Photon

madur portable gas analyser

www.madur.com

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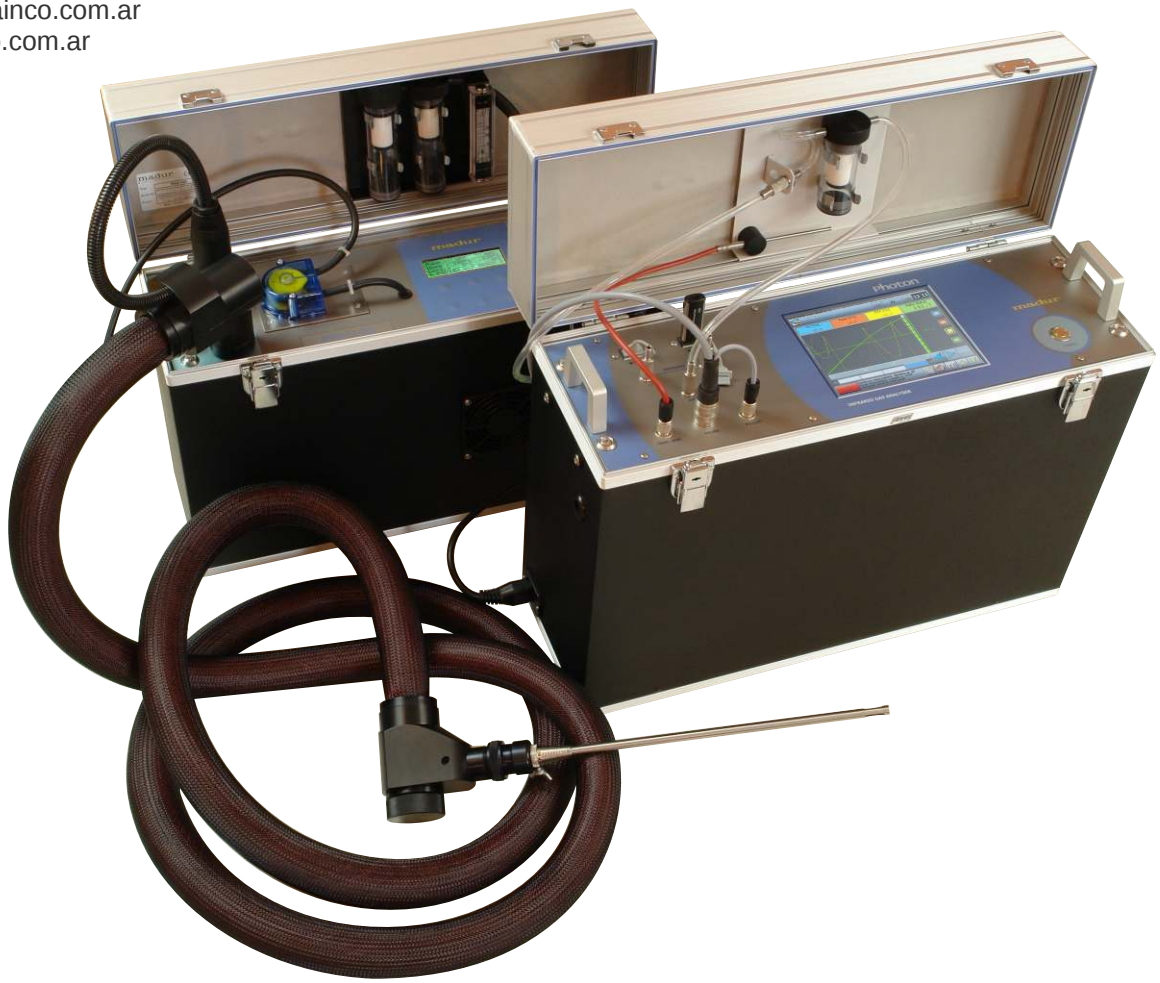

CHARACTERISTIC | FEATURES | TECHNICAL DATA | SENSORS | EQUIPMENT | APPEARANCE

Photon is a portable analyser using the most current technological developments. It is designed to use mostly infrared sensors, but can also be fitted with further electrochemical sensors.
The modular construction allows the instrument to be configured to suit practically any user needs.
In addition to this, it is possible to set the range of each sensor as required for the measuring system.
The analyser also has a plenty of analogue inputs and outputs to ensure ease of data transfer in both directions and documentation of all results.
The analyser can thus also be used for various control operations.

