Dräger

Technical manual
X-am® 2800
MQG 0200
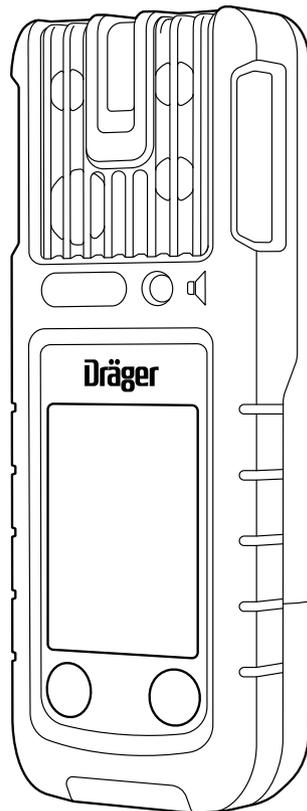
More languages available
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Dräger. Technology for Life®

Contents

1 Safety-related information

1.1 Basic safety information

– Before using this product, carefully read these instructions for use and those of the associated products.

– Strictly follow the instructions for use. The user must fully understand and strictly observe the instructions. Use the product only for the purposes specified in the Intended use section of this document.

– Do not dispose of the instructions for use. Ensure that they are retained and appropriately used by the product user.

– Only trained and competent users are permitted to use this product.

– Comply with all local and national rules and regulations associated with this product (e.g. IEC 60079-14, EN 60079-29-2, EN 45544-2).

– Only specialist, trained personnel are permitted to check, repair and maintain the product as described in these instructions for use and the technical manual. Further maintenance work that is not detailed in these instructions for use or in the technical manual must only be carried out by Dräger or personnel qualified by Dräger. Dräger recommend a Dräger service contract for all maintenance activities.

– Only use genuine Dräger spare parts and accessories when performing maintenance work, or the proper functioning of the product may be impaired.

– Do not use a faulty or incomplete product. Do not modify the product.

– Notify Dräger in the event of any component fault or failure.

– Substitution of components may impair the intrinsic safety of the product.

– Electrical pairing with devices which are not listed in these instructions for use should only be done following consultation with the respective manufacturers or an expert.

1.2 Use in areas subject to explosion hazards

To reduce the risk of ignition of a flammable or explosive atmosphere, strictly observe the following warnings:

Use in areas subject to explosion hazards

Devices or components for use in explosion-hazard areas which have been tested and approved according to national, European or international explosion protection regulations may only be used under the conditions specified in the approval and with consideration of the relevant legal regulations. The devices or components may not be modified in any manner. The use of faulty or incomplete parts is forbidden. The appropriate regulations must be observed at all times when carrying out repairs on these devices or components.

Oxygen enriched atmospheres

Explosion protection is not ensured in oxygen enriched atmospheres (>21 Vol% O_2).

► Remove the device from the explosion-hazard area.

Oxygen-deficient atmospheres

The CatEx sensor may display false readings and incorrect measured values when used for performing measurements in an oxygen-deficient atmosphere (<12 Vol% O_2). In this case the CatEx sensor cannot provide a reliable measurement.

► The CatEx sensor is intended to measure flammable gases and vapours mixed with air (i.e. O_2 content ≈ 21 Vol%). If the O_2 content falls below 12 Vol% and an operational O_2 sensor is available in the gas detector, a channel error is triggered on the CatEx channel due to oxygen deficiency.

► A CatEx sensor should preferably be operated with an active XXS O_2 sensor so that oxygen deficiency can be evaluated by the gas detector.

► Remove the gas detector from the area or discontinue measurement.

NOTICE
Damage to the CatEx sensor!
Fractions of catalytic poisons in the measuring gas (e.g. volatile silicon, sulphur, heavy metal compounds or halogenated hydrocarbon) can damage the Cat Ex sensor.

► If the CatEx sensor can no longer be calibrated to the target concentration, replace the sensor.

⚠ **WARNING**
Risk of explosion!
If the CatEx sensor is exposed to hydrogen and low temperatures (< -10 °C) for a long time (> 1 h), measured values that are too low may be displayed. This also applies if hydrogen is being measured but the measured gas set is not hydrogen.

► The CatEx sensor should be set to the measured gas "hydrogen"for regular and planned measurements of hydrogen. Measuring tasks which last less than 30 min. are not affected by this.

2 Conventions in this document

2.1 Meaning of the warning notes

The following warning notes are used in this document to notify users of possible dangers. The meanings of the warning notes are defined as follows:

Alert icon	Signal word	Consequences in case of nonob-servance
⚠	WARNING	Indicates a potentially hazardous situation. If not avoided, it could result in death or serious injury.
⚠	CAUTION	Indicates a potentially hazardous situation. If not avoided, it could result in physical injury. It may also be used to alert against unsafe practices.
	NOTICE	Indicates a potentially hazardous situation. If not avoided, it could result in damage to the product or environment.

2.2 Trade marks

Brand	Brand owner
X-am®	Dräger
Bluetooth®	Bluetooth SIG, Inc.

The brands listed are only registered in certain countries and not necessarily in the country in which this material is sold.

2.3 Glossary

Term	Description
Operation signal	A periodic optical (green LED) and/or acoustic signal.
Monitoring	Monitoring without pump (diffusion)
Capture range	The capture range refers to a measured value range within which minor variations in measured values (such as signal noise, variations in concentration) do not cause variations in the display. Measured values outside the capture range will be displayed with the actual measured value.
Peak	Peak value
Quick bump test	Test for alarm triggering
Extended bump test	Test for accuracy
Special state	If a special state is signalled, the user is not warned of gas concentrations which may be dangerous. The following device features are special states: Initial set-up/configuration with the PC, switch-on sequence, menu, bump test and calibration, warm-up 1 of the sensors, device error, measuring channel error.
D-Light	The D-Light feature allows the user to check and indicate compliance with certain settings.
Physical sensors	The CatEx, IR, and PID sensor types are designated as physical sensors. There are also the electrochemical sensors.

2.4 Abbreviations

Abbreviation	Explanation
A1	Pre-alarm
A2	Main alarm
STEL	Short time exposure limit, threshold of an exposition over a short period of time (generally 15 minutes).
TWA	Time weighted average, average shift values are generally limited to eight hours exposure per day per workplace for 5 days a week during a work lifetime. Observe the national definition of the occupational exposure limit.

3 Description

3.1 Product overview
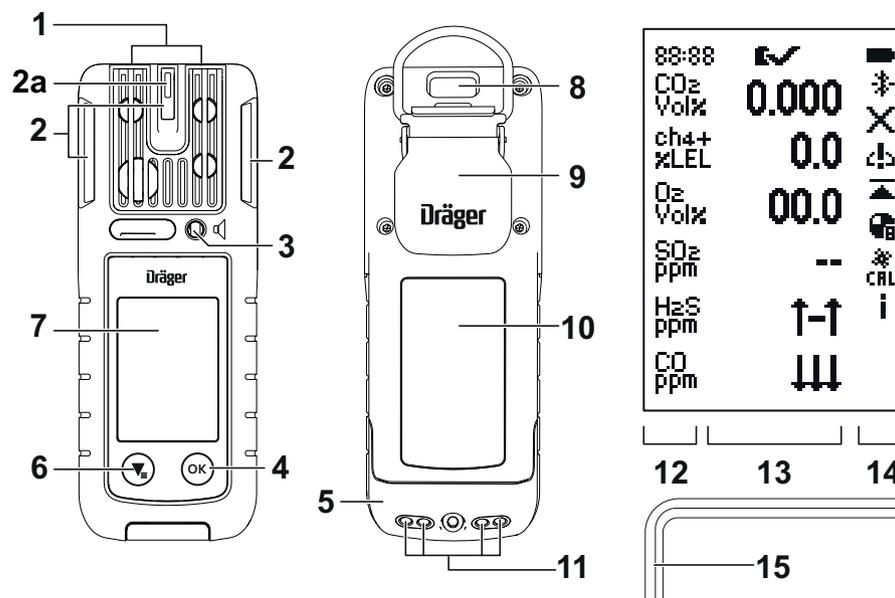
Graphic A			
1	Gas inlet	8	IR interface
2	Alarm LED	9	Fastening clip
2a	D-Light	10	Name plate
3	Horn	11	Charging contacts
4	(ok) key	12	Measured gas display
5	Power pack	13	Measuring value display
6	(▼) key	14	Special symbols
7	Display	15	Allen key (2 mm; alternative: Torx T8)

3.2 Intended use

Dräger X-am 2800 is a portable gas detector for continuous monitoring of the concentration of several gases in the ambient air within the working area and in explosion-hazard areas.

