USER MANUAL

OLC/OLCT 100

Gas Detector

Part Number: NPO100GB
Revision: F.1

OLDHAM

The Fixed Gas Detection Experts

All of the information that is provided in this document is accurate to the best of our knowledge.

As a result of continuous research and development, the specifications of this product may be changed without prior notice.

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Contents

Thank you for choosing this OLDHAM instrument.

All of the necessary actions have been taken in order to ensure your complete satisfaction with this equipment.

It is important that you read this entire manual carefully and thoroughly.

The extent of our responsibility

- OLDHAM shall not be held responsible for any damage to the equipment or for any physical injury or death resulting in whole or in part from the inappropriate use, installation, or storage of the equipment, which is the result of not complying with the instructions and warnings, and/or with the standards and regulations in force.

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Warning

- This is not a contractual document. In the best interest of its customers and with the aim of improving performance, **OLDHAM** reserves the right to alter the technical features of its equipment without prior notice.
- **READ THESE INSTRUCTIONS CAREFULLY BEFORE THE FIRST USAGE:** these instructions should be read by all persons who have or will have responsibility for the use, maintenance, or repair of the instrument.
- This instrument shall only be deemed to be in conformance with the published performance if used, maintained, and repaired in accordance with the instructions of OLDHAM by OLDHAM personnel or by personnel authorised by OLDHAM.

Guarantee

- Under normal conditions of use and on return to the factory, parts and workmanship are guaranteed for 3 years, excluding such consumables as sensors, filters, etc.

Destruction of the equipment

European Union (and EEA) only. This symbol indicates that, in conformity with directive DEEE (2002/96/CE) and according to local regulations, this product may not be discarded together with household waste.

It must be disposed of in a collection area that is set aside for this purpose, for example at a site that is officially designated for the recycling of electrical and electronic equipment (EEE) or a point of exchange for authorized products in the event of the acquisition of a new product of the same type as before.

Chapter 1 | Presentation

Purpose

This range of sensors is designed to detect a particular gas depending on the type of sensor used.

Operating principle

The measurement sensor converts the target gas into voltage or current. This electrical parameter is:

- either conducted directly via a connecting cable to a dedicated central measurement unit (as with the OLC 100 explosimeter) that operates on the principle of the Wheatstone bridge. Such a measurement unit is available in the OLDHAM range.
- or amplified, corrected for temperature, linearised, and converted to a 4-20 mA signal (as for the OLCT 100) and conducted via a connecting cable to a centralized unit (measurement unit or industrial automation system).

Composition of the detector

A detector comprises the following elements:

Id.	Description
1.	Company label
2.	Cover
3.	PCB protector (for OLCT version).
4.	PCB.
5.	Cable gland inlet.
6.	Enclosure.
7.	Sensor block.
8.	Nozzle.
9.	Ground connection.
10.	LEL sensor (high temperature).

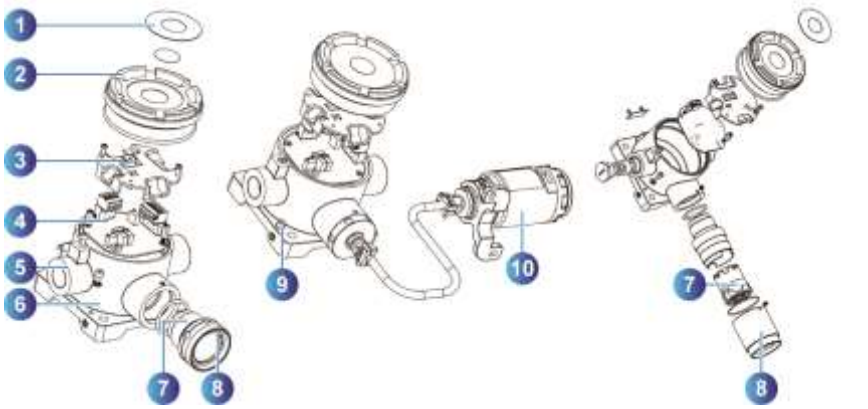
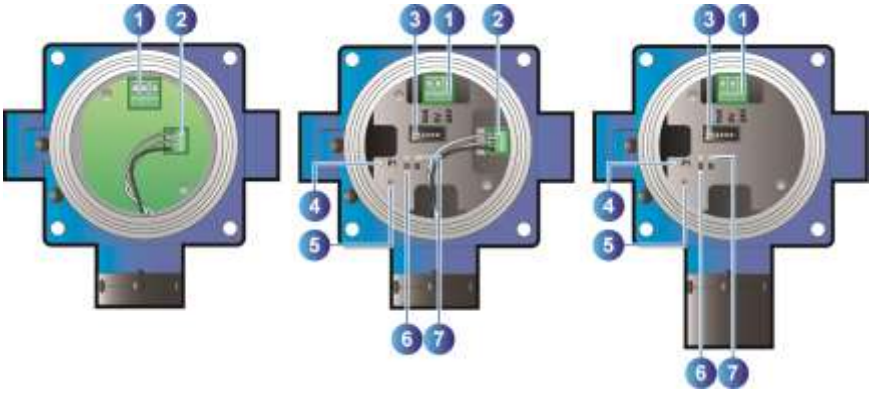


Figure 1 : component parts of an OLCT 100 detector

Internal elements

The following elements are internally accessible to the user:

Id.	Description
1.	Terminal for the cable being connected to the controller (measurement unit, automation).
2.	Sensor block connector.
3.	Calibration ribbon connector.
4.	4 mA adjustment.
5.	Push button access for 4 mA adjustment.
6.	Zeroing.
7.	Sensitivity adjustment.



OLC 100 detector *OLCT 100 explosimeter* *OLCT 100 detector for toxic gases*

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Figure 2 : internal view of the detectors

Identifiers

The enclosure has two identifier labels, as described below:

Company label

This in turn groups the detector features together:

Id.	Description
1.	Manufacturer's name.
2.	Type of product
3.	ATEX- IECEx Marking
4.	CE symbol and the number of the organisation that provided the OLDHAM production quality certification (INERIS)
5.	Warning..
6.	Type of gas detected and range of measurement.
7.	Maximum ATEX certification temperature (excluding metrological performance)
8.	Symbol of Marine Certification and number of the Approval Agency that issued the certificate
9.	Recycling symbol.

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Figure 3 : Firmplate

Side label

This label shows the following :

Id.	Description
1.	Thread diameter and pitch for cable inlet
2.	Detector reference number, less sensor (P/N)
3.	Detector serial number (S/N) The first two digits (in this case 09) correspond to the year of manufacture (in this case 2009)

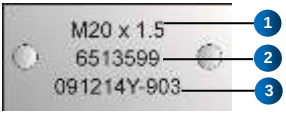

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Figure 4 : side label

Chapter 2 | Ranges

OLC 100 and OLCT 100 ranges

The OLC 100 range is reserved for the detection of explosive vapor by using a Wheatstone bridge sensor.

The OLCT 100 range of detectors is provided with an amplifier producing a 2 or 3 wire 4-20 mA analog output. These are transmitter detectors and, therefore, the letter "T".

	OLC 100	OLCT 100 XP	OLCT 100 XPIR	OLCT 100 IS	OLCT 100 HT
Features	Explosion proof	Explosionproof	Explosionproof	Intrinsically safe (1)	Explosionproof (2)
Detection of explosive gases	Catalytic sensor (VQ1)	Catalytic sensor (VQ1 or AP 4F) or semi-conductor	Infrared sensor		Catalytic sensor high temperature
Detection of toxic gases		EC Or SC		EC	
Detection of oxygen		EC		EC	
Detection of CO_2			Infrared sensor		
4-20 mA output	(3)	2 wires for EC 3 wires for SC 3 wires for LEL	3 wires	2 wires	3 wires

(1) Requires the use of a Zener barrier
(2) Sensor can be remote up to 5, 10, or 15 meters using a high temperature cable
(3) mV bridge output, 3 wires
EC : Electrochemical sensor
SC : Semi-conductor sensor.
LEL : Catalytic bead
AP : Poison resistant

Table 1 : comparison of OLC 100 and OLCT 100 series detectors

Chapter 3 | Installation

It is recommended that the guides relating to the installation, use, and maintenance of flammable gas and oxygen detectors (standard EN/IEC 60079-29-2) and toxic gas detectors (standard EN 45544-4) should be clearly understood.

Installation shall be in accordance with the standards in force, classification of the zone, and in conformity with standards EN/IEC 60079-14 and EN/IEC 61241-14, the editions in force, or with other national and/or local standards.

Regulations and conditions of use

- The installation should meet all the regulations currently in force for installations in explosive atmospheres, in particular the standards IEC/EN 60079-14 and IEC/EN 60079-17 (whichever editions are in force) or in accordance with other national standards.
- Generally speaking, the ambient temperature, supply voltage, and power that are mentioned in this document relate to explosion safety. **This has nothing to do with the operating temperatures of the detector.**
- The equipment is allowed in zones 0 (IS version only), 1, 2, 20 (IS version only), 21 and 22 for ambient temperatures ranging from -50 ° C to + 70 °.
- The detector sensor in the transmitter should always be in contact with the ambient air. Therefore:
  - Do not cover the detector.
  - Do not paint the detector.
  - Avoid dust.

Necessary equipment

- Complete detector assembly
- Requisite connector cable
- Multimeter (intrinsically safe, if necessary)
- Tools
- Fixing hardware

Electrical power supply

Type of detector	Supply (V DC)	Maximum current (mA)	Power consumed (mW)
OLCT 100 XP HT	15,5 to 32	110	1705
OLCT 100 XP LEL	15,5 to 32	100	1550
OLCT 100 XP IR	15,5 to 32	80	930
OLCT 100 XP EC	10 to 32	23,5	235
OLCT 100 XP SC	15,5 to 32	100	1550
OLC 100	By Oldham controller	340	(1)

(1) Depends on the central measurement unit.

Location of the detector

Depending on the density of the gas to be detected or the application, the detector shall be positioned at the ground level, or on the ceiling at the same height as the airflow, or near to the air extraction ducts. Heavy gases may be detected at the ground level, while light gases will be found at ceiling height. Gas densities are provided on page 28.

Detector positioning

The detector shall be installed with the detector sensor pointing downwards.

For explosive gas detectors only, any tilt of more than 45° from the vertical will lead to an inaccurate measurement.

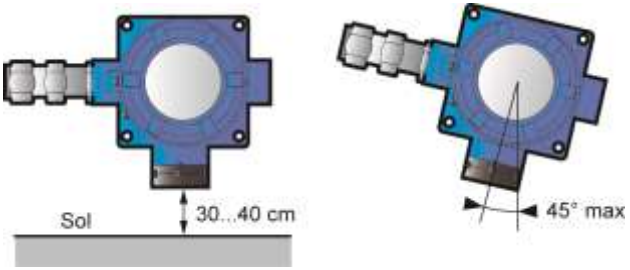

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Figure 5 : sensor pointing downwards (left) and maximum tilt angle for an explosimeter (right)

Installation of the enclosure shall be secured with 4 x M6 screws and the appropriate plugs for the supporting material

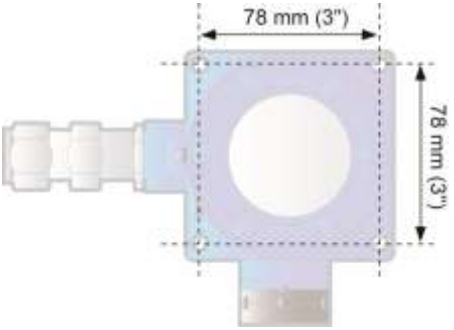

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Figure 6 : fixing template for the enclosure

A special holder is available for mounting the detector on the ceiling (see section on accessories.

