SIMRAD Optronics
icare

Installation, Operating and Maintenance Manual

Explosimeter/Catharometer
Compact Sensor
DMCX61 and DMCK61

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Explosimeter / Catharometer

You have just acquired an SIMRAD OPTRONICS ICARE compact sensor explosimeter or catharometer and we thank you.

Thorough studies have been undertaken on this product to guarantee you maximum operating safety, large flexibility of use and maintenance whilst proposing excellent performance.

This manual is meant for the installer, the operator and the maintenance department.

After the general and technical specification chapters, every building trade will find the chapters corresponding to its necessary information.

Reading the present manual is essential for any person intervening at installation level and before the first installation, at operating level and at equipment maintenance level.

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1. GENERAL

The DMCX61 explosimeter is a low-temperature catalytic oxidation polling sensor. The DMCK61 catharometer measures gases by means of thermal conductivity.

The DMCX61 explosimeter is designed to monitor the risks of explosion induced by the presence of inflammable gases or vapors (hydrogen, hydrocarbons, alcohol, etc.).

The explosimeter measurement principle requires a minimum oxygen content; the characteristics may be altered by certain poisons (silicones, etc.).

The DMCK61 catharometer is mainly designed for detection or measurement of gas concentrations in industrial, chemical and nuclear environments.

MDXi Multichannel Detection Unit and Programmable Logic Controllers

The DMCX61 explosimeter and the DMCK61 catharometer are connected either to a 1/2mA channel board or a 4/20mA channel board on an SIMRAD OPTRONICS ICARE multichannel detection unit; or directly to an 4/20mA or 0/22mA input on a commercially-available PLC.

Easy Installation

The housing used consists of two parts: A wall-mounted support on which the cable gland and a unit housing the electronics and the detection cartridge are fixed.

It is possible to assemble and dismantle the electronics unit or the cartridge without removing the cable from the cable gland, which reduces the time required for installation and maintenance and lowers the risks of damaging the cable and the metal armoring.

Disconnectable Cartridge

The detection cartridges can be disconnected using a safety procedure.

They are common to the entire range of SIMRAD OPTRONICS ICARE explosimeters and catharometers (DMRX60, DMRX61, DMRX63, DMRK60, DMRK61 and DMRK63 network remote sensors, DMTX60, DMTX61, DMTX63, DMTK60, DMTK61 and DMTK63 remote sensors and DMCX60, DMCX61, DMCK60 and DMCK61 compact sensors) in order to reduce the number of spare parts required.

1.1. IDENTIFICATION AND MARKING

The SIMRAD OPTRONICS ICARE range of gas detectors is broken down into several families of detectors ensuring different types of protection for different gases. The original reference system below is used to identify the main characteristics of an SIMRAD OPTRONICS ICARE detector.

Explanation of the References

COMPLETE DESIGNATION						
Generic designation				Cartridge reference		
C	**T**	**60**	**A**	**M**	**01**	**- A**
Detector Family	Type of detection	Type of housing	Type of output	Type of cell	Characteristics	Type of material
C : compact	T : Toxicity	60 : BT 606	M : 1 - 2 mA	TOX/02 :		- A : Aluminium housing and cartridge
T : Remote sensor	O : Oxygen	61 : BT606 high	A : 0 - 22 mA	M : ICARE	See appendix C	- X : SS housing and cartridge
R : Network	X : Explosimeter	62 : BT606 low temperature	E : 4 - 20 mA	Y : Toxicity	and D dated D9606012	
E: Echo	K : Catharometer	05 : BT05 (alu)	L : LON	N : Toxicity		
	I : IR polling	07 :BT07 (SS)	W : Wheatstone	G : Toxicity		
	V : ultraviolet and infrared	50 : UVIR rect.		OTHERS :		
		40 : IREX rect.		X : Explosimeter		
		63 : BT606 + digital board		K : Catharometer		
		64 : BT606 + digital board + low temp.		I : IREX atmosphere		
		08 : PVC box for Echo		R : IREX circulation		
				V : UV + IR^2		
				W : UV		
				D : IR + IR		
				S : Surface conversion type		
				C : input courant		

The various characteristics which identify the detector for the different users are specified on a label placed on the underside of the detector's main body and are :

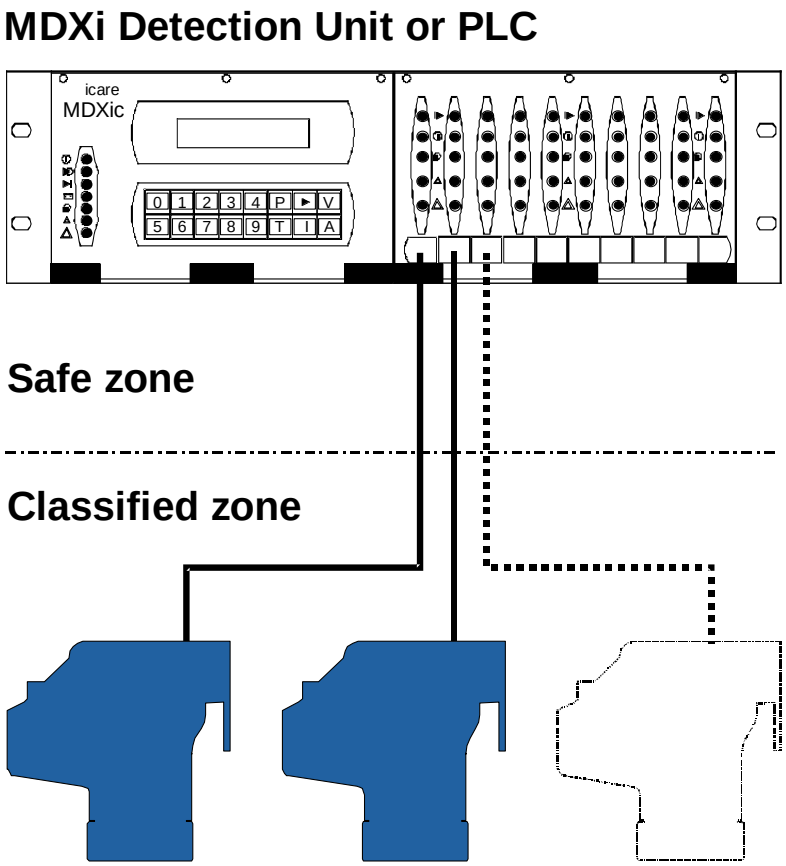
- manufacturer : SIMRAD OPTRONICS ICARE
- model : DM…
- serial n°: S/N : xxxxxxxxx
- approval type: CE 0081 Ⓔx II2G / EEx d IIC T6
- certification number : LCIE 03 ATEX 6263
- following warnings: *Do not open while energized*
- degree of protection: *IP66*
- voltage : *VDC : 28V*
- consumption : W :

As shown in the reference table, there are several types of cell corresponding to the different SIMRAD OPTRONICS ICARE gas detectors. In order to facilitate their identification, a color-code system has been used on the cell ring:

- YELLOW for explosimeters,
- BROWN for catharometers.

