

USER'S MANUAL

GAS ANALYZER SMOKE-METER EOBD



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 **CAUTION**

In order to avoid any trouble, please respect the following instructions before using the equipment:

- Use the equipment according to this manual instructions
- Do not use the equipment if the power cord or any of the accessories seem to be damaged or if the equipment seems not to work properly.
- Disconnect the power cord before making any change of fuse on the power filters.

S Y M B O L S

	In compliance with European Directives
	Earth plug
	Important instructions related to the use and maintenance inside of the enclosed manual.
	Electric danger sign
	In compliance with the DEEE European Union Directives

NB: Pictures in this document are just illustrations and may differ from reality.

SUMMARY

I.	STATION OVERVIEW	2
I.1.	OVERALL DIAGRAM	2
I.2.	Overview.....	4
I.3.	Installation, Commissioning	13
I.4.	Preventive maintenance, cautions.....	15
II.	GAS ANALYZER	16
II.1.	Principle.....	16
II.2.	Operating conditions.....	21
II.3.	Technical features	22
II.4.	Emission test	23
II.5.	Gas Free Test.....	26
II.6.	Messages :	34
III.	SMOKE-METER.....	39
III.1.	OPERATING PRINCIPLE	39
III.2.	OPERATING CONDITIONS.....	40
III.3.	TECHNICAL FEATURES	41
III.4.	INSTALLATION AND CAUTIONS	42
III.5.	OPACITY TESTING PROCEDURE	43
III.6.	OPACIMETER MESSAGES.....	49
IV.	EOBD MODULE.....	51
IV.1.	Overview	51
IV.2.	Principle	52
IV.3.	Measure and control	52
V.	CONFIGURATION.....	54
V.1.	Clock/date:.....	54
V.2.	Garage Header:.....	54
V.3.	Operator:.....	55
V.4.	Gas analysis:.....	55
V.5.	Smoke-meter:	61
V.6.	Centralization:.....	63
V.7.	Printing:.....	63
V.8.	Impression Test:.....	63
V.9.	OPTION:.....	64
V.10.	Parameters by default :	64
V.11.	PC keyboard	64
V.12.	Info Maintenance.....	64
V.13.	Information :	65

I. STATION OVERVIEW

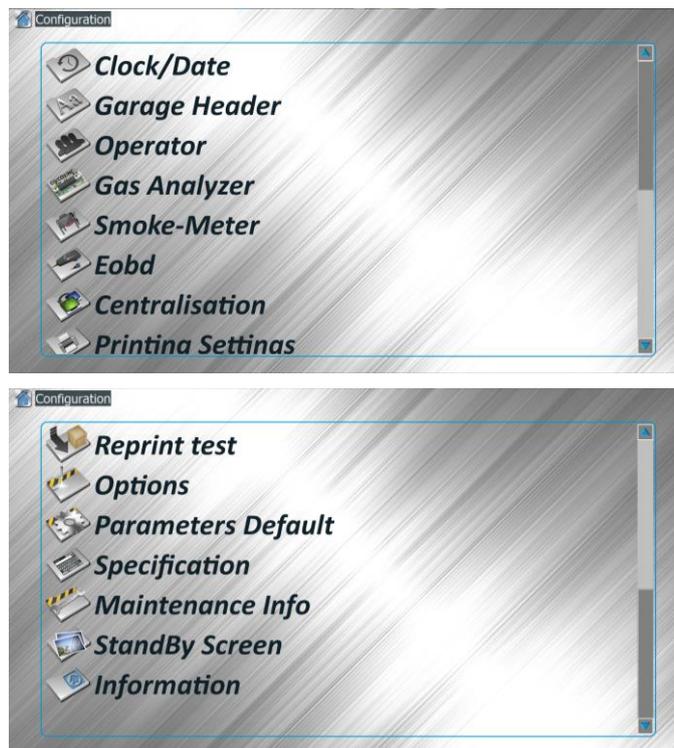
I.1. OVERALL DIAGRAM

The diagrams presented below allow to understand the menu hierarchy; the user can thus easily follow the various sub-parts architecture.

I.1.1. Main menu:

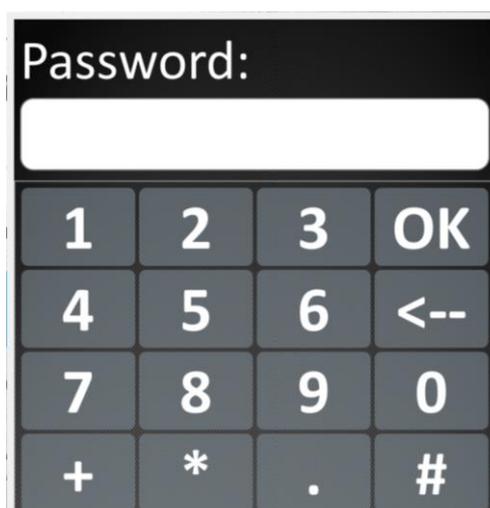


I.1.2. Configurations:



I.1.3. Secured access:

Strategical parts of the software are locked by password. Only maintenance have the access.



I.2. Overview

I.2.1. The Station



I.2.2. Components supplied

1 User's Manual

Main :

Description
Display tool (Pc, Tablet,...)
Remote
Keyboard
Mouse
Power supply cable

For gas analyzer:

Description
Gas analyzer
Probe and exhaust pipe
Output pipe
Oil temperature probe
Filters
Power supply cable

OPTIONS :

Description
Trolley,
Printer
Kit OBD (CAP4XXX)
Kit Measure on battery. (CAP85XX)
IR probe without wire (CAP13XX)
Keyboard support for trolley
Wheeled support for trolley

For smokemeter :

Description
Smoke-meter cell
Exhaust probe
Support probe cell
Oil temperature probe
Power supply cable and communication cable

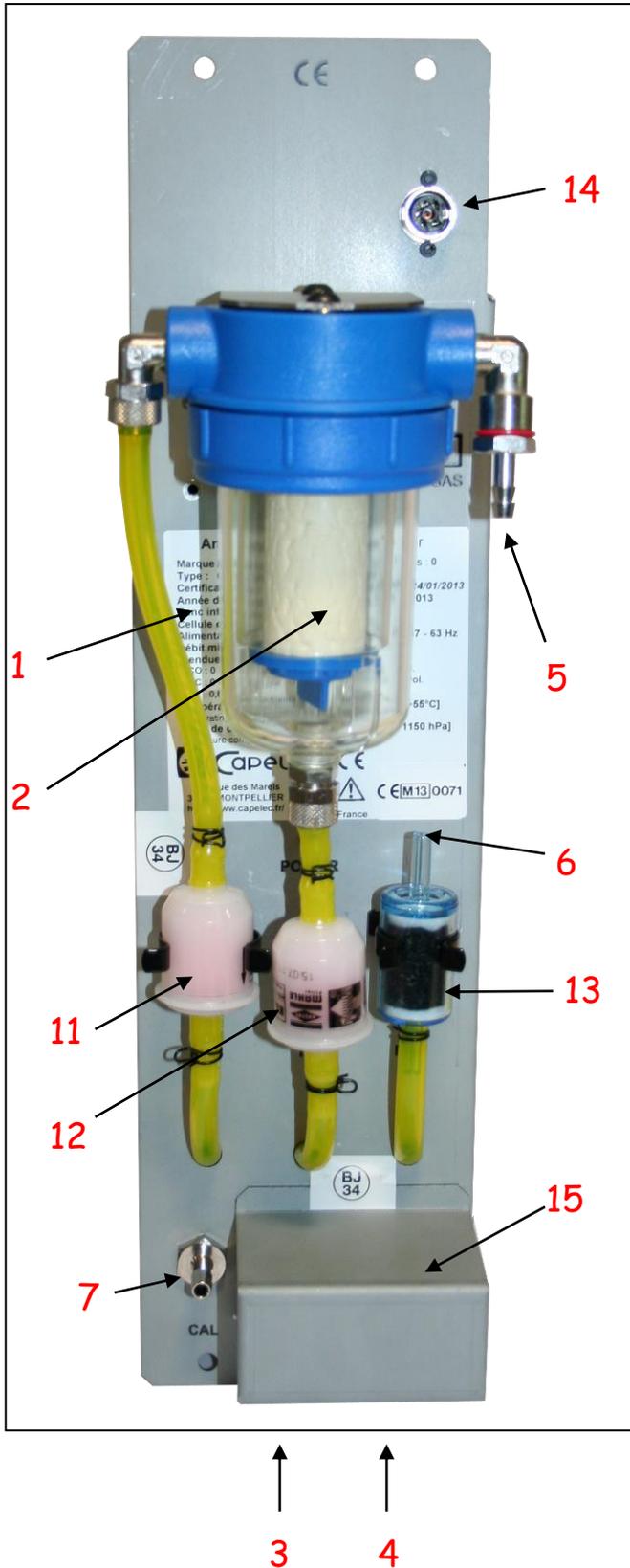
All the CAPELEC accessories are LV (Low Voltage) accessories for the alternative power part and VLV (Very Low Voltage) for the direct power part. They are all protected.



All the accessories supplied are exclusively dedicated to the CAPELEC equipment they have been designed for. Furthermore, they exclusively have to be used in Very Low Voltage situations. CAPELEC responsibility cannot be engaged in case of use of the equipment not complying with the instructions hereby.

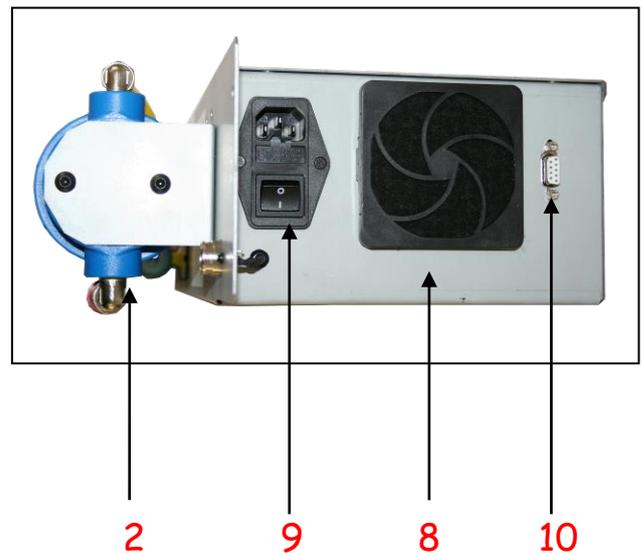
I.2.3. Gas Box

FRONT FACE



- _1_ Identification plate
- _2_ Settling tank filter (*FD*)
- _3_ Measured gas outlet (*GAS*)
- _4_ Condensate outlet (*COND*)
- _5_ Intake of gas to be measured (*GAS*)
- _6_ surrounding air intake for zero setting
- _7_ Intake of calibration gases (*CAL*)
- _8_ Ventilator filter (*FV*)
- _9_ Mains filter with fuse, 230V switch
- _10_ Serial Port COM1
- _11_ gas pump protection filter (*FG*)
- _12_ Condensate pump protection filter (*FC*)
- _13_ Activated carbon filter (*FCC*)
- _14_ Oil temp connector
- _15_ Protection box for O2 & NOX sensors

TOP VIEW:



I.2.4. Smoke-meter



I.2.5. Temperature module and tachometer

CAP85XX: Tachometer on battery or Vibration



For operation please refer to RPM tester manual.

I.2.5.1. Technical features

⇒ Measurement characteristics

- Automatic initialization
- Measurement range: 400 - 9 990 rpm.
- Maximum error: <20 rpm at speeds below 2000 rpm
<2 % in other cases
- Response time: <1 second
- Measurement update rate: 10/s
- Initialization time: <17 seconds

I.2.5.2. List of kit contents

- CAP85XX
- One battery connection cable.
- One cigar lighter connection cable.
- One vibration Sensor

I.2.5.3. Connecting the tachometer

Connected to the cigar lighter plug

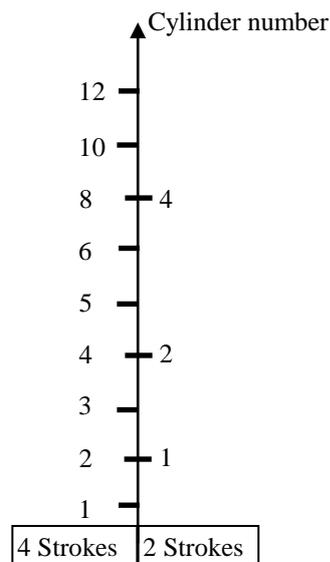
This is the simplest solution. It allows you measure the engine speed with no need to open the vehicle hood. On some vehicles, however, the engine speed measurement may be less accurate than with the unit connected directly to the battery, because of filters installed in the vehicle in order to avoid interferences coming from the engine.

I.2.5.4. RPM measurement

Select RPM mode by pushing the rpm key.



Choose the RPM mode called Battery. After three seconds, it is required to select a cylinder number. This number is corresponding to 4 stroke engine by default. If you want to measure a 2 stroke engine, see the picture below:



This counter is equipped with an automatic detection of cylinder number. In case of RPM loss, when switching the device on, or when changing the number of cylinders, the counter will take a few seconds looking for a stable RPM. When finally detected, the value can be seen on the gas analyzer or opacimeter screen.

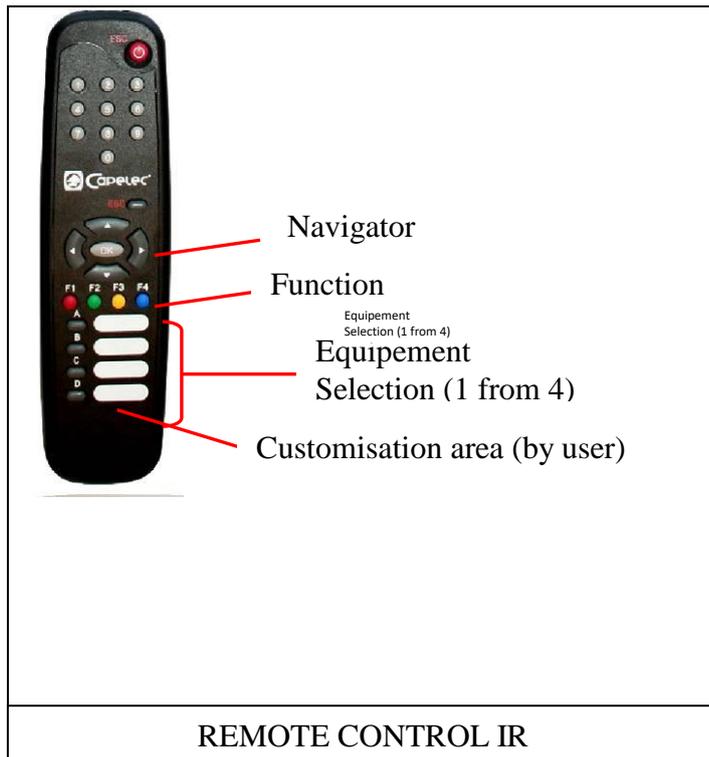
CAP4XXX: RPM via the EOBD

Allows to measure the RPM from the vehicle embedded computer.

