www.madur.com

maMoS
madur gas monitoring system

brainco

Ingeniería Brainco S.R.L.
Tel.: + 54 (11) 4206-0151
Fax: + 54 (11) 4032-0622
Oyuela 315 (B1874DEG)
Avellaneda - Buenos Aires
Argentina

brainco@brainco.com.ar
www.brainco.com.ar

CHARACTERISTIC | FEATURES | TECHNICAL DATA | SENSORS | EQUIPMENT | APPEARANCE

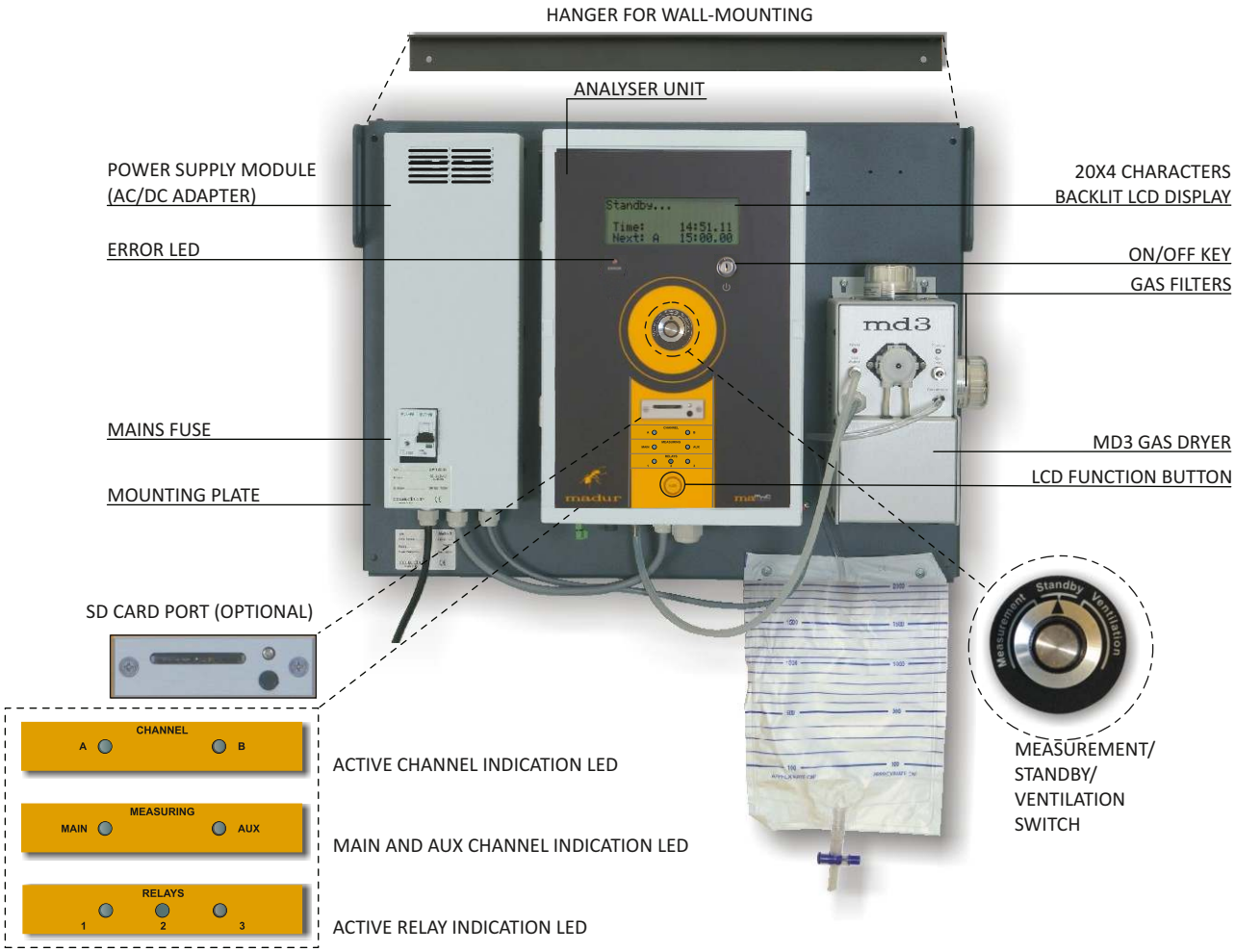
Small in size, yet very skillful analyser – it has the best capabilities/price ratio. maMoS is our alternative for large, intricate CEMS systems, as it does not fall behind them concerning functionality and abilities, and is far ahead in terms of expenses.

