Omitec
Modular Integrated Diagnostics

OM4600 Emission Analyser

Operating Instructions

www.omitec.com

Omitec

OM 4600
EMISSION ANALYSER

OPERATING INSTRUCTIONS

I321520
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Contents

Important Information

Every reasonable effort has been made to ensure that information within these Operating Instructions is correct at the time of release, but Omitec cannot accept responsibility for any errors that may occur.

The information in these Operating Instructions is subject to change without notice, and does not represent a commitment on the part of Omitec.

Service & Warranty

The reliability of this equipment is fully supported by our service agents, with repair workshops and field service engineers to provide a full range of After-Sales Care, including installation, contract maintenance, factory overhaul and emergency repairs on site. Please refer to the page at the end of this manual for full details.

Note: If a service engineer is called out under service warranty where, upon inspection and test the equipment is found to be in full working order and no fault found, the user is liable to be charged the cost incurred for this call out. Before calling out an engineer, ensure your equipment is faulty by checking its operation, particularly mains supply and fault codes/self test if applicable.

Software Licence

Further to our general Terms & Conditions of Sale, the software described in these Operating Instructions is furnished under the following Software Licence Agreement:

1. Licence: You may use the program on the machine provided. You may not copy, duplicate or transmit the program in any form, in whole or in part, without the express prior written permission of Omitec.
2. Term: The licence is effective until terminated. You may terminate the licence by destroying the program together with all copies, or returning the program to Omitec
3. Omitec does not warrant that the program will meet your requirements or that its operation will be uninterrupted or error free.
4. In no event will Omitec be liable to you for any incidental or consequential damages, including lost profits, business operation and the like, arising out of the use or inability to use this program.

You acknowledge that you have read this Agreement, understand it, and agree to be bound by its provisions.

WARNING: Do not attempt to operate this equipment unless you have read and understood these instructions.

Important Information

Safety Precautions

1. The equipment is not weatherproof and should not be used outside in rain or snow.
2. The internal circuits and components of the analyser should not be tampered with. No internal parts are operator serviceable.
3. Operators should exercise due caution with regard to the engine fan and associated belts.
4. Always provide ventilation by using an exhaust gas extraction system or by having an adequate supply of fresh air.

   WARNING: Carbon Monoxide is a highly poisonous gas. If breathed in, it is absorbed by the blood and will result in greatly slowed reactions and if absorbed in sufficient quantity can be fatal. Published figures show that a concentration of 0.3% CO in the air can be fatal if inhaled for 30 minutes.
5. Before starting an engine, ensure that the gear selector is in neutral or park.
6. Care should be taken with regard to scalding from the cooling system, burns from the exhaust system and electric shocks from the ignition HT system.
7. When disconnecting the fuel system of a hot engine beware of the fire hazard caused by petrol spilling onto manifolds, ignition distributor, etc.
8. Position the mains cable and sampler pipe in such a manner that they do not present a hazard to anyone.
9. The earth lead of the mains supply cable **MUST ALWAYS** be connected to a good earth point.

Introduction

The OM4600 Analyser is a fully microprocessor controlled exhaust gas analyser employing Non-Dispersive lnfra-Red (NDIR) Techniques. The unit measures carbon monoxide, carbon dioxide and hydrocarbons. A further channel is provided employing Electrochemical measurement of Oxygen. Zero may be commanded at any time by the operator, and automatically executed by the analyser. An automatic auto zero check is performed every thirty minutes when the analyser is switched on.

Important Note: It is not recommended that the OM4600 is left for extended periods of non-use. This will result in the battery which supports the Real Time Clock of the unit completely discharging and may lead to operational problems, requiring an expensive service visit. To avoid this, power the unit up for at least 1 hour approximately once a month.

Extremes of Weather Conditions

Extremes in weather conditions can give very low temperatures. In such weather conditions and where temperatures are likely to fall below freezing, we recommend that you leave the unit switched on at all times.

This will reduce any effect of Temperature Cycling or dampness and assists in preventing any incidence of ice forming within the collection bowl / filter pipes or pump.

This is particularly beneficial if there is no background heating in your garage, or if there are high levels of cold through draft in low overnight temperatures.

Please note that the operating temperature range of this equipment is +5 to +40ºC.

Reception

The 4600 will operate on an A.C. mains supply voltage of 100 to 240 volts, 50/60 Hz. There is no requirement to adjust the unit for supply voltages within this range

NOTE: The mains connection MUST include a good earth bond.

Unpack all items and examine for any damage. Check contents against the packing list enclosed for any loss or discrepancy. Report any breakage, loss or discrepancy to the supplier immediately.

Analyser Set Up

Set up the analyser as follows.

1. Connect sample probe hose to sample inlet port.
2. If not already fitted, remove the oxygen sensor from its packaging, screw into the housing and fit electrical connector.
3. The Analyser is available with an Engine Speed Adapter OM4600/1 and an Oil Temperature probe OM4600/2 + OM4600/3.

