

maMos

madur gas monitoring system



CHARACTERISTICS

FEATURES

TECHNICAL DATA

SENSORS

EQUIPMENT

APPEARANCE

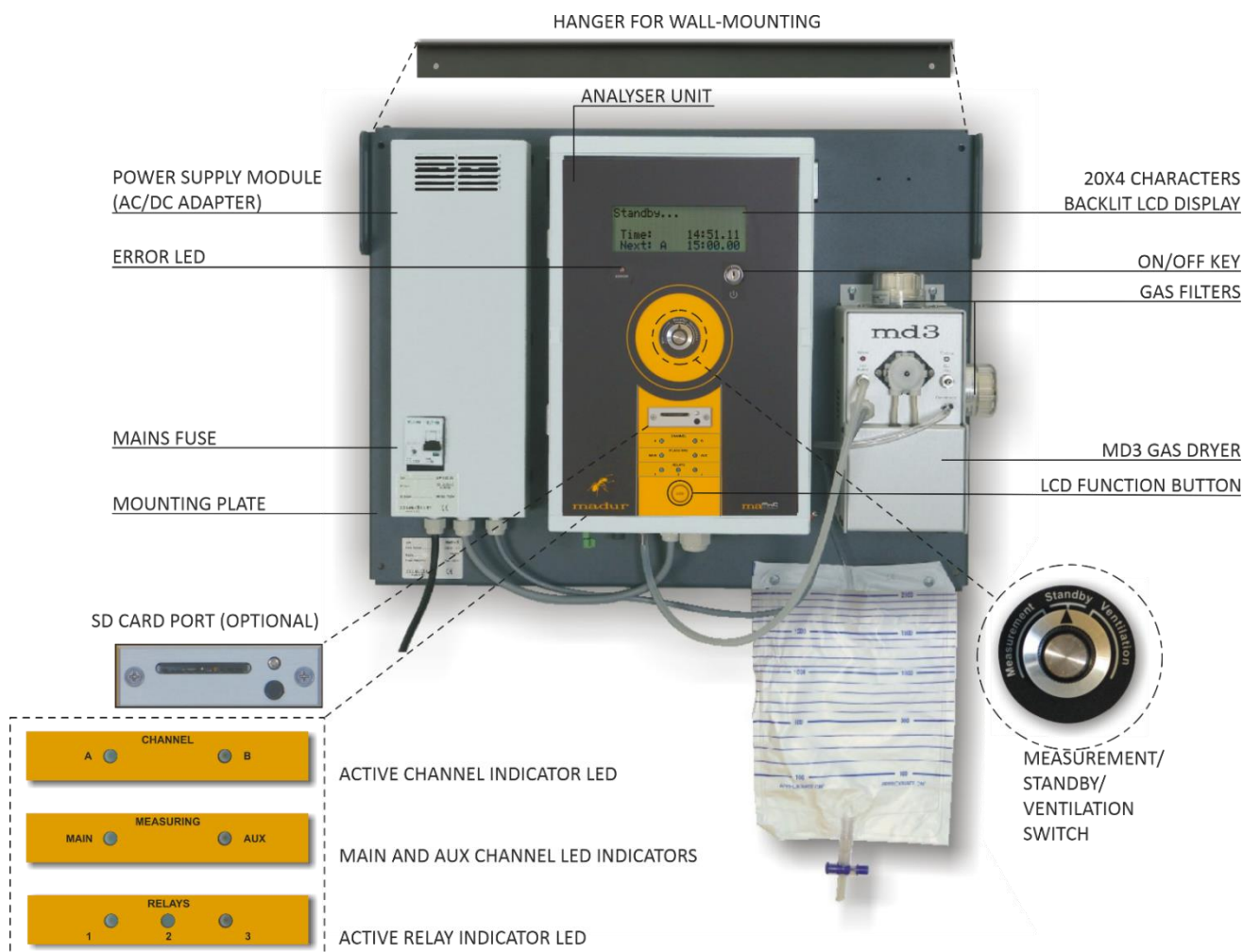
Small in size, but very capable analyser – it has the best price/performance ratio. maMos is our alternative to large, complex CEMS systems, as it does not fall behind them in terms of functionality and capabilities, and is far ahead in terms of cost.

