

KANE457

Flue Gas and Ambient Air
Analyser with direct CO₂
measurement






Complies with EN50397 and EN50543

Stock No: 19291-3 July 2014

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KANE457 OVERVIEW

The **KANE457** Combustion and Ambient Analyser measures carbon dioxide (CO₂), carbon monoxide (CO), differential temperature and differential pressure. The direct measurement of CO₂ is achieved using a Kane designed infra-red sensing system. CO₂ is measured at both flue gas concentrations and at ambient concentrations using two separate sensing systems. These sensing systems are automatically compensated for changes in ambient temperature and in atmospheric pressure.

Low flow is automatically detected in both combustion and ambient modes. It can be triggered by low battery voltage, a kinked hose, a full water trap, saturated particle filter or a blockage in the hose or probe.

Flue CO₂ in % is set to zero in fresh air automatically after the initial countdown. For extra accuracy ambient CO₂ in ppm is set to a true zero using a Kane 'ZeroCal Capsule'.

If "RESET GAS ZERO" is indicated ensure that the unit is in fresh air before pressing the button with an "Enter" symbol.

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

The KANE457 Combustion Analyser can also measure CO levels in ambient air - useful when a CO Alarm is triggered. It can also perform a Room CO + CO₂ Test for up to 30 minutes duration.

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

The large display shows 4 readings at a time and all data can be printed via an optional infrared printer. The printed data can be 'live' data or 'stored' data.

The memory can store up to:

- 99 combustion tests
- 20 pressure tests
- 20 let-by/tightness tests
- 20 temperature tests
- 20 room tests
- 20 ambient tests
- 240 timed tests

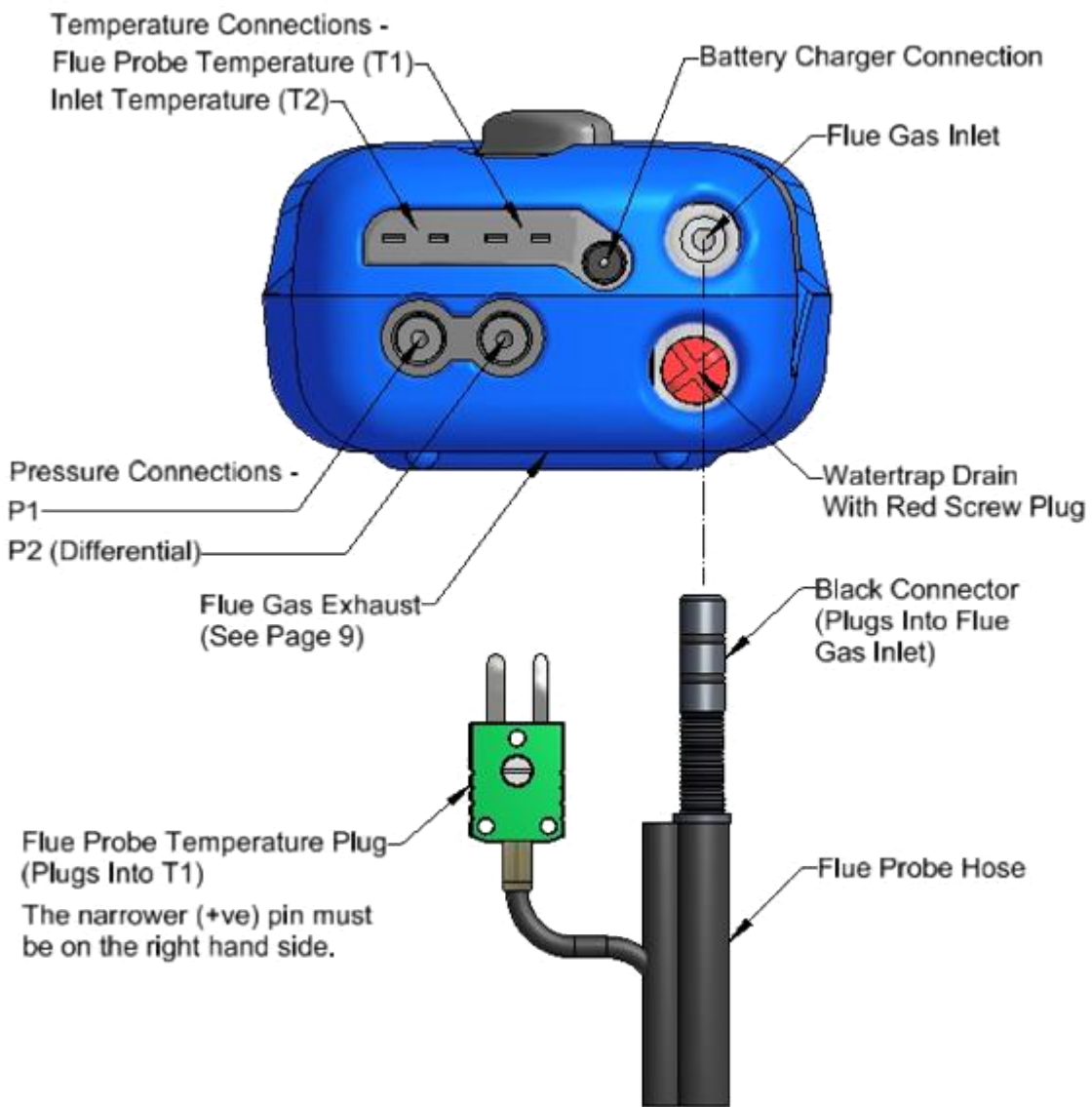
Two lines of 20 characters can be added to the header of printouts.

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

The four buttons (from left to right) switch on and off the analyser, switch on and off the backlight and task light, switch on and off the pump and send data to a printer or to the memory. The buttons with UP, DOWN and ENTER arrows also change settings such as date, time, fuel, etc. when in MENU mode.

ANALYSER LAYOUT & FEATURES





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 sleeve and fit 4 "AA" batteries in the battery compartment. **Take great care to ensure they are fitted with the correct battery polarity.** Replace the battery cover and protective rubber sleeve.

Switch the analyser on and check that the analyser's time and date are correct. To reset see **USING THE MENU, Section 5.**

CHARGING NIMH BATTERIES

Ensure that you use the correct charger. The part number is 19278.

TO FULLY CHARGE NIMH BATTERIES:

Switch the KANE457 on.

The charger must then be connected and switched on.

When charging, the red Battery Charging Indicator will illuminate.

Now switch the KANE457 off. The display will show "BATTERY CHARGING"

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

An in-vehicle charger can be used to top up the analyser's batteries from a 12 volt vehicle battery. The part number is 18342.

BATTERY DISPOSAL

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

BEFORE USING THE ANALYSER EVERY TIME:

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

- To empty water trap, unscrew its stopper and re-tighten stopper once the trap is empty.
- To change the particle filter, remove protective rubber sleeve, slide the water trap unit from the analyser, remove the particle filter from its' spigot and replace. Reconnect the water trap unit and rubber protective sleeve.

