

USER MANUAL

REMOTE SENSOR

S/3-T2 y S/2-T2

OXYGEN



incluidas





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WARNINGS



Read the user manual carefully before commissioning or service.

Instructions are included on the use of the FIDEGAS® Test Kit supplied with FIDEGAS® control units to verify proper operation.

- This equipment should not be opened in a hazardous area when it is powered. Periodic calibration can only be performed by the manufacturer or a technical service authorized for calibrations.
- Avoid cleaning near the remote sensor with detergents containing bioalcohols, industrial solvents or rinse aids with suspended silicones. To clean the detector, only use a cloth moistened with clean water.
- During construction, installation or maintenance work on the facilities, remote sensors must be protected to prevent damage to the sensor resulting from work such as welding or painting and must be installed as late as possible, but always before there is a risk of the presence of gas or gas vapors. If remote sensors have already been installed, they must be protected by airtight packaging for the entire duration of the works, clearly indicating that they are not operational.
- Remote sensors must be protected against vibrations, against the risks of mechanical impacts and direct exposure to sunlight.
- Do not submerge the remote sensor in water or other liquid under any circumstances.
- It is recommended to send the equipment to the manufacturer or authorized technical service for calibration at the end of life or when it does not work with the FIDEGAS® Test Kit supplied.
- Please note that failure to follow these basic precautions may lead to incorrect operation of the equipment, which is not the responsibility of the manufacturer.
- This device is designed to operate in atmospheres containing values less than 25% v/v of O₂. Exposures to atmospheres with higher concentrations of O₂ will drastically reduce their lifespan.
- The minimum acceptable concentration of Oxygen for respiration is between 17 and 19% v/v (oxygen-deficient atmosphere). Oxygen concentrations greater than 23% are considered oxygen-enriched atmospheres.
- Sudden temperature changes can produce erroneous sensor readings.

LIMITATIONS

- Remember that if the remote sensor has been disconnected, there may be variations in the concentration of O₂ and will not be detected.
- Make sure that the supply voltage (12 – 24) Vdc and the connections are correct.
- When installing the remote sensor, you should take into consideration the places where it should NOT be installed (section 4).
- Under no circumstances should any component of the appliance be manipulated, as there is a risk of irreversible damage.
- S/2-T2 version in plastic box is NOT suitable for use in potentially explosive atmospheres.
- LP output: Not suitable for voltages greater than 30 Vdc and consumption greater than 0.5 A.

WARRANTY

- Warranty two (2) years is given by C.A.E., S.L. manufacturer of FIDEGAS® against any manufacturing defect from the date of purchase and cease to be effective if this equipment is not installed, used and maintained according to the guidelines stated in the User Manual.
- This warranty becomes void in cases where it is found that:
 - a) The equipment has been repaired, tampered with or external accessories have been added, with the involvement of people outside our Authorized Service Center.
 - b) It has suffered any impact or damage.
 - c) The serial number has been altered or manipulated and does not match our records.
- C.A.E., S.L. manufacturer of FIDEGAS®, is not liable for damages that may arise as a result of misuse of the equipment.
- All the necessary efforts have been made to ensure the accuracy of the information provided in this document. However, C.A.E., S.L. manufacturer of FIDEGAS®, reserves the right to make improvements or modifications to this equipment without prior notice.
- Any failure to follow these instructions automatically voids this warranty and the expenses are responsibility of the user.

QUALITY CONTROL



This product has been designed, manufactured and commercialised under the honestys of the after-sales service, controlled within a Quality Management System certified according to ISO 9001:2015 and audited by AENOR.