This label also indicates the type of gas and the scale for which it is intended. Of course, to ensure correct operation of the entire system, these indications must be the same as those marked on the label placed on the detector itself.

1.2. ARCHITECTURE



1.3. BREAKDOWN

The explosimeter/catharometer compact sensors comprise:

- A wall-mounted support secured by two screws, with a cable gland and three plugs, which can be replaced by a cable gland if necessary (see chapter 3.4 "Accessories").
- A housing containing a printed circuit board.
- A cartridge colored yellow for explosimeters and brown for catharometers, located in the lower part of the detector. This cartridge is connected to the sensor by a hollowed bolt which leaves the label visible.

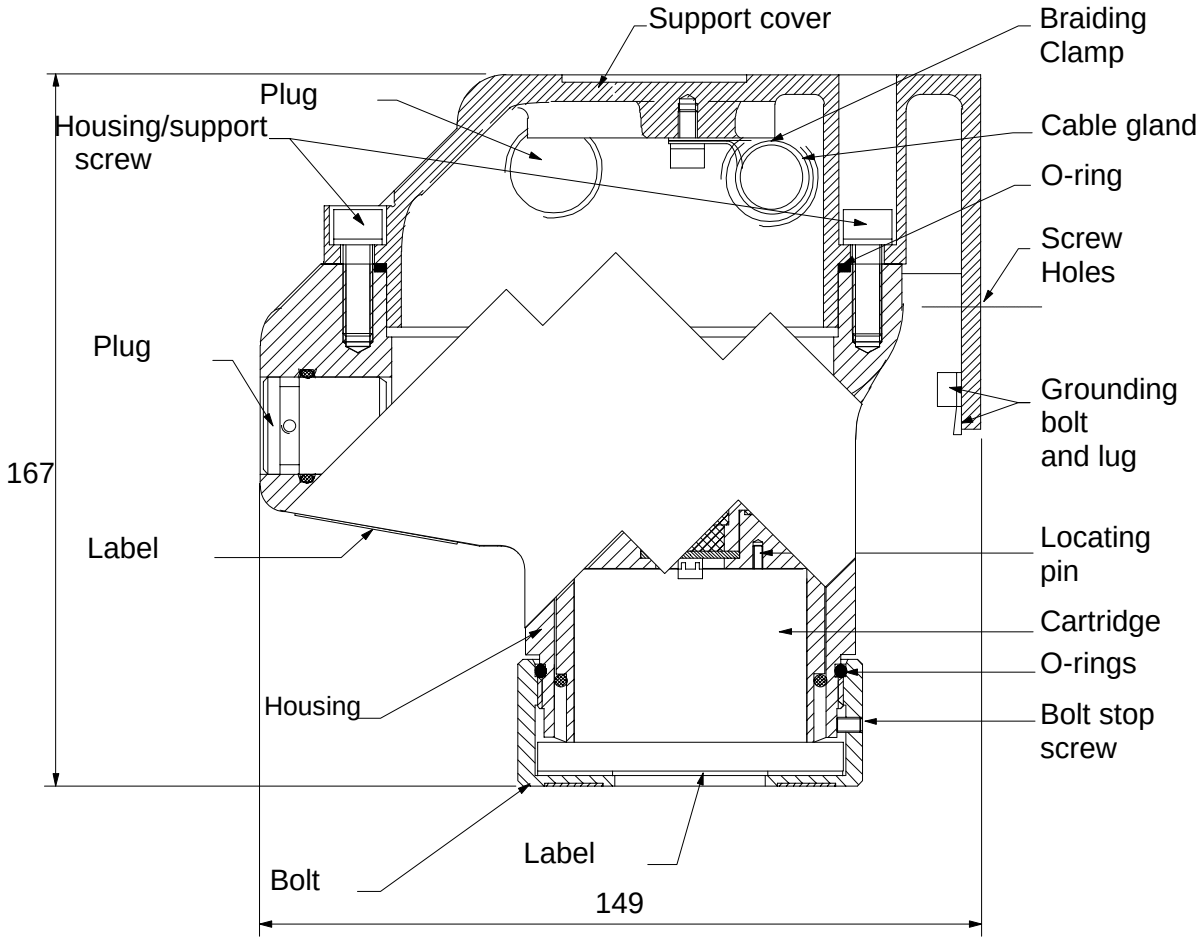


Figure 1: Layout Drawing

2. TECHNICAL SPECIFICATIONS

2.1. CERTIFICATION AND ⟨Ex⟩ REFERENCE STANDARDS FOR EXPLOSIVE ATMOSPHERES AND EMC

The equipment has been designed to meet the most stringent European and product standards, as listed below:

- European Directive 94/9/CE for products intended for operation in explosive atmospheres (normally called the ATEX directive). For the certified equipment, this is shown on the detector's label by the symbol ⟨Ex⟩, along with the required protection rating and the number of the approval obtained from a certified laboratory. The directive refers to the harmonized European Standards satisfied by the detector as listed below:
  - EN 50014 (1997) + amendment 1 and 2,
  - EN 50018 (2000) + amendment 1,
  - EN 50054 (1992),
  - EN 50057 (1992).
- European Directive 89-336/CEE concerning the Electromagnetic Compatibility applicable to SIMRAD OPTRONICS ICARE detectors. The directive refers to the harmonized European Standards satisfied by the detectors as regards the environment:

  - Industrial environments:
  - EN 50 081-2: 1993
  - EN 50 082-2: 1995

  - Residential, commercial and light industrial environments:
  - EN 50 081-1: 1992
  - EN 50 082-1: 1992

  Protection rating ensured by the detector housing: IP66 in accordance with standard EN 60529: 1991.

