

Oxygen (O₂) transmitter with monitoring

MG-4000-R3



- Measures the O₂-content in flue gases from boiler burners using:
 - ✓ Oil
 - ✓ Gas
 - ✓ Biomass fuel
- Measures also O₂-content in other gases
- No reference gas required.
 - ✓ Simple calibration in ambient air
- High degree of protection - IP65
- Rigid design on O₂-probe
 - ✓ Long life span
 - ✓ Adjustable insertion length
- Display shows:
 - ✓ Current measuring values
 - ✓ Set parameters
 - ✓ Error indication
- Operation state with 8 LED diodes
- 2 Alarm relays
 - ✓ Alarm at low O₂-content
 - ✓ Alarm O₂-measurement error
- Data communication
- Manual operating of output signal
- High degree of EMC protection

APPLICATION

MG-4000-R3 is used for the measuring of O₂-content in flue gases from oil burners, gas burners and Bio mass fired boilers.

MG-4000-R3 can be used together with a controller to optimize the air/fuel ratio in the furnace. This will result in the highest possible firing efficiency and it will remain over time regardless of deviation in the fuel composition and combustion air.

The measuring probe (MG-4000-R3/S) is mounted in the flue gas duct after the boiler. The measuring tip can easily be adjusted to center it in the flue gas flow. When calibrating, no special reference gas is required, calibration is performed in the ambient air. Mounting and installation is simple and similar to standard insertion temperature sensors.

The O₂-transmitter consist of two parts; measuring probe (MG-4000-R3/S) and the central unit (MG-4000-R3). The probe include a zirconiumdioxid (ZrO₂) sensor, heating element, signal amplifier and the loop generator for the ion pump. The Central unit include electronics for measuring the sensor signal, analogue outputs, relay output for alarm, display and power supply.

MEASUREMENT PRINCIPLE

At higher temperatures (>500 °C) stabilised zirconium-dioxide (ZrO₂) is a solid electrolyte for oxygen. This can be used in two ways:

- ❑ *To transport oxygen through a ZrO₂-disc (ion pump) according to Faraday's first law.*
- ❑ *To measure the ratio of partial pressure from oxygen on each side of a ZrO₂-disc according to Nernst's equation.*

Most modern oxygen meters available on the market use one of the mentioned principles. To avoid disadvantages such as relatively large probes, linearization of measurement signals, reference air, etc. both principles can be combined into an accurate and stable measuring method.

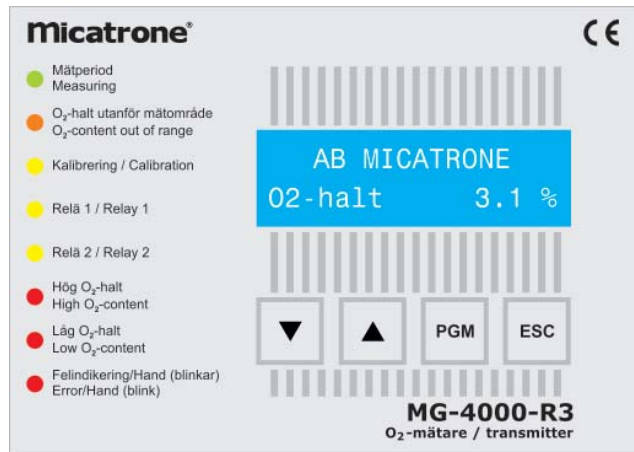
The sensor is enclosed by a heating element to maintain the temperature of the ZrO₂-discs at 700°C. This makes the sensor insensitive to changes in the flue gas temperature and the flow rate.

- ❑ *Based on this principle the sensor is very small and with that the probe can be made small.*
- ❑ *No reference air is required and the Nernst voltage does not need to be linearized.*

MG-4000-R3, which has its probe mounted in the flue gas duct, measure the O₂-content in wet flue gases. Portable O₂-measurement instruments extract a gas sample from the duct and measure the content in dry gases.

DISPLAY

The display can show current measuring values, error indication and set parameters.



For fast reading of the operating status, the display include 8 LED diodes with set function:

Measuring

Flashes for each new measuring/pump cycle from the probe.

O₂-content out of range

Is lit if measured O₂-content is outside the measuring range set in parameter 1.

Calibration

Is lit during the calibration.