It has modular construction, and many add-ons, that makes it easily adjustable to a very specific, individual application.

Powerful PC software allows to adopt many aspects of the analyser's work very individually (work schedule, analogue outputs' behaviour, data presentations, and more...).

Manufactured according to the principles of ISO 10396.

- Standard configuration consists of up to 6 sensors (NDIR and electrochemical)
- Up to 8 sensors in an extreme, unique configuration
- **NEW** Large display with backlight, 4 lines x 20 characters
- Different types of gas dryers to fit the customers needs
- Compact, Split and Twin split configurations
- Data-logger with SD card for results collection
- Analogue outputs (both current and voltage) to control external devices
- Digital and analogue inputs to pass signals from external devices, to trigger maMoS actions
- Communication with PC via different interfaces (USB, LAN, RS485 and **MODBUS**).
- Different work modes to select from (continuous measurements, work with scheduler, measurements triggered with digital input, “work in-turns” - allows to measure from two different sources, and more...)
- Powerful PC program to adjust the analyser's settings and to view the results
- Rich offer of add-ons and accessories
- **NEW** Possibility to work with heated hoses
  Standard lengths: 3m 5m, 8m for 115VAC and 230VAC supply.



COMPACT CONFIGURATION

ALL MOUNTED AT MEASUREMENT SITE

WITH MD2 GAS DRYER

WITH MD3 GAS DRYER

SPLIT CONFIGURATION

ANALYSER AND GAS DRYER ARE INSTALLED SEPARATELY, EACH WITH ITS OWN POWER SUPPLY
GAS DRYER INSTALLED ON THE MEASUREMENT PLACE, ANALYSER CAN BE IN A DISTANCE