OPTIONAL EQUIPMENT

REFERENCE	OPTIONAL EQUIPMENT
03645	Gas collector cone for sensor S/3 & S/2
03665	LS3 support for S/3 sensors
01314	S/3 mask with active carbon filter
Consult	FIDEGAS® Test Kit
03146	RS-485 module for remote sensor
03932	MS3-RE V1.1 Relay Module
03807	MS3-CAL Calibration Module
Consult	MIR display module
03297	MK-E7 Calibration Mask

SUPPORTED PRODUCTS

- Ref. CA- Control Units
- Ref. CS4 Control Units
- SCAEDA
- GPRS Telecontrol
- MIR V3 remote indicator
- Industrial communication modules

DIRECTIVE 2014/34/UE (ATEX)

Classification of hazardous areas

ZONE	Definition
0	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is present continuously or for long periods or frequently
1	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is likely to occur in normal operation occasionally.
2	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only

Equipment category

Category	Definition	Area(s) of use
1	Equipment with a "very high" degree of security	0
2	Equipment with a "high" degree of security	1 and 2
3	Equipment with a "normal" degree of security	2

Group of gases

Cluster	Reference gas	Definition
	Methane	Equipment mines and below
IIA	Propane	Equipment intended for surface industries other than mines
IIB	Ethylene	
IIC	Hydrogen	

Temperature Classification

The equipment so that temperature reaches

Explosive limit

The relationship between % LEL (Lower Explosive Limit) and % v/v (volume/volume) varies from one gas to another. Based on the standard to give the following examples:

Gas	Formula	100% LIE
Methane	CH ₄	4.4% v/v
Hydrogen	H ₂	4.0% v/v
Butane	C ₄ H ₁₀	1.4% v/v
Propane	C ₃ H ₈	1.7% v/v

1. GENERAL

The remote gas detection sensors Ref. S/3-T2 and S/2-T2 Oxygen detect the presence of selected oxygen in the defined ranges, with a high degree of precision, due to the use of electrochemical technology sensors, thereby which achieves excellent stability and linearity in measurements. In addition, the internal microcontroller contains a mathematical model of the sensor's behavior, thus compensating for variations in the reading throughout the temperature range.

They are available in their S/3-T2 version in ATEX anti-defrAGRANCE casing or in their S/2-T2 version in a plastic box.

They are especially indicated for connection to control units and/or data recording systems, for monitoring oxygen concentration.

To do this, they have an industrial standard output in a 4-20 mA current loop proportional to the concentration of gas present in the air and a UART-TTL serial communication port. Its integration into industrial communication systems is possible through RS-485 connectivity through an optional module.

They also have a potential-free (LP) normally open (NO) output associated with the alarm and fault status that can be used to control external elements such as optical-acoustic alarms. By default, the alarm is set to 20% of full scale.

2. MARKING

C.A.E., S.L. declares that the FIDEGAS® toxic GRS Ref. S/3-T2 is designed and marked in compliance with the requirements of Standards EN 60079-0 and EN 60079-1 (ATEX Enclosures).

The marking labels are located on the bottom (Ref. S/3-T2) and on the side (Ref. S/2-T2) of the equipment enclosure and allow the user to identify all the main characteristics of the purchased equipment :

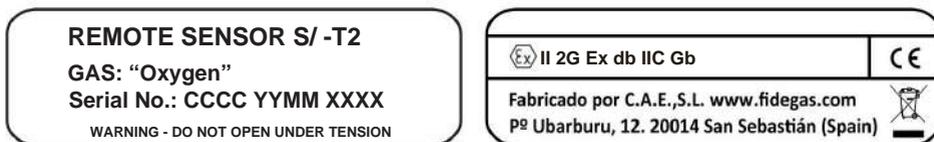
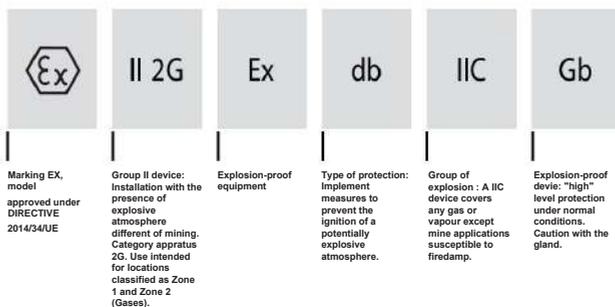


Figure 1: identification and marking labels (Serial No. and Gas are specified in section 9)



* GRS: acronym for Remote Gas Sensor.