2.2. OPERATING ENVIRONMENT CONDITIONS

- **Temperature:** Between -20°C and +60°C,
- **Pressure:** 1013 hPa ± 10%,
- **Relative humidity:** 0 - 95% RH without condensation,
- **Dust:** To ensure optimum operation, do not place the compact sensor in a dusty atmosphere.

Certain situations may be critical to the operation and maintenance of these instruments. In chapter 3.4, SIMRAD OPTRONICS ICARE proposes a series of accessories that will meet your needs. For further technical details concerning

the explosimeter and catharometer compact sensors and their cartridges, see the performance table in chapter 2.5.

2.3. STORAGE

Detectors and cartridges must be stored in their original packaging. **To guarantee their metrological characteristics, it is essential to store the cartridges in their original packaging pending setting into service, in compliance with the conditions described in the accompanying manuals**.

- **Temperature:** between -30°C and +70°C,
- **Pressure:** 1013 hPa ± 10%,
- **Relative humidity:** 0 - 95% RH without condensation,
- **Shelf life:** **if a cartridge is to be stored for more than one year, it must be subjected to metrological testing by ICARE OTUS SUPERVISION in order to ensure operation of the detector on which it is fitted**.

2.4. POWER SUPPLY

- **Rated voltage:** 24 V_{DC},
- **Power supply range:** The power supply voltage must be between 18 Vdc and 28 Vdc with a maximum variation of 1V/s in operation,
- **Power consumption under 24 V_{DC}:** 1W
- **Power transients:** Can withstand power transients equal to or less than 100 ms,
- **The electrical installation must be to the state of the art. Particular attention must be paid to safety and electromagnetic compatibility. Please refer to the applicable standards and regulations**

2.5. PERFORMANCES

		CATHAROMETERS		
PERFORMANCES	**EXPLO**	**H_2**	**CO_2**	**HE**
Scales	100 % LEL	20% vol 100% vol	100% vol	20% vol 100% vol
(0-90%) (dry)	< 15 ❶	< 10	< 30	< 10
Zero point stability ❷	< 3	< 3	< 3	< 3
Sensitivity drift ❷	< 3	< 3	< 3	< 3
T° range (°C)	-20 / +60	-20 / +60	-20 / +60	-20 / +60
Zero drift in T° ❷ ❸	< 3	< 5	< 5	< 5
Sensitivity drift in T° ❷ ❸	< 5	>20	>20	>20
Linearity ❷	< 5	< 2	< 5	< 2
Accuracy ❷ ❸	< 9	< 22	< 25	< 22
Repeatability ❷	< 1	< 1	< 1	< 1
Service life (years)	3	10	10	10
Relative humidity (% RH)	0 - 95	15 - 95	15 - 95	15 - 95
Pressure range (P atm)	± 10 %	± 10 %	± 10 %	± 10 %
Cross sensitivity	All inflammable compounds	All gases with either very high or very low thermal conductivity		
Poisons	Silicon compounds and certain halogen compounds	None	None	None
Effect of O_2-enriched or depleted atmospheres	Min. O_2 content: 10 %	None	None	None
Warm-up or biasing time	< 1 min.	< 1 hour	< 1 hour	< 1 hour

❶ Methane reaction time.
❷ In % of scale.
❸ In the -10°C to +40°C range.

3. INSTALLATION

The detectors described in this manual are safety instruments intended to be installed in explosive atmospheres and have been designed in compliance with standards EN50014: 1997 and EN50018: 2000. We wish to emphasize the importance of taking particular care when installing this equipment on site. Failure to comply with the state of the art could result in malfunctions in SIMRAD OPTRONICS ICARE equipment, which may no longer ensure the degree of safety for which it was designed.

Reminder to the user: When working in certain sites, restrictions may apply which you are advised to respect for the sake of your own and others' safety.

3.1. FITTING THE SUPPORT

Before fitting the compact sensor support cover, it is necessary to first determine which type of gas is to be detected; the height at which the compact sensor is mounted will depend on the density of this gas.

For example, a compact sensor intended to detect hydrogen (density = 0.07) will be positioned high (on the ceiling), whereas for a heavy gas like butane (density = 2.11), it will be positioned low down.

To determine the position at which the compact sensor should be fitted, see the tables in Appendix 1 and **Erreur ! Source du renvoi introuvable.**, for the density of the different gases.

In addition, the compact sensor must be positioned as near as possible to the potential leak sources and the air flow (i.e. lower and upper ventilation) must be taken into account.

You will find a drilling template in Appendix 3 to help respect the center distance between the support cover drill hole axes. Use two 6 mm diameter screws to secure the support.

3.2. ELECTRICAL CONNECTIONS

INSTALLATION RECOMMENDATIONS

- Always switch off the power supply before making connections.
- Respect the connection specifications relative to each instrument in the installation.
- Use the recommended cables.
- When inserting the cables into the support, respect the installation instructions.
- Use suitable cable end fittings.
- Respect the specifications when connecting cable shieldings.

CABLE CHARACTERISTICS

The cable type must be chosen in accordance with applicable regulations.

In France, for zones classified as explosion risk zones, we recommend the use of NF M 87 202 armored, shielded cables in compliance with the requirements of standard NF C 15 100.

The table below defines the maximum acceptable lengths under a minimum power supply voltage of 19 V_{DC} at the line input , for the most frequently used cable sections.

Copper conductor section in mm²	0.5	0.9 / 1	1.5
Maximum permitted cable length in m	500	1000	1500

Table 1: Cable Lengths

CABLE GLAND

In order to ensure flameproof / explosionproof protection, check that the cable gland is correctly tightened.