OM1669

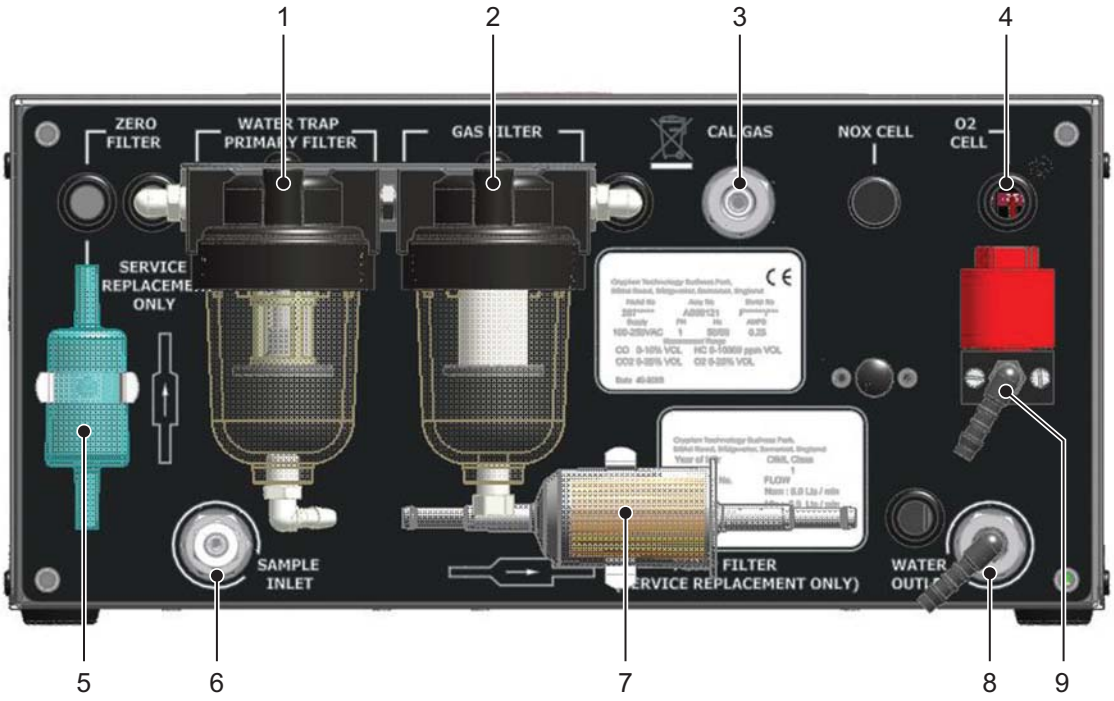
Engine Speed Adapter

CR0132

OM4600/2 + OM4600/3 Oil Temperature Probe

External Connections

Filter Panel

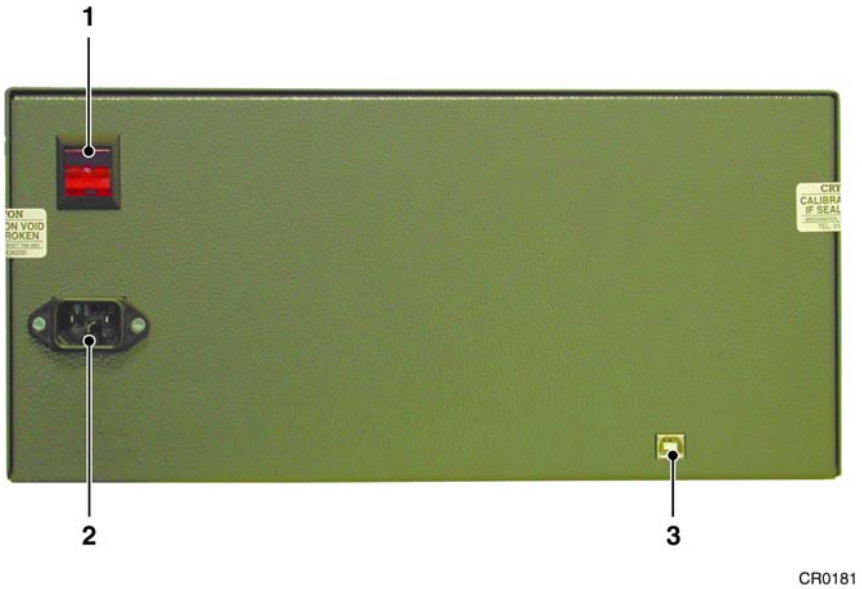


OM1668

1. Water Trap and Primary Filter
2. Gas Filter
3. Calibration Gas Port
4. Oxygen Cell
5. HC absorbent Zero Filter
6. Sample Gas inlet
7. Pump filter
8. Water Exhaust
9. Sample Exhaust

External Connections

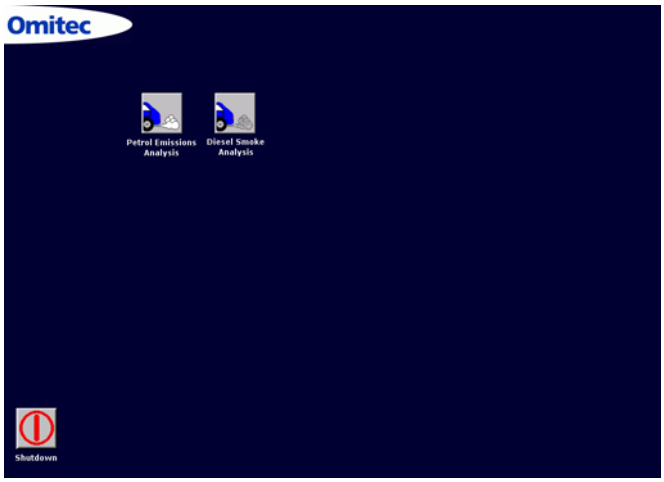
Mains Switch



1. Mains ON/OFF Switch
2. Mains Inlet Socket
3. PC Communications USB

Omitec Desktop

Connect the unit to the supply and switch on. The PC will boot up and display the ‘Omitec desktop’ as shown.

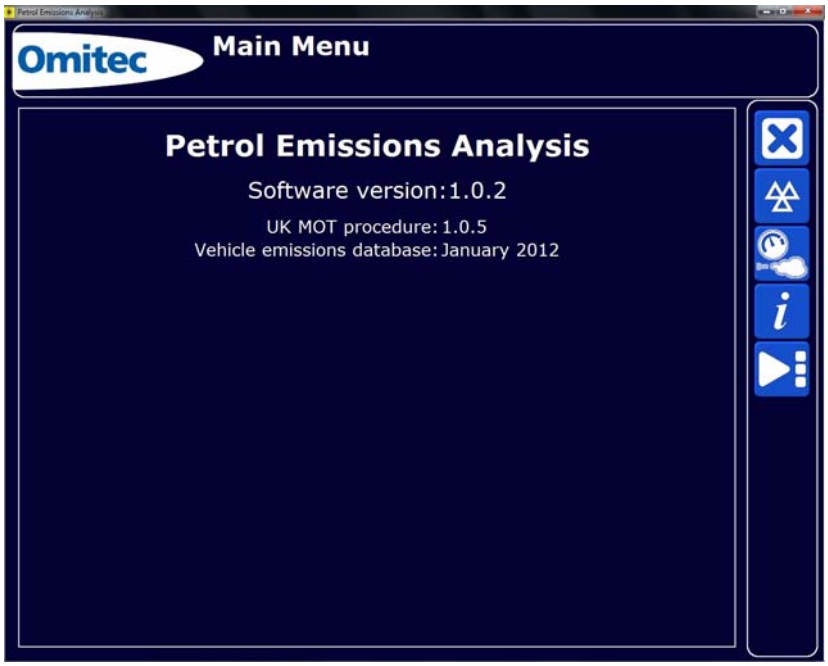


The Gas Analyser application is started by ‘double clicking’ the Gas program launch icon on the desktop. The unit will then perform an autozero. After the autozero the analyser will display the main menu screen as shown below. If the analyser is being switched on for the first time that day, a leak test will be required. Please refer to the next section ‘Performing a Leak test’.

