BT. 13.04.03 ASC/E

ASCOMB SERIES

Control and monitoring combustion systems with zirconium oxide probe **ascomb** series

- **Zirconium oxide probe ZO2 line**
- **Indicator, monitor and controller OXI, OXM, OXR line**
- **Complete systems line SI**

Based on the measurement of oxygen content in the flue gases by means the zirconium oxide probe, the systems grant a continuous control of the combustion. The following advantages are available:

- **Energy saving**
- **Normatives compliance**
- **Reduction of pollution**
- **Low cost**
- **Quick installation and low maintenance**
- **Financial benefits and avoidance of excessive climate levy.**

E

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Energy saving through the control of combustion

Starting from combustion theory...
The characteristics curves of combustion are represented in fig. 1. From this can be seen the relationship between the higher efficiency values and the minimum pollution. This area is called optimise zone of combustion. In this area is the correct fuel and air ratio.
This situation grants a limited air excess avoiding any dangerous and expensive oxygen defect situation. Based on the fact the boiler load requires different oxygen quantities, the fuel air ratio changes as shown in fig. 2.

The oxygen content on the flue gases in the chimney, represents the significant parameter of the combustion process.
The continuous measurement of this value, enables a manual or automatic intervention on the burner setting in order to reset to the optimum air/fuel ratio.

Fig. 1 - Characteristics curves of combustion

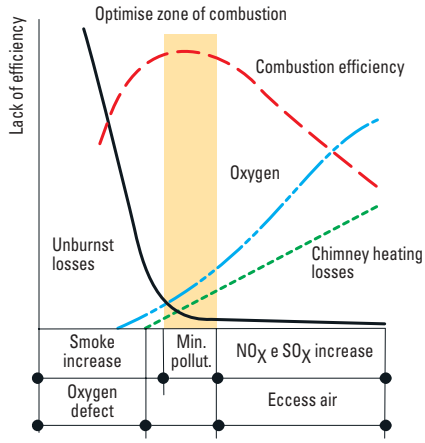
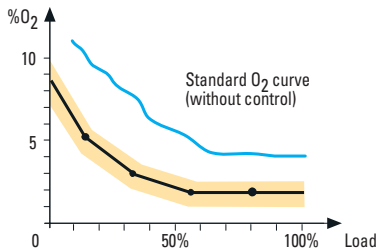


Fig. 2 - $\%O_2$ correction curve as function of boiler load



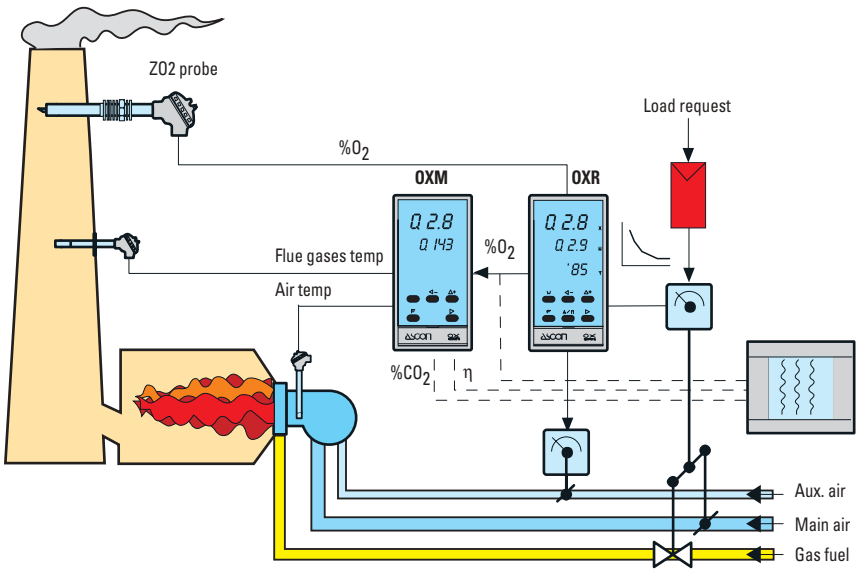


Fig. 3 - Example of typical combustion control system

...to ASCOMB systems.
The ASCOMB systems (see fig. 3) perform the combustion control using a zirconium oxide probe directly inserted in the stack.
This probe ensure a continuous, swift and accurate read-out of the oxygen content in the flue gases.
Thanks to a wide range of components it is possible obtain different system for indication calculation and control purposes.