Connect the flue probe hose to the analyser's flue gas inlet and connect the flue probe's temperature plug to the T1 socket – check the plug's orientation is correct - see Page 6.



FRESH AIR PURGE


Position the flue probe in fresh air, then press  / . The analyser's pump starts and the analyser auto-calibrates for approximately 90 seconds. When complete:

Select "Ratio" on the dial. *In fresh air the CO reading should be zero.*

Select "O₂/Eff" on the dial. *In fresh air the O₂ reading should be 20.9% ± 0.2%.*

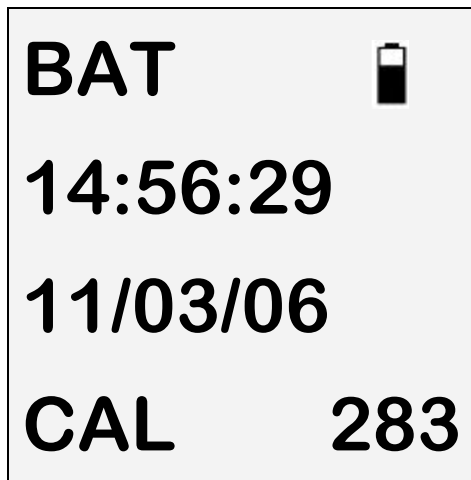
**RESET
GAS ZERO
IN FRESH
AIR ↓**

This message indicates that the analyser needs to be reset in fresh air. To do so, ensure that the analyser is in fresh air and press  / .

To perform a manual 'Gas Zero', select 'Ratio' on the dial, hold down the  key and you will see the message above.

STATUS DISPLAY

Select any of the three “Status” positions on the dial to view the following:



- Replace alkaline batteries if less than 1 bar.
Recharge NiMH batteries if less than 1 bar.
- Current time. Can be re-set via the “Menu”.
- Current date. Can be re-set via the “Menu”.
- Shows number of days until next calibration is due.

NOTE: The typical BAT status symbol for fully charged batteries is 3 bars

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 analyser must only be used in well-ventilated locations by trained and competent persons after due consideration of all the potential hazards.**

Users of portable gas detectors are recommended to 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).

USING THE FOUR FUNCTION BUTTONS:

SWITCHING ON THE ANALYSER:

Press  /  button to switch the unit ON. This must be done in fresh air to ensure that the analyser auto calibrates its' sensors properly.



When switched on, the analyser beeps and briefly displays battery %, fuel and pressure units. Its' bottom line counts down from 90 until the sensors are ready to use. If the analyser will not auto calibrate, its' sensors need to be replaced or recalibrated by a Kane authorised repair centre.



If an inlet temperature probe (optional) is connected into the T2 socket during its' countdown, the measured temperature from the inlet probe will be used as the inlet temperature.

If an inlet temperature probe is not connected to the analyser during countdown the measured temperature from the flue probe will be used as the inlet temperature.

If neither probe is connected during countdown the analyser's internal ambient temperature will be used as the inlet temperature.

SWITCHING OFF THE ANALYSER

Press  /  button to switch the analyser OFF. The display counts down from 30 with the pump on to clear the sensors with fresh air – If the probe is still connected, make sure analyser and probe are in fresh air.

Press  /  if you want to stop the countdown and return to making measurements.

Note: The analyser will not switch off unless the CO reading is below 20ppm.



BACKLIGHT & TASKLIGHT

Press  /  to switch the display's backlight and tasklight on and off.

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

SWITCHING PUMP ON / OFF

The analyser normally operates with the pump on.

Press  /  to switch the pump off and on.



When the pump is switched off "-PO-" is displayed instead of the O₂, CO & CO₂ readings. The analyser also displays "PUMP OFF" on the top line approx every 40 seconds.

NOTES:

- 1) The pump will not switch off if the CO reading is above 20ppm . This helps to protect the CO sensor from damage.
- 2) The pump will automatically switch itself off when the rotary switch is set to Menu, Status, Pressure, Tightness or Differential Temperature.

ZEROING THE PRESSURE SENSOR

To re-zero the pressure sensor when "Prs" is selected on the dial, press and hold

 /  until the top line display shows CAL ZERO.

PRINTING DATA

Press and quickly release  /  to start the analyser printing. The analyser displays a series of bars until this is completed. Press and release the key again to abort printing.

Make sure the printer is switched on, ready to accept data and its' infrared receiver is in line with the analyser's emitter (on top of the analyser).

STORING A SET OF READINGS

Press and hold  /  for approx. 2 seconds.

The top line briefly displays the log number.

Note: This STORE function is inhibited in normal operation if the pump is switched off.



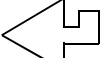
USING / / BUTTONS

The function buttons below the symbols  /  /  are used to navigate through the menu when the rotary switch is set to MENU – See USING THE MENU, Section 5.

USING THE ANALYSER FOR:

COMBUSTION TESTING

Select "Menu" on the rotary switch and navigate using the function buttons:

 = Scroll up	 = Scroll down	 = Enter
---	---	---

MAIN MENU	SUB MENU	OPTIONS / COMMENTS
SETUP	SET FUEL	NAT GAS, L OIL, PROPANE, BUTANE, LPG, PELLETS (wood)
	N <input type="checkbox"/> C <input type="checkbox"/> G	Ef(C) = condensing boiler nett efficiency Ef(N) = nett efficiency, Ef(G) = gross efficiency
	SET TIME	HH:MM:SS format e.g. 7 am = 07:00:00, 7pm = 19:00:00
	SET DATE	DD/MM/YY format
	OUTPUT	Std Printer Fast Printer XML DATA
	PASSKEY	WIRELESS* Set to 1111
	EXIT	
REPORT	COMB'N	Stored combustion tests: VIEW, DEL ALL, EXIT
	EXIT	
SCREEN	CONTRAST	Factory setting is 04
	AUX	Enables users to customise the parameters on the AUX display: LINE 1, LINE 2, LINE 3, LINE 4, EXIT
	HEADER	Printout header, 2 lines, 20 characters per line: HEADER 1, HEADER 2, EXIT
	EXIT	
SERVICE	CODE	Password protected for authorised service agents only. Leave set to 0000.

* Wireless is a factory fitted optional extra.

To EXIT the MENU at any time simply move the rotary switch to any position other than "Menu". Any changes that have not been "entered" will be ignored.

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 analyser's operating specifications. In particular:

- a) Do not exceed the flue probe's maximum temperature (600°C)
- b) Do not exceed the analyser's internal temperature operating range
- c) Do not put the analyser on a hot surface
- d) Do not exceed the water trap's levels
- e) Do not let the analyser'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 and quickly release  /  to start the analyser printing. The analyser displays a series of bars until this is completed. Press and release the key again to abort printing.