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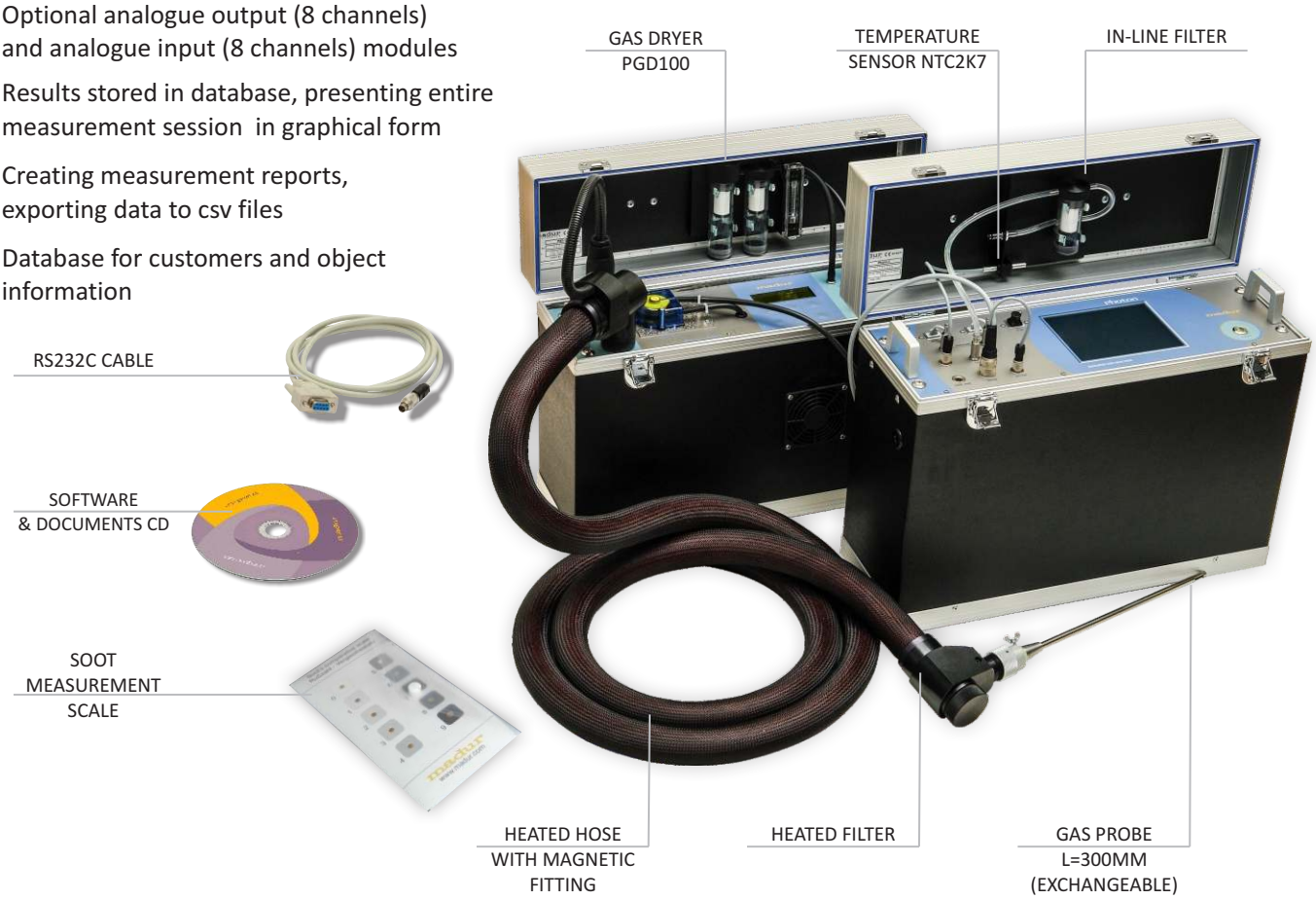
- Double thermal stabilization (of entire casing and of each NDIR sensor separately)
  - Thermal stabilization the accuracy of up to 0.01°C
  - Reduced short warm-up time (30 min ÷ 60 min)
  - Improved accuracy of the NDIR sensors
- Up to 6 NDIR sensors, up to 3 electrochemical cells
- **NEW Thermal Conductivity Detector (TCD) for H_2**
  NEW Photoionization Detector (PID) for VOC (Volatile Organic Compound)
- Work with PGD-100 gas conditioner
- 6,4", high-resolution - VGA (640 * 480) colorful touch screen
- PC-104 industrial class computer with Windows CE
- Algorithms controlling analyser's work (warming up, compensation of cross-sensitivity values, response time)
- Measurement of temperatures (ambient, gas), pressures (atmospheric, differential), flow velocity (with help of Pitot tube), through-device flow control
- Calculating combustion parameters, like: stack loss, combustion efficiency, excess air coefficient, dew point temperature
- Communication with PC computer via RS232C and Ethernet interface
- 2x USB port for connecting peripherals (mice, keyboards) and Photon add-ons (analogue outputs / inputs)
- Optional portable printer
- Optional analogue output (8 channels) and analogue input (8 channels) modules
- Results stored in database, presenting entire measurement session in graphical form
- Creating measurement reports, exporting data to csv files
- Database for customers and object information