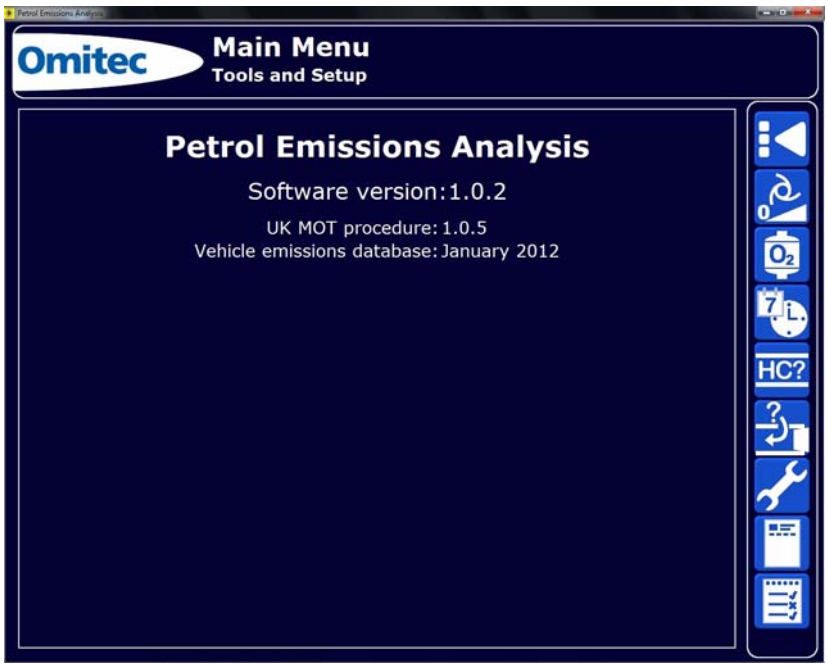
The analyser is controlled by means of the icons displayed down the right hand side of the screen.

Note: From switch on, Autozeroes will be performed at 5 minutes, 15 minutes and 30 minutes. They will then be performed every 30 minutes thereafter.

Main Menu



Tools & setup Menu



Icons Symbols

The icon functions are as follows:

Exit from program or current test/page.

Display context sensitive help.

Starts the MOT procedure.

Calls up a live display of gases, engine speed, oil temperature and calculated Lambda for test and repair operations

Information page. Contains data regarding software versions, serial numbers, PEFS, calibration dates.

Selects the next menu

Returns to previous menu

Next/continue.

Back/return

Accept

Cancel

Repeat

Print

Controls And Operation


Edit personal/garage header


Add/delete testers


Set/adjust time and date


Autozero


Check/replace Oxygen Cell


HC Residue test


Leak test


Service Mode

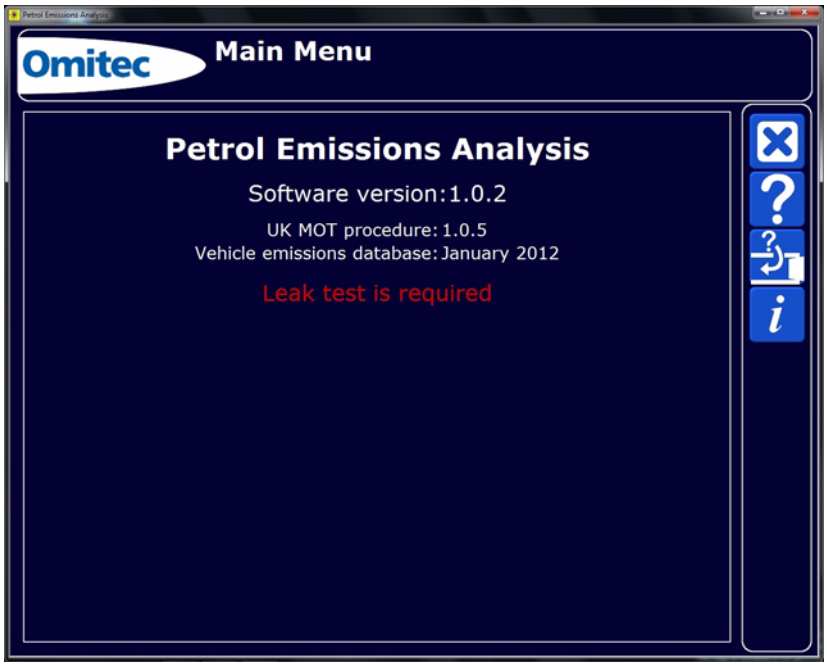

RPM set up


OIl temperature set up


Pump on/off switch

Performing A Leak Test

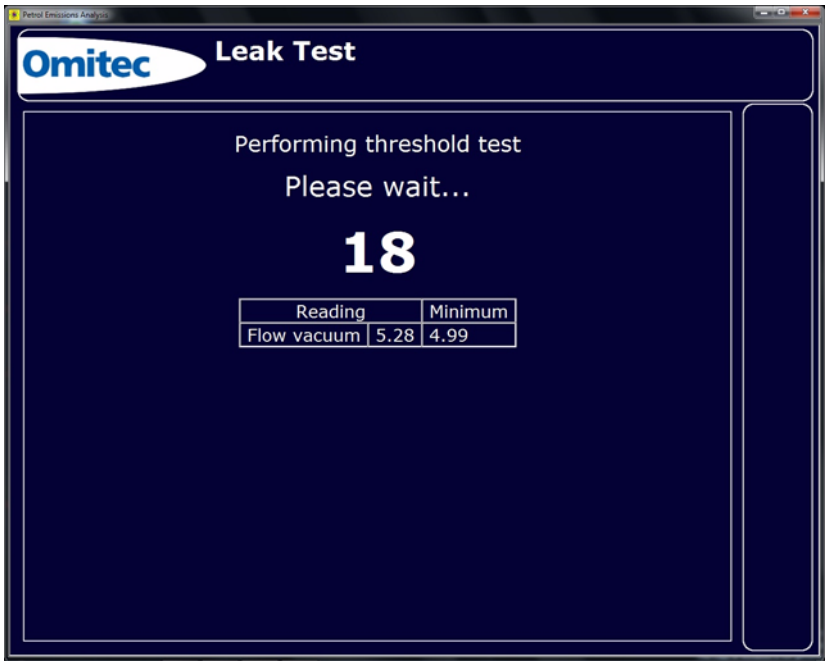
At the start of each day, the analyser will force a leak test to be performed. The following screen will be displayed:



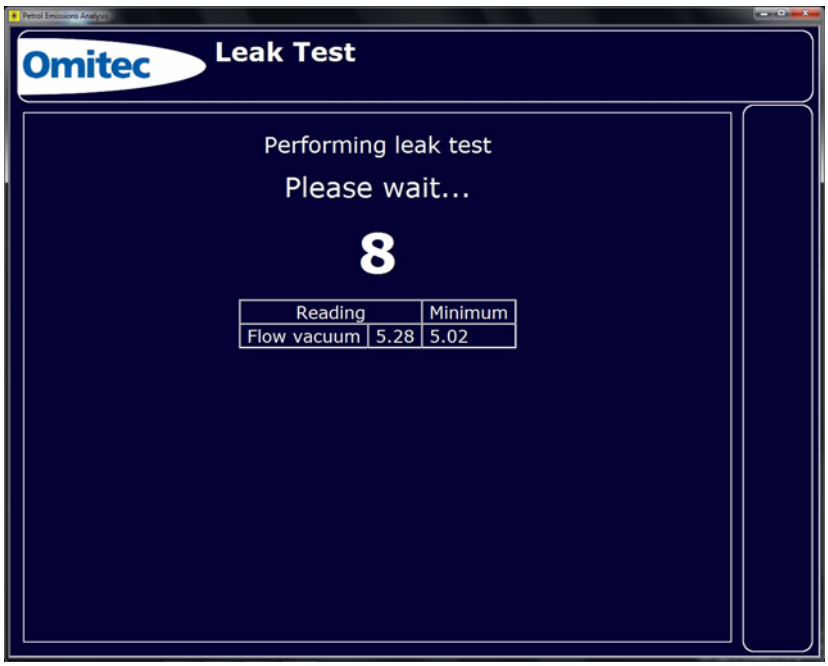
Click on the Leak Test icon and block off the end of the sample probe using the silicone adapter provided. Ensure that the adapter fully covers the holes in the probe end as shown.

Block Sample Probe

The analyser will then perform a threshold test. This is to ensure that the pump is operating correctly.



The flow vacuum must reach a minimum of 3.00 to pass this stage of the test This will be followed by the performing leak test screen.



The pump will turn off. The flow vacuum reading must stay above the minimum limit shown in green. This is an active limit and will vary depending on the overall vacuum reading at the end of the threshold test.

Live Readings

Connections to a vehicle

Sample Probe

Carefully insert the sample probe into the vehicle exhaust noting that it is not necessary to insert the whole length of the flexible section. Do not allow the flexible steel probe end to become kinked. Use the adjustable clip to secure the probe to the exhaust. Do not force the probe into the exhaust - some vehicles have very short tail pipe sections and it is possible to damage the probe and the exhaust itself.

Take care when removing the probe from the exhaust at the end of the test. Do not roll up the sample pipe whilst it is still connected to the analyser as excessive amounts of water may enter the filter unit.

Obtaining Correct Measurement Results

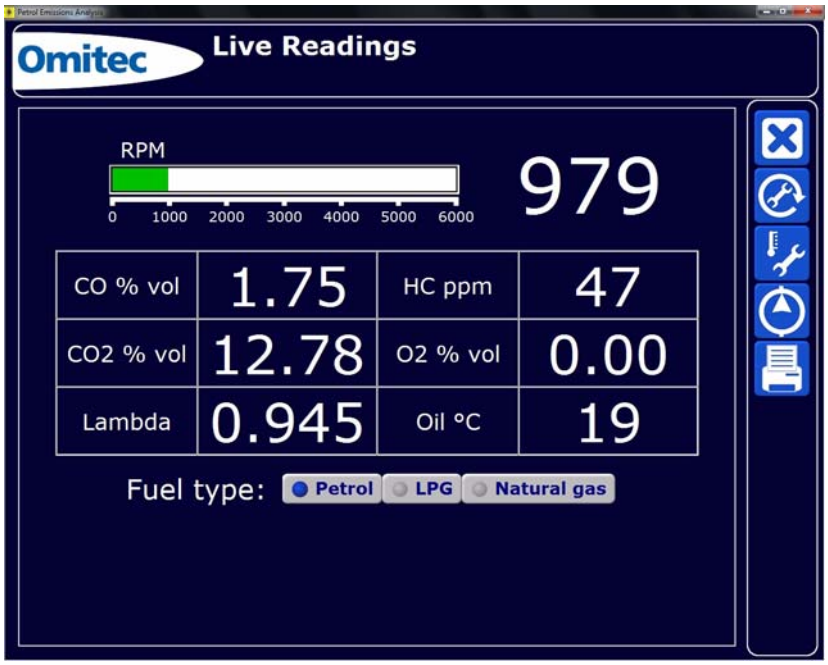
To ensure that exhaust gas test results are correct it is vital that the following points are noted while performing the test.

a. Before testing a vehicle ensure that:
- The engine is up to normal operating temperature.
- There are no leaks in the exhaust system.
- The tachometer is set for the correct number of cylinders so that engine speed is correctly displayed, and that the engine is running at the required speed.
- The exhaust sample probe is fully inserted.
- The analyser is set for the correct fuel type for the vehicle under test - this ensures that the lambda calculation is accurate.

b. The analyser will automatically perform an Auto Zero whilst warming up, and at intervals during use. Any internal errors will also be indicated and testing halted.

c. The analyser will display error messages if faults are detected. These error messages fall into two categories:
- Messages such as 'Failed leak test' and 'Restricted gas flow' are covered in other sections of this manual and can normally be fixed by the operator.
- Error messages that indicate an internal fault can only be fixed by an Authorised Service Agent. The screen will explain the particular error.