Make sure the printer is switched on, ready to accept data and its' infrared receiver is in line with the analyser's emitter (on top of the analyser).



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

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

RATIO DISPLAY



NAT GAS	→ Fuel type can be changed via “Menu”.
R 0.0008	→ CO/CO ₂ ratio.
CO_p 52	→ Carbon monoxide (ppm).
CO₂% 6.3	→ Carbon dioxide (%).


Press  /  to print a full combustion test, (or send to PC via optional Wireless module).

Hold  /  for 2+ seconds to log a full combustion report.

O₂/EFF DISPLAY

O₂% 9.8	→ Oxygen (%) left after combustion. Should be 20.9% ± 0.1% in fresh air.
TF_c 145.1	→ Flue temperature (°C).
Tl_c 5.4	→ Inlet temperature (°C). Normally set by flue probe during fresh air purge.
Ef_c 91.3	→ ‘Net’, ‘Gross’ or ‘Condensing’ efficiency (%) can be selected via “Menu”.

Press  /  to print a full combustion test, (or send to PC via optional Wireless module).

Hold  /  for 2+ seconds to log a full combustion report.



AUX DISPLAY



P	0.00
R	0.0008
Cop	52
CO ₂ %	6.3

→ The AUX (auxillary) display can be customised via MENU / SCREEN / AUX.

The parameters displayed on lines 1, 2, 3 and 4 can be set by the user.

They remain the AUX parameters until changed by the user.



Press  /  to print a full combustion test, (or send to PC via optional Wireless module).



Hold  /  for 2+ seconds to log a full combustion report.



VIEWING/PRINTING A LOGGED COMBUSTION REPORT


Select MENU / REPORT / COMB'N / VIEW

Use ,  and  to select the log number to be viewed.

Use  and  to scroll through the individual readings on lines 2 & 3.

Hold  or  for 2+ seconds to scroll to the next / previous log number.

Press  /  to print the test, (or send to PC via optional Wireless module).

NOTE: Before the 100th test can be stored the Combustion section of the memory must be cleared. Make sure you have printed/captured the test results that you want first. To do this select MENU / REPORT / TIGHTN'S / DEL ALL / YES then press Enter. .

If you try to store the 100th test before clearing the memory the top line will show FULL and the analyser will 'beep'

FULL	
R	0.0008
COp	52
CO₂%	6.3

and two seconds later the display will show

DEL ALL?
NO

Use the UP or DOWN to change to YES then press ENTER to clear memory

KANE457 COMBUSTION PRINTOUT

KANE457 V 1.00G		
YOUR COMPANY NAME & PHONE NUMBER HERE		
SERIAL NO. 000000000		
DATE		01/07/14
TIME		12:00:08
COMBUSTION		
FUEL		NAT GAS
O2	%	5.4
CO2	%	8.8
CO	Ppm	12
FLUE	°C	55.1
INLT	°C	17.2
NETT	°C	37.9
EFF	(C)	98.3
LOSSES		1.7
XAIR	%	34.8
Cal. due on 01/07/15		
CO/CO2		0.0001
PRS	mbar	0.00
Customer		
Appliance		
Ref.		

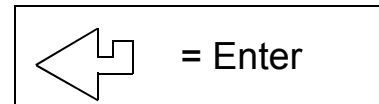
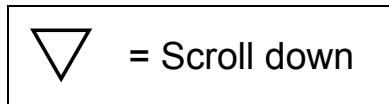
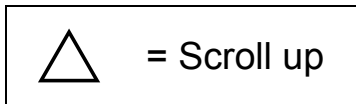
NOTE: The COMBUSTION printout is the same for rotor positions: AUX, RATIO and O2/EFF.

USING THE KANE457 AS A THERMOMETER OR PRESSURE METER

There are four unique displays associated with pressure and temperature testing (Status gives the same readings in all three operating positions.)

USING THE PRESSURE/TEMPERATURE MENU

Select "Menu" on the rotary switch and navigate using the function buttons:



MAIN MENU	SUB MENU	OPTIONS / COMMENTS
SETUP	PASSKEY	1111
	SET TIME	HH:MM:SS format e.g. 7 am = 07:00:00, 7pm = 19:00:00
	SET DATE	DD/MM/YY format
	EXIT	

MAIN MENU	SUB MENU	OPTIONS / COMMENTS
PRESSURE	SMOOTH	OFF = normal response. ON = slower (damped) response
	RESOLVE	LOW = e.g. 0.01mbar resolution. HIGH = displays to an extra decimal place
	PS UNITS	mbar, mmH ₂ O, Pa, kPa, PSI, mmHg, hPa, lnH ₂ O
	TIME	LET BY = Set duration of let-by test in minutes. Default = 1 minute STABIL'N = Set duration of stabilisation in minutes. Default = 1 minute TIGHTN'S = Set duration of tightness test in minutes. Default = 2 minute
	EXIT	

MAIN MENU	SUB MENU	OPTIONS / COMMENTS
REPORT	PRESSURE	Stored pressure tests: VIEW, DEL ALL, EXIT
	TIGHTN'S	Stored tightness tests: VIEW, DEL ALL, EXIT
	TEMP	Stored differential temperature tests: VIEW, DEL ALL, EXIT
	EXIT	

MAIN MENU	SUB MENU	OPTIONS / COMMENTS
SCREEN	CONTRAST	Factory setting is 04
	AUX	Enables users to customise the parameters on the AUX display: LINE 1, LINE 2, LINE 3, LINE 4, EXIT
	HEADER	Printout header, 2 lines, 20 characters per line: HEADER 1, HEADER 2, EXIT
	EXIT	
SERVICE	CODE	Password protected for authorised service agents only. Leave set to 0000.

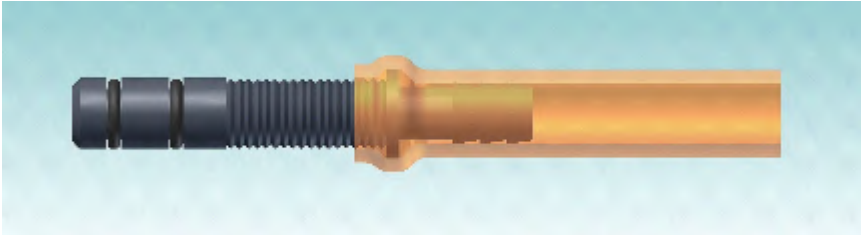
NOTE: To EXIT the MENU at any time simply move the rotary switch to any position other than "Menu". Any changes that have not been "entered" will be ignored.

 **WARNING:**

Before using the KANE457 to measure the pressure of a gas/air ratio valve, read the boiler manufacturer's instructions thoroughly. If in doubt contact the boiler manufacturer.

After adjusting a gas/air ratio valve it is essential that the CO, CO₂ and CO/CO₂ ratio readings are within the boiler manufacturer's specified limits.

