GAS ANALYZER
INFRAGAS-109 • INFRAGAS-205 • INFRAGAS-209
INFRAGAS-305 • INFRAGAS-309

OPERATION AND MAINTENANCE MANUAL

Mod. MAU_GAS_G rev. 1.71 dated 27/02/2018
ASSEMBLAD – Automotive Division - Technical dept.

CE

GB

Note:

INDEX

1 GENERAL INFORMATION

Please read carefully this manual before use and strictly attain to the following instructions to carry out measures and maintenance operations.

INFRAGAS-109 / 209 / 309 / 205 / 305 are infrared gas analyzers to measure car and motorcycle exhaust gas.

Some operation, measure, device or function have an asterisk between brackets (*); this means that such operation, measure, device or function is available only on certain models while on others can be an optional.

The technical characteristics and homologations may be referred only on certain models.

Open the equipment only during operation for which it is clearly indicated and after having switched off the power supply; close the equipment and put it in the original configuration before switching on again, in particular close and lock the cover.
Take care of the correct tubing and pipe connection, avoid to breath fumes and make sure they can be dispersed in an open ambient.
The manufacturer decline every responsibility in case of an incorrect use or an use not expressly specified in this manual; the responsibility is anyhow limited to the equipment's repair operation with the exclusion of any other direct or indirect damage.

For more information please read the chapter "Warranty condition".
For technical support or spare parts requests please read the chapter "Technical Support"

Due to the continuous technical development of Assemblad equipments, the gas analyzer could have new functions, or modified functions, than that specified on this manual.

The gas analyzers performs measures in compliance with Italian "D. M. n. 628 of 23/10/1996", and subsequent modifications as for "Circ. n. 88/95 of 6/09/1999".
The gas analyzer performs measures in compliance with Italian "D. M. of 16/01/2000" , and subsequent modifications as per "C. d. of M.d.T. of 4/01/2002" and "Circ. 64/404 of 19/01/2005"
The gas analyzer is approved for the communication protocol defined by the technical specifications MCTCNET version 2.10 dated 24/09/2015 and subsequent integrations.

The gas analysers are homologated for OIML R99, edition 2008, class 00 and for MID (MI-0.10) n. SK 15 – 044 D.

2 TECHNICAL DATA

RANGE AND RESOLUTION

		RANGE			RESOLUTION
CO		0	÷	9.999 vol. %	0.001 %
CO2		0	÷	19.99 vol. %	0.01 %
HC		0	÷	15000 ppm	1 ppm
O2		0	÷	25,00 vol. %	0,01%
RPM		0	÷	9999 rpm/1'	1 rpm/1'
Oil Temp.		0	÷	130 °C	0.1 °C
Int. Temp.		0	÷	50°C	0.1 °C
Amb. Press.		800	÷	1060 mbar	1 mbar
NOx	(*)	0	÷	5000 ppm	1 ppm
CO corr.		0	÷	9.9 vol. %	0.1 %
Lambda		0.500	÷	2.000	0.001

OPERATIONAL CHARACTERISTIC

Response Time	- 20 sec. max
Warming Time	- 2 min. typical
Temperature range	- 0 °C ÷ + 40 °C
Supply	- 9 ÷ 16 Vcc
Power	- 30 W max
Barometric pressure	- 850 ÷ 1060 mbar
Gas flow	- 3 l/min
Compressed air (*)	- from 2 to 4 bar
Periodic calibration	- 12 months max.
Dimensions	- 263x155x84 mm (Infragas-109)
	- 290x198x168 mm (Infragas-209/309)
	- 344x160x270 mm (infragas-205/305)
Weight without pipe	- 3,0 Kg about (Infragas-109)
	- 6,8 Kg about (Infragas-209/309)
	- 4,2 Kg about (Infragas-205/305)

DISPLAY – KEYBOARD

N. 1 Display LCD with backlight 240*128 pixel.
N. 16 alphanumerical keys.

PRINTER

Thermal printer 32 column customizable with workshop data.

SERIAL INTERFACE

1 or 5 (*) serial interface RS-232 9 pin, 9600 baud, 8 bit, no parity, 1 stop bit.

OTHER FUNCTIONS

Compatible with communication protocol MCTCNET
Low flow warning
Automatic and continuous condense drainage
Automatic calibration
Error indication
Clock – calendar (*)

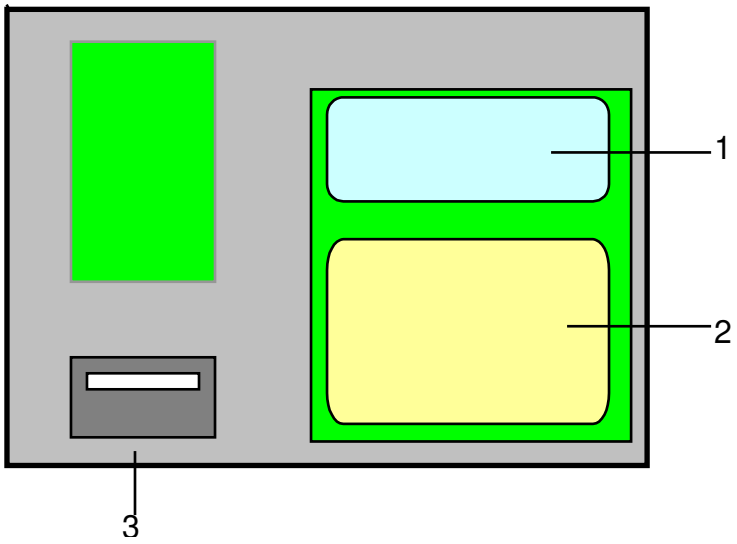
3 DESCRIPTION

INFRAGAS-205 PONY is an multifunctional exhaust gas analyzer for vehicles based on microprocessor electronic.

3.1 GENERAL SPECIFICATIONS

- CO, CO2 and HC measure with non dispersive infrared absorption method.
- O2 (oxygen) measure with electrochemical transducer contained into the equipment.
- RPM measure using an external universal RPM counter.
- Oil temperature measure with a dedicated probe.
- Lambda and CO correction calculation in accordance with the international norms.
- Ambient pressure measure with barometric pressure transducer.
- Internal temperature measure for measures compensation.
- Clock/Calendar with a dedicated battery in order to maintain data also with power off. Date and time can be easily set with the keyboard (see specific chapter) or using a PC connection.
- Automatic drainage of condense. In case a fault occurs an indication will appear on the display and the gas suction will stop.
- Motorcycle version performs an automatic cleaning of the probe during every calibration.
- Visualization of each value on the hi-intensity backlight LCD for the best visibility in every working area.
- Thermal printer, customizable with workshop data. Each measured value, also the ones not displayed, will be printed.
- Membrane protected keyboard to avoid moisture and liquid ingress.
- Gas filter device (condense separator and corpuscular filter) fitted on rear panel for a quick and easy maintenance.
- Display indication of faults as: missing flow, pneumatic line fault , condense drainage fault, etc.
- Measure with automatic calibration, test procedures indication and vehicle gas suction indication.
- Standard serial interface RS-232 for connections with personal computer and other equipments.
- Bluetooth interface for connections with personal computer and other equipments (*).

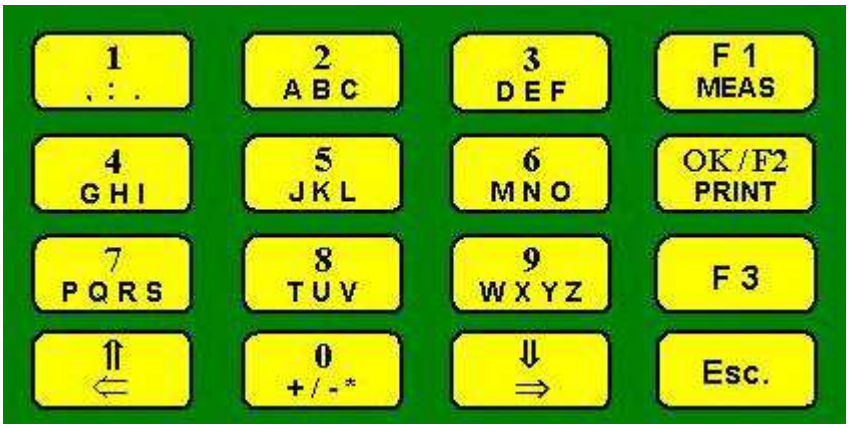
3.2 FRONT PANEL INFRAGAS-205/305



Main items on the front panel of Infragas-205/305:

1) Display LCD
2) Keyboard
3) Thermal printer.

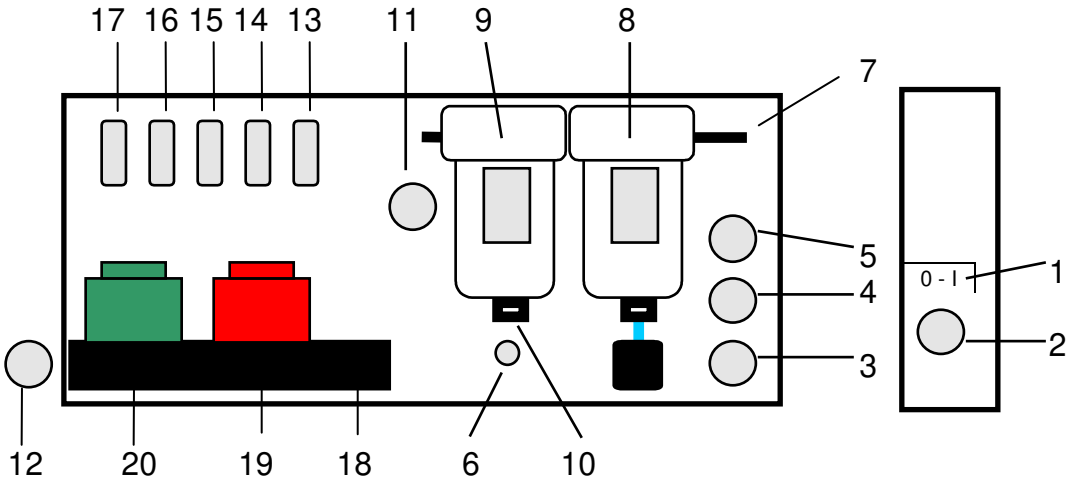
3.3 KEYBOARD



Keyboard Infragas 205/305

Key MEAS:	Start measure.
Key OK/PRINT:	Confirm entered data. Print results when test is finished.
Key F3:	Force test to continue or end also in case of non positive data.
Key ESC.	Stop test execution and go back to main menu. Go back of one level when into a menu.
Key 0 ÷ 9	Alphanumerical data input (mobile phone style).
Key Arrows	Choice of set-up data. Alphanumerical data cancellation. LCD contrast setting. Choice of data to be displayed.

