OGGIONI®

# enose® RAS/AD GAS TRANSMITTER

*enose® Technology*


## *INSTALLATION AND OPERATING INSTRUCTIONS*

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# WARNINGS and CAUTIONS

The RAS series transmitters are designed to continuously analize toxic or explosive gas in the athmosphere. The may be used in hazardous areas with explosion hazard in the range 0-100% LEL.
The analysis unit may use catalytic, solid state or NDIR technology transducers.
The transmitters have a 4-20mA standard engineered output or alternatively three threshold outputs associated to the Alarm, Warn and Fault conditions.
These devices are an integral part of gas detection fixed installations, to protectd industrial plants and the workers safety

Before using the enose® transmitters make sure you have read and understood the operating and installation instructions in the present manual.

Improper use of these products, as well as the inadequate maintenance of the same, can compromise the efficiency jeopardizing the safety of the controlled environments and users.
Improper use of the equipment described in this manual or a use out of manufacturer's specification, as well as unauthorized modification of the product will be considered NON-COMPLIANCE with invalidation of any form of guarantee.

# USE AND RESTRICTIONS

The flammable gas transmitters equipped with catalytic sensors CANNOT be used in inert atmosphere or in oxygen deficiency.
As prescribed in the Europea Standard EN 60079-29-2 the minimum concentration of oxygen present in the environment, for a proper device operation, must be **> del 10% v/v.**
Always about the use of catalytic sensors, we must recall that there are substances that can significally influence the sensor response.

These substances are called poisoning, the most common are:
Silanes, silicates, silicones.
Halides (compounds containing fluorine, chlorine, bromine and iodine)
Sulphur glycols (compounds that polymerize the sensor catalytic element)
Heavy Metals (ex. Tetraethyl lead).

If these substances may be present, it is recommended to often verify the sensor sensibility performing a calibration test.
The sensor is exposed to the atmosphere to be analyzed through an entrance protected by a sintered steel filter, having a flame-break function.
This filter has to be maintained clean, protected by water infiltrations or by powder deposits.

Performing paintings or insulation operations with foaming agents, in the area where the sensors are installed it is recommended to adequately protect the devices and never expose them to solvents or substances that may affect the proper operating of the devices.

After exposure to a high concentration of gas (close to or greater than the full scale) always check the sensitivity of the sensor by running a calibration test.

*Always remember that the only sure method to check the proper operating of the transmitters is to perform a calibration test using a gas mixture of calibration gas having a known concentration.*

# EC Declaration of Conformity

We, Oggioni s.a.s,
Via G. da Besana,11
20045 Besana B. (Mi)
Italy
declare under our sole responsibility that the mentioned product is in accordance with the applicable european directive and to the listed harmonized standards or normative documents. Where applicable, a competent body has been released the relevant EC Type Examination

This Declaration of Conformity is relevant to the following products

**Gas detector, RAS series**
Equipment or protective system intended for use in potentially explosive atmospheres

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relevant european directive **94/9/EC**
**2004/108/EC**

applied harmonized standards

| | |
|---|---|
| **EN-60079-0:2006** | Electrical apparatus for explosive gas atmospheres: General requirement |
| **EN-60079-1:2007** | Electrical apparatus for explosive gas atmospheres: Flameproof enclosures “d” |
| **EN 60079-29-1: 2007** | Explosive atmospheres. Gas detectors.Performance requirement |
| **EN-50270 :2006** | Electromagnetic Compatibility - Electrical apparatus for detection and measurement of combustible gases, toxic gases or oxigen |

Type of protection: **II 2G**
**Ex d IIC T6 IP65**

Notified Body: CESI S.p.A.
EC Type Examination **CESI 03 ATEX 041X**

Notification of Quality System according to annex VII of 94/9/EC directive no. 03 ATEX 4539Q issued by Notified Body Nemko AS – CE0470

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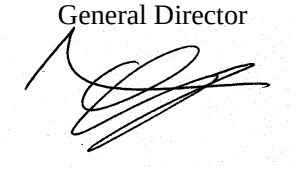
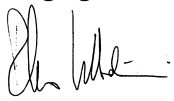
Signature of manufacturer

General Director



Managing Director



Date: 01/02/2012

# I INTRODUCTION

## 1.1 General Description

The RAS series transmitters are designed and manufactured in compliance with the safety and health requirements as defined in Annexe II° of Directive 94/9/CE.
To meet the requirements of the directive the following harmonized European standards have been used:

EN 60079-0: 2009-08
EN 60079-1: 2007-07

The enose® AD transmitters are designed to measure concentrations of combustible gases in the range of 0-100% Lower Explosive Limit (LEL) or concentrations of toxic gases, in ppm range, in an atmosphere generally consisting of air.
The transmitters use our enose® technology which thanks to the extreme integration of the components, allows the mounting of all the transmitter parts, directly inside the transmitter probe body , giving the instrument a high degree of reliability and strength.

