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KANE251

Combustion Analyser

Stock No: 19462 July 2014

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KANE251 OVERVIEW

The KANE251 Combustion Analyser measures carbon dioxide (CO2), carbon monoxide (CO) and Flue temperature.

It calculates oxygen (O2), CO/CO2, ratio, losses, combustion efficiency (Nett, Gross or Condensing) and excess air.

In addition the KANE251 Combustion Analyser's CO sensor checks CO levels in ambient air - useful when a CO Alarm is triggered.

The CO reading can be referenced to the oxygen reading in ppm or mg/m3.

The analyser has a protective rubber cover with integral magnet for "hands-free" operation and is supplied with a flue probe with integral temperature sensor.

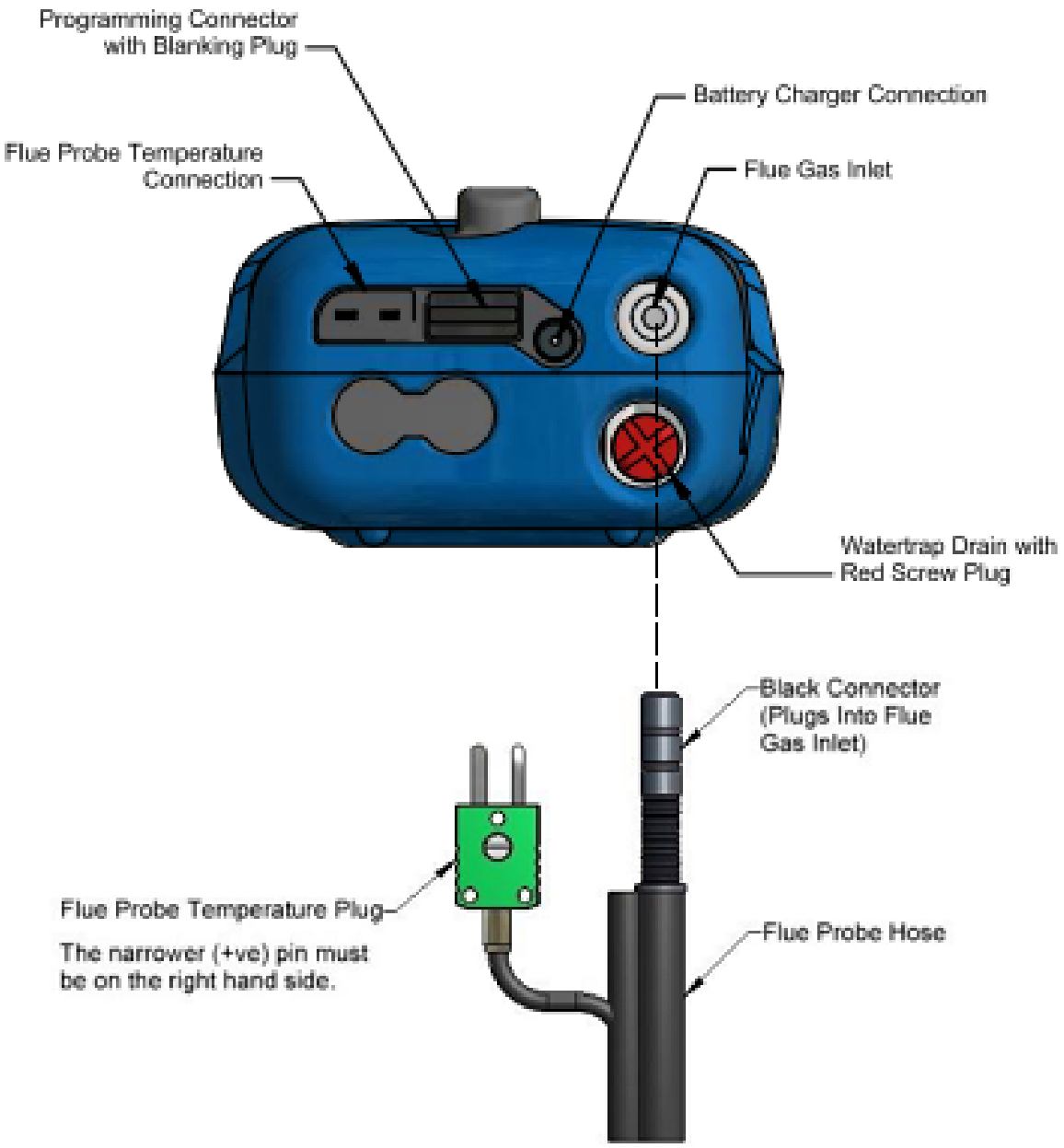
The large display shows 2 readings at a time and all data can be printed via an optional infrared printer. The printed data can be 'live' data, 'frozen data' or stored data. 20 sets of tests can be stored. Two lines of 16 characters can be added to the header of printouts.