In the OLCT 100 HT version, only the OLC20 HT removable detector head can be used at temperatures from -20°C to + 200°C. The OLCT 100 HT enclosure can only be used in ambient temperatures from -40°C to + 70°C. The high temperature cable between the OLCT 100 HT enclosure and the OLC20 HT head is integral with the instrument and is not user-replaceable.

The cable should be protected mechanically

Connector cable

The detector shall be connected to the controller (measurement and automation unit) by a shielded instrumentation cable, armoured when necessary. The choice of cable will be dictated by the particular requirements of the installation, distance, and type of detector (see table below).

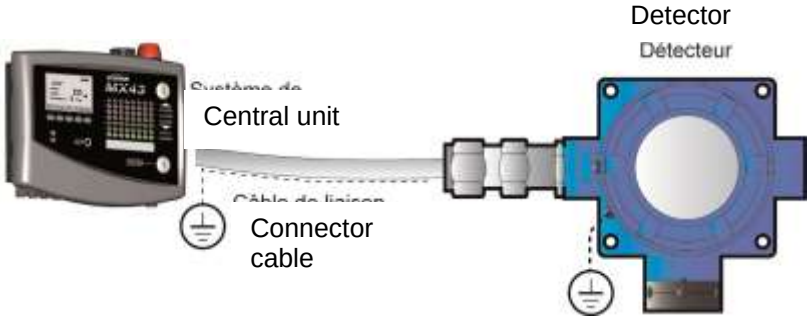

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Figure 7: the cable connecting the detector to the controller should be chosen with care

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Type of detector	Type of sensor	Maximum length (km) for cable of cross-section as indicated			Maximum load resistance for 4-20 Ma
		0,5 mm²	0,9 mm²	1,5 mm²	
Upstream line voltage (Vcc)		24	24	24	
OLCT 100 XP	Catalytic or semiconductor	0,8	1,4	2,4	250
OLCT 100 XP (1)	Electrochemical	<4	<4	<4	
OLCT 100 XPIR	Infra-red	1,4	2,6	4,4	250
OLCT 100 IS (2)	Electrochemical	1,8	3,3	<4	
OLCT 100 HT	Catalytic, high temperature	0,8	1,4	2,4	250

(1) for resistance calculations, the assumed load is 120 Ω for 4-20 Ma.

(2) for resistance calculations, the assumed load is 120 Ω for 4-20 Ma, and a 300 Ω Zener blocking diode.

Warning: all wiring should meet the installation standards and should be described in a system document for SI installations

The cable must have a braided screen to reduce the influence of electrical and radio-frequency interference. A cable such as AFNOR M 87-202 01-IT-09-EG-FA (Nexans) may be used. It shall be selected according to the type of detector and in accordance with the table shown hereinabove. Below are further examples of suitable cables:

Non ATEX zone: CNOMO FRN05 VC4V5-F

ATEX zone: GEUELYON (U 1000RHC1)

ATEX zone: GVCSTV RH (U 1000)

ATEX zone: xx-xx-09/15- EG-SF or EG-FA or EG-PF (U 300 compatible with M87202)

The maximum permissible length will depend on the cross-section of the cable conductors (see table) and on the minimum supply voltage.

Cable connection

Switch off line power supply

On the controller:

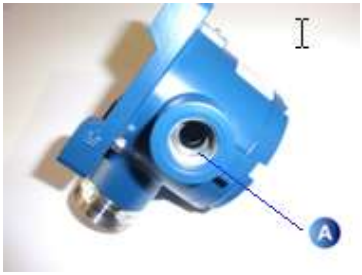
1. Inhibit any installation alarms to avoid unexpected triggering during operation.
2. In accordance with the manufacturer's instructions, switch off the power to the module in order to be connected to the detector.

Cable preparation

The cable shall be taken from the controller (measurement and automation) to the point of measurement (see Figure 8). The passage, support, and protection of the cable shall be according to best practice.

Cable entry

It is essential that the instructions provided by the manufacturer of the compression gland are followed and the braided screen is correctly connected. M20x1.5 flamme proof certified cable gland shall be used (see Chapter 11).



1 - Remove the joint and the two metal washers found in the sensor.

2 - Arrange the cable as shown in the picture.

3 - Spread the braided shield as shown in the picture.

Avoid creating "pigtails" with the braided shield**.**

4 - Insert the part back into the OLCT100.

Cable connection

The connection of the cable between the detector and controller should be made with the power off. The site should be at equal potential

Connect the cable to the detector side before connecting the controller side.

After the wiring has been completed, connect the cable screen to the ground terminal of the controller.

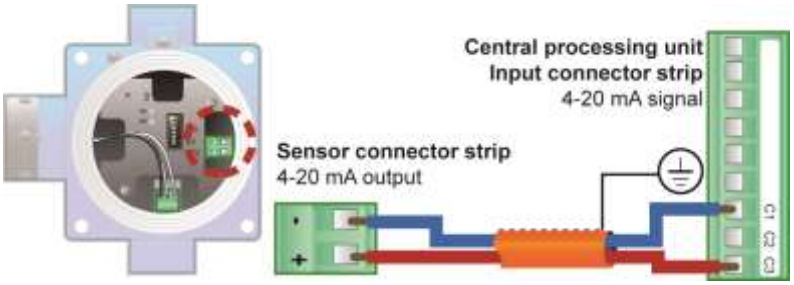


Figure 8: connections for a 2-wire 4-20 Ma detector

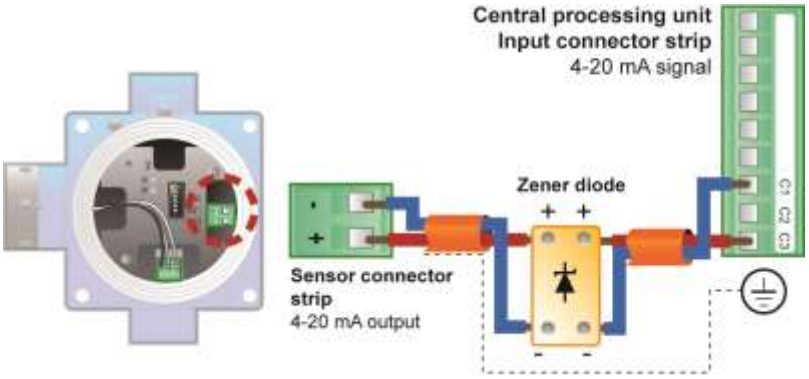


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Figure 9: connections for an intrinsically safe, 2-wire 4-20 Ma detector with a Zener diode

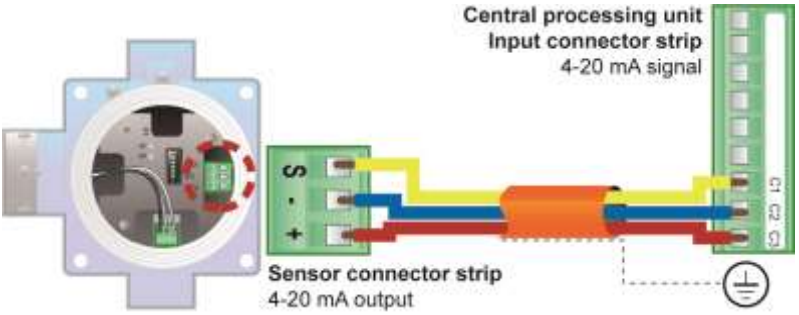

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Figure 10: connections for a 3-wire 4-20 Ma detector

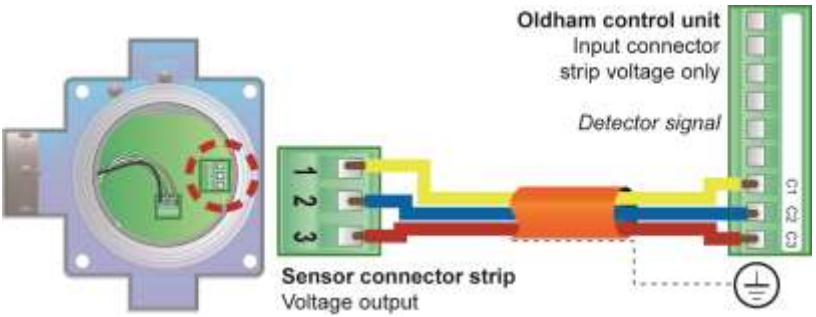

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Figure 11: connections for a 3-wire OLC 100 type detector

Connecting the enclosure to ground

Connect the enclosure ground terminal to earth according to the regulations. This ground connection may, however, be taken from the terminal on the screw fixing the PCB to the inside of the housing.

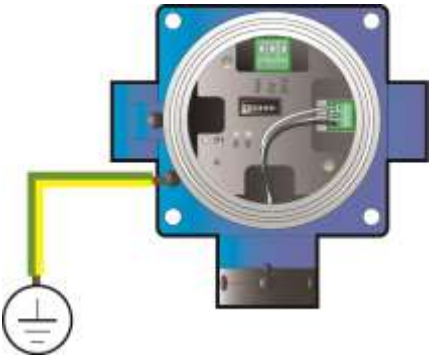

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Figure 12 : Ground connection terminal

Closing the cover

Before connecting the cable to the terminal on the controller, it is essential that the cover is completely closed.

Chapter 4 | Calibration

The tasks described in this chapter are reserved for authorised trained personnel only, since these tasks are liable to affect detection reliability

This procedure describes:

- zero adjustment;
- Sensitivity adjustment.

Necessary equipment

- Multimeter (ranges 0-30 mA and 0-2 V), intrinsically safe if necessary.
- Cylinder of pure air.
- Cylinder of calibration gas, of suitable concentration for the measurement range (between 30 and 70% of the measurement range).

Commissioning

Prior checks

Check the following points:

- Detector housing grounded.
- Connexion of the shielding of the cable and the ground to the controller
- Integrity of the mechanical mounting (fixings, cable gland, and cover) ensured.

Powering up detector

1. Inhibit any installation alarms to avoid unexpected triggering during the operation.

2. Connect power to the detector line in accordance with the manufacturer's instructions.

Stabilization time

After mounting, it is essential to allow the detector temperature to stabilize. In addition, after turning the power on, certain sensors require a further pre-heating time. Any adjustment before the time indicated will result in an incorrect measurement, which may in turn compromise the safety of the goods and personnel. The total waiting time is summarised below:

- Explosimeter: 2 hours.
- Oxygen detector: 1 hour.
- Electrochemical detector: 1 hour, excluding:
  - NO (nitrogen monoxide): 12 hours.
  - HCl (hydrogen chloride): 24 hours.
  - ETO (ethylene oxide): 36 hours.
  - CH_2O (formaldehyde): 36 hours.
- Semiconductor sensor: 4 hours.
- Infra-red detector: 2 hour.

Calibrating the OLC 100

The cover of the detector remains closed, with any adjustments being carried out at the central measuring unit.

For an explosimeter, it is recommended that the detector should be calibrated by using the gas to be detected. If the user would like to calibrate the detector with a gas other than that detected and programmed in the factory, reference should be made to the table on page 30 by using the recommended gas and corresponding coefficient.