If using larger bore tubing when performing pressure tests:





Push 'orange' tube over the rim of the spigot to ensure a gas tight seal.

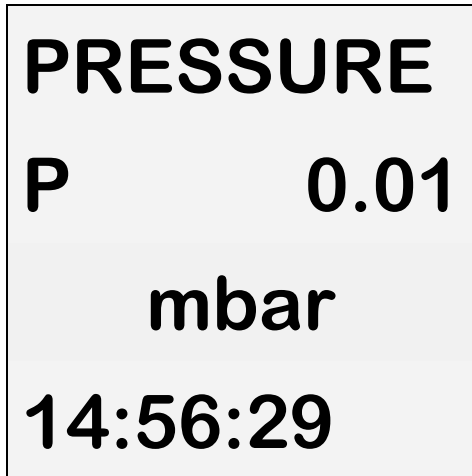


This may not produce a gas tight seal.



PRESSURE TEST



Select "Prs". The pump stops automatically. Press  /  to auto-zero the pressure sensor. **Do this before you connect to anything.** Using the black connectors and manometer hose, connect to P1 for single pressure or P1 and P2 for differential pressure.

PRS display





- Normal response or smoothed (damped) response can be selected via "Menu".
- 'High' or 'Low' resolution readings can be selected via "Menu".
- Pressure units can be selected via "Menu".
- Displays time to enable manually timed tests.



Press  /  to print a full pressure test, (or send to PC via optional Wireless module).

Hold  /  for 2+ seconds to log a pressure report.

Viewing / printing a logged pressure test

Select MENU / REPORT / PRESSURE / VIEW

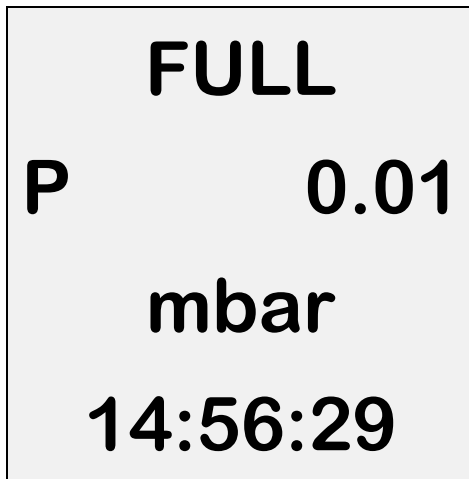
Use  or  to select the log number to be printed.

Press  /  to print the test, (or send to PC via optional Wireless module).

Before the 21st pressure test can be logged this section of the memory must be cleared. Make sure you print off any results that you need before actioning the

DELETE ALL  .

If you try to store the 21st test before clearing the memory the top line will show FULL and the analyser will 'beep'



FULL
P 0.01
mbar
14:56:29



And two seconds later the display will show



DEL ALL?
NO


Use the  or  to change to YES then press  to clear memory

LET-BY & TIGHTNESS TESTING

Select "Tightness". The pump stops automatically. Press  /  to auto-zero the pressure sensor. **Do this before you connect to anything.**


Connect from the test point to P1 using a black connector and manometer hose.

The display shows "LET BY?". Use ,  and  to select YES or NO.

If YES is selected set the let-by pressure then press  to start the let-by test. The display shows:

LET BY		→	The let-by test is automatically stored in the memory.
P1	10.15	→	Pressure at start of let-by test.
P2	10.15	→	Real time pressure reading.
TIME	59	→	Let-by default time is 1 minute. Can be changed via "Menu".

If the let-by test fails simply move the rotary switch to any position other than "tightness" to abort the test.



If the let-by test passes adjust the gas pressure for the tightness test and press  to start the stabilisation test. The display shows:

STABIL'N		
P1	20.01	→ Real time pressure reading.
	mbar	→ Pressure units.
TIME	59	→ Stabilisation default time is 1 minute. Can be changed via "Menu".

When complete press  to start the tightness test:



TIGHTN'S		
P1	20.01	→ Pressure at start of tightness test.
P2	20.01	→ Real time pressure reading.
TIME	119	→ Tightness default time is 2 minutes. Can be changed via "Menu".



When complete the display will show:

LOG	01	→ The tightness test is automatically stored in the memory.
P1	20.01	→ Pressure at start of tightness test.
P2	19.98	→ Pressure at end of tightness test.
PRINT		→ Press  to print the complete test.

Viewing / printing a logged Let-by and Tightness test

Select MENU / REPORT / TIGHTN'S / VIEW

Use  or  to select the log number to be printed.

Press  /  to print the test, (or send to PC via optional Wireless module).

Note:

The analysers's memory can store up to 20 tightness tests. Tightness tests are logged automatically therefore the tightness section of the memory will be full after the 20th tightness test is complete.

Before the 21st tightness test can be performed the tightness section of the memory must be cleared. To do this select MENU / REPORT / TIGHTN'S / DEL ALL / YES then press

If you try to store the 21st test before clearing the memory the top line will show FULL and the analyser will 'beep'

```
FULL  
P1      20.01  
P2      19.98  
PRINT  ↓
```

And two seconds later the display will show

```
-----  
DEL ALL?  
NO  
-----
```



Use the UP or DOWN to change to YES then press ENTER to clear memory



DIFFERENTIAL TEMPERATURE

Select "Diff Temp" to measure flow, return and differential temperatures

DIFF TEMP display



TEMP		→ Pump stops automatically when dial is moved to Diff Temp.
T1c	60.4	→ Use the T1 connection for the flow temperature sensor.
T2c	55.2	→ Use the T2 connection for the return temperature sensor.
ΔTc	5.2	→ Real time temperature difference.



Press  /  to print a differential temperature test, (or send to PC via optional Wireless module).


Hold  /  for 2+ seconds to log a differential temperature report.

Viewing / printing a differential temperature test

Select MENU / REPORT / TEMP / VIEW

Use  or  to select the log number to be printed.

Press  /  to print the test, (or send to PC via optional Wireless module).

Before the 21st temperature test can be logged this section of the memory must be cleared. Make sure you print off any results that you need before actioning the DELETE ALL  .

If you try to store the 21st test before clearing the memory the top line will show FULL and the analyser will 'beep'

FULL	
T1c	60.4
T2c	55.2
ΔTc	5.2





And two seconds later the display will show

DEL ALL?
NO

Use the UP or DOWN to change to YES then press ENTER to clear memory

FAST START METHOD

This allows access to pressure and temperature modes without having to go through the 90 second Combustion countdown.

With the KANE457 switched off, press and hold down the  /  **button and then** press and release  /  . Release  /  after MANO_MOD is displayed on top line.

The KANE457 will now operate as a fixed display thermometer/pressure meter with the pump off and inhibited. The readings can be printed but not stored.

The display will show:

P	0.00	→ Real time pressure reading.
T1	21.3	→ Use the T1 connection for the flow temperature sensor.
T2	21.3	→ Use the T2 connection for the return temperature sensor.
ΔT	0.0	→ Real time temperature difference.