The extreme modularity of this technology allows the usage of sensors in various technologies: NDIR (infrared), Catalytics, Pellistor, Electrochemical Cell and MOS.

The transmitters can be supplied with relay outputs that can be associated to the alarm and fault conditions and with a display, having this way an autonomous measurement station, remote.


Fig. 1.1.1 RAS AD version

## 1.2 Features

The RAS/AD enose® transmitters have been designed in compliance with the requirements of ATEX 94/9/CE Directive concerning the fixed gas detection systems.

The gas transmitters are controlled by a microprocessor, they have a 4-20 mA analogue output,or three relay outputs with voltage free contacts that can be associated to the alarm or fault conditions. These transmitters also have a communication serial line RS-485 with Modbus RTU protocol for the opartion of diagnosys and maintenance.

Small size
Low Power consumption
Non Intrusive "One Person" calibration.
Very resistant to poisoning substances.

The RAS detectors meet the requirement of the ATEX 94/9/CE directive, including functional performances, they are also conorm to SIL 2, being this way suitable to be apart of security systems

## 1.3 Typical Application

Ideal to detect combustible gas and solvents, the typical application field of the RAS transmitters are:

Chemical and Petrochemical Industry
Gas treatment, storage and distribution plants
Combustible material storage

# II SPECIFICATION

## 2.1 General specification

| | |
|---|---|
| Used Sensor Technologies | NDIR (Infrared) - type RAS/AD/2xx/..<br>Catalytic / Pellistor - type RAS/AD/1xx/..<br>Electrochemical Cell - type RAS/AD/3xx/..<br>MOS (Semiconductor) - type RAS/AD/4xx/.. |
| Code of protection | II 2G Ex-d IIC T6 |
| IP Rating | IP65 |
| Location | Hazardous area (zone 1) |
| Short-term repeatability | ±2% FSD 60 min. |
| Long-term repeatability | ±5% FSD 3 months |
| Accuracy | ±5% FSD |
| Response time | $T_{90}$ ≤20 seconds ; $T_{50}$ ≤10 seconds *(methane) |

* reference mixture used ($CH_4$), for other gas or vapors response time may be longer

## 2.2 Electrical Specification

| | |
|---|---|
| Supply Voltage | 12-30 Vdc |
| Power consumption | **IR Combustible sensors**:<br>140mA@13.5V; 80mA@24V<br>**Catalytic combustible sensors :**<br>H.Q. sensor – 140mA@13.5V; 80mA@24V<br>Standard sensor – 75mA@13.5V; 55mA@24V<br>**Oxygen/Toxic sensors:**<br>60mA@13.5V; 40mA@24V<br>**MOS sensors:**<br>100mA@13.5V; 70mA@24V<br>**Relays Configuration:**<br>+20mA@13.5V; +10mA@24V every energized relay, for a maximum of 3 relays |
| Supply fuse | 500 mA |
| Signal fuse | 63 mA |
| Analogue output | 4-20 mA |
| Load | 0-300 ohms |
| Cable Type | 4-20mA: 3 conductor shielded cable<br>Relays: 2 conductor |
| Relays | 2 relays for Warn / Alarm<br>1 Fault relay<br>Programmable for normally energised/de-energised, with manual/automatic reset<br>Max. contact resistance 150 mΩ<br>Max. switching voltage 100Vdc<br>Max. switching current 1A |

## 2.3 Environmental Specification

| | |
|---|---|
| EMC susceptibility | According to EN 50270; EN 61000-6-3 |
| Storage temperature | -20 to +40 °C |
| Operating temperature | -40 to 70 °C<br>-20 to 50°C - for electrochemical cells only |
| Humidity range | 90% R.H. n.c. |
| Pressure range | 80-120kPa |
| Air speed | 0 – 6 m/s |

## 2.4 Mechanical Specification

| | |
|---|---|
| Overall dimensions | 170x100x70 mm |
| Weight | 0.4 Kg |
| Mounting | 2x6 mm holes |
| Termination | Gland Ex-d |
| Junction box attachment | 3/4" Conical Thread UNI 6125 – ISO 7/1 Rc |

## 2.5 Ordering information

The RAS detectors may have various output configurations according to the application requests. In brief, the coding below, groups together the various options.

| Atex Case | RAS | / | | | / | | | | | / | | | | / | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