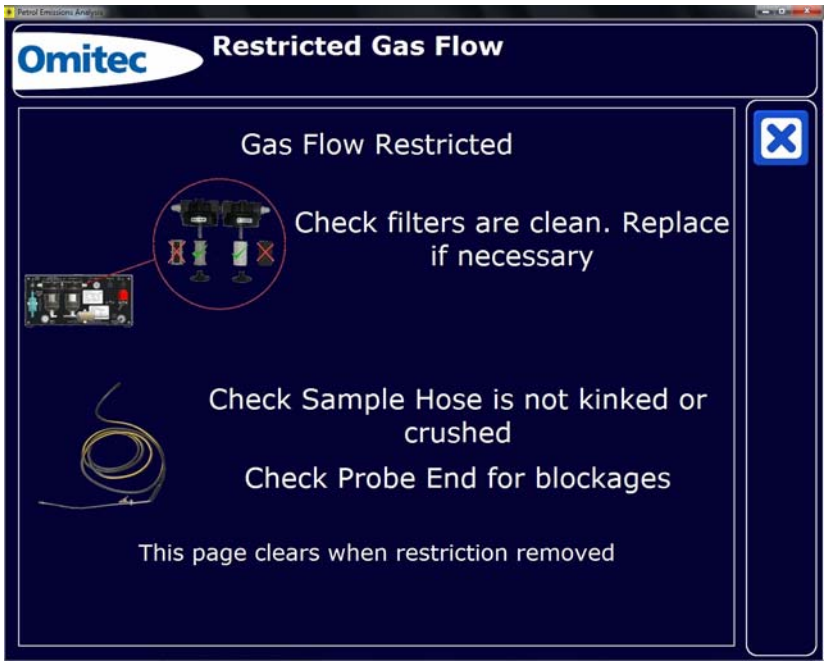
d. The measured results are presented on the screen as shown below and do not normally need any interpretation. Provided that the correct fuel type is selected the Lambda calculation will be correct. The engine should be run in a stable state for at least 20 seconds to allow gas readings to stabilise before results are recorded.



If there is no engine speed adapter fitted or it is not connected to an engine, the RPM reading will be ‘greyed out’.

Selection of the different fuel types is made by clicking on the respective ‘radio’ button on the screen. The analyser will always default to Petrol.

Note: Should the filters become excessively contaminated, the sample probe become blocked or the sample pipe kinked or crushed, the following screen will be displayed:



For further information, please refer to the ‘Troubleshooting’ section of this manual.

5-Gas Analysers

The 5-gas emission analysers are identical in operation to the OM4600 4-gas.

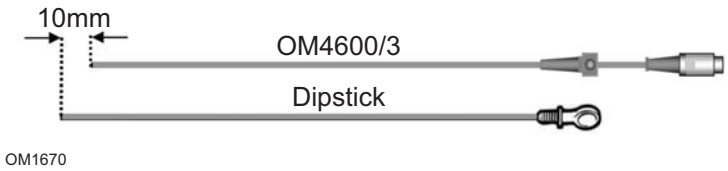
The fifth gas, NOx (oxides of nitrogen), is only displayed when the analyser is configured to read it. This configuration may only be performed during production or by an authorised service agent. Measurement of NOx is achieved by means of a chemical sensor fitted next to the oxygen sensor and is displayed on the live readings screen.

The sensor used to measure NOx concentration is a catalyst and theoretically has an unlimited life. Unfortunately, in day to day usage there are a number of compounds that can ‘poison’ the cell and gradually stop it reacting to the gas.

If the NOx channel should stop reading when connected to a vehicle, it may be necessary to replace the cell. Before replacing the cell, first check that the electrical connector on the top of the cell is correctly connected and that the wiring is not damaged. If the connector has become disconnected, refit and proceed to Replacement of NOx Sensor. Note that in this case it should not be necessary to actually replace the cell. If the wiring has been damaged it will be necessary to contact your local service agent.

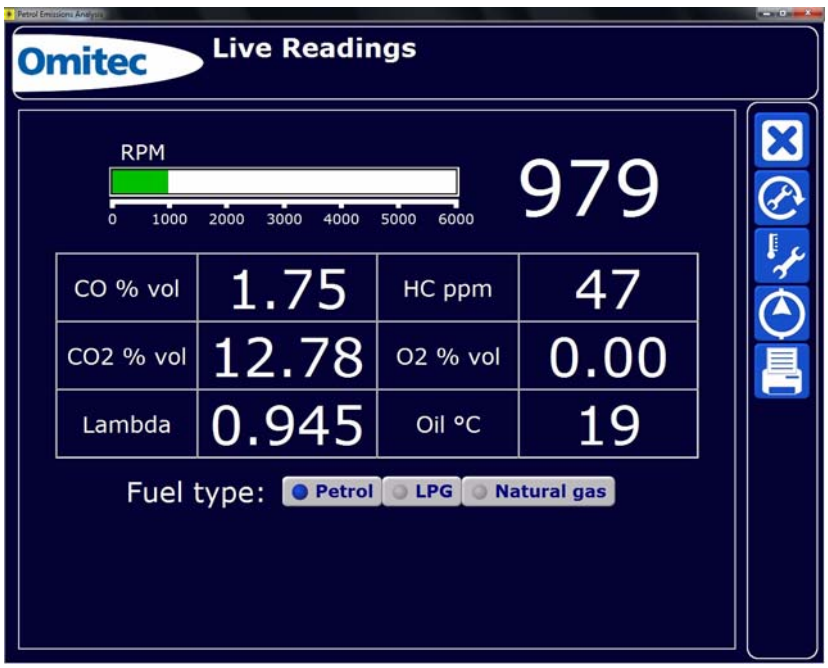
Oil Temperature Probe

CAUTION: Great care must be taken when performing the test to ensure that no damage to the oil temperature probe and/or engine is incurred by contact with moving engine parts.



Remove the dipstick from the engine and check that the oil is at the correct level. Compare the temperature probe to the dipstick and adjust the rubber bung so that the length of probe inserted into the engine is approximately 10mm shorter than that of the dipstick. Insert the probe into the engine via the dipstick hole. **DO NOT ALLOW PROBE TO COME INTO CONTACT WITH THE CRANKSHAFT.** The oil temperature will be displayed in steps of one degree on the Live Readings screen.