PRESSURE ZEROING

In MANO_MOD disconnect any tubing and PRESS and HOLD the PUMP key until the analyser beeps and the top line shows ZERO CAL.

The standard printout for this mode is as follows:

KANE457 V 1.00G		
YOUR COMPANY NAME & PHONE NUMBER HERE		
SERIAL NO. 000000000		
DIFF TEMP		
DATE		01.07/14
TIME		12:00:08
T1	°C	60.1
T2	°C	47.0
ΔT	°C	13.1
Customer		
Appliance		
Ref.		

Exit 'Mano-Mod' by switching the KANE457 off.

The 'Menu' and 'Tightness' positions still operate normally in 'Mano-Mod' all other positions are inhibited.

If using larger bore tubing when performing pressure tests:



Push 'orange' tube over the rim of the spigot to ensure a gas tight seal.

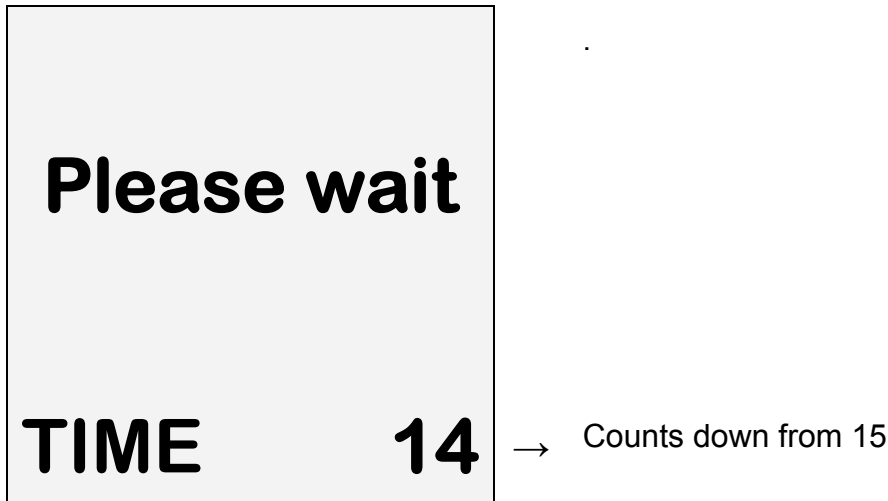


This may not produce a gas tight seal.

AMBIENT TESTING

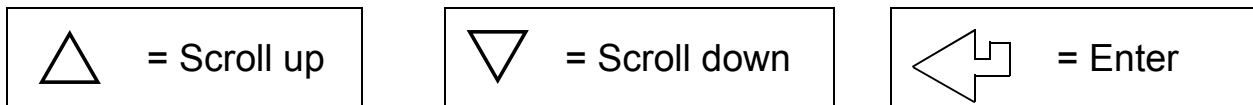
There are four unique displays associated with Ambient Air testing (Status gives the same readings in all three operating positions.)

NOTE: Whenever the analyser is switched from ambient CO2 mode to flue CO2 mode or vice versa there is a 15 second stabilisation period and the screen shows



USING THE AMBIENT MENU

Select "Menu" on the rotary switch and navigate using the function buttons:



MAIN MENU	SUB MENU	OPTIONS / COMMENTS
SETUP	PASSKEY	1 1 1 1
	SET TIME	HH:MM:SS format e.g. 7 am = 07:00:00, 7pm = 19:00:00
	SET DATE	DD/MM/YY format
	EXIT	

MAIN MENU	SUB MENU	OPTIONS / COMMENTS
REPORT	ROOM AIR	Stored room air tests: VIEW, DEL ALL, EXIT CO2 and CO
	AMBIENT	Manually stored tests: VIEW, DEL ALL, EXIT CO2 and CO
	TIMED	Stored tests: VIEW, DEL ALL, EXIT CO2 and CO
	EXIT	

MAIN MENU	SUB MENU	OPTIONS / COMMENTS
SCREEN	CONTRAST	Factory setting is 04
	AUX	Enables users to customise the parameters on the AUX display: LINE 1, LINE 2, LINE 3, LINE 4, EXIT
	HEADER	Printout header, 2 lines, 20 characters per line: HEADER 1, HEADER 2, EXIT
	EXIT	
SERVICE	CODE	Password protected for authorised service agents only. Leave set to 0000.

NOTE: To EXIT the MENU at any time simply move the rotary switch to any position other than "Menu". Any changes that have not been "entered" will be ignored.

ROOM TEST

Select "Room Test" to measure and record CO2 and CO readings for up to 30 minutes.

Press  /  to start Room CO testing.

You need to choose between a 15 minute or 30 minute test.

ROOM AIR display

ROOM AIR
SET TIME
15 or 30
ENTER

→ Use up/down keys to toggle between 15 or 30 mins

→ Press Enter to select



COp 0
CO2p 800
TEST 00
LOG 01

→ Real time CO reading (ppm)

→ Real time CO2 reading (ppm).

→ Test 00 = initial CO test in series.
→ Test 30 = maximum of 30 tests in series.

→ The CO test series is automatically stored in the memory as a log number.

The user can stop the Room Air test at any time by pressing  / .

If not stopped earlier, the Room Air test will automatically end after 15 or 30 minutes.

At the end of a test the display will show

LOG	1	→ This is the first log
TEST	9	→ This test ended after 9 minutes
CO_p	40	→ This is the CO reading at the end of the test
CO₂p	800	→ This is the CO ₂ reading at the end of the test



The room air test series is automatically stored in the memory as a log number.

When completed the log can be printed immediately by pressing .



You can also view individual TEST results by pressing the SEND key to scroll through the individual tests.

Viewing / printing a logged Room Air test

Select MENU / REPORT / ROOM CO / VIEW

Use  or  to select the log number to be printed.

Use the SEND key to increment the TEST NO being viewed

Press  /  to print the test, (or send to PC via optional Wireless module).

You can also view individual TEST results by pressing the SEND key to scroll through the individual tests.

NOTE: During a Room Air test it is not unusual to see CO readings of 2 or 3 ppm even in a room that is notionally CO free. This can be due to migration, traffic or smoking.

AMBIENT CO₂ + CO TEST

Measuring Ambient CO₂.

CO₂ is a very difficult gas to measure because there are many sources generating it. Whilst 'zeroing' in 'fresh air' is adequate when measuring flue gases where the CO₂ concentration ranges from 5% (50,000ppm) to 12% (120,000ppm), or so, when measuring at ambient levels a more consistent zero is recommended. This is because 'fresh air' is often not fresh enough and is not constant. Car exhaust fumes, boiler flues and humans and animal breathing (40,000 ppm in breath) all contribute to variable levels of CO₂ in 'fresh air'.