Zeroing

Proceed as follows :

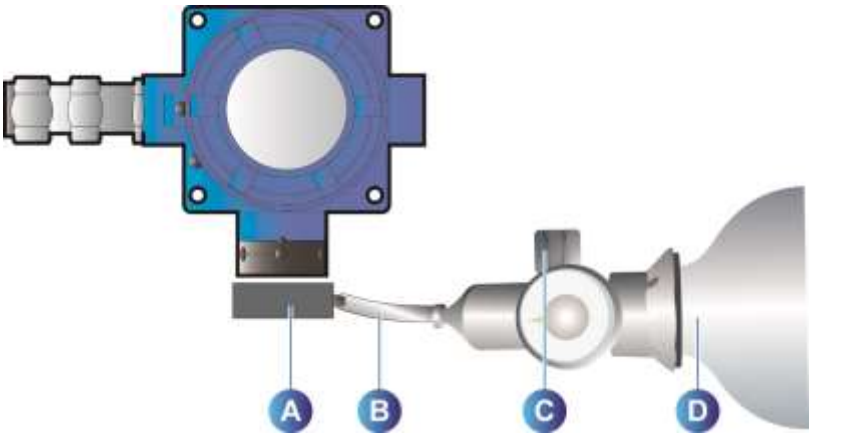

Figure 13 : Zeroing (OLC 100)

1. Inhibit any alarm signals on the controller.
2. Place the calibration cup onto the detector head (Figure 13, "A").
3. Connect the calibrator cup to the pure air cylinder "D" using a flexible hose "B".
4. Open the valve on the zero air cylinder (flow rate 30 to 60 litres/h) "C".
5. After the measurement has stabilised (approx. 2 minutes), read the display of the central measuring unit.

   A displayed figure of "0.0" corresponds to 0% gas.
6. If a different value is displayed, adjust the "0" on the measuring unit to correct the value until a reading of exactly 0.0% is obtained.
7. Close the valve "C" on the cylinder. Remove the calibration cup "A" if no sensitivity control is necessary.
8. Reset any alarm signals on the controller.

Adjustment of gas sensitivity

This procedure takes place after the zeroing stage:

1. Inhibit any alarm signals on the controller.
2. Place the calibration cup on the detector head (Figure 13, "A").
3. Connect the calibration cup to the calibration gas cylinder "D" by using a flexible hose "B".
4. Open the valve on the calibration gas cylinder "C" (flow rate 30 to 60 litres/hr).
5. After the measurement has stabilized (approx. 2 minutes), read the display of the central measuring unit.
6. Adjust "S" on the measuring unit in order to display the desired value.
7. Close valve "C" on the cylinder and remove the calibration cup "A".
8 . Walt for the measured signal to return to zero and reset the alarm signals on the controller.

Calibrating the OLCT 100

Wait for the stabilization time on power-up.

For a LEL detector, it is recommended to calibrate with the targeted gas. Should the operator calibrate with another gas, please refer to tables on pages 32 to 34 to know the recommended calibration gas and the cross sensitivity factor.

Zeroing (OLCT 100)

Proceed as follows:

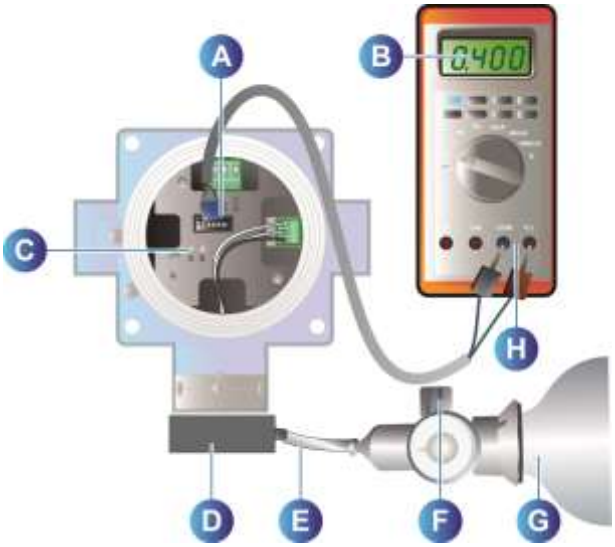

Figure 14: Zeroing and Sensitivity adjustment (OLCT 100)

Inhibit any alarm signals on the controller.

2. Insert the blue and green plugs on the measurement lead into the + and - multimeter sockets, respectively (Figure 14, "H")
3. Insert the measurement lead plug into connector "A".
4. Place the calibration cup on the detector head ("D").
5. Connect the calibration cup to the pure air cylinder "G" by using a flexible hose "E".
6. Open the valve "F" on the pure air cylinder (flow rate 30 to 60 litres/h).

7. After the measurement has stabilized (approx. 2 minutes), read the value on the multimeter "B".

   A measurement of 0.4 V corresponds to 4 mA, i.e. 0% gas.

   Note: for the oxygen detector, inject pure nitrogen instead of air.

8. If a different value is displayed, adjust the "0" control ("C") in order to correct the value until 0.4 V is exactly displayed.

9. Close the valve "F" on the cylinder. Remove calibration ribbon cable "A", calibration pipe "D", and close the detector again if no sensitivity control is necessary.

10. Reset any alarm signals on the controller.

Sensitivity adjustment (OLCT 100)

This procedure enables the measurement to be adjusted corresponding to x% gas. Proceed as follows

1. Inhibit any alarm signals on the controller.

2. Insert the blue and green plugs on the measurement lead into the + and - multimeter sockets, respectively (Figure 14Figure 14: Zeroing and Sensitivity adjustment (OLCT 100), "H").

3. Insert the measurement lead into connector "A".

4. Place the calibration cup on the detector head ("D").

5. Connect the calibration cup to the calibration gas cylinder "G" by using a flexible hose "E".

   A stainless steel pressure gauge and Teflon tube must be used for toxic gases and Freons.

   Note: for an oxygen detector, use a cylinder of pure air or roughly 19% oxygen.

6. Open the valve "F" on the calibration gas cylinder (flow rate 30 to 60 litres/h).

7. Once the measurement has stabilized (approx. 2 minutes), read the value on the multimeter.

Use the following formula to determine the voltage value that is to be displayed:

$$\text{Voltage displayed (mV)} = 400 + \frac{(1600 \times \text{calibration gas concentration})}{\text{Sensor range}}$$

For example, for a range of 1000 ppm CO with a calibration gas cylinder of 300 ppm, the voltage displayed will be:

$$\text{Voltage displayed (mV)} = 400 + \frac{(1600 \times 300)}{1000} = 880 \text{ mV}$$

8. If a different value is displayed, adjust the "S" control ("C") to correct the value until an exact value of the calibration gas is displayed.
9. Close the valve "F" on the cylinder. Remove measurement cable "A", calibrate cup "D", and close the detector again.
10. Wait for the measured signal to return to zero and reset the alarm signals on the controller.

Calibration coefficients of explosive gases for catalytic detectors

When a VQ1 type sensor is used (available for OLC 100 and OLCT 100), the coefficients are as follows:

Gas	Chemical Formula	LEL (%)	LSE (%)	Flash point (°C)	Vapor density	Coefficient Calibration gas CH4 (methane)	Coefficient Calibration gas H2 (Hydrogen)	Coefficient - Calibration gas C4H10 (Butane)	Coefficient - Calibration gas C5H12 (Pentane)
Ethyl acetate	C4H8O2	2,10%	11,50%	-4°C	3,0	1,65	1,35	0,90	0,80
Acetone	C3H6O	2,15	13,00	-18	2,1	1,65	1,35	0,90	0,80
Acetylene	C2H2	1,50	100	-18	0,9	2,35	1,90	1,25	1,15
Acrylic acid	C3H4O2	5,30%	26,00%	54°C	2,5	2,50	2,00	1,35	1,20
Butyl acrylate	C7H12O2	1,20%	8,00%	37°C	4,4	3,50	2,80	1,85	1,70
Ethyl acrylate	C5H8O2	1,70%	13,00%	-2°C	3,5	3,05	2,45	1,65	1,50
Acrylonitrile	C3H3N	2,80%	28,00%	-1°C	1,8	1,45	1,20	0,80	0,70
Ammoniac	NH3	15,00	30,20	< -100	0,6	0,90	0,75	0,50	0,45
Benzene	C6H6	1,20%	8,00%	-11°C	2,7	4,00	3,20	2,15	1,90
1.3-Butadiene	C4H6	1,40%	16,30%	-85°C	1,9	2,55	2,05	1,35	1,25
Butane	C4H10	1,50	8,50	-60	2,0	1,90	1,55	1,00	0,90
Butanol (Butyl Alcool)	C4H10O	1,4%	11,3%	29°C	2,6	1,95	1,60	1,05	0,95
2 - Butanone (MEK)	C4H8O	1,80%	11,50%	-4°C	2,5	3,90	3,15	2,10	1,90
Cyclohexane	C6H12	1,20%	8,30%	-17°C	2,9	2,00	1,60	1,10	1,00
Dimethylether	C2H6O	3,00%	27,00%	-41°C	1,6	1,80	1,45	0,95	0,90
Dodecane	C12H26	0,60%	~6,0%	74°C	5,9	4,00	3,20	2,15	1,90
Ethane	C2H6	3,00	15,50	135	1,0	1,50	1,20	0,80	0,75
Ethanol	C2H6O	3,30	19,00	13	1,6	2,15	1,75	1,30	1,00
Ether (Diethylether)	(C2H5)2O	1,70%	36,00%	-45°C	2,6	1,90	1,55	1,00	0,90
Ethylene	C2H4	2,70	34,00	- 135	1,0	1,65	1,35	0,90	0,80
LPG	Prop+But	1,65	~9,0	< -50	1,9	1,90	1,55	1,00	0,90
Diesel	Melange	0,60	~6,0	55	> 4	3,20	2,60	1,70	1,55
Natural Gas	CH4	5,00	15,00	-188	0,6	1,05			
Heptane	C7H16	1,10	6,70	-4	3,5	2,20	1,80	1,20	1,05
Hexane	C6H14	1,20	7,40	-23	3,0	2,10	1,70	1,15	1,00
Hydrogen	H2	4,00	75,60	-	0,069		1,00		
Isobutane	C4H10	1,50%	8,40%	-83°C	2,0	1,50	1,20	0,80	0,75
Isobutene	C4H8	1,60%	10,00%	<-10°C	1,9	2,20	1,80	1,20	1,05
Isopropanol	C3H8O	2,15%	13,50%	11,7°C	2,1	1,60	1,30	0,85	0,80

