

## 1 GENERAL DESCRIPTION

**GreenLine 4000** is designed to satisfy the market needs; but they are the result of the advanced research and experience of **Eurotron Instruments**. Eurotron has been developing and manufacturing portable flue gas analyzers since 1986.

**GreenLine 4000** is a multigas compact palm-top multifunction instrument. The micro-processor based instrument includes a flue gas analyzer, an emissions monitor and an ambient parameters indicator. Two internal electrochemical sensors read the Oxygen (O<sub>2</sub>) and carbonic monoxide (CO) gas concentration. The gas temperature and air temperature are used in connection with the gas analysis to calculate the efficiency, excess air, and CO<sub>2</sub> concentration. A 10 gas parameters programmable table is used for calculations approved in accordance with DIN33962.

A third cell (NO or SO<sub>2</sub>) enables the pollution measurement. The NO concentration can be expressed in terms of NO<sub>x</sub> as required by ambient laws.

External sensors are available for ambient parameters measurement: ambient relative humidity and temperature (T+RH%), ambient CO, to check and evaluate gas network leakage and natural gas leakage detector.

**GreenLine 4000** can install a forth electrochemical sensor to monitor pollution. In this way you can measure simultaneously and using a single unit, NO/NO<sub>x</sub> and SO<sub>2</sub> gas concentration.

The instruments are completed with a pressure (draught) sensor, an internal printer, an internal memory for storing data and a RS232 serial interface for configuration and data transfer from and to a PC.

- ◆ Draft measurement is possible using the internal pressure sensor and the special gas sample probe.
- ◆ The optional internal printer is impact type and the generated document is very legible and has a long time duration.
- ◆ The internal standard memory may store up to 250 complete gas analysis divided by Tag.
- ◆ The GreenLine 4000 has a standard IR serial interface and an optional RS232 conversion module and a configuration PC software are available to configure the analyzer.



### Features & Benefits

- **New user friendly interface:** very intuitive and in English language to use the instrument without instruction manual.
- **Large dimensions and lighting LCD display:** very legible using the "Zoom" function and the automatic back-light device.
- **Easy and quick upgrading** hardware and software are made using modular design to upgrade the system yourself.
- **Differential pressure measurement:** gas velocity, pressure, draft,  $\Delta P$ , etc.
- **Averaging** between three gas analysis.
- **Internal impact type printer:** more legible and long time duration for you documents.
- **Single battery pack:** rechargeable to power both the instrument and the printer.
- **Internal memory:** up to 250 complete data analysis.

## 1.1 Ordering code

### GreenLine 4000 – 7824 – A – B – CC – D – EEE – F – GGG – H

Each GreenLine 4000 is equipped with a O<sub>2</sub> sensor, internal 250 memory, real-time clock capabilities, rechargeable battery pack, battery charger and supplied with a Report of Calibration and an instruction manual.

<b>Table A</b>	<b>Sensor n.1</b>		
1	O <sub>2</sub> (0-25%)		
<b>Table B</b>	<b>Sensor n.2</b>		
0	none		
2	CO (0-8000 ppm) H <sub>2</sub> compensated + CO sensor exclusion		
2X	CO (0-20000 ppm) + CO sensor exclusion		
2Y	CO (0-10.00 %)		
<b>Table C</b>	<b>Sensor n.3</b>	<b>Sensor n.4</b>	
0	none	none	
4	NO e NO <sub>x</sub> (0-4000 ppm)	–	
5	NO <sub>2</sub> (0-1000 ppm)	NO <sub>2</sub> (0-1000 ppm)	
6	SO <sub>2</sub> (0-4000 ppm)	SO <sub>2</sub> (0-4000 ppm)	
8	--	CO (0-10.00 %)	
<b>Table D</b>	<b>Gas sampling probe</b>		
0	none		
3	Standard (l=300 mm) max 800°C + Draft (cat. BB610046) max 500°C		
5D	Standard (l=750 mm) max 800°C + Draft (cat. BB610080) max 500°C		
5X	Standard (l=750 mm) max 800°C + Draft (cat. BB610050) max 1000°C		
8	Standard (l=750 mm) max 800°C + Draft (cat. BB610082) max 1200°C without TC		
<b>Table E</b>	<b>Options</b>		
0	none		
1	Internal impact printer		
2D	Draft/differential pressure measurements capability + dual hoses with connector		
4	Graphic display capability		
<b>Table F</b>	<b>Battery charger</b>		
1	115 VAC with USA plug		
2	230 VAC with Schuko plug		
3	230 VAC with UK plug		
4	230 VAC with European plug		
5	100 VAC with USA/Japan plug		
<b>Table G</b>	<b>Accessories</b>		
0	None		
1	Configuring PC software + IR/RS232 converting module (cat. EE260166 + BB530100)		
2	Magnetic plate (cat. BB880032)		
3V	Vinyl Carrying case with shoulder strap (instrument + gas probe + accessories) (cat. BB830043)		
3	ABS Carrying case (instrument + gas probe + accessories) (cat. BB830028)		
4	Aluminum carrying case (instrument + gas probe + accessories) (cat. BB830033)		
5	Remote air sensor with 2 meters cable length (cat. BB830006)		
7	Pressure probe kit (dual hose) (cat. EE300086)		
8	External Ambient CO probe (cat. BB830009)		
9	External Sniffer (natural gas checker) (cat. BB830010)		
B	External Manual pump for smoke measurement (cat. BB610041)		
C	External Temperature and relative humidity probe (cat. BB830008)		
D	External ionization current probe (cat. BB830019)		
E	12Vdc auto battery charger (cat. BB290040)		
<b>Table H</b>	<b>Calibration certificate</b>		
1	Eurotron report		