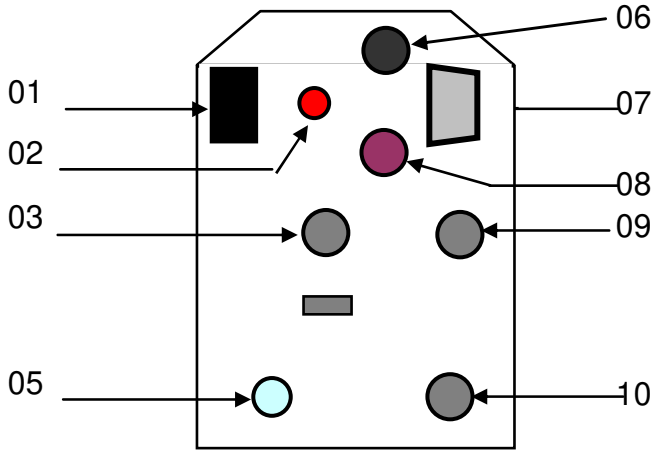
3.4 REAR PANEL INFRAGAS 205/305



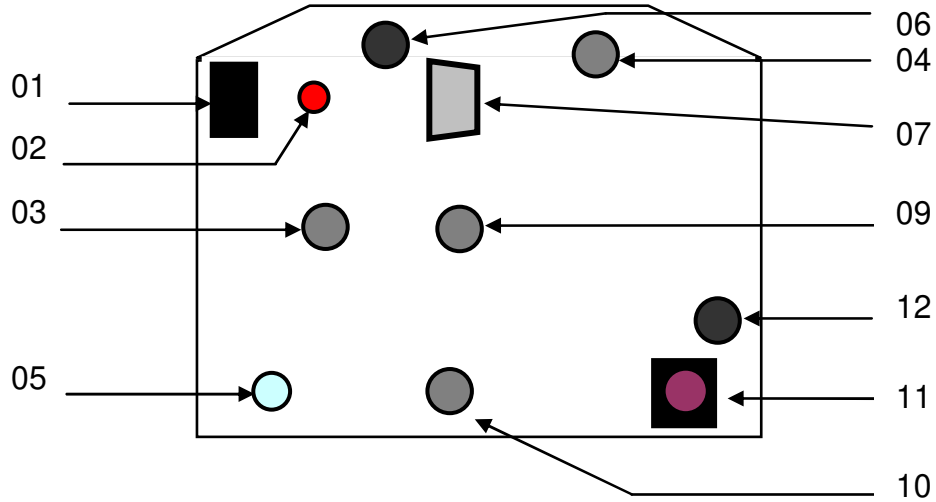
Main items on the rear panel of Infragas-205/305:

1) Power on switch.
2) Fuse.
3) Power supply plug.
4) External RPM Counter connection.
5) Oil temperature probe connection.
6) Drainage.
7) Exhaust Gas input.
8) Condense separator and filter cartridge (5 micron).
9) Condense separator and filter cartridge coalescence (motorcycle*).
10) Condense sensor.
11) Compressed air input (motorcycle*).
12) Exhaust Gas output.
13) PC Serial connection.
14) Smokemeter Serial connection.
15) Speedometer Serial connection.
16) Universal RPM counter Serial connection.
17) EOBD Serial connection (*).
18) Active carbon filter.
19) Oxygen Sensor
20) NOx Sensor (*)

3.5 CONNECTOR PANEL INFRAGAS 109



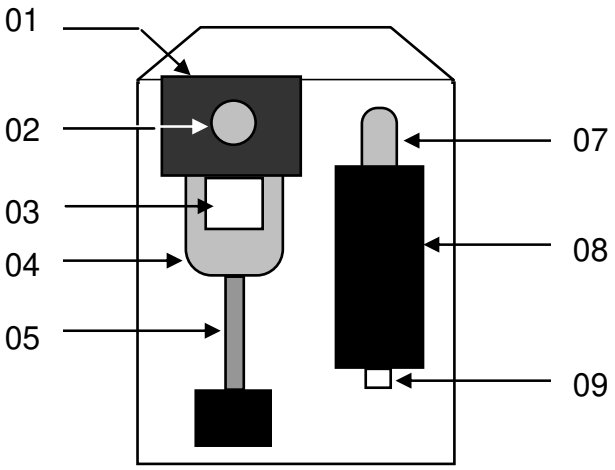
3.6 CONNECTOR PANEL INFRAGAS 209/309



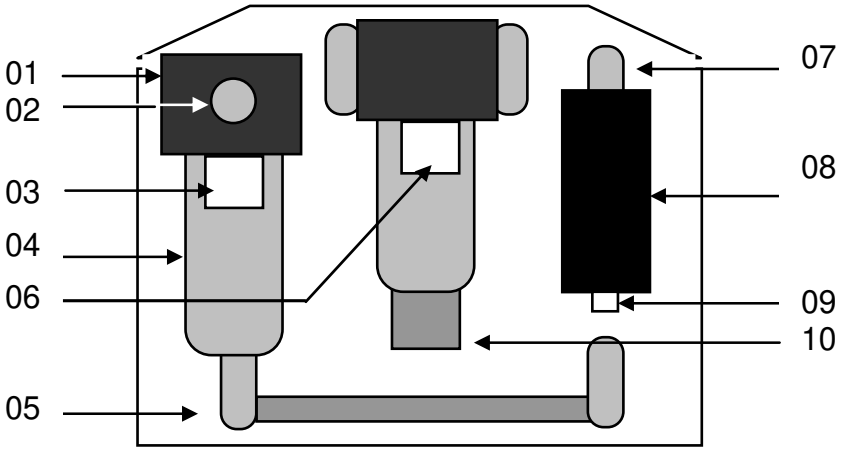
Main items on the connector panel of Infragas-109/209/309:

01 – Power on switch.
02 – Led
03 – External RPM Counter connection.
04 – Compressed air input
05 – Drainage.
06 – Fuse gas analyser
07 – RS-232 connector
08 – Power supply plug.
09 – Oil temperature probe connection.
10 – Exhaust Gas output.
11 – Connector battery charger.
12 – Fuse battery

3.7 GAS PANEL INFRAGAS 109



3.8 GAS PANEL INFRAGAS 209/309



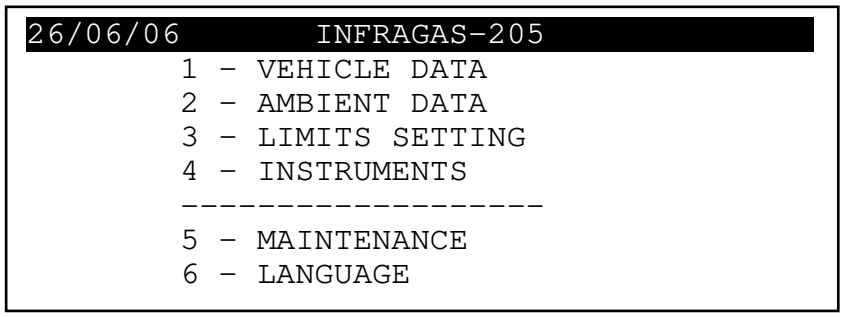
Main items on the gas panel of Infragas-109/209/309:

- 01 – Condense separator
- 02 – Exhaust Gas input.
- 03 – Filter cartridge (5 um)
- 04 – Cup of condense separator
- 05 – Condense pipe
- 06 – Filter cartridge 25 um (Coalescent 0,01 um for Infragas-309)
- 07 – Input condense sensor case
- 08 – Condense sensor case
- 09 – Condense discharge
- 10 – Valve for manual discharge

3.9 DISPLAY AND MENU

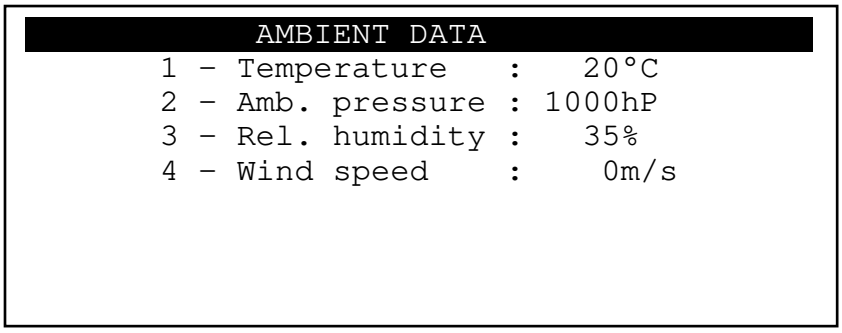
The gas analyser INFRAGAS-205 has a display to show the menu and the measurement. Some part may be not enabled, some other reserved for technical service.