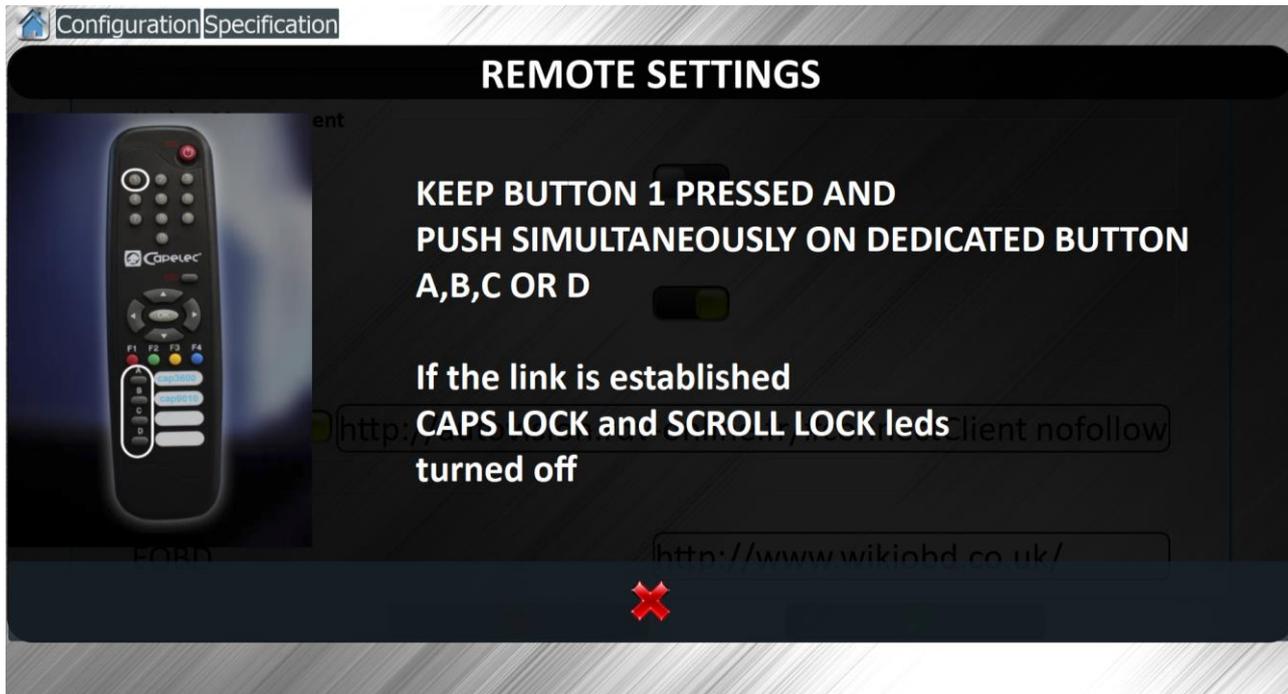
I.2.6. Remote control

This product is composed of:

- 1 remote control with IR emitter (« knob box »)
- 1 USB dongle with IR receiver (with led active on data activity)



You can configure the remote in the menu:
 CONFIGURATION >SPECIFICATION >REMOTE SETTINGS



The remote can be used in several equipment by using channels A to D.

The remote control gives the possibility to use all the function shortcuts offered by the software (F1, F2, ... ←, ↑, ... etc.).

1 – Selection:



- press F1 to launch the selection page in gas analysis mode.

- press F2 to launch the selection page in opacimeter mode.

- press F3 to launch the selection page in EOBD scantool mode.

2 –browsing:



Use the arrow keys to select the function desired. The active one is blue lighted.

The up and down keys are used to switch from one active zone to the other. The right and left ones, to change of zone.

When all the zones are correct, just press OK to save.

I.3. Installation, Commissioning

I.3.1. Advises

The device can remain switched on 24/24. Nevertheless, it is recommended to cut the power supply during the night if the device is not used. When turning it on in the morning, getting operational again can take the gas module a few minutes. As for the smoke head, it will take a maximum of 9 minutes to reach the right operating temperature (preheating).

I.3.2. Commissioning

 Before turning the device on, connect it to a 230VAC 50 Hz power supply equipped with an earth plug and having been checked by an agreed technician. Also check that the power cord is not damaged whatsoever.

 The machine and smoke head power supplies are protected by filters equipped with fuses. In case of replacement, use T2AL 250V fuses kind.

When working properly:

When the screen is turned on, the fan starts refreshing. The OS is downloaded.

The main menu will appear after a few seconds.



Main Menu: the equipment is ready for use

Use the direction arrows located either on the remote control or on the computer keyboard to navigate through the menu. Click with the mouse or the OK key to save your choice. Press the ESC key to go one page back at any time.

You can also use the touch screen to select your choice.

I.3.3. Navigation, user's interface

The user's interface has been designed for an optimal use of the touch screen. All the functions are very accessible with a simple touch.

The touch function can also be replaced by the use of a remote control, giving access to the same functionalities. Useful when tests are running remotely, from the inside of the vehicle for instance.

A PC keyboard and a mouse can also be used for the navigation through the interface.

When necessary to dial information, a virtual keyboard will automatically appear.



I.4. Preventive maintenance, cautions

I.4.1. Overview

Every single device is checked before being shipped by a skilled technician who will stick on it the primary check marks.

The seals, preventing anybody from influencing the metrological results quality, cannot be removed excepted by an approved person. They guarantee the equipment conformity.



Electric Risks Caution: in case of gas analyzer or opacimeter opening, be careful to electric risks of electrocution. Any manipulation should be done by a skilled person.

I.4.2. Cables and surfaces cleaning

Station, screen, keyboard, cell and cable can be cleaned with a clean rag and some alcohol. Do not use any other product and especially solvents.

The screen should be cleaned with cotton. Do not use any abrasive product.

II. GAS ANALYZER

II.1. Principle

The gas analyzer is a module dedicated to PTI and automotive workshops. It allows measurement of carbon monoxide (CO), carbon dioxide (CO₂), hydrocarbons (HC) in hexane equivalent (C₆H₁₄), and oxygen (O₂) concentration of the gases from spark-ignition vehicles (petrol, high-octane petrol, LPG), with or without catalytic converter. As an option, it can be equipped with the NO_x kit allowing nitrogen oxides to be measured.

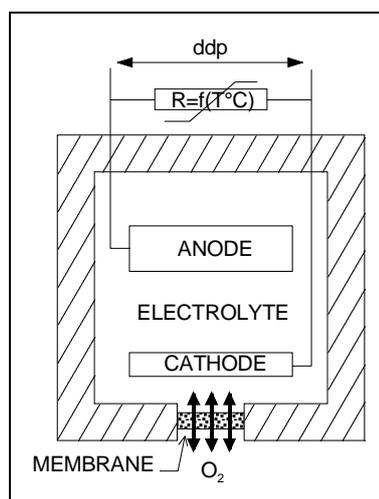
The CAP3201 also allows the following values to be obtained at any time:

- Calculation of the corrected CO value
- Calculation of Lambda value
- The measurement of rotation speed (measured by induction clip, by battery input ...)
- Measurement of oil temperature.

The measurement of CO, CO₂ and HC is carried out using non-diffusing infrared radiation. The gas passes through a measuring chamber, at the ends of which there are three infrared detectors and three transmitters. Each transmitter emits a specific wavelength associated with one of the three gases.

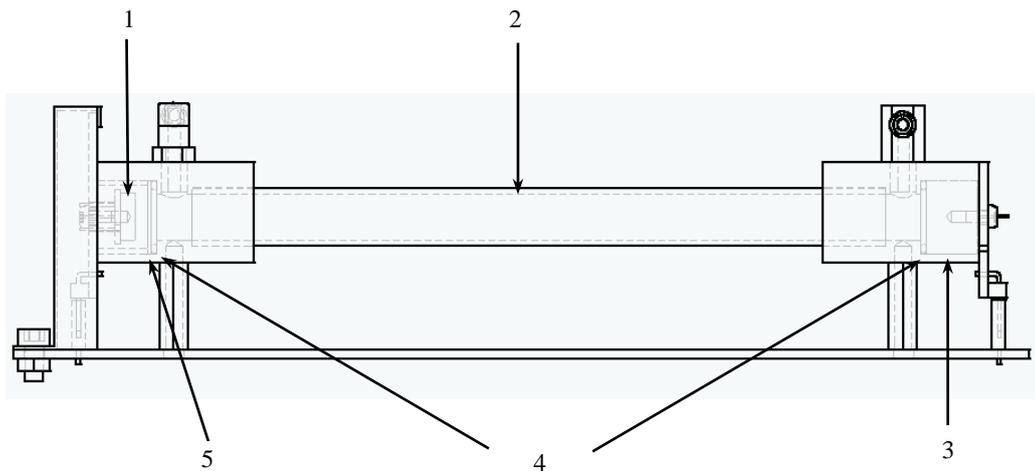
Each of the detectors transmits an electrical signal corresponding to the received radiation intensity.

Measurement of oxygen concentration is carried out by an active chemical sensor.



Principle of oxygen measurement:

The oxygen sensor is an electrochemical one; it is based on the principle of electrolysis. In the presence of oxygen, an ionic current is generated through the cathode, the electrolyte and the anode, giving rise to a potential difference at the terminals of a resistor, which varies according to temperature. As a result, the sensor is temperature-compensated.



N°	Descriptions
1	IR detector
2	Sample cell
3	IR transmitter
4	O rings
5	Optical window

Principle of NDIR measurement:

The CAP3201 is based on non-dispersive infrared technology.

Instead of using a refractory prism to achieve the very high spectral definition of infrared light (like those used in laboratory high performance equipment), the machine uses NDIR. NDIR devices are generally used for measuring concentrations of a specific and limited set of gases in mixtures having a known and limited collection of basic gases.

It is possible for example to take the measure of the CO₂ concentration from a basic gas such as the exhaust gas coming from a car. Some gases might have an absorption spectrum masking CO₂ presence.

A specific collection of gases (CO₂, C₆H₁₄, CO) is measured as follows: a unique range of wavelengths in the infrared spectrum is selected for each gas in order to measure the point where its absorption is high and where there is no other basic gas which is equally absorbent.

Optical filters transmitting only the given range of wavelengths are placed in front of the thermocouple detector. When the set is full of gas, the infrared detector measures the reduction in the infrared energy obtained for the range of wavelengths linked to each gas.

The signal processing electronics then determine the I/I₀ ratio.

I/I_0 = degree of absorption

I = signal received (sample) for each gas to be measured.

I₀ = signal for reference

II.1.1. Corrected CO

Corrected CO is calculated as follows:

If (%CO + % CO₂) ≥ 15 then corrected CO = CO

If (%CO + % CO₂) < 15 then corrected CO = CO x (15 ÷ (CO+ CO₂))

II.1.2. Lambda

The lambda value is calculated using the simplified BRETTSCHEIDER equation as follow:.

$$\lambda = \frac{[\text{CO}_2] + \frac{[\text{CO}]}{2} + [\text{O}_2] + \left(\frac{\text{Hcv}}{4} \cdot \frac{3,5}{3,5 + \frac{[\text{CO}]}{[\text{CO}_2]}} - \frac{\text{Ocv}}{2} \right) \cdot ([\text{CO}_2] + [\text{CO}])}{\left(1 + \frac{\text{Hcv}}{4} - \frac{\text{Ocv}}{2} \right) \cdot ([\text{CO}_2] + [\text{CO}] + \text{K1} \cdot [\text{HC}])}$$

Where:

[] = concentration in per cent volume,

K1 = conversion factor for NDIR measurement to FID measurement,

H cv = Atomic ratio of hydrogen to carbon,

- (a) for petrol (E5) 1,89
- (b) for petrol (E10) 1,93
- (c) for LPG 2,53
- (d) for NG/biomethane 4,0
- (e) for ethanol (E85) 2,74
- (f) for ethanol (E85) 2,61

O cv = Atomic ratio of oxygen to carbon

- (a) for petrol (E5) 0,016
- (b) for petrol (E10) 0,033
- (c) for LPG 0,0
- (d) for NG/biomethane 0,0
- (e) for ethanol (E85) 0,39
- (f) for ethanol (E75) 0,329

CNG, LPG EFFECT (Only on special version)

On special version, on the measure page you can select LPG, CNG or PETROL cars. The only effect is to change HC calculation:

- LPG involves $HC \cdot 0.5$
- CNG involves $HC \cdot 0.3$
- PETROL involves $HC \cdot 1$.

II.2. Operating conditions

The gas analyzer is equipped with an automatic monitoring system of parameters that have an influence on measurements. If at least one of these parameters is out of bounds, and might have a metrological impact on results, then the gas analyzer automatically prevents any measurement from being performed until operating conditions are stabilized.



Failure to observe operating conditions may lead to the equipment degradation or to a temporary withdrawal of it:

- Atmospheric pressure 1000 mbar +10% -25%
- Power supply 230 VAC +10% -15% 50 Hz+-2%
- Ambient temperature: from -10 to 55 °C
- Gas temperature: 200 °C tolerated by the probe
- Storage temperature: -32 to +55 °C
- Relative humidity: <98% non-condensing
- Ambient air clean and room well ventilated

II.3. Technical features

- Preheating duration: < 9 minutes at 0°C (1 minute minimum)
- Response time: 13 seconds for HC, CO, CO₂, 28 seconds for oxygen (transition from 20.9% to 0.1% for a gas with 0% O₂)
- Nominal pump delivery: 6 l/min.
- Minimum pump delivery: 3.5 l/min.
- Air pressure variation: automatic correction by integrated absolute pressure sensor
- Zero point and sensitivity: automatic compensation
- Supply 115-230V / 1.5A ; 47Hz à 63Hz ; Fuses T2AL 250V.