It has a modular design and many add-ons, making it easy to adapt to a very specific, individual application.

Powerful PC software allows you to customise many aspects of the analyser's operation (work schedule, analogue outputs behaviour, data presentation, etc.).

Designed according to the principles of ISO 10396.

- Standard configuration consists of up to 6 sensors (NDIR and electrochemical).
- Up to 8 sensors in extreme, unique configuration.
- Large backlit display, 4 lines x 20 characters.
- Different types of gas dryers to suit customer requirements.
- Compact, Split and Twin-split configurations.
- Gas multiplexer for more sampling points (4-8 channels).
- Data logger with SD card for recording results.
- Analogue outputs (both current and voltage) to control external instruments.
- Different working modes to choose from (continuous measurements, working with scheduler, measurements triggered by digital input, “working in-turns” - allows to measure from two different sources, and more...).
- Powerful PC program for setting up the analyser and viewing the results.
- Wide range of add-ons and accessories, to mention a few: stationary gas probe, heated filter, stationary pitot tube for measurement of flow velocity measurement
- Communication with PC through various interfaces (USB, LAN, RS485 and MODBUS)
- Digital and analogue inputs to receive signals from external devices and to trigger maMoS actions
- Possibility to work with heated hoses. Two types of heated lines are available: 100W/m and self-regulating heated line (35W/). Standard lengths: 3m 5m, 8m for 115VAC and 230VAC supply.



IP55 CABINET FOR MAMOS ANALYSER AND ACCESSORIES



DUAL FILTER WITH ABSORBENT



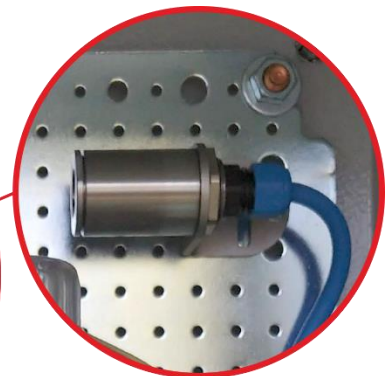
ACCESSIBLE AC POWER SOCKET

SUPPORT FOR HEATED HOSES

- IP55 cabinet provides enhanced protection for the analyser, MD3 dryer and other accessories; allowing the instrument to be installed outdoors or in harsh measurement environments.
- Optional air conditioning and/ or heater allows operation in hot/cold weather conditions.
- The IP cabinet is available in several versions:
 - with/without the glazed doors,
 - 304/316 stainless steel or painted steel,
 - 800x600mm or 1000x800mm size.
- Purge and pressurised version for hazardous gases/environments:

OVERPRESSURE SENSOR

REDUNDANT LEL SENSOR



FLOW SENSOR

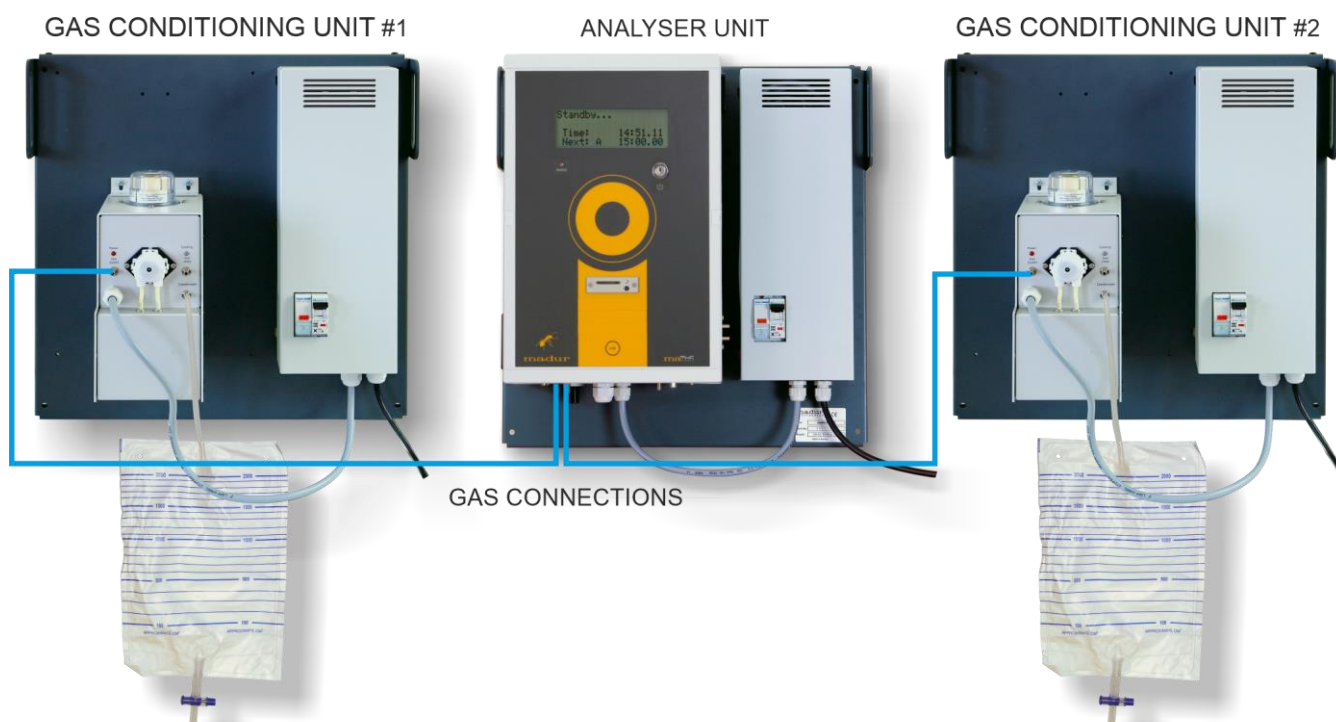


SHUT-OFF VALVE

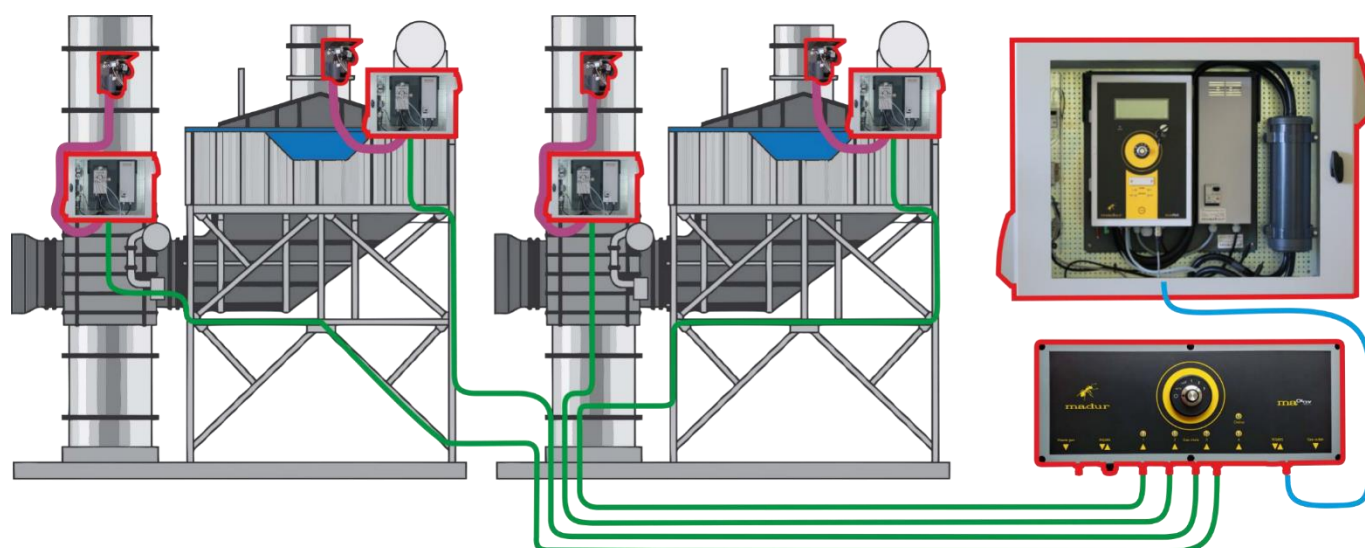


PURGE FAN

TWIN-SPLIT CONFIGURATION: ONE ANALYSER – TWO SAMPLING LOCATIONS



MULTI-LOCATION SAMPLING WITH HELP OF MAPLEX GAS MULTIPLEXER



CHARACTERISTICS	FEATURES	TECHNICAL DATA	SENSORS	EQUIPMENT	APPEARANCE
MAMOS GAS ANALYSER					
Dimensions (W x H x D)			240 mm * 360 mm * 160 mm		
Weight (depends on the equipment)			4kg ÷ 5kg		
Casing material			ABS		
Mounting plate: Dimensions (H x W) material weight			596mm x 450mm aluminium 1,9kg		
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 (revolving)		
Gas pump: type max gas flow standard gas flow			Diaphragm max 5l/min 1.5l/min (90l/h) - with automatic flow control		
Current analogue outputs			4x 4÷20 mA (with the optional expansion card: 8x 4÷20 mA)		
Voltage analogue outputs			4x 0-10V (if the expansion card is used, voltage outputs are not available)		
Digital inputs			2x inputs, TTL levels, floating - high level		
Digital outputs			1 open collector output + 2 SPDT relays (optional)		
Communication interface with PC			B-type USB, RS485, LAN (RJ-45)		
Communication protocols			madur proprietary with mosys PC software, MODBUS-RTU, MODBUS-TCP		
POWER SUPPLY UNIT					
Dimensions (W x H x D)			360 mm * 130 mm * 56 mm		
Weight (depends on the equipment)			1,4 kg		
Casing material			Aluminium		
Mounting plate:			Power supply is mounted on common panel with analyser unit		
Operating conditions			T: 10°C ÷ 50°C; RH: 5%÷90% (non-condensing)		