MAIN MENU



This menu is displayed when we turn on the instrument and when we come-back from other menu.
In the high-left corner is showed the data, in the upper centre is reported the selected instrument, to operate the choice push the key-number.
After a short time the backlight is switched-off, push the ESC key to restore.
Use the arrow keys to set the contrast of the LCD, this function work only in this menu.

AMBIENT DATA



Use this menu to enter ambient data.
These data must be read from a dedicated instrument and they will be printed onto the test result report.
Press ESC to go back to the main menu.

VEHICLE DATA

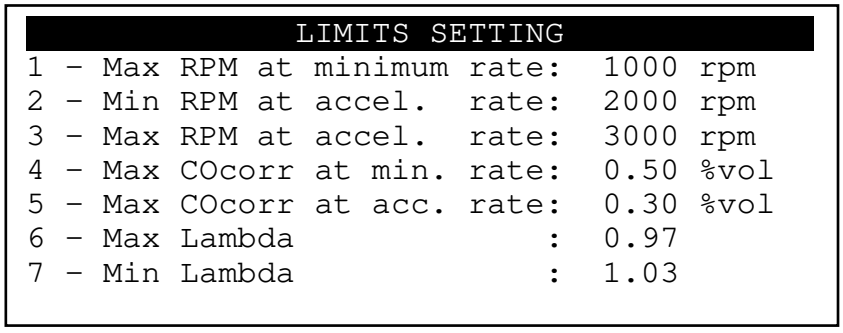
```
VEHICLE DATA
1 - Plate       :
2 - Reg. date   : dd/mm/yyyy
3 - Fuel type   : Gas. CAT
4 - N. cylinder : 4
5 - Engine      :
6 - Chassis     :
7 - oth choices :
```

```
VEHICLE DATA
1 - Vehicle type: Car
2 - Displacement:
3 - n. exhaust  : 1
4 - Transmission: Gear
5 - conf. 97/24 : No
6 - Trade name  :
7 - oth choices :
```

```
VEHICLE DATA
1 - type        :
2 - Company     :
3 - Mileage     :
4 - Km of condit:
5 - V.max Km/h  :
```

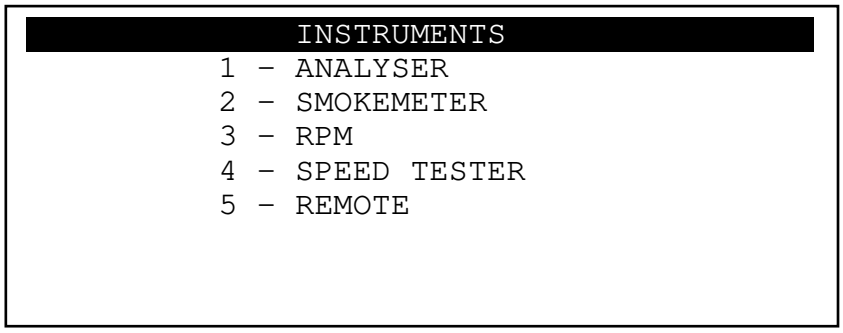
Press the corresponding key number to select the value you want to set, use the alphanumerical keys to enter a value, then press OK to confirm.
The ⇐ key delete previous character, the ⇒ key insert a space.
Before entering the registration date delete “dd/mm/yyyy”, then enter the correct date. The slash symbol will be automatically entered.
The following selections must be choice using the arrow keys:
Fuel type, N. cylinder, Vehicle type, Transmission, conf.97/24.
This selections, with Reg.date, will have an impact on the acceptable limits of the test.
Press ESC to go back to the main menu.

LIMITS SETTING



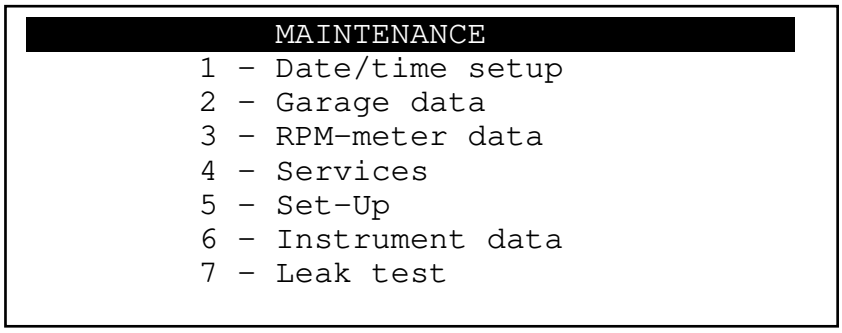
Acceptable limits of the test are set in accordance with the vehicle data entered.
It is possible, however, to edit such limits pressing the corresponding key, delete the present limit, enter a new value and press OK to confirm.
In case of no catalytic vehicle some limits will not be present because they are not requested for the test execution.
Press ESC to go back to the main menu.

INSTRUMENTS



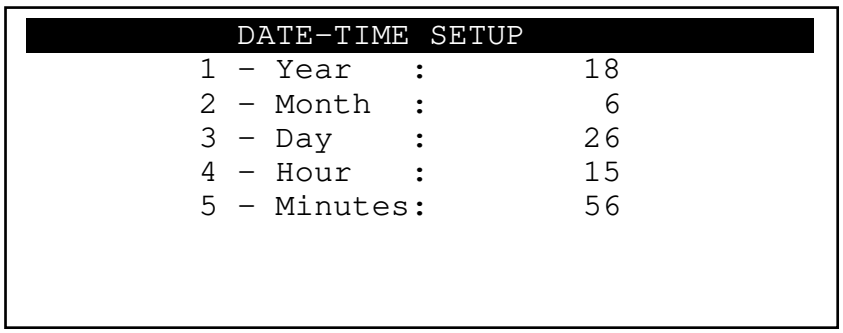
Press the corresponding numeric key to select the instrument you want to use then press OK to confirm.
If you need to connect and/or control the equipment with a PC you must select 'REMOTE'. With this selection the PC will be able to communicate with the internal gas analyser and with the connected smoke meter and RPM.

MAINTENANCE



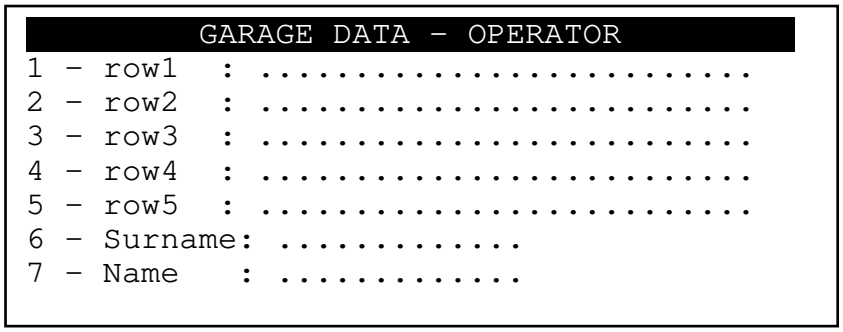
From this menu it is possible to enter on assistance and service functions.
Assistance and Set-Up are restricted to authorized technical personnel only and the access require a password.

SET DATE/TIME



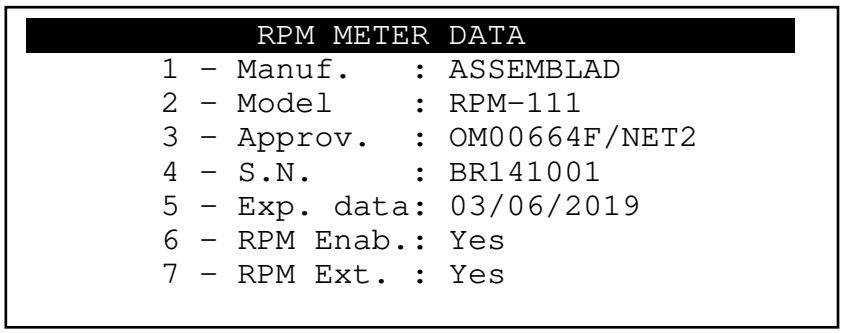
Press the corresponding numeric key to modify a value, delete present value using ⇐ key, enter a new value and press OK to confirm.
Press ESC to go back to the previous menu.

WORKSHOP DATA



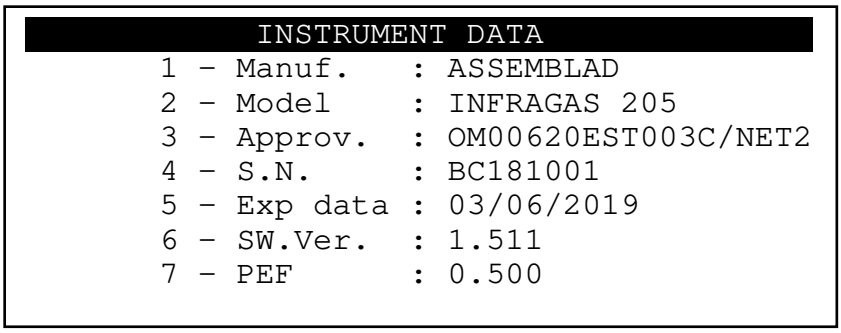
Press the corresponding numeric key to modify a value, delete present value using ⇐ key, enter a new value and press OK to confirm, max 24 character per line.
Press ESC to go back to the previous menu.

RPM DATA



In this menu the external RPM counter data will be entered.
Press the corresponding numeric key to modify a value, delete present value using ⇐ key, enter a new value and press OK to confirm.
Attention: if it is enabled the externat RPM conter but not connected or activated, the instrument report “COM: ERROR”
Press ESC to go back to the previous menu.