○ Gas table:

	<i>Specified range</i>	<i>Display range</i>	<i>Resolution</i>
CO	0 to 5 % vol	0 to 15 % vol	0,01 % vol or 0,001 % vol
CO ₂	0 to 16 % vol	0 to 20 % vol	0,1 % vol
HC (C ₆ H ₁₄)	0 to 2000 ppm vol	0 to 10000 ppm vol	1 ppm vol [0;2000 ppm] and 10 ppm above
O ₂	0 to 21 % vol	0 to 25 % vol	0,01% vol [0 ; 4 % vol] 0,1% vol above
λ	0,8 to 1,2	0,8 to 1,2	0,001

○ Measurement ranges:

- NO_x = 0 à 5000 ppm
- Engine speed = 0 à 9999 RPM
- Oil temperature = -5 à 150 °C
- Corrected CO = 0 à 10 %

○ Accuracy:

- Engine speed = +- 10 RPM
- Oil temperature = +- 1 °C
- Corrected CO = 0,03 %

○ Other resolutions:

- NO_x = 1 ppm vol.
- Engine speed = 1 tours/min
- Oil temperature = 1 °C

II.4. Emission test

II.4.1. Preliminary checks

- Place the machine in the desired location. The surface must be horizontal and must not be exposed to excessive vibrations, dust or cold. There must be no petrol vapor in the location.
- Connect the hose and probe to the separator located at the rear side.
- Do not insert the probe into the exhaust pipe at this stage.
- Press the Stop/Start switch on the station.

II.4.2. Cleaning and operating cautions

Current regulation:

This device is a 4 gas analyzer complying with ISO 3930, MID certification.

This device required little maintenance. The pneumatic circuit components that carry the gases on, located on the outside of the analyzer, only need to be maintained by the user. Any maintenance operation, other than those described below, must be entrusted to a certified CAPELEC agent. On the other hand, failing to maintain the machine in conformity with these instructions may lead to the warranty abolition.

The subsequent verification shall be carried out using suitable testing means and certified reference gases.

The interval for subsequent verification is subject to national or regional legislation. This Recommendation, however, suggests an interval not exceeding 1 year.

II.4.2.1. Bi-annual maintenance

- ◆ Change the separator filter FD,
- ◆ Change filters FC and FG,
- ◆ Visually check that the filter connections are in conformity with gas flow circuit diagram.
- ◆ Visual inspection of the sampling probe. Clean it if necessary.
- ◆ Perform a leak test.
- ◆ Store the new maintenance date.

II.4.2.2. Annual maintenance

Annual maintenance operations include the bi-annual maintenance operations. In addition, it is necessary to carry out the following operations:

- ◆ Replace the pump protection filters (FG and FC),

- ◆ Replace the activated charcoal filter. (FCC),
- ◆ Check with a calibration gas that the error is less than the maximum allowed error.
 - 1) Put into measuring mode.
 - 2) Disconnect the sampling probe from the separator.
 - 3) Connect the cylinder of calibration gas in its place. If the cylinder contains propane HC, select display of C6 HC, even though display is usually in C3 (hexane). Otherwise, use the PEF value to convert if the HC are around 2000 ppm vol. propane.
 - 4) Write down or print the stabilized measured values.If the error is too high compared to current regulatory requirements, adjustment is necessary.
- ◆ If regulation requires regular adjustment using a calibration gas, this operation must be performed prior to error testing.

II.4.2.3. Probe maintenance

The small holes at the end of the probe must never be connected. If condensation is generated or if too much residue is produced, remove the probe from the tube and blow compressed air in the opposite direction to that of suction. Perform the same operation with the sampling hose.

II.4.2.4. Separator maintenance

The separator includes a filter.

Replace the filter if it has turned to grey.

Filter replacement is carried out in the following manner:

- turn the pumps off
- Unscrew the condensation residue collector located at the back of the machine. (FD).

 The absence of one of the components inside of the separator or incorrect reassembly of the assembly will contaminate the measuring device and the measurements will be prematurely invalidated due to the resulting errors. This condition of the analyzer will require an overhaul that cannot be provided in the frame of warranty.

Perform a leak test.

II.4.2.5.Replacing a filter

If one of the filters looks dirty or if an error message is referred in the user manual to a filter replacement, the following actions must be done:

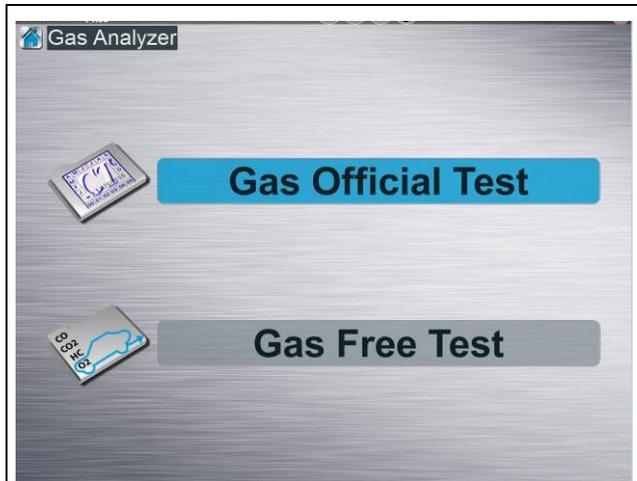
- Turn the machine off.
- Remove the filter to be replaced (behind the location designated for each filter, the reference is silkscreen printed on the case).

Replace the old filter with the new one,

- Turn the machine on.
- Perform a leak test

II.5. Gas Free Test

Select the F1 icon from the main menu for gas.



This menu allows either to open a window for several gases to be checked, or to choose a submenu related to technical inspection and according to the vehicle 1st operating day.

Select GAS Free Test and press OK

II.5.1. Customer data entry:

From the moment the test procedure is launched, the user may, if he wants, enter information about the client and his car (name, vehicle brand, mileage and ID plate number). These data will then appear on the test report.

This operation is not mandatory.

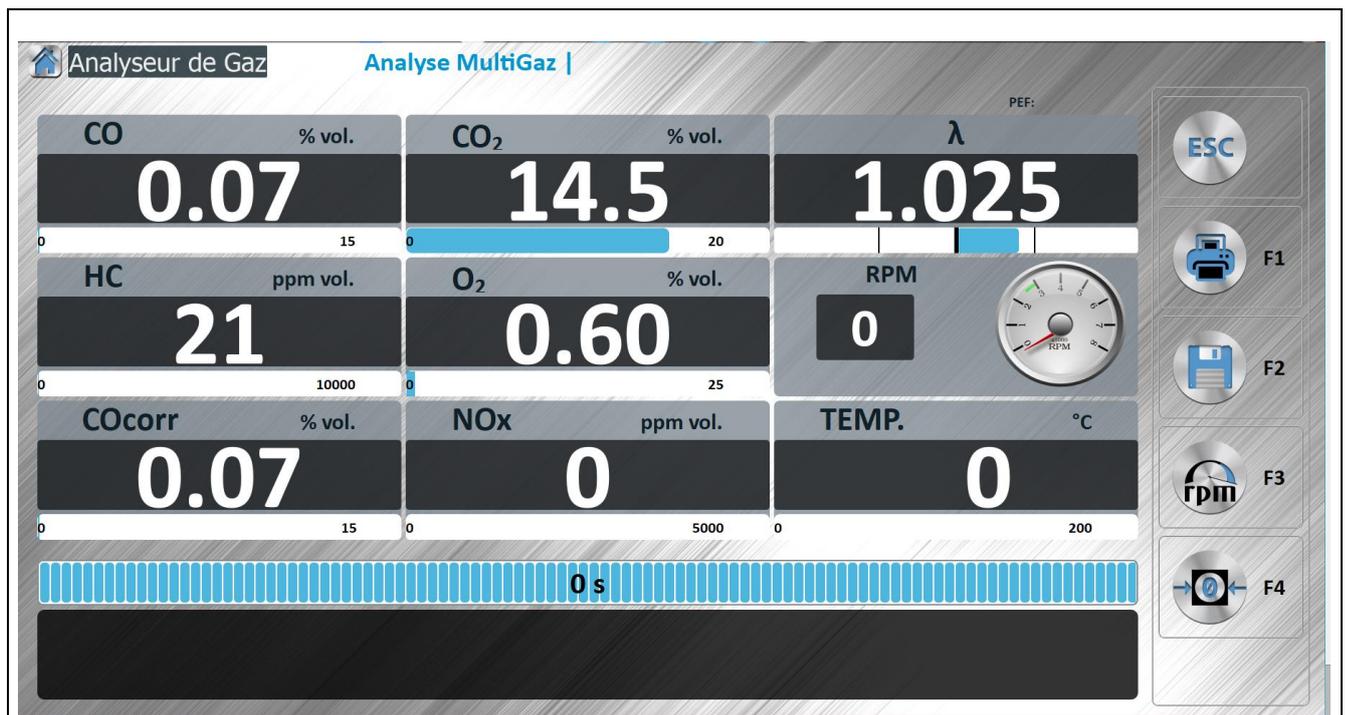
Click or press the variable slots to fill the information in.

A window to be filled in will automatically appear.

It looks like the picture below:



II.5.2. Description of graphic interface



HC = Hydrocarbons expressed as hexane (display as propane is possible) given in ppm (parts per million).

CO = Carbon monoxide expressed in % by volume.

COcorr. = Corrected CO

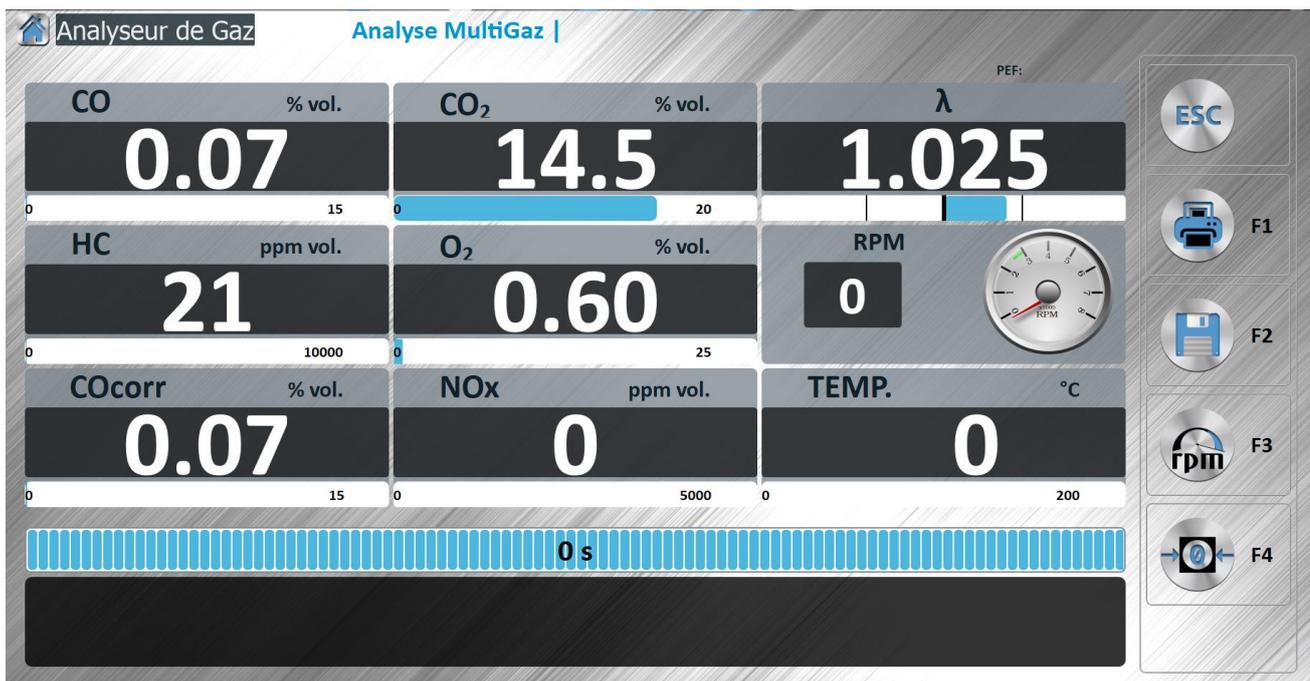
O₂ = Oxygen expressed in % by volume.

CO₂ = Carbon dioxide given in % by volume.

λ = Displays Lambda value. This value has no particular unit. We say that it is a coefficient or a ratio.

rpm = Engine speed in revolutions per minute.

°C = Oil temperature measurement (or engine if CAP13XX used) expressed in degrees Celsius.



F1 :The printer key: it is displayed only when printing is possible.

Press this key to print the report.

F2 :The storage key:

Press this key to store values. These values will be printed out on the same test report. Up to 6 current values can be stored.

F3 :The RPM key:

Allows the RPM mode to be selected.

F4 :The auto-zero key

Allows an auto-zero procedure to be started at any time. Note that the device automatically launches an auto-zero operation when necessary, and periodically every 30 minutes.

When an auto-zero operation occurs, the solenoid valve switches on so that the air sucked up by the gas module is pure and thus is filtered by an activated charcoal filter.

1 :The pump key :

The pump key:

Activates or deactivates the pumps. Pressing this key puts the machine either in STANDBY mode, or in measurement mode (activation of the pumps and launching of an auto-zero operation). The STANDBY invalidates all measures, which is shown on the display with dashes in the measurement field.

II.5.3.Preliminary checks

Before undertaking any measurement, the operator must verify that the engine is operating correctly.

The following points are to be observed:

The vehicle exhaust line must be gas-tight.