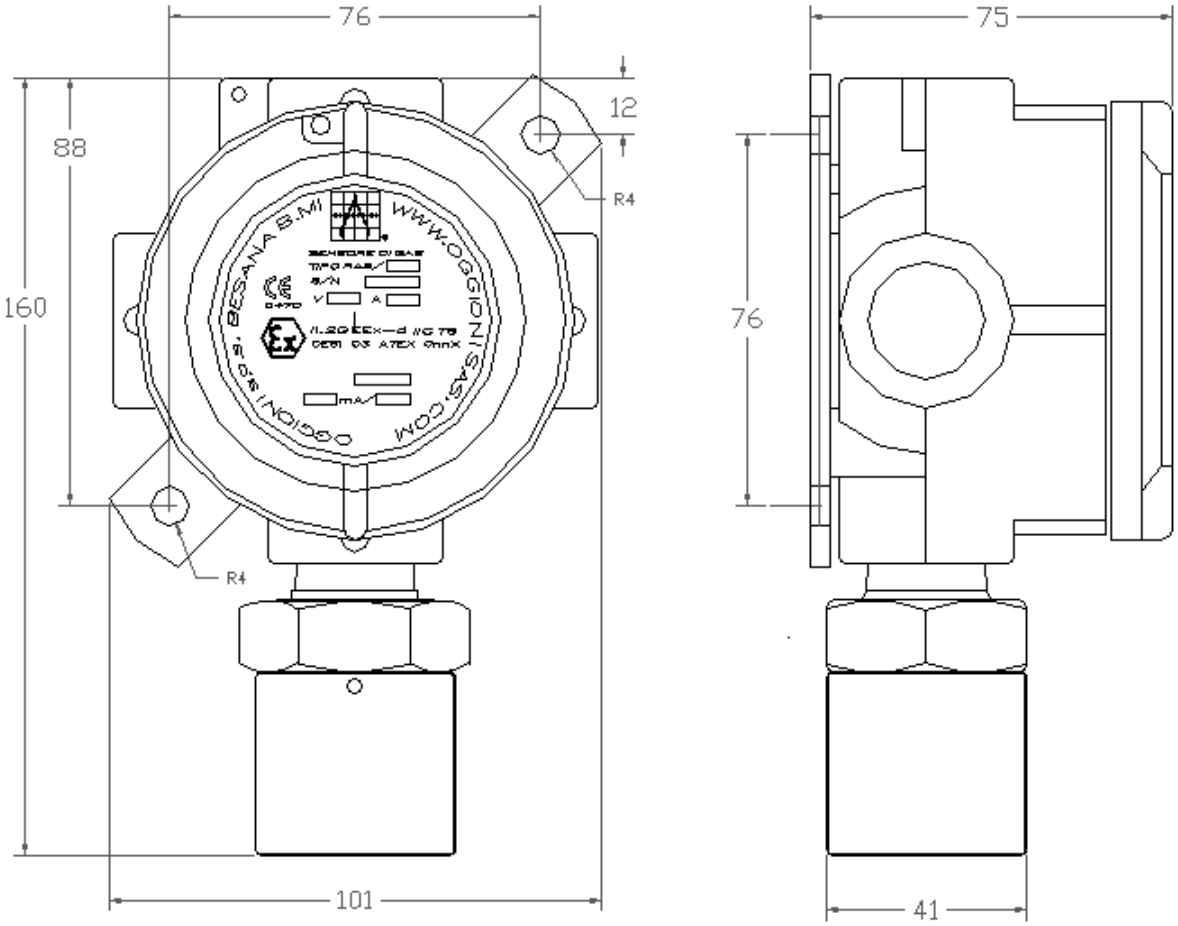
*Relay contact*

| | | |
|---|---|---|
| No display | A D | N A Normally Open |
| With display | D Y | N C NOrmally Close |

| | | | |
|---|---|---|---|
| Catalytic sensor | 1 | | |
| IR sensor | 2 | A A S | 4-20mA Output and RS485 |
| Electrochemical cell | 3 | C C S | Relay Outputs and RS485 (AD Only) |
| Semiconductor Sensor | 4 | C A S | 4-20mA, Relays and RS485 (DY Only) |

# # # Gas type (see gas table)

## 2.6 Outline drawing



# III INSTALLATION

The installation of the transmitters must be performed in accordance with European Standard EN 60079-14 or in accordance with national nomative.

Installation must be carried out by well skilled and competent personnel only.
Site the sensors to facilitate recalibration and maintenance routine.
Always mount the sensors vertically with the detection head facing downwards and the cable entry on top.

## 3.1 Sensor Location Guidelines

The first factor to consider when deciding where to position the sensors is the type of gas that has to be detected.

Normally, for gases with a lower density than the air (hydrogen, methane, etc.), the sensors are uniformly distributed at about 30cms from the highest point of the ceiling, because these "light" gases are easily defused in the air.
It is as well good practice to avoid places where there are air currents or where the air is likely to be very still because of certain irregularities of the ceiling e.g. beams etc. which stop the gas freely moving around.

For gases with higher density than the air the sensors should be placed near the floor (about 30cm high) and in proximity to possible air vents.
Particular points such airspaces, junction boxes, manholes, and weigh-bridges should always be controlled by a sensor.

For gases with a specific weight similar to the air or for toxic substances in low concentration it is a good general rule to distribute the sensors at different levels to heighten the chances of intercepting an eventual leak.

Always have the gas sensor head pointing downwards so that the gas inlet is protected from water and accumulation of dust and/or dirt. Site the sensors to facilitate recalibration and maintenance routine.