Engine Speed Adapter



Start the engine, turn on the vehicle lights, and allow engine to idle. Ensure all other vehicle accessories; internal blower, screen heater etc. are off. Attach the OM4600/1 clips to the battery noting the correct polarity (or use the optional Accessory Socket lead). When prompted by the analyser program, set the correct number of cylinders of the vehicle engine. **BEWARE OF ROTATING PARTS**.

Allow the engine to idle while the OM4600/1 initialises (this may take up to 15 seconds). When complete the unit will indicate the engine speed on the console screen.

If the indicated speed appears to be incorrect, reset the OM4600/1 by disconnecting and then reconnecting one of the battery leads.

Note: On some vehicles readings may be unstable or inaccurate. To minimise the risk of this:-

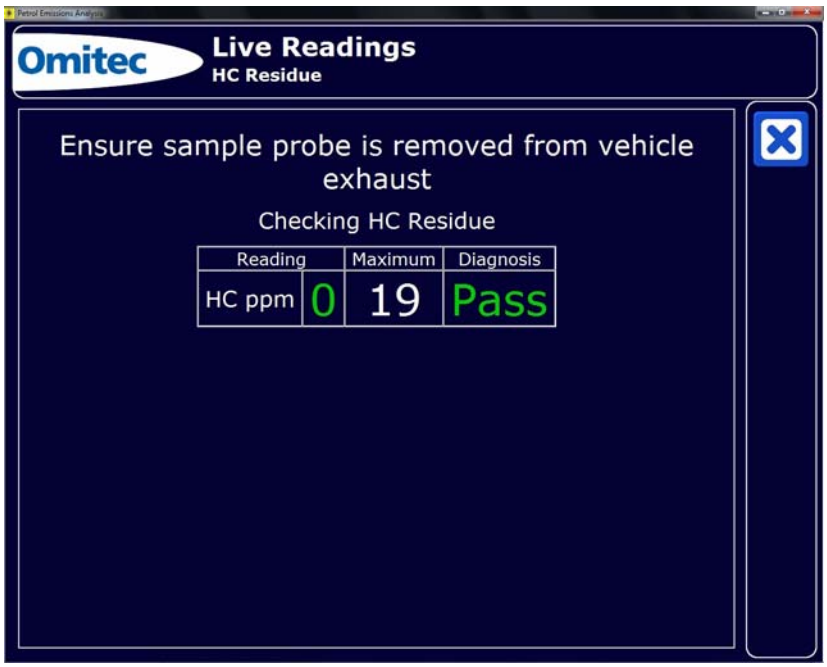
- *Ensure that the vehicle headlights are switched on. Switch off cabin fan.*
- *Keep the engine speed stable during the initialisation time <17Sec.*
- *If, after initialisation the speed is stable but reading double, the incorrect cylinder setting has been selected on the programme prompt (Settings page) - change the cylinder setting until the correct value appears.*

HC Residue Test

HC? A residue test will always be performed immediately prior to taking measurements from a vehicle. Hydrocarbon molecules are extremely 'sticky' and will tend to adhere to all of the surfaces of the sample probe and filtration system. The residue test ensures that there is no 'hang up' of Hydrocarbons within the system which may adversely affect the measurements.

WARNING: It is essential that the sample probe is in free air before performing the test.

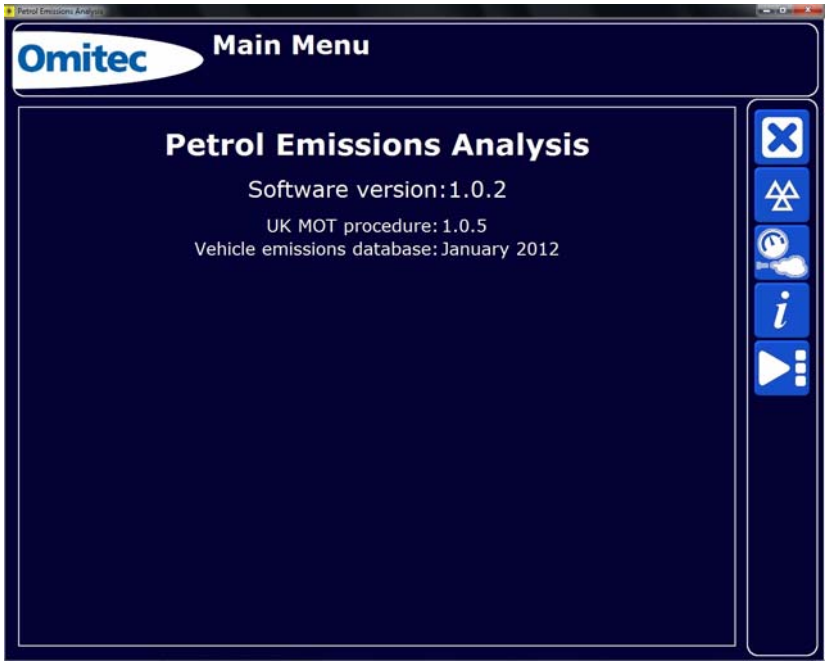
The HC reading must be below 20ppm for the duration of the test. If the reading is below 20ppm, the test will automatically exit.