## 1.2 Specifications

- **Type:** 2, 3 or 4 cells palm-top flue gas analyzer.
- **Calibration:** automatic calibration procedure at instrument switching-on.
- **Self-diagnosis:** Sensors efficiency test with anomalous status announcement.
- **Fuel types:** Up to 10 totally programmable.
- **Pump:** rate of flow 0.8 lit / head -230mbar  
*All data measured using 3 meters long probe and line filter connected. Load loss = 10 mbar using a 3 meters probe extension*
- **Power supply:** High capacity Ni-MH rechargeable battery pack / external battery charger.
- **Charging time :** 8h at 90% with instrument off.
- **Battery life:** 5h continuous operation (without printer and back-light).
- **Printer:** Impact type 24 columns with 58 mm large and 18 meters long paper roll
- **Printer power supply:** using the analyzer battery pack.
- **Print autonomy:** up to 30 reports with battery full
- **Automatic CO(ppm) and CO(%) selector:** if the sensors are installed.
- **Internal data memory:** up to 250 complete analysis data structured by Tags.
- **Service and user data:** 3 programmable lines for each programmed customer using a PC and DBGas Software.
- **Report Header:** 4 rows x 16 char programmable from keyboard
- **Display:** Large (40x56 mm) graphic LCD display with automatic back-light device. Bar graph and trend capability as option.
- **Serial interface:** Bi-directional infrared interface. External IR/RS232 converter available for PC communication.
- **Synchronous serial port:** for external keyboard and optical bar pen reader.
- **Smoke measurement:** Using the optional external manual pump. Bacharach index memory store and printout capability as standard.
- **Optional probes:** ambient CO, Bar pen, explosive gas leakage sniffer, T+RH% probe.
- **Working temperature:** from -5°C to +45 °C (up to 50°C for short time)
- **Storage temperature:** from -20 to +60°C (3 months maximum at temperatures exceeding the operational limits).
- **Dimensions:** 115x90x330 mm
- **Weight:** 1.1 kg battery and printer included

### External optional ambient CO probe

- **Range:** from 0 to 500ppm
- **Accuracy:** ±5ppm up to 100ppm; ±5% up to 500ppm
- **Resolution:** 1ppm
- **Response time:** 30s (t90)
- **Waiting starting time:** 30s
- **Working temperature:** from -5°C to +45 °C

### External optional ambient T+RH probe

- **Temperature Range:** from 0°C to 85°C
- **Temperature Accuracy:** ±1°C
- **Temperature Resolution:** 0.1°C
- **Relative Humidity Range:** from 0 to 99%RH
- **Relative Humidity Accuracy:** ±5%RH
- **Relative Humidity Resolution:** 0.1%RH
- **Response time:** 50s (t63)
- **Waiting starting time:** 30s
- **Working temperature:** from -0°C to +50 °C (up to 85°C tip only)

### External optional natural gas leak detection probe

- **Pre-heating time:** 30s minimum
- **Alarms indication:** visual with 5 steps

- **5 alarms levels:** 100, 200, 300, 400, 500 ppm
- **Acoustic Alarm indication:** respectively 1, 2, 3, 5 beep/s, continuous
- **Response time:** 5s (t90)
- **Alarm levels Accuracy:**  $\pm 10\%$  at 90 days