3.3 Approvals

A copy of the name plate, the declaration of conformity, and the sensor data relevant for measurement purposes are provided in the enclosed supplementary documentation (part no. 9300308) or at www.draeger.com/ifu.

ℹ The name plate on the gas detector must not be concealed.

FCC:

The radio license information can be found in the information on the device. For further information see: "Opening device information", page 15.

3.4 GPL (General Public License)

Depending on their configuration, Dräger products which use software use Open Source software. This is regularly subject to special licensing conditions which take precedence in their scope. Several Open Source software licensing conditions may apply in a single Dräger product, which then apply respectively to the associated software components. Further information on the Open Source software used in this products is available on the following Internet page: www. draeger.com/opensource.

4 Operation

4.1 Symbol explanations

Symbol	Explanation
	Bump test
	Fresh air calibration
	Single-gas calibration
	Mixed gas calibration
	Measurement range exceeded
	Readings below the measurement range
	Peak value
	Blocking alarm (only CatEx sensor)
	Channel error
	Overview of the bump test intervals activated (additional information for the D-Light feature). There are no gas alarms or errors.
	Warning message The gas detector can be operated normally. If the warning message is still displayed after operation, the gas detector requires maintenance.
	Fault message The gas detector or measuring channel is not ready to measure and requires maintenance.
	Information message
	STEL alarm message
	TWA alarm message
	Bluetooth® activated

Symbol	Explanation
	(flashing) Bluetooth® connection lost
	Bluetooth® connection established
	(dashes flashing) Gas detector ready for coupling
	Battery state of charge

4.2 Signalling concept

4.2.1 Acoustic operation signal

A periodic acoustic signal indicates that the device is functional. The acoustic operation signal can be deactivated using the Dräger CC-Vision PC software.

4.2.2 Visual operation signal and D-Light

The visual operation signal can be extended by the D-Light feature with activated interval check. An activated D-Light feature allows the user to also check and indicate compliance with certain settings.

The D-Light feature can be activated using the Dräger CC-Vision PC software.

Visual operation signal with deactivated D-Light:

The green LED flashing periodically (every 5 s) indicates:
– Measurement is active
– There is no device or channel error, no gas alarm and no special state

If one of the above conditions is not met, the LED will flash according to the alarm settings.

Visual operation signal with activated D-Light:

All the visual operation signal conditions apply. In addition, the following settings are checked:
– Evaluation of bump test intervals activated and complied with (factory setting) or evaluation of the calibration intervals active and complied with
– Usage interval complied with

If one of these two conditions is not met, the green LED will flash approx. every 60 s instead of every 5 s.

4.3 Switch the gas detector on or off

4.3.1 Switching on the gas detector

> ⚠ **WARNING**
> **Incorrect device feature/settings!**
> Incorrect device features/settings may mean that alarms and dangers are not detected.
> ► Before every use, check whether the display elements, the alarm features and information are displayed correctly. If one of the items listed above does not function correctly or is incorrect, do not use the gas detector and have it inspected.

> ℹ No alarms are issued during the warm-up phase!

1. Hold down the ⓞⓚ button for approx. 3 s. The display shows the following screens one after the other.
   - ⇒ Countdown
   - ⇒ The switch-on sequence and the warm-up phase of the sensors start.
   - ⇒ Display test
   - ⇒ Start screen
   - ⇒ Firmware version
   - ⇒ Alarm element test (LEDs, alarm signal and vibration alarm)
   - ⇒ Customer-specific information screen (optional and can be configured with the Dräger CC Vision PC software)
   - ⇒ Alarm thresholds, STEL, TWA (if configured) and LEL factor (if available)
   - ⇒ Any expired bump test or calibration interval as well as early warnings (if configured)
   - ⇒ Measured value display

4.3.2 Switching off the gas detector

> ℹ When the gas detector is placed in the charging cradle, it switches off automatically.

1. Hold down ⓥ and ⓞⓚ simultaneously until the displayed countdown has finished.
   - ⇒ The visual, acoustic and vibration alarms activate briefly.
   - ⇒ The gas detector is switched off.

4.4 Preparations for operation

> **⚠ WARNING**
> **Serious damage to health**
> An incorrect calibration can lead to incorrect measured values, which may result in serious damage to health.
> ► Before performing safety-relevant measurements, check the calibration by means of a bump test, adjust as necessary, and check all alarm elements. If national regulations exist, the bump test must be performed in accordance with these regulations.

ℹ The gas detector should be worn for personal monitoring in the proximity of the breathing zone.
Dräger recommend using the clip to attach the gas detector to clothing either on your collar or breast pocket. If gases are expected in a closed space that are (much) heavier than air (e.g. CO_2), then the gas detector can be worn in a lower position, e.g. on your belt or at your hip.

ℹ The gas detector has magnetic switches. Do not put any magnets in the immediate proximity of the gas detector (e.g. name badges with magnetic holders). This could trigger features (e.g. bump test) on the gas detector.

1. Switch on the gas detector. The current measured values are shown in the display.
2. Observe warnings, error messages and special states.
3. Verify that the gas inlet openings and membranes are clean, freely accessible, dry and undamaged.
4. Check that the date and time are set correctly.

4.5 Connecting a gas detector to a smartphone

The gas detector can be connected to a suitable smartphone via Bluetooth®. The Bluetooth® feature and the GATT (Generic Attribute Profile) interface (subject to licensing) can be activated via the CC-Vision PC software.

Data transmitted via Bluetooth® can be used for additional safety measures. However, the data does not replace primary on-site measures by the gas detector. The alarm on the gas detector is decisive. An important consideration is that a mobile network and WLAN reception are not always available or can be interrupted.

For specific features, Dräger offers apps that can be installed on a suitable smartphone or tablet. A license may be required under certain circumstances. For detailed information on connecting via Bluetooth® also refer to the instructions for use of the smartphone used.

Prerequisites

– Bluetooth® is activated on the gas detector and the smartphone.

⚠ **WARNING**
Risk of explosion
The use of an unsuitable smartphone in an explosion-hazard area may lead to the ignition of flammable or explosive atmospheres.

► The smartphone must be suitable and approved for use in explosion-hazard areas.

ℹ The Bluetooth® feature is not part of the technical suitability test and may only be used in countries for which approval is available. Contact Dräger if you have any questions about availability.

ℹ Contamination of the gas detector or shielding elements (e.g. case) can reduce the Bluetooth® range.

ℹ Failure of the Bluetooth® communication of the gas detector is to be expected in the vicinity of strong transmitters in the range of the 2.4 GHz band.

ℹ When connecting a new smartphone, the connection that is currently stored is deleted during this process.

1. Switch on the gas detector.
2. Call up the Quick menu: Press ⊙ 3x in measuring mode.
3. Select and confirm the Bluetooth® connection.
4. Select the gas detector on the smartphone:
   a. Short name of the gas detector in the Android/iOS Bluetooth® menu.
   b. Part number and serial number in optional Dräger app.
      A 6-digit number is displayed on the smartphone and on the gas detector.
5. Check that the numeric code on both devices match and, if it matches, confirm it on both devices. The devices must be coupled within 20 s otherwise the numeric code will become invalid.
✓ Coupling of the devices is complete.
   Once a connection has been successfully established, it is saved and the two devices are automatically connected in the future (adjustable via the CC-Vision PC software).
   If the connection is lost, the gas detector automatically tries to establish a new connection.

4.6 During operation

⚠ **WARNING**
Danger to life and/or risk of explosion!
The following alarms indicate a danger to life and/or risk of explosion:
– A2 alarm
– STEL or TWA alarm
– Device/channel error
► Immediately leave the hazard area.

⚠ **WARNING**

Incorrect measured values!

Only for diffusion mode: If water seals the gas inlets on the gas detector (e.g. in heavy rain or if the gas detector is submerged in water), incorrect measured values may be returned.

► With the display facing downward, shake the gas detector to remove the water.

⚠ **WARNING**

Incorrect measured values!

A different reading may be shown if the gas detector experiences a considerable impact or a significant vibration.

► When using a CatEx or IR sensor (depending on the gas detector type), a calibration of zero-point and sensitivity must be carried out after an impact load that results in a fresh air display not equal to zero.