ANALYSER UNIT

GAS CONNECTION

GAS CONDITIONING UNIT

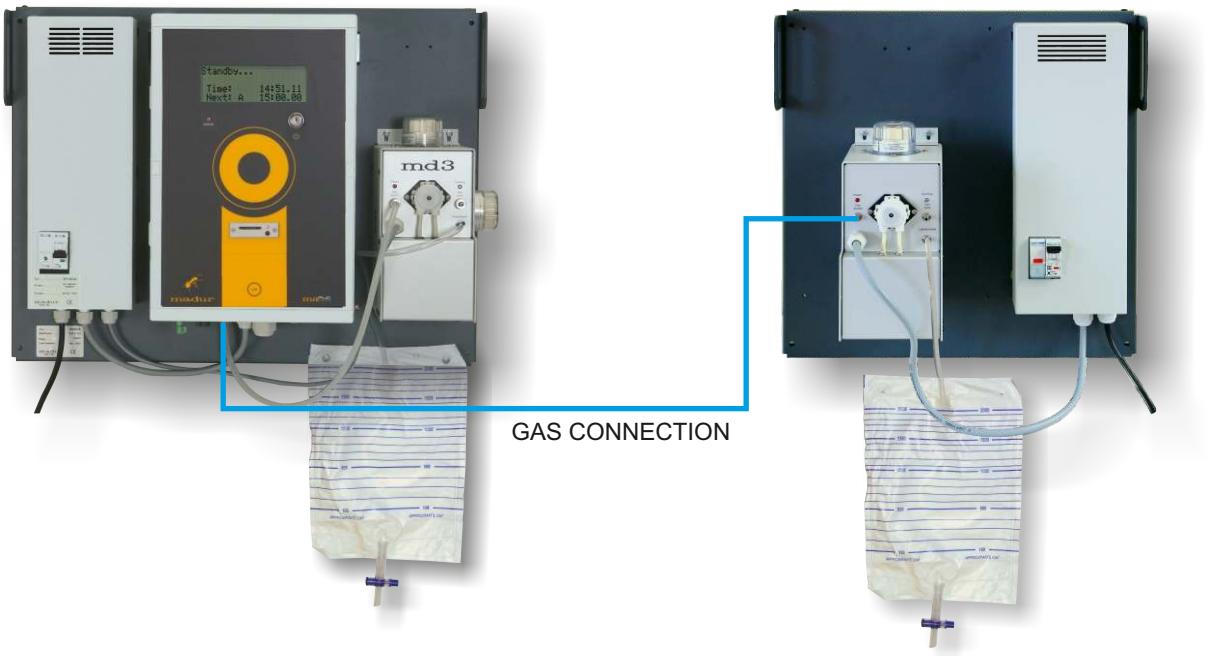
TWIN SPLIT CONFIGURATION

ANALYSER AND TWO GAS DRYERS, EACH WITH A POWER SUPPLY.

TWIN-SPLIT CONFIGURATION WITH ONE DRYER ON A SEPARATE MOUNTING PLATE.

ANALYSER WITH GAS CONDITIONING UNIT #1

GAS CONDITIONING UNIT #2



TWIN SPLIT CONFIGURATION, WITH BOTH GAS DRYERS ON SEPARATE MOUNTING PLATES

GAS CONDITIONING UNIT #1

ANALYSER UNIT

GAS CONDITIONING UNIT #2

MAMOS GAS ANALYSER

Dimensions (W * H * D)	240 mm * 360 mm * 160 mm
Weight (depends on equipment)	4kg ÷ 5kg
Casing material	ABS
Mounting plate: dimensions (H*W) | material | weight	596 mm * 450 mm | aluminium | 1,9 kg
Operating conditions	T: 10°C ÷ 50°C; RH: 5%÷90% (non condensing)
Storing temperature	0°C ÷ 55°C
Power consumption (analyser only)	30W max
Data-logger: type| size| number of results	SD flash card | max 4GB | practically unlimited
Display: type| maximum number of results per screen	20 characters x 4 rows | 4 measurement results
Gas pump: type| max gas flow| standard gas flow	Diaphragm | max 2l/min | 1.5l/min (90l/h) - with automatic flow control
Current analogue outputs	4 outputs 0 mA ÷ 20 mA or 4 mA ÷20 mA
Voltage analogue outputs	4 outputs 0 V ÷ 5 V or 0 V ÷ 10 V
Digital inputs	2 inputs, TTL levels, floating - high level
Digital outputs	1 open collector output + 2 SPDT relays (optional)
Communication interface with PC computer	B type USB

POWER SUPPLY UNIT

Dimensions (W * H * D)	360 mm * 130 mm * 56 mm
Weight	1,4kg
Casing material	Aluminium
Mounting plate	Power supply is mounted on common plate with analyser unit
Operating conditions	T: 10°C ÷ 50°C; RH: 5% ÷ 90% (non condensing)
Storing temperature	-20°C ÷ 55°C
Input voltage	100 ÷ 240 V AC 50 / 60 Hz
Output voltage	24V DC / 6,3 A | 150W
Output current	6,3A max
Mains fuse	6A
Cable pass	2 pcs PG-9

MD2 GAS DRYER

Dimensions (W * H * D)	211 mm * 74 mm * 82 mm
Weight	450g
Drying method	Water condensation by rapid cooling down
Cooler type	Based on Peltier cooling element with fan (7VDC supply)
Cooling temperature	Down to +4°C electronically stabilised Dew point of outlet gas 8°C below the temperature of inlet gas
Ready to operate after	10 minutes
Operating conditions	T: 0°C ÷ 35°C, RH: 5% ÷ 90% (non-condensing)
Storing temperature	0°C ÷ 55°C
Maximum gas flow for efficient drying (at inlet gas temp. 100°C and RH 100%)	40 l/h
Gas filter	Integrated, with condensate reservoir and replaceable insert
Filter insert: length | ID | OD | material | pore size	32mm | 15mm | 20mm | PE | 5µm
Condensate removal	With peristaltic pump installed in analyser's body
Peristaltic pump capacity	38 ml/min
Power supply	Via maMoS (through 15-pin D-SUB connector)
Power consumption	9 W

