

# GA-12<sup>plus</sup>

madur hand-held gas analyser



## CHARACTERISTICS

## FEATURES

## TECHNICAL DATA

## SENSORS

## EQUIPMENT

## APPEARANCE

The GA-12<sup>plus</sup> is the smallest, handheld gas analyser in madur's portfolio.

The instrument is powered by a single 18650 Li-Ion battery cell, and it can be equipped with up to 4 electrochemical sensors.

Suitable for perform soot testing using a heated probe holder and electronically controlled gas pump.

Offers a wide range of gas probes and other accessories.

The GA-12<sup>plus</sup> is an attractive alternative to other larger analysers. Manufactured according to the principles of EN 50379 and EN 50270 standards.

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- Equipped with 3 or 4 electrochemical cells (typical configuration: O<sub>2</sub>, CO, NO, SO<sub>2</sub>).
- Operates with an optional external portable printer via IR-LED wireless communication.
- Built-in, rechargeable Li-Ion battery (1 cell 18650) for up to 16 hours of operation.
- Results are displayed on a 128x64 backlit LCD display.
- Built-in memory to store results.
- Supplied with a standard gas probe holder (M30x1 fitting) which fits all types of madur's K-type thermocouple gas probes.
- The heated version of the probe holder (optional) allows soot tests to be carried out.
- Has a built-in pressure sensor for chimney draft measurement and continuous gas flow control (pump check).
- The second (optional) differential pressure sensor allows measurement of chimney draft and gas flow velocity (using the pitot tube).
- Optional RH and temperature sensor.
- Measurement of gas and ambient temperature.
- Calculation of many combustion parameters such as stack loss, efficiency, etc.
- Gas filter with condensate trap & replaceable insert
- Optional Bluetooth communication with Windows
- Firmware for gas calibration



CHARACTERISTICS	FEATURES	TECHNICAL DATA	SENSORS	EQUIPMENT	APPEARANCE
<b>GA-12<sup>plus</sup> GAS ANALYSER</b>		<b>VERSION A</b>	<b>VERSION B</b>		
		single pressure sensor	with the 2 <sup>nd</sup> differential pressure sensor		
Dimensions (W * H * D)		243mm x 130mm x 60mm			
Dimensions with gas connectors (W * H * D)		257mm x 130mm x 60mm	271mm x 130mm x 60mm		
Weight with 4-sensors (without accessories)		615 g	635g		
Casing material		ABS case, rubber protective boot (optional)			
Operating conditions		T: 10°C ÷ 50°C, RH: 5% ÷ 90% (non-condensing)			
Storing temperature		-20°C ÷ +55°C			
Power supply		Mains power supply: input 80÷264VAC; output: 18VDC, 2A; P1J 5,5/2,1			
Maximal power consumption		20 W			
Standard battery: type   work time   charging time		1-cell Li-Ion 3,6V (LG MH1) / 3,2 Ah   20h   7h (0→100%)			
Data memory		64 measurement reports			
Display		Graphical LCD 128 * 64 with variable contrast and backlighting			
Printer		External thermal IR printer MCP 8850 with charger			
Paper size		58mm paper			
Gas pump		Diaphragm, Brushless motor, min 0,5 l/min (with automatic flow control)			
Wired communication interface		USB-RS232 adapter: with PC Windows			
Wireless communication (optional)		Bluetooth dongle: with Windows PC			
Gas filter with condensate trap		Inline filter installed on a probe holder with condensate trap			
Filter insert: grade   inside diameter   length		20µm   12mm   32mm			
<b>MEASUREMENTS: ENVIRONMENT SENSORS AND CALCULATIONS</b>					
Variable	Method	Range	Resolution	Accuracy	T <sub>90</sub> time
T <sub>gas</sub> – gas temperature	K-type thermocouple	-10°C ÷ 1000°C	0,1°C	±2°C	10 sec
T <sub>amb</sub> – 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
RH – relative humidity (special probe needed)	SHT11 capacitive polymer sensor	5÷95%	1%	±5% abs.	30 sec