⚠ **CAUTION**

The volume of the horn is reduced!

If water gets into the opening on the horn (e.g. by immersing the gas detector in water or due to heavy rain), the volume of the horn can be significantly reduced.

► With the display facing downward, shake the gas detector to remove the water.

ℹ Only using Bluetooth® or API applications is insufficient for raising the alarm in safety-critical applications. Raising the alarm on the gas detector is decisive. Contact Dräger for a description of the API interface.

ℹ Dräger recommends limiting the usage time at temperatures below -20 °C, as the rechargeable battery life and the display may be restricted.

ℹ At temperatures below -25 °C, there may be limitations to what is shown on the display. Dräger then recommends only using the alarm elements as a display.

⚠ **WARNING**

High readings outside of the LEL display range or a blocking alarm may indicate an explosive concentration.

If the concentrations of combustible gases are too high, this may be the result of a lack of O_2.

The IP degrees of protection do not extend to instances in which the equipment detects a gas during or after its exposure to these conditions. In the case of dust deposits and contact with water by immersion or a jet of water, check the calibration and functional integrity of the device.

The PEAK, STEL and TWA evaluations are interrupted if a menu is selected.

The STEL values are reset when a bump test is started, irrespective of whether the bump test is successful or is cancelled.

If the gas detector is used for offshore applications, it must be kept at least 5 m away from compasses.

4.6.1 Monitoring measuring mode

In normal measuring mode, the measured values are displayed for each measured gas. The operating signal sounds at regular intervals (configurable), and the green LED flashes (e.g. visual operating signal or D-light feature).

If a measuring range is exceeded or not reached, the respective symbol is displayed instead of the measured value.

If, in measuring mode, an event (e.g. an alarm) occurs, the respective symbol is displayed in the status bar (after the event is acknowledged, if necessary) alternating with the measured values.

4.6.2 Alarms

In the event of an alarm, corresponding displays, the visual alarm, vibration alarm as well as the audible alarm are activated. For further information, see the following chapter: "Alarm settings (factory setting)", page 37

To acknowledge an alarm:

1. Select (OK).

4.6.3 Special state

The operation signal is deactivated during a special state. Special states are displayed by the following visual signals:
- Yellow LED flashing – 'warm-up 1' special state
- Yellow LED continuously illuminated – general special state

No alarms are issued during a special state.

The special state is exited by resolving the potential error, in the event of an intact gas detector, by switching to normal measuring mode, or automatically after approx. 1 minute.

4.6.4 Blocking alarm

The blocking alarm protects the CatEx sensor.

If the measuring range is exceeded significantly at the CatEx channel (very high concentration of flammable substances), a blocking alarm is triggered. This CatEx blocking alarm can be acknowledged by switching the gas detector off and then on again in fresh air.

If the gas detector cannot be switched off because the A2 alarm is active and the switch-off mode in the CC-Vision is set to "Switching off not allowed during A2", remove the power pack or place the gas detector in the charging cradle and allow it to switch off automatically.

4.7 Calling the Quick menu

The Dräger CC-Vision software can be used to save preferred features in the Quick menu.

Possible features:

– ✳ Fresh air calibration
– ✓◌ Bump test
– ▲ Delete peak values
– ⁑ Bluetooth® connection

To open the Quick menu:

1. Press (▼) 3x in measuring mode.
2. Press (▼) to scroll through the available features.
3. Press (ok) to call the selected feature.

4.8 Activating silent mode

Silent mode for the gas detector can be permanently activated using the Dräger CC-Vision PC software. When silent mode is active, vibration and the horn are deactivated.

4.9 Opening information

4.9.1 Opening device information

This feature can be used to call up device, channel, firmware and Bluetooth® (e-Label) information and peak evaluations.

If any warning or fault messages exist, the corresponding note and fault codes are displayed. Further information on the individual fault codes for service and maintenance is provided in the technical manual.

ℹ️ If no key is pressed for 10 s, the gas detector automatically returns to measuring mode.

1. Press (ok) 3x in measuring mode.
   ⇒ Device information is displayed.
2. Press (ok) to scroll through the available device information.

4.9.2 Opening channel information when the device is switched off

1. Press (▼) for at least 1 s when the device is switched off.
   ⇒ Channel information is displayed.
2. Press (▼) to end the display (after 3 s the display is automatically ended).

5 Troubleshooting

If the following remedial measures are unsuccessful, contact DrägerService.

If an error code is shown when an error occurs, report this to DrägerService. Most codes are accompanied by an instruction symbol which briefly explains the warning or error without using text.

5.1 Error

The sensor technology that can be used depends on the device type.

The first digit of the code represents the sensor channel:

Code	Sensor channel	Code	Sensor channel
2xx	DrägerSensor CatEx SR	5xx	EC3
3xx	EC1	6xx	EC4
4xx	EC2		

Code		Cause	Remedy
102		Customer's life time counter has expired.	Reset life time counter with Dräger CC-Vision.
103		Gas detector defective.	Contact DrägerService.
104		Program code checksum error	Contact DrägerService.
105		Bump test interval expired	Carry out bump test.
108		Gas detector defective.	Contact DrägerService.
109		Menu function cannot be performed as an error has occurred.	Determine fault code using the Info menu and disable if necessary.
110		Alarm element test faulty.	Repeat the alarm element test with X-dock.
111		Faulty alarm element test: Alarm LED	Repeat the alarm element test with X-dock.
112		Faulty alarm element test: Horn	Repeat the alarm element test with X-dock.
113		Faulty alarm element test: Vibration motor	Repeat the alarm element test with X-dock.
115		Gas detector disabled by X-dock.	Activate device with X-dock.
122		Internal device error	Switch the gas detector off and on again.
			Contact DrägerService.
123		Hardware error (reference voltage source)	Contact DrägerService.
124		Device temperature too high.	Operate gas detector within permitted temperature range.
125		Device temperature too low.	Operate gas detector within permitted temperature range.
132		Self-test failed	Contact DrägerService.
141		Vibration motor defective.	Contact DrägerService.
148		Ambient pressure too low.	Operate gas detector within permitted ambient pressure range.
149		DB version invalid for this firmware.	Repeat the software update or contact DrägerService.

Code		Cause	Remedy
x01	CAL	No valid zero-point calibration.	Carry out a fresh air calibration / zero-point calibration.
x02	CAL	No valid span calibration.	Carry out the span calibration.
x03		Measured value of sensor in negative range.	Carry out a fresh air calibration / zero-point calibration.
x04		Sensor not connected or faulty.	Connect sensor or check contacts.
x05		Error during bump test.	Repeat the bump test.
x07	t50 t90	Faulty rise time test.	Repeat the rise time test with X-dock.
x08		Invalid value	
x09		Channel error	Contact DrägerService.
x12	CAL	Calibration interval has expired.	Carry out the span calibration.
x13		Measurement invalid.	Reinaugurate sensor.
x14		Sensor hardware error	Replace the sensor.
x19		If a channel error occurs on the CO-channel when activating ToxicTwins, this error will be set on the HCN channel.	Recalibrate the CO-channel or replace the sensor.
x21		Insufficient oxygen for the correct functionality of the CatEx sensor.	Operate the gas detector in atmospheric conditions.
x22	CAL	Zero calibration failed (CatEx thermal conduction range).	Carry out a fresh air calibration / zero-point calibration.
x23	CAL	Span calibration failed (CatEx thermal conduction range).	Carry out the span calibration.
x24		Gas detector incorrectly configured by Dräger CC-Vision.	Replace sensor for affected channel with Dräger CC-Vision.
x36		Device temperature too high.	Operate gas detector within permitted temperature range.
x37		Device temperature too low.	Operate gas detector within permitted temperature range.
216	CAL	Thermal conduction calibration interval for DrägerSensor CatEx SR has expired.	Perform span calibration for DrägerSensor CatEx SR.
218		Blocking alarm not plausible.	Calibrate sensor.
242		Sensor current for DrägerSensor CatEx SR too low.	Contact DrägerService.

5.2 Warnings

The sensor technology that can be used depends on the device type.