Gas	Chemical Formula	LEL (%)	LSE (%)	Flash point (°C)	Vapor density	Coefficient Calibration gas CH4 (methane)	Coefficient Calibration gas H2 (Hydrogen)	Coefficient - Calibration gas C4H10 (Butane)	Coefficient - Calibration gas C5H12 (Pentane)
Kerosene (JP4)	C10 - C16	0,70%	5,00%	> 50 °C	> 4	5,00	4,00	2,65	2,40
Methyl Methacrylate	C5H8O2	2,10%	12,50%	2°C	3,5	2,25	1,80	1,20	1,10
Methane	CH4	5,00	15,00	-188	0,55	1,00			
Methanol	CH3OH	5,50%	44,00%	11°C	1,1	1,40	1,15	0,75	0,70
Naphta	melange (Mixture)	0,90%	5,90%	> 44°C	> 4	3,50	2,80	1,85	1,70
Nonane	C9H20	0,70	5,60	31	4,4	4,40	3,55	2,35	2,10
Octane	C8H18	1,00	6,00	12	3,9	2,70	2,20	1,45	1,30
Ethylene Oxyde	C2H4O	2,60%	100%	-20°C	1,5	2,10	1,70	1,15	1,00
Propylene oxide	C3H6O	1,90%	37,00%	70°C	2,0	2,35	1,90	1,25	1,15
Pentane	C5H12	1,40	8,00	-49	2,5				1,00
Propane	C3H8	2,00	9,5	-104	1,6	1,55	1,25	0,85	0,75
Propylene	C3H6	2,00	11,70	-107,8	1,5	1,65	1,35	0,90	0,80
Styrene	C8H8	1,1	8,00	31	3,6	6,30	5,05	3,35	3,00
Gasoline lead free	/	1,10%	~6,0 %	21°C	3 à 4	1,80	1,45	0,95	0,90
Toluene	C7H8	1,20	7	5	3,1	4,00	3,20	2,15	1,90
Turpentine Oil	-	0,8%	6,0%	35°C	4,7	3,50	2,80	1,85	1,70
Triethyl amine	C6H15N	1,20%	8%	-15°C	3,5	2,05	1,65	1,10	1,00
White Spirit	melange (Mixture)	1,10%	6,50%	>30°C	> 4	3,50	2,80	1,85	1,70
Xylene	C8H10	1,00	7,60	25	3,7	4,00	3,20	2,15	1,90

Cells with a grey background: gases recommended for calibrating the detector

Table 2 **: Calibration coefficients of explosive gases for catalytic detectors (VQ1)**

When an anti-poison 4F type sensor is used (only available for OLCT 100), the coefficients are as follows:

Gas	Chemical Formula	LEL %	LSE %	Vapor density	CH_4 Coef	C_5H_{12} Coef	H_2 Coef
Acetone	C_3H_6O	2,15	13,0	2,1	1,8	0,9	
Acetylene	C_2H_2	1,5	100	0,9	1,4		
Ammoniac	NH3	15,0	30,2	0,6	1,0	0,5	
Benzene	C6H6	1,2	8,0	2,7	2,10	1,05	
n-Butane	C4H10	1,5	8,5	2,0	1,8	0,9	
Ethane	C2H6	3,0	15,5	1,0	1,4	0,7	
Ethanol	C2H6O	3,3	19,0	1,6	1,6	0,8	
Ethylene	C2H4	2,7	34,0	1,0	1,4	0,7	
n-Hexane	C6H14	1,2	7,4	3,0	2,85	1,4	
Hydrogen	H2	4,0	75,6	0,07			1,0
Isopropanol	C3H8O	2,15	13,5	2,1	1,8	0,9	
JP-4					3,0	1,5	
JP-5					3,1	1,55	
JP-8					3,2	1,6	
Methane	CH4	5,0	15,0	0,55	1,0		
Methanol	CH3OH	5,5	44,0	1,1	1,35	0,65	
n-Pentane	C5H12	1,4	8,0	2,5	2,0	1,0	
Propane	C3H8	2,0	9,5	1,6	1,6	0,8	
Styrene	C8H8	1,1	8,0	3,6	2,4	1,2	
Toluene	C7H8	1,2	7,0	3,1	2,5	1,25	
Xylene	C8H10	1,0	7,6	3,7	2,4	1,2	

Cells with a grey background: gases recommended for calibrating the detector

Table 3 **: Calibration coefficients of explosive gases for catalytic detectors with a 4F sensor.**

Example

Calibration of an "acetone" detector with a calibration gas of 1% volume butane
Value to be displayed:

$$\frac{1\ \%\text{(injected butane)}}{1{,}5\ \%\text{ (LEL butane)}} \times 100 \times 0.95\ \text{(coefficient butane/acetone)} = 63\ \%\ \text{LEL}$$

Note:

- LEL values vary according to the source.
- Coefficients are accurate to ± 15%.

Chapter 5 | Preventive maintenance

Periodic checks enable the equipment and installation to remain in conformity and ensure reliable detection. This chapter describes what preventative action should be taken and at what intervals. Inspection and maintenance are carried out in accordance with standards in force EN60079-17 or IEC 60079-17, with whatever editions are in force or with other national standards.

Frequency of maintenance

Gas detectors are safety devices. OLDHAM recommends the regular testing of fixed gas detection installations. This type of test consists of injecting the calibration gas into the detector at a sufficient concentration to activate the pre-set alarms. It is to be understood that this test is in no way a replacement for a detector calibration.

The frequency of gas tests depends on the industrial application where the detector is in use. Frequent inspections should be made in the months following the commissioning of the installation, and should then become more widely spaced provided that no significant deviation is observed. If a detector should fail to react in contact with the gas, calibration is essential. The frequency of calibrations shall be appropriate according to the results of the tests (humidity, temperature, dust, etc.); however, it must not exceed one year.

The general manager should put safety procedures in place on-site. OLDHAM cannot be held responsible for their enforcement.

To attain SIL capability level 1 in accordance with European standard EN 50402, *Requirements relating to the safety operation of fixed gas detection systems*, the maintenance interval for explosive gas detectors must be no more than 6 months. To obtain SIL capability level 2, the maintenance interval must be no more than 3 months

Actions

Periodic maintenance comprises the following actions:

- Removal of dust from the sensor's protective housing, using only a dry cloth. No water or solvents should be used. Severely dusty heads or sensors should be replaced immediately.
- For use in dusty explosive atmospheres, the user should undertake full and regular cleaning to avoid the build-up of dust. The maximum permissible thickness of a dust layer must be less than 5 mm.
- Replacement of screws: if the screws on the fire-proof part "d" of the body need to be replaced, screws of equal quality or better than A4.70 should be used.
- Zero inspection with pure air.

Gas sensitivity inspection and possible adjustment, as per Chapter 4 | Calibration.

Chapter 6 | Maintenance

Maintenance primarily comprises changing any sensors that no longer meet their initial metrological characteristics.

Since they are liable to affect detection reliability, the tasks described in this chapter are reserved for authorized trained personnel only.

Inspection and maintenance shall be carried out in accordance with standards EN60079-17 or IEC 60079-17, with whatever editions are in force or with other national standards.

The 4 mA level is factory-set. This value cannot be changed or adjusted. This check does not concern explosimeter OLC 100.

Opening the cover

This stage is necessary for the 4 mA check, zeroing, and calibration of the detector. Unscrew the lid of the enclosure by using a tool positioned like a cross.

. All the necessary steps should be taken before opening the lid of the enclosure if it is installed in an ATEX zone, in particular:

- **A fire permit from the appropriate department.**
- **Continuous use of a portable explosimeter.**
- **Use of an intrinsically safe multimeter.**
- **Reduction to an absolute minimum of the time involved.**

This observation does not concern intrinsically safe versions that are used in an ATEX gas zone (see Chapter 11 | Specific instructions for use in explosive atmospheres and operational safety).

Checking the current generator

Although this setting is made in the factory, it is possible that the transmitter and controller may have to be matched. In this case, proceed as follows

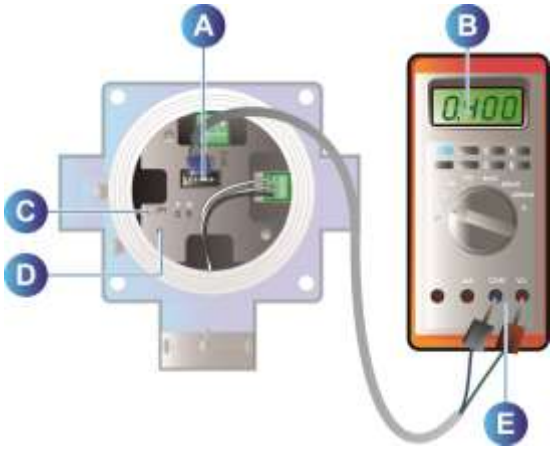

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Figure 15: checking the current generator

1. Insert the blue and green plugs on the measurement lead into the + and – multimeter sockets, respectively.
2. Insert the measurement lead plug into connector "A".
3. Use a small screwdriver to press the 4 mA adjust button "D".

   The instrument then sends a 4 mA signal down the line. The multimeter displays 400 mV.
4. On the controller (measurement and automation), check that the measurement displayed corresponds to 0% of the measurement scale.
5. If some different value is displayed, keep pressing the button and adjust P1 ("C").
6. Release the push-button "D". Remove the measurement lead when adjustment is complete.

Possible errors

The table below summarizes the various possible detector errors:

OLC 100 explosimeter

Observed fault	Possible cause	Action
Zero setting not possible	Sensor	Replace the sensor
	Cable	Check cable
	Main unit detector module	Check module
Sensitivity adjustment not possible	Sensor	Replace the sensor
	Connector cable	Check cable
	Inappropriate calibration gas	Check calibration gas concentration
High gas concentration indication	Maladjustment	Zero and span the detector

OLCT 100 Detector

Observed fault	Possible cause	Action
Line current 0 mA	Connector cable	Check cable
	Power supply	Check voltage
	PCB	Replace the PCB
Line current < 1mA		Power the detector down then power it up (Off/On)
	Sensor	Replace the sensor
	PCB	Replace the PCB
	Line resistance too high	Check cable
	Power supply	Check voltage
Analog output is frozen at 20 mA	Gas concentration has reached 100% LEL	Proceed a power cycle (Off/On) Zero and span the detector
Courant de ligne >23mA	Over Range	Adjust zero and sensitivity settings Replace the sensor
Zero setting not possible	Sensor	Replace the sensor
	PCB	Replace the PCB
Sensitivity adjustment not possible	Sensor	Replace the sensor
	PCB	Replace the PCB
High gas concentration indication	Maladjustment	Adjust zero and sensitivity settings

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Replacing sensor block

Standard Version

First follow the instructions in the section *Opening the cover*

The sensor block encloses the actual detector sensor itself. A sensor block can only be associated with a defined detector. A guide pin ensures that the sensor block goes together correctly

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Figure 16: The sensor block (the black component) fits in the cover of the head

Follow the procedure below :

- Inhibit any alarm signals on the controller.
- Switch off the supply to the detector.
- For a catalytic sensor, first remove the PCB connector.
- Loosen the locking screw on the detector head and unscrew the head.
- Withdraw the (catalytic) detector head or the defective sensor block (OLCT 100).
- Replace the worn-out sensor with an identical part.
- Screw the detector head back on again and tighten the locking screws.
- Re-establish the supply to the detector from the controller.
- Adjust the settings for the new detector (see Chapter 4 | Calibration, page 25).
- Close the detector cover.
- Reset any alarm signals on the controller.

High temperature version

Proceed as follows for the high temperature version.

- Inhibit any alarm signals on the controller.
- Switch off the supply to the detector.
- Loosen the maintenance screw (Figure 17, "B") on the detector head cover and remove it.
- Replace the defective detector head and replace the maintenance screw "B" on the detector head cover. Disconnect the high temperature cable from terminal block "A" on the detector head. Connect the high temperature cable to terminal block "A".

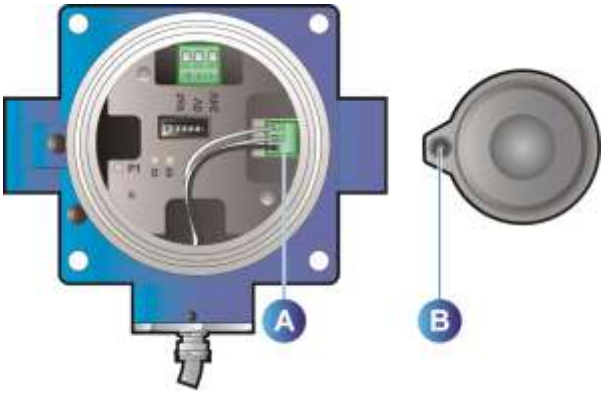

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Figure 17 : OLCT 100 HT – elements specific to changing the high temperature sensor

Screw the detector head back on again and tighten the locking screws.