Monitoring for normatives compliance

Over the years various standard on regulation for civil and industrial installation have been applied. The oxygen content on the flue gases has always been an important reference parameter. This is exactly what ASCOMB systems measure for combustion control.

Starting from this point and integrating it with other parameters like flue gase temperature and/or carbon monoxide (see BT. 13.05.03 ZCI) it is possible perform monitoring system in the majority of the cases.

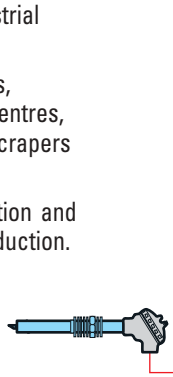
ASCOMB systems where and how

Where
The application possibilities of ASCOMB systems are many both in civil and industrial sectors.

Civil: schools, prisons, hospitals, shopping centres, condominiums, sky-scrapers etc.

Industrial: Power station and boilers for steam production.

How
ASCOMB system building-up:
starting from the ZO2 probe and the related power supply unit model AZO-AL04 combines the most suitable electronics.



	Boiler power	Burner
OXI Indicator oxygen percentage	Low	2 stage/modulating
OXM Monitor for calculation of the main combustion variables	Medium/high	2 stage/modulating
OXR Control of oxygen content in the flue gases with respect to the boiler load	Medium/high	Modulating

The basic system can be also integrated with other components like air/flue gases temperature (mandatory for OXM), recording and/or data acquisition through a SCADA, carbon monoxide measurement and so on.

SI line ASCOMB systems

They are already assembled turn-keys solutions.
It is possible to choose the solution in a range of standard systems or create a custom one.
The advantages are:

- **one ordering code**
- **simpler installation**
- **quicker start-up**
- **easier and faster after-sales assistance.**

Some examples of SI line		Cabinet	ZO2 probe	AZOAL04 power supply	OXI	OXM	OXR	fgT probe	airT probe	Recorder	CO analyzer
Indication											
SIS-M1-0010	Oxygen	1	1	1	1						
SIS-M1-0020	Oxygen + recording	1	1	1	1					1	
SIS-M1-0030	Oxygen + flue gases temp (fgT)	1	1	1	1			1			
SIS-M1-0040	Oxygen + fgT + recording	1	1	1	1			1		1	
Monitoring											
SIS-M1-0080	Oxygen + fgT + recording	1	1	1		1		1	1	1	
SIS-M1-0110	Oxygen + fgT + CO + recording	1	1	1		1		1	1	1	1
Control											
SIS-R1-0520	O_2 Control	1	1	1			1	1	1		
SIS-R1-0530	O_2 Control + fgT + recording		1	1	1			1	1	1	1
SIS-R1-0590	O_2 Control + fgT + recording	1	1	1		1	1	1	1	1	

ZO2-100-300-500-700-C100 and AZO-AL04

ZO2 zirconium oxde probe and AZO-AL04 power supply unit
Zirconium oxide probe for continuous, swift and accurate measurement of the oxygen content in the flue gases up to 600 °C.

A free air reference circuit is not required because one part of the sensor is in contact with the ambient air present in the connection head.

An internal heater maintains the sensor at a constant temperature of 600 °C.
The power is provided by the AZO-AL04 power supply unit which grants:
- protection from the high level of absorbtion, typical during the initial heating phase
- voltage correction required by the probe directly on its head connection terminals, integrated "sense" system
- switching technology for a minimum heating dissipation inside the panel.