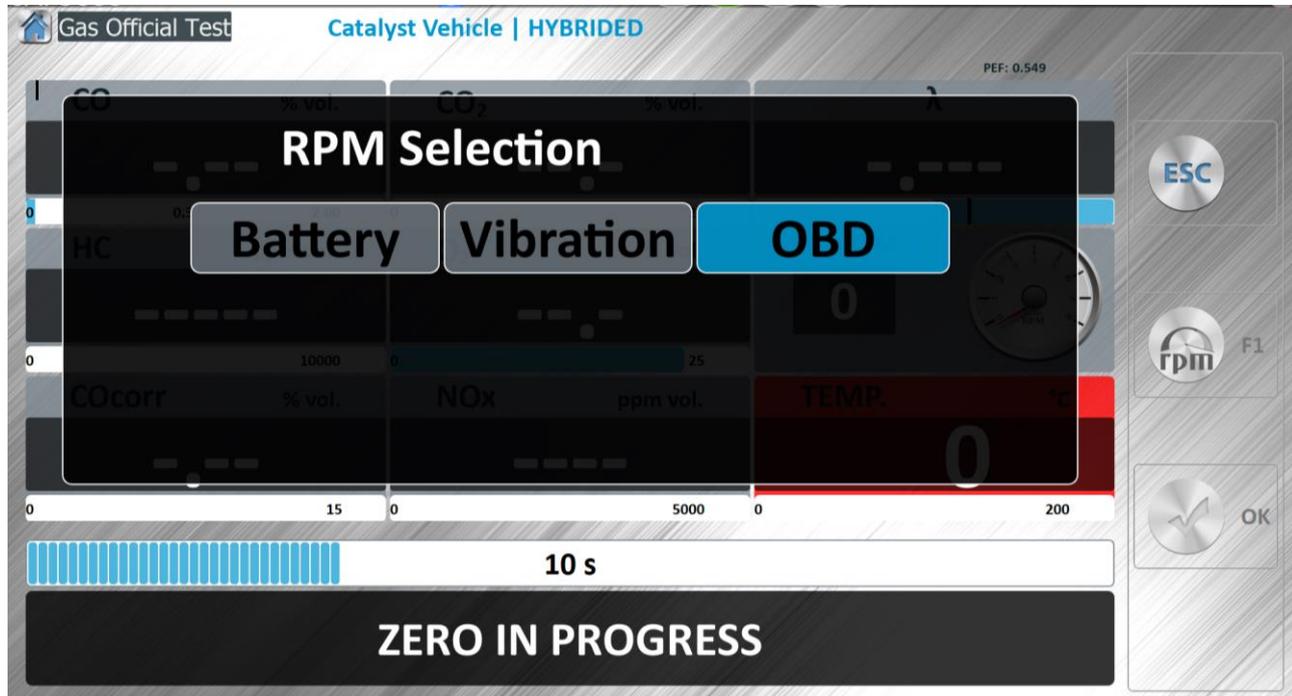
The gearbox must be in neutral, with the clutch engaged, for vehicles with manual or semi-automatic transmissions; the selector should be in neutral for vehicles with automatic transmissions or in accordance with the instructions of the vehicle manufacturer.

Accessories and optional equipment that influence the engine speed at idle must not be activated, barring manufacturer's instructions or regulation to the contrary.

The engine must be at normal operating temperature that is to say with an oil temperature at least equal to 80°C.

II.5.4.RPM mode selected:

Every time a gas check procedure is launched, the RPM value is displayed.



RPM mode can be changed by pressing the rpm key

- « **E.O.B.D** »: This mode will retrieve the RPM value from the vehicle embedded computer.
- « **Battery** »: this mode will retrieve the RPM value from battery signal (noise).
- « **Vibration** »: this mode will retrieve the RPM value from engine vibration.



In case of difficulties to get a coherent value, turn the high beam lights on as well as the rear defrosting system and turn all the other tools off.

II.5.5.Preparation to measurement

- Tachometer

Install the sensor, then press the operating speed key to determine the appropriate mode. This mode is automatically saved. The value of the operating speed must immediately appear.

- Oil or engine temperature

Replace the oil level measurement gauge with the oil temperature sensor. Adjust the probe length in order for it to soak into the oil when the sealing cone acts as a stopper. The engine must be warm before any measurement.

- Gas measurement

Insert the sampling probe as far as possible in the exhaust gas exit tube. The minimum depth, when the layout allows it, is 30 cm. If this condition cannot be fulfilled, it is necessary to use a collector tube that acts as an exhaust system extension.

In exhaust systems with a single exhaust pot, but provided with two exit tubes, it is necessary to use a collector tube into which the probe is inserted.

For analysis of the catalytic converter gases upstream, the entire length of the flexible sampling tube must be used.

Start the measurement by pressing the PUMP key (if the pumps are not on).

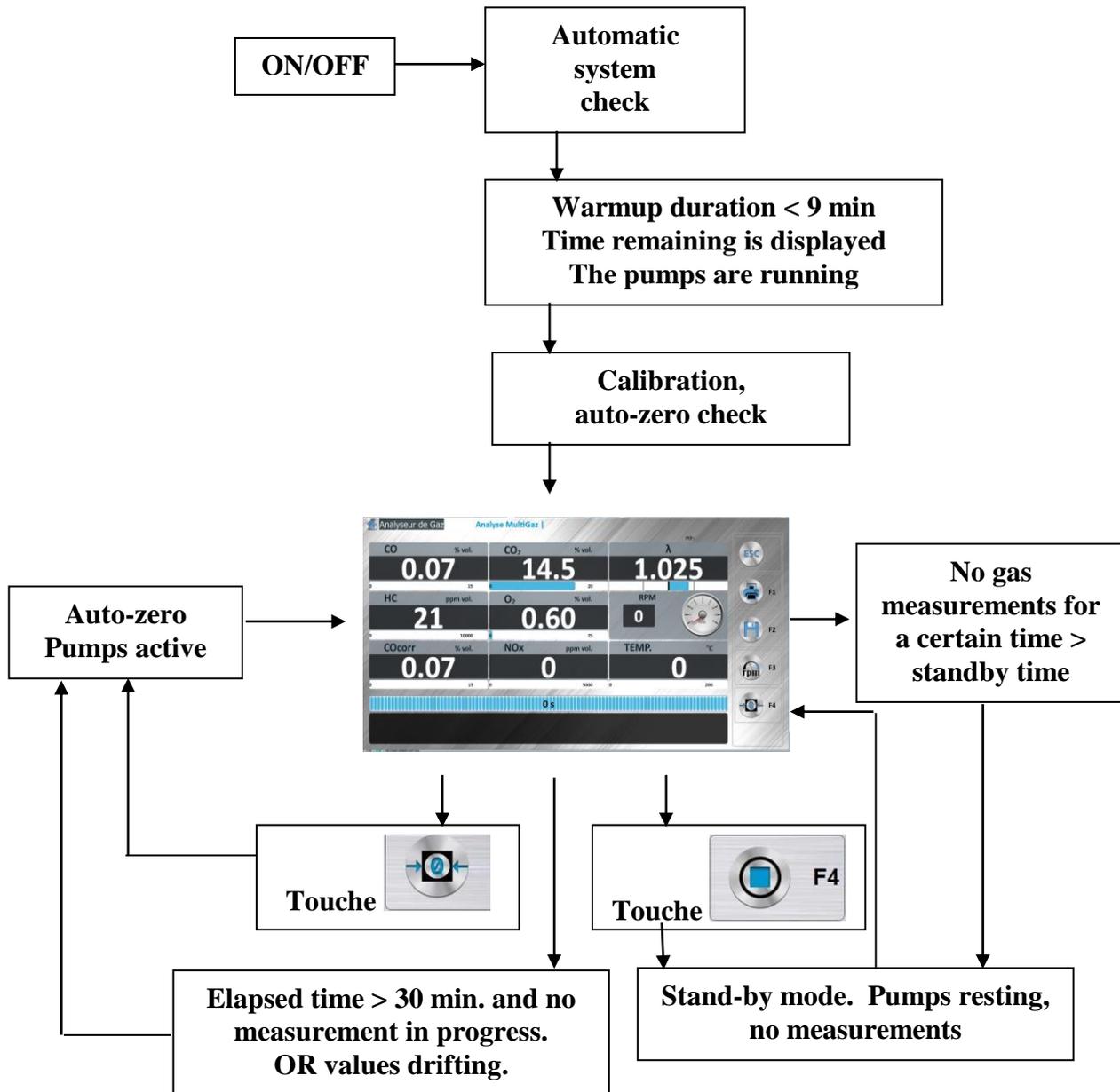
Start the engine. Before the probe is inserted, it is preferable to activate the pumps and to wait for zeroing to finish before inserting the sampling probe as indicated above.

II.5.6.Analysis and measurement

Automatic calibration is then engaged. The pump starts running and the following message is displayed on the screen: "ZERO IN PROGRESS".

After this period, the LCD screen will show the following message: "Measurement in progress," the results of each measurement will appear on the displays, the system is then ready to carry out a measurement (concentrations must be similar to those in air: 0% for CO, CO₂, 0 ppm vol. for HC, 20.9% for O₂.)

The equipment is ready to be used. It is recommended that a seal integrity test is performed in order to verify that the probe is correctly installed and that the equipment has not be damaged during transport.



Operating diagram

Activating the pump has the effect of triggering automatic calibration. This phase is launched as soon as the pump is started. While this procedure is in progress, the message “auto-zero in progress” is displayed in the message box.

When the message disappears, measurement operations become available on the screen. Automatic zeroing occurs every 30 minutes if the analyzer is in measurement mode. If a measurement is in progress, the analyzer will await the end of the measurement operation before launching calibration. Before carrying out a zeroing operation, the analyzer performs a check of the air intake.

Note that if a field contains no value and remains in the “----” status, the associated measurement is not available. We can note the following cases:

- The temperature probe is not connected to the analyzer; oil temperature measurement is not available.
- The NOx option is not present; NOx measurement is not available.
- Concentrations of HC, CO, CO₂ and O₂ give values for LAMBDA out of bounds; LAMBDA is not available.
- One of the gas measurements is invalid.

NOTICE:

At any time during this phase, it is possible to stop the pumps by pressing the mode key and put the machine in the stand-by. However, in order to avoid dirt accumulation, it is recommended that the machine is rinsed with clean air by letting the pumps run for 1 minute with the probe removed from the exhaust pipe. It is possible to program the equipment for it to, that after a certain time has elapsed without exhaust gas measurement, automatically switches to standby.

II.5.7. Printing results

Printing of values displayed on screen is accomplished by simply pressing the PRINT key

II.6. Messages :

Message displayed	Call Maintenance	Do it yourself
Leak present	YES	
Data invalid	YES	
HC out of bounds		YES
CO out of bounds		YES
CO2 out of bounds		YES
O2 out of bounds		YES
NOx out of bounds	-	-
Lowflow detected		YES
HC residue in gas inlet		YES
Error com.	YES	
Adjustment necessary	YES	
Change O2 sensor	YES	
Condensation: wait		YES
Heating problem	YES	

II.6.1. Leak present

Repeat the test, disconnecting the probe from the device and plugging the gas entry port on the separator. If the problem disappears, the leak is in the probe tubing.

Otherwise, it affects the machine. Check the filter connections. Check that the separator is correctly installed and adequately tightened.

Test the various parts of the pneumatic circuit with leak tests, moving the plug progressively upstream, up to the pumps.

Open the machine and perform a visual check of the pneumatic circuit.

Replace the leaking portion of the pneumatic circuit.

II.6.2. Data invalid

Adjustment necessary.

II.6.3. HC out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

Perform a further adjustment if the problem persists.

II.6.4.CO out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

Perform a further adjustment if the problem persists.

II.6.5.CO2 out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

Perform a further adjustment if the problem persists.

II.6.6.O2 out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

Check sensor connections.

II.6.7.NOx out of bounds

Out of range.

Check NOx sensor connections (optional).

Replace the NOx sensor if the message persists after several attempts to zero.

II.6.8.Flow too low

Check that the flexible tubes. Check that they are not kinked, twisted or plugged.

Disconnect the sampling probe to see whether the problem is connected with it, or persists.

1) If the probe is disconnected, the message is no longer active:

Check that the sampling tube is not crushed by an external mass.

Clean the probe and the flexible sampling tube with compressed air.

2) If the probe is disconnected, the message remains active:

Check the flow with a flow meter.

If the flow is between the minimum flow and the nominal flow, it is necessary for Maintenance to open the machine to check the pressure switch and if necessary calibrate it using a pressure sensor at a trigger pressure of 160 mbar, or even to replace it.

If on the other hand the flow is outside the acceptable range indicated at the rear of the machine, it is necessary to open the machine to check what, in the pneumatic circuit, is reducing flow. If no flexible tube seems twisted, kinked or plugged, check the electro valves and finally replace the pump diaphragms if necessary.

II.6.9.HC residue in gas inlet

When a measurement is carried out on ambient air, if the CO₂ concentration is below 2% by volume for more than twenty seconds while the HC measurement gives more than 20 ppm, it is assumed that hydrocarbon residues are present in the inlet tract.

These residues may also be in the ambient air. One must therefore ensure that the work area is well ventilated. It may be necessary to clean the probe. If the problem appears again, clean the separator.

If the HC measurement drops back to a level below 20 ppm for more than 20 seconds, this message disappears, a zero operation is carried out and the message “measurement in progress” appears.

II.6.10.Error com. (bench)

Check that the device is grounded. Extensions for the power supply cable are absolutely required to include a ground connector as well as the power supply plug.

Communication between the main card and the test set is defective. First, check that the power supply and communication cables are correctly connected and that the “happy LEDs” are blinking. Connect the infrared set to a computer and check that it is communicating correctly with the maintenance program. Next, check that at the Tx pin of the main card, a signal is regularly transmitted. Depending on the problem encountered, replace the defective component..

II.6.11.Adjustment necessary

Call Maintenance: adjustment with the help of a calibration gas is necessary. This message indicates excessive drift in the machine.

II.6.12.Change O₂ sensor

During a zero operation, the system associates the oxygen concentration in air (20.9%) with the corresponding potential at the terminals of the oxygen sensor. This potential is usually in the range [6mV - 13mV]. If the potential is not in this range, the message “Change O₂ sensor” appears. This means that the oxygen sensor is defective or incorrectly connected.

Please contact your manufacturer or supplier for O₂ sensor replacement.

II.6.13.Condensation: wait

This message may appear during the start-up phase. In this case, just wait for the machine to be warmed up and ready to carry out measurements.

If on the other hand this message appears in the course of a measurement and persists, it is necessary to carry out a check of the following points:

Check that the separator is correctly connected.

Check the flow at the condensate exhaust connector.

Check the internal parameters in the maintenance menu.

Perform a leak test.

Depending on the results obtained, notify Maintenance, which will undertake the replacement of the defective part.

II.6.14.Heating problem

If the estimated warm-up time of the machine (elapsed time between the time the machine is turned on and the time when measurements are possible) is exceeding 15 minutes, this message will appear.

If the temperature is below 5°C, it is necessary to move the equipment to a hotter place and restart it.

II.6.15.Other :

(1) RPM out of range

This is shown on screen by a “----” display.

If this message appears, it means that the measurement of operating speed is over 9999 rpm. Check that the correct sensor has been chosen in the Operating Speed menu and the information concerning the engine to be tested is correct and has been completed.

(2) TMP. Out of range

This is shown on screen by a “----” display.

If the ambient temperature is below 0°C or if a measurement is in progress, this means that the measured value is outside the range 0-150°C.

If not, check that the oil temperature probe is correctly connected to the connector assigned to it.
If not, replace the sampling probe.