- Re-establish the supply to the detector from the controller.
- Adjust the settings for the new detector (see Chapter 4 | Calibration, page25).
- Close the detector cover.
- Reset any alarm signals on the controller .

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Chapter 7 | Accessories

Accessory	Utilization	Illustration	Reference
Tools kit	Tool kit for OLCT 100 including calibration cup, Allen key, sensor removal key and connector cable		6147879
humidifier kit	Used for the calibration of the semi-conductor transmitters		6335918
Calibration cup	Facilitates the injection of calibration gas on the sensor Effect on measurement: measurement similar to that for natural diffusion Effect on response time: none	 204	6331141
PTFE remote sampling cup	Enables measurement in *bypass* mode Effect on measurement: no effect if calibration is carried out under the same conditions (cup, flow rate) Effect on response time: none	 200	6327910
Splash-guard kit	Protects the detector against splashes Effect on measurement: no effect. Effect on response time: response time for natural diffusion can increase for certain gases. Contact us for details.	 202	6329004
Remote calibration cup	Enables the detection of ambient gases simultaneously with a calibration gas injection pipe. Effect on measurement: no effect. Effect on response time: negligible.	 214	6327911

Accessory	Utilization	Illustration	Reference
PTFE water barrier	Protects the gas inlet from dust and splashing Effect on measurement: no effect, but cannot be used for detecting O_3, HCl, HF, or CL_2. Effect on response time: response time increased (contact us for heavy gases of a density greater than 3 and at low concentrations < 10 ppm	 216	6335975
Universal Pitot tube	Enables the measurement of a gas passing through a sheath Requires the use of the gas circulation head Effect on measurement: no effect. Effect on response time: negligible.	 224	6793322
Mounting kit	Enables a detector to be fixed to the ceiling. Effect on measurement: no effect. Effect on response time: no effect.	 218	6322420
Sunshield	Protects any detector mounted on the outside of a building. Effect on measurement: no effect. Effect on response time: negligible.	 222	6123716
Wall mounting gas collector	Allows the sensor to detect more quickly the gas. (Wall mounting) Effect on measurement: no effect. Effect on response time: response time can increase up to 10%.		6331169
Ceiling gas collector	Allows the sensor to detect more quickly the gas. (Ceiling) Effect on measurement: no effect. Effect on response time: response time can increase up to 10%.		6331168

Accessory	Utilization	Illustration	Reference
Replacement adaptater kit	Enables replacement of an existing detector without having to re-drill holes.	 220	6793718
Duct Mounting kit			B301172

Cable gland

Purpose	Reference
M20 cable gland for non-armoured cable Material: stainless steel	6343493
M20 cable gland for non-armoured cable Material: Nickel-plated brass (not recommended for use with ammonia or acetylene)	6343499
M20 cable gland for armoured cable Material: stainless steel	6343489
M20 cable gland for armoured cable. Material: Nickel-plated brass (not recommended for use with ammonia or acetylene)	6343495

Chapter 8 | Spare parts

List of spares for the various detectors

Part Number	Description
6 314 010	Catalytic sensor 0-100% LEL CFC100 VQ1 for OLC 100
6 313 994	Catalytic sensor 0-100% LEL CFC100 4F for OLCT 100
6 314 042	Infrared sensor 0-100% LEL CH4 for OLCT 100
6 314 102	Infrared sensor 0-100% LEL (4.4% vol) CH4 pour OLCT 100
6 314 108	Infrared sensor 0-100% VOL CH4 pour OLCT 100
6 314 103	Infrared sensor 0-100% LEL C3H8 pour OLCT 100
6 314 104	Infrared sensor 0-100% LEL C4H10 pour OLCT 100
6 314 105	Infrared sensor 0-100% LEL Isobutane pour OLCT 100
6 314 106	Infrared sensor 0-100% LEL GPL pour OLCT 100
6 314 128	Infrared sensor 0-100% LEL C5H12 pour OLCT 100
6 314 107	Infrared sensor 0-100% LEL ethanol pour OLCT 100
6 314 142	Infrared sensor 0-5000 ppm CO2 pour OLCT 100
6 314 043	Infra-red sensor 0-5% vol. CO2 for OLCT 100
6 314 109	Infrared sensor 0-10% vol CO2 pour OLCT 100
6 314 145	Infrared sensor 0-100% vol CO2 pour OLCT 100
6 314 016	Electrochemical sensor 0-30% O2 for OLCT 100
6 314 017	Electrochemical sensor 0-100 ppm, 0-500 ppm and 0-1000 ppm CO for OLCT 100
6 314 018	Electrochemical sensor 0-30.0 ppm, 0-100 ppm H_2S for OLCT 100
6 314 019	Electrochemical sensor 0-1000 ppm H_2S for OLCT 100
6 314 125	Electrochemical sensor 0-5000 ppm H2S pour OLCT 100
6 314 020	Electrochemical sensor 0-100 ppm, 0-300 ppm and 0-1000 ppm NO for OLCT 100
6 314 021	Electrochemical sensor 0-10.0 ppm and 0-30.0 ppm NO_2 for OLCT 100

Part Number	Description
6 314 022	Electrochemical sensor 0-10.0 ppm, 0-30.0 ppm and 0-100 ppm SO_2 for OLCT 100
6 314 025	Electrochemical sensor 0-10.0 ppm Cl_2 for OLCT 100
6 314 023	Electrochemical sensor 0-2000 ppm H_2 for OLCT 100
6 314 026	Electrochemical sensor 0-30.0 ppm, 0-100 ppm HCl for OLCT 100
6 314 028	Electrochemical sensor 0-10.0 ppm and 0-30.3 ppm HCN for OLCT 100
6 314 029	Electrochemical sensor 0-100 ppm NH_3 for OLCT 100
6 314 030	Electrochemical sensor 0-1000 ppm NH_3 for OLCT 100
6 314 031	Electrochemical sensor 0-5000 ppm NH_3 for OLCT 100
6 314 033	Electrochemical sensor 0-1.00 ppm PH_3 for OLCT 100
6 314 035	Electrochemical sensor 0-3.00 ppm ClO_2 for OLCT 100
6 314 024	Electrochemical sensor 0-30.0 ppm ETO for OLCT 100
6 314 032	Electrochemical sensor 0-1.00 ppm AsH_3 for OLCT 100
6 314 027	Electrochemical sensor 0-50.0 ppm SiH_4 for OLCT 100
6 314 034	Electrochemical sensor 0-1.00 ppm $COCl_2$ for OLCT 100
6 314 036	Semiconductor sensor for methyl and methylene chloride for OLCT 100
6 314 037	Semiconductor sensor for R12, R22, R123 and FX56 freons for OLCT 100
6 314 038	Semiconductor sensor for R134a, R142b, R11, R23, R141b, R143a, R404a, R507, R410a, R32, R227, R407c and R408a freons for OLCT 100
6 314 039	Semiconductor sensor for ethanol, toluene, isopropanol, 2-butanone and xylene for OLCT 100
6 451 626	OLC 100 Board
6 451 646	OLCT 100 IR Board
6 451 621	OLCT 100 SC Board
6 451 594	OLCT 100 catalytic Board
6 451 623	OLCT 100 toxic Board
6 451 649	Usual EC OLCT 100 Board
6 451 648	OLCT 100 O2 Board

Chapter 9 | Declarations of EC conformity

The document hereafter (2 pages) reproduces the EC declaration of conformity.

Déclaration de Conformité CE
EC Declaration of Conformity

La **Société Industrial Scientific Oldham**, ZI Est 62000 Arras France, atteste que les
The ***Company*** **Industrial Scientific Oldham**, *ZI Est 62000 Arras France, declares that*

Détecteurs de gaz OLC 100 et OLCT 100 (XP, XP IR, IS)
Gas detectors OLC 100 and OLCT 100 (XP, XP IR, IS)

sont conformes aux exigences des Directives Européennes suivantes :
comply with the requirements of the following European Directives :

1) Directive Européenne ATEX 94/9/CE du 23/03/94 : **Atmosphères Explosives**
European Directive ATEX 94/9/CE dated from 23/03/94: Explosive Atmospheres

Normes harmonisées appliquées : *Harmonised applied Standards*	**EN 60079 -0**:09	Protection du matériel-règles générales *Equipment protection-general requirements*
	EN 60079-1:07 ('d') **EN 60079-11**:12 ('i') **EN 60079-31**:09 ('t') **EN 60079-26**:07 ('Ga')	
	EN 60079-29-1:07[16]	Exigences d'aptitude à la fonction des détecteurs de gaz inflammables *(Performance requirements of detectors for flammable gases)*
	EN 50271:10	Appareils de détection de gaz utilisant un logiciel et/ou des technologies numériques *(Apparatus for the detection of gases using software and/or digital technologies)*

Attestation CE de Type du matériel : **INERIS 09 ATEX 0075X**
EC type examination certificate

Catégorie *(category)*/Marquage *(marking)* :

OLC 100 OLCT 100 (XP, XP IR)	**II 2 GD** **Ex d IIC T6 Gb / Ex tb IIIC T85°C Db** (-50°C<Ta<+70 °C)
OLCT 100 IS *(version aluminium / aluminum version)*	**II 2 GD** **Ex ia IIC T4 Gb / Ex ia IIIC T135°C Db** (-50°C<Ta<+70 °C)
OLCT 100 IS *(version inox / stainless steel version)*	**II 1 GD** **Ex ia IIC T4 Ga / Ex ia IIIC T135°C Da** (-50°C<Ta<+70 °C)

Déclaration de Conformité CE
EC Declaration of Conformity

OLDHAM

CE

INERIS

Notification Assurance Qualité de Production :
Notification of the Production QA
INERIS 00 ATEX Q403

Délivré par l'Organisme notifié numéro 0080 :
Issued by the Notified Body n°0080
INERIS, Parc Alata
60550 Verneuil en Halatte France

II) Directive Européenne CEM 2004/108/CE du 15/12/04: Compatibilité Electromagnétique
European Directive EMC 2004/108/CEE dated from 15/12/04: Electromagnetic Compatibility

Normes harmonisées appliquées :
Harmonized applied Standard
EN 50270:06 for type2:CEM-Appareils de détection de gaz
EMC- apparatus for the detection of gases

Sécurité de Fonctionnement *(Functional Safety)*

Normes appliquées
Applied Standards
EN 61508:11 et *(and)* **EN 50402**:05

Niveau d'intégrité de Sécurité[b]
Safety Integrity Level
Capability SIL 2 selon certificat INERIS
(according to INERIS certificate) No. 93664/2012

(a) OLC 100 et OLCT 100 XP avec cellule catalytique type VQ1
OLC 100 and OLCT 100 XP with VQ1 catalytic sensor

(b) OLC 100 et OLCT 100 XP avec cellule catalytique type VQ1
OLC 100 and OLCT 100 XP with VQ1 catalytic sensor

OLCT 100 XP et IS avec cellule CO, H2S, NH3 ou O2 (en cours)
OLCT 100 XP and IS with CO, H2S, NH3 or O2 sensors (pending)

Page 2 sur 2 (page 2 out of 2)

Arras, le 22/05/2013

ISO 9001:2008 CERTIFIE
ISO 14001:2004 CERTIFIE

Industrial Scientific Oldham
Z.I. EST - B.P. 417
62027 ARRAS Cedex – FRANCE
el Mobley www.oldhamgas.com

Certification Project Engineer

The document below (1 page) reproduces the 96/98/EC Marine Directive declaration of conformity (followed by the certificate, 3 pages).