Storing temperature			-20°C ÷ 55°C		
Input voltage			30W max		
Output voltage			100 ÷ 240VAC, 50÷60 Hz		
Output current			24VDC / 6,3A 150W		
Main fuse			6A		
Cable pass			2x PG-9		

MD3 GAS DRYER



Dimensions (W x H x D)	Without filters: 110 mm x 205 mm x 160 mm With filters: 145 mm x 240 mm x 160 mm
Weight	1790g (single filter version)
Drying method	Water condensation by rapid cooling down
Cooler type	Based on Peltier cooling element with fan (24 VDC supply)
Cooling temperature	Constant, about +1°C; dewpoint of the output gas ≈ +4°C
Ready to operate	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 or optionally 2 Filter body – PA, cover – PC, gasket – FKM
Filter insert: length ID OD material mean 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

IP55 CABINET



Dimensions (W x H x D)	Standard version: 800mm x 600mm x 300mm (other sizes on demand)
without the optional equipment like AC, and gas and electric connections	
Weight	25,5 kg (painted steel version with glazed doors) + weight of the analyser and its accessories
Material	Painted steel or 304 SS or 316 SS
Installation type	Wall-mounted
Lock type	3-points lock, 3mm double-bar
IP rating	IP55 for the cabinet with fan forced ventilation (NEMA 3) IP65 for cabinet without ventilation (NEMA 4x) IP65 for cabinet with the AC (NEMA 4x)
Accessibility	Front
Operating conditions for the analyser in IP55 cabinet with fan forced ventilation	max. ambient temp. 35°C, out of direct sunlight
Storing temperature	0°C ÷ 55°C
Ventilation fan: size efficiency loudness IP rate	120mm x 120mm 55m³/h 40dBA IP55