The KANE251 combustion analyser is controlled using 4 buttons and a rotary dial.

The four buttons (from left to right) the power button, switch on and off the backlight and "freeze" or hold data, switch on and off the pump, SEND button, to print live readings, if the SEND button is held for 2 seconds the data is stored in the memory, a log number will be briefly displayed. The buttons with UP, DOWN and ENTER arrows also change settings such as date, time, fuel source and AUX page settings.

The rotary dial changes the displayed data and selects access to the menu to make changes to the date, time, etc.

ANALYSER LAYOUT & FEATURES


Programming Connector with Blanking Plug
Battery Charger Connection
Flue Probe Temperature Connection
Flue Gas Inlet
Watertrap Drain with Red Screw Plug
Black Connector (Plugs Into Flue Gas Inlet)
Flue Probe Temperature Plug
The narrower (+ve) pin must be on the right hand side.
Flue Probe Hose

1. BATTERIES

Battery Type

This analyser has been designed for use with disposable alkaline batteries or rechargeable Nickel Metal Hydride (NiMH) batteries. No other battery types are recommended.

⚠ WARNING
The battery charger unit must only be used when NiMH batteries are fitted. Do not mix NiMH cells of different capacities or from different manufacturers. All four cells must be identical.

Replacing Batteries

Turn over the analyser, remove its protective rubber cover followed by the battery cover and fit 4 “AA” batteries in the battery compartment. Take great care to ensure that they are fitted with the correct battery polarity. Replace the battery cover and the protective rubber cover.

Switch the analyser on and check that the analyser’s date and time are correct. To reset the date and time, see using the MENU section.

Charging NiMH batteries

Ensure that you use the correct charger. Part number 19278

To fully charge NiMH batteries:

Switch the KANE251 on. The charger should be connected and switched on. When charging the red Battery charging indicator will illuminate. Switch the KANE251 off. The display will show BATTERY and a battery symbol.

The first charge should be for 12 hours continuously. NiMH are suitable for top up charging at any time even for short periods.

Battery Disposal

Always dispose of depleted batteries using approved disposal methods that protect the environment.

2. BEFORE USING THE ANALYSER EVERY TIME:

Check the water trap is empty and the particle filter is not dirty:

To empty water trap, unscrew the red screw plug and re-tighten once it is empty.

To change the filter, remove protective rubber cover, pull out the water trap unit from the analyser, remove the water trap's particle filter from its' spigot and replace. Reconnect the water trap and protective rubber cover.

Connect the flue probe hoes to the analyser's flue gas inlet and connect the flue probe's temperature connector to the T1 socket – check the plug's orientation is correct otherwise incorrect temperature measurements will occur (see Page 6).

After switch on, check fuel source, date and time are correct and battery power is sufficient.

3. FRESH AIR PURGE

Position the flue probe in fresh air, then press ON/OFF. The analyser's pump starts and the analyser auto calibrates for approximately 75 seconds.

Using the rotary dial select CO_2 & CO. In fresh air both COppm and CO_2% reading should be zero.

4. STATUS DISPLAY

Select the "Status" position on the dial to view Battery Status and Calibration Due Date.

5. SAFETY WARNING

This analyser extracts combustion gases that may be toxic in relatively low concentrations. These gases are exhausted from the back of the instrument. **This meter must only be used in well-ventilated locations by trained and competent persons after due consideration of all the potential hazards.**

Sensor manufacturers recommend users of portable gas detectors containing electrochemical conduct a “bump” check before relying on the unit to verify an atmosphere is free from hazard.

A “bump” test is a means of verifying that an instrument is working within acceptable limits by briefly exposing to a known gas mixture formulated to change the output of all the sensors present. (This is different from a calibration where the instrument is also exposed to a known gas mixture but is allowed to settle to a steady figure and the reading adjusted to the stated gas concentration of the test gas).

6. USING THE FOUR FUNCTION BUTTONS:

Switching ON the Analyser:

Press the ON/OFF button to switch the analyser ON. This must be done in fresh air, to ensure the analyser auto calibrates its sensors correctly.

