



*Gas Analysers & Integrated Systems
for Process Gas Analysis*

Zirconia Oxygen Analyser

8864



Main Applications

- Gas production industry (purity monitoring)
- Nitrogen and Oxygen generators
- Endothermic generators
- Mixers
- In general, Oxygen control (from traces up to 100%) in every process with non-combustible background gas
- and many others

Features

- Accuracy better than 1% of full scale
- Ranges from 100 ppm O₂ FS up to 100% O₂ FS
- Temperature controlled sensing unit
- Fast response time
- Excellent long term stability
- Very easy maintenance thanks to modular construction
- IP65 protection
- Versions for safe area or in Explosion-Proof housing for hazardous area Zone 1 / Zone 21
- Powerful microprocessor based control unit

Sensing Unit

The Measure

The 8864 is an extractive type Zirconia Oxygen analyser that can be used in every application with not combustibles background gasses where an in situ measure is not convenient.

Output signal

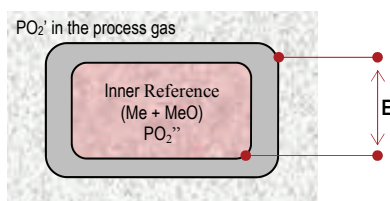
The electronic circuit, mounted under the protective chassis on the head block, is directly connected to the sensor and supplies a direct logarithmic or a linear 4-20 mA signal, corresponding to the selected range. If combined with monitor M701, it's possible to select the output range maintaining on the display a **resolution of 0.1 ppm** and a visualization up to 25% O₂, (or from 10% to 100% O₂) with isolated linear 4-20 mA output and 2 optional configurable alarms. Other options selectable.

Extremely Rugged

The model 8864 is specifically designed for continuous measurements in the most heavy duty applications. There are no inner moving parts; installation position and eventual vibrations don't alter the accuracy and stability of the measure. L'unità The sensing unit of is housed in a rugged IP65 housings, configurable for safe or hazardous area with the highest protection mode **II 2 GD EEx-d IIC T6, IP65 T 85°C, T_{amb} -10...+50°C**

Very Easy Maintenance

Modular construction makes maintenance extremely easy. It's enough to unscrew the cap of the housing to have access to inner sensing unit that can be removed only by disconnecting 3 wires and unscrewing 2 screws.



Measuring Principle

The measuring principle on which the analysis is based is linked to the use of Zirconium oxide which, at high temperatures, can behave like a solid state electrolyte, developing an electromotive force on two electrodes placed in contact with different O₂ concentrations (partial pressures), proportional to the temperature in Kelvin degrees (°K) and the logarithm of the ratio between the two pressures PO₂' and PO₂" in accordance with Nernst's well-know ratio:

$$E = RT/nF(\text{Lg } PO_2' / PO_2'')$$

where: R = Perfect gas constant (8,31 Joule/degree bulk)
F = Faraday's constant
T = Absolute temperature in °Kelvin
n = 4

Specifications...

...Performance

Accuracy:

With M701: the worst between ± 1% of span and 1 ppm

Without M701: the worst between ± 2% of span and 0.05% O₂

Repeatability:

± 0.5% of span (short term).

Response Time (max. 1500 cc/min flow rate)

Initial: 0.1 sec.

90% of step-change: less than 1 sec.

Drift:

Zero: max. ± 1% of span per week

Span: negligible

Ambient Temperature Influence:

max. ± 0.06% of reading per °C

Atmospheric Pressure Influence:

1% of reading per 1% change in ambient pressure.

Sample Flow Rate Influence:

less than 0.5% of span over flow range of 100 to 1000 cc/min.

Line Voltage Influence:

max. 0.02% of span, for each 1% change of power voltage.

Gas Interference:

combustibles gases + Oxygen reduce the measure.

Linearization:

within 1% of span

Range:

see suffix C on the ordering information

...Operative

Sample Requirements

Sample Flow Rate: 250 ÷ 1000 cc/min.

Sample Pressure: 3000 Pa minimum (with filter and flow meter).

Analogical Output:

Direct at 8864 sensor output: logarithmic 50 mV/decade or 4-20 mA (on a max load of 500 ohm) linear and proportional to the selected range (optional galvanic insulation module).