If ambient CO₂ readings are taken immediately after flue CO₂ readings have been taken it may take a few minutes for the system to be completely purged of CO₂.

For accurate ambient measurements the KANE457 should always be zeroed using a 'ZEROCAL' capsule. This capsule contains a chemical that absorbs CO₂ and totally removes it from the gas stream. Please note that these chemicals don't last forever and the capsule must be replaced at least annually. The colour of the chemicals change as more CO₂ is absorbed

TAKING AMBIENT READINGS

Rotate the dial to *AMB CO₂ + CO*

AMBIENT CO₂ + CO DISPLAY

CO_p	0	→ Real time CO reading (ppm).
CO₂p	1234	→ Real time CO ₂ reading (ppm).
CO_x	00	→ Maximum CO reading (ppm)
CO₂x	2345	→ Maximum CO ₂ reading (ppm)

These readings can be printed by quickly pressing the PRINT/SEND key or can be stored in memory by pressing the PRINT/SEND key until the analyser beeps and a log number appears on the top line of the display

TIMED LOGGING

There are situations when CO₂ readings need to be taken over specific periods of time to establish a profile of concentrations. The KANE457 allows for unattended timed monitoring. Logging periods range from 4 hours to 24 hours. The sampling period is automatically adjusted to always give 240 samples.

NOTE: only one test sequence is stored

Overall time	Sampling rate
4 hours	1 minute
8 hours	2 minutes
12 hours	3 minutes
16 hours	4 minutes
20 hours	5 minutes
24 hours	6 minutes

CO_p	0	→ Real time CO reading (ppm).
CO_{2p}	1234	→ Real time CO ₂ reading (ppm).
CO_v	00	→ Average CO reading (ppm)
CO_{2v}	2345	→ Average CO ₂ reading (ppm)

Whilst the timed log function is operation you can check the progress at any time by pressing and holding the PUMP key

**TIME TO
FINISH
3HR 59 MIN
TEST 1**

To stop the test at any time press the SEND key

**TEST
RESULTS
SAVED
PRINT !**

When printing is finished simply rotate the dial to another position to reset.

NOTE: To printout 240 test results takes a considerable time and you need to be sure that your printer batteries have enough charge remaining to complete this task. If you are going to be doing lots of these tests it might be better to have an optional Wireless module fitted to your analyser so that you can transfer the results directly to a PC.

**AMBIENT
ZERO**

↓

Press the PUMP key when in 'fresh air'

INITIAL

PURGE

CO2p 1234

→ Current CO2 reading in ppm

TIME 59

→ Countdown for 60 seconds

FIT

ZERO CAP

PRESS

→ Press the PUMP key after fitting ZEROCAP



ZEROING

→ This zeroing function uses a different pump to combustion pump. It is much quieter.

CO2p 20

→ This number may fluctuate + and -, but should be zero at the end of the countdown

TIME 59

→ Countdown for 60 secs

DONE

NOTE: You must remove both seals from the ends of the Zero Capsule before using it. The capsule must be attached to the dedicated port on the side of the analyser by the bottom of the display. Once the granules in the capsule have changed colour from Blue/Grey to Brown, it must be replaced.

Refit both seals to the capsule after use to preserve the life of the granules.

PRINTOUTS

KANE457 V 1.00G
 SERIAL NO. 000000000
 YOUR COMPANY NAME & PHONE NUMBER HERE

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

COMBUSTION

FUEL		NAT GAS
O2	%	5.4
CO2	%	8.8
CO	ppm	12
FLUE	°C	55.1
INLT	°C	17.2
NETT	°C	37.9
EFF	(C)	98.3
LOSSES		1.7
XAIR	%	34.8

Cal. due on 01/07/15

CO/CO2		0.0001
PRS	mbar	0.00

Customer

Appliance

Ref.

KANE457 V 1.00G
 SERIAL NO. 000000000
 YOUR COMPANY NAME & PHONE NUMBER HERE

AMBIENT CO/CO2

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

CO ppm	0
CO2 ppm	223
MAXIMUM CO	0
MAXIMUM CO2	223

Customer

Appliance

Ref.

KANE457 V 1.00G
 SERIAL NO. 000000000
 YOUR COMPANY NAME & PHONE NUMBER HERE

PRESSURE

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

PRS	mbar	-0.037
-----	------	--------

Customer

Appliance

Ref.

KANE457 V 1.00G
 SERIAL NO. 000000000
 YOUR COMPANY NAME & PHONE NUMBER HERE

ROOM AIR TEST

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

TEST	CO ppm	CO2 ppm
0	0	0
1	0	222
2	0	192
3	0	177
4	0	178
5	0	183
6	0	189
7	0	192
8	0	200
15	0	235

MAXIMUM CO 0
 MAXIMUM CO2 235

Customer

Appliance

Ref.

KANE457 V 1.00G
 SERIAL NO. 000000000
 YOUR COMPANY NAME & PHONE NUMBER HERE

DIFF TEMP

DATE 01.07/14
 TIME 12:00:08

T1	°C	60.1
T2	°C	47.0
ΔT	°C	13.1

Customer

Appliance

Ref.

KANE457 V 1.00G
 SERIAL NO. 000000000
 YOUR COMPANY NAME & PHONE NUMBER HERE

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

LET BY TEST

PRS-1	mbar	10.12
PRS-2	mbar	10.11
LET-BY	MINS	1:00

TIGHTNESS TEST

PRS-1	mbar	20.12
PRS-2	mbar	20.10
ΔPRS	mbar	-0.02
STABIL'N	MINS	1:00
TIGHTN'S	MINS	2:00

Customer

Appliance

Ref.

ANALYSER PROBLEM SOLVING

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

Fault symptom	Causes / Solutions
<ul style="list-style-type: none"> • Oxygen too high • CO₂ too low 	<ul style="list-style-type: none"> • Air leaking into probe, tubing, water trap, connectors or internal to analyser.
<ul style="list-style-type: none"> • CO reading (- - -) 	<ul style="list-style-type: none"> • Analyser was stored in a cold environment and is not at normal working temperature. • CO sensor needs replacing.
<ul style="list-style-type: none"> • Batteries not holding charge • Analyser not running on mains adapter. 	<ul style="list-style-type: none"> • Batteries exhausted. A single cell may be damaged. • Faster charge not initiated • AC charger not giving correct output. • Wrong charger being used: Must have 9 volt DC output • Fuse blown in charger plug.
<ul style="list-style-type: none"> • Analyser does not respond to flue gas 	<ul style="list-style-type: none"> • Particle filter blocked. • Probe or tubing blocked. • Pump not working or damaged with contaminants.
<ul style="list-style-type: none"> • Net temperature or Efficiency calculation incorrect. 	<ul style="list-style-type: none"> • Ambient temperature set wrong during Automatic Calibration.
<ul style="list-style-type: none"> • Flue temperature readings erratic 	<ul style="list-style-type: none"> • Temperature plug reversed in socket. • Faulty connection or break in cable or plug.
<ul style="list-style-type: none"> • T flue or T nett displays (-OC-) 	<ul style="list-style-type: none"> • Probe not connected. • Faulty connection or break in cable or plug.
<ul style="list-style-type: none"> • Ratio, EFF, X-Air all display (- - - -) 	<ul style="list-style-type: none"> • CO₂ reading is below 2%.
<ul style="list-style-type: none"> • Analyser just continually beeps 	<ul style="list-style-type: none"> • Turn dial back to MENU and press ENTER • Turn dial back to Tightness and press ENTER

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.