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Dimensions (W * H * D)	500 mm * 395 mm * 173 mm
Weight	14 kg ÷ 18 kg
Casing material	Plywood covered with aluminium
Operating conditions	T: 10°C÷50°C RH: 5%÷90% (non-condensing)
Storing temperature	-20°C ÷ +55°C
Power supply input	115 or 230 VAC
Maximal power consumption	150 W
Operating system	Windows CE 5.0
Display	6,4" VGA (640 * 480)
Data storage: type | capacity	Compact Flash card | max. 4 GB
Interface for external devices (USB disk, mouse, keyboard)	2 x USB
Communication interface with PC	RS-232C, RJ45 (Ethernet)
Warming-up time	90 min maximum
Warming-up temperature	About 18°C above ambient temperature
Maximum outside temperature drift (not affecting warm-up temperature)	±5°C

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
IL - incomplete combustion	Calculated	0 ÷ 100%| 0,1%	± 5°C	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
Paramagnetic	25,00% | 0,01%	± 0,01% abs. or 5% rel.	45 sec	EN 14789; OTM-13
Paramagnetic	100,00% | 0,1%	± 0,1% abs. or 5% rel.	45 sec	EN 14789; OTM-13
CO - CARBON MONOXIDE				
NDIR	20 000 ppm | 1 ppm	± 3 ppm abs. or 3% rel.	45 sec	EN 15058; METHOD 10
NDIR	10% | 0,01%	± 0,03% abs. or 3% rel.	45 sec	EN 15058; METHOD 10
NDIR	100% | 0,1%	± 0,3% abs. or 3% rel.	45 sec	EN 15058; METHOD 10
CO_2 - CARBON DIOXIDE				
NDIR	5% | 0,01%	± 0,03% abs. or 3% rel.	45 sec	ISO 12039; OTM-13
NDIR	25% | 0,01%	± 0,03% abs. or 3% rel.	45 sec	ISO 12039; OTM-13
NDIR	100% | 0,1%	± 0,3% abs. or 3% rel.	45 sec	ISO 12039; OTM-13
CH_4 – METHANE				
NDIR	5% | 0,01%	± 0,03% abs. or 3% rel.	45 sec	
NDIR	25% | 0,01%	± 0,03% abs. or 3% rel.	45 sec	
NDIR	100% | 0,1%	± 0,3% abs. or 3% rel.	45 sec	
NO - NITRIC OXIDE				
NDIR	1 000 ppm | 1 ppm	± 3 ppm abs. or 3% rel.	45 sec	ISO 10849; METHOD 7E
NDIR	5 000 ppm | 1 ppm	± 3 ppm abs. or 3% rel.	45 sec	ISO 10849; METHOD 7E
NO_2 - NITROGEN DIOXIDE				
NDIR	1 000 ppm | 1 ppm	± 3 ppm abs. or 3% rel.	45 sec	ISO 10849; METHOD 7E
Electrochemical	1 000 ppm | 1 ppm	± 5ppm abs. or 5% rel.	60 sec	CTM-022