M701: 4-20 mA isolated proportional to the range on maximum load of 500 Ω

Diagnostic NV Logical Output (not valid measurement):

Logical Non Valid output from relay free contact. Normally supplied in fail safe condition (triggered relay and closed contact if not in alarm). Can be modified in filed.

Ambient Requirements

Relative Humidity: 90% maximum.

Operation Temperature: -10 to +50 °C

Storage Temperature: 70° C max.

Power Requirements:

22 ÷ 30 Vac, 50 VA directly or by transformer from 115/230 Vac 50/60 Hz, 50 VA to 24 Vac

Pneumatic Connections:

¼" or 6 mm OD tubing (compression fittings supplied)

Wiring Connections:

General purpose housing: 2 openings for G 3/8" (PG 13 cable grip).

Explosion proof housing: 2 openings for GK 1/2" (cable grip or conduit).

...Physical

Material Contacting Sample Gas:

AISI 316, Anticorrosal, Platinum-Iridium, Tefzel, Viton, Zirconia, Alumina

Weight:

7 kg in Standard housing

8,5 Kg. EEx-d housing

Dimensions:

150 x 150 x 290 mm (standard housing);

180 x 155 x 325 mm (explosion proof housing)

Finish: Epoxy grey textured enamel

Protection: IP65 (watertight and dust tight)

Positioning: not critical

Version for hazardous area

II GD EEx-d IIC T6 IP65 T85°C T_{amb} -10...+50°C



Designed in accordance to directive ATEX 94 / 9 / CE

Certificate number:
CESI 03 ATEX 130

M701 Control Unit

Description

The M701 model is a smart instrument which elaborates the signals coming from the Zirconia probes, providing for the computing and displaying of the Oxygen value in % or parts per million following the Nernst's law.

The instrument has been designed to re-transmit the 4 -20 mA signal according to the set range and may be connected to a PC or an external printer in order to have a chronological tabulation of both measures and alarms.

In case of malfunction, the instrument will automatically provide for the supervision of the probe.

Isolated current output is standard. Optional RS232C output can directly drive a printer with selectable timing and baud rate.

The unit can be housed in a compact Noryl DIN case for panel mounting (standard), in a IP 65 case with clear front door for wall mounting or in explosion proof housing for mounting in classified area.

Single or dual alarm

A single alarm (high or low) or dual alarms (1 high and 1 low, 2 high or 2 low) can be provided as option.

Each alarm consists of: 1) a keyboard configurable alarm threshold; 2) a LED, which is lit when an alarm is detected; 3) a relay contact that can be used to actuate an external signal or to start a shutdown process device.



Display

It provides a continuous readout indication of the requested variable in engineering units (e.g. %), of alarms set point and alarms condition.

Advantages of a modular construction

Control and sensing unit split, gives the customer the possibility to select the preferred mounting configuration, optimizing costs.

It will be possible to have the control unit in field, but also remote it in control room. Moreover, in case of failure, sensing and control can be separately repaired or replaced, reducing to the minimum the plant stop.

Other versions

The model 8864 can be provided for rack 19" mounting or configured for laboratory use in half-rack 19" dimension; with both the solutions, sensing and control unit are integrated into a smart aluminum case.

Refer to [model G405](#).



Transportable / Laboratory version



Rack 19" version

Technical Specifications

Inputs

Input signals: 1 for self-heated probe, 2 for process-heated probe; 3 for process-heated probe and auxiliary external thermocouple (same type).

Scanning time: 0,6 seconds

Conversion type: double ramp

Resolution: 1/20000

Response time: 1 second typical

Input's impedance: 100 Mohm typical

Isolation between channels: none

Alarms

Contact rating: N.O./N.C. 1 A @ 250 Vac (define the alarm contact condition -soldering type- at order)

Set: programmable on 100% of range

Relay status: normally triggered / not triggered

Number of alarms: 2 on concentration, 1 on temperature t1, 1 on temperature t2

Hysteresis: 5 / 1 / .5 / .1% of range

Delay: 10 / 5 / 1 / .1 seconds

Alarm scanning: ON/OFF programmable

Threshold: high or low to be selected at order; field adjustable by soldering jumpers.