RETURNING YOUR ANALYSER TO KANE

When returning your KANE457, 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 us.

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

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

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



ANALYSER SPECIFICATION

(NOTE: MAY BE SUBJECT TO CHANGE)

Parameter	Range	Resolution	Accuracy
Temp Measurement			
Flue Temperature	0-600°C	0.1°C	$\pm 2.0^{\circ}\text{C}$ $\pm 0.3\%$ reading
Inlet Temperature (Internal sensor)	0-50°C	0.1°C	$\pm 1.0^{\circ}\text{C}$ $\pm 0.3\%$ reading
Inlet Temperature (External sensor)	0-600°C	0.1°C	$\pm 2.0^{\circ}\text{C}$ $\pm 0.3\%$ reading
Flue Gas Measurement			
Oxygen ^{*2}	0-21%	0.1%	$\pm 0.3\%$
Carbon monoxide ^{*1}	0-20ppm 21-2,000ppm nom 4,000ppm max for 15 mins	1ppm	$\pm 3\text{ppm}$ $\pm 5\%$ reading
Carbon dioxide ^{*1}	0-20%	0.1%	$\pm 0.3\%$ volume
Efficiency (Net or Gross) ^{*2}	0-99.9%	0.1%	$\pm 1.0\%$ reading
Efficiency High (C) ^{*2}	0-119.9%	0.1%	$\pm 1.0\%$ reading
Excess Air ^{*2}	0-250%	0.1%	$\pm 0.2\%$ reading
CO/CO ₂ ratio ^{*2}	0-0.999	0.0001	$\pm 5\%$ reading
Pressure (differential)			
Nominal range $\pm 160\text{mbar}$ Maximum over range without damage to sensor is $\pm 800\text{mbar}$	$\pm 0.2\text{ mbar}$ $\pm 1\text{ mbar}$ $\pm 160\text{ mbar}$	Maximum 0.001 mbar <25mbar	$\pm 0.005\text{ mbar}$ $\pm 0.03\text{ mbar}$ $\pm 3\%$ of reading
Ambient Measurements			
Carbon Monoxide	As above	As above	As above
Carbon Dioxide	0-1,000ppm 1,000-5000ppm 5001 to 9999ppm	1ppm 1ppm 5ppm	$\pm 50\text{ppm}$ $\pm 5\%$ reading $\pm 8\%$ reading

*1 Using dry gases at STP

*2 Calculated

Pre-programmed Fuels	Natural gas, Propane, Butane, LPG, Light Oils (28/35 sec), Wood Pellets
Storage Capacity	99 Combustion tests 20 Pressure tests 20 Tightness tests 20 Temperature tests 20 Room CO tests 20 Ambient tests up to 240 timed tests (one sequence only)
Ambient Operating Range Temperature Humidity Atmospheric Pressure	0°C to +40°C 10% to 90% RH non-condensing 860 to 1060hPa
Battery Type / Life	4 AA cells >8 hours using Alkaline AA cells
Chargers (optional)	220v charger, for NiMH batteries only 12v in vehicle charger, for NiMH batteries only
Dimensions Weight: Handset: Probe:	0.8kg handset with protective cover 200 x 45 x 90mm 300mm long including handle. 6mm diameter x 240mm long stainless steel shaft with 3m long neoprene hose. Type K thermocouple

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 analyser 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 analyser before use by:

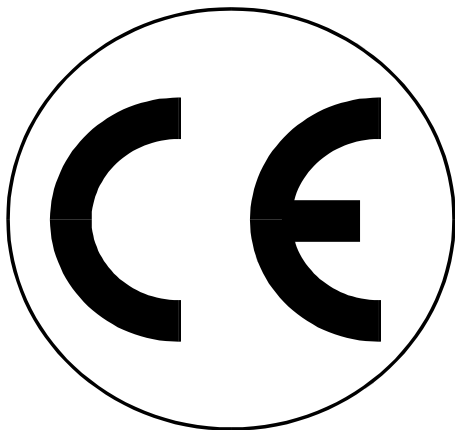
Use the normal start up sequence in the location where the analyser will be used.

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 analyser's position to minimize interference or switch off, if possible, the offending equipment during your test.

At the time of writing this manual (February 2013) 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/KANE457 details the specific test configuration, performance and conditions of use.

END OF LIFE DISPOSAL

The Waste Electrical or Electronic Equipment (WEEE) Directive requires countries in the EU to maximize collection and environmentally 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.

EN 50379 REGULATED INSTRUCTIONS

EN 50379 Section 4.3.2 “Instructions” defines a number of specific points that must be included in the relevant instruction manuals. The paragraph numbering below relates to that section of EN 50379.

- f) The KANE457 is compliant the EN 50379 Part 2 and Part 3 .
- g) The KANE457 is intended to be used with the following fuels:
 - Natural gas
 - Light oil (28/35 sec)
 - Propane
 - LPG
 - Wood pellets
 - Butane
- h) The KANE457 is designed for use with either non-rechargeable alkaline AA cells or rechargeable NiMH AA cells. Four cells are needed. Types cannot be mixed. Under no circumstances should any attempt be made to recharge alkaline cells.

The battery charger supplied with the KANE457 is rated for indoor use only. Its voltage input must be in the range 100 – 240 V ac at 50 – 60 Hz with a current capability of 0.3 A. The chargers output voltage is 9 V dc at a maximum of 0.66A.

The charger has no user serviceable components.

Only a correctly specified and rated charger must be used with the KANE457.

- i) The KANE457 is not designed for continuous use and is not suitable for use as a fixed safety alarm.
- j) An explanation of all the symbols used on the analyser’s display is given in Appendix 1 of this manual.
- k) The recommended minimum time required to perform one complete measurement cycle and achieve correct indication of the measured values in EN 50379 Part 2 is 110 seconds. This is based on the T_{90} times defined in the standard, always assuming that parameters being measured have reached stability. This time is the summation of the times for a draught test (10 secs) and a combustion test (90 secs) plus the time to move the hose connection from the pressure input to the water trap (10 secs)
- l) The recommended minimum time required to perform one checking procedure in EN 50379 Part 3 is 110 seconds as described in section f) above.