## 3.2 Generic wiring guidelines

The use of shielded cables is recommended to connect the sensor to the power supply unit.
Should more than one strand of wire be used in the wiring be sure that the cable screen is continuous and that the conductors are soldered at the joints.
The cable screen must be connected to safety grounding in safe area.
Furthermore it must be remembered that the protective shielding must be grounded only on the control unit or power supply side and should never be connected to the detector.
The use of terminal leads is recommended, or in any case joints on the power cable must be clamped with flat tab connectors or soldered.

Complete all cable insulation testing before connecting the cable at either end.
When all wiring has been completed and tested, the system may be powered-up.

The following table gives a guide about the wire section depending on the distances.

| Distance Km | AWG Section | $mm^2$ Section |
|---|---|---|
| <1 | 17 | 1 |
| 1.5 | 15 | 1.6 |
| 2.5 | 13 | 2.5 |

## 3.3 Guide lines for proper installation according to EMC Directive

To comply with EN 50270 EMC (Electromagnetic Compatibility), you have to observe some simple points during the installation.

In General:
The area chosen to instal the detectors must be free from strong electromagnetic interferences.

Eventual autonomous power supply sources powering the detectors must be equipped with line filters type FN 660 (Schaffner) or equivalent or in any case in accordance with the EMC Directive

To connect the input devices it is recommended to use shielded cables with a minimum cover of 80%.
It is recommended to avoid connecting inductive or capacitive loads, that could generate transient on the system power supply, to the same power supply source used for the detectors.

If actuators, sirens or other devices secondary power supply is necessary, it is recommended to use a separate winding on the secondary of the transformer of main power supply.

The electrital power supply must be properly connected to the grounding.

## 3.4 General precautions

- Do not paint the the sensor head or the transmitter body.
- At start up always verify the transmitter response using a mixture of known gas
- Do not expose the transmitter to electrical and/or mechanical shocks.
- Make sure that the sensor has a good exposure to the atmosphere maintaining the sintered head filter clean and free of condensation
- Any repairs or tecnical operation on the transmitter must be performed only by athorized Oggioni s.a.s. personnel

## 3.5 Storage

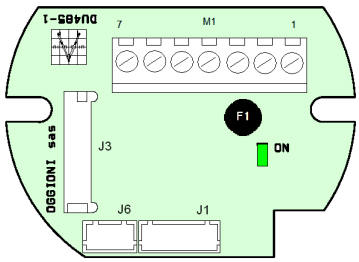
The gas detectors must be stored in clean areas, not humid and always in the temperature range conforming the indications of the tecnica specifications.

In case of prolonged storage, the detectors must be into their original packing and they have to be sealed in plastic bags containing if possible a drying agent.

## 3.6 Cable connection guidelines

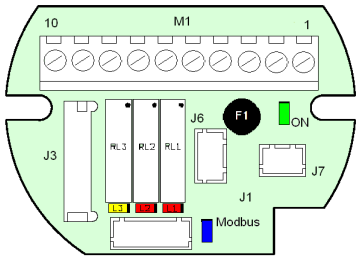
The RAS/AD gas detectors must be connected according to the configuration you have as specified here below. In the following tables the available RAS/AD configurations with their connections are described:

### a) 4-20mA with serial line RS485 version RAS/ AD/... / AAS




| Terminal pins | Signal | Description |
|---|---|---|
| 1 | (-) | Negative |
| 2 | +12÷24VDC | Power supply (Positive) |
| 3 | 4-20mA | Analogue output |
| 4 | (-) | Negative |
| 5 | A | A RS-485 |
| 6 | B | B RS-485 |
| 7 | Shielld | Cable shield |

### b) RS485 serial line and 3 relays version RAS /AD/... / CCS




| Terminal pins | Signal | Description |
|---|---|---|
| M1 Connector | | |
| 1 | (-) | Negative |
| 2 | +12÷24VDC | Power supply (Positive) |
| 3 | N/U | Not Used |
| 4 | NO/NC | First alarm threshold |
| 5 | Common | First alarm threshold |
| 6 | NO/NC | Second alarm threshold |
| 7 | Common | Second alarm threshold |
| 8 | NO/NC | Fault |
| 9 | Common | Fault |
| 10 | Shield | Cable shield |
| **Terminal pins** | **Signal** | **Description** |
| J7 Connector | A | A RS-485 |
| | B | B RS-485 |
| | | |
| **LED Indications** | | |
| ON | Green | Power on |
| L1 | Red | First alarm threshold |
| L2 | Red | Second alarm threshold |
| L3 | Yellow | Fault |
| Modbus | Blue | RS-485 communication status |

NOTE:

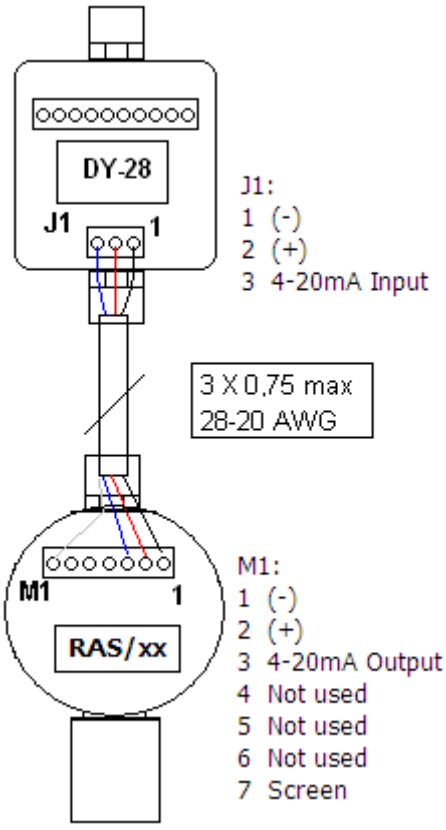
All three relays are featuring one single contact only. Therefore while the relay is not activated the contact will remain open (N.O.) and LEDs will be OFF.

With the relay energized the contact will be closed and its related LED will be ON. So, should the relays be programmed as normally energized, the related contacts will be closed in normal operation and relative LED will be ON, and they will open when the associated event occurs (Alarm, Fault) or in case of main power interruption and related LED will automatically switch OFF.

Relays alarm thresholds are programmed during production by the manufacturer on customer request and can be modified only by connecting the gas detector to a PC using a specific software called "enoseBlu2" (see enoseBlu2 software Instruction Manual for relays alarm thresholds modification procedure).

### c) Remote display configuration

If necessary, it is possible to add a DY-28 remote display to the gas detector. In this case the connections between the gas detector and the display unit shall be done as indicated in the picture.




The power electrical connections and the 4-20mA signal between the two units shall be done through the gas detector's M1 terminal and the J1 connector of the DY-28 display unit.

Pin J1 DY-28 display unit pin J1 assignment:

| Terminal pins | Signal | Description |
|---|---|---|
| J1 Connector | | |
| 1 | (-) | Negative |
| 2 | +12÷24VDC | Power supply |
| 3 | 4-20mA | Analogue Output |

For further information please see the DY-28 manual

***N.B.:*** *The remote display can only be connected with an AAS detectors main board, as the 4-20mA output is requested on the main board.*

## 3.7 Final inspection and Start Up

Complete all cable insulation testing before connecting the cable at both ends.

The CABLE SHIELD must be isolated and it must NOT BE CONNECTED TO THE ELECTRONIC CIRCUIT OF THE GAS DETECTOR.

After all the wiring has been connected and completely tested, the detector must be closed, and only after this the system can be powered on.

In case of output relays version (RAS/AD/…/**CCS**), during the warm up time the Fault relay will be active (showing the Fault condition) and, when the warm up procedure will successfully finish, the Fault relay will return to its normal position.
In case the gas detector is faulty, the Fault relay will stay in fault condition (showing the effective fault event) even after the warm up time has elapsed.

After the warm up procedure, in normal operation status, the instrument analogue output must have the 4 mA value.

## 3.8 Fault conditions and Actions

Fault or malfunction conditions are indicated by the detector by activation of fault relay (for CCS version) or giving the value of 2mA on the analogue output signal (for AAS version).
The following table gives indication of fault conditions and possible actions:

| Condition | Mode | Actions |
|---|---|---|
| Power up | Automatic reset | Wait for end of start-up cycle, about 1 minute |
| Start Up Fail | Latching (manual reset) | Switch the instrument OFF and ON again, if problem is not solved check sensor status and if necessary replace it |
| Sensor fault | Latching (manual reset) | Check sensor status and if necessary replace the sensor |
| EEPROM<br>CRC Error | Latching (manual reset) | Restart the instrument, if problem is not solved send the instrument back to the supplier |
| Calibration Error | Latching (manual reset) | Try to make a new calibration, if problem is not solved replace the sensor |
| Over Range | Automatic reset | Check absence of gas in ambient, switch the instrument OFF and ON again, if problem is not solved check sensor status and if necessary replace it |
| Sensor negative drift | Automatic reset | Restart the instrument or make a new zero calibration |

# IV TEST AND VERIFICATION

The instrument is factory calibrated for one specific gas.
It is recommended to periodically check the sensor response according to the EN60079-17 using the test and calibration appropriate kit.

*To verify the gas detector calibration, follow the instructions below:*

Mount the GDA-FA-2 adapter on the gas detector GM2 sensor head and connect the flexible pipe to the regulator mounted on the gas cylinder.

Connect a multimeter (with 20mA scale) in series to the 4-20mA signal; on the multimeter you shall read 4mA in normal conditions.

If the gas detector has relays output only (CCS version), you will just check the relays being activated when reaching the set alarm threshold giving gas from the test gas bottle.