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METHOD		RANGE	RESOLUTION	ACCURACY	T <sub>90</sub> TIME	CONFORMITY
<b>O<sub>2</sub> - OXYGEN</b>						
Electrochemical		20,95%	0,01%	± 0,2% abs. or 5% rel.	45 sec	EN 50379; CTM-030
Electrochemical		25%	0,01%	± 0,2% abs. or 5% rel.	45 sec	EN 50379; CTM-030
<b>CO – CARBON MONOXIDE</b>						
Electrochemical		2 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379; CTM-030
Electrochemical		4 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379; CTM-030
Electrochemical		20 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379; CTM-030
Electrochemical		10%	0,001%	± 0,005% abs. or 5% rel.	45 sec	EN 50379; CTM-030
Electrochemical with H <sub>2</sub> compensation		4 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	45 sec	EN 50379; CTM-030
<b>NO – NITRIC OXIDE</b>						
Electrochemical		500 ppm	0,1ppm	± 2 ppm abs. or 5% rel.	45 sec	EN 50379; CTM-022
Electrochemical		2 000 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
<b>NO<sub>2</sub> – NITROGEN DIOXIDE</b>						
Electrochemical		200 ppm	0,1ppm	± 2 ppm abs. or 5% rel.	60 sec	EN 50379; CTM-022
Electrochemical		1 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	60 sec	EN 50379; CTM-022
<b>SO<sub>2</sub> – SULPHUR DIOXIDE</b>						
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
<b>H<sub>2</sub>S – HYDROGEN SULPHIDE</b>						
Electrochemical		1 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
Electrochemical		2 000 ppm	1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
<b>H<sub>2</sub> – HYDROGEN</b>						
Electrochemical		1 000 ppm	1 ppm	± 10 ppm abs. or 5% rel.	50 sec	
Electrochemical		2 000 ppm	1 ppm	± 10 ppm abs. or 5% rel.	50 sec	
<b>NH<sub>3</sub> – ANHYDROUS AMMONIA (MEASUREMENT OF DRY OR NON-CONDENSING GAS ONLY)</b>						
Electrochemical		1 000 ppm	2 ppm	± 10 ppm abs. or 5% rel.	50 sec	

## STANDARD EQUIPMENT

### SUPPLIED WITH THE DEVICE

- Carrying case for the analyser and accessories
- Power supply (charger) for the built-in Li-Ion battery with plug type (EU, US, UK, AU, BR)
- Single condensate trap with a fine filter (5µm mean pore size)
- 2,5m USB-RS232 adapter – connecting cable between the analyser and the PC computer

## ADDITIONAL EQUIPMENT

### NECESSARY FOR THE ANALYSER TO WORK

- Probe holder  
Together with an interchangeable gas probe pipe, the holder is a complete gas probe for gas sampling. It has a single gas tube and an electrical cable terminated with a 4-pin connector. The gas probe pipe is fixed with an M30x1 nut. Inside the electrical connector there is a PT500 ambient temperature sensor. The probe holder is equipped with an in-line filter with condensate trap (pore size of the filter inlet is 20µm).

The probe holder is available in two versions:

- unheated (standard probe holder without the possibility to perform the soot test),
- heated (with a slot for a soot test filter).



- Gas probe pipe  
The gas probe is immersed in the gas duct and is used to extract the gas sample and measure its temperature. Replaceable probes are easily connected to probe holders (with M30x1 nut). They have a K-type thermocouple to measure gas temperature and a threaded fixing cone. Together with the probe holder it is a complete gas probe.

A wide range of probe pipes are available. They vary in length and operating temperature. It is advisable to have probe pipes, to be able to adapt to the measurement location.

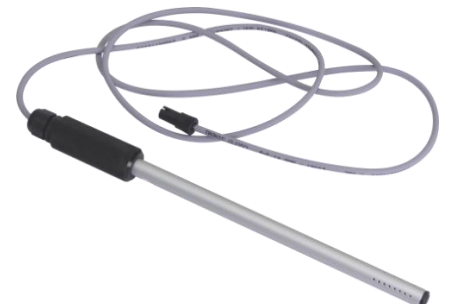


## OPTIONAL EQUIPMENT & SPARE PARTS

- Portable printer and print paper  
Portable printer (battery operated) communicates with the analyser via the wireless HP-IR interface. Allows immediate printing of results on 58mm thermal paper. The printer is supplied together with 4 Ni-MH rechargeable batteries and a single roll of paper. The mains adapter for the charger can be ordered in the AU/EU/UK/US versions.



- RH and ambient temperature probe  
Probe for the RH and ambient temperature measurements. The maximum operating temperature for this probe is 120°C, therefore it is not suitable for the in-stack measurements.



## OTHER OPTIONAL EQUIPMENT

- Boiler inlet air temperature sensor**

The ambient air temperature (or rather the temperature of the air entering the boiler) is a parameter used to calculate many combustion parameters. This PT500 temperature sensor on a 3m cable is used to measure this temperature and must be connected to the Temp. Amb. socket. If the sensor is not connected, the analyser will assume that the boiler air inlet temperature is equal to the temperature measured by the NTC2k7 sensor (installed in the connector of the gas probe holder).



- Magnetic bracket or anchor cone for PT500 sensor**

Allows the boiler inlet air temperature sensor to be mounted close to the actual boiler inlet.