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

Method	Range | Resolution	Accuracy	Time (T_{90})	Conformity
SO_2 - SULPHUR DIOXIDE				
NDIR	1 000 ppm | 1 ppm	± 3 ppm abs. or 3% rel.	45 sec	ISO 7935; METHOD 6C
NDIR	5 000 ppm | 1 ppm	± 3 ppm abs. or 3% rel.	45 sec	ISO 7935; METHOD 6C
H_2S- HYDROGEN SULPHIDE				
Electrochemical	1 000 ppm | 1 ppm	± 5 ppm abs. or 5% rel.	70 sec	
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	± 3 ppm abs. or 3% rel.	45 sec	ISO 21258
CHF_3 - FLUOROFORM (REFRIGERANT R23)				
NDIR	2,5% | 0,01%	± 0,03% abs. or 3% rel.	45 sec	
VOC - VOLATILE ORGANIC COMPOUNDS				
PIT - Photoionization Detector	100 ppm | 1 ppm	± 5ppm abs. or 5% rel.	120 sec	METHOD 21
PIT - Photoionization Detector	1 000 ppm | 1 ppm	± 5ppm abs. or 5% rel.	120 sec	METHOD 21

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STANDARD EQUIPMENT

SUPPLIED ALONG WITH THE DEVICE

- 3m mains cable (with selectable plug type)
- Single gas filter with condensate trap and filter insert (pore size 5µm)
- 2.5m RS-232C communication cable with DB9 female connector
- Software CD with program and manuals
- Quick coupling for the probe holder (3pc)
- Ambient temperature sensor with 300mm cable

  This NTC2k7 temperature sensor with a 300mm cable is used for measuring the ambient air temperature. It helps to set the optimal target temperature for Photons thermal stabilization. The sensor is connected to the Temp. Aux socket (in some units the socket is without label). The head of NTC2k7 sensor is installed in analyser's lid. For calculations, where ambient temperature is required, Photon uses readings from PT500 3m sensor (boiler's inlet air temperature sensor). In case of absence of this PT500 sensor, readings from NTC2k7 are being used.

  ordering code:
  sensor NTC2k7 with 300mm long cable (grey) - ZPH2-SENS-NTC

- Photon — PGD-100 electric communication cable

  2.5m communication cable for connecting the PGD-100 gas dryer to the Photon analyser. Spare part for Photon - also available separately.

  ordering code:
  ZMPH-KAB-RS232

- Photon — PGD-100 gas hose connection

  2.5m long gas hose for connecting the PGD-100 gas dryer to the Photon analyser. Quick couplers on both ends. Spare part for Photon - also available separately.

  ordering code:
  Z10-GAS-CON-02

ADDITIONAL EQUIPMENT

NECESSARY FOR THE ANALYSER TO WORK

- PGD 100 gas conditioner

  PGD-100 is a powerful gas conditioner preparing gas sample for the co-operating analyser by removing dust, salts particles and condensate, so the sample is dry and clean.
  Using gas conditioner is essential in case of majority measurements with gas analysers.
  Photon communicates with, and controls PGD-100 dryer via 2.5m electric cable. Gas sample is delivered via 2.5m Tygon tube.

- Heated hose

  Heated hose with heated gas filter supplies gas sample to the analyser's conditioning module. Thanks to the heaters that coil the tube and thermal insulation of the hose, the gas in its inside is protected against uncontrolled water condensation. The hose has M30x1 threaded connection to fix gas probe pipe. The other end has magnetic quick-coupler and electric connector to connect it with analyser.
  Standard length of hose is 3m, it is possible to order other lengths of hoses.
  Hose is provided with a carrying bag and filter inlet (glass fibre 70 µm. pores).

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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 thermocouple type K (in some configurations type S) for measurement of gas temperature and a threaded fixing cone.
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

- Boiler's inlet air temperature sensor

Ambient air temperature (or rather boiler's intake air temperature) is a parameter used for calculation of many combustion parameters.This PT500 temperature sensor on a 3m cable is used for measurement of the aforesaid temperature. It is optional equipment. The sensor has to be connected to the Temp. Amb. socket. If this sensor is not connected Photon assumes the boiler's inlet air temperature to be equal to the temperature measured with the NTC2k7 sensor installed in the device's lid.

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 length of tubes are available. Pitot tube has 2m gas tubings to connect it with the analyser.