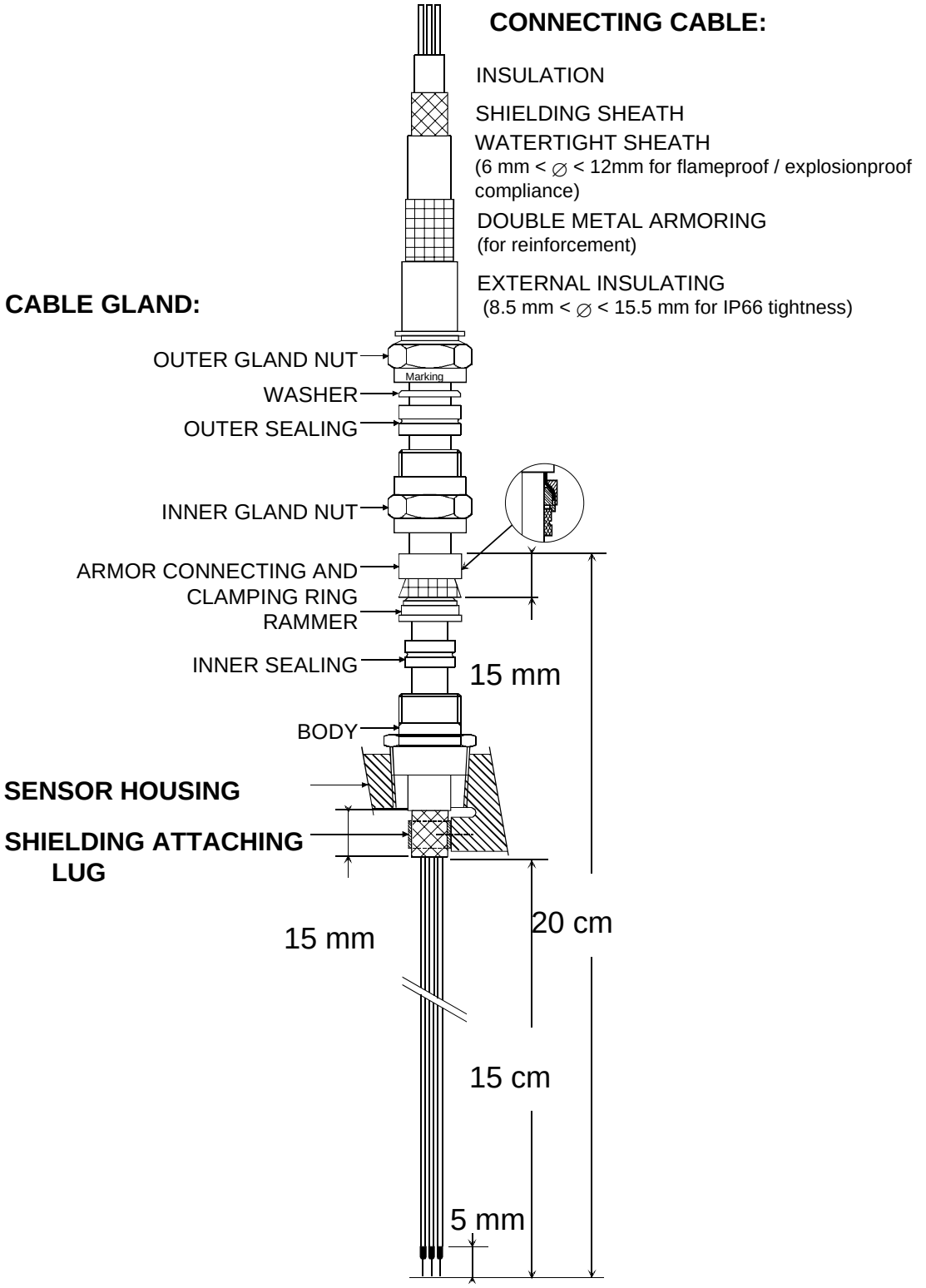


Figure 2: Detailed View of Cable Gland and Cable Assembly

TERMINAL CONNECTION

The installer must connect each compact sensor to the local grounding network using a green and yellow conductor fitted with a terminal lug and connected to the grounding terminal on the support cover.

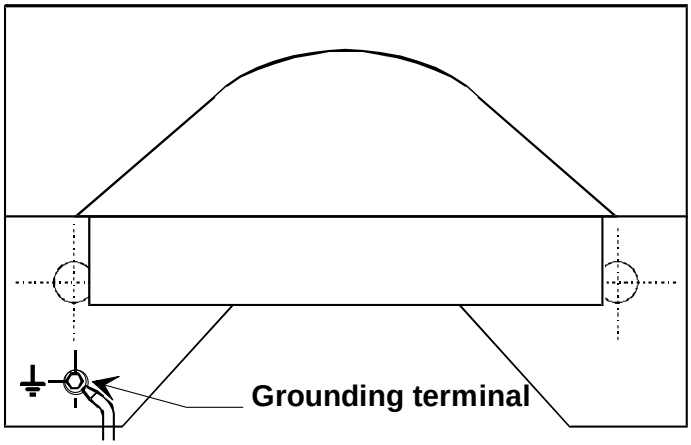
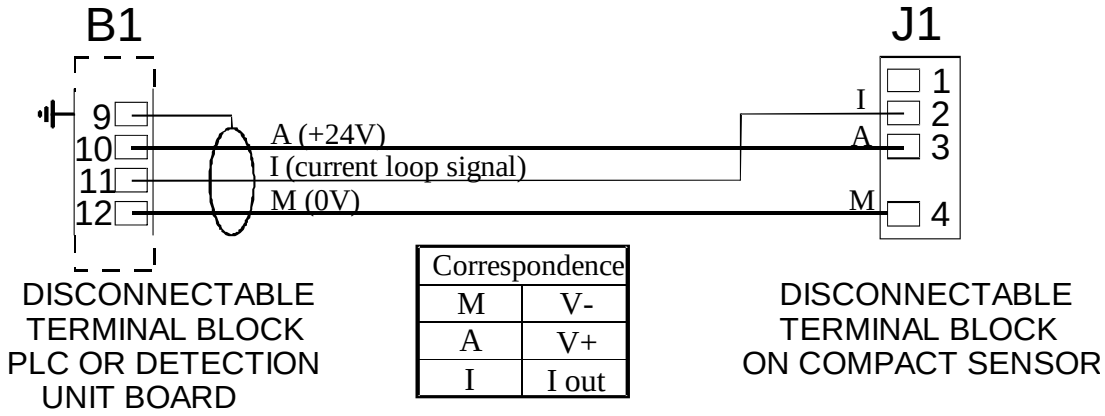


Figure 3: Location of Grounding Terminal on Support

The cable shielding must be connected on the inside of the wall support using one of the clamps provided (see Figure 2, page 14).

MULTICHANNEL DETECTION UNIT OR PLC CONNECTION



Correspondence	
M	V-
A	V+
I	I out

Figure 4 : PLC or Detection Unit Connection Diagram

If the cable used for this connection is a three-conductor cable with wires colored blue, white and red, you are advised to connect as follows:

- Blue for M,
- Red for A,
- White for I.