OLDHAM

QUALITY DEPARTMENT

EC DECLARATION OF CONFORMITY TO TYPE FOR OLCT 100

In accordance with the Marine Equipment Directive (MED) 96/98/CE, as amended

DECLARATION N°: .....

Manufacturer's, or his authorized Representative's name & address:
OLDHAM SAS - ZI EST – RUE ORFILA –CS 20417- 62027 ARRAS CEDEX

Works' address:
OLDHAM SAS- ZI EST – RUE ORFILA – CS 20417- 62027 ARRAS CEDEX

In compliance with Article 10.2 of the Council Directive 96/98/EC, the Marine Equipment Directive, as amended. We declare under our sole responsibility that the products detailed below conform to type, as described in the EC Type Examination certificate:

No 35253/A0 EC, issued by Bureau Veritas on 11 Sep 2013

Product Types: OLC(T) 100 XP, OLC(T) 100 IS

Product Descriptions: OLCT 100, Gas Detector

We further declare also that these products have been marked for their identification in accordance with Article 11 of the Marine Equipment Directive, after having been duly authorized by the EC Notified Body, the identification number of whom is stated below.

Modules for Production conformity assessment, within which the EC Declaration of conformity is issued:
Module D - Production-Quality Assurance.
Quality System Approval Certificate N° SMS.MED.D/93734/A.0, issued by Bureau Veritas

Serial Numbers:

Limitation/Application:
The equipment fulfills the Directive 96/98/EC requirements for installation in General power Distribution Zone and/or Deck Zone

REGULATIONS and STANDARDS complied with:
SOLAS 74 convention as amended, regulations II-2/4, VI/3
IMO Res. MSC.98(73)-(FSS code) 15
MSC.1/Circ. 1370- MSC.291(87) Modifies Reg II-2/4- MSC 292(87) FSS Code Ch. 16
EN 60945 (2002) including IEC 60945 corrigendum 1 (2008)
IEC 60092-504 (2001), IEC 60533 (1999)
And as applicable to
EN 50104 (2010) Oxygen, EN 60079-29-1 (2007)

MARKING & IDENTIFICATION AFFIXED TO THE PRODUCTS:

0062

Serial number XXXXXXX-XXX
(The first 2 digits indicate the year of manufacture)

Issued at ARRAS FRANCE, on ..../..../... **by**
Marc TRIQUET
Quality Engineer

F2013-02/B

MARINE DIVISION

BUREAU VERITAS

Certificate number: 35253/A0 EC
File number: AP 4430
Annex A1 Item number: A.1/3.54

This certificate is not valid when presented without the full attached schedule composed of 7 sections

www.veristar.com

Notified Body 0062 - MARINE EQUIPMENT DIRECTIVE 96/98/EC

EC TYPE EXAMINATION CERTIFICATE

as per Module B of European Union Council Directive 96/98/EC on marine equipment as amended by Commission Directive 2011/75/EU

This certificate is issued to

OLDHAM SAS
ARRAS CEDEX - FRANCE

for the type of product

FIXED OXYGEN ANALYSIS AND GAS DETECTION EQUIPMENT
OLC(T)100 Gas Detector

Requirements:
SOLAS 74 convention as amended, Regulations II-2/4, VI/3.
IMO Res. MSC.98(73)-(FSS code) 15
MSC.1/Circ.1370 - MSC.291(87) Modifies Reg. II-2/4 - MSC.292(87) FSS Code Ch. 16
EN 60945 (2002) including IEC 60945 Corrigendum 1 (2008)
IEC 60092-504 (2001), IEC 60533 (1999)
and as applicable to:
EN 50104 (2010) Oxygen, EN 60079-29-1 (2007)

This certificate is issued under the French Maritime Authority to attest that BUREAU VERITAS did undertake the relevant type-examination procedures for the product identified above which was found to comply with the relevant requirements of the Council Directive 96/98/EC of 20 December 1996 as amended

This certificate will expire on: 11 Sep 2018

For BUREAU VERITAS Notified Body 0062,

At BV VALENCIENNES, on 11 Sep 2013,

Lucien Frallini

BUREAU VERITAS PARIS 1828 INTERNATIONAL REGISTER

This certificate does not allow to issue the Declaration of Conformity and to affix the mark of conformity (wheelmark) to the products corresponding to this type. To this end, the production-control phase module (D, E or F) of Annex B of the Directive is to be complied with and controlled by a written inspection agreement with a notified body.
This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with, BUREAU VERITAS. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. BUREAU VERITAS is designated by the French Maritime Authority as a "notified body" under the terms of the French Regulations Division 140 Chapter 140.0. This certificate is issued within the scope of the General Conditions of BUREAU VERITAS Marine Division available on the internet site www.veristar.com. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against BUREAU VERITAS for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION:

Explosimeter and oxygen gas detector - Model: **OLC(T) 100**

Detection Gas	Methane	Oxygen	Toxic
Detection principle:	Explosimeter Detector	Oxygen Detector	Toxicmeter Detector
Measuring Range:	0-100%LEL	0-30$_{vol}$%	
Ex Certification:	Ex d IIC T6 Gb, Ex t IIIC T85°C Db IP66.	Ex d IIC T6 Gb, Ex t IIIC T85°C Db IP66, Ex ia IIC T4 Gb Ex iaD 21 T135°C IP66	Ex d IIC T6 Gb, Ex t IIIC T85°C Db IP66, Ex ia IIC T4 Gb Ex iaD 21 T135°C IP66
Power Supply	24 VDC		
Ingress Protection	IP 66		

2. DOCUMENTS AND DRAWINGS:
User manual for OLC/OLCT100 detector No. NPO100GB-rev D, dated 2011.

3. TEST REPORTS:
CNPP:
- Environmental Test Report No. PN 12 8972, dated Aug 16, 2012.
EMITECH:
- Test Report EMITECH R022-PNN-12-102965-1
INERIS:
- EMC Test Report No. INERIS DRA-12-131030-05548A, dated Dec 09, 2012.
- Test Report No. INERIS DRA-10-106867-08821A, OLCT100 MethaneVQ1, dated August 2010.
- Test Report No. EDL15443-Vibration, dated March 30, 2010.
- Test Report No. INERIS-DRA-M00693-12/030, Oct 19, 2012.
- Test Report No. INERIS-DRA-M00045-09/079, Oct 10, 2010.
- Test Report No. INERIS-DRA-M00045-10/006, Jan 15, 2010.
OLDHAM:
- Test Report No. 387A OLCT100 O2 according to EN50104, dated Nov 07, 2012.
Certificates:
INERIS09ATEX0075X, dated 2010.05.07 & IECEx INE 09.0023X, dated 2010.05.02.

4. APPLICATION / LIMITATION:
4.1 - As per Requirements of Regulations stated on the front page of this certificate.
4.2 - The equipment fulfils the EMC requirements for installation in General Power Distribution Zone and / or Deck Zone.

5. PRODUCTION SURVEY REQUIREMENTS:
This certificate does not allow the applicant to issue the Declaration of Conformity and to affix the mark of conformity (wheelmark) to the products corresponding to this type. To this end, the production-control phase module D "Production Quality Assurance" or E "Product Quality Assurance" or F "Product Verification" of Annex B of the Directive is to be complied with and controlled by a written inspection agreement with a Notified Body.

6. MARKING OF PRODUCT:
- Ex marking as relevant.
- Markings as per MED 96/98/EC:
  - YYYY/XX where YYYY is the number of the Notified Body undertaking surveillance module (when BV, 0062) and where XX are the last two digits of year mark affixed.

7. OTHERS:
This approval is given on the understanding that the Society reserves the right to require check tests to be carried out on the units at any time and that: **OLDHAM SAS - ZONE INDUSTRIELLE EST - Rue Mathieu Orfila -BP 20417 - 62027 ARRAS CEDEX - FRANCE** will accept full responsibility for informing shipbuilders, ship-owners or their sub-contractors of the proper methods of use and general maintenance of the units and the conditions of this approval.

*** END OF CERTIFICATE ***

Chapter 10 | Technical specifications

Dimensional characteristics

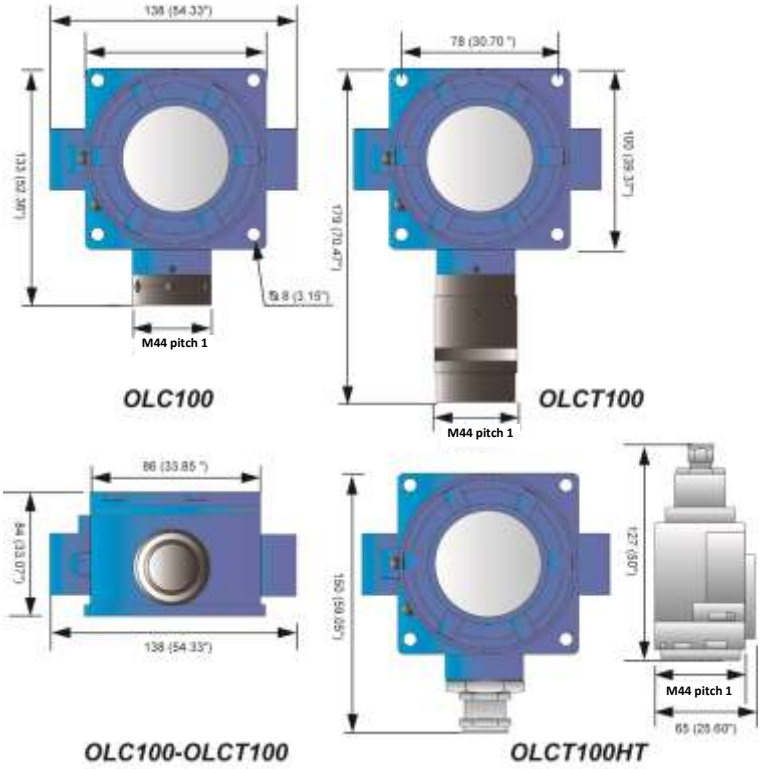

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Figure 18: dimensional characteristics of the detectors

General Specifications

Supply voltage at the detector terminals:	▪ OLC 100: 340 mA (current supply) ▪ OLCT 100 XP HT: 15.5 V to 32 V ▪ OLCT 100 XP LEL: 15.5 V to 32 V ▪ OLCT 100 XP IR: 13.5 V to 32 V ▪ OLCT 100 XP EC: 10 V to 32 V ▪ OLCT 100 XP SC: 15.5 V to 32 V
Average consumption:	▪ OLC 100: 340 mA ▪ OLCT 100 XP HT: 100 mA ▪ OLCT 100 XP LEL: 110 mA ▪ OLCT 100 XP IR: 80 mA ▪ OLCT 100 XP EC: 23.5 mA ▪ OLCT 100 XP SC: 100 mA
Output current (signal):	▪ Current source encoded from 0 to 23 mA (non isolated) ▪ Linear 4 to 20 mA current reserved for measurement ▪ 0 mA: electronic fault or no power supply ▪ < 1 mA: fault ▪ 2 mA : initialization mode ▪ frozen to 20 mA : the concentration of combustible gas has reached 100% LEL
Type of cable	▪ Explosimeter: screened, 3 active wires ▪ HT Explosimeter: screened, 3 active wires ▪ Electrochemical detector: screened, 2 active wires ▪ Infra-red detector: screened, 3 active wires ▪ Semiconductor detector: screened, 3 active wires
Cable inlet:	M20x1.5 (cable gland not suppled) or ¾ NPT
Maximum diameter of cable entering the detector:	12 mm
Electromagnetic compatibility:	Conforms to EN50270
Ingress Protection:	IP66
Approvals :	Conforms to European Directive ATEX 94/9/CE (see attached Declaration) and to IEC Ex schedule for fire-proof detectors SIL 2 in accordance with EN50402:05 /EN61508:11 Performance approved according to EN 60079-29-1:07 (VQ1 catalytic bead)