Relay 1

Is lit when relay output on terminal 5-7 is active.

Relay 2

Is lit when relay output on terminal 8-10 is active.

High O₂-content

Is lit when measured O₂-content exceed the set value in parameter 2.

Low O₂-content

Is lit when measured O₂-content is below set value in parameter 3.

Error indication

Is lit to indicate defect probe. The display shows additional error information. This LED is also used to indicate manual 'HAND' operating state. The LED is flashing.

INPUT AND OUTPUT

Power supply

MG-4000-R3 should be connected to 230 VAC \pm 10%, 50 Hz.

Alarm function

Two change-over relay contacts. The function of each relay output is programmable, e.g. Alarm at low O₂-content or alarm if defect probe/sensor.

Output signals

MG-4000-R3 has two analogue output signals for actual O₂-content, One mA-signal (0/4...20 mA) and one voltage signal (0/2...10 V).

Data communication

MG-4000-R3 uses a RS-485 interface with Modbus RTU communication protocol.

See separate instruction, mi-356gb, for further information.

Manual operation 'HAND' of output signals

During maintenance or service, in programming mode, the output signals can be set manually if you want a specific O₂-content.

EMC-protection

MG-4000-R3 has been design with a high EMC protection to manage a harsh electrical environment. The apparatus comply or surpass with current EMC regulations and standards within EU.

The different standards describes test levels for both household/office and industrial environment. Micatrone has chosen to comply with household/office standard regarding emitted interference since this standard is more demanding than industrial and for immunity to comply with the industrial standard.

In all tests, where interference with the function is allowed according to EMC regulations, this product meet the demands without affecting the functionality. This ensure that the apparatus will work without the risk of interruption during normal operation.

MG-4000-R3 comply with EMC standard:

- ❑ SS-EN-61326-1:2013.

TECHNICAL DATA

Central unit MG-4000-R3

General

Supply voltage:	230 VAC \pm 10%, 50/60 Hz
Power consump.:	35 VA
Ambient temp.:	0...45 °C, preferred < 30 °C
El. connections:	Max. 2 x 1,5 mm ² /terminal
Cable entry:	12 holes for M20 gland
Degree of protection:	IP 65
Dimensions:	360x300x140 mm [HxWxD]
Weight:	6,5 kg

O₂-measuring

Range:	0...5 % O ₂
(selectable)	0...10 % O ₂
	0...20 % O ₂
	0...100 % O ₂
Resolution:	0,1 % O ₂
Measurement error:	Max \pm 0,2 % O ₂ -units
Time constant:	< 10 sec.
Heating time:	< 200 sec.

Relay outputs

Max. load:	230 VAC, 2A
------------	-------------

Output signal

mA:	
Signal range:	0/4...20 mA
Max. load:	500Ω
Volt:	
Signal range:	0/2...10 Volt DC
Min. load:	50 kΩ

Data communication (accessory)