3.3. INSTALLING THE HOUSING

Once the wall-mounted support is attached, the disconnectable terminal block and the ground connected and the cable gland in place, the installer attaches the housing as follows:

- Check that the O-ring is in place.
- Position the housing near the support in order to be able to plug the disconnectable connector into the printed circuit board,
- Connect the connector to terminal block J1 on the printed circuit board.
- Insert the housing into the support guide. Wind any excess cable length into the hollow part of the support.
- Tighten the two upper screws to secure the housing

For the position of the two attaching screws, see Figure 1: , page 8.

3.4. ACCESSORIES

ACCESSORY	DESCRIPTION	COMMENT
TLU 600/610	**Remote control**	Required for adjustments and maintenance
AS006	**Adapter plate**	Used to adapt old detector attachments to fit new generation detectors
AS005	**Calibrating cup**	Fits all cartridges
AS215	**Label holder**	For on-site identification of sensors
ACCALEX	**Calibration kit**	The kit comprises: - One air cylinder and one pressurized cylinder containing a mixture of air and a gas of titrated concentration, - A 30 l/H flowrate pressure reducing and regulating valve, - A 3 metre long hosepipe. The calibrating cup is not included in the calibration kit
AS015	**Filter gate**	For use in certain situations to block out interfering gases.
AS016	**Calibration at a distance**	Accessory enabling a gas supply tube to be attached near the cartridge.
AS011-2X	**Stainless steel circulation cup**	For use with gas circuit systems.
AS02x	**Installation on pipeworks etc.**	A series of accessories for installing detectors on different types of housing/pipeworks

4. STARTUP

Before starting up each time and after carrying out any work on the compact sensor, the installer must check that the installation still complies with requirements..

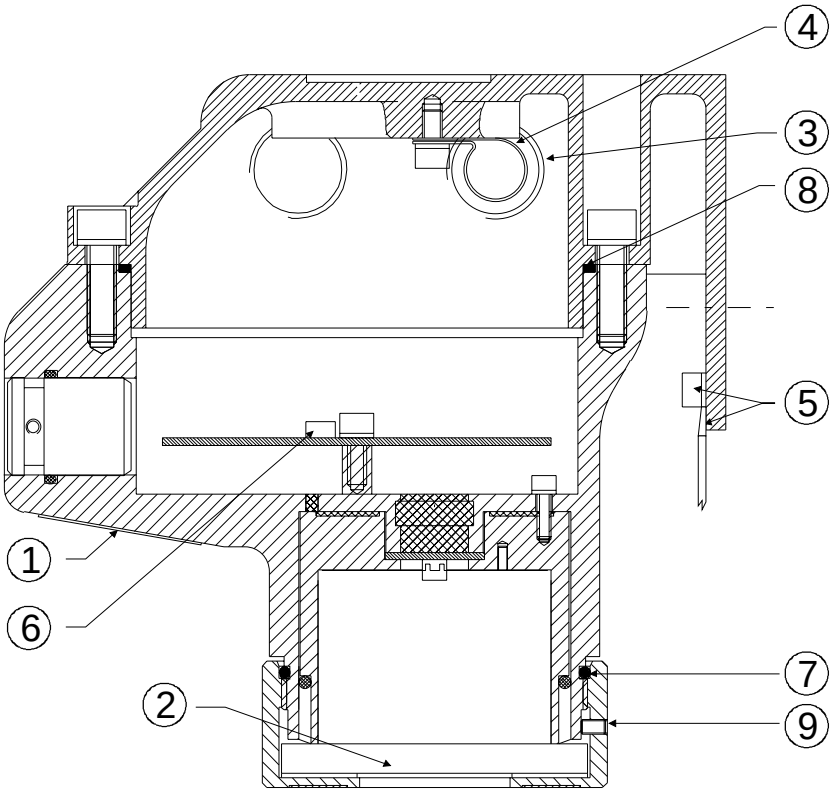


Figure 5: Installed Components to be Checked

4.1. CHECKING GAS TYPE MARKING

- Label ① on the compact sensor indicates the type of detector, the type of gas and the scale for which the instrument is calibrated,
- The color of the cartridge ② must correspond to the type of detector.

4.2. CHECKING THE WIRING

- Check the cable gland ③ assembly (see Figure 2, page 14).
- Check that the braid is correctly secured by cable clamp ④,
- Check connection ⑤ between the support cover and the local grounding network,
- Checking the wiring and the pin arrangement on disconnectable terminal block J1 ⑥.

4.3. CHECKING THE MECHANICAL ASSEMBLY

- Check that 0-rings ⑦ and ⑧ are in place.
- Check the lubrication between the support and the housing.
- Check that an Hc stopscrew is fitted and correctly tightened in one of the threaded holes in the ring. This screw can be fitted in the most accessible hole and is intended to inhibit rotation of the ring. **It must be fitted, since it ensures the safety of the entire system**.

4.4. POWER-UP

The compact sensor is powered through the multichannel detection unit or the Programmable Logic Controller. See the operating manuals of these instruments for the compact sensor power supply instructions.

The control of a device power-on can solely be done from a multichannel detection unit or the Programmable Logic Controller, by a correct information of gas concentration.

4.5. CHECKING SYSTEM FUNCTIONS

All explosimeter/catharometer compact sensors are delivered factory-adjusted, however the user must check the following, in order to ensure correct operation of the entire system:

- Zero point: If there are no pollutant gases or, if necessary, by injecting air at 30l/H using the calibration kit equipped with an air cylinder,
- Sensitivity By injecting a titrated gas at 30l/H using the calibration kit and a gas cylinder set to the required value,
- The alarm thresholds,
- The interlocks.

If corrections are required see chapter 5: ADJUSTMENT OF explosimeter/catharometer, page 19.

5. ADJUSTMENT OF EXPLOSIMETER/CATHAROMETER COMPACT SENSORS

All adjustments are made on the detection unit.

5.1. ZERO POINT SETTING

With the compact sensor in an environment corresponding to its zero point (pure air, nitrogen, etc.), the installer sets the zero point in compliance with the procedure described in the detection unit operating manual.

5.2. CALIBRATION

For this operation, a calibration kit is required. Inject the titrated gas into the compact sensor. The calibration procedure is specified in the detection unit operating manual.

5.3. REPLACING THE CARTRIDGE

When replacing a new cell, the interlocks must be inhibited (see detection unit operating manual).

The power must be switched OFF before replacing a cartridge. Switch off the compact sensor power supply in a safe zone from the detection unit or the PLC (all conductors must be disconnected).