CHARACTERISTICS	FEATURES	TECHNICAL DATA	SENSORS	EQUIPMENT	APPEARANCE
METHOD	RANGE	RESOLUTION	ACCURACY	T ₉₀ TIME	CONFORMITY
O₂ - OXYGEN					
Electrochemical	20,95%	0,01%	± 0,2% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	20,95%	0,01%	± 0,2% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	25%	0,01%	± 0,2% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	100%	0,1%	± 0,2% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Paramagnetic	25%	0,01%	± 0,2% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Paramagnetic	100%	0,1%	± 0,2% 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
Electrochemical	20 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical with H ₂ compensation	10 000 ppm	1 ppm	± 0,005% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	20 000 ppm	10 ppm	± 50 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	10%	0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	25%	0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	50%	0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	100%	0,1%	± 0,5% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
CO₂ – CARBON DIOXIDE					
NDIR	10%	0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	25%	0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	50%	0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	100%	0,1%	± 0,5% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
C_xH_y – HYDROCARBONS (CALIBRATED WITH METHANE)					
NDIR	25%	0,01%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	50%	0,01%	± 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	EN 50379; CTM-022
Electrochemical	5 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379; CTM-022
NO₂ – NITROGEN DIOXIDE					
Electrochemical	1 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	60 sec	EN 50379; CTM-022
Electrochemical	5 000 ppm	5 ppm	± 25 ppm abs. or 5% rel.	60 sec	EN 50379; CTM-022
SO₂ – SULPHUR DIOXIDE					
Electrochemical	2 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379
Electrochemical	5 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379
NDIR	20 000 ppm	10 ppm	± 50 ppm abs. or 5% rel.	45 sec	EN 50379; Method 6C
H₂S – HYDROGEN SULPHIDE					
Electrochemical	10 ppm	10 ppb	± 50 ppb abs. or 5% rel.	70 sec	
Electrochemical	50 ppm	0,1ppm	± 1 ppm abs. or 5% rel.	70 sec	
Electrochemical	1 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
Electrochemical	5 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
Electrochemical	10 000 ppm	5 ppm	± 25 ppm abs. or 5% rel.	70 sec	

CHARACTERISTICS	FEATURES	TECHNICAL DATA		SENSORS	EQUIPMENT	APPEARANCE
METHOD	RANGE	RESOLUTION	ACCURACY	T ₉₀ TIME	CONFORMITY	
H ₂ – HYDROGEN						
Electrochemical	1 000 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 ₂ O – NITROUS OXIDE						
NDIR	2 000 ppm	1 ppm	± 10 ppm abs. or 5% rel.	45 sec	ISO 21258	
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	
ETO – ETHYLENE OXIDE						
Electrochemical	100 ppm	1 ppm	± 5 ppm abs. or 5% rel.	70 sec		
HCL – HYDROGEN CHLORIDE						
Electrochemical	100 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec		
Electrochemical	1 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec		
NH ₃ – ANHYDROUS AMMONIA						
Electrochemical	100 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec		
Electrochemical	1 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec		
MEASUREMENTS: ENVIRONMENT SENSORS AND CALCULATIONS						
VARIABLE	METHOD	RANGE RESOLUTION		ACCURACY	T ₉₀ TIME	
T _{gas} – gas temperature	K-type thermocouple	-10°C ÷ 1150°C	0,1°C	±2°C	10 sec	
T _{amb} – boiler intake air temperature	PT500 resistive sensor	-10°C ÷ 100°C	0,1°C	±2°C	10 sec	
Differential pressure (draft)	Silicon piezoresistive pressure sensor	-25 hPa ÷ +25 hPa	10 Pa	±2Pa abs. or 5% rel.	10 sec	
Gas flow velocity	Indirect: with L-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% rel.	10 sec	
qA - stack loss	Calculated	0 ÷ 100%	0,1%	± 5% rel.	10 sec	
Eta η - combustion efficiency	Calculated	0 ÷ 100%	0,1%	± 5% rel.	10 sec	

STANDARD EQUIPMENT

SUPPLIED WITH THE DEVICE

- Mamos gas analyser on a mounting plate
- Power supply module that converts mains supply (115 VAC / 230VAC) to 24VDC for mamos and accessories
- USB communication cable (for PC connection)
- RS485-USB converter (for MODBUS-RTU connection)
- PVC bag for condensate
- Wall mounting bracket for analyser + raw plugs and screws for mounting
- 8x analogue outputs (4x 4-20mA + 4x 0-10V)
- 2 digital inputs for triggering mamos behaviour

ADDITIONAL EQUIPMENT

NECESSARY FOR THE ANALYSER TO WORK

- MD3 gas dryer

Highly efficient gas dryer based on the Peltier cooling element.

Equipped with one or two microfibre filters.

