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Portable Combustion Analyser

BOSTON X

Operating Instructions

IMPORTANT NOTE
Read this instruction manual carefully and keep it.

NOTE: This manual is valid for equipment with firmware version 1.0 and later

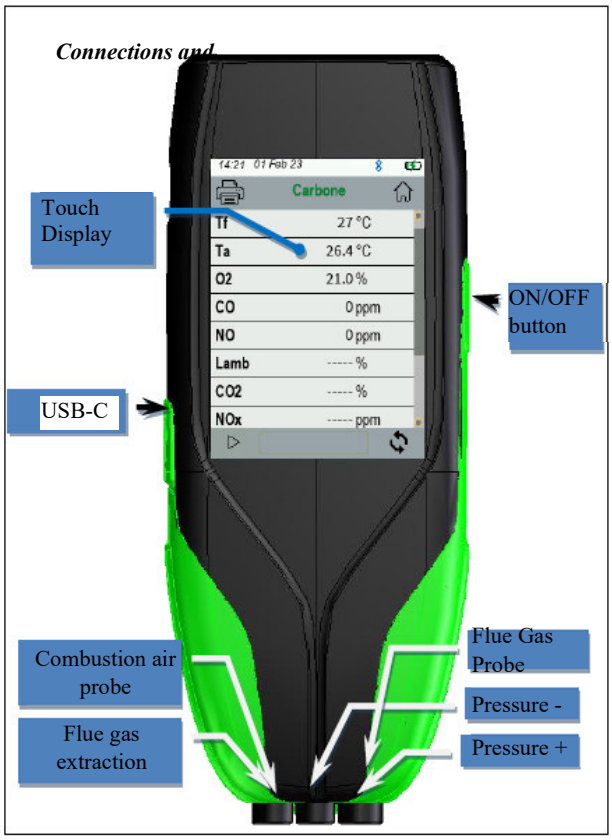
Documento / Document name: IST-ST200AN.ST01.01-A_BostonX_EN.docx			
Oggetto / Subject :			
Rev.	***Data / Date***	***Da / By***	***Note***
//	01/05/23	UT/BD	Prima release
B	20/05/2024	UT/BD	Correzione Codice Batt

CONTENTS:

1 Introduction

Our products are designed and manufactured with the utmost care in order to provide the highest reliability for their intended use. Proper use and regular maintenance of the instrument are indispensable for improving reliability and keeping the value of the BOSTON X high.
The equipment must never be used for applications other than those for which it is intended, nor stored at temperatures that are too low or too high (see 'Technical specifications'), nor should it be subjected to sudden changes in temperature in order to avoid condensation forming inside.
Careful maintenance by the customer is required

2 Product description



Ta probe: this is the Tc K connector to which the combustion air temperature probe is connected

Pressure +: this is the pressure connection to which the flue gas pressure probe connection is connected

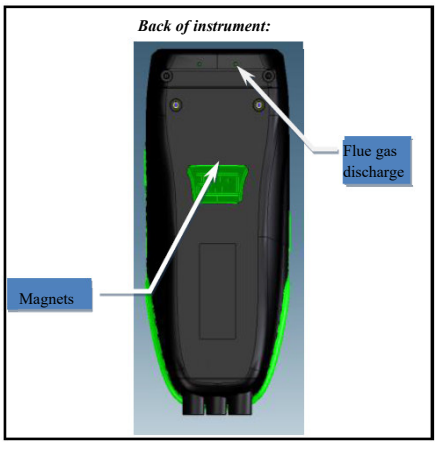
Flue gas temperature: this is the Tc K connector to which the thermocouple connector on the flue gas probe is connected

Flue gas intake: this is the connector to which the flue gas probe is connected

Pressure -: this is the auxiliary pressure connector (negative port)

Mini USB-C socket: this is the USB cable connector for communication with the PC.