Cartridge removal procedure:

- Loosen the locknut screw using a 1.5 mm Allen wrench (see Figure 1, page 8).
- Loosen the locknut manually up to the end of the first thread.
- Pull on the nut to extract the cartridge.
- Loosen the second thread to separate the nut from the cartridge.

To fit a new cartridge:

- Choose a new cartridge with the same colored label as the removed cartridge and insert it into the housing. Respect the assembly direction given by the locating pin.
- Ensure that the O-ring is in place, then tighten the locknut manually.
- Tighten the locknut screw using a 1.5 mm Allen wrench. This is essential to retain the cartridge in place.

Switch ON the power supply, then adjust the zero point setting on the new cell if there are no pollutant gases present, or inject air if required using the calibration kit.

To calibrate the new cell, a calibration kit is required.

6. MAINTENANCE

Routine servicing and maintenance operations must be carried out by a qualified, authorized person.

6.1. PREVENTIVE MAINTENANCE

- A monthly check of the zero point is recommended.
- Calibration test: A gas test is recommended every three months followed by calibration if necessary.

6.2. CORRECTIVE MAINTENANCE

If the detection unit or the PLC signals a fault in a compact sensor, the power supply and the 1 mA current loop (I out) must be tested in pure air.

These two tests must be carried out at the detection unit output. If these measurements are correct, replace the detection cartridge.

7. COMPACT SENSOR REMOVAL AND REASSEMBLY

When carrying out any work on the compact sensor, the operator must respect the state of the art applicable to safety in classified zones and the procedures specific to each site. The power supply must be switched off before carrying out any work

Housing removal procedure:

- Loosen the two upper screws, holding the housing in place.
- Separate the housing from the support, taking care not to pull sharply on the cable connected to the printed circuit board.
- Disconnect the connector from disconnectable terminal block J1.

The compact sensor reassembly procedure is described in chapter 3.3: INSTALLING THE HOUSING, page 16.

8. SPARE PARTS

- Cable gland,
- O-rings,
- Lubricant for flameproof / explosionproof seal: Brand name MOLYKOTE, part number P40,
- Explosimeter and catharometer type X and K cartridges.

9. WARNINGS

9.1. FOREWORD

This document is not contractual. The product characteristics may be modified without notice for improvement purposes or for upgrading to meet applicable standards.

9.2. OWNERSHIP AND CONFIDENTIALITY

The information, design data, drawings and diagrams contained in this document remain the property of ICARE and are confidential.

The information contained in this document cannot be used, either partially or wholly, nor divulged or reproduced without the prior agreement of SIMRAD OPTRONICS ICARE.

9.3. LIABILITY

The liability of ICARE shall be limited to any direct prejudice resulting from failure on SIMRAD OPTRONICS ICARE's part to fulfil the contract. SIMRAD OPTRONICS ICARE shall decline all liability for any indirect prejudice caused.

By explicit agreement between the parties, the term "indirect prejudice" shall refer in particular to any financial loss, moral damage, loss of profit, earnings, clients or order, or any action taken against the client by a third party.

Moreover, any damages due from SIMRAD OPTRONICS ICARE for any reason whatsoever, shall not exceed the tax-exclusive value of the contract, except in the event of an intentional or fraudulent offense on the part of SIMRAD OPTRONICS ICARE.

10. WARRANTY COVERAGE

Application of the equipment warranty is subject to compliance with the rules and regulations and the operating instructions contained in this manual.

The SIMRAD OPTRONICS ICARE warranty shall not apply, furthermore SIMRAD OPTRONICS ICARE declines all liability, for damage to equipment or harmful accidents caused by negligence, failure to supervise the equipment or failure to use the equipment in compliance with the applicable recommendations, standards and regulations stipulated in the present manual.

The SIMRAD OPTRONICS ICARE warranty shall not apply to faults resulting either, from materials supplied by the Purchaser, from design imposed by the Purchaser, from servicing or maintenance carried out on SIMRAD OPTRONICS ICARE equipment by a third party not explicitly authorized, or from the use of unsuitable storage conditions.

In order to guarantee correct operation of the system, any addition of equipment to the system or any modification of the installation must be validated by SIMRAD OPTRONICS ICARE.

APPENDICES

APPENDIX 1 : Gas and Vapor Explosimetry Codes

Code	Name	Formula	L.E.L. %	U.E.L. %	St. %	Density	CX61
			SATURATED HYDROCARBONS				
A1	Methane	CH_4	5	15	9.43	0.6	X
A2	Ethane	C_2H_6	3.1	12.45	5.64	1.0	X
A3	propane	C_3H_8	2.1	10.1	4.02	1.6	X
A4	Butane	C_4H_{10}	1.86	8.41	3.12	2.1	X
A5	Iso butane		1.80	8.44	.312	2.1	X
A6	Pentane	C_5H_{12}	1.40	7.80	2.55	2.5	
A7	Iso pentane		1.32		2.55	2.5	
A8	Hexane	C_6H_{14}	1.25	6.90	2.16	3.0	X
A9	Heptane	C_7H_{16}	1	6	1.87	3.5	X
B1	Octane	C_8H_{18}	0.95	3.2	1.65	3.9	
B2	Nonane	C_9H_{20}	0.83	2.90	1.97	4.4	
B3	Decane	$C_{10}H_{22}$	0.67	2.60	1.93	4.9	
B4	Dodecane	$C_{12}H_{26}$	0.60		1.12	5.9	
B5	Tetradecane	$C_{14}H_{30}$	0.5		0.96	7.0	
			CYCLICAL HYDROCARBONS				
C1	Cyclopropane	C_6H_6	2.45	10.45	4.44	1.5	
C2	Cyclohexene	C_6H_{10}	1.22	4.81	2.10	2.8	
C3	Cyclohexane	C_6H_{12}	1.33	8.35	2.27	2.9	X
C4	Methyl hexane	C_7H_{14}	1.15		1.95	3.3	
			HYDROGEN				
D1	Hydrogen	H_2	4	74.2	29.50	0.07	X
			ACETYLENES				
D5	Acetylene	C_2H_2	2.5	80	7.72	0.9	X
D6	Allylene	C_4H_4	1.7		4.97	1.7	X
D7	Hexene-1	C_6H_{12}	1.2	6.9		0.67	
			OLEFINS				
E1	Ethylene	C_2H_4	2.75	28.6	6.52	1.0	X
E2	Propylene	C_3H_6	2.0	11.1	4.44	1.5	
E3	Butadiene	C_4H_6	2	11.50	3.67	1.9	
E4	Butylene	C_4H_8	1.98	9.65	3.37	1.9	
E5	Amylene	C_5H_{10}	1.65	7.7	2.72	2.4	