III. SMOKE-METER

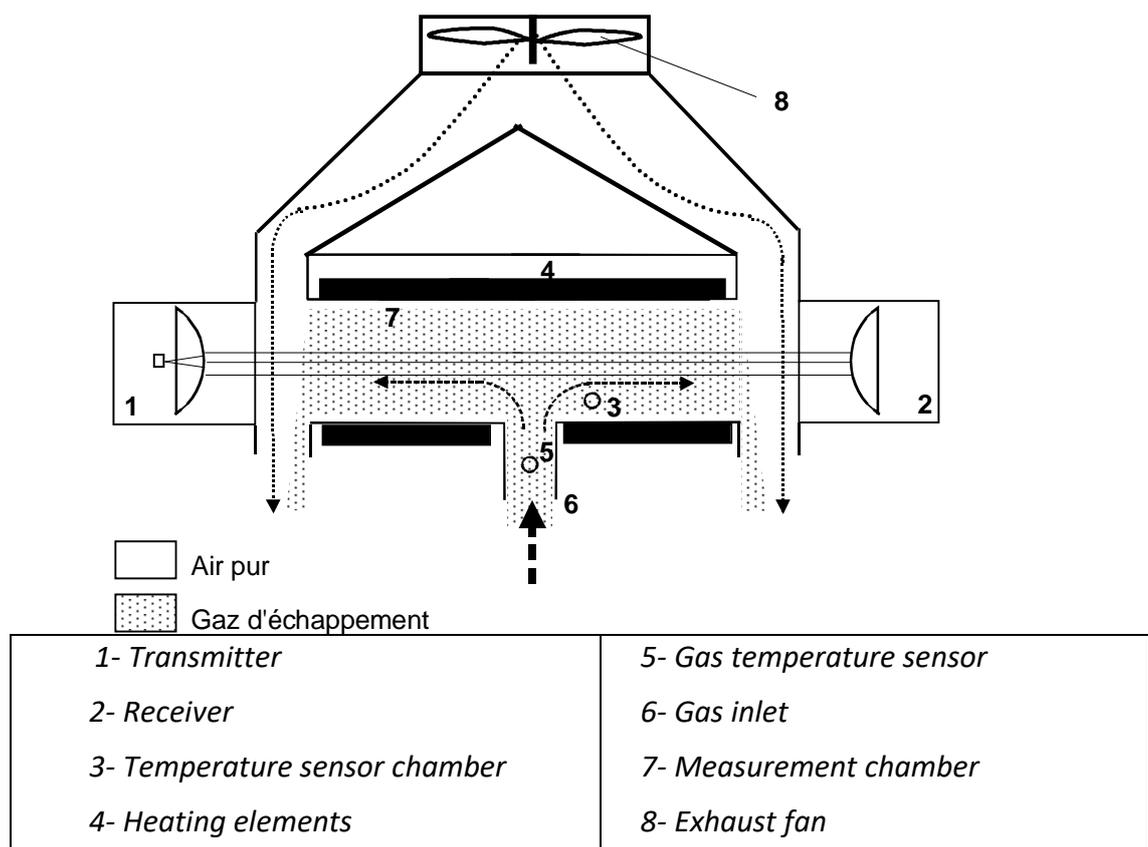
III.1. OPERATING PRINCIPLE

In the composition of the exhaust gas emitted by diesel engines, the pollutant component is considered to be carbon in suspension. A polluting vehicle emits on acceleration a puff of gas that is darker (and thus more opaque) than a vehicle in good conditions. The partial flow opacimeter is used to give a measure of this phenomenon based on a given measure unit called K (m^{-1}).

The principle of opacity measurement is the following: a beam of light (transmitter aimed at a receiver, with a constant distance between the two) is passed through a sample of gas. The fraction of incident light which reaches the receiver is inversely proportional to the concentration of particles in suspension in the gas.

The measurement obtained is digitally corrected.

The opacity of a vehicle is the maximum opacity value measured during free acceleration cycle.



Measurement chamber diagramm.

The opacimeter depends on the interactive operation of two sub-systems. The first is composed of the cell. This is what establishes the opacity measurement. The electronic system of this cell contains a microprocessor which makes it possible, on the basis of several temperature and pressure sensors, to regulate the system, to detect bad operating conditions and to correct the

measurement. All this information is directly taken into account by the central unit which is responsible for detecting maximum opacity, displaying the results on a LCD screen, printing to a thermal printer or an external A4 format printer and guiding the operator throughout the procedure.

According to current regulation, the periodic testing of opacimeters is not compulsory. These devices, may, however later become subject to this type of inspection.

III.2. OPERATING CONDITIONS

The opacimeter automatically checks the parameters that have an influence on the measurement. If at least one of these parameters is out of bounds, hence threatening to metrologically alter the results, the opacimeter disables itself and prevents any measurement from occurring until operating conditions are re-established.

The following problems result in the system being disabled:

- Detector temperature out of bounds (limits extending from 41 C to 55°C)
- Chamber temperature out of bounds (limits extending from 70°C to 110 C)
- Supply voltage out of bounds
- Fan speed too low
- Computer to cell communication problem
- Windows need to be cleaned
- Problem with a temperature sensor.

III.3. TECHNICAL FEATURES

- Power supply 115-230V / 1.5A; 47Hz à 63Hz.
- Preheating duration: from 3 to 6 min depending on ambient temperature.
- Zero adjustment and calibration before use: automatic.
- Control of adjustment: automatic by electrical filter at around 50%.
- Ambient temperature range for operation: +5 to +40°C.
- Humidity: 30% to 90%.
- Storage temperature: -32°C to +55°C.
- Measurement range of the measured value:
- Opacity: 0.00 to 9.99 m⁻¹. 0.0 to 99.9%
- Resolution 0.01 m⁻¹ or 0.1%
- Maximum relative error:
- Measurement range of influencing factors (which allow correction of the opacity value):
- Temperature of the gas being measured: 0-256 C (resolution 1°C)
- Physical response time 10% to 90%: less than 0.2 sec. for gas at 75L/min.

III.4. INSTALLATION AND CAUTIONS

III.4.1. Installation, commissioning:

Place the cell in the place desired. The surface has to be horizontal and not too much exposed to vibrations, dirt and cold temperature.

- Check that the opacity cell is correctly connected to the station and connect it to the 230 VAC 50 Hz mains.
- Press the Stop/Start switch on the station.
- Start the PC
- Press the Stop/Start switch of the cell.

III.4.2. Cleaning and cautions during operation:

Occasionally, large carbon particles enter the chamber while the engine is being tested. The great inertia of these particles will cause them to be thrown against the windows located on each side of the chamber. A monthly inspection is recommended to determine whether the two windows have an excessive coating.



Gas input do not clean, gas temperature sensor presence inside.

Where the windows are concerned, a dry cotton rag is the proper tool for cleaning these two surfaces.

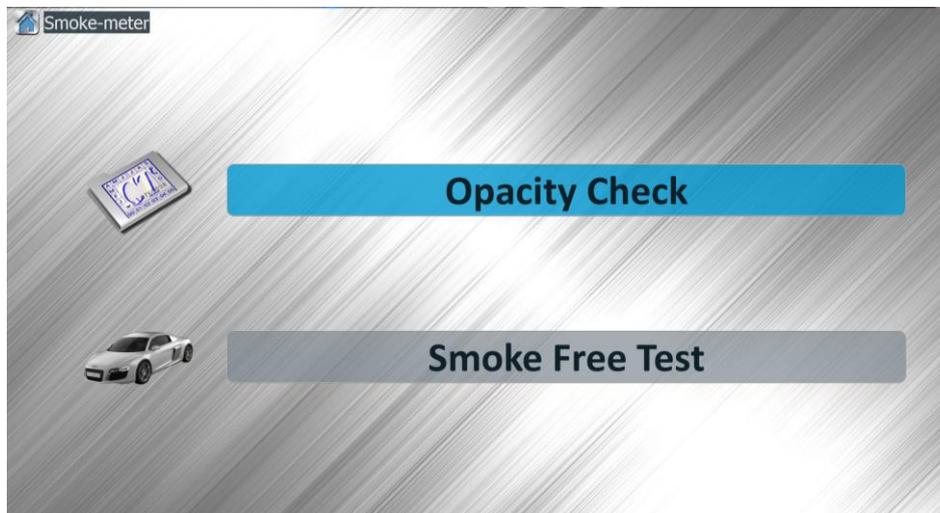


DO NOT USE ANY CLEANING FLUID.

It is not necessary to open the cell to carry out these maintenance operations.

III.5. OPACITY TESTING PROCEDURE

This procedure allows to determine, for a given vehicle, of whether or not its opacity is lower than the current limit.

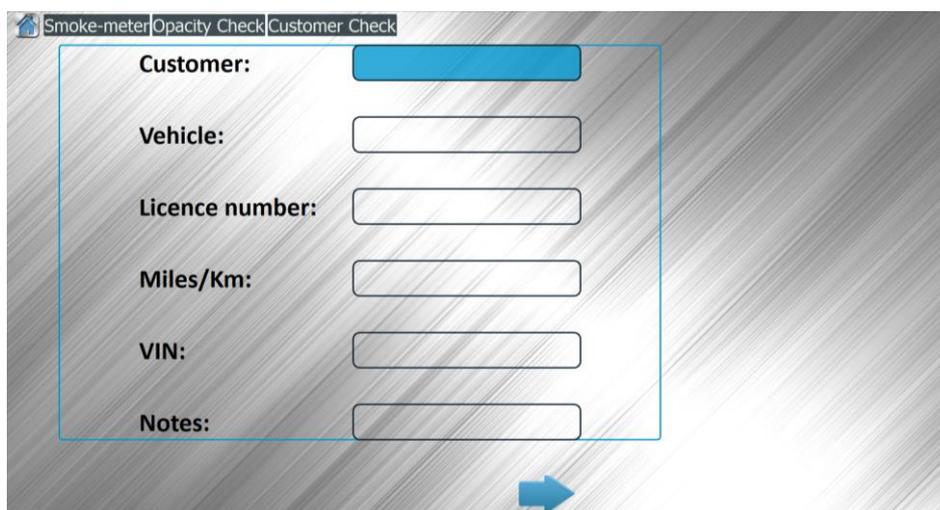


- Opacity check for official test procedure
- Smoke free Test for to determine the opacity of the vehicle

III.5.1. Client data entry

From the moment the test procedure is launched, the user may, if he wants, enter information about the client and his car (name, vehicle brand, mileage and ID plate number). These data will then appear on the test report.

The entry window appears this way:

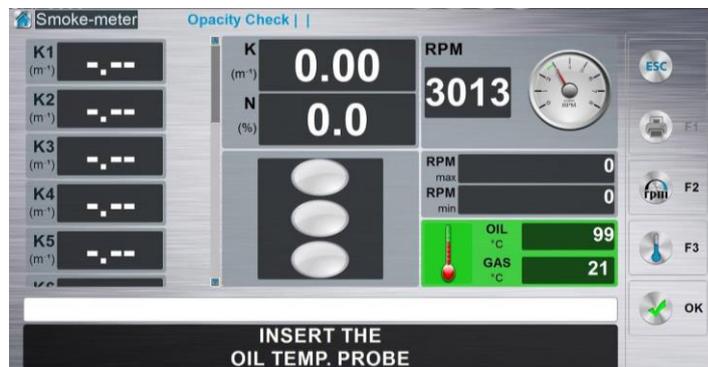


The screenshot shows a software window titled 'Smoke-meter Opacity Check Customer Check'. It contains a form with the following fields:

- Customer:
- Vehicle:
- Licence number:
- Miles/Km:
- VIN:
- Notes:

A blue arrow points to the right at the bottom of the form area.

III.5.2. Description of the graphic interface:



This graphic interface is composed of several elements:

- ◆ The tachometer:

The tachometer reading may run from 0 to 9999 rpm. In addition, a graphic drawing allows the trend in engine operating speed to be quickly visualized.

Only one of the sensors allowing the engine speed to be caught is needed for reading the rotation speed.

- ◆ The oil or engine temperature:

Use one of devices allowed. User can see value on this window.

- ◆ Current opacity:

This value constantly shows the current opacity; it is expressed in two opacity units. One is given per meter (m^{-1}) and the other in percent.

- ◆ The message box :

It directs the operator through the procedure. Messages displayed here are of two types:

Error messages. Every detected error or timeout results either in cancellation of the procedure or invalidation of the free acceleration. In both cases, the message window contains the type of error that caused the problem.

Instruction messages. During the procedure, several different phases follow one another in sequence. The message window indicates to the operator what he must do and what the opacimeter is doing. This allows easy understanding of the procedure and gives effective guidance to the operator.



- ◆ The «operating speed mode » key:

Allows the operating speed mode to be selected depending on the

sensor type used at the input.

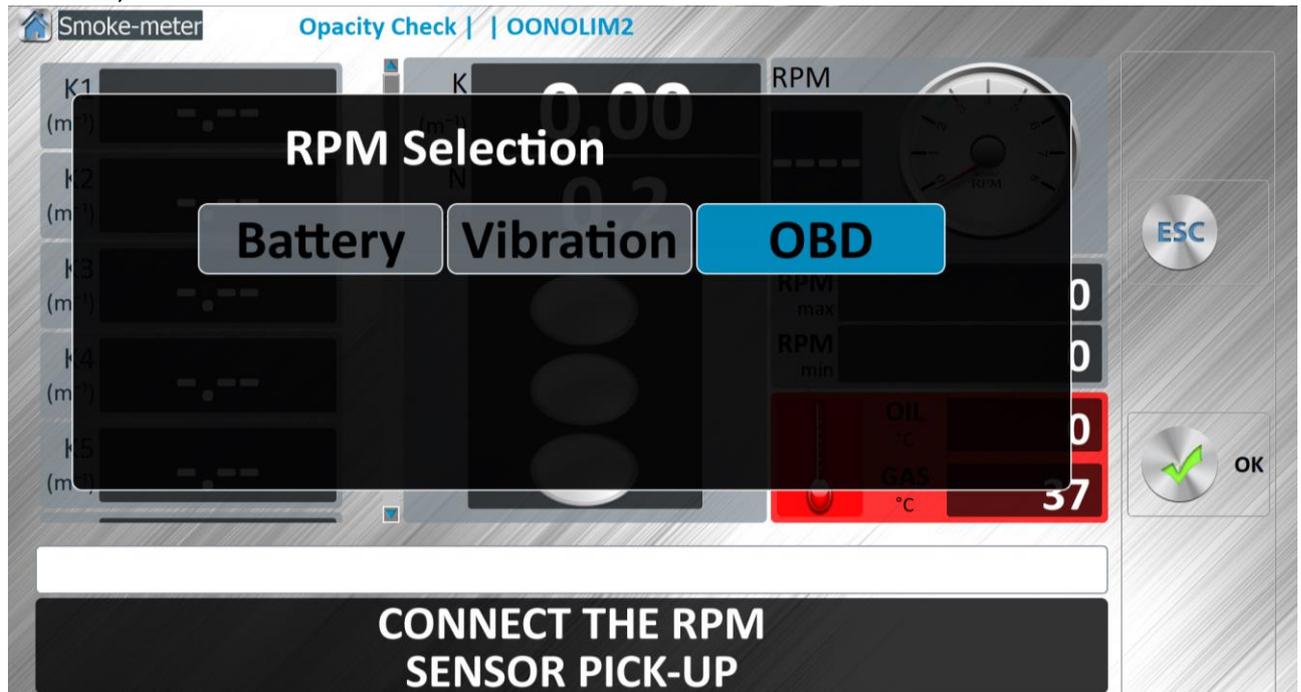


◆ The “print” key:

This key allows the results to be printed or transferred to a central computer in a technical testing centre for example.

