www.madur.com

GA-40 T plus

madur portable gas analyser

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

Professional flue gas analyser that combines high quality of sample conditioning with great measurement accuracy. The device is contained in a compact soft casing.
Analyser is equipped with heated hose with heated filter and a built-in highly efficient condensation dryer.
It can be fitted with up to 9 sensors (electrochemical cells and NDIR sensors).
It has built-in pressure sensor, large internal memory for results and built-in ribbon printer for standard (non-thermal) paper. The device meets standards of EN 50379.

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- Equipped with up to 7 electrochemical cells
- Equipped with up to 2 NDIR sensors
- Built-in 58mm ribbon, graphic printer
- Built-in rechargeable battery for up to 8 hours of operation (heated hose and gas dryer require AC power)
- Built-in Peltier dryer with peristaltic pump for condensate removal
- Equipped with heated hose with built-in heated gas filter
- Heated hose with standard M30x1 fitting, fits all madur gas probes with K-type thermocouples
- Additional gas filter with condensate trap
- Differential pressure sensor - for measurements of chimney draft and flow velocity (with help of Pitot tube)
- Soot measurement programme
- Measurements of gas and ambient temperatures, optionally 2 additional inputs for temperature sensors
- Analogue outputs (4-20mA / 0-10V) - optional
- Built-in large memory for results, two formats of data savings
- Calculations of many combustion parameters
- Calibration of electrochemical sensors allowed to user

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Dimensions (W * H * D)	470 mm * 310 mm * 160 mm
Weight (without accessories)	12,0 ÷ 12,8kg
Casing material	Aluminium padded with foam and fabric (polyester)
Operating conditions	T: 10°C ÷ 50°C, RH: 5% ÷ 90% (non-condensing)
Storing temperature	0°C ÷ 55°C
Power supply: input | maximal power consumption	115 VAC or 230 VAC | 90 W (without heated hose)
Battery: type |work time | charging time	Lead-acid, rechargeable 12V / 2,2Ah | 7h | 14h
Data memory: size | number of results	32kB | 30 reports + 10 banks (1024 sets of data)
Display	Graphical LCD 128 * 128, with variable contrast and backlighting
Printer	High-speed dot matrix, graphic printer for 57 mm normal paper
Analogue outputs (optional)	Two current (0/4 ÷ 20mA) or voltage (0 ÷ 10V) outputs
Gas pump | gas flow	Diaphragm, max 2l/min (with automatic flow control) | 90l/h (1,5l/min)
Purging pomp for CO sensor	Diaphragm, max 1,5l/min
Communication interface with PC computer	RS-232C
Gas filtering	1. Heated filter included in the heated hose 2. Built-in final filter (behind the gas dryer) with replaceable insert

BUILT-IN GAS DRYER, HEATED HOSE DRIVER, HEATED HOSE

Drying method	Water condensation by rapid cooling down
Cooler type	Based on Peltier element
Cooler temperature	+5°C electronically stabilised
Cooler temperature hysteresis	~ 1°C
Maximum gas flow for efficient drying	100 l/h
Condensate pump	Peristaltic, 38 ml/min
Heated hose temperature	+120°C electronically stabilised
Heated hose temperature hysteresis	~ 5°C
Heated hose length	3m (optionally 5m or 10m)
Heated hose power consumption	360W (max)
Heated hose thermocouple wires	K-type (S-type optionally)

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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
T_1 & T_3 – external temperatures	K-type thermocouple	-10 ÷ 1000°C | 0,1°C	± 2°C	10 sec
T_1 & T_3 – external temperatures	S-type thermocouple	-10 ÷ 1500°C | 0,1°C	± 2°C	10 sec
T_2 & T_4– external temperatures	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% rel.	10 sec
qA - stack loss	Calculated	0 ÷ 100% | 0,1%	± 5% rel.	10 sec
Eta - η combustion efficiency	Calculated	0 ÷ 120% | 0,1%	± 5% rel.	10 sec
U_1 & U_2 – analogue inputs (voltage)	Delta-sigma ADC	-20V ÷ +20V | 0,01V	± 2% rel.	10 sec
I_1 & I_2 – analogue inputs (current)	Delta-sigma ADC	-20mA ÷ +20mA | 0,01mA	± 2% rel.	10 sec