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

- Analogue outputs module

Optional module with 8 current and 8 voltage galvanically separated outputs. Installed into the device's lid. Connected to the USB Photon socket.

ordering code:
ZPH2-ANA-OUT

- Analogue inputs module

Optional module with 8 current and 8 voltage galvanically separated inputs. Installed into the device's lid. Connected to the USB socket of Photon.

ordering code:
ZPH2-ANA-IN

- Martel portable printer with USB cable

Photon can be equipped with portable printer - Martel MCP8810 with RS232C communication protocol (converted to USB port). Small, portable, battery operated printer. Must be connected to Photon USB socket.

ordering codes:
Martel MCP-8810, thermal printer with USB interface - MPH-PRINT1
USB cable for connecting the printer to analyser - ZPH2-PRINTER-USB-KAB

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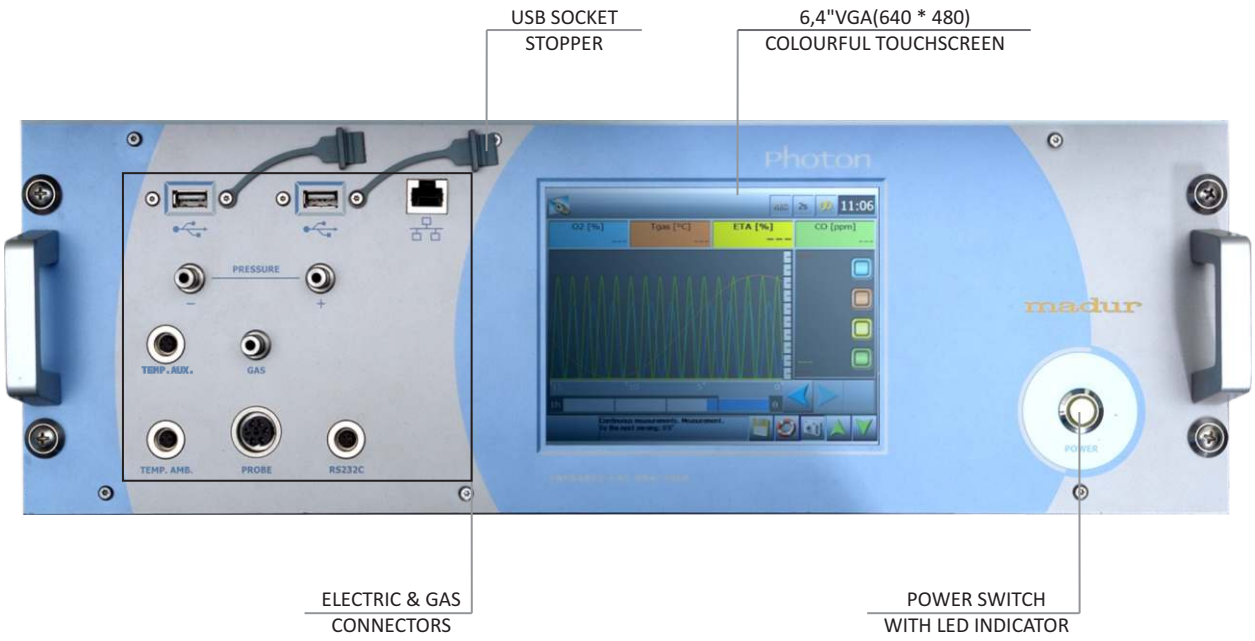
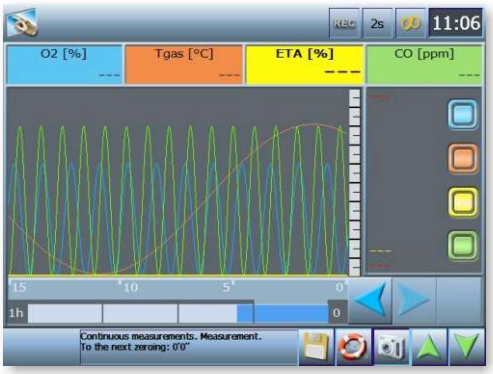
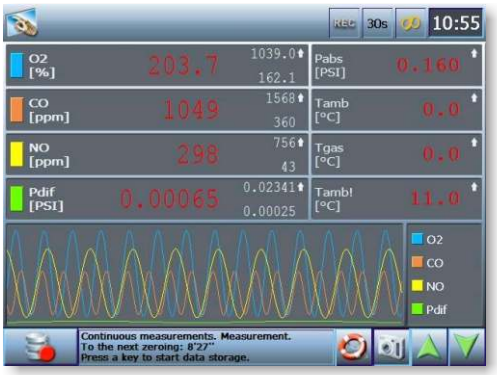
FRONT PANEL

WITH LCD AND SOCKETBOARD



EXAMPLE PRINTSCREENS

RESULTS GRAPH