and 5600 with Dräger X-am Pump (p/n 8327100)**

**PROPERTIES**

<table>
<thead>
<tr>
<th>Material</th>
<th>Fluorinated rubber 8325837</th>
<th>Tygon E-3603 8325838</th>
<th>Rubber 8325839</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Fluorinated rubber</td>
<td>Polyvinyl chloride</td>
<td>Chloroprene rubber / Natural rubber</td>
</tr>
<tr>
<td>Inner Ø</td>
<td>3.2 mm</td>
<td>3.2 mm</td>
<td>3.2 mm</td>
</tr>
<tr>
<td>Outer Ø</td>
<td>6.4 mm</td>
<td>6.4 mm</td>
<td>6.4 mm</td>
</tr>
<tr>
<td>Hardness</td>
<td>56 Shore A</td>
<td>60 Shore A</td>
<td>Black</td>
</tr>
<tr>
<td>Colour</td>
<td>Black</td>
<td>Transparent</td>
<td>Black</td>
</tr>
<tr>
<td>Benefit</td>
<td>Suitable for vapours</td>
<td>Phthalate-free</td>
<td>Conducts electricity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(plasticizer)</td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>-15 °C to + 200 °C</td>
<td>-55 °C to 74 °C</td>
<td>-30°C to 134°C</td>
</tr>
<tr>
<td>Antistatic</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Use in explosion-hazard area</td>
<td>Suitable</td>
<td>Suitable</td>
<td>Suitable</td>
</tr>
<tr>
<td>Further features</td>
<td>Solvent resistant</td>
<td>Flexible, no kinking</td>
<td></td>
</tr>
</tbody>
</table>
# TEST RESULTS AND MEASUREMENT RECOMMENDATIONS

<table>
<thead>
<tr>
<th>GAS</th>
<th>FORMULA</th>
<th>DISPLAY 10 m FKM hose</th>
<th>DISPLAY 10 m PVC hose</th>
<th>DISPLAY Antistatic rubber hose</th>
</tr>
</thead>
</table>

- **suitable** $t_{90}$ time
- **suitable** limited suitable, longer rinsing time, $t_{90} > 5$ min.
- **not suitable**
5.13 Dräger CC-Vision Basic

CC stands for calibration and configuration. It describes the two main functions of this PC software. This software ensures the professional configuration and calibration of Dräger gas detectors as well as the documentation of the results.

Whether it be alarm thresholds, turn off behaviour, or measured and calibration gas, CC-Vision Basic helps you configure your gas detectors – even if you want to duplicate configurations and transfer these to other devices.

The device functions are clearly displayed on the screen in a tree structure and allow to set the device parameters quickly and individually and to calibrate the sensors.

Anyone who has purchased a Dräger X-dock and the X-dock Manager will naturally want to use them to manage all of their devices. However, the CC-Vision Basic is not a contradiction in terms. The CC-Vision Basic sets the parameters of individual devices, while the X-dock sets the parameters of entire groups of devices based on the specifications provided by the CC-Vision Basic.

The Dräger X-dock and the Dräger CC-Vision Basic work in perfect symbiosis to provide even better support for your processes.

Test it for yourself and download CC-Vision Basic free of charge from: www.draeger.com/software

5.14 Dräger GasVision

The gas detector’s data logger provides a wealth of information – but the trick is to find the relevant information and process the data accordingly.

This is where the Dräger GasVision software provides support. The data logger provides both a graphic AND tabular display to conveniently navigate through the data.

- Zoom into certain areas to look at these in detail
- Display the TWA, average value, MAX and MIN values for marked areas
- Export data to Excel
- Directly display the measured data of a connected device

This visualisation of the data allows hazardous situations to be detected and appropriate measures to be introduced.
Concluding remark
This chapter only covers part of the extensive accessories available. In addition to pump, calibration and communication accessories, a large range of pockets and cases (with or without equipment) and various power packs complement the group of accessories that can be adapted to the relevant application. The services, such as maintenance contracts, full service maintenance contracts and the all-inclusive worry-free package or training, such as service technician training, round out the gas detector technology area. Our branch employees are more than happy to provide advice on these products and services.
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