

ETG DUST MINI for installation in hazardous areas

The equipment is approved to the following marks:

II 3G ExnL IIC T6, II 3D Ex tD A22 IP66 T85°C

OPERATING INSTRUCTIONS



ETG DUST MINI



ETG DUST MINI-HT

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Legend:



IMPORTANT INSTRUCTIONS

TERMINOLOGY:

- (default) = factory setting
- Led = light indicator

The equipment must be used only for the function which it was designed for.

1 DESCRIPTION

The ETG DUST MINI probe is designed to detect the presence of dust in any kind of air filtration plant or stack.

It belongs to the group "II" of instruments, correspondent to the instruments destined to be used in all the different sites than by mines, where explosive atmospheres could originate.

- The instrument is suitable for use in **Zone 2** and **Zone 22**.

The **Zone 2** is where it is unlikely that an explosive atmosphere, consisting of a mixture of air and flammable substances in the form of gas, vapor or mist is present during normal operation. If that occurs, it may persist only for a short period.

The **Zone 22** is where it is unlikely that an explosive atmosphere in the form of a cloud of combustible dust in air is present during normal operation but, if you present, it persists only for a short period.

- The instrument belongs to the **category 3**, indicating environments with small chance that explosive atmospheres are manifested due to gas, steam, fogs or mixtures of air and powders.
- For the **category 3** the safety level is guaranteed from the normal operation.
- The product is suitable for use in explosive atmospheres caused by gases, vapors or mists and / or explosive atmospheres caused by dust.
- The products comply with IEC EN 60079-15:2005. The type of security used is the "NL" applicable to devices with limited energy.
- The product is suitable for use in environments that have any type of gas.
- The device is designed to operate in the temperature class T6, corresponding to a maximum surface temperature of 85°C. (185°F.)
- Can be set in two ways to achieve the alarm:
 - a) by a **Moving Average** (with time from 5 "to 45")
 - b) as a function of a **Real Average**, calculated in a set time (10 'or 30').
- The two static alarm outputs are normally closed and reported to the zero level of the power supply connected to ground through the probe body.
- The probe body is made of aluminum and the sensor element consists of a stainless steel rod electrode.
- The probe is fixed onto a stainless steel sleeve threaded by 1" GAS or 1" ½ GAS for model -HT. (optional Supplied) quickly through a nut. The probe can be extracted without to disconnect electrically it.
- Electrical connections are made via cable with 4 twisted pairs, 2 mt. long.
- The power supply range of the probe is 12 Vdc ÷ 27 Vdc, 30 mA max.

1.1 WARNINGS

- To remove the accumulations of dust, to clean with damp cloth or with anti-static products.
- All the connections, must be made respecting the normative applicable in the zone and in the environment of installation, according to the norm of reference EN 60079-14
- Verify the earth connection of the instrument.
- The instrument is approved for zones which have precise characteristics. Don't install and to use it in different environments from those specified.
- The installation, the maintenance and the reparation, must be performed only from competent and authorized technicians.

2 INSTALLATION

- When it is possible, the probe must be placed with distances from obstacles or bends, in according to the criteria specified by the legislation UNICHIM (at least 5 diameters after curves or fans and 2 diameters before curves or discharge into the atmosphere). If it is possible, mount the probe between the filter and the fan. The not protected mounting on chimney without an hat or bend against the rain causes false alarms in presence of rain or hail and possible loss of isolation of the electrode.
- The rod must not touch or brush the opposite wall of the conduit. If the electrode is too long, it must be shorted (removing burrs) taking care not to apply torsion forces.
- Do not mount the probe on vibrating surfaces.
- The fixing of the probe is fast with nut, to be screwed on the stainless steel sleeve (optional).
- The base must be welded on the pipe and it must penetrate at least one centimeter into it. This is to prevent that drilling burrs could retain filaments of materials. The presence of mobile elements on the rod of the probe, or near it, generates spurious signals.
- The mounting on thin walls must be reinforced with a metallic handkerchief.