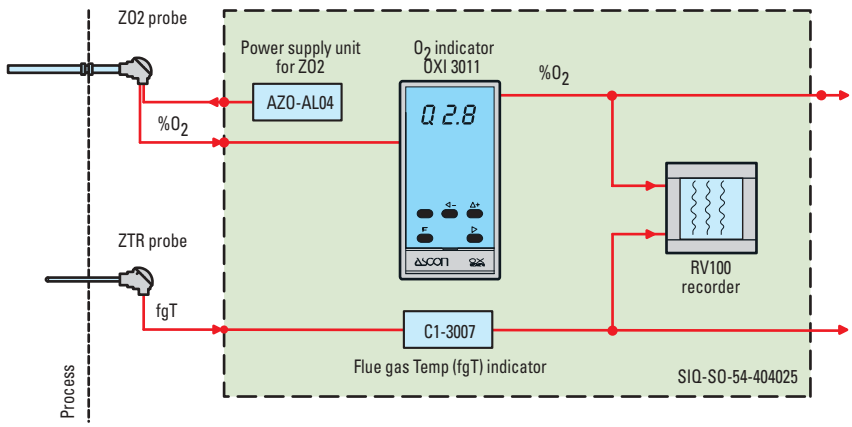
ZO2 for **"in-situ"** measurement

ZO2-C100 for **extractive** measurement method

Probe models:	**ZO2 for "in-situ" measurement**, length: 100, 300, 500, 700 mm (other lengths on demand)
	ZO2-C100 for extractive measurement method, length 100 mm
Sensor:	Electrically heated Zirconium oxide by means external AZO-AL04 power supply
Flue gas temperature :	Up to 600 °C
Output:	Logaritmic mV signal (4/20mA by means OX line instruments)
Range:	0.3..20.9 %O_2
Accuracy:	3% (between 0.5...10% O_2)
Warm-up time:	Minimum 15 minutes, standard 45 minutes
Construction:	Sheath: AISI316, connection head: painted alluminium DIN B, protection: IP67
Process connection:	Compression nipple 1" NPT M
Ambient temperature :	-20…+70 °C
Calibration interval:	1 year (with Methan fuel and flue gases temperature < 350 °C)
Mounting position:	Adjustable, at right angle to the gases flow direction
Connection:	2 + 2 wires 1.5 mm^2 min. for the heater
	2 shielded and twisted wires 0.5 mm^2 for sensor output
Weight:	2 kg max.

Model:	**AZO-AL04**
Power supply:	100…240 Vac ±10%; 47/63 Hz
Power consumption:	1.6 A at 115 VAC; 0.6 A at 230 VAC
Output Voltage / Current:	12 Vdc/8.5 A max.
Ambient temperature:	0...50°C
Mounting:	With fixing clamp
Connection:	M3 screwed terminals + Molex 5051 provided
EMC:	CE compliant

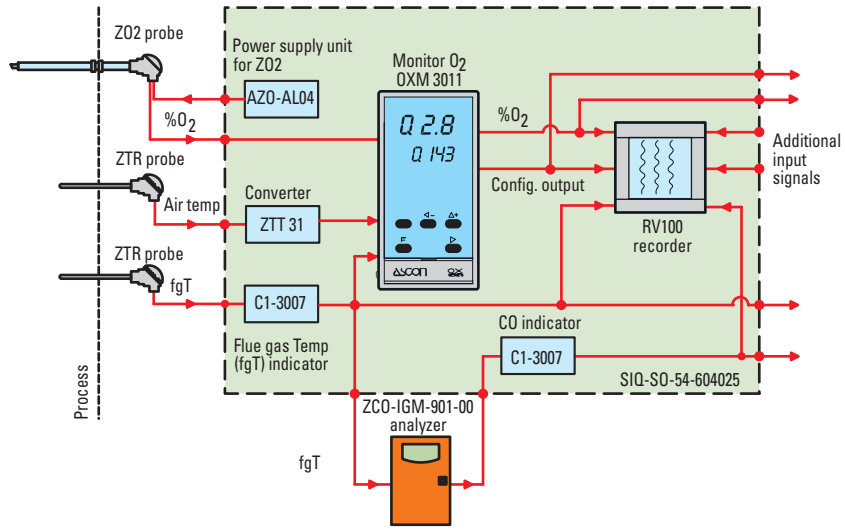
ASCOMB SI line: SIS-M1-0040



OXI

Oxygen indicator in 48x96 DIN size with acquisition and linearisation capability of the logaritmic signal coming from the ZO2 probe. As alternative a 4/20mA linearized signal (range 0...20.9%) is available.
In combination with the ZO2 probe and its AZO power supply it establishes the basic system to monitor the combustion by means of the oxygen measurement in the flue gases. More complex system can be obtained adding flue gases temp measurement and data recording or data acquisition through a SCADA.