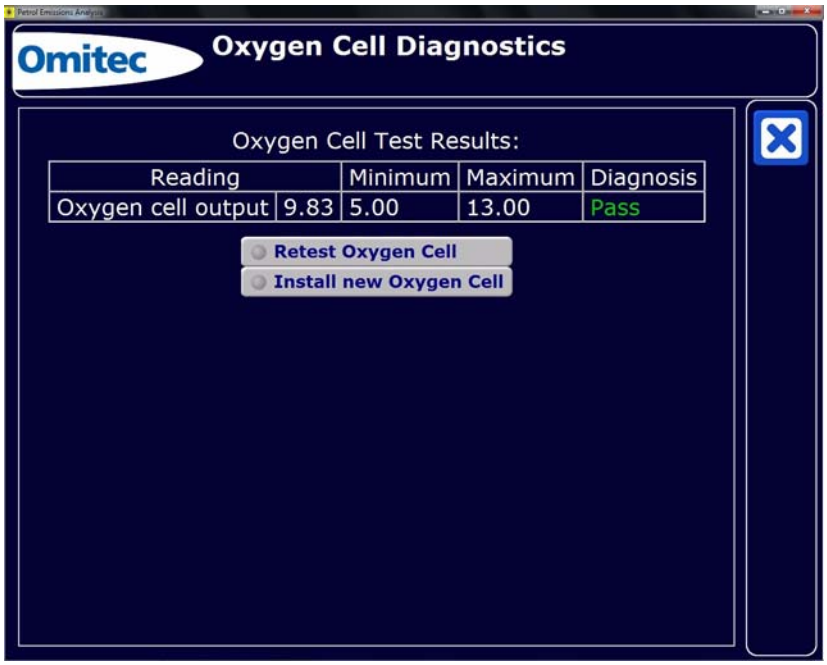
Readings of 20ppm and above will be displayed in red and the test will not exit until less than 20ppm is achieved. **NO ATTEMPT SHOULD BE MADE TO TEST A VEHICLE UNTIL THE HC RESIDUE IS BELOW 20ppm.**

Oxygen Cell Diagnostics

The Oxygen cell is a chemical voltaic device similar in many ways to a battery. As such, the cells are prone to ‘wear out’ periodically. The lifetime of each cell is very much dependent on the usage. It is therefore advisable to always keep a spare cell available as it is extremely difficult to predict when the device may fail. Provided the spare is kept within its sealed packaging, it will have a very long shelf life. The Oxygen cell is tested at the end of the Autozero routine. If it fails, the following screen will be displayed:



To check and, if necessary, replace the cell, select Oxygen Cell Diagnostics.



The Oxygen cell output is the voltage measured at the last Autozero. In normal operation the output must fall between 5 and 13 millivolts. For installation of a new cell, the software automatically tightens the limits to between 7 and 13 millivolts.

Before replacing the cell, carefully inspect the connector and wiring to ensure that it has not been disconnected or damaged. If it has become unplugged, reconnect and select Re-test.

To replace, carefully disconnect the connector from the top of the cell noting the orientation. Unscrew the existing cell and replace with the new. Reconnect the lead and select Install new cell.

Time/Date

Selecting the time/date icon allows the operator to change the current time. Only Authorised Service Personnel may change the date.

Service Mode

Allows calibration and setup of the analyser. May only be performed by Authorised Service Personnel or an Authorised Service Agent.

Note: There is a calibration time out built into all legislative analysers, after which the unit will not operate without recalibration. The OM4600 is set to 6 months.

Routine Maintenance

The OM4600 analyser requires very little maintenance. However, to ensure trouble free operation it is essential to daily:

1. Check the condition of the filters and replace as necessary. Remove any build up of water from the Gas filter bowl.
2. Disconnect the sample hose from the analyser and blow out with an airline. **DO NOT APPLY THE AIRLINE TO THE ANALYSER ITSELF**.
3. Inspect the sample hose and probe for damage. Replace as necessary.

Gas Sampling and Filtration System

A Three stage filtration system is employed to remove carbon particles and moisture from the exhaust gases. No regular emptying of the water trap is required as water is automatically expelled from the system during normal use. However, under conditions of prolonged heavy use some water may find its way into the gas Filter bowl. This should not be allowed to build up to the point where it may enter and damage the analyser

The filtration system comprises a disposable paper pre-filter (fitted in the sampling hose), a nylon mesh primary filter and water trap and a disposable gas filter.

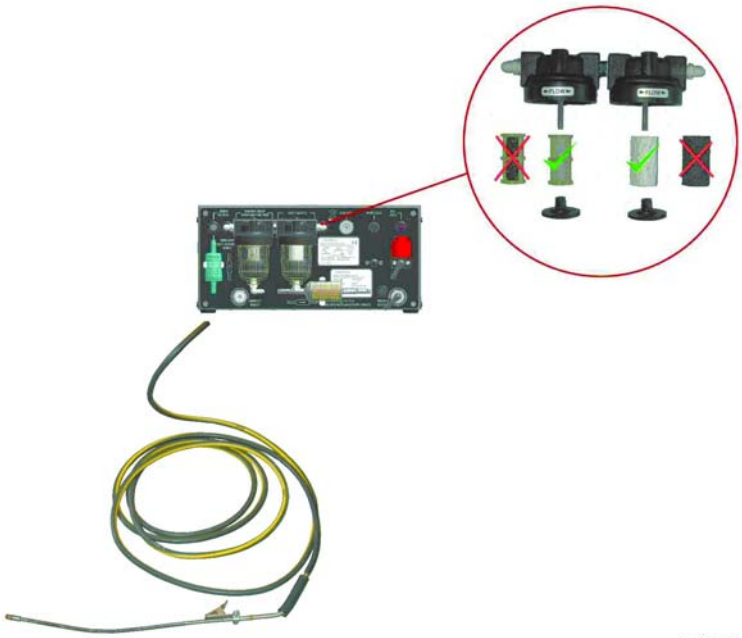
The gas filter element should be replaced regularly - it should not be allowed to become heavily sooted.

WARNING: A considerable amount of water can accumulate in the sampler pipe during normal use. NEVER roll up the pipe towards the analyser whilst still connected, as this will result in flooding the filters with water blocking the paper filter.

If a blockage occurs in the gas sampling system, the message 'GAS FLOW RESTRICTED' will be displayed. To determine the fault follow the procedure below:

Remove the sample hose. If the fault message clears, the blockage is in the hose or probe. Blow out the hose and probe with an air line (with the hose disconnected from the analyser) or replace faulty part. If the message persists, remove and clean/replace filters.

Cleaning/Replacing the Filters



Note: Before dismantling, note the orientation of filter bowls. Disconnect pipe from bottom of water trap and carefully unscrew the bowls. The filters can then be removed by unscrewing the retaining thumbwheel at the bottom of each one.

The nylon mesh filter can be washed in warm soapy water. **DO NOT USE SOLVENTS**. The gas filter should be replaced.

Note: When reassembling filter components, do not over tighten retaining thumbwheels or filter bowls.