Serial interface

Standard: RS 232 C

Check lines: CTS

Speed: 9600, 4800, 2400, 1200, 600, 300 baud/sec.

Parity: even, odd, none

Isolation: 1500 V

Diagnostics

TC out of order: err1 message on display

Broken CJ: err2 message on display

Anomalous conditions: OFL message on display

Analogical output

Output: 4-20 mA isolated proportional to 100% of range on maximum load of 500 Ω

Total Range (over range): 3.6 - 24 mA

Resolution: 1/3800

Isolation: 1500 V

Uploading time: 1 second

Printing messages

Periodical printing: programmable in hours, min.

Alarm printing: automatic printing

Printing message: year, month, day, hours, minutes,

% O₂, temperature, alarm 1 status, alarm 2 status

Probe resistance

Range: from 0 to 99.9 Kohm

Reading: from keyboard in off-line conditions

Ambient requirements

Working temperature: 0 \pm 50 $^{\circ}$ C

Storage temperature: -10 \pm +75 $^{\circ}$ C

Humidity: 10 \pm 90% without condense

Physical specification

Dimensions: 96 x 96 x 185 mm.

Weight: about 0,5 Kg.

Mounting: panel cut out

Clock

Clock type: Gregorian

Back-up: by means of lithium battery

Battery life: 1 year in case of power supply absence.

Accuracy: 1 second/month

Power Supply:

220 / 110 Vac; 50/60 Hz; 5 VA

Explosion-proof housing

Protection mode:

II 2 GD EEx d IIC T6 IP65 T85 $^{\circ}$ C T_{amb} -20 \pm +60 $^{\circ}$ C
for hazardous area ZONE 1 / ZONE 21

Installation:

Wall or panel

Adjustable without opening the housing

3 Gk 3/4" holes

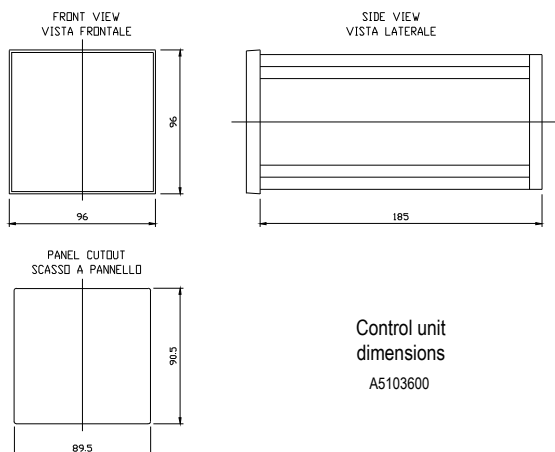


IP65 housing

Installation:
Wall or panel

Clear front door

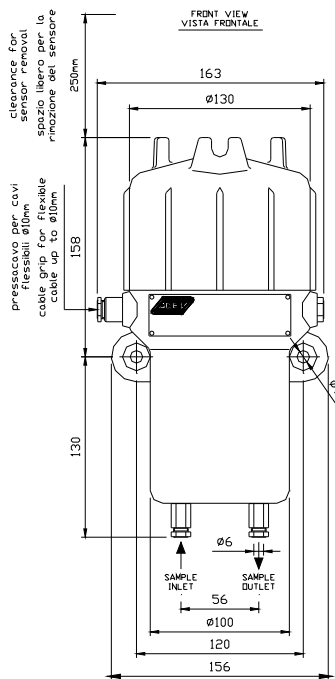
Dimensional Specifications



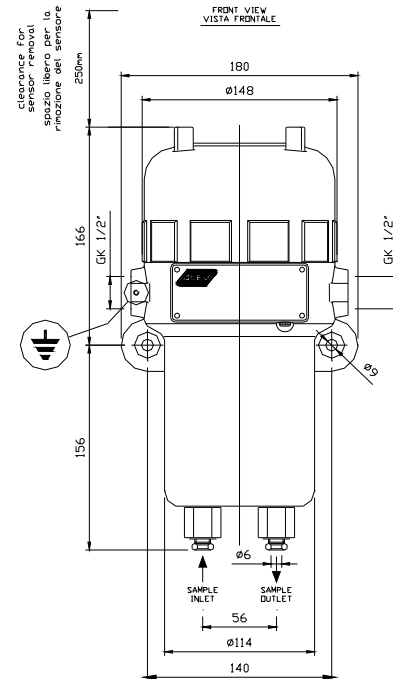
Conformity to European Normative

In accordance to Low Voltage directive 2006/95/EC
 In accordance to EMC directive 2004/108/EC:
 - EN 61000-6-2
 - EN 61000-6-3
 - EN 50270