III.5.3. Displays the selected operating speed mode:

Each time the opacity program is launched, the operator knows the operating speed mode that is selected,



RPM mode can be changed by pressing the rpm key

- « **E.O.B.D** »: This mode will retrieve the RPM value from the vehicle embedded computer.
- « **Battery** »: this mode will retrieve the RPM value from battery signal (noise).
- « **Vibration** »: this mode will retrieve the RPM value from engine vibration.



In case of difficulties to get a coherent value, turn the high beam lights on as well as the rear defrosting system and turn all the other tools off.

III.5.4. Detecting the cell

At the beginning of the test, the cell presence is checked.

After a few seconds, the cell is detected.

If not, the following message is displayed:

**COMMUNICATION PROBLEM
CHECK CONNEXION**

In this case, check whether the cell is properly connected.

III.5.5. Auto-zero and error checking

Following the phase which consists in preparing the vehicle for measurement and ensuring that it is operating correctly, the opacimeter needs to perform an auto-zero. This is an internal procedure in the measurement cell that allows it to calculate the sensitivity of the detect such that an invisible gas is assigned an opacity of 0.00 m^{-1} . This procedure is carried out automatically; it is however compulsory to check the following point:

DURING THE AUTO-ZERO OPERATION, THE SAMPLING PROBE MUST NEVER BE INSERTED INTO THE EXHAUST LINE OF A RUNNING ENGINE.

Before this procedure is launched, a general check of all the parameters of the cell is automatically carried out.

Three cases could then occur:

1°) The opacimeter was just started and the preheating phase is still in process. In this case, it is necessary to wait for the measuring chamber to reach its operating temperature. A specific message is displayed on the screen: it provides information on the procedure progress.

WARMUP 90%

2°) The opacimeter refuses to operate because it has detected an error or a breakdown. In some cases, it is possible to recover by carrying out the recommended operations (cleaning the measurement cell windows, for example); for others, actions described in the Maintenance manual are required.

3°) The opacimeter is ready.

The auto-zero operation will start. During auto-zero, this message will be posted on the screen.

ZERO IN PROGRESS

The auto-zero operation is a procedure which, taking ambient air as a reference, establishes the signal levels for zero opacity. It is therefore important not to put the measurement probe into the exhaust pipe until required by the software.

III.5.6. Probe and sensors Insertion

Once the auto-zero operation is carried out, the following messages appear on the screen:

**INSERT THE PROBE INTO
THE EXHAUST PIPE**

**INSERT THE OIL
TEMPERATURE SENSOR**

CONNECT THE RPM SENSOR

Now is the time to put the sampling probe, the oil temperature sensor and the tachometer in place:

III.5.6.1. The probe :

To do this, move the cell near the exhaust pipe outlet.

The probe must be inserted to a depth at least equal to 5 cm. If the layout of the exhaust line allows it, it is preferable to insert it as deep as possible. Ensure that the probe is not kinked, which might alter the flow of gas arriving at the measuring chamber.

The sliding clip on the probe allows the probe to be affixed to the exhaust pipe.

Only the original probe reference, allows valid results to be achieved. This probe may not be extended or modified.

III.5.6.2. The oil temperature sensor or engine temperature:

Select, according to the mode chosen:

- With the 85XX mode or « WIRED » mode, it is necessary to insert the probe into the gauge. Do not insert it too deep. Adjust the probe length in order for it to soak into the oil when the sealing cone acts as a stopper.
- With CAP13XX, point out one of the engine hot area
- With CAP4XXX, the engine temperature is automatically retrieved by the vehicle embedded computer.

After inserting the probe and the sensors, with the engine still running, it is necessary to notify the opacimeter that all is ready. To do this, press the OK key to move on to the following phase.

III.5.7. Preliminary checks

Before undertaking any measurement, the operator must satisfy himself that the engine is operating correctly. Opacity measurement being a rather demanding procedure for the engines, it is imperative that this step be carefully followed to avoid engine damage and to obtain a valid opacity measurement.

The following points are to be observed:

- The vehicle exhaust line must be gas-tight. This check can be carried out by partially blocking the exhaust while the engine is at idle. No leak must be observed.
- The gearbox must be in neutral, with the clutch engaged, for vehicles with manual or semi-automatic transmissions; the selector should be in neutral for vehicles with automatic transmissions or in accordance with the instructions of the vehicle manufacturer.
- Accessories and optional equipment that influence the engine speed at idle must not be activated, barring manufacturer's instructions or regulation to the contrary.
- The engine must be at normal operating temperature

III.6. OPACIMETER MESSAGES

III.6.1. Error messages

III.6.1.1. « Mains voltage out of bounds »

The cell power supply should be between 195 and 253 VAC.

Beyond that, the cell cannot operate correctly. Have the mains power checked.

III.6.1.2. « Windows dirty »

You must turn the equipment off and proceed a cell lens cleaning as described in the maintenance chapter of this manual.

III.6.1.3. « Fan is defective »

The air flow system is unable to ensure a constant effective length. Call the Maintenance service.

III.6.1.4. « Sensor problem »

A temperature sensor is defective; call the Maintenance service.

III.6.1.5. « Warming »

Tube temperature must be 80°C. It is therefore necessary to carry out a warmup operation whose duration can vary from 3 to 6 minutes.

III.6.1.6. « Detector Temp. out of range »

The temperature of the optical detector must be between 25 °C and 45 °C.

After a preheating period, this error resolves itself. Wait.

III.6.1.7. « Time left »

If no acceleration was detected within the prescribed interval, this message appears.

III.6.1.8. « Probe connected? »

This message appears right away after the preceding one, because, most of the time, non-detection of an acceleration is caused by an incorrectly inserted probe.

III.6.1.9.« Measurement invalid »

The opacity curve contains several peaks, making it impossible to determine opacity. Use more vigorous foot pressure on the accelerator

III.6.2.User guidance messages

III.6.2.1.« Zero in progress»

This message should disappear after a few seconds at the end of the auto-zero operation. Maximum duration should be 4 seconds. It is not an error; it means that the procedure for resetting opacity to zero is in progress. Wait.

III.6.2.2.« Acceleration No X »

This message indicates the beginning of a new acceleration.

The user must therefore push the accelerator pedal all the way down as soon as this message is displayed.

III.6.2.3.« Measure in progress »

Acceleration has been detected; the accelerator pedal must be kept pushed to allow acquisition of opacity during the current acceleration.

III.6.2.4.« Return to idle »

Starting with this message, the accelerator pedal must be released and the cell sends the central unit information about the vehicle's opacity.

IV. EOBD MODULE

IV.1. Overview



The Scantool is a tool allowing access to the internal data of on-board systems. It connects to the OBDII auto diagnostic plug (SAE J1962 standard) of the vehicle and scans the information stored in memory or current data made available and accessible by one of the 5 standardized protocols.

- ISO 11519-4 (SAE J1850) at 41.6 Kbps PWM (FORD).
- ISO 11519-4 (SAE J1850) at 10.4 Kbps VPW (CHRYSLER- GM).
- ISO 9141-2 at 10.4 Kbps (European vehicles).
- ISO 14230-1.2 to 10.4 Kbps or Keyword 2000 (CAN equipped vehicles).
- CAN (Controller Area Network; Keyword 2000 layer) (system which will be applied generally to European vehicles in the coming years).

Since the 1st January 2000, all petrol vehicles sold in Europe must compulsorily be equipped with an on-board computer controlling engine and drivetrain operation and capable of communicating its internal information to diagnostic devices according to at least one of the 4 protocols cited earlier.

IV.2. Principle

The Scantool is not a measuring instrument. All information displayed on the screen is only information transmitted by the computer.

Information available varies according to each model.

Connected to the vehicle, the Scantool asks questions of the computer and displays the answers.

IV.3. Measure and control

IV.3.1. Connection

The Scantool connects directly to the EOBD connector of the vehicle. This connector allows communication the computer and also power supplies this unit.

Generally this connector is located under the dashboard on the driver's side, in the glove compartment or under the main ashtray.

It is therefore easy to make measurement while staying, the Scantool in hand, inside of the vehicle. This is especially appreciated in the context of measurements carried out on the road.

The connector is shaping as following, and the CAP4XXX is connecting as following:



Certain vehicles manufactured between 1996 and 2000 are equipped with this connector. Everything appears to show that they are equipped with OBD.

IV.3.2. CAP4XXX

First connect the device to the vehicle EOBD connector. The device red led will light on. It will start blinking when the communication with the embedded computer is established.

Caution: CAP4XXX and embedded computer can communicate only and only if the vehicle engine in on.

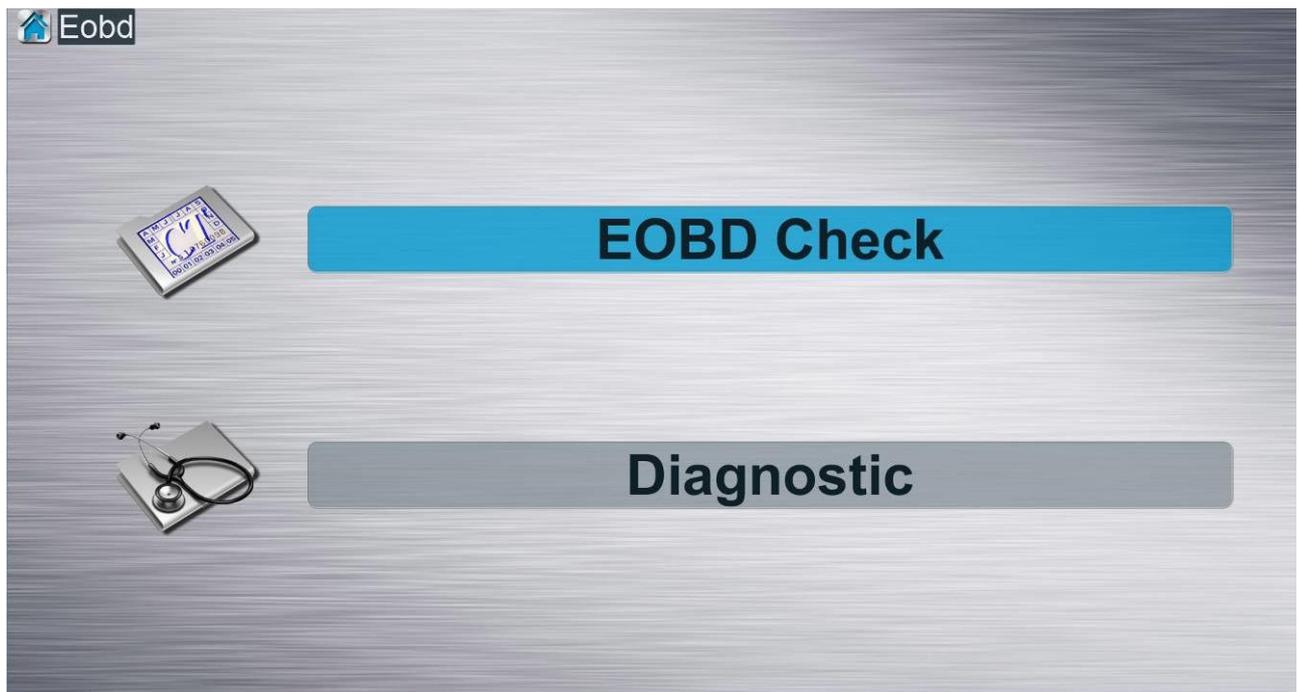
Select EOBD from the main menu.

IV.3.3.Diagnosis Menu

This menu is mainly dedicated to garages, not submitted to any procedure imposed by the PTI regulation. It gives access the various data retrieved by the vehicle embedded computer:

- Stored breakdown codes (injection, emission, AC, brakes, gearbox, body, chassis, network...),
- Active breakdown codes, (breakdowns detected but not confirmed yet. This breakdown exits but the computer will wait for several driving cycles to store it and turn the related led on)
- Current values, (list of measures done by the sensors in charge of regulating and controlling motorization),
- Fixe values (internal breakdown values),
- Oxygen sensor data (from lambda sensors),
- Test procedures,
- Reset procedure (erases memorized breakdowns and turns the board leds off),
- Information about vehicle (serial number, model, ...)

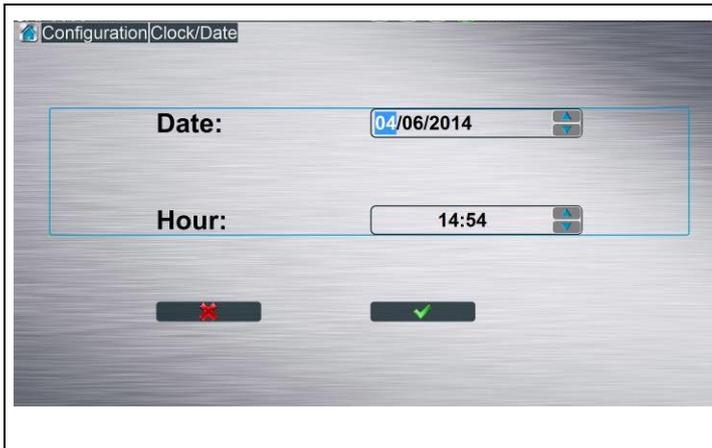
Choose “DIAGNOSIS » from the EOBD main menu to view these data.



V. CONFIGURATION

V.1. Clock/date:

Allows to change hour and date in the system.