3. OPERATION

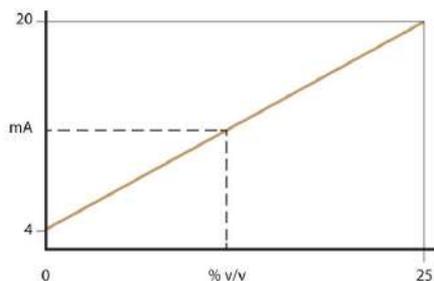
When connecting the supply voltage, the remote sensor requires a warm-up time during which the output signal, 4-20mA is disabled and the concentration reading is zero. Once this period has elapsed, it works as a linear meter of the concentration of gas present in the atmosphere.

The measured gas concentration information is accessible by 2 means:

Current loop 4-20 mA proportional to the existing gas concentration. The measured gas concentration is easily calculated by applying the following transfer function to the 4-20 mA output signal:

Range (0-25) % v/v

$$\% v/v = 25 \cdot \left(\frac{\text{mA} - 4}{16} \right)$$



Range (21-0) % v/v

$$\% v/v = 21 - 21 \cdot \left(\frac{\text{mA} - 4}{16} \right)$$

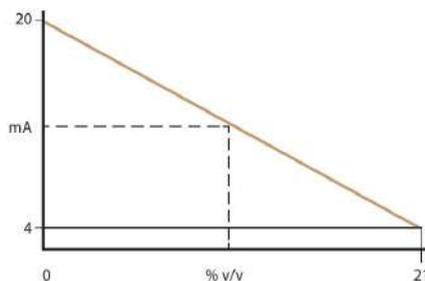


Figure 1: Relationship between concentration and 4-20 mA output

Output signal	Output status
<1mA	Fault
2mA	Output disabled, heating
4-20mA	Concentration reading
>20mA	Overrange

Serial communication, where in addition to the measured concentration it is possible to obtain more information from the sensor, such as the internal temperature, the detection range, the operating status or the sensor supply voltage.

A FIDEGAS® industrial communication module can be used to access this information.

4. LOCATION

Improper placement of the remote sensor may decrease the effectiveness of the gas detection system.

The remote sensor must be installed with the sensor oriented vertically downwards, where gas tends to accumulate, approximately 1.5 meters away from gas consumption points or smoke outlets and away from air currents.



Figure 2: Correct orientatio of the GRS



Figure 3: Wrong orientation of the GRS

The position of the remote sensor must be determined in collaboration with people who are familiar with the operation of the facilities and equipment affected and also with the technical personnel involved in the safety procedure. You can obtain more details or assistance by contacting FIDEGAS® or your authorized distributor.

The position of each remote sensor must be recorded and this data provided to security personnel.

Oxygen is a gas permanently present in the air and uniformly distributed with Nitrogen. The concentration of Oxygen in the air is 20.9% at atmospheric pressure. The installation position of the remote sensor will be directly in the place whose Oxygen concentration we want to control.

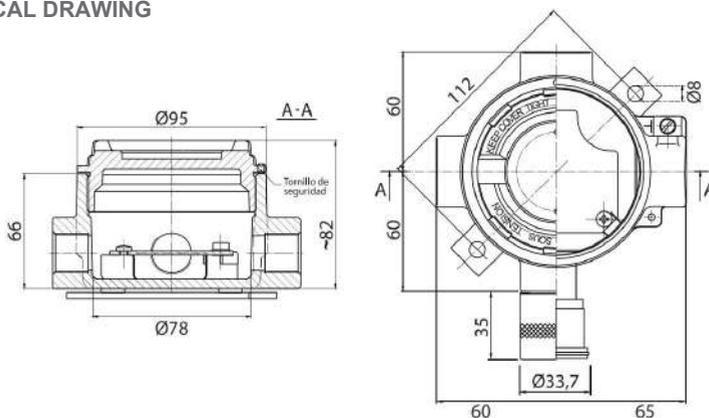
Oxygen levels decrease mainly due to: welding, cutting and abrasion processes; chemical reactions (oxidation); bacterial action (fermentation); or displacement by other gases such as Carbon Dioxide or Nitrogen.