In accordance to directive ATEX 94/9/EC



Sensing unit dimensions in General Purpose housing



Sensing unit dimensions in Explosion-Proof housing

Ordering 8864



Suffix A - Line voltage

- 0 24 Vac (only sensing)
- 2 230 V 50/60 Hz
- 4 115 V 50/60 Hz

Suffix B - Stream composition

- 1 Non corrosive background gases
- 2 Thermal treatment Atmosphere
- 9 Corrosive background gases or special on specification (not combustibles)

Suffix C - Range

Combined with M701 control unit ^{a)}

Menu A: ^{b)}

- 001 0-25 %
- 002 0-10 %
- 003 0-5 %
- 004 0-2 %
- 005 0-1 %
- 006 0-1000 ppm
- 007 0-100 ppm
- 008 0-50 % freely selectable

Menu B: ^{b)}

- 198 98-100 %
- 195 95-100 %
- 190 90-100 %
- 180 80-100 %
- 150 50-100 %
- 110 10-100 %
- 100 0-100 %

4-20 mA direct output from sensor

- 005 0-5 %
- 010 0-10 %
- 025 0-25 %
- 999 On specification

Suffix D1 - Alarm threshold

- 0 None
- 1 1 low alarm
- 2 1 high alarm
- 3 1 high alarm + 1 low alarm
- 4 2 low alarms
- 5 2 high alarms
- 9 On specification

Suffix D2 - Wrong calibration and fault alarms ^{c)}

- 0 None
- 1 Wrong calibration alarm shared with an alarm threshold
- 2 Fault alarm shared with an alarm threshold
- 3 Wrong calibration alarm on dedicated relay
- 4 Fault alarm on dedicated relay
- 5 Wrong calibration alarm shared with fault alarm
- 9 On specification

Suffix E - Alarm contacts

- 0 None
- 1 Closed in alarm condition
- 2 Open in alarm condition

Suffix F - Serial output

- 0 NO
- 1 RS 232 C + internal clock

Suffix G - Sensing unit

- 1 IP65 housing for sensing unit _ standard
- 2 Explosion-proof housing for sensing unit
- 9 On specification

Suffix H - Autocalibration ^{c)}

- 0 NO
- 1 Autocalibration
- 2 Autocalibration + autocalibration start inlet free contact
- 3 Autocalibration + autocalibration start inlet free contact with calibration in progress free contact
- 4 calibration in progress free contact (for manual calibration)

Suffix I1- Control unit

- 0 Without control unit and power supplier ^{d)}
- 1 M702
- 2 EC2001
- 3 M701 (standard)
- 9 On specification

Suffix I2- Control unit configuration

- 0 Not used (select only combined with suffix I1 = 0)
- 1 Provided loose for mounting in a cut out 89,5 x 90,5 mm
- 2 Mounted & wired in IP65 housing (power supplier included)
- 3 Mounted & wired in Ex housing (power supplier included)
- 9 On specification

Suffix O - Options

- 0 None
- 1 220/117 Vac, 350 VA transformer
- 2 Diagnostic in fail safe mode on the NV output
- 3 Galvanic insulation module
- 9 On specification

Notes:

- ^{a)} Selecting the M701 control unit, the output from sensor will be 50 mV/decade.
- ^{b)} Menu A and B are alternative. As one full scale is selected at order, it will be possible to turn to another full scale (in filed) belonging to the same menu.
- ^{c)} Only combined with 4-20 mA output from the sensor and M702 control unit
- ^{d)} Select only in case the sensing unit is ordered as spare part or with direct 4-20 mA output proportional to one of the following ranges: 0-5 %; 0-10 %; 0-25 %.
- ^{e)} Only combined with suffix C = 005, 010, 025