- The cable of the probe must run separately from the power cables. It must be protected with sheath and left enough long to allow to extract the probe without to have to **disconnect the cable**.
- The probe must be protected from direct sunlight and bad weather with adequate coverage.

3 **ELECTRIC CONNECTIONS**

POWER SUPPLY OF THE PROBE :

3.1 THROUGH THE POWER SUPPLY USER:

12 ÷ 27 Vdc, 30 mA

(0 V) Shield

(+ V) White wire

3.2 THROUGH THE AUXILIARY MODULE DMA-M (terminal block M1):

(0 V) Shield = terminal 1

(+ V) White wire = terminal 9

The power supply of the **DMA-M** module can be selected between 115/230 VAC 3VA and 24/48 VAC.

 **Connect the DMA-M equipment to a power network in accordance with the law.**

- Make connections with bipolar cable 2 x 1 mm² H02VV-F (certified PVC).

The power supply of the equipment does not require to be the connection to ground.

- Lock the cable with the nut of the cable grip and clip the conductors close to the extractable terminal board.

- The power line should be provided with an omnipolar magnetothermal switch, with distance between the contacts of at least 3 mm to and it must supports a power consumption of 3 VA.

The switch must comply with the norms IEC 947-1 and IEC 947-3. It must be easily accessible, marked as switch for the dust detector and placed in its proximity.

The probe outputs are NPN transistors with the emitters connected to 0 Volt and collectors to the terminals 7-8 of the terminal block **M1** of the module **DMA-M**; the transistors are normally closed in the absence of alarm. When the static outputs are connected to other inductive load instead to the **DMA-M** module, apply a diode in parallel to the output.

4 **METHODS OF OPERATION** (for rapid start-up see Appendix A)

a) Warning of the transition from healthy filter to faulty filter by calculating the concentration with the **Moving Average**.

b) Warning of the transition from healthy filter to faulty filter by calculating the concentration with **Real Average** and with possibility of setting the threshold Alarm in mg/Nmc.

The selection of the method is done via jumper setting inside the probe (see figure).

As reference value for the generation of alarms is necessary to make an acquisition of the average value of the concentration of the dust in the filter output.

The acquisition time used to determine this reference value can be chosen between 10 and 30 minutes with the criteria described below.

4.1 **OPERATION WITH CALCULATION MOBILE AVERAGE**

Jumper inside the probe is not inserted (default)

After the power supply, a warm-up time of 90 seconds begins, during which the led of the probe blinks green. At the end of the 90 seconds, the green switches to permanent light and the probe becomes active. The led of the auxiliary module changes from intense light to attenuated light.

If the LED pulses red indefinitely, in sincronization with the Alert relay, it means that the test of the insulation of the electrode has failed. In this case, remove the sensor and thoroughly clean and dry it.

The value of the instantaneous emissions is calculated every second. The quantity of peak values used to calculate the Average value depends on the set up time of 5 -15 - 30 or 45 seconds. (See the table for the settings to paragraph 4.1.1)

In other words, the mobile average is realized in this way: the peak values measured every second are temporarily stored in a container with storage capacity of the selected time (5 -15 - 30 or 45 seconds), where the new peak value replaces the oldest. This system allow to evaluate an actual dust increase, filtering the highest Peak values, usually rare.

- Ensure that the filter plant is operating under normal conditions, with running cleaning, and ensure that the filter is in good condition (new or filter with filter elements considered healthy or recently replaced or by recent examination gravimetric).
- Start the acquisition period by pressing the button located inside the auxiliary module. The Average time chosen must be long at least as two cleaning cycles of the filter:

- . to select a time of 10 minutes hold the button for a time between 2 and 3 seconds.
- . to select a time of 30 minutes hold the button for longer than 6 seconds.