The placement of the remote Oxygen sensor will depend on the type of gas that is displacing the Oxygen. If the gas is heavier than air (relative density >1) we will install the remote sensor 30cm from the ground. On the contrary, if it is lighter than air (relative density <1) we will install the remote sensor 30cm from the ceiling or on the ceiling. As a general valid criterion, the remote sensor can be installed at the breathing height of people (1.80 m) to provide direct protection.

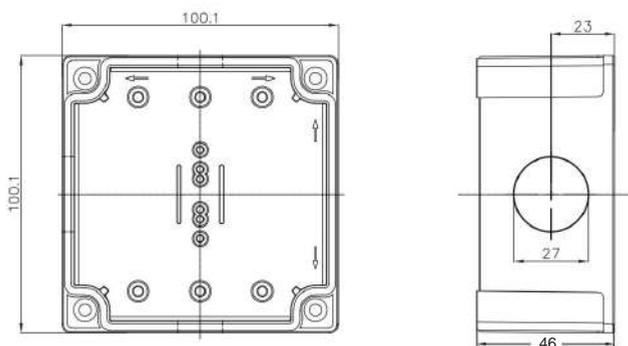
Additionally, the following warnings must be taken into account when locating remote sensors:

- Access to the equipment must be comfortable for maintenance and inspection operations.
- The equipment with its ATEX cable gland must be protected against risks related to operation of the facilities.
- The remote sensor must be protected against vibrations and risks of mechanical impact.
- The remote sensor should never be placed directly below or above a water or liquid outlet.
- When placed outdoors, protection against rain and/or sun must be provided.
- Do not install in a draft, near a door, window, fan or extractor.
- Do not install in a humid or wet place.
- Do not install where dirt and dust can obstruct the gas inlet to the sensor.
- Avoid places where the temperature may exceed the limits of the operating range.
- Avoid places where sudden changes in temperature may occur.

5. TECHNICAL DRAWING



Plans and dimensions remote sensor S/3-T2



Plans and dimensions remote sensor S/2-T2

6. INSTALLATION

6.1 Wiring for S/3-T2 version

- Wiring must comply with local regulations and standards.
- The outer diameter of the cable must not exceed the maximum dimensions of the ATEX cable gland.
- The conductors must be stripped and inserted in such a way that unwanted contacts cannot occur.
- The cable gland must be tightened over the cable sheath ensuring tightness.
- The cable mesh in the control unit must be connected to ground; for this purpose, the control unit has clamps so that the connection of the mesh to ground is made comfortably.
- In the remote sensor the mesh must make contact inside the stuffing box, specification detailed in section 7.1.



For more information related to connection to the control unit, consult the user manual of the control unit.

To ensure the ATEX protection of the system, the Central - Remote Sensor connection must be made using a shielded cable with a minimum section of 3 x 0.75 mm² for a maximum length of 200 meters.



For correct signal transmission, remember not to make splicing.

The use of the cable contemplated in our certification Ref. Cable S3 or a similar one is highly recommended, respecting the following characteristics:

Composition: Z1C4Z1-K 3x0.75 mm² shielded hose, 85% tinned polished copper braid, Halogen Free Polyolefin. External diameter 6.6 mm, 400 V, -10 °C / +60 °C, < 26 μ /Km for 0.75 mm².

Compliance: Reaction to fire CPR Cca-s1b,d1,a1 according to UNE-EN 50575:2014+A1:2016.

6.2 Installation S/3-T2 and S/2-T2



Along with the S/3-T2 ATEX remote sensor, an accessory bag is delivered that contains: an ATEX cable gland, a gasket and an Allen key.