When switched on the analyser bleeps and displays the battery %, date, time, fuel and model number. The second line of the display counts down from 75 until the sensors are ready to use. If the analyser will not auto calibrate! Its sensors need to be replaced or recalibrated by Kane authorised repair centre.

If the flue probe is connected to the analyser during the countdown the measure temperature will be used as the inlet temperature (Ti).

If the flue probe is NOT connected during the count down then the analysers internal ambient temperature will be used as the inlet temperature (Ti).

Switching off the Analyser:

Press the ON/OFF button to switch the analyser OFF. The display counts down from 29 with the pump on to clear the sensors with fresh air – if the flue probe is still connected, make sure the analyser and probe are in fresh air.

Press the SEND/PRINT button to abort the off count down and return to making measurements.

Note: The analyser will not switch off unless the CO reading is below 40ppm.

Backlight & Data Freeze:

Press the backlight button for 1 second to freeze the current data on the screen. Press the backlight button for a 1 second to disable the freeze function.

Press the backlight button for 2 seconds to switch on the analysers display backlight. Press the backlight button for 2 seconds to disable the backlight.

NOTE: Use of the backlight significantly increases the current drain on the batteries.

Switching the PUMP on / off

The analyser operates normally with the pump on.

Press the PUMP button to witch the pump off and on

When the pump is switched off “–PO-“ replaces the readings on the top line of the display. The analyser also displays “PUMP OFF” on the top line approximately every 40 seconds

NOTE: The pump will not switch off if the CO reading is above 40ppm. This helps to protect the CO sensor from damage.

The pump automatically switches itself off when the rotary dial is set to Menu, Status and Temp if the CO value is less than 40ppm.

Printing Data

Press the SEND/PRINT button for 1 second to start the data transfer from the analyser to the infa-red printer. The analyser displays a series of bars until the transfer is completed. Press the button for 1 second again to abort the transfer.

Make sure the printer is switched on, ready to accept data and the infa-red receiver is inline with the emitter of the analyser (on top of the analyser).

Storing Data

Press and hold the SEND/PRINT button for approximately 2 seconds.

The top line of the display briefly displays the log number.

Note: The store function is inhibited in normal operation if the pump is switched off.

7. USING △ / ▽ / ⏎ BUTTONS

The function buttons with the symbols △ / ▽ / ⏎ below are used to navigate through the menu when the rotary dial is in the menu position.

8. USING THE ROTARY DIAL (STARTING FROM MENU):

Select “Menu” on the rotary dial and navigate using the function buttons.

△ = Scroll up ▽ = Scroll down ⇦ = Enter

	ROTARY DIAL POSITIONS
MENU	Rotate the dial to MENU and use the UP or DOWN and ENTER keys to select the following function for change: 1 Time – Uses “Military” time as standard: 7am = 07:00, 7pm = 19:00 2 Date 3 Aux. Two pages of two lines to display desired parameters not currently on the rotary dial. 4 O2 Ref. 5 The display’s contrast 6 Header – 2 lines each of up to 16 characters that appear on the printout. Use ENTER and UP/DOWN. 7 Gross or Net or Condensing Boiler / Furnace efficiency 8 ppm or mg/m^3 9 Report 10 Printing select the PRINTER model KMIRP/KANEIRP-2 11 Service – Password protected for service personal only When you have selected the function to change, press ENTER to select. Repeat this to scroll through the menu and select (using the ENTER key) and change (using the UP / DOWN keys) the function. The final, logical ENTER returns you to the main menu display. To exit the Menu function you can normally rotate the dial to another position - Unless the final logical ENTER is pressed, no changes are made.

	ROTARY DIAL POSITIONS
STATUS	Displays the battery level and the number of days until calibration is due
AUX	Displays up to two pages of two lines that toggle for custom setting
O_2 / Eff	Displays calculated Oxygen values and the calculated efficiency when O_2 values are less than 18% EFFn, EFFg or EFFc as selected by the user.
CO_2 &CO	Displays Carbon Dioxide in % and Carbon Monoxide in ppm
RATIO	Displays the CO/CO2 ratio and the selected fuel type
TEMP	Displays the flue (Tf) and inlet (Ti) temperatures in ^{o}F or ^{o}C . If the flue probe's temperature sensor is broken or open circuit Tf displays -OC- ^{o}C
FUEL	SET FUEL, select the boiler/furnace fuel using UP/DOWN and ENTER keys. Preprogrammed fuels: NAT GAS, Light Oil, PELLETS(wood), BUTANE, L.P.G., Heavy Oil, User
DATE / TIME	Displays the date and time

9. MEASURING FLUE GASES

After the countdown is finished and the analyser is correctly set up, put its' flue probe into the appliance's sampling point. The tip of the probe should be at the centre of the flue. Use the flue probe's depth stop cone to set the position.