The gas dryer can be equipped with its own power supply to operate independently of the gas analyser, either as a part of a split/ twin split configuration, or as a stand-alone unit.



- MD4 gas dryer

The newly developed version of the gas dryer installed in the IP55 cabinet allows the dryer to be installed at a distance from the gas analyser, in outdoor conditions.

The IP55 cabinet protects the electronics of the gas dryer not only from weather conditions, but also from dust and harsh working environment.

The MD4 dryer is also available with PermaPure's Nafion tube (instead of the Peltier element) – this version of the dryer is highly recommended for measuring gases that are highly soluble in water, e.g. HCL.



- MC+ pre-cooler

If the gas to be measured is very humid, it may be necessary to reduce its energy (dehumidify) before the proper drying with the MD3 / MD4 gas dryer.

MC+ is a SS316 water trap combined with a large area aluminium radiator to reduce the gas temperature. The radiator is supported by the fan to further reduce the gas temperature. A peristaltic pump removes any water that condensed during the process.

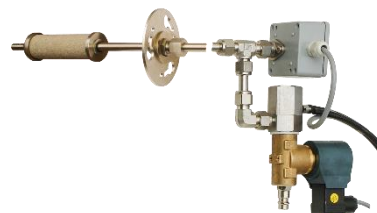


OPTIONAL EQUIPMENT

- Stationary gas probe

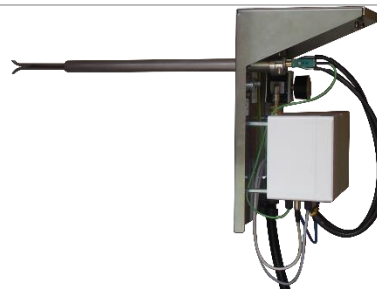
Gas probe specially designed for stationary use. The probe is available in different lengths and is fitted with a suitable holder (different types are available). It can also be fitted with and optionally:

- Thermocouple to measure gas temperature.
- Sintered stainless steel filter (cleanable) – particularly recommended when dealing with high concentrations of dust and soot.
- "Blow-back" cleaning option - valve that allows switching between the measured gas and the compressed air inlet used to clean the sintered filter.



- Stationary pitot tube

S-type pitot tube equipped with ANSI flange mounting and stainless steel housing for accessories. The ingenious valve system allows the stationary pitot tube to be cleaned with the compressed air, extending maintenance intervals.



- Heated filter

The heated filter is installed immediately after the gas probe. It is best used in conjunction with the heated hose to prevent vapour from condensation.



- GF4 scrubber

2x water bubblers, 1x coalescing filter, 1x container with the activated carbon. This filter has been designed for harsh conditions such as syngas, where tar, oily mists and high levels of dust need to be removed before the sample can be further conditioned.



- Gas multiplexer

The maPlex gas multiplexer increases the number of sampling points per one analyser. One multiplexer can support up to 4 channels and it is possible to link up to two multiplexers (8 channels in total).

The multiplexer is available in two versions:

- Standard (clean gas) version with the solenoid valves
- Dirty gas version – with SS316 heated ball valves with planetary gear actuators.



- Gas-electric connections

Umbilical cables are used for gas transport and electrical connection (power supply and communication between the analyser and its peripherals).

There are several options to choose from:

- Cold line: PE / PTFE gas pipe + electric cable, both inserted in the flexible conduit
- Self-regulating heated line (35W/m) heats up the gas max. 60°C
- Heated line (100W/m) that heats the gas up to 180°C



EXAMPLE PRINT SCREENS FROM THE PC PROGRAM

ANALYSER WORKING MODES:

Work mode

Duration of cycle's phases hh:mm:ss

Full cycle time 03:00:00

Phase: 'Ventilation' 00:15:00

Phase: 'Infusion' 00:01:00

Phase: 'First zeroing' 00:02:00

Phase: 'Measurement' 01:00:00

Phase: 'Warm-up' 00:00:10

Ends in

Work mode

Flip-flop for Twin/Multi channel configuration

Description of the chosen mode

00:00:00 Time of the first zeroing

Infinity The number of repetitions

Available only for Twin-Split configuration. Similar to the Cyclic mode but ventilation occurs every N-measurements (depending on the set times). Ventilation > Measurement A > Measurement B > Measurement A > Measurement B > ... > Ventilation.