Power supply: this is the connector for the mains power supply/battery charger



Flue gas exhaust: the part from which analysed flue gas is discharged

Magnets: *to attach the instrument to the boiler shell.*

3 Warnings and Preliminary Operations

The instrument and Bluetooth printer (model ST339) are supplied with new, not fully charged batteries.
The instrument's battery pack (Li-ion technology) reaches its maximum efficiency after a few charge cycles, so it is possible that the battery life will initially be shorter than indicated on the data plate.
The printer batteries (Lithium technology) must be removed from the battery compartment if not used for a long period of time.
The same charger but different cable (supplied with the instrument) is used to charge the instrument's and Bluetooth printer's batteries
Before using the instrument, check the condition of the filters (replace them if necessary).

3.1 Charging the instrument's battery

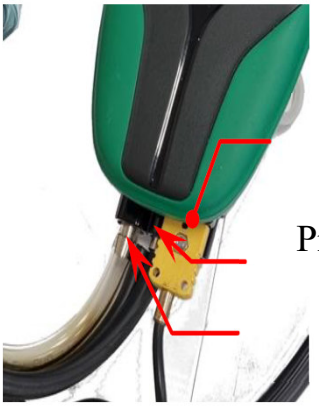
When first used and after a long period of non-use of the equipment, we recommend charging the battery by connecting the instrument to the mains charger supplied, leaving it on charge for at least 8 hours.
Charging operation:
a) Make sure the instrument is switched off and connect it to the charger.
b) Plug the battery charger into the mains socket (100-240Vac)
c) The instrument switches on and the battery charging icon appears on the display.
d) When charging is complete, the charging ended icon appears on the display.

3.2 Charging the Bluetooth printer battery (model ST339)

When first used and after a long period of non-use of the equipment, we recommend charging the battery by connecting the printer (ST339 model) to the mains charger supplied, leaving it on charge for at least 8 hours.
Charging operation:
a) Make sure the printer is switched off and connect it to the charger.
b) Plug the battery charger into the mains socket (100-240Vac)
c) The printer's 'status' LED starts flashing, indicating that charging is taking place.
d) When charging is complete, the printer's 'status' LED goes out

3.3 Flue gas probe connection

Before proceeding with flue gas analysis, check that the probe is connected to the instrument correctly

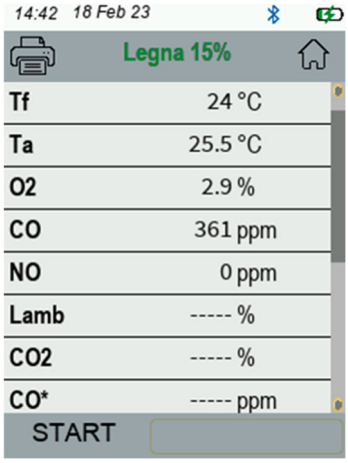


Connect the transparent probe tube to the larger diameter circular connector (the one on the left)
Connect the black probe tube to the circular connector on the right (in the centre)
Connect the probe's male TcK connector (yellow connector) to the instrument's female TcK connector (also yellow)

Also check that the cap on the condensate collector (condensate trap) is correctly positioned, i.e. properly inserted.

3.4 User interface: Touch Display

Touch Display



Main screen
First line: displays the clock and date status icons
Second line: displays the printer, fuel, and menu access

The remainder of the display shows the measured and calculated parameters

Last line: displays START to proceed with automatic analysis.

Bluetooth icon: this is displayed when Bluetooth is active (optional module)

Printer Icon: when the buzzer is deactivated, a crossed-out note is displayed

Menu Icon: to access the Menu

Battery icon: this is displayed when the instrument is powered by battery only and visually indicates the charge level.

Printer icon: this is displayed when the Bluetooth printer is connected

Right arrow icon: takes you to the next menu

Left arrow icon: takes you to the previous menu

Disc icon: save settings

Bin Icon: Delete Settings

Dilution Pump Icon: Manual switch for the CO dilution pump

Feed Icon: displayed when analysis values are stable

4 Using the Instrument

4.1 Switching on and off

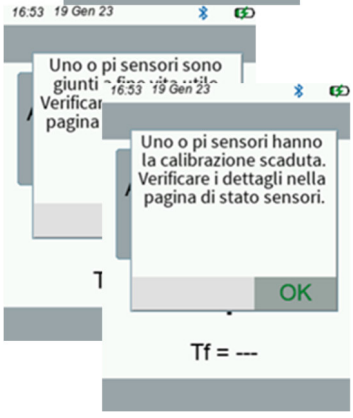
The instrument is switched on by pressing and releasing the (On/Off) button
To switch the instrument off, simply press and hold down the (On/Off) button until a 'beep' is heard. When the button is released, the instrument switches off.