Weight :	▪ OLC 100: 0.950 kg. ▪ OLCT 100 XP HT: 1.8 kg. ▪ OLCT 100 XP LEL: 1.0 kg. ▪ OLCT 100 XP IR: 1.1 kg. ▪ OLCT 100 XP EC: 1.1 kg. ▪ OLCT 100 XP SC: 1.1 kg.
Materials:	Epoxy painted aluminum, 316 Stainless Steel in option

Catalytic sensor (OLCT 100 XP)

Common characteristics

Measurement range	0–100% LEL
Measurement principle:	catalytic
Accuracy:	see table below
Temperature range:	see table below
Relative humidity:	0 to 95% RH (non-condensing relative humidity)
Pressure:	atmospheric ± 10%
Response time:	T_{50} = 6 seconds. T_{90} = 15 seconds for Methane
Lifetime (typical)	48 months
Storage conditions:	-50 to 70°C, 20 to 60% RH, 1 bar ± 10%, 6 months maximum
Warm-up time (max)	2 hours to first switching on power

Specific characteristics

Type of sensors	Accuracy	Operating temperature range
Anti-poison sensor 4F (unmarked sensor)	1% LEL between 0- 70 %LEL 2% of the measurement between 71 and 100% LEL	-40 to +70°C
VQ1 sensor (sensor with identifying mark)	1% LEL between 0- 70 %LEL OLCT 100 : 2% of the measurement between 71 and 100% LEL OLC 100 : 5% of the measurement between 71 and 100 % LEL	-40 to +70°C
VQ1 sensor, high temperature assembly	1% LEL between 0-70%LEL 2% of the measurement between 71 and 100% LEL	-20 to +200°C

4F poison resistant sensor

Figure 19: mark on VQ1 sensor

Toxic sensors (OLCT 100 XP and OLCT 100 IS)

Common characteristics

Measurement principle:	Electrochemical sensor
Pressure:	Atmospheric ± 10%

Type of gas		Measurement range (ppm)	XP Version	IS Version	Temperature range °C	% RH	Accuracy (ppm)	Lyfe (months)	Reponse time T_{50} / T_{90} (s)	Storage conditions	Warm-up time max (h)
AsH_3	Arsine	1,00		■	-20 à +40	20 - 90	+/- 0,05	18	30/120	(1)	1
CH_2O	Formaldéhyde	50,0		■	-20 à +50	15 - 90	+/- 1,5	36	50/240	(1)	36
Cl_2	Chlore	10,0		■	-20 à +40	10 - 90	+/- 0,4	24	10/60	(1)	1
ClO_2	Dioxyde de chlore	3,00		■	-20 à +40	10 - 90	+/- 0,3	24	20/120	(1)	1
CO	Monoxyde de carbone	100 300 1000	■ ■ ■	■ ■ ■	-20 à +50	15 - 90	+/- 3 (gamme 0-100)	36	15/40	(1)	1
$COCl_2$	Phosgene	1,00		■	-20 à +40	15 - 90	+/- 0,05	12	60/180	(2)	1
ETO	Oxyde d'ethylene	30,0		■	-20 à +50	15 - 90	+/- 1	36	50/240	(1)	36
H_2	Hydrogene	2000	■	■	-20 à +50	15 - 90	+/-5 %	24	30/50	(1)	1
H_2S	Hydrogene sulfure	30,0 100 1000	■ ■ ■	■ ■ ■	-40 à +50	15 - 90	+/- 1,5 (gamme 0-30)	36	15/30	(1)	1
HCl	Acide chlorhydrique	30,0 100		■ ■	-20 à +40	15 - 95	+/- 0,4 (gamme 0-10)	24	30/150	(1)	24

NH_3	Ammoniac	100 1000 5000	■ ■ ■	■ ■ ■	-20 à +40	15 - 90	+/- 5 +/- 20 +/-150 ou 10%	24	50/90 50/90 50/120	(1)	1
NO	Monoxyde d'Azote	100 300 1000	■ ■ ■	■ ■ ■	-20 à 50	15 - 90	+/- 2 (gamme 100)	36	10/30	(1)	1
NO_2	Dioxyde d'Azote	10,0 30,0		■ ■	-20 à 50	15 - 90	+/- 0,8	24	30/60	(1)	12
O_2	Oxygene	0-30% vol	■	■	-20 à +50	15 - 90	0,4 % vol (de 15 à 22 % O_2)	30	6/15	(1)	Aucun (3)
PH_3	Phosphine	1,00		■	-20 à +40	20 - 90	+/- 0,05	18	30/120	(1)	1
SiH_4	Silane	50,0		■	-20 à +40	20 - 95	+/- 1	18	25/120	(1)	1
SO_2	Dioxyde de Soufre	10,0 30,0 100		■ ■ ■	-20 à +50	15 - 90	+/- 0,7 (gamme 0-10)	36	15/45	(1)	1

(1) 4 – 20 °C
20 – 60 % RH
1 bar ± 10 %
6 months maximum

(2) 4 – 20 °C
20 – 60 % RH
1 bar ± 10 %
3 months maximum

(3) If cartridge is mounted in the transmitter

Semiconductor sensors (OLCT 100 XP)

Common characteristics

Measurement principle:	semiconductor
Temperature range:	-20°C to +55°C
Relative humidity:	20 to 95% RH (non-condensing relative humidity)
Pressure:	atmospheric ± 10%
Lifetime (typical):	40 months
Storage conditions:	-20 to 50 °C, 20 to 60% RH, 1 bar ± 10%, 6 months maximum
Warm-up time (max):	4 hours to first switching on power

Type of gas		Measurement range	Accuracy	T_{50} / T_{90} (s)
Methyl chloride	CH_3Cl	500 ppm	+/- 15% (from 20 to 70% FS)	25/50
Methylene chloride	CH_2Cl_2	500 ppm		
Freon R12		1 %vol	+/- 15% (from 20 to 70% FS)	25 / 50
Freon R22		2000 ppm		
Freon R123		2000 ppm		
FX56		2000 ppm		
Freon R134 a		2000 ppm	+/- 15% (from 20 to 70% FS)	25 / 50
Freon R11		1 % vol		
Freon R23		1 % vol		
Freon R143 a		2000 ppm		
Freon R404 a		2000 ppm		
Freon R507		2000 ppm		
Freon R410 a		1000 ppm		
Freon R32		1000 ppm		
Freon R407 c		1000 ppm		
Freon 408 a		4000 ppm		
Ethanol		500 ppm	+/- 15% (from 20 to 70% FS)	25 / 50
Toluene		500 ppm		
Isopropanol		500 ppm		
2-butanone (MEK)		500 ppm		
Xylene		500 ppm		

Infrared sensors (OLCT 100 XP-IR)

Measurement range:	0–100% LEL (explosive gases) 0-100% Vol CH4
	0-5000ppm CO_2 0–5% CO_2 (carbon dioxide) 0-10% CO_2 0-100% CO_2
Measurement principle:	Infra-red absorption
Accuracy:	- CO_2 version: +/- 3% of full-scale at mid-scale (20°C) - LEL version: +/- 5% of full-scale at mid-scale (20°C)
Temperature range:	-40 to +55 °C (LEL and Vol CH4) -20 to +50 °C (CO_2)
Relative humidity:	0 to 95 % RH (non-condensing relative humidity)
Pressure:	Partial pressure measurement (the measurement changes with pressure)
Response time:	- CO_2 version: T_{50} → 11 s and T_{90} → 30 s - LEL version: T_{50} → 11 s and T_{90} →30 s
Lifetime (typical):	60 months
Storage conditions:	4–20°C 10–60% RH 1 bar ± 10% 6 months maximum
Warm-up time (max):	2 hours to first switching on power

Chapter 11 | Specific instructions for use in explosive atmospheres and operational safety

General comments

OLC/OLCT 100 conforms to the requirements of European Directive ATEX 94/9/CE relating to explosive Dust and Gas atmospheres. On account of their metrological performance as tested by the accredited organization INERIS (in process), the OLC/OLCT 100 transmitter detectors intended for the measurement of explosive gases are classed as safety devices in the sense of the European Directive and may, therefore, contribute to limiting the risks of explosion.

The information given in the following sections should be respected and taken into account by the manager of the site where the equipment is installed. As far as the aim of improving the health and safety of workers who are exposed to the risks of explosive atmospheres is concerned, refer to European Directive ATEX 1999/92/CE.

OLC/OLCT 100 detectors also conform to the requirements of the IEC international certification scheme relating to explosive Dust and Gas atmospheres.

Two modes of protection can be used:

- The mode of protection using fire-proof housing "d" for gaseous explosive atmospheres, or housing "tb" for explosive dust atmospheres.
- The intrinsically safe "ia" mode of protection for gaseous explosive atmospheres, or "id" for explosive dust atmospheres.

Cable Entries

Cable glands shall be flameproof certified (« d ») for use in explosive atmospheres. Ingress Protection will be greater or equal to IP66. Cable glands will be mounted according to IEC/EN 60079-14 standard, edition in force, and to additional requirements from local standards. They shall be of M20x1.5 or ¾ NPT type. In the case of an ISO thread (M20), the engagement shall be 5 threads at least. Cables used shall have an operating temperature range equal or greater than 80 °C.

Threaded joints

The threaded joints on the OLC(T)100 may be lubricated to maintain fire-proof protection. Only non-hardening lubricants or non-corrosive agents having no volatile solvents may be used. Warning: silicone based lubricants are strictly forbidden, since they contaminate the OLC(T)100 detector elements.

Metrological performance for the detection of flammable gases

Standard C1000 OLC/OLCT 100 filament version detectors conform to IEC / EN 60079-29-1 standards, *Suitability requirements for the operation of flammable gas detectors*, category 0 to 100% LEL Group II, reference gas 0-100% LEL Methane and Propane.

These detectors are classed as safety devices according to ATEX 94/9/CE Directive and may, therefore, contribute to limiting the risks of explosion. For this to be so, they must be connected to Oldham type MX 15, MX 32, MX 42A, MX 48, MX 43, MX 52 or MX 62 detection controllers, or otherwise connected to measurement systems with 4-20 mA inputs conforming to section 1.5 of Annex II of Atex Directive 94/9/CE and compatible with their characteristics (see transfer curve).

Transfer curve

The curve shown gives the transmitter output current as a function of the gas concentration. If the user connects the transmitter to a controller other than the one provided by Oldham, they should be certain that the transfer curve is fully compatible with the input characteristics of their equipment to ensure the proper interpretation of the information provided by the transmitter. Similarly, the controller should provide sufficient voltage to compensate for any voltage drop in the cable.