When the button is released, the led of the probe pulses for 10 seconds with a frequency of approximately 2 Hz to signal that an acquisition period of 10 minutes is activated. A pulsation frequency of 0.5 Hz indicates the time of 30 minutes. At the end of the 10 seconds, the led is permanently lighted with yellow colour for the duration of the programmed acquisition time. In the auxiliary module, the green led switch from attenuated light to full light.

The signalling of the end of the time is indicated on the Probe with the LED permanently lighted with green light and on the auxiliary module with attenuated light.

From this moment the probe checks the emissions of the filter in according to the set parameters. (See the table "Time of the Moving Average").

- The Alert Alarm is activated if the average concentration of the last period exceeds the value acquired by 5 (default) or 7 times.
- The Main Alarm is activated if the concentration exceeds the average value acquired by 20 times.

The Alarms of the module DMA-M are signaled by de-energizing the relay Alert and Alarm and off of the relative LED.

4.1.1 SETTING THE DIP-SWITCHES ON THE AUXILIARY UNIT DMA-M

The remote programming of the probe, by setting the Dip-Switches on the auxiliary module, is indicated in the following tables :

MULTIPLICATION FACTORS FOR WARNING ALARM

Dip-Switch	Conductor to short-circuit	Multiplication factors
1		
off	None	x 5 (default)
ON	Shield / Red-Black	x 7

REFERENCE VALUES FOR ALARM SET-POINT

Dip-Switch	Conductors to be connected in short-circuit	MODE
2		
off	None	Based on Acquisition (default)
ON	Shield / Red	Calculated by ETG

Note that the values, calculated from ETG will be available only upon request for systems with the same design features and type of dust (after tests carried out in ETG firm).

TIME OF THE MOVING AVERAGE

Dip-Switch		Conductors to short-circuit	Seconds
3	4		
ON	off	Shield / Green-Black	5
off	ON	Shield / Green	15
off	Off	None	30 (default)
ON	ON	Shield / Green-Black / Green	45

To make active the changes of the settings, remove and connect again the power supply to the probe

If at the end of the acquisition time, the acquired concentration multiplied a factor of 20 overcomes the full-scale value, the Led of the probe blinks Red / Green in permanent way together at the ALERT/PEAK relay of the auxiliary Module. It means that the selected multiplier has exceeded the full scale: to verify the integrity of the filter and to repeat the acquisition.

4. 2 OPERATION WITH CALCULATION OF THE REAL AVERAGE

The operation with real average is activated with jumper internally inserted to the probe (see the relative figure). After to have applied the power supply, a period a warm-up time of 90 seconds begins, during which the led of the probe blinks green. At the end of the 90 seconds the probe becomes active, the green led switches to fixed light and the led of the auxiliary module switches from full light to attenuated light.

If the LED pulses red indefinitely, in synchronization with the Alert relay, it means that the electrode insulation test has failed. Remove the sensor and thoroughly clean and dry the insulator.

The Alarms of Peak and of Average are generated when the concentration exceeds the reference value multiplied by the selected factor.

The Peak alarm lasts for as long as the set threshold is exceeded. It is typically used to identify the faulty element of the filter, if the alarm is correlated with the command of the cleaning, which has caused the alarm. The alarm of Average, is activated at the end of each period of average measurement, if the acquired value exceeds the selected threshold and it lasts until the end of the next period. If the value of the average concentration in the next period is decreased below the limit, the alarm disappears.

4.2.1 INSTRUCTIONS TO START THE AVERAGE TIME

The start of the acquisition is done via the button in the auxiliary module. The selected Average time must have a duration for at least two cleaning cycles of the filter:

- . For the time of 10 minutes press the button for a time between 2 and 3 seconds.
- . For the time of 30 minutes press the button longer than 6 seconds.

When the button is released, the led of the probe blinks red for 10 seconds with a frequency of approximately 2 Hz to signal that an acquisition time of 10 minutes is activated. The blinking frequency of 0.5 Hz indicates the time of 30 minutes. At the end of the 10 seconds the led becomes permanently yellow for the duration of the programmed Average time and the green led of the module **DMA-M** switches to full light.