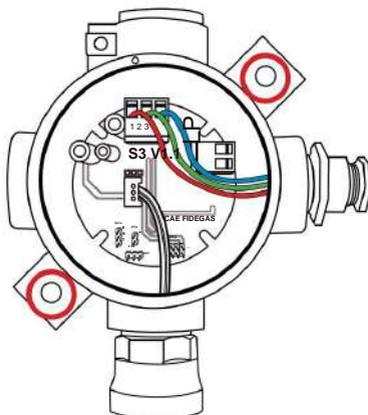


Along with the S/2-T2 ABS remote sensor, an accessory bag is delivered that contains: a Cable Gland with its corresponding gasket.

Steps to follow for the installation of the remote sensor Ref. S/3-T2 and S/2-T2:

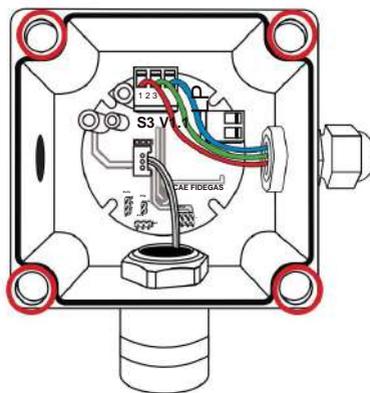
1. a) Loosen the Allen security screw on the cover and unscrew the cover counterclockwise.
1. b) Unscrew the four screws and remove the cover.

S/3-T2 ATEX



S/3-T2 ATEX installation

S/2-T2 ABS



S/2-T2 ABS installation

2. Fix the main body of the enclosure with its fixed location.
3. Insert the wiring through the cable gland
4. Make the connections with the electronic circuit respecting its connection map (see section 7).
5. Adjust the length of the cables so that they can be housed inside the box.
6. a) Screw the cover clockwise and tighten the Allen security screw on the cover.
6. b) Assemble the cover and screw in the four screws.

7. CONNECTIONS

Map of connections available in the remote sensor Ref. S/3-T2 and S/2-T2.

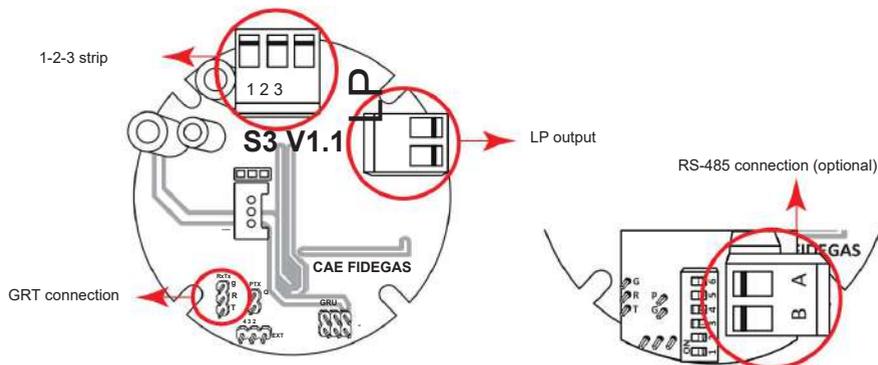


Figure 4: Connections

Strip 1-2-3: sensor power strip and 4-20 mA signal output strip numbered from 1 to 3.

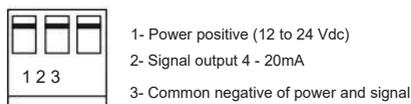


Figure 5: 4-20 mA connection identification

LP Output Strip: potential-free (LP) normally open (NO) non-latched output associated with the alarm and fault status. Maximum values: 30 Vdc, 0.5 A.

GRT connection: serial connection in TTL values.

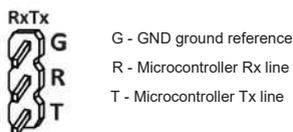


Figure 6: GRT connection identification

RS-485 connection (optional): with this optional factory-installed module, the sensor can be equipped with RS-485 communication for integration into industrial buses.