Code	Name	Formula	L.E.L. %	U.E.L. %	St. %	Density	CX61
			AROMATICS				
F1	Benzene	C_6H_6	1.35	6.75	2.72	2.8	
F2	Toluene	C_7H_8	1.27	6.75	2.27	3.1	X
F3	Styrene	C_8H_8	1.10	6.10	2.05	3.6	
F4	Xylene	C_3H_{10}	1.0	6.0	1.95	3.7	
F5	Dipentene	$C_{10}H_{16}$	0.7			2.0	
			KETONES				
G1	Acetone	C_3H_6O	2.55	12.8	4.97	2.0	X
G2	Methyl-ethylketone	C_4H_8O	1.81	9.5	3.67	2.4	X
G3	Methyl-propylketone	$C_5H_{10}O$	1.55	8.15	2.90	2.9	
G4	Methyl-butyl	$C_6H_{12}O$	1.22	8	2.40	3.5	
			ALDEHYDES				
H1	Acetaldehyde	C_2H_4O	3.97	57	7.72	1.5	
H2	Butyraldehyde	C_4H_8O	2.47		3.67	2.4	X
			ACIDS				
H5	Acetic	$C_2H_4O_2$	5.4		9.47	2.1	
			ALCOHOLS				
I1	Methyl	CH_4O	6.72	36.50	12.24	1.1	
I2	Ethyl	C_2H_6O	3.28	18.95	6.25	1.6	X
I3	Allyl	C_3H_6O	2.52	18	4.97	2.0	
I4	Propyl	C_3H_8O	2.15	13.50	4.44	2.1	
I5	Propylene glycol	$C_3H_8O_2$	2.62	12.5	4.44	2.6	
I6	Isopropyl	C_3H_8O	2.02	12.55	4.97	2.1	X
I7	Butyl	$C_4H_{10}O$	1.4	11.25	3.37	2.6	X
I8	Isobutyl	$C_4H_{10}O$	1.2	10.9	3.66	2.6	
I9	Amyl	$C_5H_{12}O$	1.19	10	2.72	3.0	
J1	Iso-amyl	$C_5H_{12}O$	1.20	9	2.72	3.0	
			ESTERS				
K1	Methyl formate	$C_2H_4O_2$	5.05	22.7	9.47	2.1	
K2	Ethyl formate	$C_3H_6O_2$	2.75	16.40	5.64	2.6	
K3	Methyl acetate	$C_3H_6O_2$	3.15	15.60	5.64	2.6	
K4	Ethyl acetate	$C_4H_8O_2$	2.18	11.40	4.02	3.0	X
K5	Propyl acetate	$C_5H_{10}O_2$	1.77	8	3.12	3.5	
K6	N-Butyl acetate	$C_6H_{12}O_2$	1.4	7.6		4.1	
K7	N-Butyl acrylate	$C_7H_{12}O_2$	1.3	9.9		4.4	

Code	Name	Formula	L.E.L. %	U.E.L. %	St. %	Density	CX61
			ETHERS				
L1	Di-methyl Ether	C_2H_6O	3.40	27		1.6	X
L2	Methyl ethyl Ether	C_3H_8O	2	10.10	4.44	2.1	
L3	Di-ethyl Ether	$C_4H_{10}O$	1.85	36.50	3.37	2.6	
L4	Di-vinyl Ether	C_4H_6O	1.70	27	4.02	2.3	
			OXIDES				
M1	of carbon	CO	12.50	74.20	29.50	1.0	
M2	of ethylene	C_2H_4O	3	80	7.72	1.5	X
M3	of propylene	C_3H_6O	2	22	4.97	2.0	
			HALOGEN COMPOUNDS				
	BROMIDES						
N1	Methyl	CH_2Br	3.50	14.50	12.24	3.3	
N2	Ethyl	C_2H_5Br	6.75	11.25	6.52	3.8	
	CHLORIDES						
N5	Methyl (chloromethane)	CH_3Cl	7.1	18.50	12.24	1.7	
N6	Vinyl	C_2H_3Cl	4	21.70	7.72	2.2	
N7	Ethyl (chlorethane)	C_2H_5Cl	4	14.8	6.52	2.2	X
N8	Propyl (chloropropane)	C_3H_7Cl	2.6	11.10	4.44	2.7	
N9	Allyl	C_3H_5Cl	3.28	11.15	4.97	2.6	
O1	Chlorobutane	C_4H_7Cl	2.02	9.25	3.67	3.0	
O2	Butyl	C_4H_9Cl	1.85	10.10	3.37	3.1	
O3	Isobutyl	C_4H_9Cl	2.05	8.75	3.37	3.1	
O4	Amyl	$C_5H_{11}Cl$	1.60	8.63	2.72	3.5	
O5	Monochlorobenzene	C_6H_5Cl	1.35	7.05	2.70	3.9	
O6	Benzyl	C_7H_7Cl	1.10	14	2.40	4.3	
O7	Dichloroethylene	$C_2H_2Cl_2$	9.7	12.80	9.47	3.3	
O8	Dichloroethane	$C_2H_4Cl_2$	6.20	15.90	7.72	3.4	
O9	Dichloropropane	$C_3H_6Cl_2$	3.40	14.50	4.97	3.9	
			MISC. COMPOUNDS				
	MISC.						
P1	Ammonia	NH_3	15.50	26.20	21.82	0.6	X
P2	Turpentine	$C_{10}H_{16}$	0.80		1.47	4.7	
P3	Gas oil		6	13.50			X
P4	Petrol		1.40	7.50		3.0 to 4.0	X
P5	Special petrols A, B		1	6.50			
P6	Kerosene		0.7	5			X

Code	Name	Formula	L.E.L. %	U.E.L. %	St. %	Density	CX61
P7	White spirit		1.5	6.5		4.5	
P8	GPL	C_3H_8/ C_4H_{10}	2.1	3.2	3.56	1.6/2.1	
P9	Acrylonitrile	C_3H_3N	3.0	17		1.83	
R1	Chloroprene	C_4H_5Cl	4	20			

The density shown relates to a temperature of 21°C at a pressure of 1013 Hpa (air = 1).