INSTRUMENT DATA



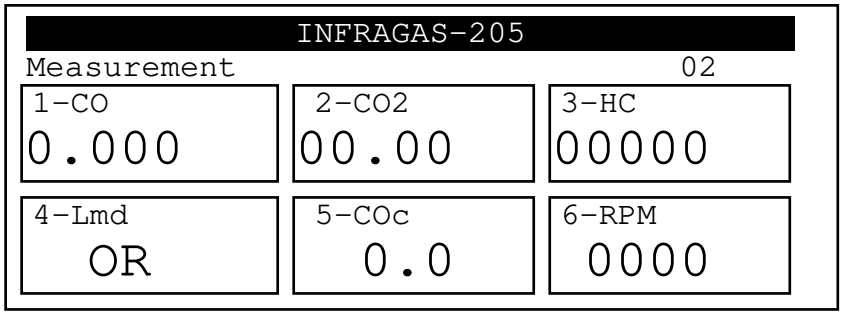
In this menu it is possible to read the information of the instrument connected.
Data cannot be modified (read only), they are acquired from the instrument.
Press ESC to go back to the previous menu.

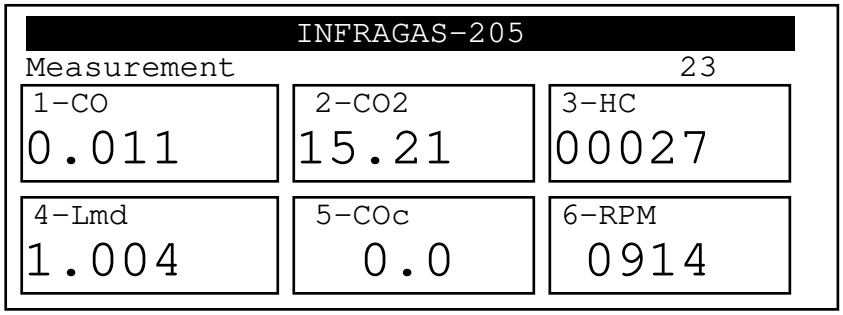
LEAK TEST

This function is able to perform the leak test on the pneumatic circuit of the gas analyzer. Refer to the specific paragraph for detailed instructions.

MEASUREMENT SCREEN

With the key F1 MEAS a measure is activated, the instrument perform an autozeroing, in this phase is possible to select the type DIAGNOSIS or CERTIFICATION with the key F3.





During the test phase the following data will be displayed:

- Test type, certification or diagnosis.
- Test duration in seconds.
- 6 windows with measured value displayed. To select different parameters press the corresponding numeric key, use arrows keys to select the required parameters, press OK to confirm.

Some help or error messages could be displayed depending on specific events that can occur during the test phase.

3.10 ACCESSORIES

STANDARD ACCESSORIES

1) Gas probe (for car). It is made by a teflon pipe protected by an external spring with a corpuscular filter that stops the non gaseous and bigger particles. The probe end is made with a steel pipe connected to a flexible and interchangeable stainless steel terminal.
2) Power supply 220Vac→12 Vcc, the model with battery inside have instead a battery charger
3) Oil temperature probe.
4) PC connection cable.
5) Operation and maintenance manual.

OPTIONAL ACCESSORIES

1) Trolley.
2) NOx sensor
3) Personal computer.
4) Software DRAGONGAS.
5) Bluetooth interface
6) Metrological logbook.

3.11 MOTORCYCLE PROBE

The gas probe supplied for motorcycle equipment is different from the one supplied for car analyzer
The motorcycle probe is made by a Teflon pipe with a condense separator, manually drained, with a 25 um filter.
The pipe is protected by a spring and it is connected to the gas analyzer and to the condense separator through quick connections.
The condense separator is mounted on a metal support, be sure that the drain valve positioned on the lower side is closed, verify that the flow direction goes from the terminal to the analyzer.

The finale part is made with a flexible brass pipe on which the terminal must be connected.
For motorbike use the rigid terminal with input from the bottom, pay attention to avoid solid parts ingress from the exhaust pipe and from the ground.

In alternative, flexible terminals can be used, these are more protected against detritus because suction holes are lateral.
To perform a measure with multiple exhaust pipes, connect to the brass pipe 3 “Y” unions, with the needed flexible terminals, close the holes not used with the dedicated caps.
Use washers and torque as necessary, verify that there is not air leakage with a leak test.

It is supplied an expansion brass tube with silicon adaptors.
This tube is positioned on the condense separator support and it is used as an extension for short exhaust pipe, when using this expansion tube, insert the rigid terminal into the tube itself.

3.12 WATERSTOP-206

The Waterstop-206 is an automatic anti-flooding device. It is used to protect the gas analyzer in case of abnormal quantity of condensate accumulated in the exhausts of vehicles.

Connection to the gas analyzer.

Put vertically the Water stoP-206, as indicated in Figure, near the input connection gas of the gas analyzer that we want to protect.

Connect with adequate pipe the gas analyzer to the Water stoP-206 upper connection (Output to ANALYZER)

Connect the gas probe to the lower part of the Water stoP-206 (Input from EXHAUST)

Operation

We remember you that the Water stoP-206 must be placed in a vertical position, as indicated in Fig. 1, and we strongly suggest to fix it to the analyzer or to the support trolley, using i:e a biadhesive tape or coupling, etc.

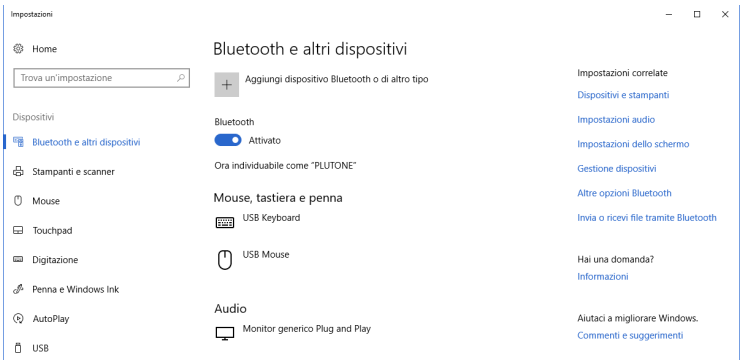
When the analyzer through the probe gas aspirates only gas from the exhaust the Water stoP-206 remains practically inactive and it does not interfere with the flow of gases. If, together with the gas, also any liquids arrive (§), or even only condensed water (§), the floater of the Water stoP-206 goes up till contacting with the gasket and closing every flux of gas and water to the analyzer (@@) .

When the Water stoP-206 stops, the analyzer in put in condition of “Low flow” or “No flow” or “Error....” and the anomaly will alarm the operator and stopping the aspiration pump.

Then to operator must stop the analyzer pump, remove the Water stoP-206 from the analyzer and expel all the water that has been stopped inside. Normally it is necessary to remove the Water stoP-206 from the analyzer because the depression created inside maintains closed the system of the Water stoP-206.

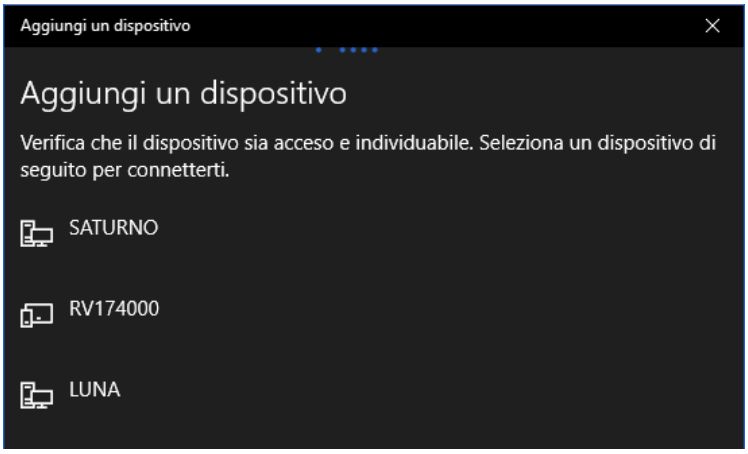
Every time after the Water stoP-206 is activated it is suggested to remove also the probe gas and to the eliminate the water eventually still inside

3.13 STANDARD BLUETOOTH USB ADAPTER CONFIGURATION

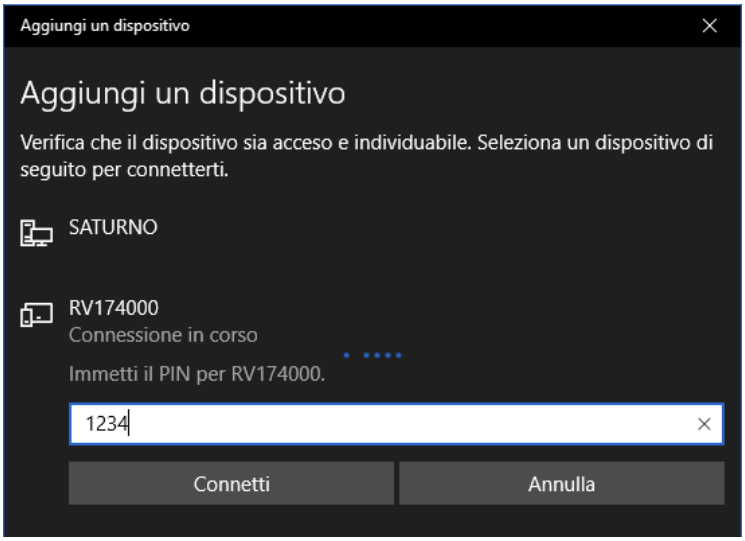


It is recommended to use the standard windows bluetooth configuration.