For appliances that have internal sampling points, you can connect using a suitable plastic or rubber hose. **Always remember to refit the covers/seals once sampling has been completed.**

With balanced flues, make sure the probe is positioned far enough into the flue so no air can 'back flush' into the probe.

NOTE: Ensure that the flue probe handle does not get hot

Make sure you do not exceed the meter's operating specifications. In particular:

Do not exceed the flue probe's maximum temperature
Do not exceed the meter's internal temperature operating range
Do not put the meter on a hot surface
Do not exceed the water trap's levels
Do not let the meter's particle filter become dirty and blocked

View the displayed data to ensure that stable operating conditions have been achieved and the readings are within the expected range.

Press the SEND/PRINT button for 1 second to start the data transfer from the analyser to the infa-red printer. The analyser displays a series of bars until the transfer is completed. Press the button for 1 second again to abort the transfer.
Make sure the printer is switched on, ready to accept data and the infa-red receiver is inline with the emitter of the analyser (on top of the analyser).

Press and hold the SEND/PRINT button for approximately 2 seconds to store the data in the memory.

Press the BACKLIGHT key for one second to "freeze" the readings before printing.

NOTE: In accordance with BS7967 and EN50379 the value of the CO/ CO_2 RATIO is shown to 4 decimal places.

R 0.0008	→ NOTE: 0.0008 is less than 0.004.
R 0.0040	→ Many manufacture's instructions show this as **0.004**.

AUX display

COn 021 **O2% 05.0**	→ The AUX (auxillary) can be customised via MENU AUX. The parameters are displayed in 2 pages of 2 lines and can be set by the user. They remain the AUX parameters until changed by the user.

Press the SEND/PRINT button for 1 second to print the full combustion test.

Press and hold the SEND/PRINT button for approximately 2 seconds to store the combustion test in the memory.

Press the BACKLIGHT key for one second to "freeze" the readings before printing.

O2/EFF display

O2% 05.0	→ Oxygen (%) left after combustion. Should be 20.9% ±0.1% in fresh air
EFC 98.2	→ 'Net', 'Gross', or 'Condensing' combustion efficiency (%) can be selected via "Menu"

Press the SEND/PRINT button for 1 second to print the full combustion test.

Press and hold the SEND/PRINT button for approximately 2 seconds to store the combustion test in the memory.

Press the BACKLIGHT key for one second to “freeze” the readings before printing.

CO2 & CO display

COp 052	→	Carbon monoxide in (ppm)
CO2% 08.9	→	Carbon dioxide (%)

Press the SEND/PRINT button for 1 second to print the full combustion test.

Press and hold the SEND/PRINT button for approximately 2 seconds to store the combustion test in the memory.

Press the BACKLIGHT key for one second to “freeze” the readings before printing.

RATIO display

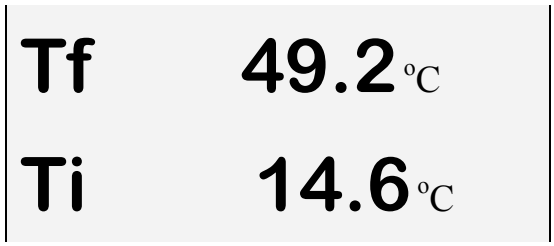
R 0.0006	→	CO/ CO_2 RATIO
NATU GAS	→	Fuel source seleced

Press the SEND/PRINT button for 1 second to print the full combustion test.

Press and hold the SEND/PRINT button for approximately 2 seconds to store the combustion test in the memory.

Press the BACKLIGHT key for one second to “freeze” the readings before printing.

Temperature display



→ Flue temperature (°C)

→ Inlet temperature (°C) Normally set by the flue probe during the fresh air purge.

Press the SEND/PRINT button for 1 second to print the full combustion test.

Press and hold the SEND/PRINT button for approximately 2 seconds to store the combustion test in the memory.

Press the BACKLIGHT key for one second to “freeze” the readings before printing.

Fuel display

→ Set the fuel source.

→ Fuel source currently selected

Use the △ / ▽ scroll to the required fuel source.

Press the ⇦ button to select the fuel source. DONE will be briefly displayed on the bottom line of the display.

Set User Fuel

→ Set the fuel source

→ Fuel source currently selected

Press the ⇦ button to select User fuel.