Slowly open the gas cylinder regulator to have a test gas flow not greater than 0,5 l/min. and maintain it constant.

The read current on the multimeter will increase until the maximum value is reached and then the readout gets stable.
This step should take about 1 min, check continously the 4-20mA output with a multimeter during the complete procedure.
The test is passed if the output in mA will reach the value correspondent to the gas concentration contained into the test gas bottle. An acceptable reading is included between 90% and 120% of test gas concentration.

If the gas detector only has relays output (CCS version), you will see the relays activating when the read concentration reaches the set alarm threshold (relays will change their status and you will see red LED switching ON or OFF according to the configuration requested – if normally energized or normally not energized at rest).

After the test is finished, close the gas flow and remove the gas detector sensor head adapter.

It is recommended to perform a gas detectors functional test every six months according to the operation instructions related to the used sensor type.

*WARNING: If you are working in a classified explosion hazardous area make sure you are taking all the necessary precautions before you open the gas transmitter body. This operations can only be performed by qualified and trained personnel.*

# V CALIBRATION

It is recommended to check every three months the sensor response using the test and calibration appropriate kit.

To make a correct calibration, the following instruments are requested:
Calibration kit with adaptor for GM2 head.
Cylinder with test gas with known concentration (preferably with a concentration of 50% of the detector full scale).
Magnet to start Calibration procedure.

> *Before starting any verification and calibration procedure all personnel responsible for security must be informed and all alarm systems which might be connected to the system must be switched off.*

## 5.1 ZERO Calibration

Fig. 1
Starting from this position, slowly move the magnet until reaching the final position in Fig. 2

Fig. 2
From this position remove the magnet and the zero calibration procedure is terminated.

## 5.2 SPAN Calibration

To start the span calibration, mount the adapter to the GM2 sensor head and connect it to the pipe of the gas cylinder via the rapid plug as in the picture.

Start the calibration procedure following the steps below. It can be done in two ways:

- blindly, see subchapter 5.2.1.
- checking the 4-20mA output with a multimeter during the procedure (see subchapter 5.2.2.).

### 5.2.1 Span calibration with relay outputs (CCS)

This procedure consists of the following steps :
Switch off all the alarm systems that might be connected to the gas detection system, informing all the security personnel and responsible.

Place the calibration magnet on the left side of the sensor (as shown in figure 1) and slowly move the magnet 120° to the right (as shown in figure 2) the PreAlarm red LED will switch on showing the reading of the magnet, suddenly turn the magnet left (before the red LED switches off again) to put it back to the start position.
The PreAlarm red LED switches off, wait for about 40 seconds until the Alarm red LED switches on (if after about 40 seconds the LED doesn't switch on, the calibration procedure didn't start so repeat the sequence with the magnet).

Remove the magnet from the instrument head. In this moment the detector enters the span calibration status.

Slowly open the gas cylinder adapter valve until you have a flow not greater than 0,5 l/min. and maintain a constant gas flow for about 60". Now the read value should be stable. After about 60 seconds close the adapter valve.

Wait until the red LED switches off, in this moment the span calibration procedure is finished. If the Fault yellow LED changes its status (Fault condition) the calibration failed, so repeat all the procedure from the beginning. If the fault condition remains, please see par. 3.6
Remove the adapter from the gas detector's head and switch on again all the alarm systems connected to the gas detection system.

### 5.2.2 Span calibration using an multimeter

Disable all alarm outputs on the central unit, put the calibration magnet on the left side of the sensor, (as shown in figure 1) and slowly move the magnet 120° to the right, (as shown in figure 2), wait few seconds and then bring the magnet in the start position to the left again.

Connect a multimeter (with 20mA full scale) in series to the 4-20mA signal.
On the ampermeter you shall read as follows:
Just after removing the magnet : the current will go down from 4mA to 1mA and will remain steady for about 20s.
After the 20s, the expected calibration value will be shown, (by default at 12mA, that corresponds to 50% of the full scale).
This value may be changed by the operator, should the calibration bottle concentration have a different value. (See the NOTES below).
This value will be stable for about 20s.

After the 20s the detector will show the real gas value read, then the multimeter will read 4mA.
Slowly open the valve of the adaptor until you have a flow no greater than 0,5 l/min. and maintain a constant flow of test gas. The read current will increase until the maximum value will be reached and the readout will get stable. This step takes about 1 min.

After about 1 minute close the gas flow and take off the adapter from the GM2 sensor head. As soon as the gas read decreases below 80% of the highest read value, the detector will set the span. The highest value read will be assigned to the expected span value. While doing this, the value in mA read on the ampermeter's display will drop to 1 mA.
This step takes about 20s, then the instrument will turn back to the real gas value in that moment. Considering the gas may be still inside the sensor head, the operator will probably read a current value dropping towards 4 mA.