During the average time the sensor detects the dust emissions, at the end calculates the average value and stores it.

At the end of the average time the LED on the probe turns green and the LED in the **DMA-M** module blinks for some seconds with full light, then with attenuated light; from this moment the probe checks the emissions of the filter in according to the set parameters.

The signalling of the end of the time is indicated on the Probe with the short blinking of the led, then with fixed light. On the auxiliary module it is indicated with a short blinking light.

OPERATION WITH REAL MEDIA ALLOWS THREE TYPES OF EMPLOYMENT:

4.2.2 ALARM FOR THE CHANGE FROM GOOD FILTER TO FAILURE FILTER

This mode allows you to easily get the signalling of the degradation of the filter by comparing the current value with that of the last periods (It does not quantify the emissions in mg/Nm³) and allows to evaluate an effective increase of the dust, filtering the instantaneous values, which are probably higher, but typically rare.

- Ensure that the plant is operating under normal conditions and it is very important to be sure that the filter is in good condition. (A filter is considered healthy by recent replacement of filter elements or recent gravimetric exam)

The physiological output of the filter is considered the reference value.

- The start of the acquisition time is performed following the procedures described in Chapter 4.2.1; the duration of the acquisition time must include at least two cleaning cycles of the filter.

At the end of the average time, the probe checks the emissions of the filter according to parameters set.

- Peak alarm is activated whenever the concentration exceeds the reference value of 20 or 50 times.
- The Average alarm is activated if the concentration at the end of the period exceeds the reference value multiplied by the selected multiplication factor (see table in section 4.2.5)

4.2.3 CALIBRATION WITH REFERENCE TO A GRAVIMETRIC SAMPLING

To calibrate the detector in mg/Nm³ is necessary to use as a reference gravimetric isokinetic sampling (see EN 13284-1), lasting 30 minutes.

The acquisition has to be started at same time of the beginning of the gravimetric sampling, during the normal operation of the plant, with active cleaning. To select and start the acquisition of 30 minutes, follow the procedures described in Chapter 4.2.1.

When the gravimetric value will be available, set up the factor of multiplication next more to the relationship:

$$\frac{\text{Threshold of alarm}}{\text{Gravimetric examination value}}$$

Example:

- Threshold of the alarm = 10 mg/Nm³
- Gravimetric examination value = 2 mg/Nm³
- Multiplication factor = 5 (dip-switch **3-4 ON**)
- The Average alarm is activated if the average concentration exceeds the value of 10 mg/ Nm³ (applying a multiplier factor 3 x the alarm is activated at 15 mg/Nm³)
- The Peak alarm is activated if the concentration exceeds the reference value of 20 or 50 times the emission detected, nominal = 40 or 100 mg/Nm³.

4.2.4 CALIBRATION WITH REFERENCE TO A PREVIOUS GRAVIMETRIC EXAMINATION

Use this mode if it is supposed that the filter is in the same state of efficiency since the last examination.

- Select and start an acquisition of 30 minutes with normal production of dust and cleaning of the filter ON, following the procedures described in chapter 4.2.1.

Example of calculation to generate the alarm with a concentration of 10 mg/Nm³ :

- Gravimetric concentration detected last Gravimetric Examination = 1,5 mg/Nm³
- multiplication factor of to set : $\frac{10,0}{1,5} = 6,6$ (dip-switch 2 ON) Choose the multiplication factor nearest for defect

The alarm is activated when the average concentration is greater than: $1.5 \times 6 = 9 \text{ mg/Nm}^3$ and the Peak alarm of: $20 \times 1.5 = 30 \text{ mg/Nm}^3$.