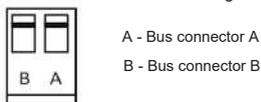


Figure 7: RS-485 connection identification

7.1 3-wire remote sensor connection

To connect the remote sensor to a 3-wire system, use Terminal Strip 1-2-3 respecting the polarity as indicated in figure 5.

Keep in mind that through this output it is not possible to connect several sensors to each other, neither in series nor in parallel.

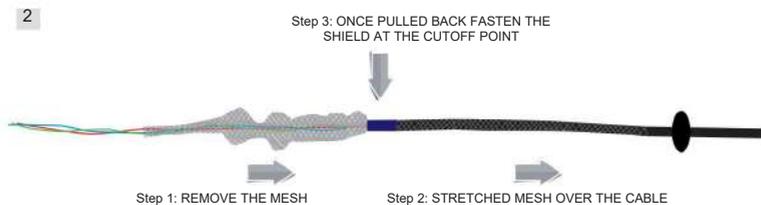
S/3-T2 version ATEX enclosure:

A) Place the ATEX cable gland on the SRG and tighten it with a wrench. Loosen the ATEX gland adjustment ring. Pass the supplied gasket through the cable and strip the cable to about 15 centimeters, as shown in image 1.



A source of breakdowns is usually the loose threads from the stripping of the cable and the mesh itself.

B) Remove the mesh back over the cables and past the cutting point until it is fully stretched, tape at the cutting point so that the mesh has no return.



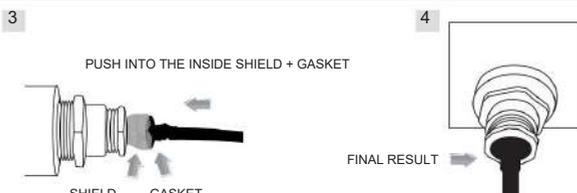
C) Insert the cable inside the ATEX cable gland until the tape appears, tighten the thread with the help of a wrench so that the cable and the mesh are well tied.

D) Finally, slide the mesh with the help of the gasket towards the interior of the ATEX stuffing box to finish adjusting both inside as shown in images 3 and 4.

E) Remove and cut the plastic protection and connect the wires to the SRG strip, so that the colors and numbering match both on the Control Panel and on the GRS (1-2-3), detailed specification in section 7.1.



Remember that the mesh should not touch the electronic circuit.



F) Close the cover and tighten the Allen security screw.

7.2 Connection of the remote sensor to the FIDEGAS® Control Unit

Connect the wiring in such a way that the colors and the 1-2-3 numbering of the power strip match on both the remote sensor and the Control Unit.

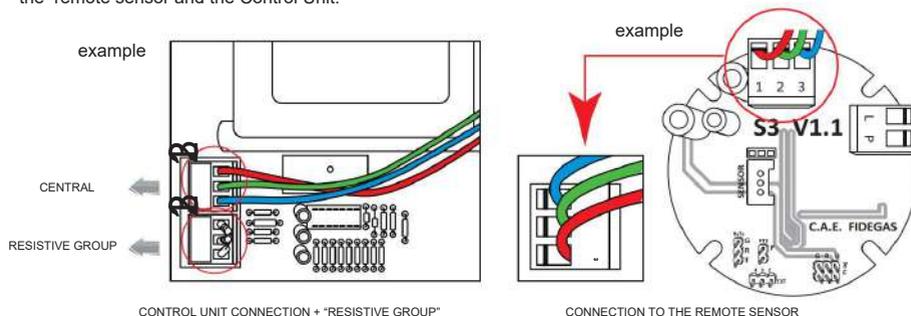


Figure 8: Control Unit-Remote Sensor Connection



If any Remote Sensor input is not used in the Control Unit, a “Resistive Group” must be placed per unused input; these are supplied inside the Control Unit.

The cable should NOT be “tight” on either the Control Unit or the Remote Sensor, thus minimizing the force exerted on the strip.



For more information related to connection to the gas plant, consult the user manual of the control unit.

7.3 Remote sensor connection via serial communication

It is possible to use the GRT connection to connect the sensor at TTL levels. For more information contact the manufacturer.