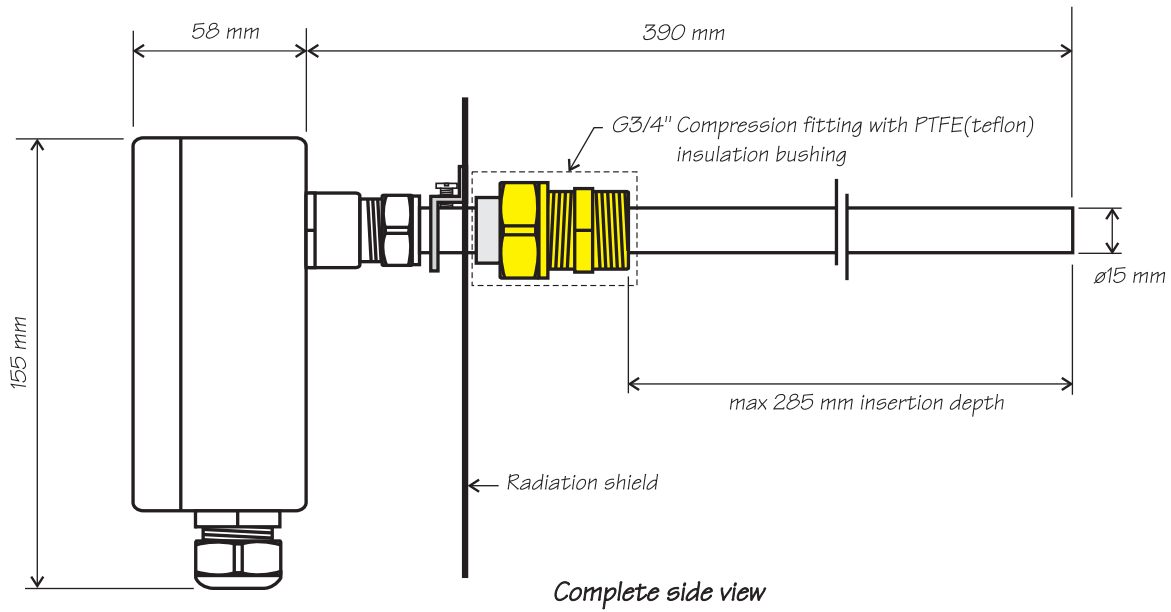
Interface:	RS-485
Protocol:	Modbus RTU

Sensor probe MG-4000-R3/S

General

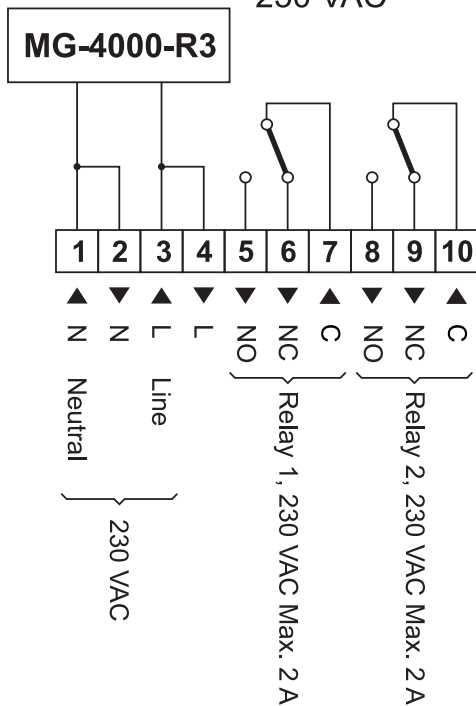
Temperature range	
for flue gases:	0...400 °C
Flue gas flow:	Max 20 m/s
Ambient temperature	
for connection head:	0...50 °C
El. connections:	1,5 mm ² /terminal
Cable entry:	1x M20x1,5 threaded hole
Cable to central unit:	type FKAR-G 10x0,5 mm ²
Cable length:	max 10 m
Degree of protection:	IP 65
Material probe pipe:	Stainless steel
Material conn. head:	Aluminium
Duct mounting conn:	G 3/4"
Weight:	1,5 kg

Dimensions O₂-probe

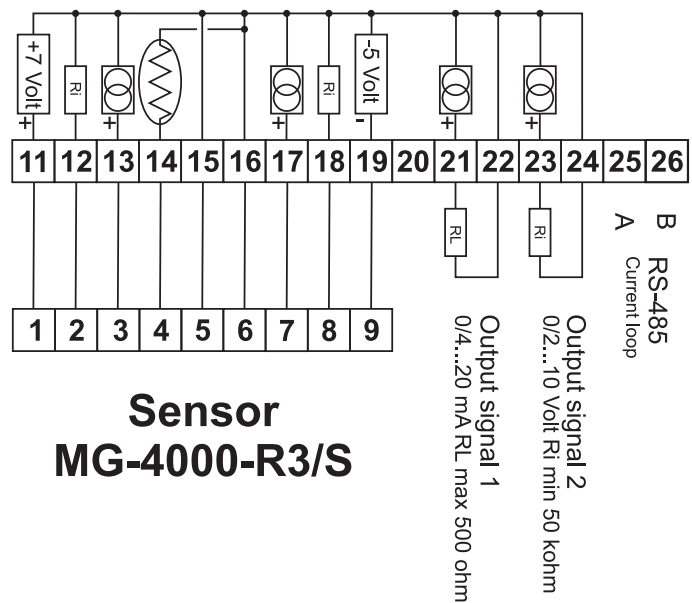


Electrical connections

Low voltage 230 VAC



Signal voltage



AB Micatrone
Åldermansvägen 3
171 48 SOLNA
SVERIGE

Telefon: 08-470 25 00

Internet: www.micatrone.se

E-post: info@micatrone.se