4.2.5 SETTING THE DIP-SWITCHES ON THE AUXILIARY UNIT DMA-M

The remote programming of the probe is made by setting the dip-switch of the auxiliary module, as shown in the following tables:

PEAK ALARM:

Dip-Switch	CABLE	Multiplicatio n factors
1	Conductors to be connected in short-circuit	
off	None	x 20 (default)
ON	Shield / Red-Black	x 50

AVERAGE ALARM:

Dip-Switch			CABLE	Multiplicatio n factors
2	3	4	Conductors to be connected in short-circuit	
off	off	off	None	x 2 (default)
off	off	ON	Shield / Red	x 3
off	ON	off	Shield / Green-Black	x 4
off	ON	ON	Shield / Red / Green-Black	x 5
ON	off	off	Shield / Green	x 6
ON	off	ON	Shield / Red / Green	x 8
ON	ON	off	Shield / Green-Black / Green	x 10
ON	ON	ON	Shield / Red / Green-Black / Green	x 15

To make the changes of the settings active remove and reconnect the power supply to the probe

If after the acquisition the Led of the probe permanently blinks Red/Green, in synchronization with the Peak relay of the auxiliary Module, it means that the selected multiplier has exceeded the full scale. Verify the integrity of the filter and to repeat the acquisition.

5 TEST OF THE PROBE

The functionality of the probe and of the electrode insulation are automatically verified at the power-up and every two hours.

Any dysfunction is indicated :

- . on the probe by LED blinking red light continuous.
- . by continuous pulsation with 1Hz frequency of the output No. 2 (Alarm relay)

The possible causes are:

- . Loss of insulation of the electrode: thoroughly clean the insulator. Remove any waste on the electrode and dry it.
- . Unlikely failure of the electronic circuitry.

6 TECHNICAL CHARACTERISTICS

Power supply Probe	: 12 ÷ 27 Vdc 1 W
Power supply DMA-M MODULE	: 115/230 Vac 3 VA (on request : 24/48 Vac)
Electrode Length ETG DUST MINI	: 210 mm (protrusion from the standard base mounting)
Electrode Length ETG DUST MINI-LT/HT	: 1.5 mt maximum.
Detectable concentrations	: 0,01 ÷ 5000 mg/ Nm ³
Minimum velocity of the process flow:	> 5 m/s
RESPONSE TIME:	
Mobile Average Mode	: proportional to the concentration and averaging time set
Real Average Mode	: Peak value = 2 sec : Average value= 10 o 30 minutes
Probe Outputs	: 3-color LED indication (green, yellow, Red) : Transistors normaly ON: load max 125 mA, voltage max = 30 Vdc, dropout max = 1V
Relè del Modulo DMA-M	: 220 Vac maximum 2 A 110 Vdc maximum 0.5 A, (no inductive load)
Module DMA-M Temperature	: -20 + 40°C (-4°F +104°F)
Process Temperature Probe	: -20 + 100°C (-4°F +284°F)
Process Temperature Probe HT	: -20 + 400°C (-4°F +752°F)
Process Relative Humidity	: 75% not-condensing. (With condensing humidity, use the HT probe together with the anti-condensation Kit)
Grade of protection of the Probe	: IP 66
Grade of protection of the Module	: IP 65
Pressure at electrode side	: 1 BAR (100 Kpa)
Auxiliary module DMA-M	: Material : ABS, dimensions : 110 x 110 x 70 mm.

7 WARRANTY

The equipment is guaranteed for the time of one year after delivery, free our headquarter. Mechanical or electrical damages due to incorrect use or installation, are excluded. The warranty lapses in case of tampering of the electronic circuit.

APPENDIX A **FAST START-UP WITH MODE “MOVING AVERAGE”**

Install the probe as shown in chapter 2 and connect it to the auxiliary module as in chapter 3.

Set in OFF state all the dip-switches (default) of the auxiliary module, that correspond to 30 seconds of Average.

After to have applied the power supply, a period a warm-up time of 90 seconds begins, during which the led of the probe blinks green. At the end of the 90 seconds the probe becomes active, the green led switches to fixed light and the led of the auxiliary module switches from full light to attenuated light.

If the red LED pulses indefinitely, in sincronization with the **Alert** relay, it means that the electrode insulation test has failed. Remove the sensor and thoroughly clean and dry the insulator.