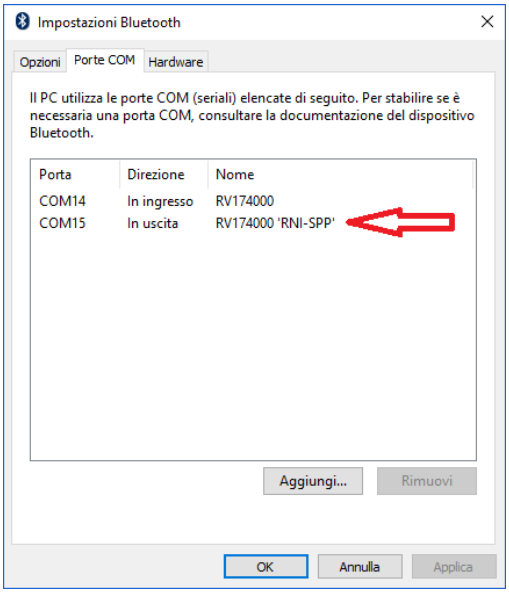
Open the BlueTooth devices panel and select 'Add wireless device'.



Select the Blu.Radio-217 Interface, typically named like RV174000.
Then press the next key



Insert the passkey '1234' then press the 'CONNECT' key.
Wait for some seconds to finish the configuration procedure.



In the property of the device you can find the serial port number to use in your software.

BluRadio-217 specification

Power supply : 5÷12 Vcc on pin 9 or external power supply by plug connector, 5 Vcc by micro-USB-B connector.
Communication: 9600 baud, 8 bits data, 1 bit stop, no parity
Range : 100+ meters in open space (Class 1)

Note

If the Blu.radio-217 interface is placed in a close cabinet or other location with radio problem, use a wire extension for RS232 communication to place the interface in a better expose location.

4 INSTALLATION

Installation is easy and can be performed by the user or, if required, by Assemblad authorized personnel.

4.1 TRANSPORT AND INSTALLATION

Due to small dimensions of the equipment, transportation can be done by hand, take care to particularly avoid crashes or falls, damages caused for these reasons are not covered by warranty.
It is suggested to keep the original package in case of future shipment for periodic calibration, technical assistance, etc.

If a trolley has been supplied together with the equipment, it must be put over with care in order to guarantee stability during movements, on the trolley shelf and supports it is possible to place all the accessories needed for its use.

Connect the optional Universal RPM Counter to the external RPM plug or to the dedicated RPM serial port on the rear panel, connect the Oil temperature probe to the Oil Temp plug, connect the Gas probe to the condense separator input.
For motorcycle equipment connect compressed air line (maximum pressure setting is 4 bar) to the dedicated connector-plug.

Metrological logbook must be kept in a secure place and showed to the technical personnel for periodic control or to National Inspectors for verification. The buyer is legally responsible for the correct preservation from loss and/or damage. ASSEMBLAD decline every responsibility in case of what said above is not observed.

4.2 CONNECTION TO POWER SUPPLY

Infragas 109 – Infragas 205 – Infragas 305

Connect the equipment to a power supply plug, at 220 Vca. 50 Hz., using the 12V power adaptor supplied and verify that such values correspond to the ones indicated on the rear label. Put the power button in the ON position to switch on the equipment.

Infragas 209 – Infragas 309

Press the switch in position [-] (upwards) for at least one second to switch it on or in position [=] (downwards) to switch it off. The instrument will automatically shut off when the battery falls below the guard level. Approaching this level will be signalled by an acoustic alarm.

5 OPERATION

5.1 OPERATIONS TO BE AVOID

Do not use gas analyzer with diesel vehicles; do not use car version of gas analyzer with 2 stroke vehicles, improper use may cause damages to the equipments.
Avoid operation in proximity of the output pipe when it is connected to an engine running vehicle if a dedicated exhaust has not been put in place.
Do not obstruct air inlet on the rear panel.
Do not leave the instrument at direct sun ray (whether it is switched on or not), do not wet the instrument.

5.2 NOTES AND CAUTIONS

Clean frequently the gas probe, check corpuscular filter and replace it when needed.

Before each test execution, verify that water is not present in the condense separator. In case of excessive condense check that the drainage and the pump are working properly.

Clean periodically the cartridge filters contained into the condense separator to avoid pneumatic flow leakages into the equipment and error messages. To do that, switch off the instrument, remove the pipe connected to the condense separator bottom side, unscrew plastic caps, remove filters, check and replace if necessary.
The Condense separator connected to the drainage pump contain a 5 um filter.
Equipments for motorcycle have an additional condense separator positioned along the probe with a 25 um filter and another filter into the second condense separator.

The oil temperature probe must not be used to measure temperature of liquids different from oil (for example water or cooling liquid) or warmed on air. An improper use will damage the probe permanently.

During measurement be sure that the oil temperature probe cable and others equipment connecting cables (i.e. RPM counter, Smoke meter, etc.) are not close to the sparking plug cables, to the coil, etc. in order to avoid electromagnetic interference to the instrument circuits.

In case of obstruction of the gas output, after having removed the cause, wait 5 minutes with the equipment switched on to restore the oxygen sensor stability.

In case of pneumatic circuit low flow warning, check that:
- gas probe is not obstructed or full of condense.
- condense separator filter is free from water.
- corpuscular filters and cartridge filter are not obstructed or damaged.
- gas output on the rear panel is not obstructed.

The message "or" or similar indicates a reading that exceed the measure range.
For other warning messages please refer to chapter DIAGNOSTICS.

5.3 INSTRUMENT POWER ON

Connect the power cable to the instrument and switch it on, the instrument will go in warm-up for a period of about 2 minutes.

5.4 STANDARD MEASURE FOR CAR

- Before star measuring: clean the gas probe and the condense separator, check the filters, switch on the instrument, wait for the warm-up to be finished.
- Enter vehicle data, check and eventually modify test measurement limits.
- Insert the oil probe into the car oil filler pipe, run the engine, the measure must be carried out with an oil temperature not less than 80 °C
- Perform two quick engine idle accelerations and then leave engine to the minimum speed, check for excessive water presence into the exhaust pipe.
- Press MEAS to start the gas analysis procedure.
- Perform the leak test at least once per day as indicated in the dedicated paragraph.
- Perform the HC residual test as indicated in the dedicated paragraph.
- Prepare the external RPM counter (if present) to the test, refer to the specific RPM Manual.
- Insert the gas probe for at least 30 cm. into the vehicle exhaust pipe.
- Wait at least 30 seconds in order to stabilize the reading, press F3 key to stop the test or go to the minimum acceleration.
- In case of catalytic vehicle put the engine to the minimum acceleration, maintain it for at least 30 seconds, press F3 key to stop the test.
- Press OK/PRINT key to print the test report.
- Press ESC key to terminate the test.
- The gas analyzer runs automatically periodic calibrations until the gas is present and it switches off the pump when the gas is not detected.

5.5 STANDARD MEASURE FOR MOTORCYCLE

- Do not use car analyzer for 2 stroke engine vehicle or diesel engine.
- Set up the analyzer as described in the previous chapter.
- Move the motorcycle on the speedometer, insert the gas probe with the specific connection and, eventually, the external RPM counter.
- Enter vehicle data.
- Start the measure, follow the instructions that appear on the display, it is important to maintain the speed constant (typically 40 Km/h ±3 Km/h).
- In case the motorcycle has more than one exhaust pipe, stop the vehicle, move the gas probe and repeat the test.
- If some parameters are not automatically detected, insert them manually.

5.6 SMOKE METER

The INFRAGAS-205 PONY gas analyzer is able to manage smoke measurement for diesel engine connecting a Smoke Meter OPA-105 'Puma' to the dedicated serial port.
From Instrument Menu select 'OPA-105'.

5.7 RPM COUNTER

The INFRAGAS-205 PONY gas analyzer is able to read vehicle RPM using an external universal RPM counter. This can be connected to the dedicated RPM digital input.
It is also possible connect the RPM counter to the serial port (RPM-405).

5.8 SPEEDOMETER

The INFRAGAS-205 PONY gas analyzer is able to read the tested motorcycle speed value using a speedometer connected to the dedicated serial port.

5.9 EOBD

The INFRAGAS-205 PONY gas analyzer is able to manage data coming from an EOBD interface connected to the dedicated serial port.

5.10 PRINTER

The gas analyzer printout is made by: test values measured, calculated values, date and time of the test and (eventually) the workshop name.

5.11 MCTC-NET

The gas analyzer is approved for the technical specifications of MCTCNet.
The communication can be done in DIR mode with software GASANALYZER or in "RS SENZA ESITO" (RSSE) mode connecting the serial port with a Pc station.
In the "RS SENZA ESITO" mode the default address is "1", the communication parameters are the following:
9600 baud, 8 bit, no parity, 1 stop bit.
To enable communication with a PC select 'REMOTE' from the Instrument Menu.

In case of measure error or anomaly, the analyzer send a COD type response with an error code that has the following meaning:
1 – gas analyzer in WARMING status
2 – gas analyzer LOW FLOW status
3 – gas analyzer out of order for CONDENSE ERROR
4 – FUEL definition error received
5 – OUTPUT definition error received
6 – OPERATION NOT ALLOWED in the present status received
7 – gas analyzer in LEAK TEST status
8 – gas analyzer in HC RESIDUAL TEST status
9 – internal temperature or input pressure or output pressure out of limit
A – power supply voltage out of limit

5.12 LAW AND DEFINITION REFERENCES

Refer to the applicable laws and to the manufacturer specification when performing test procedure or vehicle setup. The principal definitions are as follow:

1) *Minimum engine speed* is the engine speed lower than 1000 rpm, if not specified by the vehicle manufacturer, with the fuel feeding system controls (accelerator and enhancement) in idle position, electrical devices not working, gear in idle position and clutch inserted on manual or semiautomatic gear vehicle, selector in "zero" or "parking" position on automatic gear vehicle.

2) *Accelerated minimum engine speed* is the engine speed between 2000 and 3000 rpm, if not specified by the vehicle manufacturer.

3) *Normal temperature condition* is when the engine oil temperature is equal or greater than 80 °C, if not specified by the vehicle manufacturer.