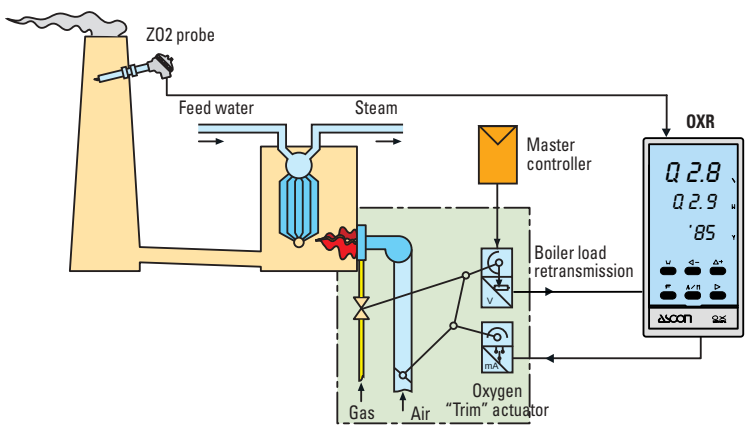
ASCOMB SI line: SIS-M1-0110



OXM

Oxygen monitor in 48x96 DIN size with acquisition and linearisation capability of the logaritmic signal coming from the ZO2 probe. As alternative a 4/20mA linearized signal (range 0...20.9%) is available.
In combination with the ZO2 probe, its AZO power supply, air and flue gases temp. probes, it establishes a real combustion monitor. The following variables can be calculated: η (efficiency), λ (air eccess) and $\%CO_2$ (carbon dioxide).
More complex system can be obtained adding recorder, the OXR controller and,when requested by the normatives, the ZCO carbon monoxide analyzer (see BT.13.02.03 ZCI).