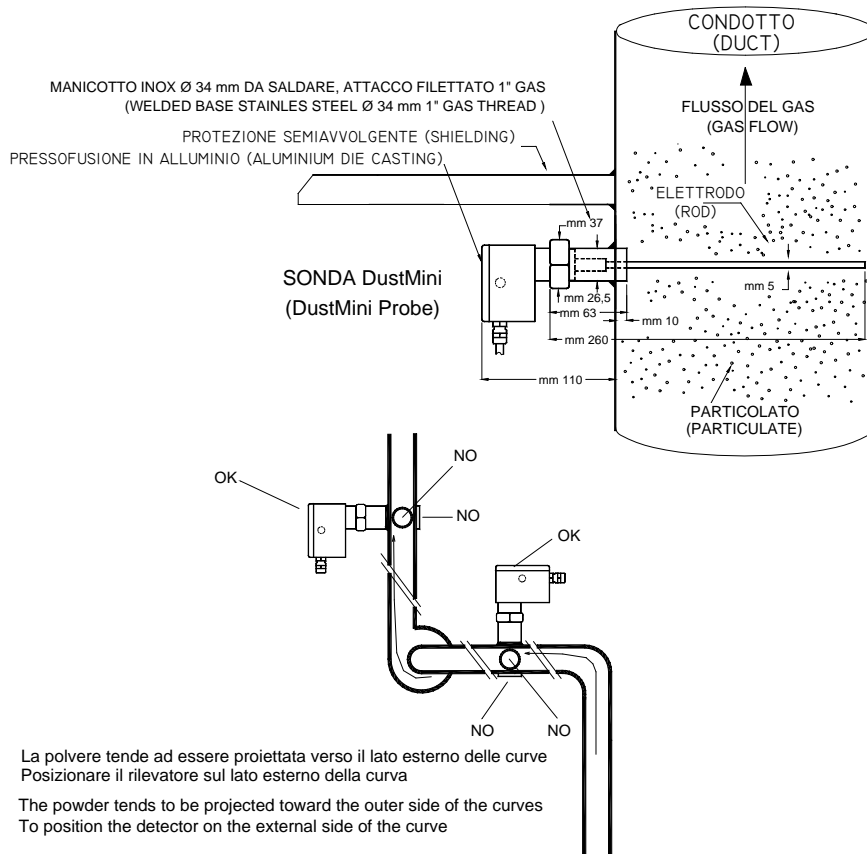
- Ensure that the system is operating under normal conditions, with active cleaning and that the filter is in good condition (new or filter with filter elements considered healthy or recently replaced by recent examination gravimetric).
- The start of the acquisition is done via the button in the auxiliary module. The selected Average time must has a duration for at least two cleaning cycles of the filter:
 - ' For the time of 10 minutes press the button for a time between 2 and 3 seconds.
 - ' For the time of 30 minutes press the button longer than 6 seconds.

When the button is released, the led of the probe blinks red for 10 seconds with a frequency of approximately 2 Hz to signal that an acquisition time of 10 minutes is activated. The blinking frequency of 0.5 Hz indicates the time of 30 minutes. At the end of the 10 seconds the led becomes permanently yellow for the duration of the programmed Average time and the green led of the module **DMA-M** switches to high light.

At the end of the average time the LED on the probe turns green, the green led of the module **DMA-M** switches to attenuated light, the average value is stored and compared with current emissions.

The probe checks by now the emission actively and alarms will be generated as follows:

- . The **Alert** alarm is activated if during the last 30 seconds (default), the average concentration exceeds the stored value of 5 times.
- . The **Alarm** is activated if during the last 30 seconds, the average concentration exceeds the stored value of 20 times.



La polvere tende ad essere proiettata verso il lato esterno delle curve
 Posizionare il rilevatore sul lato esterno della curva
 The powder tends to be projected toward the outer side of the curves
 To position the detector on the external side of the curve