7.4 Connection of the remote sensor using RS-485 module

Using an optional module it is possible to go from TTL values to RS-485 connectivity compatible with FIDEGAS® communication modules (see compatible products).

For more information, consult the user manual “RS485 Communications Module Manual for S3 FIDEGAS® boards Ref. MS3-RS485 V1”.

7.5 Connecting the remote sensor to other devices

If you connect the Remote Sensor to another PLC type device, you must check that it has a standard 4-20 mA input/s, analog voltage inputs or some type of industrial serial communication.



For more information related to connecting to the device, refer to the user manual of the device.

In the case of voltage inputs, it will be necessary to transform the signal into voltage current by connecting a resistor to the device between the negative power supply (3) and the 4-20 mA signal output (2). The value of this resistance depends on the voltage range, applying the formula $R=V/I$

Example: to transform the range 4-20 mA to 1-5 Vdc, a 250 ohm resistor is used

$$I = 4 \text{ mA} = 0.004 \text{ A} \Rightarrow V = 1 \text{ Vdc} \Rightarrow$$

$$I = 20 \text{ mA} = 0.02 \text{ A} \Rightarrow V = 5 \text{ Vdc} \Rightarrow$$

$$R = V / I = 1 / 0.004 = 250 \text{ ohm}$$

$$R = V / I = 5 / 0.02 = 250 \text{ ohm}$$

8. MAINTENANCE



Before carrying out maintenance operations, the property must be warned that the gas detection system alarms and scheduled actions will be activated.

Check regularly that there is no dust obstructing the gas inlet.

The minimum recommended maintenance is:

- Function check at start-up.
- Field calibration every 6 months.
- Once the useful life of the sensor has expired, it is recommended that it be sent to the factory for evaluation or replaced with a spare part.

8.1 Operating test

The operating test is about checking, not the accuracy of the measurement, but rather that the sensor is capable of detecting the target gas in safe concentrations. For this purpose, the FIDEGAS® TEST KITS are used to apply a known and approximate concentration of gas, which must be detected by the sensor and activate the alarm.



1. Remove the mask from the Test Kit (tester) and place it over the sensing head.

2. Insert the cannula (tube) through the hole in the mask, release gas for 2-3 seconds and wait for the alarm to activate. If the alarm does NOT activate in the Contro Unit, repeat this operation releasing more gas.

3. Once the proper functioning check has been carried out, do not forget to remove the mask and store it next to the Tester.



When the Test Kit has low pressure, more gas application time will be necessary to perform the check. The Test Kit is not valid for further testing when there is no outlet pressure.

8.2 Field calibration

With field calibration the aim is to check the accuracy of the measurement, being able, if necessary, to correct any detected deviations.



Field calibration should only be carried out by the manufacturer or the authorized technical service for this purpose.

To carry out the calibration in the field, follow the ON-SITE CALIBRATION PROCEDURE FOR TOXIC GAS AND/OR OXYGEN SENSORS P-SAT-02.

8.3 Replacing the GRS



An spare GRS is made up of an electronic circuit and a cap that incorporates the sensor. These elements have been calibrated together at the factory, therefore they should not be exchanged with other spare parts. Before replacing the GRS electronic circuit, the system must be disconnected from the mains supply and/or auxiliary batteries, the GRS must not be opened or manipulated with voltage.

- Loosen the Allen security screw and unscrew the cover (S/3-T2) or unscrew the 4 screws and remove the cover (S/2-T2).
- Disconnect the connection strip (1-2-3) and the sensor connector from the electronic board.
- Unscrew the two retaining screws on the electronic board and remove it, unscrew the cap that incorporates the sensor, join it to its electronic board and remove it.
- Unseal the new GRS, disconnect the electronic board and screw it into its location, finish tightening it with the help of a tool.
- Fix the new electronic board in its location and screw the two screws into position.
- Connect the connection strip (1-2-3) and the socket connector to the electronic board.
- To finish, screw on the GRS cover and tighten the Allen security screw (S/3-T2) or screw the cover (S/2-T2).
- Put the supplied marking label/s.