USER	→	Set the User Fuel calorific value
K1	→	K1

Press the ⇦ button to select K1. DONE will be briefly displayed on the bottom line of the display.

K1	→	Fuel constant
0.000	→	Set fuel constant

Use the △ / ▽ scroll to the correct value.

Press the ⇦ button to select.

USER	→	Set the User Fuel calorific value
K2	→	Set fuel constant

Press the ⇦ button to select K2. DONE will be briefly displayed on the bottom line of the display.

K2	→	Fuel constant
0.000	→	Set fuel constant

Use the △ / ▽ scroll to the correct value.

Press the ⇦ button to select.

USER	→	Set the User Fuel calorific value
K3	→	Set fuel constant

Press the ⇦ button to select K3. DONE will be briefly displayed on the bottom line of the display.

K3	→	Fuel constant
0.000	→	Set fuel constant

Use the △ / ▽ scroll to the correct value.

Press the ⇦ button to select. DONE will be briefly displayed on the bottom line of the display.

USER	→	Fuel Source
EXIT	→	Exit

Press the ⇦ button to select and the User Fuel is now set.

Date/Time display

14 : 47 : 15	→	Current time. Can be reset via “Menu”.
23 / 01 / 14	→	Current date. Can be reset via “Menu”.

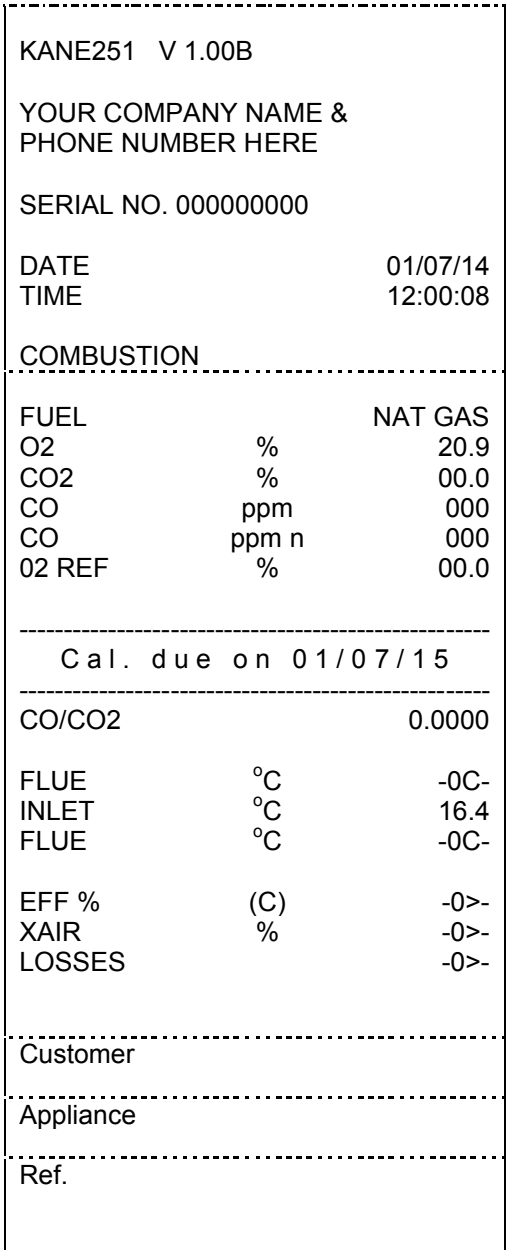
Press the SEND/PRINT button for 1 second to print the full combustion test.

Press and hold the SEND/PRINT button for approximately 2 seconds to store the combustion test in the memory.

Press the BACKLIGHT key for one second to “freeze” the readings before printing.

10. EXAMPLE PRINTOUT IN AMBIENT AIR

The standard printouts are:



KANE251 V 1.00B

YOUR COMPANY NAME &
PHONE NUMBER HERE

SERIAL NO. 000000000

DATE		01/07/14
TIME		12:00:08

COMBUSTION

FUEL		NAT GAS
O2	%	20.9
CO2	%	00.0
CO	ppm	000
CO	ppm n	000
02 REF	%	00.0

Cal. due on 01/07/15

CO/CO2		0.0000
FLUE	°C	-0C-
INLET	°C	16.4
FLUE	°C	-0C-
EFF %	(C)	-0>-
XAIR	%	-0>-
LOSSES		-0>-

Customer

Appliance

Ref.

NOTE: Printouts of stored readings will also include the TEST NO. below the serial number.