WARNING: When dismantling and reassembling filter bowls, ensure that the 'O' rings do not become damaged or displaced and that the pipework is not kinked or trapped. NEVER CLEAN USING SOLVENTS.

Troubleshooting

Description/error message	Action
The OM4600 gas Analyser is not communicating	Check communication cable Check Analyser module switched on Check Mains supply OK
Leak Test threshold failed	Check pump is running. Disconnect sample hose from analyser, block sample inlet and re-test. If test passes, check sample probe and hose for leaks. If test fails, check filter bowl ‘O’ rings for damage.
Leak Test failed	Disconnect sample hose from analyser. Block sample inlet and re-test. If test passes, Check sample probe and hose for leaks. Check filter bowl ‘O’ rings for damage.
HC residue Test failed	Check sample probe in free air. Blow out sample probe & pipe assembly. Change gas filters if heavily contaminated. Wash filter bowls with warm soapy water.
Gas Flow Restricted	Disconnect sample hose from analyser, if condition clears, check probe and hose assembly for blockages. Ensure sample hose not kinked or crushed. Clean/replace filters.

Consumable Spares

The following parts can be ordered by contacting the Omitec Product Support Helpline on 0844 665 7681, quoting the part numbers given below, or through your authorised agent.

 CR0135	OM4600/5 Sample Hose and Probe
 CR0136	OM4600/6 Sample Probe only (flexible)
 CR0137	FILT 0041 Primary Filter
 CR0138	FILT 0040 Gas Filter
 CR0139	FILT 0043 Pre-filter

Consumable Spares

 CR0140	TRDU 0067 Oxygen Sensor
 CR0141	TRDU0103 NOx Sensor (5 gas units on)
 CR0142	OM4600/3 Oil temperature Probe

Operating Parameters

Measured Gas

HC	Hydrocarbons
CO	Carbon Monoxide
CO_2	Carbon Dioxide
O_2	Oxygen

Ranges

CO	0 to 10%
CO_2	0 to 20%
HC	0 to 10000 ppm
O_2	0 to 25%
NO_x	0 to 5000 ppm (5 gas units only)

Accuracy/Performance

OIML R99 Class 0

HC	± 10 ppm HC	absolute or 5% of reading, whichever is wider.
CO	± 0.03% CO	
CO_2	± 0.50% CO_2	
O_2	± 0.10% O_2	
NO_x	± 25 ppm	(5 gas units only)

Resolution

HC	1 ppm vol.	
CO	0.01% vol.	
CO_2	0 1% vol.	
O_2	0.01% vol.	
NO_x	1 ppm	(5 gas units only)

RPM

0 - 10,000 rpm with DIS/Wankel and 4 stroke selection

Oil Temperature

0 – 120 °C

Technical Specifications

Lambda

Calculated using Brettschneider formula.

Resolution	0.001
Fuel type selection:	Unleaded, L.P.G. or C.N.G.

Environmental

Operating temp.	+5 to +40 °C
Storage temp.	-20 to +55 °C

Relative Humidity
90% non condensing

Warm-up Time
60 Seconds

Response Time
11 seconds to 95% of final reading with 8 metre sample hose

Flow Rate
8 litres/min nominal

5 litres/min minimum

Operating Pressure
750 - 1100 mbar

1000 mbar nominal

Power Requirements
100 - 240V AC, 50 - 60 Hz

Power Consumption
60 watts maximum

Size
343mm (13.5") W x 220mm (8.7") D x 17Omm (7") H

Weight
5.2kg

LAMBDA Calculation

The analyser calculates lambda using the BRETTSCHNEIDER Formula:

Lambda =

$$\lambda = \left(\frac{CO_2 + \frac{CO}{2} + O_2 + \left(\frac{H_{cv}}{4} \times \left[\frac{3.5}{3.5 + \frac{CO}{CO_2}} \right] - \frac{O_{cv}}{2} \right) \times (CO_2 + CO) - \frac{W_{cv}}{2}}{\left(1 + \frac{H_{cv}}{4} - \frac{O_{cv}}{2} \right) \times (CO_2 + CO + [K_1 \times HC])} \right)$$

Where:	[...]	= concentration in % vol and ppm vol respectively
	K_1	= conversion factor for FID (flame ionisation detector) against NDIR (Non Dispersive Infra-Red)
	H_{cv}	= atomic ratio hydrogen to carbon
	O_{cv}	= atomic ratio oxygen to carbon
	W_{cv}	= 0

Constants

H_{cv}	= 1,7261
O_{cv}	= 0,0175
K_1	= 6x10-4
W_{cv}	= 0

After Sales Service

After Sales Service

Apart from the routine maintenance and adjustments stipulated in this manual the equipment must not be tampered with in any way. All further servicing must be carried out only by an engineer from an Authorised Agent. Failure to observe these conditions will invalidate the Guarantee.

Helplines

On-Site Service / Overhaul / Spare Parts

If you require a Service Engineer to attend ON SITE, either due to an equipment fault, or for machine calibration, or if the equipment covered by this manual requires to be sent back for factory overhaul, or if you need spare parts, please contact our Product Support Helpline at the following number during normal office hours.

Tel: 0844 665 7681

Fax: 0844 665 7604

Email: support@Omitec.com

A fully comprehensive Product Support Contract is also available which provides additional assistance with equipment technical support. Please contact Product Support on the above Helpline no. for further details.

Call Omitec Helpline for details of local service agents.

Omitec provide information and contracts covering: Car Data, Fault Code Information, Diagnostic Information, Software Support Contracts, Software Updates & Accessories.

Disposal of equipment

• Do not dispose of this equipment as miscellaneous solid municipal waste but arrange to have it collected separately.

• The re-use or correct recycling of electronic equipment (EEE) is important in order to protect the environment and the wellbeing of humans.

• In accordance with European Directive WEEE 2002/96/EC, special collection points are available for the delivery of waste electrical and electronic equipment.

• The public administration and producers of electrical and electronic equipment are involved in facilitating the processes of the re-use and recovery of waste electrical and electronic equipment through the organisation of collection activities and the use of appropriate planning arrangements.

• Unauthorised disposal of waste electrical and electronic equipment is punishable by law with appropriate penalties.

Disposal of batteries

• Batteries must be recycled or disposed of properly. Do not throw batteries away as part of normal refuse disposal.

• Do not throw batteries into open flame.

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