**WARNING**!! If the calibration procedure fails, the multimeter will measure 2 mA. In this case switch off the power, then power on again, wait for the detector warm up time and then repeat the calibration procedure.
Eventually, after the 4-20 mA output gets stable to 4 mA again (detector reading gets to zero again), it is recommended to check the calibration applying gas again from the bottle and checking the read value.

**NOTES** – Changing the expected span gas (calibration gas concentration):

To change the expected span span (calibration gas concentration), as soon as the 12mA value is read on the multimeter, put the magnetic tool on the sensor head again (in central position) and keep it still, the value of the expected gaas concentration will start increasing. When the desired expected span value has been reached, the magnet must be removed.

If the desired value is lower than the default 50%, one should keep the magnet on until the full scale is reached, after which the counting will start over from zero again. Then, when the desired expected value has been reached, the magnet can be removed.

A previous calculation is necessary to find the current value corresponding to the expected desired span concentration, according to the detector full scale, and considering the following remarks:

The scale in current goes from 4mA corresponding to zero gas (fresh air) to 20mA corresponding to the detectors full scale.
Therefore there will always be a delta of 16mA from zero to full scale value.

*100% f.s. : 16mA = 30% f.s. : x*

*Then:*

*x = 30 * 16 /100 that is x = 4.8 mA*

*The expected current value for a concentration of 30% of full scale will therefore be:*

*4.0 mA + 4.8mA = 8.8mA.*

**Table 1 – Response time various sensors**

| Gas | Formula | Sensor Technology | Standard Range | Response T50 | Response T90 |
|---|---|---|---|---|---|
| Flammable | | Standard Catalytic | 0 - 100% LEL | n.a. | < 10 sec. |
| | | High Qualità Catalytic | 0 - 100% LEL | n.a. | < 10 sec. |
| | | Infrared | 0 - 100% LEL | n.a. | < 30 sec. |
| Various | | MOS | Various | n.a. | < 10 sec. |
| Oxygen | O2 | Electrochemical cell | 0 - 30% Vol. | n.a. | < 15 sec. |
| Carbon Monoxide | CO | Electrochemical cell | 0-300/500 ppm | < 10 sec. | < 30 sec. |
| | | | 0-500/1500 ppm with H2 and SO2 filter | < 10 sec. | < 30 sec. |
| Carbon Dioxide | CO2 | Infrared | 0 - 10000 ppm | n.a. | < 30 sec. |
| | | | 0 - 5% Vol. | n.a. | < 30 sec. |
| | | | 0 - 100% Vol. | n.a. | < 30 sec. |
| Hydrogen Sulfide | H2S | Electrochemical cell | 0 - 30 ppm | < 15 sec. | < 30 sec. |
| | | | 0 - 100 ppm | < 15 sec. | < 30 sec. |
| Hydrogen | H2 | Electrochemical cell | 0 - 1% Vol. | < 40 sec | < 70 sec. |
| | | | 0 - 4% Vol. | < 40 sec. | < 60 sec. |
| Nitric Dioxide | NO | Electrochemical cell | 0 - 100 ppm | < 10 sec. | < 20 sec. |
| Nitrogen Dioxide | NO2 | Electrochemical cell | 0 - 50 ppm | < 10 sec. | < 30 sec. |
| Ammonia | NH3 | Electrochemical cell | 0 - 100 ppm | < 20 sec. | < 60 sec. |
| | | | 0 - 500 ppm | < 30 sec. | < 90 sec. |
| | | | 0 - 1000 ppm | < 20 sec. | < 90 sec. |
| | | | 0 - 5000 ppm | < 30 sec. | < 90 sec. |
| Hydrogen Cyanide | HCN | Electrochemical cell | 0 - 30 ppm | < 25 sec. | < 50 sec. |
| Hydrogen Chloride | HCl | Electrochemical cell | 0 - 30 ppm | < 30 sec. | < 70 sec. |
| Hydrogen Bromide | HBr | Electrochemical cell | 0 - 30 ppm | < 30 sec. | < 70 sec. |
| Chlorine | Cl2 | Electrochemical cell | 0 - 10 ppm | < 30 sec. | < 60 sec. |
| | | | 0 - 50 ppm | < 20 sec. | < 60 sec. |
| Sulphure Dioxide | SO2 | Electrochemical cell | 0 - 20 ppm | n.a. | < 25 sec. |
| Silane | SiH4 | Electrochemical cell | 0 - 50 ppm | < 10 sec. | < 60 sec. |
| Boron Trifluoride | BF3 | Electrochemical cell | 0 - 10 ppm | < 30 sec. | < 90 sec. |
| Hydrogen Fluoride | HF | Electrochemical cell | 0 - 10 ppm | < 30 sec. | < 90 sec. |

**NOTE: the above declared response times are the one declared by the sensor manufacturers, for the nude sensor without considering a flame arrester.**

# VI MAINTENANCE

## Safety Warning

*Installation and maintenance must be performed only by trained, skilled and competent personnel.*
*Before starting any maintenance procedures, all responsible security personnel should be informed and all alarm systems which might be connected to the system should be switched off.*

This instruments need a routine maintenance, including calibration on a regular basis.
It is recommended a complete system check-up at least once a year.