KANE251 V 1.00B

YOUR COMPANY NAME &
PHONE NUMBER HERE

SERIAL NO. 000000000

LOG		001
DATE		01/07/14
TIME		12:00:08

COMBUSTION

FUEL		NAT GAS
O2	%	20.9
CO2	%	00.0
CO	ppm	000
CO	ppm n	000
02 REF	%	00.0

Cal. due on 01/07/15

CO/CO2		0.0000
FLUE	°C	-0C-
INLET	°C	16.4
FLUE	°C	-0C-
EFF %	(C)	-0>-
XAIR	%	-0>-
LOSSES		-0>-

Customer

Appliance

Ref.

11. WHEN YOU FINISH USING THE METER

Remove its' probe from the flue - THE PROBE WILL BE HOT - and let it cool. Do not put the probe in water which will be sucked into the meter, damaging its' pump and sensors.

When the meter's readings return to ambient levels, switch it off. The meter counts down from 30 before switch off with the pump running to self clean its sensors.

12. ANALYSER PROBLEM SOLVING

If any problems are not solved with these solutions, contact us or an authorised repair center.

Fault symptom	Causes / Solutions
• Oxygen too high • CO_2 too low	• Air leaking into probe, tubing, water trap, connectors or internal to analyser.
• CO reading (- - - -)	• Analyser was stored in a cold environment and is not at normal working temperature. • CO sensor needs replacing. • Pump is switched off
• Batteries not holding charge • Analyser not running on mains adapter.	• Batteries exhausted. • AC charger not giving correct output. • Fuse blown in charger plug.
• Analyser does not respond to flue gas	• Particle filter blocked. • Probe or tubing blocked. • Pump not working or damaged with contaminants.
• Net temperature or Efficiency calculation incorrect.	• Ambient temperature set wrong during Automatic Calibration.
• Flue temperature readings erratic	• Temperature plug reversed in socket. • Faulty connection or break in cable or plug.
• T flue or T nett displays -(-OC-)	• Probe not connected.
• X-Air, EFF display (-O>-)	• CO_2 reading is below 2%.
• Analyser just continually beeps	• Turn dial back to MENU and press ENTER

13. ANALYSER ANNUAL SERVICE & RE-CERTIFY

Although sensor life is typically more than five years, the analyser should be serviced and re-certified annually to counter any long-term sensor or electronics drift or accidental damage.

Local regulations may require more frequent re-certification.

Kane International has service facilities at Atherton near Manchester Tel: 01942-873434 (the primary service centre for UK customers) and at Welwyn Garden City in Hertfordshire Tel: 01707-375550 (the primary service centre for non-UK customers).

By sending your analyser back to Kane for an annual fixed price service (check *www.kane.co.uk* for details) you have the opportunity to extend the warranty on your analyser to 5 years.

13.1 RETURNING YOUR ANALYSER TO KANE

When returning your KANE251, please always ensure that you enclose:

- ✓ Your full contact details
- ✓ A daytime telephone number
- ✓ Details of faults you might have experienced

Packing your analyser

When returning your analyser, please pack it appropriately to prevent any damage during transit.

Before sealing your package, please ensure that you have enclosed the items listed above and that it is clearly marked for the attention of:

Northern Service Centre
Kane International Ltd
Gibfield Park Avenue
Atherton
Manchester
M46 0SY

Southern Service Centre
Kane International Ltd
Kane House, Swallowfield
Welwyn Garden City
Hertfordshire
AL7 1JG

Sending your analyser

Once the analyser has been securely packed then your package is ready for shipment back to Kane. If you do not have an account with a courier company you can take your package to your local Post Office. It is advisable to send the package by Special Delivery so that it is insured and traceable while in transit.

When we receive your analyser

On receipt of your package, our Service Engineers will inspect the analyser and any accessories and confirm to you the total service cost. Once you have accepted this the work will be carried out, and upon completion the analyser returned to you.