MD3 GAS DRYER

Dimensions (W * H * D)	Without filters: 110 mm * 205 mm * 160 mm With filters: 145 mm * 240 mm * 160 mm
Weight	1790 g (single filter version)
Drying method	Water condensation by rapid cooling down
Cooler type	Based on Peltier cooling element with fan (12VDC supply)
Cooling temperature	Constant, about +1°C, output gas dewpoint about +4°C
Ready to operate after	5 minutes
Operating conditions	T: 0°C ÷ 50°C, RH: 5% ÷ 90% (non-condensing)
Storing temperature	0°C ÷ 55°C
Maximum gas flow for efficient drying (at inlet gas temp. 100°C and RH 100%)	100 l/h
Gas filters: quantity | material	1 (optionally 2) | PA - body, PC - cover, viton - sealing
Filter insert: length | ID | OD | material | pore size	42mm | 26mm | 32mm | glass fibre | 2µm
Condensate removal	With built-in peristaltic pump
Peristaltic pump capacity	38 ml/min
Power consumption	30 W

Method	Range | Resolution	Accuracy	Time (T90)	Conformity
O_2 - OXYGEN				
Electrochemical, partial pressure	20,95% | 0,01%	± 0,1% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	25,00% | 0,01%	± 0,1% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	100,00% | 0,1%	± 0,1% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
CO - CARBON MONOXIDE				
Electrochemical	4 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochem., with H2 compensation	4 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical	20 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochem., with H2 compensation	20 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical	10% | 0,001%	±0,005% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	10% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	EN 15058; Method 10
NDIR	25% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	EN 15058; Method 10
NDIR	50% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	EN 15058; Method 10
NDIR	100% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	EN 15058; Method 10
CO_2 - CARBON DIOXIDE				
NDIR	5% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; OTM-13
NDIR	10% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; OTM-13
NDIR	25% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; OTM-13
NDIR	50% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; OTM-13
NDIR	100% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	ISO 12039; OTM-13
C_xH_y - TOTAL HYDROCARBONS				
NDIR	1% | 0,1%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	5% | 0,1%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	10% | 0,1%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	25% | 0,1%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	50% | 0,1%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	100% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	
NO - NITRIC OXIDE				
Electrochemical	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	CTM-022
Electrochemical	5 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	CTM-022
NO_2 - NITROGEN DIOXIDE				
Electrochemical	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	60 sec	CTM-022
Electrochemical	4 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	60 sec	CTM-022
SO_2 - SULPHUR DIOXIDE				
Electrochemical	2 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	
Electrochemical	5 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	
H_2S- HYDROGEN SULFIDE				
Electrochemical	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
Electrochemical	10 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	

Method	Range | Resolution	Accuracy	Time (T90)	Conformity
H_2 - HYDROGEN				
Electrochemical	2 000 ppm | 1 ppm	± 10 ppm abs. or 5% rel.	50 sec	
Electrochemical	20 000 ppm | 1 ppm	± 10 ppm abs. or 5% rel.	70 sec	
Thermal Conductivity Detector	10% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	
Thermal Conductivity Detector	25% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	
Thermal Conductivity Detector	50% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	
Thermal Conductivity Detector	100% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	
N_2O - NITROUS OXIDE				
NDIR	2 000 ppm | 1 ppm	± 10 ppm abs. or 5% rel.	45 sec	ISO 21258
NDIR	5 000 ppm | 1 ppm	± 10 ppm abs. or 5% rel.	45 sec	ISO 21258
CHF_3 - FLUOROFORM (REFRIGERANT R23)				
NDIR	2,5% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	
Cl_2 - CHLORINE				
Electrochemical	250 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	60 sec	
VOC - VOLATILE ORGANIC COMPOUNDS				
PID - Photoionization Detector	100 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	120 sec	METHOD 21
PID - Photoionization Detector	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	120 sec	METHOD 21