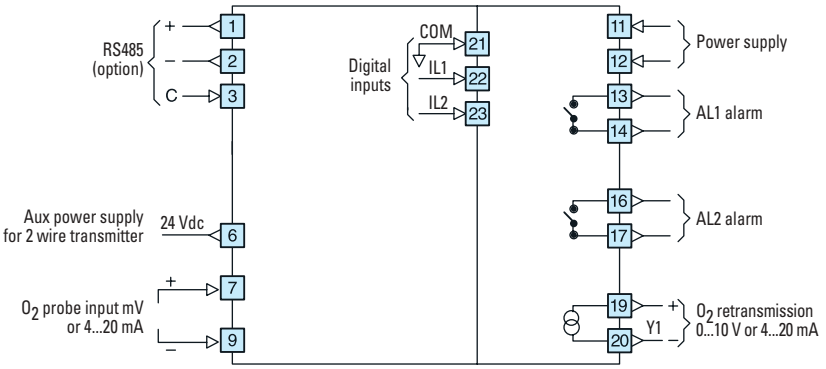
Example of OXR controller application



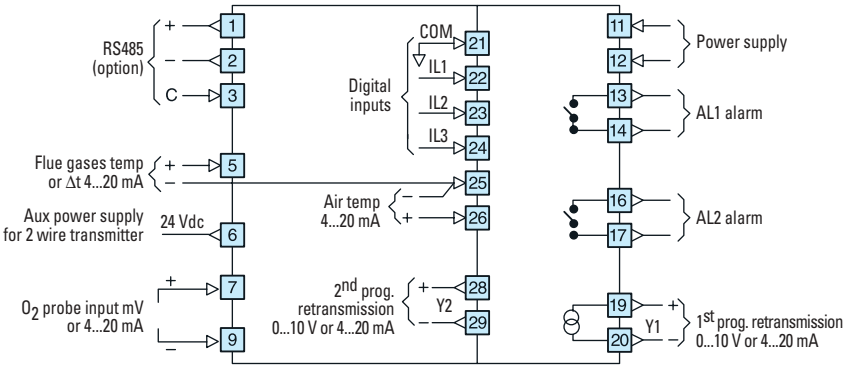
OXR

Oxygen "Trim" controller in 48x96 DIN size with acquisition and linearisation capability of the logaritmic signal coming from the ZO2 probe.
As alternative a 4/20mA linearized signal (range 0...20.9%) is available.
Its target is optimization of the air/fuel ratio acting on the adjustement of the air quantity requested by the master controller (load). The optimization is related to the oxygen content in the flue gases. This enable to save fuel comsumption.
It is possible to select, up to 2 curves of 4 segments (depending on fuel characteristics) to perform a corrective action during the load changing.