The first digit of the code represents the sensor channel:

Code	Sensor channel	Code	Sensor channel
2xx	DrägerSensor CatEx SR	5xx	EC3

Code	Sensor channel	Code	Sensor channel
3xx	EC1	6xx	EC4
4xx	EC2		

Code		Cause	Remedy
150		Ambient pressure too high.	Operate gas detector within permitted ambient pressure range.
152		Customer's life time counter will expire soon.	Reset life time counter with Dräger CC-Vision.
156		Ambient pressure too low.	Operate gas detector within permitted ambient pressure range.
159	CAL	Calibration not possible. Menu function cannot be performed as a notice exists that prevents the function (e.g. sensors warming up).	Determine notice code using the Info menu and disable if necessary.
163		Life time expired.	Reset life time counter with Dräger CC-Vision.
165		Error sent from Bluetooth control.	Switch the gas detector off and then on again / Contact DrägeService.
175		Bluetooth connection interrupted.	Reconnect the device.
182		Device temperature too high.	Operate gas detector within permitted temperature range.
183		Device temperature too low.	Operate gas detector within permitted temperature range.
185		Battery pre-alarm	Charge or replace battery.
x51		Sensor warming up (warm-up 1). Followed by measurement standby, bump test standby	Wait until warm-up time is complete.
x52		Sensor warming up (warm-up 2). Followed by calibration standby	Wait until warm-up time is complete.
x53		Value negative.	Perform a fresh air calibration.
x54		Temperature too high.	Operate gas detector within permitted temperature range.
x56	CAL	Calibration interval has expired.	Carry out the span calibration.
x69	BT	Bump test expired.	Carry out bump test.
x70	BT	Bump test interval expires soon.	Carry out bump test.
x71	CAL	Calibration expires soon (CatEx thermal conduction range).	Carry out the span calibration.
x73	CAL	Calibration expired (CatEx thermal conduction range).	Carry out the span calibration.
x77		Temperature too low.	Operate gas detector within permitted temperature range.

Code		Cause	Remedy
x97		Value negative.	Perform a fresh air calibration.

Code		Cause	Remedy
271		Thermal conduction calibration interval for DrägerSensor CatEx SR has expired.	Perform span calibration for DrägerSensor CatEx SR.
272		Sensor switched off due to over-gassing.	Restart the gas detector.

5.3 Instructions

Code		Cause
30		Wait for fresh air.
90		No sensor selected for this feature.

6 Maintenance

⚠ WARNING
Risk of explosion!
To reduce the risk of ignition of a flammable or explosive atmosphere, observe the following:

► Do not open the gas detector in explosion-hazard areas.

⚠ WARNING
Danger to health!
Test gas may damage health if inhaled.

► Do not inhale the test gas. Observe the hazard warnings of the relevant Safety Data Sheets and the instructions for use of the gas detector! Observe the national regulations when defining calibration intervals.

ℹ Contact DrägerService to replace the display and printed circuit board.

6.1 Maintenance intervals

Check	Interval
Inspections and maintenance by experts.	Every 12 months
Check signalling elements with the signal test	Automatically whenever the device is started

For inspection and maintenance, see e.g.:

– EN/IEC 60079-29-2 – Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen
– EN 45544-4 – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours - Part 4: Guide for selection, installation, use and maintenance
– National regulations

6.2 Calibration intervals

Observe the relevant specifications in the DrägerSensor® & Gas Detectors Manual and in the instructions for use/data sheets of the Dräger sensors installed.

Recommended calibration intervals for DrägerSensors:

DrägerSensor®	Calibration interval
CatEx SR, XXS O_2, XXS H_2S LC, XXS CO LC, XXS SO_2, XXS NO_2	Every 6 months[1]
CatEx SR, measured gas: H_2	Every 4 months[1]
Other DrägerSensors	See the special data sheets for the respective sensors.

1) The recommended calibration interval can be extended to 12 months if it is ensured that an advanced bump test (tolerance: max. ±20 %) is carried out and passed before use in safety-relevant measurements. The advanced bump test checks the existing sensitivity.

ℹ️ National regulations may stipulate shorter intervals and must be applied.

6.3 Test gases

Test gas properties (e.g. relative humidity, concentration) can be found in the relevant sensor data sheet.

The relative humidity of the test gas is not relevant for O_2 sensors.

Different test gases are used depending on the type of calibration.

6.4 Performing the bump test

The bump test can be performed as follows:

– Manual bump test
– Bump test with the bump test station
– Bump test with X-dock

ℹ️ The Dräger CC-Vision PC software can be used to configure whether a quick or advanced bump test should be performed with the menu or in the bump test station. Dräger recommends using the extended bump test for cross calibrations (see the Dräger X-dock instructions for use).
For the CatEx sensor, we recommend methane as the test gas, including for cross calibration, if methane is expected in the target application.

Prerequisites

– A bump test can only be carried out if at least one sensor has been configured for the bump test with the Dräger CC-Vision PC software (does not apply to bump test with X-dock).

– The gas detector is switched on and warm-up phase 1 is complete.

– A suitable test gas cylinder is available, e.g. test gas cylinder (order number 68 11 130) with the following mixed gas ratios: 50 ppm CO, 15 ppm H_2S, 2.5 Vol% % CH_4, 18 Vol% O_2 (other test gas cylinders can be added on request)

⚠ **WARNING**
Health hazard from test gas
Breathing in of test gas can be harmful to health or lead to death.
► Do not inhale the test gas.
► Observe risks connected with the test gas, hazards notes and safety advice (see for example safety data sheets, instructions on the testing media).

ℹ Dräger recommends a test gas concentration of <60 %LEL for CatEx sensors and a measuring range of 0 % to 100 %LEL.

1. Connect the test gas cylinder to the calibration adapter (order no. 8318752).

2. Insert the switched-on gas detector into the calibration adapter and press it down until it locks into place.

3. Call the bump test via the Quick menu. Failure to do so means that the bump test is performed without documentation.

4. Open the test gas cylinder valve, the volume flow must be 0.5 L/min and the gas concentration must be higher (lower with O_2) than the alarm threshold concentration that is to be tested.

5. Wait until the detector displays the test gas concentration with sufficient tolerance.
   ⇒ Ex: ±20 % of the test gas concentration
   ⇒ O_2: ±0.6 Vol%
   ⇒ TOX: ±20 % of the test gas concentration

6. Close the test gas cylinder valve and remove the gas detector from the calibration adapter.

7. If the concentrations have fallen below the A1 alarm thresholds, the gas detector automatically switches back to measuring mode after 10 s.

Further steps

If the displays are outside of the above-mentioned ranges, have the gas detector calibrated by service personnel.

6.5 Perform a bump test with the Bump Test Station

ℹ The Dräger CC-Vision PC software can be used to configure whether a quick or advanced bump test should be performed.
Dräger recommends using the extended bump test for cross calibrations (see the Dräger X-dock instructions for use).

ℹ X-am 2800 bump test with CC-Vision and Bump Test Station: Alarm triggered **approx. 3 s** after A1 threshold exceeded, if error already present.

ℹ The bump test only starts from measuring mode. Not from a menu or similar.

Prerequisites

– The gas detector is activated for the automatic bump test with the Dräger CC-Vision PC software.

– Measuring channels that are to be used for the automatic bump test have been configured. All measuring channels are used here as standard.

– A suitable test gas cylinder is available, e.g. test gas cylinder (order number 68 11 130) with the following mixed gas ratios: 50 ppm CO, 15 ppm H_2S, 2.5 Vol% CH_4, 18 Vol% O_2 (other test gas cylinders can be added on request)

⚠ **WARNING**
Health hazard from test gas
Breathing in of test gas can be harmful to health or lead to death.
► Do not inhale the test gas.
► Observe risks connected with the test gas, hazards notes and safety advice (see for example safety data sheets, instructions on the testing media).

ℹ Dräger recommends a test gas concentration of <60 %LEL for CatEx sensors and a measuring range of 0 % to 100 %LEL.

1. Prepare the Bump Test Station in accordance with the instructions provided in the quick reference guide on the Bump Test Station.
2. Insert the switched-on gas detector into the Bump Test Station and press it down until it locks into place.
3. The bump test starts automatically. ⟳ appears.
4. If a gas alarm (quick bump test) is triggered or the bump test concentration entered (advanced bump test) is reached within the given time, **OK** is shown for the corresponding gas channel.
5. Remove the gas detector from the Bump Test Station.
6. If the concentrations have fallen below the A1 alarm thresholds, the gas detector automatically switches back to measuring mode after 10 s.

Further steps

If the current measured values do not reach the target concentration ("Advanced bump test" only) set during the bump test, an error is triggered.

In this case, repeat the bump test or calibrate the gas detector.