MEASUREMENTS

Variable	Method	Range | Resolution	Accuracy	Time (T_{90})
T_{gas} - gas temperature	K-type thermocouple	-10 ÷ 1000°C | 0,1°C	± 2°C	10 sec
T_{gas} - gas temperature	S-type thermocouple	-10 ÷ 1500°C | 0,1°C	± 2°C	10 sec
T_{amb} - boiler intake air temperature	PT500 resistive sensor	-10 ÷ 100°C | 0,1°C	± 2°C	10 sec
Differential pressure	Silicon piezoresistive pressure sensor	-25 hPa ÷ +25 hPa | 1 Pa (0,01hPa)	± 2Pa abs. or 5% rel.	10 sec
Gas flow velocity	Indirect, with Pitot tube & pressure sensor	1 ÷ 50 m/s | 0,1 m/s	0,3 m/s abs. or 5% rel.	10 sec
Lambda λ - excess air number	Calculated	1 ÷ 10| 0,01	± 5°C	10 sec
qA - stack loss	Calculated	0 ÷ 100% | 0,1%	± 5°C	10 sec
Eta - η combustion efficiency	Calculated	0 ÷ 120%| 0,1%	± 5°C	10 sec

STANDARD EQUIPMENT

SUPPLIED ALONG WITH THE DEVICE

- maMoS gas analyser on a mounting plate
- Power supply unit that converts mains supply 115VAC or 230VAC to 24VDC for maMoS
- USB communication cable
- 8 analogue outputs (4x current, 4x voltage)
- 2 digital inputs for triggering maMoS behavior
- 7-pin connector for Tgas probe (thermocouple connection)
- Software CD with program and manuals
- 4 wall plugs to attach mounting plate

ADDITIONAL EQUIPMENT

NECESSARY FOR THE ANALYSER TO WORK

- MD2 gas dryer

  Md2 gas dryer – economy class Peltier cooler unit - basic equipment of the maMoS monitor.

  ordering code:
  ZMAM-DRYER-MD2

- MD3 gas dryer

  High efficiency gas dryer based on the Peltier cooling element. Equipped with 1 or 2 microfibre filters. Replaces the basic MD2 dryer.

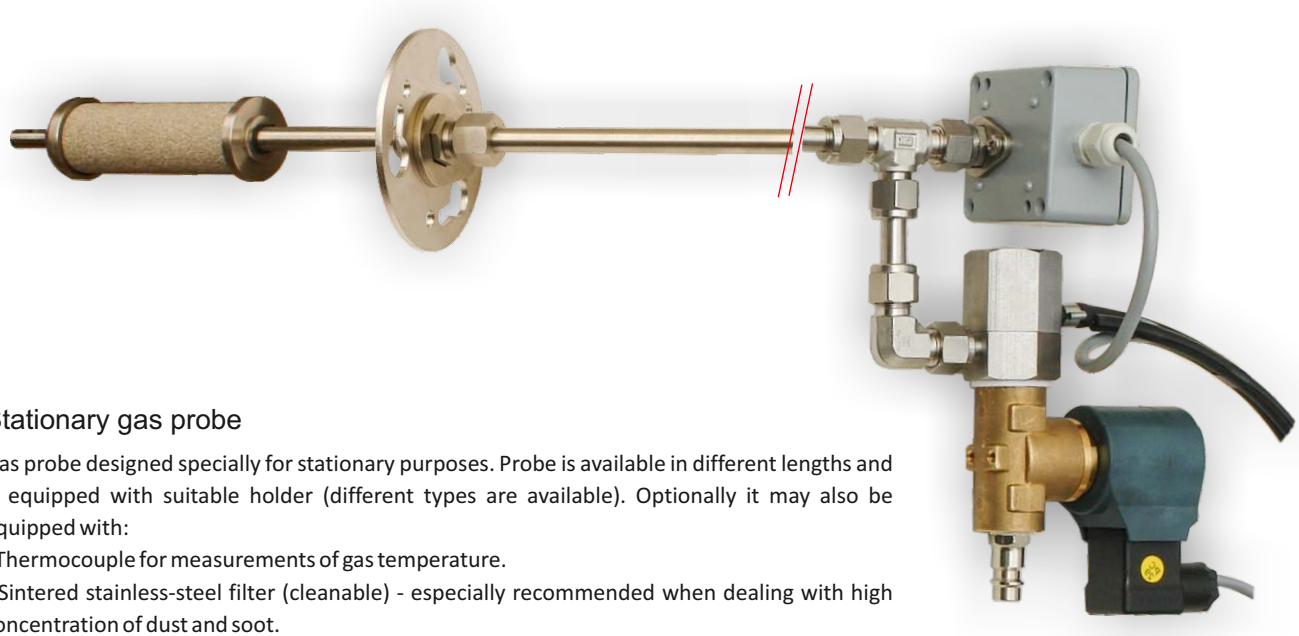
  ordering codes:
  MD3 dryer with 1 filter - ZMA3-DRYER-MD3S
  MD3 dryer with 2 filters - ZMA3-DRYER-MD3S2