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Method	Range | Resolution	Accuracy	Time (T_{90})	Conformity
O_2 - OXYGEN				
Electrochemical	20,95% | 0,01%	± 0,01% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	20,95% | 0,01%	± 0,01% abs. or 5% rel.	45 sec	ISO 12039; CTM-030
Electrochemical, partial pressure	25,00% | 0,01%	± 0,01% 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
Electrochemical	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
Electrochem., with H_2 compensation	2 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	45 sec	ISO 12039; CTM-030
NDIR	10% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	EN 15058
NDIR	100% | 0,1%	± 0,5% abs. Or 5% rel.	45 sec	EN 15058
CO_2 - CARBON DIOXIDE				
NDIR	25% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039
NDIR	50% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	ISO 12039
NDIR	100% | 0,1%	± 0,5% abs. or 5% rel.	45 sec	ISO 12039
CH_4 – METHANE				
NDIR	5% | 0,01%	± 0,05% abs. or 5% rel.	45 sec	
NDIR	25% | 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				
Electrochemica	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
NO_2 - NITROGEN DIOXIDE				
Electrochemical	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	60 sec	EN 50379, CTM-022
SO_2 - 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
H_2S- HYDROGEN SULFIDE				
Electrochemical	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	70 sec	

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Method	Range | Resolution	Accuracy	Time (T_{90})	Conformity
H_2 - HYDROGEN				
Electrochemical sensor	2 000 ppm | 1 ppm	± 10 ppm abs. or 5% rel.	50 sec	
Electrochemical sensor	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	
CL_2 - CHLORINE				
Electrochemical	250 ppm/ 1 ppm	± 5 ppm abs. or 5% rel.	60 sec	
HCl - NITRUS OXIDE				
Electrochemical	100 ppm/ 1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
N_2O - NITRUS OXIDE				
NDIR	2 000 ppm/ 1 ppm	± 10 ppm abs. or 5% rel.	45 sec	ISO 21258
VOC - VOLATILE ORGANIC COMPOUNDS				
PIT - Photo Ionization Detector	100 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	120 sec	METHOD 21
PIT - Photo Ionization Detector	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	120 sec	METHOD 21

STANDARD EQUIPMENT

SUPPLIED ALONG WITH THE DEVICE

- 3m mains cable (type of plug to be selected)
- Heated hose of selected length and supply voltage with heated filter and carrying bag
- Single gas filter with condensation trap and filter insert (pore size 5µm)
- Condensation container
- 2,5m RS-232C communication cable with DB9 female connector
- Software CD with programmes and manuals
- Quick coupler for the pressure sensor fittings (2pc.)

ADDITIONAL EQUIPMENT

NECESSARY FOR THE ANALYSER TO WORK

- **Heated hose**

  Heated hose with heated gas filter supplies gas sample to the the analyser's conditioning module.
  Hose has M30x1 threaded connection to fix gas probe pipe. The other end has magnetic quick coupler and electric connector to connect it to the analyser.
  Standard length of the hose is 3m, it is possible to order other lengths of hoses.
  The hose is provided with a carrying bag.

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- Gas probe pipe

Gas probe is immersed in the gas duct and is supposed to extract the gas sample and to measure its temperature.
Exchangeable probes are easily connected to probe holders (with M30x1 fastening) and to heated hoses. They have a threaded fixing cone and a thermocouple type K (in some configurations type S) for measurement of gas temperature.
There are many probe pipes available. They differ in length and working temperature.
For work efficiency it is advised to own different probe pipes to be able to adjust to the measurement place.

OPTIONAL EQUIPMENT & SPARE PARTS

- Ambient temperature sensor

This ambient temperature sensor on a 3m cable is used for measurement of the boiler's inlet air. In basic configuration the ambient temperature is measured by sensor installed in the connector of the gas probe handle.

ordering code:
Z40P-SENS-TEMP

- Pitot tube

Pitot tube is an accessory that allows to perform measurement of the flow velocity of the gas stream. The measurement is performed indirectly – Pitot tube is connected to analyser's differential pressure sensor. Analyser recalculates the differential pressure on the Pitot tube's outlets to velocity.
A few lengths of tubes are available. Pitot tube has 2m gas tubings to connect it to the analyser.

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

- RS232C to USB converter

2.5m cable that allows to connect the analyser (its RS232C port) with USB port in PC computer (especially valuable when PC is not equipped with COM port).

ordering code:
Z40P-USB-ADAP

- Bluetooth communication module

Module connected to the analyser's RS232C port, allows to communicate with PC computer over Bluetooth protocol.

ordering code:
Z40P-BLUE-TOOTH

- Soot test adapter

Soot test adapter is installed in place of the standard lid.
Adapter allows to perform soot test according to Bacharach method.