6.6   Check response time (t90)

ℹ The test can also take place in calibration mode in which case the values are not displaced by alarms. If necessary, the values can subsequently be discarded, if the gas detector already has a valid calibration.

1. Carry out a bump test and conduct a simplified check of the response time.

    a. Connect the test gas cylinder to the calibration adapter and open the valve on the test gas cylinder so that the calibration adapter is purged with test gas.

    b. Insert the switched-on gas detector into the calibration adapter and press it down until it locks into place. Record the starting time.

    c. Determine the time until 90 % of the test gas concentration is reached.

2. Compare the measured response time with the previous bump tests and with the t90 values indicated in the supplementary documentation (part number 9033890) provided.

> ℹ The determined t90 setting time may differ from the certified setting time, as this simplified procedure does not conform to the standard.
> The X-dock maintenance station provides the option of automatically checking the response time.

6.7 Calibrate the gas detector

6.7.1 Notes on calibration

> ⚠ **WARNING**
> **Incorrect measured values**
> Incorrect calibration means that alarms may not be triggered or only with a delay.
> ► Always carry out the clean air/zero calibration prior to the span calibration.

> ℹ If the measured or calibration gas is changed, the affected channel must be calibrated.

6.7.2 Performing a fresh air calibration

Observe the following instructions for fresh air calibration:

● To improve accuracy, a fresh air calibration must be carried out if a zero deviation exists.

● For the fresh air calibration, the display on the DrägerSensor XXS O_2 and XXS O_2 PR is set to 20.9 Vol%.

Prerequisites

– The fresh air calibration can only be carried out if at least one sensor supports fresh air calibration.

– The fresh air must be free of measured or interfering gases.

– The gas detector is switched on and warm-up phases 1 and 2 are complete.

To carry out a fresh air calibration:

1. Switch on the gas detector.

2. Call up fresh air calibration (depending on configuration):

Via the Quick menu:

● Press ⓥ 3x in measuring mode.

● Select and confirm fresh air calibration ☀.

Via the menu:

    a. Press ⓥ for approx. 4 s in measuring mode.

    b. Enter and confirm the password.

    c. Select and confirm fresh air calibration ✳.

    ⇒ All measurement channels involved in the fresh air calibration flash.

3. Press (ok) to start fresh air calibration manually.

    ⇒ All measurement channels involved in the fresh air calibration flash.

4. If necessary, press (ok) to override the stability check. In this case, a calibration takes place immediately.

    ℹ Dräger recommends using the automatic stability control (wait until the gas detector has independently carried out the calibration).

    ⇒ The new measured value is displayed for control purposes.
      The result is displayed as follows:
      OK fresh air calibration successful.
      ✗ fresh air calibration failed.

5. The fresh air calibration is complete when all participating measurement channels have passed or failed the fresh air calibration.

- Select ✓ to confirm the result.
- Select ✗ and then confirm the dialogue to discard the result.
- Select ❮ to return to the results.

6.7.3   Carrying out a single-gas calibration

Observe the following instructions for single-gas calibration:

- With a zero-point calibration, the zero-point of the selected sensor is set to zero.
- In the case of the span calibration, the sensitivity of the selected sensor is set to the concentration value of the test gas used.
- Use a standard test gas.

Permitted test gas concentration:

CatEx O_2	The permitted test gas concentration is displayed by the gas detector during single-gas calibration of the sensitivity.

The permitted test gas concentration of other gases can be read out of the gas detector by the Dräger CC Vision PC software. The permitted concentrations depend on the set parameters (e.g. alarm thresholds).

ℹ Dräger recommends selecting a test concentration in the middle of the respective measuring range or close to the expected measured value.

⚠ **WARNING**
Health hazard from test gas
Breathing in of test gas can be harmful to health or lead to death.
► Do not inhale the test gas.
► Observe risks connected with the test gas, hazards notes and safety advice (see for example safety data sheets, instructions on the testing media).

1. Connect the test gas cylinder to the calibration adapter (order no. 8318752).

2. Connect the hose to the second connector on the calibration adapter to direct the test gas to an exhaust or outside.

3. Insert the switched-on gas detector into the calibration adapter and press it down until it locks into place.

4. Press ⓥ for approx. 4 s in measuring mode.

5. Enter and confirm the password.

6. Select and confirm single-gas calibration ⑃.
The first measuring channel is displayed and the measured gas flashes.

7. Use ⓥ to select the desired measuring channel.

8. Press ⓞⓚ to start the single-gas calibration for the selected measuring channel.

   ⇒ The test gas concentration is displayed and flashes.

9. Press ⓞⓚ to confirm the test gas concentration, or use ⓥ to change the test gas concentration and confirm with ⓞⓚ. The measured value flashes.

10. Open the test gas cylinder valve, the volume flow must be 0.5 L/min.

11. Wait until the displayed measured value is stable then confirm with ⓞⓚ.

   ⇒ The display containing the current gas concentration changes with the display **OK**.

12. Press ⓞⓚ.

   • Select ✓ to confirm the measured value. The next measuring channel is displayed for calibration, if necessary. After the last measuring channel has been calibrated, the gas detector changes to measuring mode.

   • Select ✖ to discard the measured value and to return to the measuring channel selection.

   • Select ❮ to return to the measured value.

13. After successful single-gas calibration, close the test gas cylinder valve and remove the gas detector from the calibration adapter.

Further steps

If an error occurred during single-gas calibration, the fault message **X** is displayed and **--** is displayed for the affected measuring channel instead of the measured value. In this case, repeat the single-gas calibration or replace the sensor, if necessary.

6.7.4   Carrying out a mixed gas calibration

Observe the following instructions for mixed gas calibration:

• All sensors which can be calibrated and are released by the Dräger CC-Vision PC software are included in the multi-gas calibration.

• In the case of the span calibration, the sensitivity of the selected sensor is set to the concentration value of the test gas used.

Permitted test gas concentration:

CatEx O_2	The permitted test gas concentration is displayed by the gas detector during single-gas calibration of the sensitivity.
Test gas concentration of other gasses: Refer to the Dräger CC-Vision PC software	

ℹ️ Dräger recommends selecting a test concentration in the middle of the respective measuring range or close to the expected measured value.

⚠️ **WARNING**

Health hazard from test gas

Breathing in of test gas can be harmful to health or lead to death.

► Do not inhale the test gas.

► Observe risks connected with the test gas, hazards notes and safety advice (see for example safety data sheets, instructions on the testing media).

1. Connect the test gas cylinder to the calibration adapter (order no. 8318752).

2. Connect the hose to the second connector on the calibration adapter to direct the test gas to an exhaust or outside.

3. Insert the switched-on gas detector into the calibration adapter and press it down until it locks into place.

4. Press Ⓥ for approx. 4 s in measuring mode.

5. Enter and confirm the password.

6. Select and confirm mixed gas calibration ↻.
   All measuring channels are shown and flash.

7. Select Ⓞ to start the mixed gas calibration.

8. Open the test gas cylinder valve, the volume flow must be 0.5 L/min.

9. Once the measured values displayed are stable, confirm with Ⓞ.

   ⇒ The display containing the current gas concentration changes with the display **OK**.

10. Press Ⓞ.

   ● Select ✓ to confirm the measured values and switch to measuring mode.

   ● Select ✗ to discard the measured value and return to the mixed gas calibration.

   ● Select ❮ to return to the measured value.

11. After successful mixed gas calibration, close the test gas cylinder valve and remove the gas detector from the calibration adapter.

Further steps

If an error occurred during the mixed gas calibration, the fault message **X** is displayed and **--** is displayed for the affected measuring channel instead of the measured value. In this case, repeat the mixed gas calibration or replace the sensor, if necessary.

6.8 Charging the battery

To protect the battery, charge only in the temperature range of 5 to 35 °C. Outside this temperature range, the charging process is automatically interrupted and automatically continued after the temperature range has been reached again. The charging time is typically 4 h. A new NiMH power pack reaches its full capacity after 3 complete charge/discharge cycles. Never store the gas detector for extended periods without being connected to a power source (maximum of 6 months) because the internal buffer battery will drain.

ⓘ The buffer battery can be replaced if necessary.

⚠ **WARNING**
Risk of explosion
To reduce the risk of ignition of a flammable or explosive atmosphere, observe the following:

► Do not charge or replace the battery underground or in explosion-hazard areas.
► Only use the battery charger specified by Dräger. The use of a different charger nullifies the explosion protection certification of the gas detector.

● Insert the gas detector into the charger module.
   If the gas detector is switched on, then it is automatically switched off after being inserted.