Input IN1

Input IN2

No action

Restart a cycle with "Ventilation" phase

Restart a cycle with "Measurements" phase

Terminate measurements and go to "Standby"

Go to the next sampling point

The analyser restarts measurement cycle, starting with "Ventilation" phase

Stand-by Warm-up Ventilation

Preview Save Default Restart measurement cycle - force starting

ANALOGUE OUTPUTS SETTINGS:

Analogue outputs' settings

Checking inactive

Switch Checking1

$I = f(x)$

AUX channel

Legend

0,00 % x = O2 10,00 %

Start output test (5V or 10mA)

U1	I1	U2	I2	U3	I3	U4	I4
0+10V x = O2	4.20mA x = O2	0+10V x = CO2	4.20mA x = CH4	0+10V x = Tamb	4.20mA x = ---	0+10V x = ---	4.20mA x = ---
x max: 10,00	x max: 10,00	x max: 5,00	x max: 1000	x max: 100,0	x max: 1000	x max: 1000	x max: 1000
x min: 0,00%	x min: 0,00%	x min: 0,00%	x min: 0ppm	x min: 0,0°C	x min: 0	x min: 0	x min: 0

Analogue output connectors' layout

1 2 3 4 5 6 7 8 9 10

PWM Relay Relay +12V IN 1 U1 U2 U3 U4 GND

1 2 3 4 5 6 7 8 9 10

GND GND GND VCC IN 2 I1 I2 I3 I4 GND

+

-

RESULTS PREVIEW WITH STORAGE TO CSV:

madur Software, v. 14.8.0 - [Results]

File Settings Results Memory card Status Work mode Analogue outputs Relays 1-point calibration Service Debug About...

Currently connected device: 1, MaMos III, 20.3.0

Set electrical minimum

Set electrical maximum

During 'Ventilation' phase

Trigger readouts with input: In1 In2

Storage interval [s]: 1

When measurement error

Set electrical minimum

Set electrical maximum

Set electrical maximum

Outputs activity (for Twin/Multi channel configuration)

Trigger readouts with input: In1 In2

Storage interval [s]: 1

The outputs 2 & 4 are active during even cycles and keep the last value during odd cycles. The outputs 1 & 3 inversely.

The outputs 2 & 4 are active during even cycles and keep the last value during odd cycles. The outputs 1 & 3 inversely.

The outputs 2 & 4 are active during even cycles and keep the last value during odd cycles. The outputs 1 & 3 inversely.

Save settings in the analyser

Close

L.p.	Data	1: PumpFlow [l/h]	2: Tint [°C]	3: CO2 [%]
47	13.11.2024 12:58:48	169,9	23,89	0,00
46	13.11.2024 12:58:47	169,9	23,89	0,00
45	13.11.2024 12:58:46	169,9	23,89	0,00
44	13.11.2024 12:58:45	169,9	23,89	0,00
43	13.11.2024 12:58:44	169,9	23,89	0,00
42	13.11.2024 12:58:43	169,9	23,89	0,00
41	13.11.2024 12:58:42	169,9	23,89	0,00
40	13.11.2024 12:58:41	169,9	23,89	0,00
39	13.11.2024 12:58:40	169,9	23,89	0,00
38	13.11.2024 12:58:39	169,9	23,89	0,00
37	13.11.2024 12:58:17	169,9	23,89	0,00
36	13.11.2024 12:58:16	169,9	23,89	0,00
35	13.11.2024 12:58:06	169,9	23,89	0,00
34	13.11.2024 12:58:05	169,9	23,89	0,00
33	13.11.2024 12:58:04	169,9	23,89	0,00
32	13.11.2024 12:58:03	169,9	23,89	0,00

1: 169,9 PumpFlow [l/h]

2: 23,89 Tint [°C]

3: 0,00 CO2 [%]

4: 1004,3 PressAbs [hPa]

5: ---

6: 23,88

7: ---

8: ---

9: ---

10: ---

Online...

COM: 17 @115200,N,8,1

MaMos III, 20.3.0 - RS485 #1 (16)

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