- MD3 gas dryer with power supply unit

  MD3 gas dryer with its own power supply module. Can work as a part of maMoS analyser (in split or twin-split configurations), or as a standalone device.

  ordering code:
  M10-00001

OPTIONAL EQUIPMENT & SPARE PARTS



- **Stationary gas probe**

  Gas probe designed specially for stationary purposes. Probe is available in different lengths and is equipped with suitable holder (different types are available). Optionally it may also be equipped with:
  - Thermocouple for measurements of gas temperature.
  - Sintered stainless-steel filter (cleanable) - especially recommended when dealing with high concentration of dust and soot.
  - ”Blow-back” cleaning option - valve that allows to switch between measured gas and the compressed air inlet that is used for cleaning the sintered filter.

- **Pitot tube**

  Pitot tube is used for indirect measurement of gas flow velocity (measurement with the analayser’s differential pressure sensor). A few lengths of tubes are available. Pitot tube has 2m gas tubings to connect it with the analyser. It may be provided with a suitable holder for stationary purposes

  ordering codes:
  pitot tube 800mm - Z00-PITOT-8002
  pitot tube 500mm - Z00-PITOT-5002

- **Heated filter**

  Heated filter is installed right after the gas probe. It is best when it is paired with heated hose to prevent vapour from condensing.

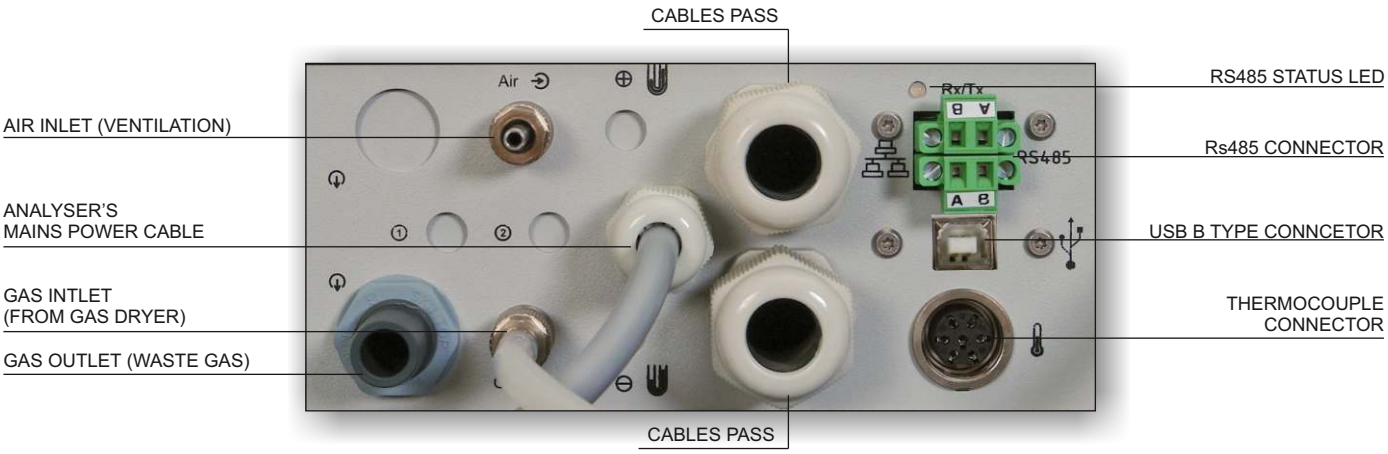
- **Ethernet / WiFi communication interfaces**

  Optional interface allows to communicate with maMoS analyser within LAN network either via cable or wirelessly with help of special WiFi adapter.