- m) Some commonly occurring materials, vapour or gases may affect the operation of the KANE457 in the long or the short term though in normal use Kane International Ltd is not aware of any specific issues that have affected the product. The following list is included to satisfy the stated requirements of EN 50379:

Solvents
Cleaning fluids
Polishes
Paints
Petrochemicals
Corrosive gases

- n) The KANE457 is fitted with an electrochemical CO sensor and an infra-red CO₂ sensor which have an expected life of more than 5 years. The calibration of these sensors must be confirmed on an annual basis.

The batteries have an expected operational life of more than 500 re-charge cycles.

- o) The KANE457 is designed to operate at ambient temperatures in the range 0°C to +45°C with relative humidity of 10% to 90% non-condensing. Whilst it is recommended that the analyser is given the protection of a carry case during transportation it is not required for normal operation.
- p) The KANE457 has an initial start up delay following switch on of approx. 90 seconds. There is no additional delay after battery replacement.
- q) Most sensors used in combustion analysers give a zero output when they fail and it is widely recommended that analysers are regularly checked (also known as a bump test) using either a can of test gas or a known source of combustion products.

The KANE457 must have its calibration checked on an annual basis and be issued with a traceable Certificate of Calibration.

The sensor within the KANE457 can only be replaced by Kane International Ltd or one of its trained and approved service partners.

The water trap should be checked on a regular basis whilst the analyser is in use (every few minutes) as the amount of condensate generated varies with the fuel type, atmospheric conditions and the appliances operating characteristics.

The particle filter should be checked at least on a daily basis when using 'clean' fuels and more often when using liquid or solid fuels.

Detailed instructions regarding the changing of the filter and the emptying of the water trap are given in Section 2 of this manual.

r) **WARNING!**

When using a KANE457 to test an appliance a full visual inspection of the appliance, in accordance with its manufacturer's instructions, must also be carried out.

APPENDIX 1 - MAIN PARAMETER:

Here are the legends used and what they mean:

- O₂** : Oxygen (Calculated) reading in percentage (%)
- CO_p** : Carbon monoxide (Measured) reading displayed in ppm (parts per million). If ' - - - ' is displayed there is a fault with the CO sensor or the instrument has not set to zero correctly. Switch off instrument and try again.
- CO_v**: Averaged ambient CO reading in ppm.
- CO_x**: Maximum ambient CO reading in ppm
- CO₂** : Carbon dioxide (measured) reading in percentage (%).
- CO_{2p}**: Carbon dioxide (measured) reading in parts per million (ppm)
- CO_{2v}**: Averaged Carbon dioxide reading in ppm
- CO_{2X}**: Maximum ambient CO₂ reading in ppm
- TF** : Temperature measured by the flue gas probe in centigrade (°C). It displays ' - **OC** - ' if the flue probe is disconnected or faulty.
- TI** : If an inlet temperature probe (optional) is connected into the T2 socket during its' countdown, the measured temperature from the inlet probe will be used as the inlet temperature.
- If an inlet temperature probe is not connected to the analyser during countdown the measured temperature from the flue probe will be used as the inlet temperature.
- If neither probe is connected during countdown the analyser's internal ambient temperature will be used as the inlet temperature.
- T Nett** : Nett temperature calculated by deducting the **INLET** temperature from the measured **FLUE** temperature. It displays ' - **OC** - ' if the flue probe is not connected or broken.
- EfC** : Combustion efficiency calculation displayed in percentage either as Gross Ef(G) or Nett Ef(N) or Condensing Nett Ef(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.
- Loss** : Losses calculated from oxygen and type of fuel. Displays reading during a combustion test. ' - - - ' is displayed while in fresh air.

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

CO/CO₂: CO/CO₂ Ratio: measured CO (ppm) divided by (CO₂ (%) x 10,000).

PRS : Pressure reading, either single point or differential.

BAT : Displays the Battery power available. Readings may be affected if used with low power batteries.

DATE : Date shown as day, month and year, DD/MM/YY. Date is recorded when each combustion test is printed or stored.

TIME : The time shown is expressed in "Military" time HH:MM:SS. Time is recorded when each test is printed or stored.

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.

FULL : The maximum number of tests have been stored in the memory. To delete the stored memory, Select Reports then select the tests to be deleted (see Page 23).

SYMBOLS used on the display

P Pressure

R CO/CO₂

λ Excess Air

\triangle Loss %: 100% minus loss % = efficiency %

TF Flue temperature

TI Inlet temperature

ΔT Nett temperature

EfG Gross efficiency

EfN Nett efficiency

EfC Condensing efficiency

- PO - Pump off

' - - - '

 Calculated oxygen greater than 18% so calculation is disabled

-OC- Open circuit temperature input

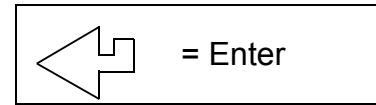
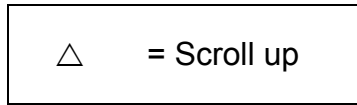
CAL Number of days left before recalibration is due

ADDENDUM

Instructions for KANE457 analysers fitted with optional Nitric Oxide (NO) sensors

DISPLAYING THE NO READING



Select "Menu" on the rotary switch and navigate using the function buttons:






The MENU main structure is as follows:


MAIN MENU	SUB MENU	OPTIONS / COMMENTS
SETUP		
PRESSURE		
REPORT		
SCREEN	CONTRAST	
	AUX	Enables users to customise the parameters on the AUX display: LINE 1, LINE 2, LINE 3, LINE 4, EXIT
	HEADER	
	EXIT	
SERVICE		

NOTE: To EXIT the MENU at any time simply move the rotary switch to any position other than MENU. Any changes that have not been "entered" will be ignored.

Use  or  to navigate to the main menu option SCREEN.


Press 

Use  or  to navigate to the sub menu option **AUX**.


Press 

The display will show:



Press  and a third line will appear.

Use  or  to navigate to the desired parameter to be displayed on line 1.

Press  to select the parameter for Line 1 and repeat the process to select the display parameter for all four lines and then EXIT

Rotate the dial from MENU to AUX to display all your chosen settings.

PRINTING and STORING

The NO readings are printed and stored in the same way as the other combustion gas readings. On the printouts the NO readings appear directly below the flue CO readings.

Note the rotor needs to be in the AUX, O₂/Eff or Ratio positions to print or store flue combustion readings

NITRIC OXIDE SENSOR SPECIFICATION

Gas Measurement	Resolution	Accuracy	Range
Nitric Oxide (NO) (low range)	1 ppm	$\pm 2\text{ppm} < 30\text{ppm}^{*1}$ $\pm 5\text{ ppm} > 30\text{ppm}$	0 to 100 ppm
Nitric Oxide (NO) (high range)	1ppm	$\pm 5\text{ppm} < 100\text{ppm}^{*1}$ $\pm 5\% \text{ reading}$ $> 100\text{ppm}$	0 to 1000 ppm

*1 Using dry gases at STP