8.4 Spare parts

List of available spare parts:

Ref. S/3-T2	Ref. S/2-T2	Gas	Range	Spare Ref.
00051	03382	O2	(0-25)% v/v	00158
00052	03383	O2	(21-0)% v/v	00170

Carefully read the procedure for correct maintenance of the product.



9. TECHNICAL CHARACTERISTICS

Supply Voltage	12 to 24 Vdc	
Consumption	At 12 Vdc: 15 mA At 24 Vdc: 10 mA If the 4-20 mA Output is used, the consumption may increase by 20 mA.	
Serial connectivity	TTL RS-485 (optional)	
Output signal	Current loop 4-20 mA (three wires)	
LP output	Max voltage 30 Vdc Max. current 0.5A	
Sensor type	Electrochemical	
Gas type	Oxygen	
Measurement range	(0-25) or (21-0) % v/v	
Alarm values	Range (0-25) % v/v	<19% v/v and > 22% v/v
	Range (21-0) % v/v	<19% v/v
Lifetime	Two (2) years approx. in clean air. It is recommended to perform a calibration EVERY 6 MONTHS	
Warm-up time	5 minutes	
Stabilization time	5 minutes	
Response time	<15 seconds	
Temperature range	-20 to 55 °C	
Relative humidity range	15 to 90%RH	
Operation pressure	850 to 1150 mbar	
Marking (S/3-T2)	 II 2G Ex db IIC Gb Group II Apparatus: installation with the presence of an explosive atmosphere other than mining. Category 2 G. use intended for sites classified as zone 1 and zone 2 (Gases)	
Serial number	CCCC: Product code AAMM: Year and month of manufacture XXXX: Manufacturing number	
Degree of protection	S/3-T2: IP66	S/2-T2: IP66/67
Dimensions	S/3-T2: 140 x 162 x 91 mm S/2-T2: 130 x 140 x 75 mm	
Weight	S/3-T2: 1150 gr	S/2-T2: 300 gr

MANUFACTURER: Comercial de Aplicaciones Electrónicas S.L.

ADDRESS: Paseo Ubarburu 12 - 20014 San Sebastián - Spain

PRODUCT DESCRIPTION:

Remote Gas Sensor Ref. S/3-T2 ATEX and S/2-T2 ABS Toxic Gas:

The above-mentioned product is declared, under our exclusive responsibility, in accordance with the provisions of the following directives:

1. **Directive 2014/34/EU** Equipment and protective systems intended for use in potentially explosive atmospheres abolishing Directive 94/9/EC (OJCE 03/29/2014 - Series L, n° 96/309). (S/3-T2 ATEX version only).
2. **Directive 2014/30/EU** Electromagnetic compatibility abolishing Directive 2004/108/EC (OJEC 03/29/2014 - Series L, n° 96/379).

This conformity is assumed in reference with the following harmonized standards:

- **EN IEC 60079-0:2018+AC:2020-02** Explosive atmospheres - Part 0: Equipment - General requirements. (S/ 3-T2 ATEX version only)
- **EN 60079-1:2014** Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d". (S/3-T2 ATEX version only).
- **EN 50270:2015+AC:2016-08** Electromagnetic compatibility - Electrical apparatus for the detection and measurement of fuel gases, toxic gases or oxygen.
- **EN 50271:2018** Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies.
- **EN 50104:2019+A1:2023** Electrical apparatus for the detection and measurement of oxygen - Performance requirements and test methods.

In San Sebastián,

A handwritten signature in black ink, appearing to be 'Julio Bouzas Fuentetaja'.

JULIO BOUZAS FUENTETAJA
GENERAL MANAGER



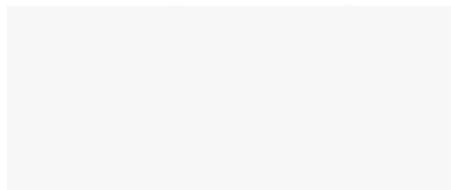
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