6.9 Charge the battery with the multicharger
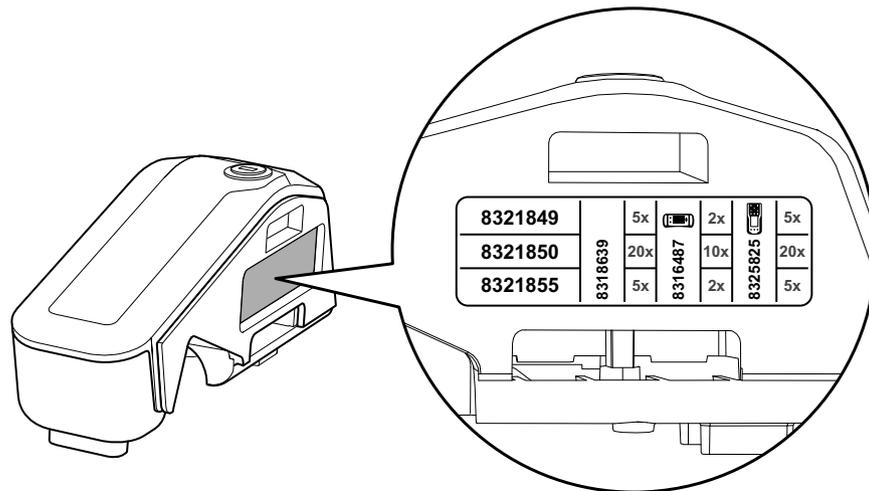
The following power supply units are available:

– 8321849 for max. 5 charging modules
– 8321850 for max. 20 charging modules
– 8321855 for max. 1 charging module when used with X-am 2x00/5x00 (vehicle power supply unit)

NOTICE
Damage to charging modules
If several charging modules are disconnected at the same time, care must be taken as otherwise the projecting tongue may break.

► Always connect or disconnect the charging modules individually and not in groups.

1. Position the instrument on an even and level surface.

2. When attaching the charging modules, disconnect the power pack from the mains supply.

3. Turn the slit of the lock to the horizontal position with a screwdriver or coin.

4. Insert the projecting tongue of the charging module (simultaneous power supply) until it engages.
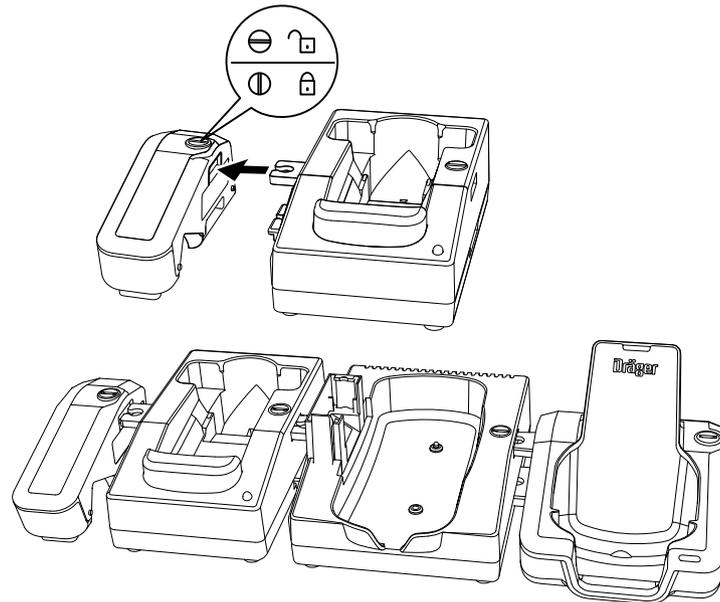
5. Close the lock by turning it by 90 degrees (with the slit vertical).

6. Attach additional charging modules in the same way.

7. Connect the power supply unit to a mains outlet.

   ⇒ If the red "Overload" LED lights up and an audible alarm sounds, this means there has been a short circuit or the power supply unit is overloaded.

8. Place the gas detector in the corresponding charging cradle.

   ℹ️ An empty rechargeable battery will be fully charged after approx. 4 hours.

   ● If a fault has been detected: Remove the gas detector from the charging module and then reinsert it. If the fault has not been rectified, contact Dräger service.

   ℹ️ After the fault has been corrected, the alarm is switched off automatically and the charging process is restarted.
   In the event of a power failure, the gas detectors already charged will be protected from discharging.

6.10 Replacing the battery

⚠ **WARNING**
Risk of explosion
To reduce the risk of ignition of a flammable or potentially explosive atmosphere, observe the following:

► Do not open the gas detector in explosion-hazard areas.

► Only the battery types specified in the technical data must be used.

► Do not charge or replace the battery underground or in explosion-hazard areas.

NOTICE
Damage to the gas detector
The power pack for the X-am 2500/5000/5100/5600 gas detectors (order no. 8318704) must not be used for the X-am 2800, as the seal cannot ensure the IP protection for the X-am 2800 and was not approved together with the X-am 2800.

► Only use the power pack (order no. 3703887) for the X-am 2800.

1. Switch off the gas detector.

2. Undo the screw on the power pack.

3. Remove and replace the NiMH power pack T4 (type HBT 0010).

4. Insert the power pack into the gas detector and tighten the screw, the gas detector switches on automatically.

6.11 Exchanging, adding or removing a sensor

ℹ In gas detector X-am 2800, only the permitted sensors may be registered.

To add a physical sensor, follow the same procedure used to exchanging a sensor. However, instead of the sensor, there is a sensor placeholder in the sensor damper. When the sensor type is exchanged, the sensor damper must also be exchanged accordingly.

When a sensor is removed from the gas detector and not replaced, the corresponding sensor placeholder (CatEx, EC) must be inserted in its place.

Equipment:

– Torx T6 screwdriver for the housing

– Torx T8 screwdriver or Allen key (2 mm) for the power pack

– Special tool for removing EC sensors (Order no. R21402)

– New sensor

– Sensor damper, if required

– Sensor placeholder, if required

Designation and description	Order no.
Sensor damper set: 1x CatEx SR, XD-IR sensor damper	3703865

Exchange the sensors using the Dräger CC-Vision PC program (refer to the Dräger CC-Vision online help). This tests the sensor compatibility and the respective gasses.

Procedure:

1. Connect the gas detector to a PC. For further information, see the following chapter: "Configuring the gas detector with the PC and reading the data memory", page 33.

2. Start the sensor exchange wizard in the Dräger CC-Vision PC software and follow the instructions.

3. Deactivate the corresponding sensor slot.

4. Open the gas detector.

   a. Loosen the screw and remove the power pack.
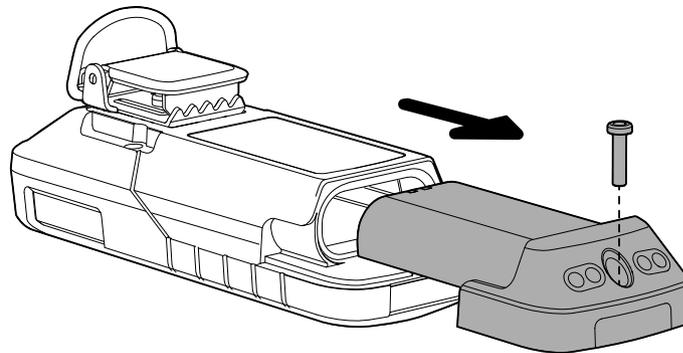


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NOTICE
Damage to the display
When lifting out the front housing cradle, it can happen (in rare cases) that the display remains caught in the front housing cradle and becomes damaged as a result.