If you have any questions that we haven't answered, please feel free to contact our Northern Service Centre:

Tel: 01942 873434
Fax: 01942 873558
Email: nservice@kane.co.uk

Tel: 01707 384834
Fax: 01707 384833
Email: sservice@kane.co.uk

13.2 Service Returns (Simply cut out and attach to your package)

Northern Service Department
Kane International Ltd
Gibfield Park Avenue
Atherton
Manchester
M46 0SY

Southern Service Department
Kane International Ltd
Kane House, Swallowfield
Welwyn Garden City
Hertfordshire
AL7 1JG

Northern Service Department
Kane International Ltd
Gibfield Park Avenue
Atherton
Manchester
M46 0SY

14. ANALYSER SPECIFICATION
(NOTE MAY BE SUBJECT TO CHANGE)

Parameter	Range	Resolution	Accuracy
Temp Measurement			
Flue Temperature	0-600°C	0.1°C	±2°C ±0.3% reading
Inlet Temperature (Internal sensor)	0-50°C	0.1°C	±1°C ±0.3% reading
Inlet Temperature (External sensor)	0-600°C	0.1°C	±2°C ±0.3% reading
Flue Gas Measurement			
Oxygen[*2]	0.21%	0.1%	±0.3%
Carbon Monoxide (H_2 compensated)	0-20ppm 21-4,000ppm nom 4,001-10,000ppm 20,000ppm max for 15 mins	1ppm	±3ppm ±5% of reading ±10% of reading
Carbon Dioxide[*1]	0-20%	0.1%	±0.3% volume
Efficiency (Net or Gross)[*2]	0-99.9%	0.1%	±1.0% reading
Efficiency High (C) [*2]	0-119.9%	0.1%	±1.0% reading
Excess Air[*2]	0-250%	0.1%	±0.2% reading
CO/CO_2 ratio [*2]	0-0.999	0.0001	±5% reading

[*1] Using dry gases at STP

[*2] Calculated

Pre-programmed Fuels	Natural gas, Light Oil, Propane, Butane, LPG, Wood Pellets.
Dimensions Weight Handset Probe	 1kg / 2.2lb 200mm / 7.9” x 45mm / 1.8” x 90mm / 3.5” L300mm / 11.8” x Dia 6mm / 0.25”with 200mm / 7.8” long stainless steel shaft, type K thermocouple and 3m / 6ft long neoprene hose
Ambient Operating Range	+0°C to +40°C / 32-104°F 10% to 90% RH non- condensing
Storage Capacity	20 sets of test results in volatile memory
Battery Life	4 AA cells >8 hours using Alkaline AA cells
Charger (optional)	110Vac/220 Vac nominal for NMiH batteries only 12v in vehicle charger for NMiH batteries only

15. ELECTROMAGNETIC COMPATIBILITY

European Council Directive 89/336/EEC requires electronic equipment not to generate electromagnetic disturbances exceeding defined levels and have adequate immunity levels for normal operation. Specific standards applicable to this meter are stated below.

As there are electrical products in use pre-dating this Directive, they may emit excess electromagnetic radiation levels and, occasionally, it may be appropriate to check the meter before use by:

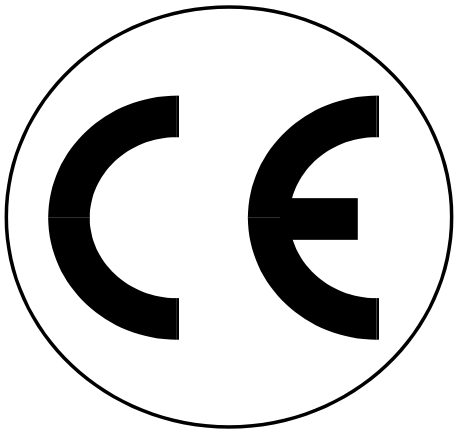
Use the normal start up sequence in the location where the meter will be used.

Switch on all localized electrical equipment capable of causing interference.

Check all readings are as expected. A level of disturbance is acceptable.

If not acceptable, adjust the meter's position to minimize interference or switch off, if possible, the offending equipment during your test.

At the time of writing this manual (July 2014) Kane International Ltd are not aware of any field based situation where such interference has occurred and this advice is only given to satisfy the requirements of the Directive.



This product has been tested for compliance with the following generic standards:

EN 61000-6-3 : 2011
EN 61000-6-1 : 2007

and is certified to be compliant

Specification EC/EMC/KI/KANE200S details the specific test configuration, performance and conditions of use.

16. END OF LIFE DISPOSAL

The Waste Electrical or Electronic Equipment (WEEE) Directive requires countries in the EU to maximise collection and environrmentally responsible processing of these items.

Products are now labelled with a crossed out wheeled bin symbol to remind you that they can be recycled.

Please Note: Batteries used in this instrument should be disposed of in accordance with current legislation and local guidelines.

APPENDIX 1 - MAIN PARAMETERS:

Here are the legends used and what they mean:

O_2 : Oxygen reading in percentage (%)

O2R: Oxygen reference setting. '----' means switched off or set to 0%.