ordering code:
Z40T-HOSE-NAKR02

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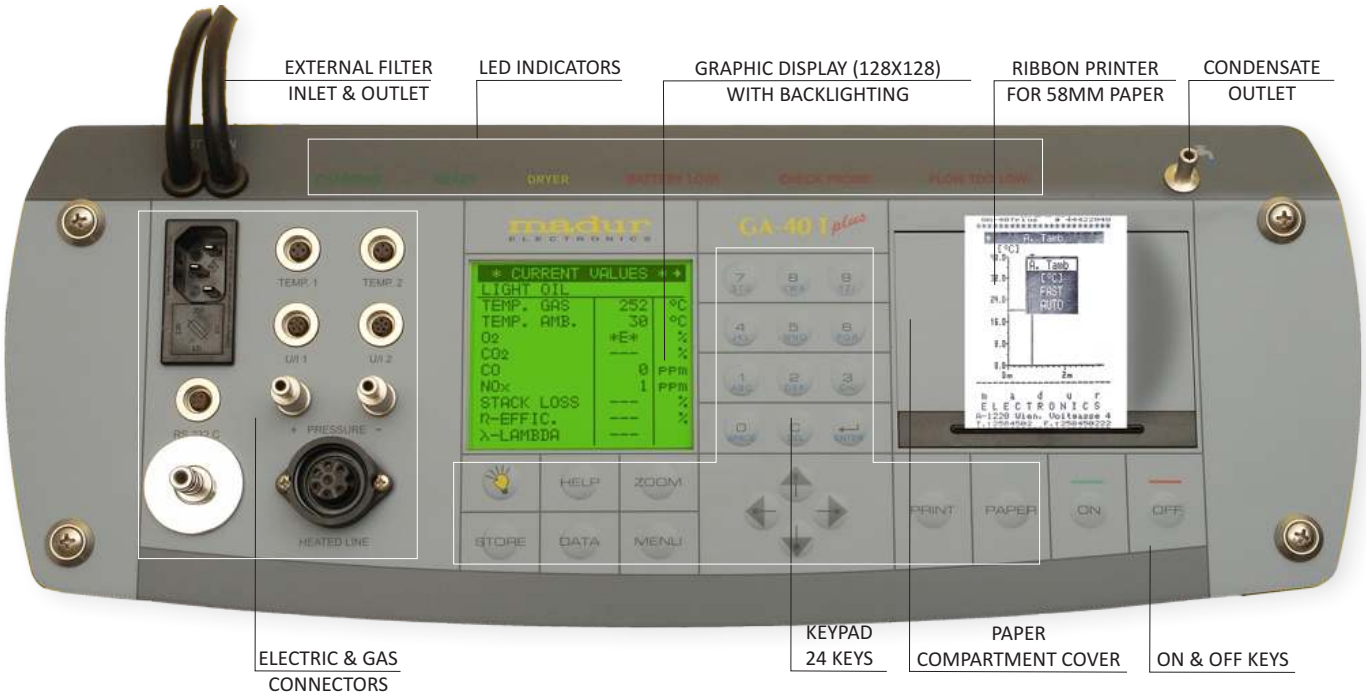
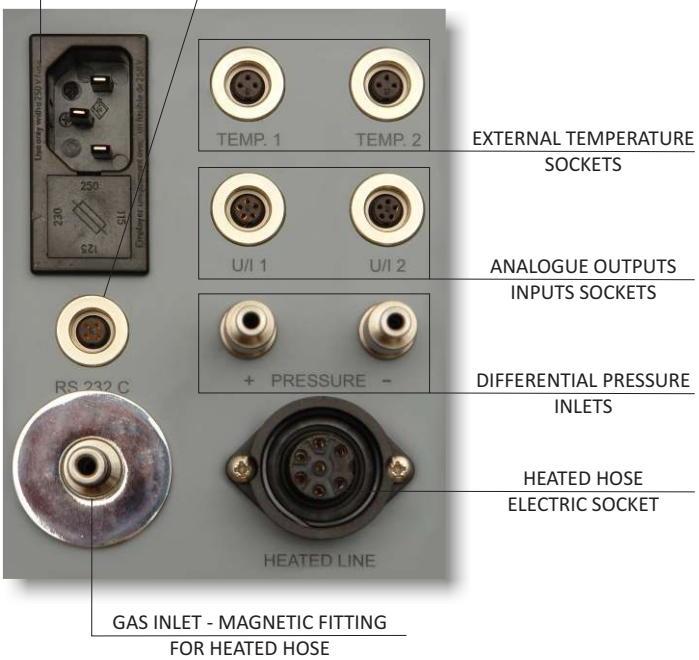
FRONT PANEL