► Lift out the front housing cradle carefully. If the display gets caught, first carefully loosen the display from the front cradle and then remove the front housing cradle entirely.
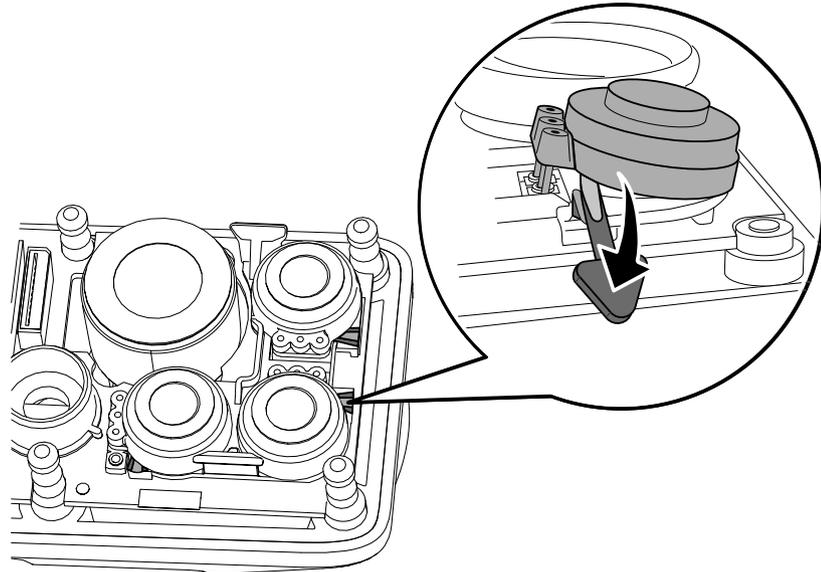
   b. Loosen 4 screws and carefully remove the front housing cradle.
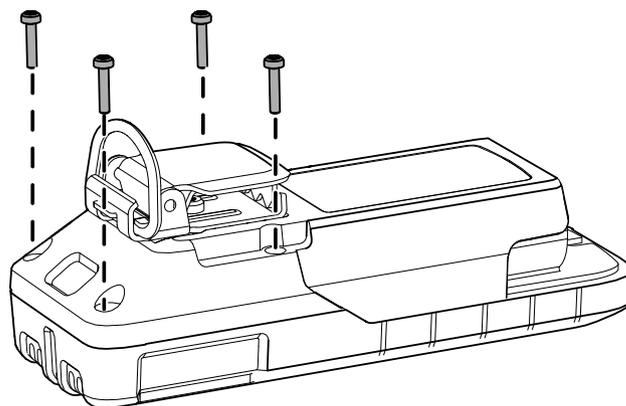
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5. Exchanging the EC sensors:

a. Place the special tool on the trough. Using the special tool, carefully lift out the EC sensor in question. Do not bend the sensor pins.
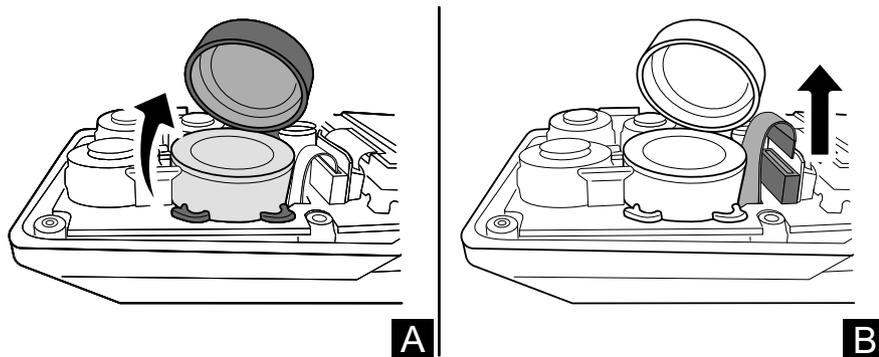

b. Only if necessary: Exchange the white sensor holder.

c. Have the sensor type and code (marked on the new sensor) as well as the sensor position at hand for the new sensor inauguration.

d. Carefully insert the new sensor evenly and not at an angle. Make sure that the pins are inserted in the correct positions.

6. Replace the CatEx sensor:

NOTICE
Damage to the flexstrip
If the flexstrip is excessively bent or twisted, it may become irreparably damaged.
► Do not allow the flexstrip to become excessively bent or twisted.

a. Open the sensor damper.

b. Carefully release the flexstrip from the printed circuit board and remove the sensor using a blunt object.

c. Have the sensor type and code (marked on the new sensor) as well as the sensor position at hand for the new sensor inauguration.

d. Carefully insert the new sensor.

e. Carefully plug the flexstrip into the bushing on the options board.

f. Close the sensor damper and make sure that it is positioned correctly.

7. Reattach the front and rear housing cradles and makes sure that the seals and sensor dampers are in the correct positions.

8. Screw on the rear housing cradle with 4 screws (35 ±5 Ncm).

ⓘ Dräger recommends first tightening the two lower housing screws and then the two upper ones.

9. Follow the instructions in the sensor exchange wizard in the CC-Vision PC software.

Next steps:

● After every sensor replacement, the fresh air calibration/zero calibration must first be carried out, followed by the span calibration (mixed gas or single-gas).

● For the XXS O_2, Dräger recommends testing the alarm feature with a suitable test gas after the fresh air calibration.

6.12 Cleaning

The gas detector does not require any special care.

If it is heavily soiled, wash off the gas detector with cold water, using a sponge if necessary. Dry the gas detector with a cloth.

NOTICE
Damage to the gas detector!
Harsh cleaning utensils (e.g. brushes), detergents and solvents can destroy the dust and water filters.
► Only clean the gas detector with cold water and, where necessary, a sponge.

For information on suitable cleaning agents and disinfectants and their specifications, see document 9100081 at www.draeger.com/IFU.

7 Configuration

ⓘ After a change to the configuration (e.g. with the CC-Vision PC software), check the basic functions of the gas detector (e.g. alarm elements).

7.1 Standard gas configuration

Different settings can be selected to meet customer requirements on delivery. The current setting can be checked and changed with the Dräger CC-Vision PC software.

The Dräger CC-Vision PC software can be downloaded at www.draeger.com/software.

DrägerSensor	Measuring range	Alarm A1			Alarm A2		
		- threshold	- acknowledgeable	- latching	- threshold	- acknowledgeable	- latching
CatEx SR [%LEL]	0 to 100	20	✔	-	40	-	✔
XXS O_2 [Vol%][1]	0 to 25	↓19.5 | ↑22.5	-	✔	↓19 | ↑23	-	✔
XXS O_2 PR [Vol%][1][2]	0 to 30	↓19.5 | ↑22.5	-	✔	↓19 | ↑23	-	✔
XXS CO LC [ppm]	0 to 2,000	30	✔	-	60	-	✔
XXS H_2S LC [ppm]	0 to 100	5	✔	-	10	-	✔
XXS NO_2 [ppm]	0 to 50	5	✔	-	10	-	✔
XXS SO_2 [ppm]	0 to 100	0.5	✔	-	1	-	✔

1) There are 4 alarm thresholds for O_2 2 ↑ (increasing) and 2 ↓ (decreasing).
2) Only available to order as an option in the modular variant 3703900.

7.2 Configuring the gas detector

ⓘ When a configuration is transmitted to the gas detector with the CC-Vision PC software, existing TWA and STEL evaluations are reset.

ⓘ Before carrying out a firmware update with the assistance of the PC software CC-Vision, make sure that the battery is least 50 % charged. The most recent PC software CC-Vision contains information concerning whether a firmware update is available.

7.2.1 Configuring the gas detector with the PC and reading the data memory

7.2.1.1 Connect the gas detector to a PC.

Equipment:
– DIRA USB cable (order number 8317409)
– Calibration adapter (order number 8318752)

Procedure:
1. Plug the DIRA dongle mount with the dongle into the socket for the calibration adapter.

2. Insert the switched-on gas detector into the calibration adapter and press it down until it locks into place.

3. Connect the DIRA USB cable to the PC.

7.2.1.2   Configuring the gas detector with the Dräger CC-Vision PC software and reading the data memory

Requirements:

– The gas detector is connected to the PC.

To configure the gas detector using the Dräger CC-Vision PC program, refer to the Dräger CC-Vision online help.

With the Dräger CC-Vision PC software, the data logger can be downloaded as a JSON file.

7.2.1.3   Reading the data memory with Dräger GasVision

Requirements:

– The gas detector is connected to the PC.

The data memory is read ans visually represented with the Dräger GasVision PC software (refer to the Dräger GasVision online help).

An interface is available for the infrared communication when reading out the measured values in external devices. Contact Dräger for more information concerning the use of this interface.

8   Device settings

Only trained and qualified personnel may change the device settings.

8.1   Factory settings

Different settings can be selected to meet customer requirements when ordering. The setting can be checked and changed with the Dräger CC-Vision PC software.

ℹ️ The changed parameter settings must be checked after being transferred to the gas detector to ensure that the values have been transferred correctly. Parameters that cannot be viewed on the gas detector must be read out and checked after being changed using the Dräger CC-Vision PC software.