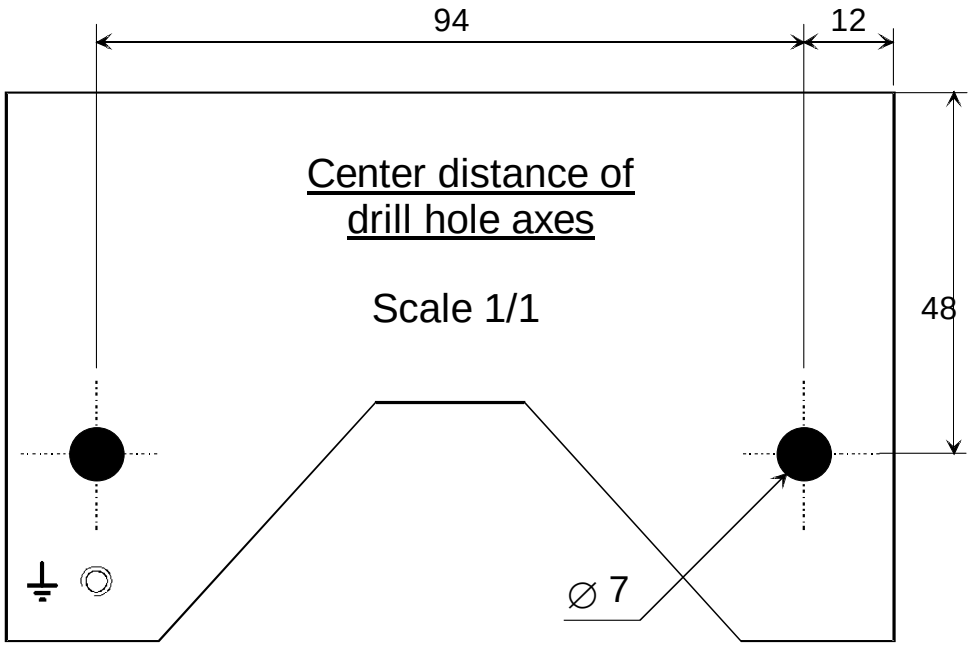
APPENDIX 2 : Catharometry Codes

Code	Name	Formula	Range	Density	CK61
01	Carbon monoxide	CO	100 ppm	0.97	
02	Carbon monoxide	CO	200 ppm		
03	Carbon monoxide	CO	500 ppm		
04	Carbon monoxide	CO	1000 ppm		
10	Hydrogen sulphide	H_2S	20 ppm	1.17	
11	Hydrogen sulphide	H_2S	50 ppm		
12	Hydrogen sulphide	H_2S	100 ppm		
13	Hydrogen sulphide	H_2S	200 ppm		
20	Sulphur dioxide	SO_2	20 ppm	2.26	
21	Sulphur dioxide	SO_2	100 ppm		
25	Nitrogen oxide	NO	100 ppm	1.04	
30	Nitrogen dioxide	NO_2	20 ppm	1.58	
35	Hydrogen	H_2	1000 ppm	0.07	
36	Hydrogen	H_2	2000 ppm		
37	Hydrogen	H_2	10000 ppm		
38	Hydrogen	H_2	5%		
39	Hydrogen	H_2	20% v/v		X
40	Hydrogen	H_2	100% v/v		X
41	Hydrogen	H_2			
42	Hydrogen	H_2			
45	Ammonia	NH_3	50 ppm	0.6	
46	Ammonia	NH_3	100 ppm		
47	Ammonia	NH_3	1000 ppm		
50	Chlorine	Cl_2	10 ppm	2.49	
51	Chlorine	Cl_2	20 ppm		
52	Chlorine	Cl_2	50 ppm		
53	Chlorine	Cl_2	1000 ppm		
55	Carbon dioxide	CO_2	20% v/v	1.5	
56	Carbon dioxide	CO_2	100% v/v		X
60	Oxygen	O_2	1% v/v	1.1	
61	Oxygen	O_2	5% v/v		
62	Oxygen	O_2	25% v/v		
63	Oxygen	O_2	100% v/v		
65	Helium	He	5%	0.14	
66	Helium	He	20%		X
67	Helium	He	100%		X
70	Hydrochloric acid	HCl	50 ppm	1.25	
71	Hydrochloric acid	HCl	100 ppm		
74	Hydrocyanic acid	HCN	50 ppm	0.93	
77	Hydrofluoric acid	HF	10 ppm	1.3	
80	Ozone	O_3	2 ppm	1.7	

The density shown relates to a temperature of 21°C at a pressure of 1013 Hpa (air = 1).

Appendix 1: Drill Hole Template for Support Attachment

TOP



BOTTOM

APPENDIX 3 : EC conformity declaration for Dm

DECLARATION CE DE CONFORMITÉ

ICARE OTUS SUPERVISION
Z.I. de St Mitre – 18, Avenue de la Roche Fourcade
13400 AUBAGNE

Nous, ICARE OTUS S≤UPERVISION, déclarons que le matériel suivant :

DETECTEUR MULTIGAZ DM

portant le marquage suivant : CE 0081 Ex II 2 G/ EEX d II C T6

-40°C≤Ta≤+65°C

Est conçu et fabriqué en conformité avec les Directives applicables suivantes :

- Directive ATEX 94/09-EC

La conformité a été obtenue par l'application des normes suivantes :

EN 50014 (1997) + Amendements 1 et 2
EN 50018 (2000) + Amendement 1

pour laquelle a été établie une Attestation CE de type LCIE 03 ATEX 6263, ainsi qu'une notification LCIE 03 ATEX Q 8046 en fonction de l'Annexe IV

Le directive basse tension 73/23/EEC n'est pas applicable à ce produit.

- Directive CEM 89/336/CEE, modifiée par les directives 92/31/CEE et 93/68/CEE

La conformité a été obtenue par l'application des normes suivantes :

EN 50081-2 (1993)
EN 50082-2 (1995)

pour laquelle a été établi un rapport d'auto-évaluation.

L'organisme notifié en charge du suivi de la Directive ATEX est le suivant :
LCIE
33, Avenue du Général Leclerc
92260 FONTENAY AUX ROSES
France

Numéro d'identification : 0081

Ce matériel ne doit être utilisé qu'à ce pour quoi il a été conçu et doit être installé en conformité avec les règles applicables et suivant les recommandations du fabricant.

Nous, soussignés ICARE OTUS SUPERVISION, déclarons par la présente que le produit spécifié ci-dessus est conforme aux Directives et aux Normes listées.

A Aubagne le : 23/7/2003

Jean François PINTENET
Président Directeur Général