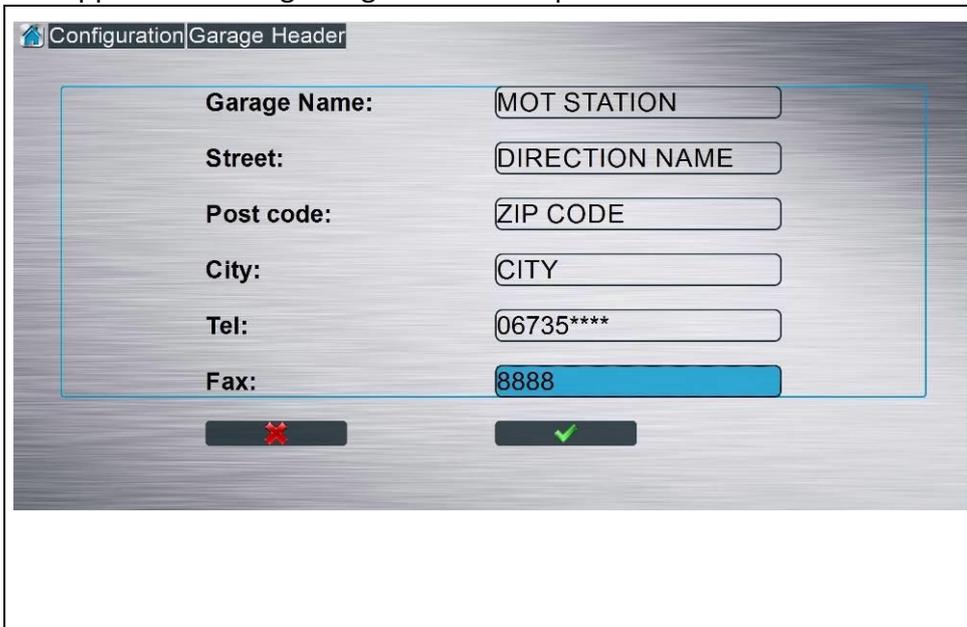


The field must be selected using the OK key; to change the value, press the UP and DOWN arrows. Finally, to save the new values, press OK.

Exit with the ESC key.

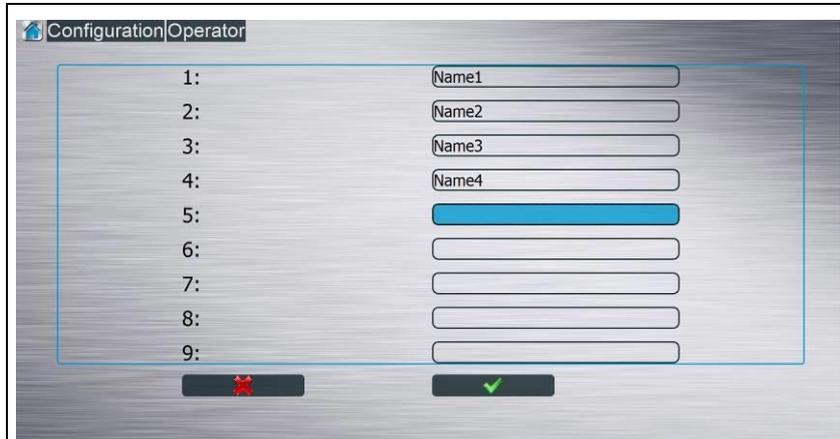
V.2. Garage Header:

This application requires information related to the garage to be filled in and personalized. This information will appear at the beginning of the test report.



V.3. Operator:

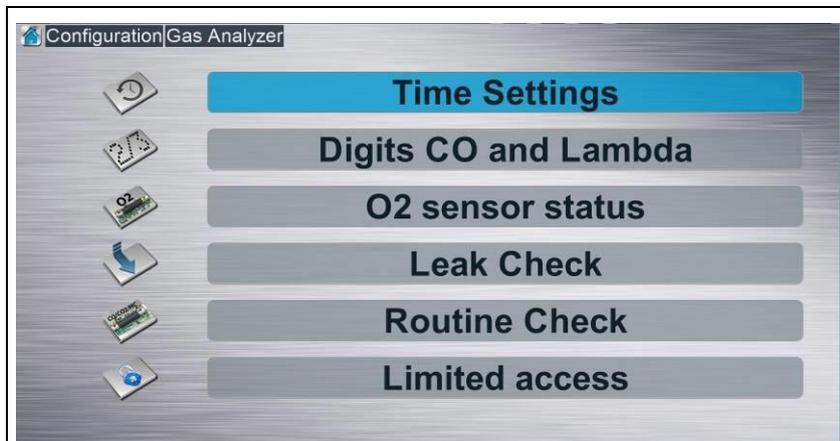
Up to 9 operator names can be stored on that page. The principle is identical to the entry of the garage header and client entry.



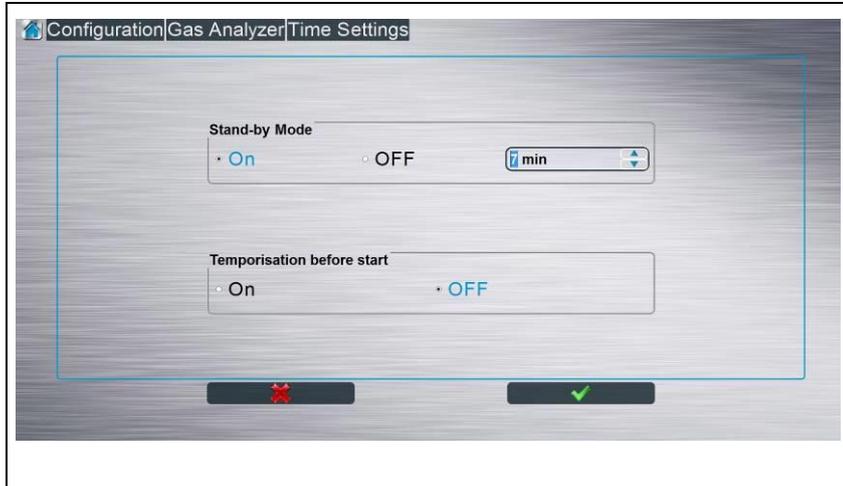
In the main menu, to select the current operator name, just click the name area. This name will appear on the printed report at the end of test.

V.4. Gas analysis:

When the operator selects « Gas analysis », the following window will appear:



V.4.1. Time settings :



The stand-by allows to stop pumps after a test.

This time can be set between 7 and 30 minutes.

The temporisation time allows adding additional time before starting a gas or smoke test.

V.4.2. Digits CO:

The DIGIT CO submenu allows selection of the number of figures after the decimal that you want to have when CO is displayed

V.4.3. O2 sensor status:

This window provides information on the oxygen sensor status. The machine performs a diagnostic on the sensor and gives its results of the sensor wear condition. Result is graduated from 0 to 100%, 100% corresponding to the most satisfactory status.

V.4.4. Leak test

The leak test is a procedure allowing the detecting of any seal problems that might occur in the pneumatic circuit. It is imperative to carry out this test at least once every three months. It is also preferable that it be carried out at least once per month by the user. The presence of a leak involves immediate maintenance work.

This test is guided throughout. The operator must attentively follow the instructions given on the screen.

Test upstream of the pump:

The following message appears: "Plug the inlet". Blocking of the inlet is automatically detected by the analyzer. The pumps then shut off and the following message appears: "Test in progress." It is

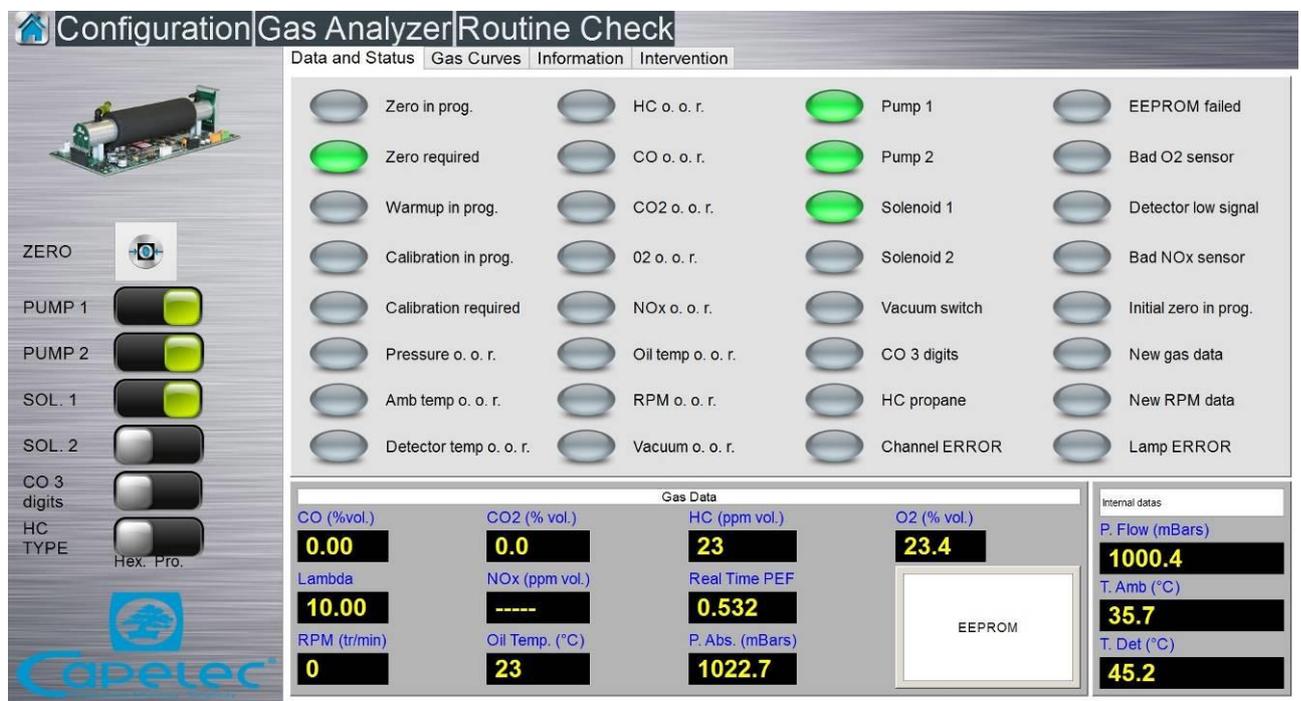
necessary to keep the inlet hermetically shut. This phase lasts at most 11 seconds. At the end of this phase, a diagnosis of “Leak present” or “Leak absent” is given. Push “OK” key to exit.

The presence of a leak disables measurement until a new test is carried out with a final result of “Leak absent”.

V.4.5. Routine check

This page shows operational data from the gas measurement cell. Gas pressure, ambient temperature, temperature of lamps and detectors. Also gives the Bench software version as well as its serial number.

All these data can be useful to your maintainer.



The screenshot displays the 'Routine Check' screen of the Gas Analyzer software. It is divided into several sections:

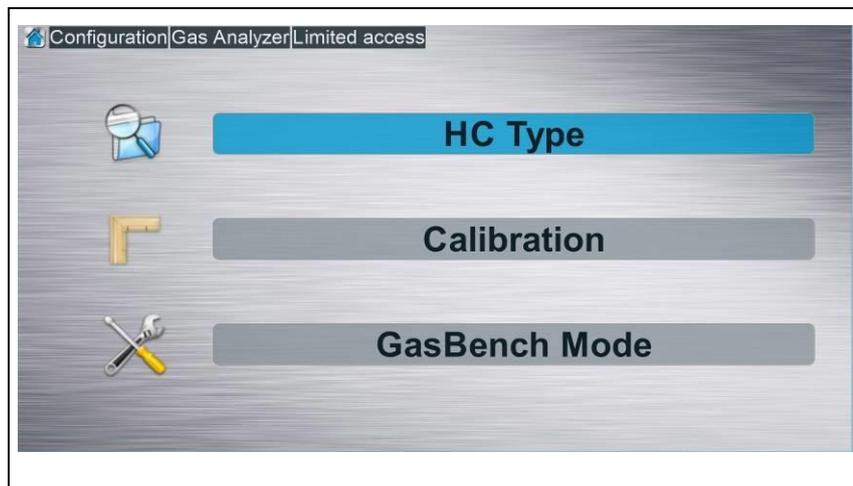
- Navigation:** Configuration, Gas Analyzer, Routine Check.
- Sub-tabs:** Data and Status, Gas Curves, Information, Intervention.
- Control Panel (Left):** Includes buttons for ZERO, PUMP 1, PUMP 2, SOL. 1, SOL. 2, CO 3 digits, HC TYPE, and Hex. Pro.
- Status Indicators (Top):** A grid of 20 indicators for various components:
 - Zero in prog. (off)
 - Zero required (on)
 - Warmup in prog. (off)
 - Calibration in prog. (off)
 - Calibration required (off)
 - Pressure o. o. r. (off)
 - Amb temp o. o. r. (off)
 - Detector temp o. o. r. (off)
 - HC o. o. r. (off)
 - CO o. o. r. (off)
 - CO2 o. o. r. (off)
 - O2 o. o. r. (off)
 - NOx o. o. r. (off)
 - Oil temp o. o. r. (off)
 - RPM o. o. r. (off)
 - Vacuum o. o. r. (off)
 - Pump 1 (on)
 - Pump 2 (on)
 - Solenoid 1 (on)
 - Solenoid 2 (off)
 - Vacuum switch (off)
 - CO 3 digits (off)
 - HC propane (off)
 - Channel ERROR (off)
 - EEPROM failed (off)
 - Bad O2 sensor (off)
 - Detector low signal (off)
 - Bad NOx sensor (off)
 - Initial zero in prog. (off)
 - New gas data (off)
 - New RPM data (off)
 - Lamp ERROR (off)
- Gas Data (Bottom Center):**
 - CO (%vol.): 0.00
 - CO2 (% vol.): 0.0
 - HC (ppm vol.): 23
 - O2 (% vol.): 23.4
 - Lambda: 10.00
 - NOx (ppm vol.): -----
 - Real Time PEF: 0.532
 - RPM (tr/min): 0
 - Oil Temp. (°C): 23
 - P. Abs. (mBars): 1022.7
 - EEPROM: (displayed in a separate box)
- Internal datas (Bottom Right):**
 - P. Flow (mBars): 1000.4
 - T. Amb (°C): 35.7
 - T. Det (°C): 45.2

V.4.6.Secured access

Enter the 5-digit secret code. Then push on OK.

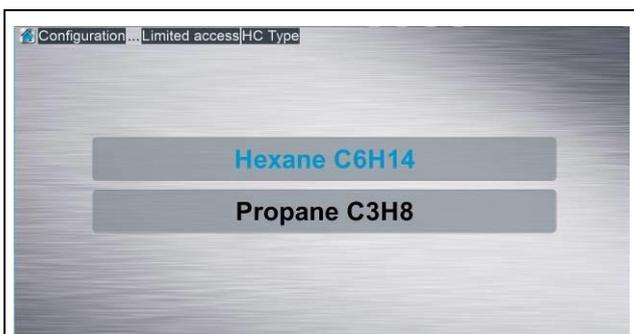
The machine requires the entry of the operator's name "**Carried out by:**" This information will be stored in memory and is not erasable.