4) *Percentage volume of Carbon Oxide* is the volume of Carbon Oxide expressed in percentage after steam water condensation and corrected as follow:

$$[CO]corr = 15\ (\S)\ \frac{[CO]}{[CO]+[CO2]}$$

[ ] = % vol
(§) = 12 for fuel CH_4
(§) = 14 for fuel GPL
(§) = 10 for fuel GASOLINE + OIL

when the sum of [CO] and [CO2] is less than 15 for gasoline fuel, 14 for GPL fuel, 12 for Methane fuel, 10 for GASOLINE + OIL fuel; in the other cases the test result is the one showed by the instrument.

5) *Lambda* is the ratio between the real and theoretical value of air quantity versus the fuel quantity, this is measured indirectly through CO, CO2, HC and O2 concentration. The Lambda value is calculated with the following formula:

$$\lambda = \frac{\{[CO_2] + \frac{[CO]}{2} + [O_2] + (\frac{H_{cv}}{4} \bullet \frac{3.5}{3.5+[CO]/[CO_2]} - \frac{O_{cv}}{2}) \bullet ([CO_2] + [CO])\}}{[1 + (H_{cv}/4) - O_{cv}/2] \bullet \{[CO_2] + [CO] + [HC] \bullet 6 \bullet 10^{-4}\}}$$

H_{CV} = 1.73 GASOLINE fuel
2.525 GPL fuel
4 METHANE fuel
O_{cv} = 0,02
[CO], [CO_2] e [O_2] = % in vol.
[HC] = ppm in vol.

6) *Test Speed* is the speed of 40 km/h (± 3 km/h) on the speedometer. For vehicles that cannot reach 45 km/h, the test speed is the maximum speed that can be reached on the speedometer less 5 km/h (± 3 km/h). For vehicles with mechanic gear, motorbike excluded, the test speed is 40 km/h (± 3 km/h) with engine RPM greater than 3500.
For vehicles with 3 wheels or 4 wheels with only one drive wheel on the speedometer the test speed is 40 km/h (± 3 km/h) with engine RPM greater than 3500. For motorbike with 3 wheels the test speed is 35 km/h (± 3 km/h) with engine RPM greater than 3500.

5.13 HC RESIDUAL TEST

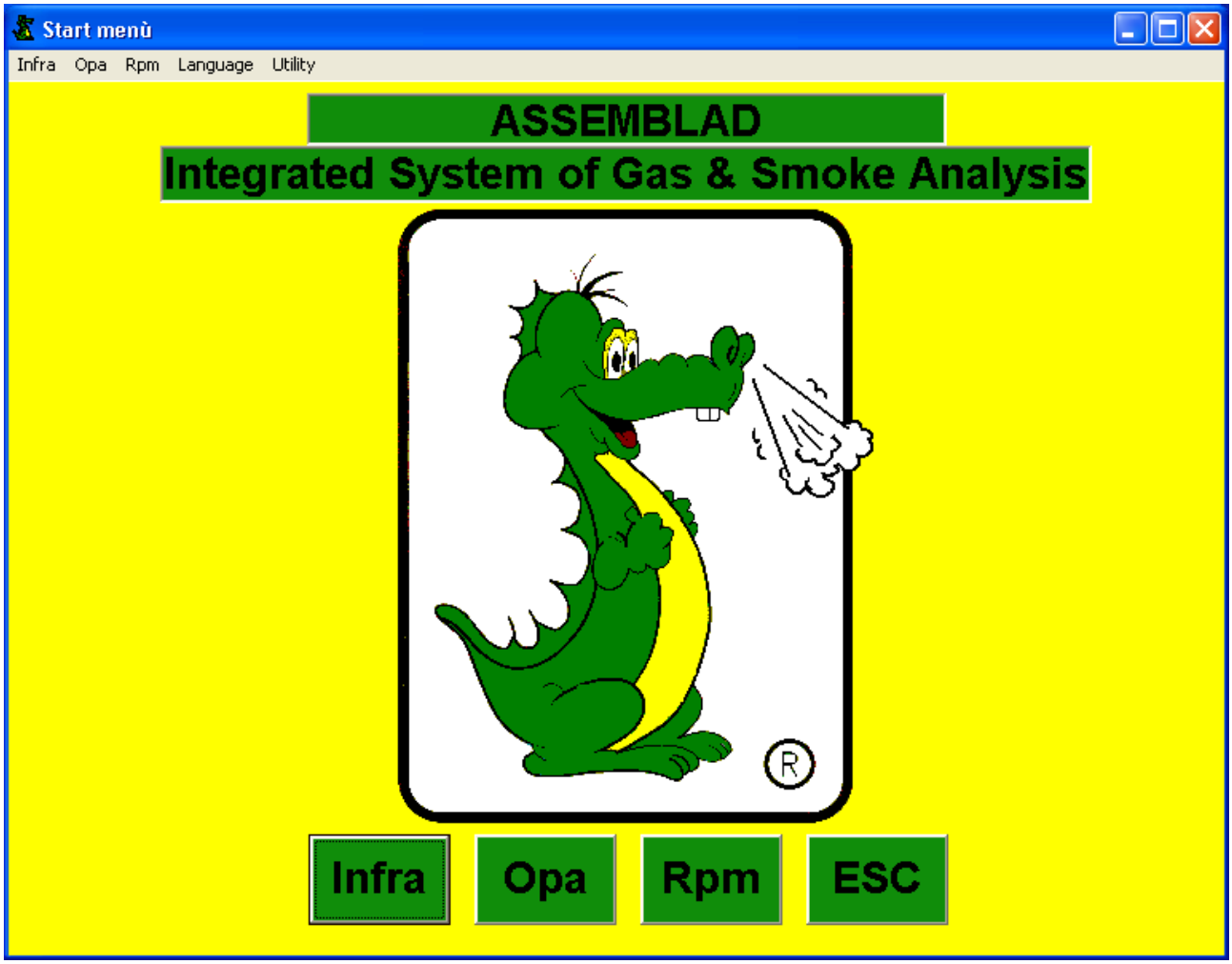
The equipment automatically performs HC residual test and inhibits the operations in case values detected are higher than normal in accordance with the regulations.

5.14 LEAK TEST

This test is automatically performed daily or manually through the Maintenance menu.
To perform the test follow the instructions on the equipment display: cap the probe end and press ‘OK’, wait until the test is finished, wait the end of the leakage phase with the pump off, uncap the probe when the test result is showed.
If the analyzer fail the leak test, the air leakage need to be identified; usually it’s caused by cracks on the probe or on the rubber pipe, or by the condense separator not correctly fitted. Repeat the leak test, if the fault still exists contact the Technical Service.
The request of the test may be disabled in the set-up menu.

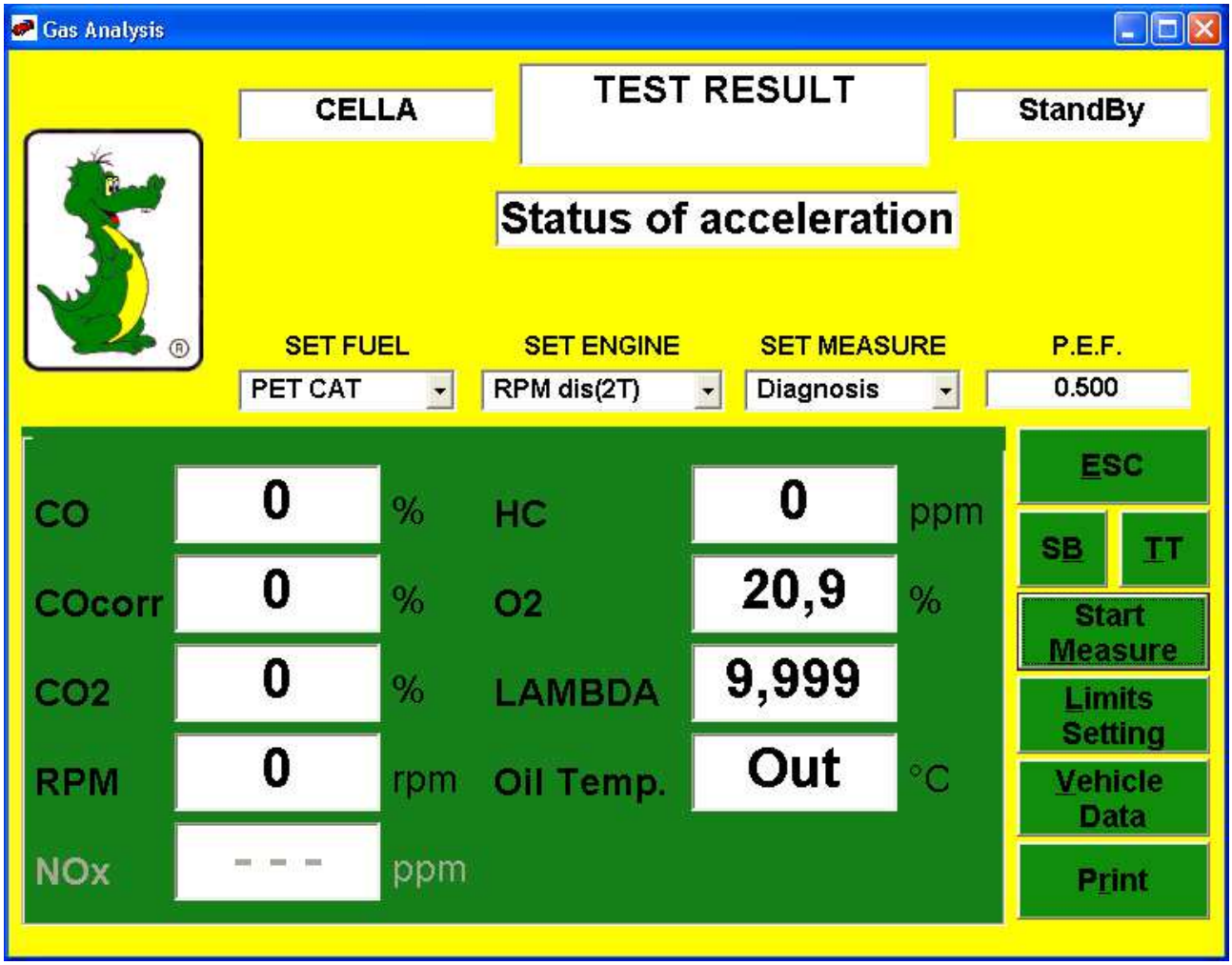
5 “INFPLUSWIN” SOFTWARE

INFPLUSWIN is a software developed to run on a PC with Windows operative system installed.