T Flue: Temperature measured by the flue gas probe in Centigrade. It displays '**- OC -**' if the flue probe is disconnected.

T Inlet: The temperature measure from the flue probe during the fresh air purge will be used as the inlet temperature. If no probe is connected then the internal ambient temperature of the KANE251 will be used as the inlet.

T Nett : Nett temperature calculated by deducting the **AMBIENT** or **INLET** temperature from the measured **FLUE** temperature. Displays in either Fahrenheit (°F) or Centigrade (°C) or and will display '**- - -**' if the flue probe is not connected.

COp: Carbon Monoxide reading displayed in ppm (parts per million). '**- - -**' is displayed if there is a fault with the CO sensor or the instrument has not set to zero correctly, switch off instrument and try again.

COm: Carbon Monoxide displayed in mg/m^3.

COn: Carbon Monoxide in ppm normalised to the O2R value viewed on the AUX screen

COM: Carbon Monoxide in mg/m3 normalised to the O2R value viewed on the AUX screen

R: CO/CO_2 Ratio: measured CO divided by measured CO_2

CO_2 : Carbon Dioxide calculation determined by fuel type. This is only displayed when a combustion test is being carried out. '**- - -**' is displayed while in fresh air.

EFF : Combustion efficiency calculation displayed in percentage either as Gross (G) or Nett (N) or Condensing Nett (C) - Use **MENU** to change. The calculation is determined by fuel type and uses the calculation in British Standard BS845. The efficiency is displayed during a combustion test, '**- - - -**' is displayed while in fresh air.

X - AIR : Excess air calculated from the measured oxygen and type of fuel used.
Displays reading during a combustion test. '**- - - -**' is displayed while in fresh air.

Losses : Losses calculated from Oxygen and type of fuel. Displays reading during a combustion test. '**- - - -**' is displayed while in fresh air.

BAT Displays the Battery power available in %

When the LO BAT symbol appears this indicates the batteries are at less than 10% of charge and should be replaced, readings may be affected if used with low power batteries. Warning: all stored readings are lost when the batteries are removed or become exhausted.

DATE : Date shown as day, month and year. The order can be changed using the menu function. Date is recorded when each combustion test is printed.

TIME : The time is shown in hours and minutes, expressed in "Military" time or the 24hr clock. Time is recorded when each combustion test is printed.

Note! When changing the batteries on the instrument the memory will store the date and time for up to one minute, if outside this time it may be necessary to re-enter the details.

Date and time may also need to be reset if re-chargeable batteries are allowed to totally discharge.

APPENDIX 2 - SYMBOLS USED ON THE DISPLAY

R	CO/CO_2
λ	Excess Air
	Loss %: 100% minus loss % = efficiency %
TF	Flue temperature
TI	Inlet temperature
∆T	Nett temperature
EfG	Gross efficiency
EfN	Nett efficiency
EfC	Condensing efficiency
- PO -	Pump off
-O>-	Calculated oxygen greater than 18% so calculation is disabled
-OC-	Open circuit temperature input
CAL	Number of days left before recalibration is due

PRODUCT REGISTRATION

Please complete, detach and return to: Kane International Ltd
Kane House, Swallowfield, Welwyn Garden City, Hertfordshire, AL7 1JG

Your Details	
Name:	
Job Title:	
Company Name:	
Company Address 1:	
Address 2:	
Town/City:	
County:	
Postcode:	
Country:	
Phone Number:	
Fax Number:	
Mobile Number:	
Email Address:	

Product Details *Note: Proof of Purchase may be required for warranty claims.*	
Date Purchased: as numbers (28.01.14):	
Purchased From:	
Model Number:	**KANE251**
Product Serial Number: located on the rear product label beneath the protective rubber sleeve	

Why did you buy a Kane Product?

☐ Made in the UK
☐ Value for Money
☐ Kane Brand
☐ Not your Decision
☐ Previous Owner
☐ Our Fixed Price Servicing Programme
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What brand was your previous analyser?

How did you hear about Kane?

☐ Magazine Advert
☐ Training School
☐ Personal Recommendation
☐ Exhibition
☐ Trade Counter
☐ Previous Owner
☐ Internet Search
☐ Other:

Which do you read most often?

	Often	Sometimes	Hardly Ever
Registered Gas Engineer	☐	☐	☐
Gas Installer	☐	☐	☐
P.H.P.I.	☐	☐	☐
P.H.A.M. News	☐	☐	☐
Heating Ventilating & Plumbing	☐	☐	☐
Heating & Plumbing Monthly	☐	☐	☐

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