Feature	Setting
Fresh air calibration without password	On
Bump test without password	On
Operation signal (acoustic)	Off
Bluetooth®	Off
Switch off allowed	On
Capture range[1]	On

Feature	Setting
LEL factor[2]	
CH$_4$ (methane)[3]	4.4 Vol% (corresponds to 100 %LEL)
H$_2$ (hydrogen)	4.0 Vol% (corresponds to 100 %LEL)
C$_3$H$_8$ (propane)	1.7 Vol% (corresponds to 100 %LEL)
STEL	STEL feature – inactive; average duration = 15 minutes
TWA	TWA feature – inactive; average duration = 8 hours
Configuration type alarm thresholds	ATEX compliant
Alarm A1	Acknowledgeable; non-latching, pre-alarm, increasing measured value (for O$_2$ sensor, decreasing measured value as well)
Alarm A2	Not acknowledgeable; latching, main alarm, increasing measured value (for O$_2$ sensor, decreasing measured value as well)
Expired bump test interval	Channel warning
Expired calibration interval	Channel warning

1) The set capture range can be read out on the gas detector and activated or deactivated. The capture range is activated in measuring mode ex works. The capture range is always deactivated in calibration mode.
2) An LEL factor can be adapted to national regulations using the Dräger CC-Vision PC software.
3) Notation in the gas detector: ch4

8.2 Device and sensor settings

Name:	Area / setting
Device settings:	
Password(s)	Numerical range (4-digit)
Acoustic operation signal	Yes / No
Switch-off mode	"Switch off is allowed" or "Switch off not allowed" or "Switching off not allowed during A2"
Short-term exposure limit (STEL)[1][2]	0 - 60 (in minutes; setting for exposure alarm)
Shift length (TWA)[3]	60 - 1440 (in minutes; setting for exposure alarm)
Sensor settings:	
A1 alarm: Latching Acknowledgeable	On / Off On / Off
A2 alarm: Acknowledgeable	On / Off
Alarm threshold A1 increasing (in measurement module)	0 to A2

Name:	Area / setting
Alarm threshold A2 increasing[4] (in measurement module)	A1 to full scale deflection
Alarm threshold A1 decreasing (in measurement module, only O_2 sensor)	A2 decreasing to A1 increasing
Alarm threshold A2 decreasing (in measurement module, only O_2 sensor)	0 to A1 decreasing
Interpretation type[1]	Inactive, TWA, STEL, TWA+STEL
Alarm threshold STEL (in measurement module)[1]	0 – full scale deflection
Alarm threshold TWA (in measurement module)[1]	0 – full scale deflection

1) Evaluation only if the sensor is designed for this.
2) Corresponds to averaging time and is used to calculate the STEL exposure value.
3) Corresponds to averaging time and is used to calculate the TWA exposure value.
4) Max. 60% LEL applies for ex-channels

8.3 Alarm settings (factory setting)

Definition:

Pre-acknowledgement: If, during the alarm condition, the acknowledgement is actuated (by pressing the OK button), the audible alarm and the vibration are switched off. The alarm is only fully reset (LED and display) once the alarm condition no longer exists.

Acknowledgement: If an acknowledgement is actuated when the A1 alarm condition no longer exists (by pressing the OK button), all alarm elements will be reset.

ℹ️ If the A2 and A1 alarms are configured as acknowledgeable, a pre-acknowledgement or acknowledgement of the A2 alarm will pre-acknowledge the A1 alarm or fully acknowledge it if no further alarm condition exists.

Explanation of symbols:

✔: Feature activated

☑: Pre-acknowledgement

Alarms / Events	Represen-tation in display	Latching	Acknowl-edgeable	LEDs	Horn	Vibration
A1 ↑ (increasing)	A1	-	✔ ☑	⊓ (single pulse)	⊓ (single pulse)	✔
A2 ↑ (increasing)	A2	✔	-	⊓⊓ (double pulse)	⊓⊓ (double pulse)	✔
A1 ↓ (decreasing)	A1	-	✔ ☑	⊓ (single pulse)	⊓ (single pulse)	✔
A2 ↓ (decreasing)	A2	✔	-	⊓⊓ (double pulse)	⊓⊓ (double pulse)	✔
STEL[1][2]	STEL	✔	-	⊓⊓ (double pulse)	⊓⊓ (double pulse)	✔
TWA[3]	TWA	✔	-	⊓⊓ (double pulse)	⊓⊓ (double pulse)	✔
Error[4]						
Battery pre-alarm[5]	-	-	✔	⊓ (single pulse)	⊓ (single pulse)	✔
Battery main alarm[6]	-	-	-	⊓⊓ (double pulse)	⊓⊓ (double pulse)	✔
Device error	-	✔	✔	⊓ (single pulse)	⊓ (single pulse)	✔
Channel error	▬▬	-	✔	-	-	-

1) The STEL alarm can be triggered with a delay of max. 1 minute.
2) After this alarm, the deployment of personnel is subject to the relevant national regulations.
3) A TWA alarm can only be reset by switching the gas detector off and then on again.
4) For troubleshooting, see the Technical Manual.
5) The battery still lasts approx. 20 minutes after the battery pre-alarm triggers.
6) The gas detector switches off automatically 20 s after a battery main alarm.

9 Storage

Dräger recommends storing the instrument in the charger module (order no. 8318639).

Dräger recommends checking the charge of the power supply at least every three weeks if the instrument is not stored in the charger module.

10 Disposal

This product must not be disposed of as household waste. This is indicated by the adjacent symbol.
You can return this product to Dräger free of charge. For information please contact the national marketing organizations or Dräger.

Batteries must not be disposed of as household waste. They are therefore marked with the adjacent symbol. Dispose of batteries at battery collection centres as specified by the applicable regulations.

11 Technical data

11.1 Gas detector

Ambient conditions:

during operation and storage	-20 to +50 °C (measuring function and storage) -40 to +50 °C (use in areas subject to explosion hazards) 700 to 1300 hPa (measuring function) 800 to 1100 hPa (use in areas subject to explosion hazards) 10 to 90 % (briefly up to 95 %) rel. hum.
Degree of protection	IP 68[1)
Alarm volume	>90 dB (A) at a distance of 30 cm
Orientation	Any
Storage time of gas detector	1 year
Storage time of sensors	The ambient conditions and storage time for sensors in original packaging correspond to that of the gas detector

Power packs for temperature class T4
(-40 to +50 °C, use in explosion-hazard areas):
    NiMH power packs type: HBT 0010

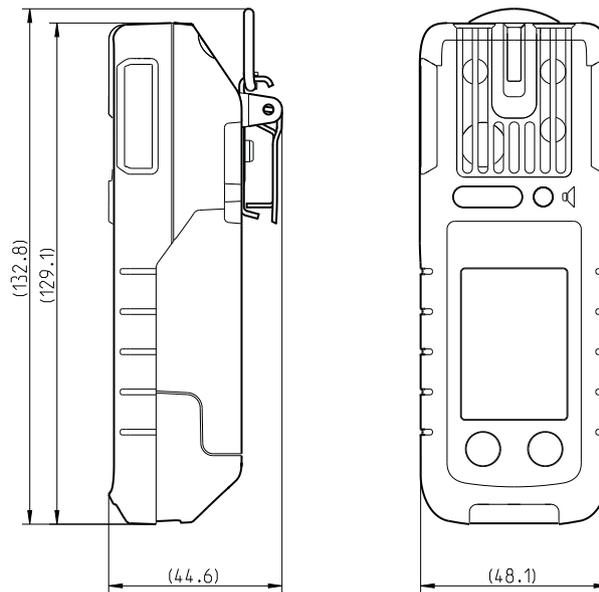|	
Electrical parameters for the charging pins[2):	U_m = 4.6 V I_m = 1.36 A
Dimensions	approx. 130 x 48 x 44 mm (H x W x D)
Weight	Typically 220 to 250 g, depending on the sensor configuration
Update interval for the display and signals	1 s
Range of Bluetooth®	approx. 95 m (line of sight)

1) Tested with power pack HBT 0010
2) The parameters are complied with when using the battery charger specified by Dräger.

Operating time under normal conditions (diffusion mode)[1]:

with CatEx and 3 EC sensors	Typically 12 h
with 3 EC sensors	Typically 100 h

1) Nominal operating time of the gas detector at an ambient temperature of 20 to 25 °C, 1013 hPa, less than 1 % alarm time. The actual operating time will vary depending on the ambient temperature and pressure, as well as the rechargeable battery and alarm conditions.

11.2   Dimensions