Check (possibly every three months) the sensor response using known gas concentration and recalibrate it every 6 months if necessary.

Make sure the atmosphere is clean and free of other gases before proceeding with the calibration and always use certified gas mixture bottles and never after the expiration date (every bottle has an expiration date).

The detector is provided with a sintered filter that during the operation may clog due to water, dust, oil etc. Check the filter by removing it and clean it with compressed air if necessary before refitting it. **(blow the compressed air from the inner side to the outer side of the cap and never vice versa)**.

DO NOT USE COMPRESSED AIR ON SINTERIZED FILTERS WHILE FIT ON THE DETECTOR HEAD!

At the end of the maintenance and/or inspection update the plant register, making sure to keep records of the actions taken and the new calibration parameters.

# VII MODBUS RTU Serial Interface

## 7.1 Introduction

The Modbus communications interface is based on the two wire half-duplex RS485 standard in conformity to the EIA-485 specification.
The Transmitter implements the RTU protocol, the RTU mode and serial format must be the same for all devices connected on the network.

The Modbus interface factory default are set as follow:
Address 127
Baud rate 19k2
Parity none
Stop Bit 1

## 7.2 Modbus read command

- READ-MULTI-HR (cod. 03 dec. Read holding register)

## 7.3 Memory map

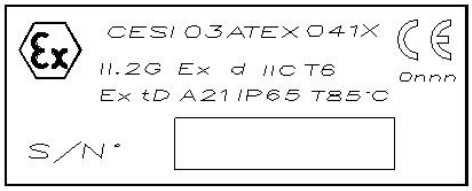
(Holding Registers)

| REGISTER CATEGORY | MODBUS ADDRESS | NAME | UNIT | MEMORY | ACCESS LEVEL |
|---|---|---|---|---|---|
| DIAGNOSTIC | 12 | Warning Quantity | General | E2PROM | READ ONLY |
| DIAGNOSTIC | 13 | Alarm Quantity | General | E2PROM | READ ONLY |
| DIAGNOSTIC | 14 | Maximum Gas | One Tenth of milliAmp | E2PROM | READ ONLY |
| DIAGNOSTIC | 54 | SIL Level | General | E2PROM | READ ONLY |
| DIAGNOSTIC | 74 | ResetHW Counter | General | E2PROM | ADMIN |
| READING FROM SENSOR | 6 | Percent Gas | Percentage | RAM | READ ONLY |
| READING FROM SENSOR | 7 | Sensor Output | milliVolt | RAM | READ ONLY |
| READING FROM SENSOR | 9 | Detected Gas Quantity | One Tenth of milliAmp | RAM | READ ONLY |
| READING FROM SENSOR | 10 | FBack Gas Quantity | One Tenth of milliAmp | RAM | READ ONLY |
| READING FROM SENSOR | 11 | Temperature | One Tenth of Centigrade | RAM | READ ONLY |

# VIII MARKING AND CERTIFICATIONS

## 8.1 GM2 Probe Marking

II 2G Ex d IIC T6


## 8.2 GM2 Probe certificates and reference standards

| | |
|---|---|
| **Manufacturer:** | OGGIONI S.a.s.<br>Via Gariberto da Besana,11<br>20045 Besana B. (MB)<br>Italia. |
| **Product:** | Gas Transmitter series RAS |
| **Type of protection:** | EN 60079-0: 2009-08<br>EN 60079-1: 2007-07 |
| **Performance According to:** | EN 61779-1:2007 EN 61779-4:2004 |
| **EMC Compliance According to directive 2004/108/EC** | EN50270 Tipo2 EN 61000-6-3:2002 |
| **Test report**: | AD-97/023215 |
| **EC type examination:** | CESI 03 ATEX 041X |

## 8.3 Series S...-SO...Case Marking

II 2GD Ex d IIC / Ex tD A21 IP66
Ta standard -20°C ≤ Ta ≤ +40°C
Ta estesa -50°C ≤ Ta ≤ +80°C

EC type examination: BVI 07 ATEX 0020U

## 8.4 Series S...-SO... Case certificates and reference standards

Manufacturer: COELBO s.r.l.
Via S.Margherita,83
20047 Brugherio (Mi)
Italia.

Product: Series S...-SO...Case

Type of protection: EN 60079-0: 2006 ; EN 61241-0:2006
EN 60079-1: 2004 ; EN 61241-1:2006

# IX ACCESSORIES

| | | |
|---|---|---|
| Splash Guard | **Cod. GDA - SD** |  |
| Collector cone | **Cod. GDA - CO** |  |
| Sensor flow adaptor | **Cod. GDA – FA/GM2** |  |
| Portable calibration Kit | **Cod. GDA – TK** |  |

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The brochure includes general specifications which are subject to change without prior notice.