GAS AND ELECTRIC CONNECTORS



ANALYSER'S AND ACCESSORIES BAGS

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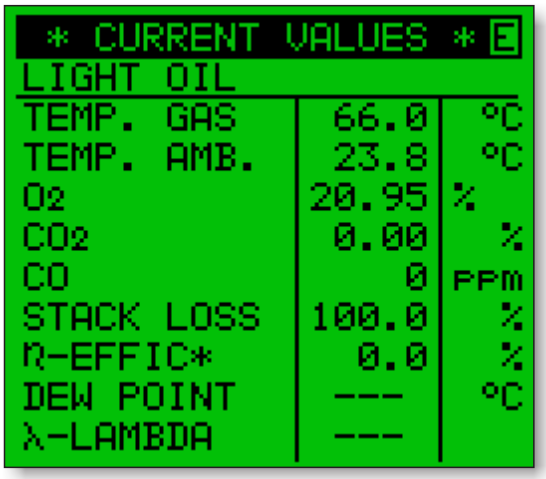
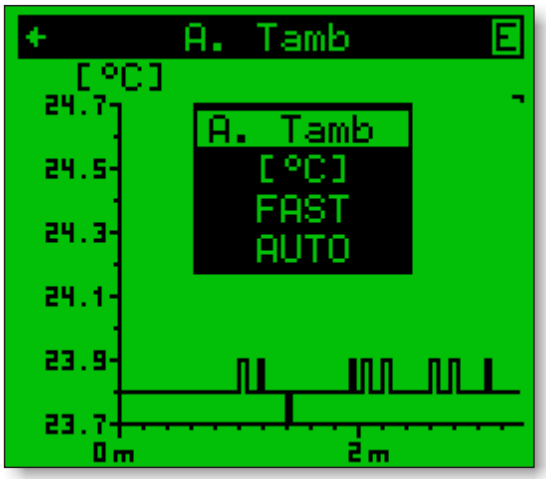
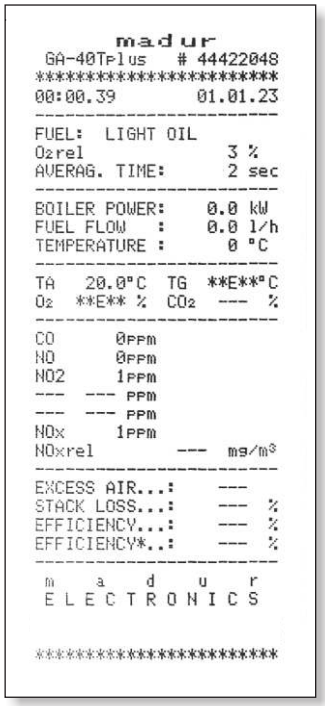
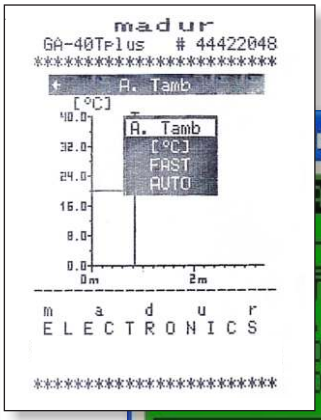
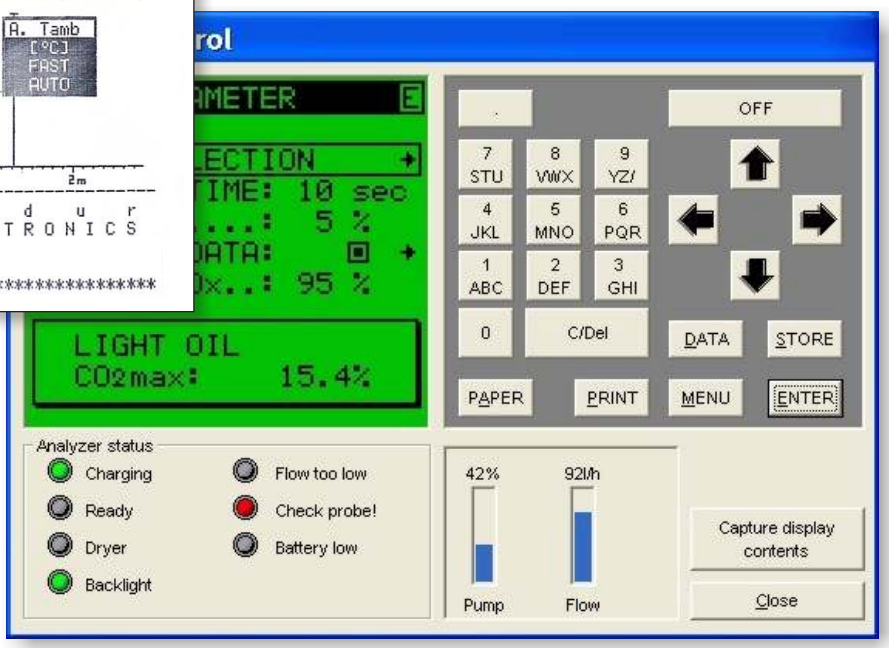
LED INDICATORS

CHARGING | READY | DRYER | BATTERY LOW | CHECK PROBE | FLOW TOO LOW!

EXAMPLE PRINTSCREEN





EXAMPLE PRINTOUTS

EXAMPLE SCREENSHOT FROM THE PC PROGRAMME