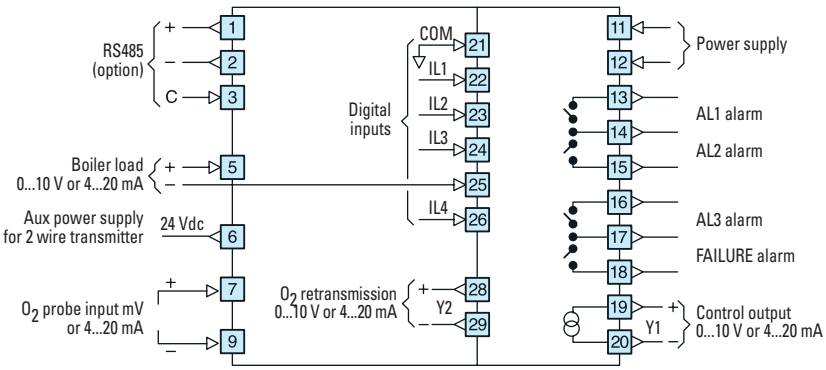
OXI wiring



OXM wiring

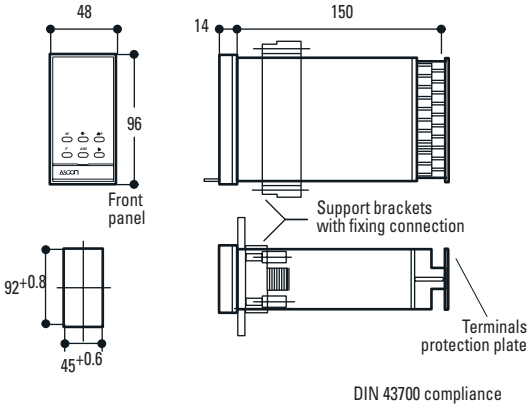


OXR wiring



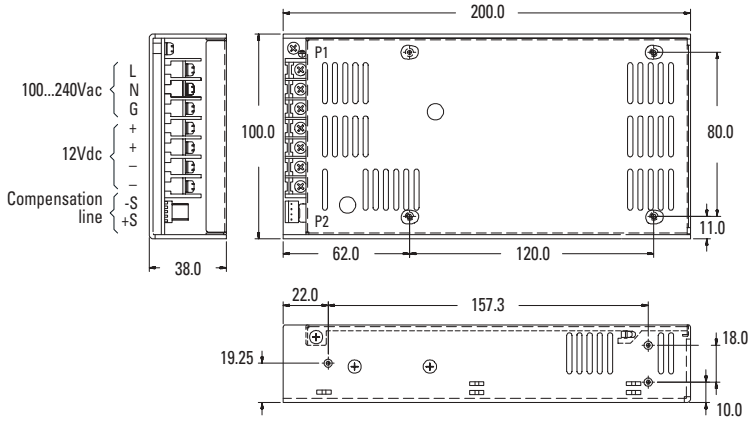
Overall dimensions and wiring

OXI-OXM-OXR instruments

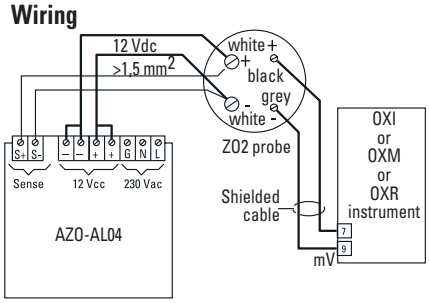


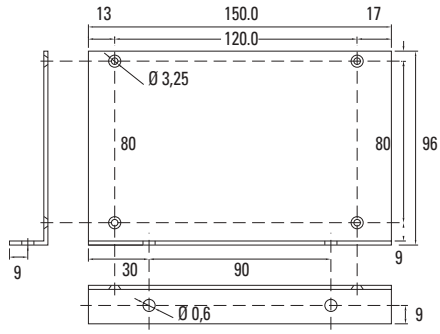
DIN 43700 compliance

AZO-AL04 aux power supply

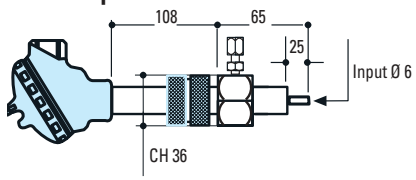


Wiring

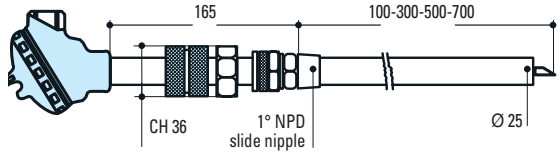




ZO2-C100 probe



ZO2 probe



Technical data	OXI	OXM	OXR
Main analog input	mV from the ZO2 probe (0.2 % ±1 digit) or 4...20 mA linearised with range 0.0...20.9%		
Auxiliary analog inputs		2 x 4...20 mA from air and flue gas temperature	4...20 mA boiler load
Main analog output	4...20 mA/0...10 V for O_2%	4...20 mA/0...10 V settable for: O_2%, fgT, Air temp, CO_2%, η, λ	4...20 mA/0...10 V control output
Auxiliary analog output			4...20 mA/0...10 V for O_2%
Digital inputs and related functions:	2 digital inputs: Hold and Fail	3 digital inputs: Hold, Fail, fuel switching	4 config. digital outputs: Hold, Fail, fuel switching, SP mem., Auto/man
Alarm output:	2 NO relay, 250 Vac/5 A configurable		3 NO relay, 250 Vac/5 A config. 1 NO relay, 250 Vac/5 A Failure
Serial comm.s (option):	RS485 (2 wire) Modbus, Jbus, BaudRate 9600 max.		
Power supply:	100...240 Vac, 50/60 Hz or 16...28 Vac, 50/60Hz and 20...30 Vdc		
Power consumption:	4 VA		
Ambient temperature:	0...50 °C		
Ambient Humidity:	35...85 % RH		
EMC:	IEC801-2, 801-3, 801-4: Level 4		
Mounting:	Front panel		
Front panel protection:	IP 54 Standard (IP65 with optional kit)		
Dimensions:	48 x 96 x 150 mm		

Ordering code

		A	B	C	D	/999
Oxygen indicator 48x96 DIN	OXI-					
Combustion monitor 48x96 DIN	OXM-					
Oxygen "TRIM" controller 48x96 DIN	OXR-					

Power supply

Serial communications

Y1 output

Y2 output

Power supply	I	M	R	A
230 Vac	✓	✓	✓	3
24 Vac/Vdc	✓	✓	✓	5

Serial communications				B
Not previded	✓	✓	✓	0
Rs485 Modbus	✓	✓	✓	3

Y1 output				C
4...20 mA	✓	✓	✓	1
0...10 V	✓	✓	✓	2

Y2 output				D
N.P.		✓	✓	0
4...20 mA		✓	✓	1
0...10 V		✓	✓	2

Oxygen probe	ZO2-	□	□	□
Lenght 100		1	0	0
Lenght 300		3	0	0
Lenght 500		5	0	0
Lenght 700		7	0	0

Power supply unit
AZO-AL04