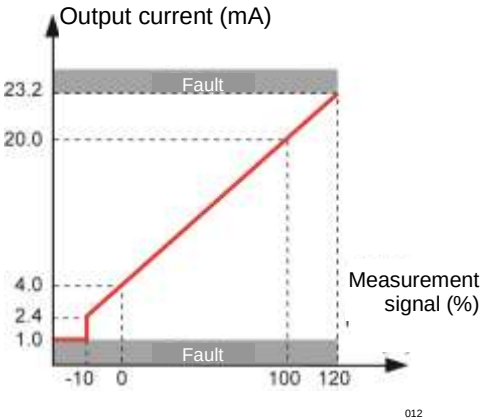


Figure 20: transfer curve for a 4-20 mA detector

Scope of use

Gas sensors have certain limitations; it is essential to fully recognize these limitations (see Chapter 10).

Presence of specific components

- Vapour from silicone or sulphur-containing components can affect the catalytic gas detector sensors and thereby distort the measurements. If the sensors have been exposed to these types of compounds, an inspection or calibration will become necessary.
- High concentrations of organic solvents (e.g. alcohols, aromatic solvents, etc.) or exposure to quantities of gas greater than the specified range of measurement can damage the electrochemical sensors. Inspection or calibration is then recommended.
- In the presence of high concentrations of carbon dioxide (CO_2 > 1% vol.), the oxygen-measuring electrochemical sensors can slightly overestimate the concentration of oxygen (0.1 to 0.5% O_2 overestimate).

Operation under low oxygen levels

- If an electrochemical detector sensor is used in an atmosphere comprising less than 1% oxygen for over one hour, the measurement may be an underestimate.
- If a semiconductor detector sensor is used in an atmosphere comprising less than 10% oxygen, the measurement may be an underestimate.
- If a semiconductor detector sensor is used in an atmosphere comprising less than 18% oxygen, the measurement may be an underestimate.

Functional safety

The detector is certified by INERIS (in process) to be in conformity with the requirements of standard EN 50402 for SIL capability 1 and 2 for the CH_4 and HC versions. Applicable since 2005, this standard is concerned with electrical apparatuses for the detection and measurement of oxygen or toxic or flammable gases or vapors, and defines the requirements relating to the safety function of fixed gas detection systems.

The detector has been developed in conformity with standard EN/CEI 61508.

The safety function of the OLC/OLCT 100 detector is the detection of flammable gases using catalytic technology and a 4-20 mA current output proportional to the gas concentration expressed as a percentage of LEL, respectively from 0 to 100% LEL. In the event of failure, the current will assume a fall-back value less than or equal to 1 mA or greater than or equal to 23 mA.

The safety function is no longer valid:

- After power has been switched on, while the measurement sensor is stabilizing and during start-up tests, the output current shall be in maintenance mode (2 mA).
- When the push button is pressed (forcing the current to 4 mA), the output current will be frozen at 4 mA.

Reliability data

These data are based on feedback from experience in the field. The analysis of the information recorded during maintenance by our technical team has enabled us to determine the following Probabilities of Failure on Demand under normal conditions of use:

Type of gas	Measurement principle	SIL Capability	λ_{DU}	PFD_{AVG}	Test period	SFF
LEL	Catalytic (VQ1)	SIL 2	$1{,}89\ 10^{-7}$	$8{,}3\ 10^{-4}$	12 months	92,9%
Oxygen(*)	Electrochemical	SIL 2	$0{,}74\ 10^{-6}$	$0.81\ 10^{-3}$	3 months	60% to 90%
CO(*)	Electrochemical	SIL 2	$1{,}09\ 10^{-6}$	$1{,}19\ 10^{-3}$	3 months	60% to 90%
H_2S(*)	Electrochemical	SIL 2	$2{,}98\ 10^{-6}$	$3{,}26\ 10^{-3}$	3 months	60% to 90%
NH_3(*)	Electrochemical	SIL 2	$4{,}48\ 10^{-6}$	$4{,}91\ 10^{-3}$	3 months	60% to 90%

(*) certification pending

Special conditions of use

In case of exposure above the measuring range, it is mandatory to bump test the instrument with gas and/or to perform a calibration.

In the event of a change of position, it is necessary to re-calibrate the detector.

OLCT 100 IS (intrinsic safety mode of protection)

The detector must be powered by an intrinsically safe source.

The detector input characteristics on the J3 power plot are:

Ui = 28V, Ii = 93.3 mA, Ci = 39.2 nF, Li = 0

Ci = 2.39 µF with Ui = 10.5V, Ci = 4.32µF with Ui = 8.6V

The detector may be opened in a gaseous explosive zone (dusty non-explosive) only to change the sensor block or for maintenance or to connect a compatible intrinsically safe voltmeter with the following characteristics:

- Certified for use in explosive atmospheres (Group IIC), no generator of current or voltage
- Ui max <= 28V; Ii max <= 93.3 mA
- Li ≤ 3.5 mH
- Ci ≤ 44 nF under 28V ; Ci ≤ 20 nF under 10.5 V ; Ci ≤ 0.88 µF under 8.6V

Appendix | Ordering information

Gas List

Please find below the list of gases that the OLC/OLCT 100 detector can detect.

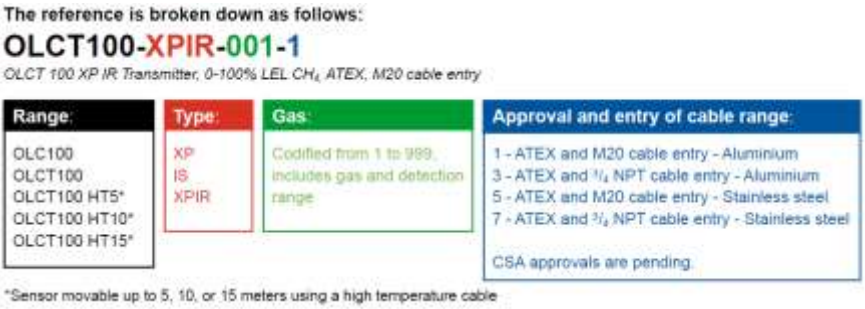
Gas Code	Gas
001	Methane 0-100 % LEL
002	Methane 0-100% LEL (4.4% vol)
003	Hydrogen 0-100% LEL
004	Butane 0-100% LEL
005	Propane 0-100% LEL
006	Ammoniac 0-100% LEL
007	Ethyl Acetate 0-100% LEL
008	Butyl Acetate 0-100% LEL
009	Methyl acetate methyle 0-100% LEL
010	Acetone 0-100% LEL
011	Acetonitrile 0-100% LEL
012	Acetylene 0-100% LEL
013	Acrylic acid 0-100% LEL
014	Acroleine 0-100% LEL
015	Butyl acrylate 0-100% LEL
016	Ethyl Acrylate 0-100% LEL
017	Acrylonitrile 0-100% LEL
018	Benzene 0-100% LEL
019	1.3-Butadiene 0-100% LEL
020	Butanol (isobutanol) 0-100% LEL
021	2-Butanone 0-100% LEL
022	Cumene 0-100% LEL
023	Cyclohexane 0-100% LEL
024	Cyclohexanone 0-100% LEL
025	Dimethylether 0-100% LEL
026	Dodecane 0-100% LEL
027	Ethane 0-100% LEL
028	Ethanol 0-100% LEL
029	Ether (diethylether) 0-100% LEL
030	Ethylene 0-100% LEL
031	Formaldehyde 0-100% LEL
032	LPG 0-100% LEL

Gas Code	Gas
033	Diesel 0-100% LEL
034	Natural gas 0-100% LEL
035	Heptane 0-100 % LEL
036	Hexane 0-100% LEL
038	Isobutane 0-100% LEL
039	Isobutene 0-100% LEL
040	Isopropanol 0-100% LEL
041	Kerosene (JP4) 0-100% LEL
042	Methyl Methacrylate 0-100% LEL
043	Methanol 0-100% LEL
044	Methylamine 0-100% LEL
045	Naphta 0-100% LEL
046	Naphtalene 0-100% LEL
047	Nonane 0-100% LEL
048	Octane 0-100% LEL
049	Ethylene Oxide (epoxyethane) 0-100% LEL
050	Propylene Oxide (Epoxypropane) 0-100% LEL
051	Pentane 0-100% LEL
052	Propylene 0-100% LEL
054	Styrene 0-100% LEL
055	Gasoline Lead free 0-100% LEL
056	Toluene 0-100% LEL
057	Trimethylamine 0-100% LEL
058	White spirit 0-100% LEL
059	Xylene 0-100% LEL
060	Methane 0-100% volume
064	MIBK 0-100% LEL
065	HFO 0-100% LEL
066	DMA 0-100% LEL
200	Oxygen O2 (electrochemical) 0-30% vol
203	CO, 0-100 ppm
204	CO, 0-300 ppm
205	CO, 0-1,000 ppm
213	H_2S, 0-30 ppm
214	H_2S, 0-100 ppm
215	H_2S, 0-1,000 ppm
216	NO, 0-100 ppm
217	NO, 0-300 ppm
218	NO, 0-1,000 ppm
219	NO_2, 0-10 ppm
220	NO_2, 0-30 ppm

Gas Code	Gas
221	SO_2, 0-10 ppm
222	SO2, 0-30 ppm
223	SO_2, 0-100 ppm
224	Cl_2, 0-10 ppm
225	H_2, 0-2,000 ppm
227	HCl, 0-30 ppm
228	HCl, 0-100 ppm
229	HCN, 0-10 ppm
230	HCN, 0-30 ppm
231	NH_3, 0-100 ppm
232	NH_3, 0-1,000 ppm
233	NH_3, 0-5,000 ppm
235	ClO_2, 0-3 ppm
239	CO_2, 0-5%
240	CO_2, 0-10 % volume
241	CO_2, 0-100 % volume
242	PH_3, 0-1 ppm
243	AsH_3, 0-1 ppm
244	ETO, 0-30 ppm
245	SiH_4, 0-50 ppm
246	$COCl_2$, 0-1 ppm
247	Formaldehyde, 0-50 ppm
248	ETO, 0-100 ppm
249	H_2S, 0-5000 ppm
250	Methanol, 0-1000 ppm
251	N_2H_4, 0-1 ppm
252	CO_2, 0-5000 ppm
253	Ethyl Mercaptant, 0-100 ppm
254	Dimethyl sulfide, 0-100 ppm
255	HBr, 0-30 ppm
256	HBr, 0-100ppm
257	BCl_3, 0-10 ppm
258	F_2, 0-5 ppm
500	R12, 0-1% volume
501	R22, 0-2,000 ppm
502	R134a, 0-2,000 ppm
503	R141, 0-2,000 ppm
504	R142b, 0-2,000 ppm
505	R11, 0-1% volume
506	R23, 0-1% volume
507	Dichloromethane, 0-500 ppm

Gas Code	Gas
508	Chloromethane (Methylchloride), 0-500 ppm
509	R123, 0-2,000 ppm
510	FX56, 0-2,000 ppm
511	R143a, 0-2,000 ppm
512	R404a, 0-2,000 ppm
513	R507, 0-2,000 ppm
514	R410a, 0-1,000 ppm
515	R32, 0-1,000 ppm
516	R227, 0-1% volume
517	R407c, 0-1,000 ppm
518	R408a, 0-4,000 ppm
519	R407f, 0-1000ppm
656	Ethanol, 0-500 ppm
657	Toluene, 0- 500 ppm
658	Isopropanol, 0-500 ppm
659	2-Butanone (MEK), 0-500 ppm
660	Xylene, 0-500 ppm
661	Styrene, 0-500 ppm
662	HFO, 0-1000ppm

To know you part number, please follow these instructions:



The Fixed Gas Detection Experts

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