  ordering code:
  ZMA3-ADAP-WIFI

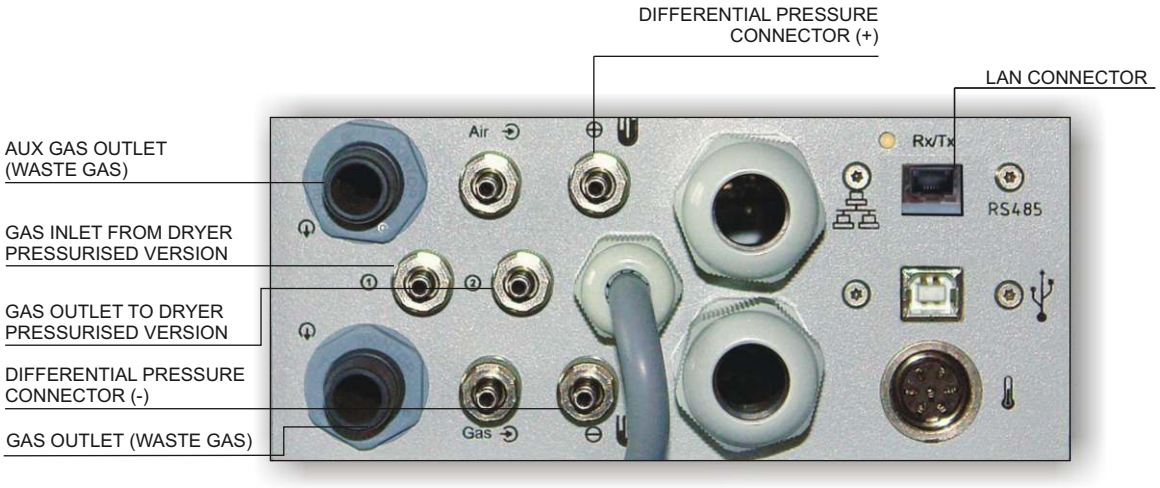
GAS AND ELECTRIC CONNECTORS (ANALYSER BOTTOM VIEW)

CONNECTION PANEL FOR THE STANDARD CONFIGURATION WITH A SINGLE GAS CHANNEL

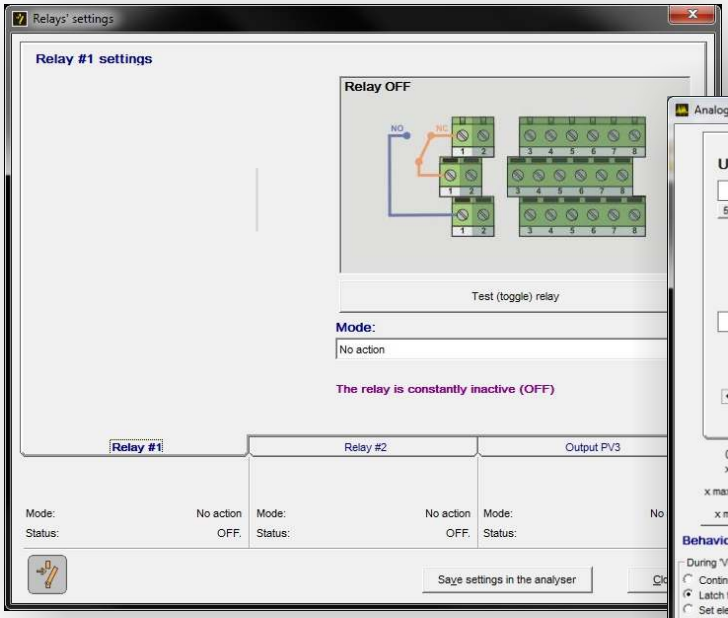


GAS AND ELECTRIC CONNECTORS (ANALYSER BOTTOM VIEW)