- Pitot tube**

A pitot tube is an accessory used to measure the flow velocity of a gas stream. The measurement is indirect – the pitot tube is connected to the analyser's differential pressure sensor. The analyser then recalculates the differential pressure at the pitot tube outlets to determine the velocity of the gas stream. A variety of tube lengths are available. The pitot tube is supplied with 2m of gas tubing for connection to the analyser.



- Bluetooth Dongle**

Module connected to the RS232C port of the analyser, allowing communication with a PC using the Bluetooth protocol.



- Leatherette case**

Soft leatherette case (for analyser only) to protect the analyser during transport.



- Rubber Protector**

Special rubber protector for the analyser housing. Protects the analyser from knocks. Shoulder strap for easy carrying of the analyser.



- Pressure Kit**

The pressure kit allows leak testing of pneumatic/gas installations. Requires a differential pressure sensor to operate.





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## FRONT PANEL

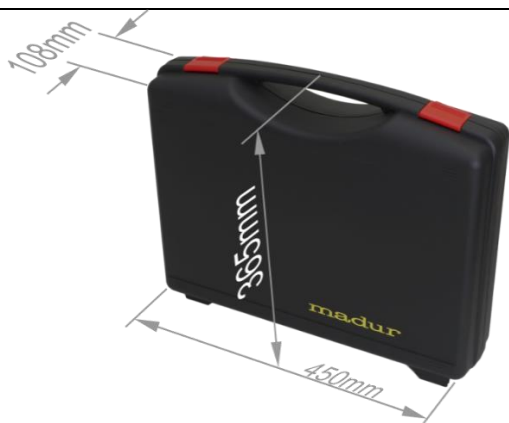
VERSION WITH A SINGLE PRESSURE SENSOR

## VERSION WITH THE ADDITIONAL

DIFFERENTIAL PRESSURE SENSOR



## ANALYSER CARRYING CASE



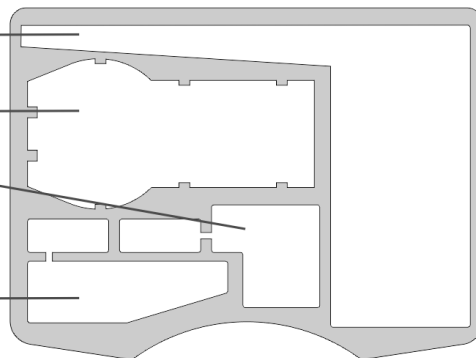
## FOAM INSERT FOR ANALYSER AND ACCESSORIES

GAS PROBE & PROBE HOLDER

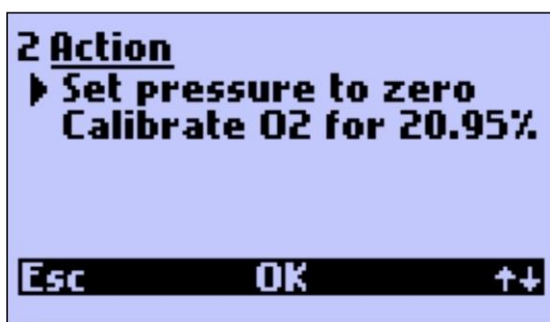
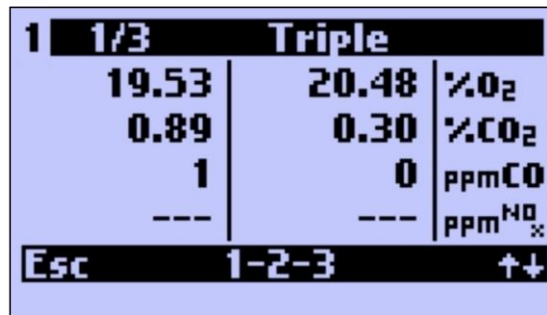
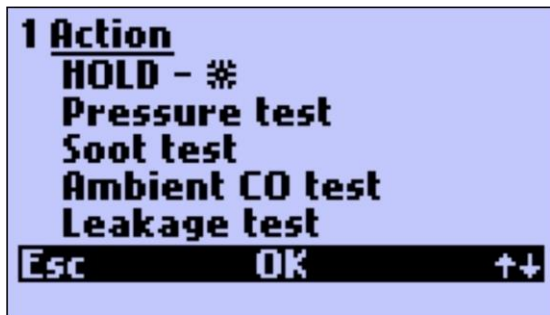
GA-12 PLUS ANALYSER

MAINS CHARGER & USB-RS232 cable

PRINTER



EXAMPLE PRINT SCREENS FROM THE ANALYSER'S SCREEN



EXAMPLE PRINT SCREEN FROM THE PC PROGRAM