This part of the program is dedicated to persons in charge of the equipment itself periodic inspection.



V.4.6.1.HC :

- Gives access to a sub-menu allowing to choose to display HC values either in equivalent value of propane or hexane.

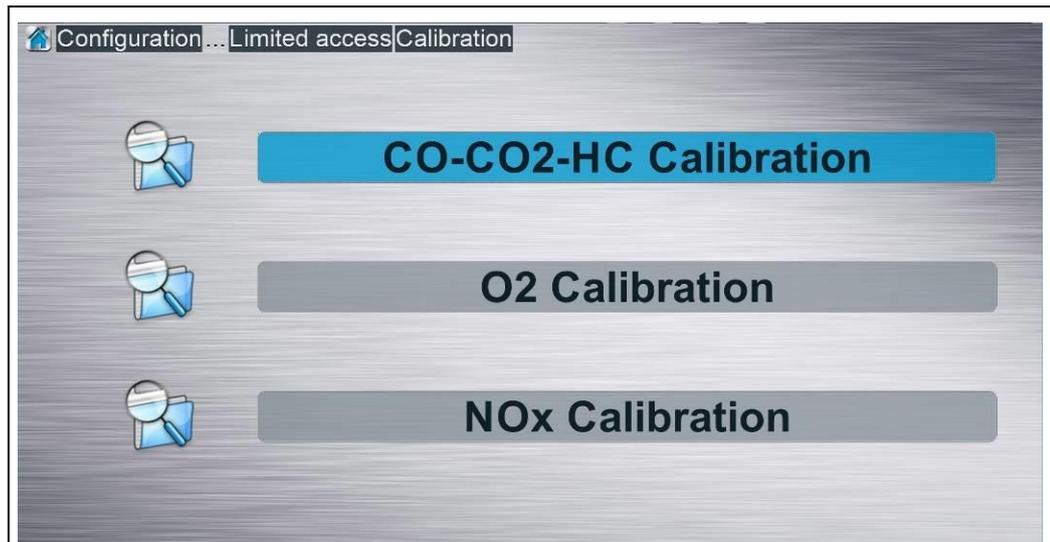


At the moment of calibration, the HC value automatically gets back to the equivalent in propane. Choosing propane allows a multiple gas check.

Note : the PEF displayed by the device is for a propane HC value close to 2000 ppm vol.

V.4.6.2.Calibration:

The second menu allows the equipment calibration, and offers several possibilities:



a) CO, HC, CO2 adjustment procedure:

→ Adjusting calibration gas concentrations:

 HC must be entered in propane equivalent.

Remember that the cylinder containing the gas required for analyser adjustment contains the following concentrations:

CO: 2,00 % vol.

CO₂: 13,0 % vol.

HC: 1600 ppm vol. propane

Balance N₂

The operator must enter the values of the CO, CO₂ and HC gas concentrations. To go to the next step, OK or ENTER must be pressed.

→ Launching the adjustment procedure:

The operator is guided throughout the procedure by messages indicating the various steps that the machine carries out during an adjustment procedure.

b) O2 initialization:

→ New O2 sensor:

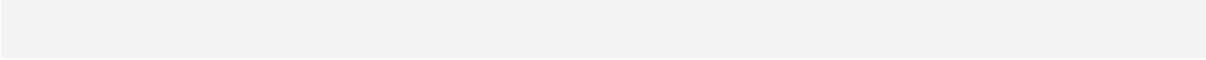
This tab is used for installing a new O₂ sensor. It is necessary to follow the procedure, which requires changing the O₂ sensor first, then pressing OK. Once this step is completed, the machine initializes the sensor for 1 minute. This consists in recovering the new sensor reference voltage.

→ O₂ 0% adjustment:

To adjust O₂ sensor to 0%.

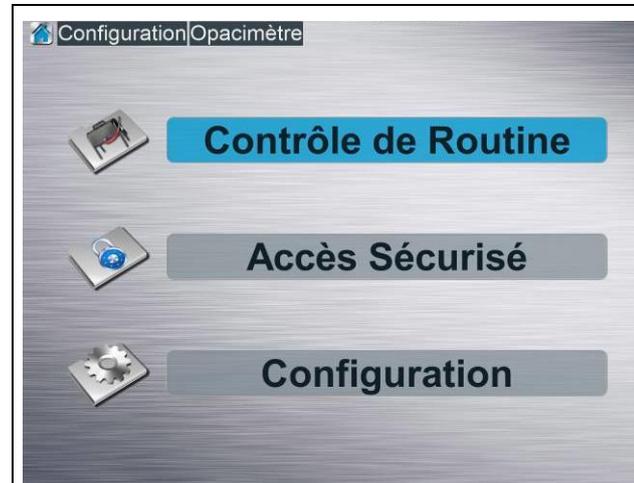
c) NOx initialization:

Same as O₂ sensor initialization.



V.5. Smoke-meter:

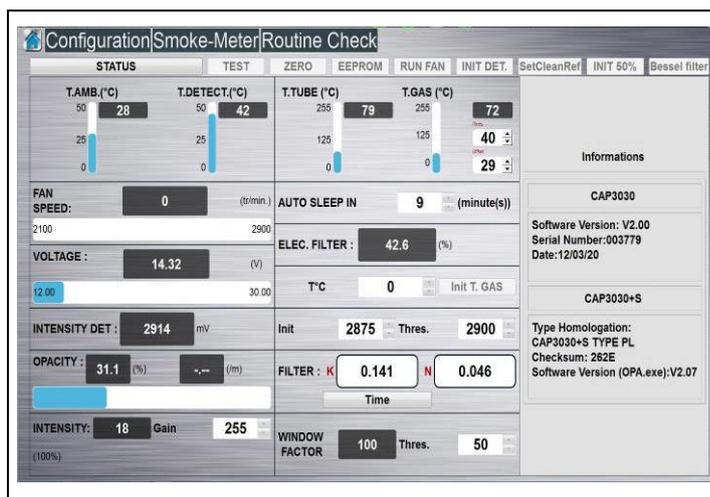
This menu is composed of 3 sub-menus detailed hereafter:



V.5.1. Routine Check:

The « routine check » sub-menu allows the operator to control the smoke-meter is working properly, by accessing the various cell parameters:

This window provides useful information.



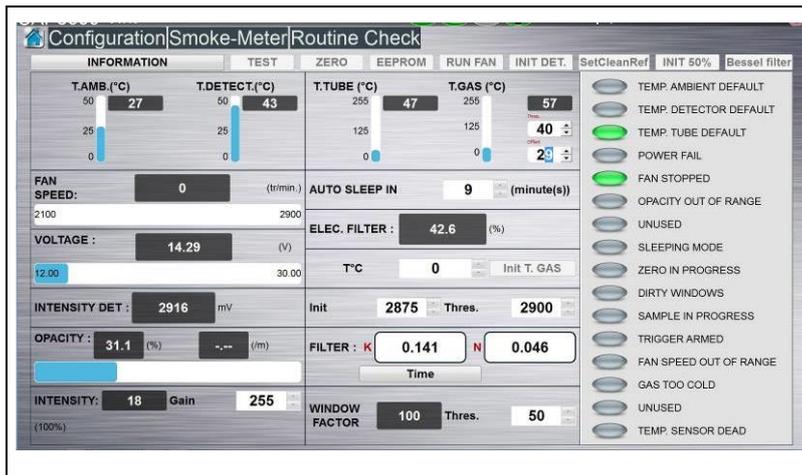
Information about the cell status :

- Current status
- Information about version

Available commands :

- Fan stop
- Zero
- Transmitter adjustment

Push the « TEST » key to have the test results.



This page shows temperature parameters, power supply tension, fan rotation speed.

CK and CN filters correspond to the electric filters values used by the cell.

Two possible commands from this page:

a) Autozero :

This key is to automatically launch the autozero procedure.

b) Error assessment from opacity values: « **TEST** »

It is about an automatic check done by electric filters around 50% and allowing to verify measures accuracy. The error is considered acceptable if not over 5%. Press “TEST” to launch this operation.



Before launching the test, proceed an autozero if opacity values are not equal to 0.

A window will appear showing the result. If this last shows “smoke-meter not conform”, clean the cell and launch the test again.

V.5.2.Secured access :

This menu is exclusively accessible by the manufacturer, CAPELEC, as it gives access to secured parameters.

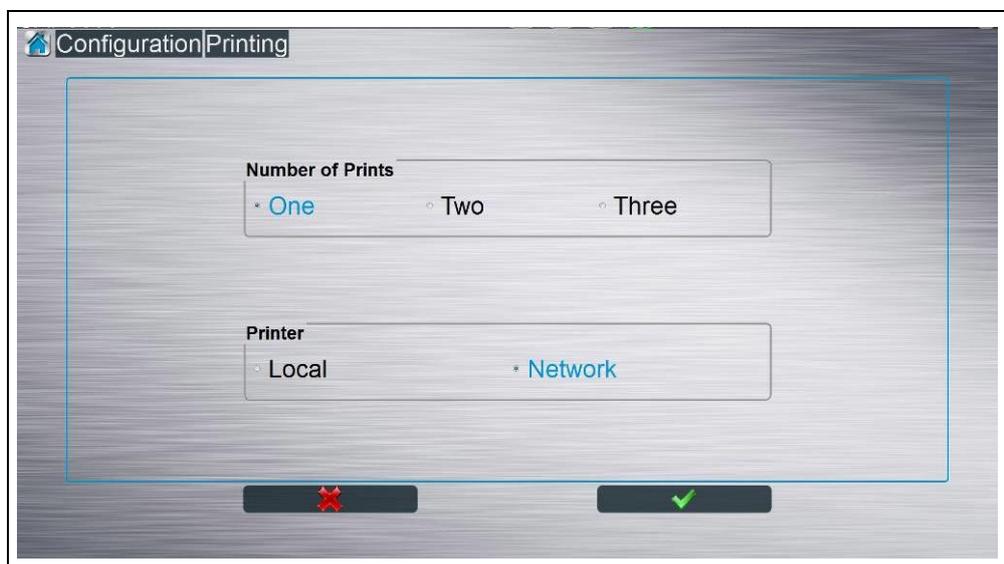
V.6. Centralization:

This menu allows to manage centre communication network.

V.7. Printing:

This menu consists of 2 sub-menus:

- « number of tickets » : allows to print 1, 2 or 3 reports once the test is finished
- « Printer » : for the operator to choose to printer to be used.



V.8. Impression Test:

All the tests, printed or transmitted, are stored in the PC hard disk

It also allows the access the tests database and print them again when necessary.

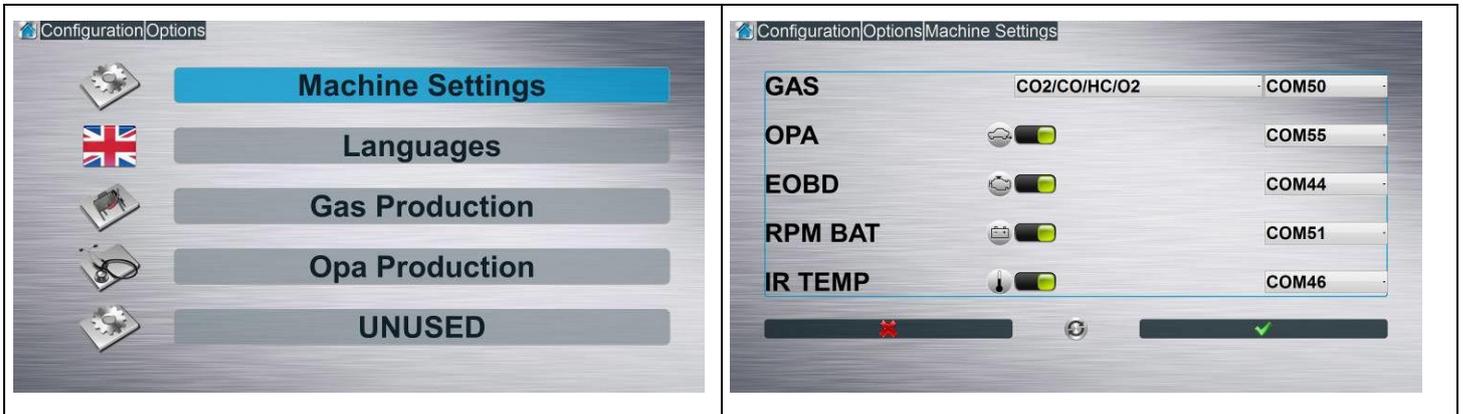
The files are stored in pdf format.

They can also be downloaded on a USB key by pressing « STORE »

V.9. OPTION:

This sub-menu is dedicated to persons in charge of installing new functions. It is secured by a 5-digit code.

Select the configuration menu in order to install a new feature.



This windows shows all the functions and options already installed.

V.10.Parameters by default :

WARNING: This window has to be used with caution because it allows resetting all the configuration values.

V.11.PC keyboard

Declare here whether the virtual or physical keyboard will be used.

Programming « absent keyboard » means the operator will preferably use the virtual keyboard.

V.12.Info Maintenance

This menu access is secured by a maintenance code.

It is possible here to fill in the information about the maintenance company, to add a logo but also to set the commissioning date.

At the moment of 1st programming, the commissioning date key is active (green). Then, once this information filled in, it will become inactive in order to make it impossible to be changed.

Configuration | Info Maintenance

Nom:

Adresse:

N° Siret:

Tel:

Logo:  

Date Service:

V.13.Information :

This window includes the manufacturer and maintenance company details, as well as information about software version. For more information on our products, visit our Internet site: www.capelec.fr.



This symbol indicates that, in accordance with directive DEEE (2002/96/CE) and with the regulation of your country, this product should not be thrown with the household refuse. You must deposit it in a place of collecting envisaged to this end, for example, an official site of collection of the electric components and electronics (EEE) for their recycling or a terminal point of products authorized which is accessible when you acquire of a new product of the same type as the old one. Any deviation compared to these recommendations of elimination of this type of waste can have negative effects on the environment and the public health because these products EEE generally contain substances which can be dangerous. In parallel, your whole co-operation with the good reject of this product will support a better use of the natural resources. To obtain more information on the points of collection of the equipment to be recycled, contact your town hall, the service of collection of waste, approved plan DEEE or the service of garbage collection domestic.