Catalytic sensors – Life Time

Catalytic Pellistor sensors used into OGGIONI DUST & RAS series gas detectors have an average life time, declared by catalytic sensor manufacturer, of about 5 years.
In normal operating conditions Catalytic/Pellistor sensors have an expected lifetime lasting many years, this period cannot be calculated as there are too many factors affecting its operation; if we should give a period, we could say approx. 3 years is an acceptable average life time period.

There are several factors affecting the operation of the catalytic sensor.
The precious metal catalyst supported on ceramic has a chemistry and structure very similar to catalytic converters used in automobile exhaust systems. As such, it can be quickly rendered ineffective when exposed to certain types of materials referred to as catalyst "poisons or inhibitors". These materials include but are not limited to: tetraethyl lead as found in "leaded" fuel, volatile silicone oils and silicone (RTV) rubber off-gas products during cure, halogenated hydrocarbons (Freons®, and common solvents such as methylene chloride, trichloroethylene and ethylene dichloride), as well as chronic/high concentrations of hydrogen sulphide and other sulphur containing gases.

1. Catalyst Poisoning: There are chemicals which will deactivate the sensor and cause the sensor to lose sensitivity and eventually become totally nonresponsive to gases. The most common chemicals that can poison catalytic sensors are those that contain silicon, such as the common oil and lubricants with silicon compounds used as additives in machinery. Sulphur compounds, which are often released with gases, chlorine, and heavy metals also cause the poisoning of the sensor.
The exact cause of this poisoning is very difficult to identify. Some chemicals, with very small concentrations, will totally destroy the sensor. There have been instances in which the silicon contained in simple hand lotions has caused problems with catalytic sensors.

2. Sensor Inhibitors: Chemicals such as halogen compounds, which are used in fire extinguishers and Freon used in refrigerants, will inhibit the catalytic sensor and cause it to temporarily lose the ability to function.
Normally, after 24 or 48 hours of exposure to ambient air, the sensor starts to function normally. These are just a few typical chemicals that inhibit the sensor performance and are by no means to be considered as the sole possible inhibitors.

3. Sensor Cracking: The sensor, when exposed to excessive concentration of gases, excessive heat, and the various oxidation processes that take place on the sensor surface, may eventually deteriorate. Sometimes this will change the zero and span setting of the sensor.
Combustible gas sensors require oxygen to oxidize or burn combustible gases & vapours. If a sensor encounters a fuel rich, but oxygen deficient environment, carbon, tars, and unburned fuel residue can build up on the active porous bead. Upon subsequent exposure to normal

oxygen level air, the tars/carbon residue may explosively burn off the active bead causing it to crack open. This often results in a sensor baseline shift severe enough to render it unusable.

Strong mechanical shock can break the fine platinum wire that suspends and powers the beads in the sensor chamber. This results in an immediate failure via a short circuit.

Due to the above mentioned characteristics of catalytic sensor elements, a “Bump test” and eventual calibration every 3 months is recommended.

Bump Test doesn’t mean calibration:
Most of manufacturer recommend to test catalytic gas detectors “Every 3 months” but this doesn’t mean to “calibrate” the gas detector:
TEST is: give a know concentration of gas (methane) and check if gas detector is reading the same value (acceptable values are between 90% and 120% of gas concentration), if this ok the test is finished.
If the gas detector reading is < 90% or >120% of gas concentration, then you need to CALIBRATE the gas detector with the standard procedure, with this calibration you change the sensor sensitivity and adjust it to the correct reading of gas.

NOTE:
Test can be made with different gas concentrations, recommended concentrations are between 30%LEL up to 55%LEL.
Calibration MUST BE performed with gas concentration equal to span gas expected by the gas detector (microprocessor).

We, as manufacturer, confirm that catalytic sensors installed into our gas detectors have an average life time of about 3 years and are made to follow and respect specific characteristics in terms of repeatability and, as everybody else, those tests are referring to a specific ambient with pressure at 1013,25 hPa at 20°C and made in a laboratory (as test performed for certifications and other test made by certification entities).
So, test made to prove short terms repeatability (+/- 2% FSd for 60 minutes) and long terms repeatability (+/- 5% FSD for 3 months) should be performed in controlled environmental conditions.
Ref. European standards EN 61779-1-2:2000