**Accuracies and ranges**

Parameter	Sensor type	Range	Resol.	Max response	Accuracy
O <sub>2</sub>	Electrochemical	from 0 to 25.0%	0.1%	20 sec.	$\pm 0.1\%$ vol.
CO H <sub>2</sub> compensated up to 1000ppm	Electrochemical	from 0 to 8000 ppm	1 ppm	50 sec.	$\pm 10$ ppm <300 ppm $\pm 4\%$ rdg up to 2000 ppm $\pm 10\%$ rdg >2000 ppm
CO	Electrochemical	from 0 to 20000 ppm	1 ppm	40 sec.	$\pm 10$ ppm <300 ppm $\pm 4\%$ rdg up to 2000 ppm $\pm 10\%$ rdg >2000 ppm
CO%	Electrochemical	from 0 to 10.00 %	0.01 %	50 sec.	$\pm 0.01\%$ <0.2% $\pm 4\%$ rdg >0.2%
NO	Electrochemical	from 0 to 4000 ppm	1 ppm	40 sec.	$\pm 5$ ppm <125 ppm $\pm 4\%$ rdg >125 ppm
NO <sub>2</sub>	Electrochemical	from 0 to 1000 ppm	1 ppm	50 sec.	$\pm 5$ ppm <125 ppm $\pm 4\%$ rdg >125 ppm
NOx	Calculated	from 0 to 5000 ppm	1 ppm		
SO <sub>2</sub>	Electrochemical	from 0 to 4000 ppm	1 ppm	40 sec.	$\pm 5$ ppm <125 ppm $\pm 4\%$ rdg >125 ppm
CO <sub>2</sub>	Calculated	from 0 to 100%	0.1 %		
Tair	Pt100	from -10 to 100 °C	0.1 °C		$\pm(0.2\% \text{ rdg} + 0.15^\circ\text{C})$
Tgas	Tc K	from -10 to 1000 °C	0.1 °C		$\pm(0.3\% \text{ rdg} + 0.3^\circ\text{C})$
$\Delta T$	Calculated	from 0 to 1000 °C	0.1 °C		
Tflow	Tc K	from -10 to 100 °C	0.1 °C		$\pm(0.3\% \text{ rdg} + 0.3^\circ\text{C})$
Treturn	Tc K	from -10 to 100 °C	0.1 °C		$\pm(0.3\% \text{ rdg} + 0.3^\circ\text{C})$
Pressure/Draft & $\Delta P$	Piezo	$\pm 150.00$ hPa	0.01 hPa		$\pm 1\%$ rdg
Excess air	Calculated	from 1.00 to infinity	0.01		
Efficiency	Calculated	from 0 to 100%	0.1 %		
Gas speed	Pitot tube	From 0 to 100.0 m/s	0.1 m/s		
Smoke index	External pump	from 0 to 9			

- *Technical units and ranges can be converted directly from ppm to mg/Nm<sup>3</sup>, mg/kwh and from hPa to mmH<sub>2</sub>O, mbar or inH<sub>2</sub>O.*
- *The relative accuracy shown are expressed as absolute or % of rdg errors at -5°C to +40°C ambient temperature.*
- *The maximum response time shown is referred to 90% signal changes.*
- *The pressure relative accuracy shown is valid only after the auto-zero procedure.*

Specifications may change without notice.

## **2 GENERAL**

### **2.1 Keypad & Display**

The tactile keyboard allows the operator to enter the main operative mode and all other complementary or auxiliary modes following the menu driven instructions.

The high contrast graphic LCD (40x56 mm), equipped with an automatic back-light device, displays the measured and/or calculated parameters in the preferred format (Zoom function). The above parameters can be also displayed in a graphic mode.

### **2.2 Built-in printer**

**GreenLine 4000** can be equipped with a built-in, rugged, impact type printer. It uses a low cost common roll of paper (58 mm large, 18 meters long) , more readable, long time and heat resistant better than the thermal printout on chemical paper. One key instruction is enough to obtain one, two or more copies of the analysis report with header and company reference data.

### **2.3 Gas sampling probe**

Flue gas sampling probes with different length, shape and max. operating are available to match the requirement of different applications. The sampling probe is connected to the instrument with a rubber hose through a combined module of water trap and suspended particle filter.

### **2.4 Measuring cells**

**GreenLine 4000** uses long life sensors for O<sub>2</sub>, CO (H<sub>2</sub> compensated), NO, NO<sub>2</sub> and SO<sub>2</sub>. An automatic device exclude automatically the CO sensor when CO high concentration level is identified. Four acoustic and visual alarms can be set on four programmable parameters.

### **2.5 Temperature probes**

A thermocouple type K is incorporated on the tip of the gas sampling probe to measure the flue gas temperature. This thermocouple is suitable for measurements up to 800°C (max 1000°C for few seconds). Temperature measurement and gas sampling from the flue gas pipe are thus always performed in the same site.

The probe is connected to the instrument with the appropriate compensated cable and connector. A Pt100 resistance thermometer (local jig or remote sensor) is used for the air temperature measurement and best efficiency calculation.

### **2.6 Pressure sensor**

The instrument is equipped with an internal sensor for pressure and stack draught. One key instruction move the operative mode to and from this function to gas analysis and vice versa. **GreenLine 4000** has, as standard feature, a differential pressure sensor.

### **2.7 Fuel technical data**

The instrument includes as standard the technical data for 4 of the most common fuels. Using the optional GasConfig software, it is possible to modify or add data of up to 10 different fuels.