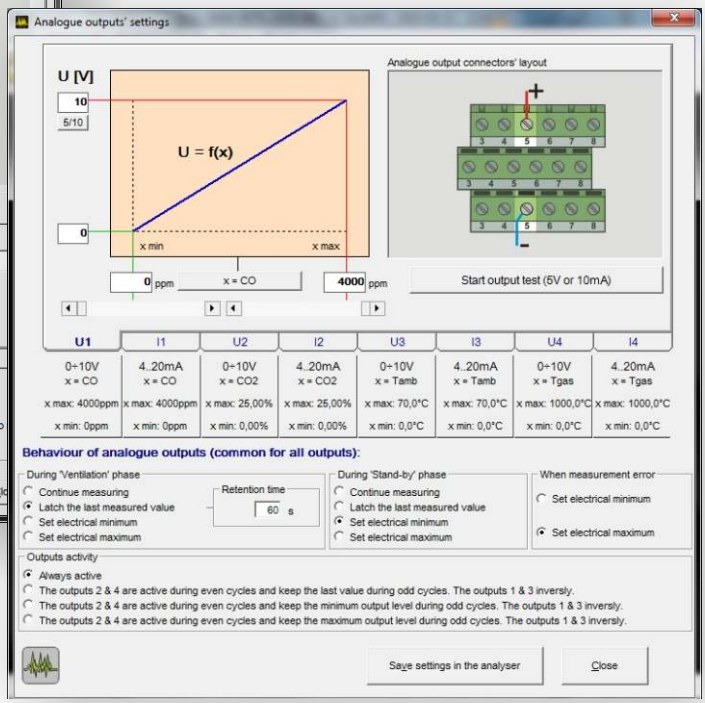
CONNECTION PANEL FOR THE OVERPRESSURE CONFIGURATION WITH A DOUBLE GAS CHANNEL



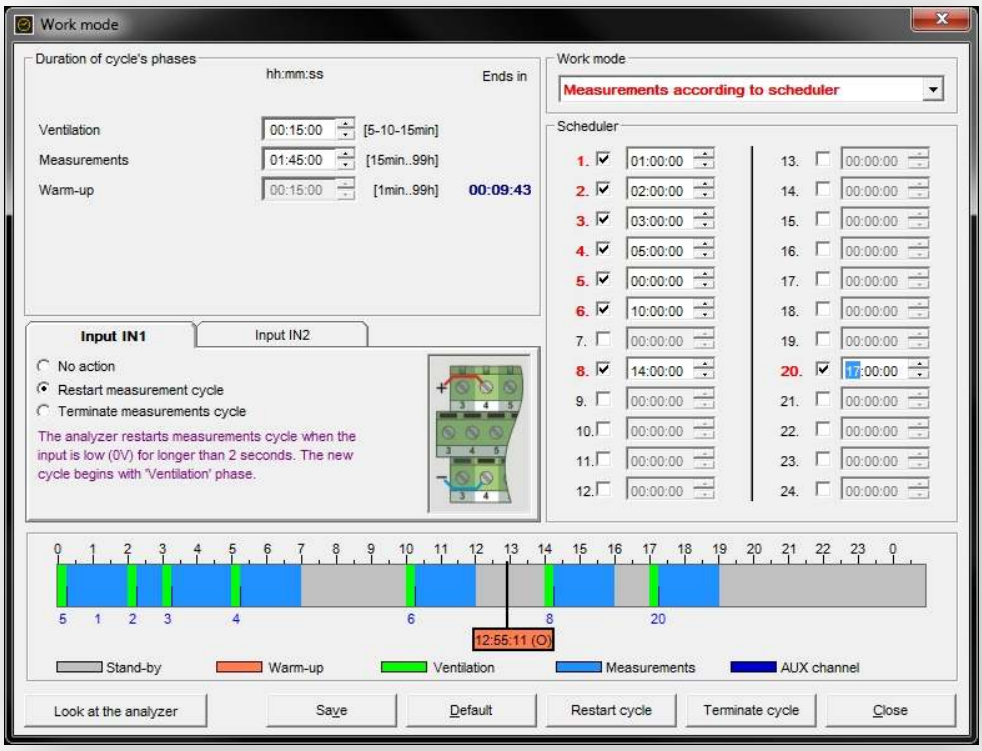
EXAMPLE PC PROGRAM SCREENSHOTS



ANALYSER'S WORKING MODES



ANALOGUE OUTPUTS' SETTINGS



DAILY WORKING HOURS AT SET TIMES