In the set-up window of the gas analyzer (Infra), in the high right side there are the model choice, select the correct model or the selection “CELLA”.

6.1 GAS ANALYZER



This section shows

- the model type;
- the analyzer status;
- a field to select the measure type;
- all the measurements performed by the analyzer;
- two sub forms with the test limits (through the button **"Limits Setting"**) and the vehicle manufacture data (through the button **"Vehicle Data"**);
- a user messages field;
- a test result field;
- a button to start and stop the measure (**"Start Measure"**);
- a button to start the leak test (**"TT"**) refer to the specific paragraph;
- a button to switch the analyzer in the StandBy or in the Measure status (**"SB"**);
- a button to print the test report (**"Print"**);

6.2 FUNCTION KEY

All functions are available clicking with the **mouse** on the buttons, or through the keyboard pressing **ALT + "the underline letter"** simultaneously. To enter in the Main Menu section press the **Infra** key on the sub menu or press **F1**; pressing **F2** it is possible open the analyzer Set-Up windows. To exit from a section click **"x"** on the right upper corner using the mouse or press **ALT+F4** or **ESC.** To select a different fuel type, RPM number and measurement type select the corresponding field with the **mouse** or press **TAB** until the field is selected, select a value using **ARROWS KEYS** and press **SPACE** to confirm.

6.3 DISPLAYED FIELDS

MODEL TYPE

In this field is displayed the gas analyzer model connected to the PC.

ANALYZER STATUS

There are three fields related to the current gas analyzer status.

1. in the FUEL field it is possible to select the fuel type
2. in the ENGINE field it is possible to select the engine type, in order to have the right RPM (**"RPMconv"** for 4 stroke engine or **"RPMdis"** for 2 stroke engine)
3. the STATUS field on the right upper side describes the current analyzer internal status:

Warming : analyzer is warming up
StandBy: analyzer is waiting for a new command
Autozero : analyzer is in auto zeroing
Measure : analyzer is measuring
Test HC : HC Test is running
Leak Test : Leak test is running
ERROR COM : no communication with the analyzer

MEASURE MODE SELECTION

In this field it's possible to select the measure mode. There are two type of measurements:

1. **Diagnosis** : this is used for standard exhaust diagnosis of vehicles and a report can be printed in every moment during the test.
2. **Certification** : this is used for exhaust diagnosis of vehicles in accordance with the Italian regulation and a report can be printed only at the end of the test.

MEASUREMENTS

In this screen section the measurements are showed.
The message '**Out**' means that an out of range has been detected, while '**---**' means that the value is not available.

When the analyzer is in **'Measure'** status and the '**Certification**' mode has been selected, measurements are compared with the limit values entered in the **"Limits Setting"** sub form. If a measure is not within limits above said the window will become red.

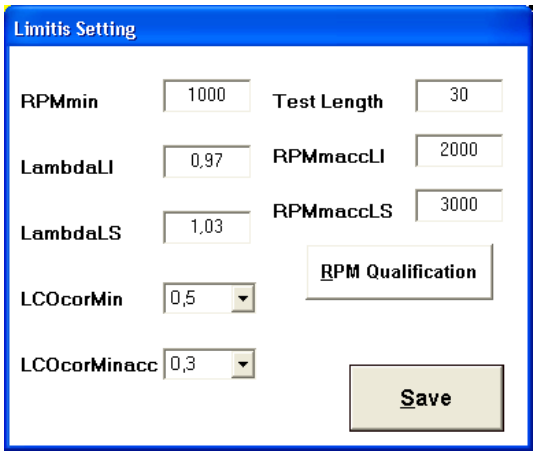
MESSAGES

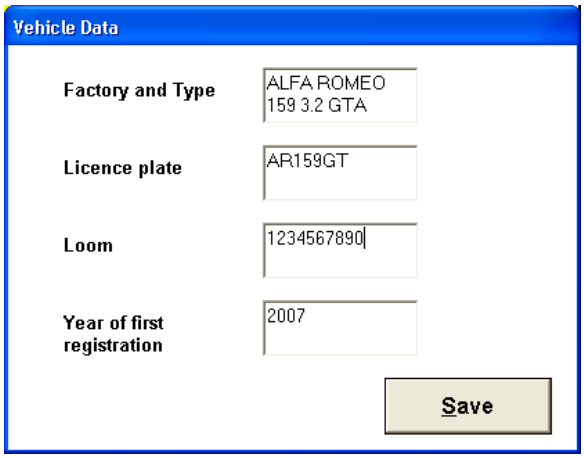
In this field are displayed operational and error messages that allow an interface between the instrument and the user, test instructions are also displayed.

RESULTS

In this field it is displayed the test result at the end of the certification measurement; if the test result is positive the field background will become green and the message "**TEST PASSED**" will appear while if the test result is negative the field background will become red and the message "**TEST NOT PASSED**" will appear.

6.4 INPUT LIMITS AND VEHICLE DATA





The **"Limits Setting"** form comprises the following values:

- RPMmin : is the limit for the engine speed minimum test, engine speed must be below this value to proceed with the test;

- LambdaLI : is the lower limit for the Lambda value;
- LambdaLS is the upper limit for the Lambda value;
Lambda is checked during the catalytic vehicle test, to obtain a positive result it must be within these limits;

- LCOcorMin : is the lower limit for the minimum engine speed CO corrected; to obtain a positive result at minimum engine speed it must be below this limit (values can be selected from a list or entered directly using the keyboard).

- LCOcorMinacc : is the lower limit for the accelerated minimum engine speed CO corrected; to obtain a positive result at accelerated minimum engine speed it must be below this limit.

- Test Length : it is possible to select the test duration in seconds;

- RPMmaccLI : is the lower limit of RPM for the accelerated minimum engine speed;
- RPMmaccLS : is the upper limit of RPM for the accelerated minimum engine speed;
When the test is performed at the accelerated minimum engine speed, RPM must be within these limits;

- RPM Qualification: with this selection is possible to choose if the RPM value must be considered or not as a condition to be verified on test result, if RPM is enable all RPM limits must be met.

The "**Vehicle Data**" form is used to enter tested vehicle information. These data will be printed on the test report.

All fields can be selected by clicking on them with the mouse or using the **TAB** key and values can be entered using the keyboard.

6.5 TEST EXECUTION

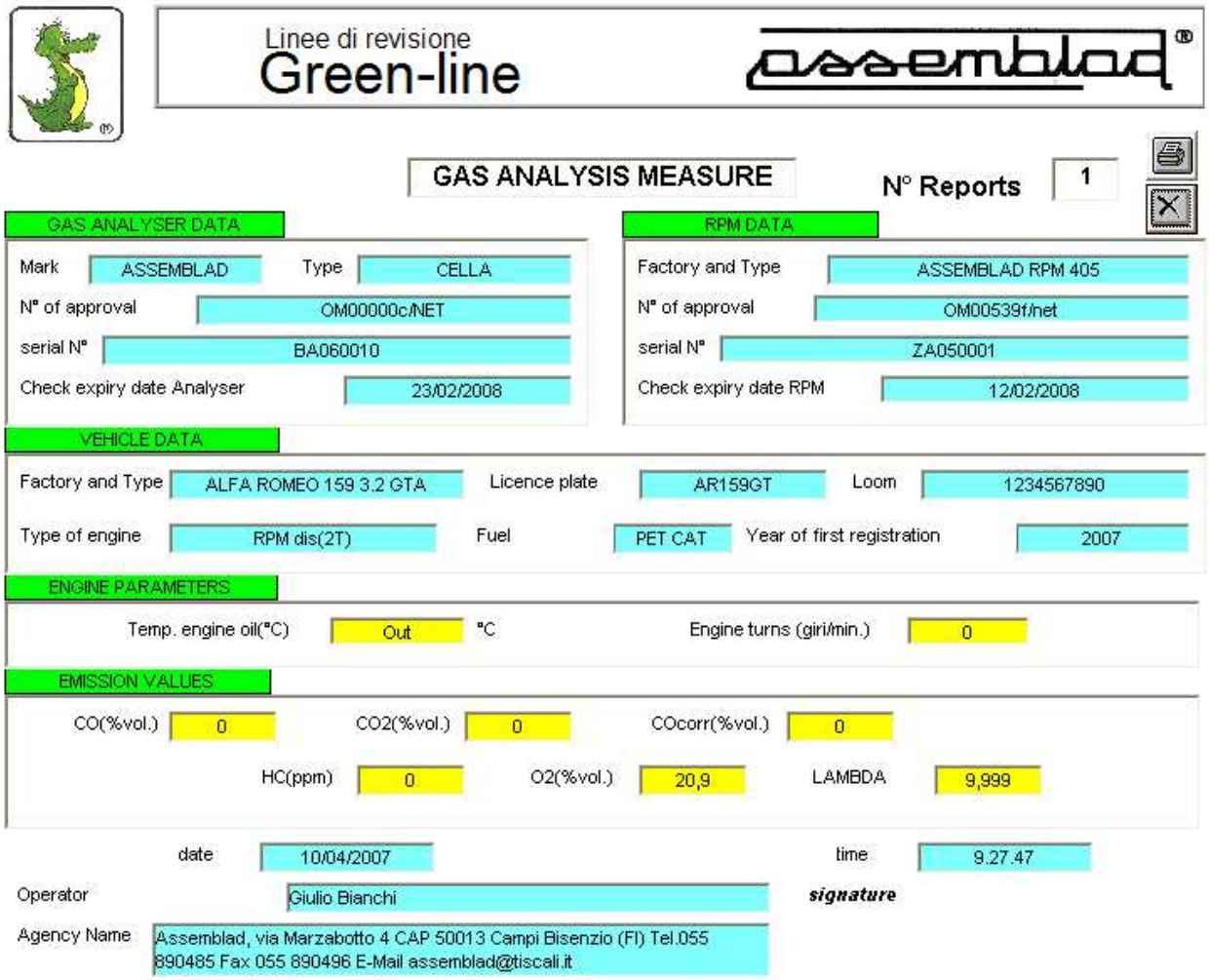
Pressing the button "**Start Measure**" the calibration will start, after that the analyzer will perform the HC residual test and then the test will begin.
If the "**Diagnosis**" mode has been selected the instrument will measure values without comparing them with the limits entered.
If in "**Certification**" mode, after the calibration execution, the test will start according to the regulation. It's possible to perform two different type of test according to the regulation: one for catalytic vehicle and one for non catalytic as follow:

- Non catalytic vehicle : only test at minimum engine speed, test duration is 30 sec by default, in this condition a progress bar will appear to indicate the test progress status and the Message field will show messages to help performing the test. At the end in the test result field a message will appear to indicate if the test has been passed or not.

- Catalytic vehicle: one test at minimum engine speed and one test at accelerated minimum engine speed will be performed, both will have a duration of 30 sec by default, a progress bar will appear to indicate the test progress status and the Message field will show messages to help performing the test. At the end of the first in the test result field a message will appear to indicate if the first test has been passed. After 7 sec the second test will start and at the end in the test result field a message will appear to indicate if the complete test has been passed or not.

6.6 REPORT PRINTOUT

It's possible to print a report of the test with the command "**Print**". The printout will come out from the default Windows printer.
When in "**Diagnosis**" mode it's possible to print in every moment and the command is always enable, while in "**Certification**" mode it's only possible at the end of the test procedure and the command will be enable only in that moment. Below it's showed a print report for the "**Diagnosis**" mode (in "**Certification**" mode an additional section for catalytic vehicle is also available) .



7 STANDARD MAINTENANCE

The following maintenance operations can be performed directly by the end user.
In case of calibration or non standard maintenance have to be carried out contact an Authorized Technical Service that will fix problems or will give instructions where to send the equipment for repair.

7.1 INSTRUMENT CLEANING

Before proceeding with the instrument cleaning disconnect the power supply.
Clean external parts using a wet cloth, use water and not solvents or chemical products.

7.2 FUSE REPLACEMENT

The fuse is placed in the rear or connector panel, if it is bowed replace with another with the same value, the use of fuse with wrong values may damage the instrument, replace the fuse as follow:

- Disconnect the power supply.
- Unscrew the fuse cap.
- Remove the fuse, replace it and screw the fuse cap.

7.3 CARBON FILTER REPLACEMENT

Usually the carbon filter, that is located on the back side or internally of the instrument, has to be replaced by the service personnel.
In case of need the end user can replace such filter simply removing it from its container and fitting in the new filter.

7.4 OXYGEN SENSOR REPLACEMENT

Usually the oxygen sensor, that is located on the back side or internally of the instrument, has to be replaced by the service personnel.
In case of need the end user can replace such sensor as follow:

- Disconnect the power supply
- Disconnect the cable
- Unscrew the old sensor
- Screw the new sensor
- Connect the cable

When the oxygen sensor is replaced, it is preferred to perform a gas calibration.

7.5 NOX SENSOR REPLACEMENT

Usually the NOx sensor, that is located on the back side of the instrument, has to be replaced by the service personnel.
In case of need the end user can replace such sensor as follow:

- Disconnect the 12 V power supply
- Disconnect the cable
- Unscrew the old sensor
- Screw the new sensor
- Connect the cable

When the NOx sensor is replaced, it is preferred to perform a NOx gas calibration.

8 TROUBLESHOOTING

If the gas analyzer shows some defects, verify the following cases to find the cause and perform a repair, otherwise contact the Technical Assistance to communicate defect, model and equipment serial number.

Analyzer does not power on
Verify that the power supply is connected to the analyzer and to the electrical network plug.
Verify that it's set to 12 Vcc.
Disconnect the analyzer from the power supply and verify the fuse.

Condense Error displayed.
Verify the condense drainage circuit, in particular the drain pump.
Switch off the analyzer, clean the condense separator and the gas probe, verify that the draining pump is working.

Date/Time not showed in the report
Verify date and time as described in the specific paragraph.

Analyzer perform an excessive number of auto calibration.
The gas analyzer perform an automatic calibration every 9-10 minutes or when detect unstable internal parameters.
The gas analyzer perform an automatic calibration also in presence of non combusted hydrocarbon in gas input, verify filters cleaning and the correct input of the compressed air (motorcycle version).

Low Flow Error displayed.
Remove the gas probe from the input connection, if error disappear clean the probe and replace the corpuscular filter, otherwise verify and clean the condense separator filter and the corpuscular filter on the rear panel.

Obstruction Output displayed.
Verify the output on the rear panel.

Display shows "-or-" or "----"
Measure is out of limit
Measure is not available because the probe is missing or because is not possible.

Display shows Out.
The instrument internal temperature is out of limit.

Oil Temperature Display shows "-or-" or "----"
Verify oil temperature probe, do not immerse into water, do not put close to hot sources, do not pool the spring, clean carefully.

Oxygen value is too high
Oxygen sensor could be faulty, remember that the average life is 1 year also if usually is longer, depending on use and operative temperature. There is a automatic warning if the sensor does not reach the minimum voltage level (5 mV), this check is made during every automatic calibration.
Verify that there are no air leakages performing the leak test.
Contact the Technical Service for the replacement.

CO/CO2/HC values are always too low
Verify the operation of the pumps capping for a short time the outputs on the rear panel and check the presence of pressure.
Another cause could be the gas probe fault or the gas input pipe, perform the leak test as described in the dedicated paragraph.
If no fault is detected contact the Technical Service.

PRINT doesn't work.
Verify the correct position of the paper and the right position of the door.

PEF displayed is not correct or some gas values are always 0 or too high
The analyzer could have suffered an electrical shock. The Technical Service can perform an instrument reset.

Analyzer cannot connect to the PC via RS-232.
Check serial cable connection between instrument and PC, try to substitute it, the cable is male/female with pin-to-pin connections.
Verify that REMOTE has been selected from the Instrument Menu.
Verify that the communication parameters are correct: 9600 baud, 8 bit data, 1 bit stop, no parity.

8.1 PONYDOCTOR

To verify equipment status or to check for fault, start the PONYDOCTOR software.

In particular verify communication status, error or warning messages and the correct operation of the MEASURE command.

9 METROLOGICAL LOGBOOK

The equipment (if needed) is supplied to the end user with an ***analyzer metrological logbook*** that is a register for verification, control and repairs of the instrument.

In case the equipment is used for legal measurements, the logbook must be always updated, providing to perform the periodic and occasional checks and/or repairs, when needed, by Assemblad or by authorized personnel, C.S.R.P.A.D. of Rome, C.P.A. authorized by “Direzione Generale della Motorizzazione Civile e dei Trasporti in Concessione”, or by Notified Bodies.

In the event that equipment is used for legal measurements, it is necessary to take the logbook with the instrument or, as an alternative, replacing it with a copy on which must be noted the place where the original is located.

10 USER INFORMATION - RAEE Directive (#)

The symbol  stamped on the equipment means that when the product will be at the end of its operative life it shall be consider as a special refusal and shall be a “special dismantle”. For this reason the user shall take it to a Dismantle Center authorized by Local Authority or to an authorized distributor for purchasing a new equivalent equipment.

(#) European Directives 2002/95/CE, 2002/96/CE and 2003/108/CE

11 WARRANTY

- 01 - This device was built with care and carefully inspected before it left the factory.
- 02 - It is guaranteed for one year from the date of purchase by the final user.
- 03 - To enjoy full rights under this warranty and avoid the risk of invalidation, you must mail a copy of the Warranty Certificate to the factory within 10 days of the purchase date.
- 04 - The warranty covers all defects in materials.
- 05 - The warranty does not cover: external cables, probes, the remote control unit, pumps, motors and the external accessories. These items are subject to wear and their efficiency depends on how they are handled or treated.
- 06 - The warranty does not cover damage caused by accidents, impact or dropping the instrument, or by negligence, improper use, non-compliance with the instructions and improper storage.
- 07 - If the device has such defects as to require technical service, you must return it to Assemblad or an authorized service center.
- 08 - Shipping charges shall be covered by the customer.
- 09 - ASSEMBLAD, even supplying support on demand for the first installation of the equipment, disclaims any liability for damages and injuries caused, even to third parties, by an improper installation, maintenance, defective or unsafe electrical connections.
- 10 - Further, ASSEMBLAD disclaims any claim for damages from anyone due to a miss utilization of the equipment for any reason.
- 11 - The warranty shall immediately become invalid if the device shows any signs of tampering.
- 12 - The exclusive court of jurisdiction for any disputes arising from the application and/or interpretation of this warranty is the Court of Florence (Italy).

Note:

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by

ASSEMBLAD S.r.l.
Via della Querce 6a/6b
50013 Campi Bisenzio (FI) ITALY
Tel. +39 055 890485 Fax +39 055 890496

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