If a high concentration of CO is present inside the analysis chamber when switching off, the instrument performs self-flushing and subsequent automatic switch off.

When switched on, the following screens appear on the display:

Screen with logo, model (e.g. Boston X), instrument firmware version indication (e.g. fw 1.001) and equipment serial number (e.g. sn 67295)

Flushing in progress indication screen.
During this phase, the flue gas probe can be inserted to search for the hottest point of the vent.



After flushing, the instrument runs a self-check of the main functions and the oxygen sensor status

In the event of sensor failure, expired calibration, end-of-life or new sensor insertion, a pop-up indication is given.

4.2 Fuel selection, boiler type and start measuring

After instrument start-up (flush + check), the instrument displays the fuel selection screen

Select the fuel type Gas/Liquid or Solid.
Then (for solid fuels only) select the fuel humidity percentage.

Finally, select the boiler type (open chamber, closed chamber or condensation)

To start the draught test procedure immediately, tick the 'Draught' box.

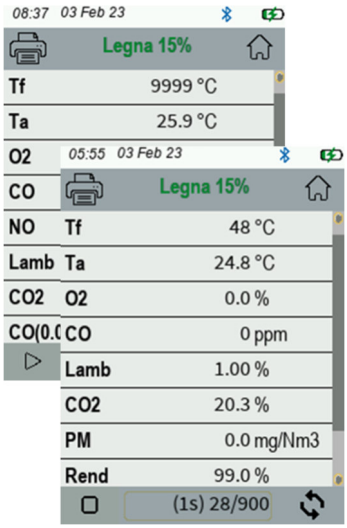
For more information on measuring draught, see section 4.4.4 " Draught" of this manual

4.2.1 "Analysis and Automatic Analysis"

Automatic analysis procedure (for liquid/gas fuels)

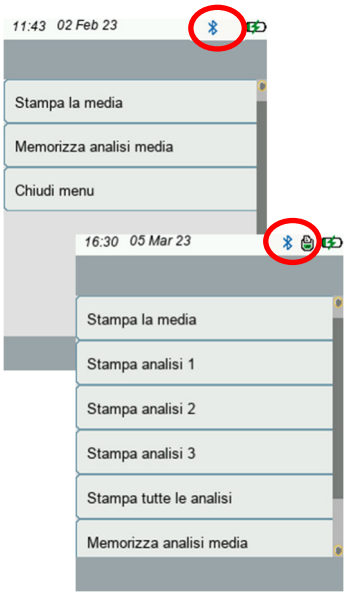
Going to the Analysis line already allows instantaneous readings on boiler operation, with the possibility of printing the same immediately.
From the Analysis view, press the (▶) button to start the procedure, which can be carried out in automatic or manual mode.
In Manual mode, the 3 analyses can be selected by the operator by pressing 'ACCEPT' after the third average calculation.
In Automatic mode, the procedure is started that performs 3 consecutive 120s analyses and calculates the average of these, the display shows a second timer to facilitate the operation.
If the values are unreliable, a warning appears on the screen
Push the (STOP) button to exit the menu

Automatic analysis procedure (for solid fuels)



Push the ( ) button to start the procedure that, only in automatic mode, takes 900 consecutive samples at 1" intervals and calculates the average. (Interval settable from 1" to 20" in the [Parameters]-[Solid Time] menu)
Push the (STOP) button to exit the menu
<u>Warning screen (for solid fuels only)</u>
Message displayed to indicate that the analysis is invalid and ask the operator whether to continue with acquisition of further samples
<u>Warning screen</u>
Message displayed to indicate that the analysis is invalid and the value cannot be used to calculate the average. Check that the instrument is correctly configured and the boiler set to TEST

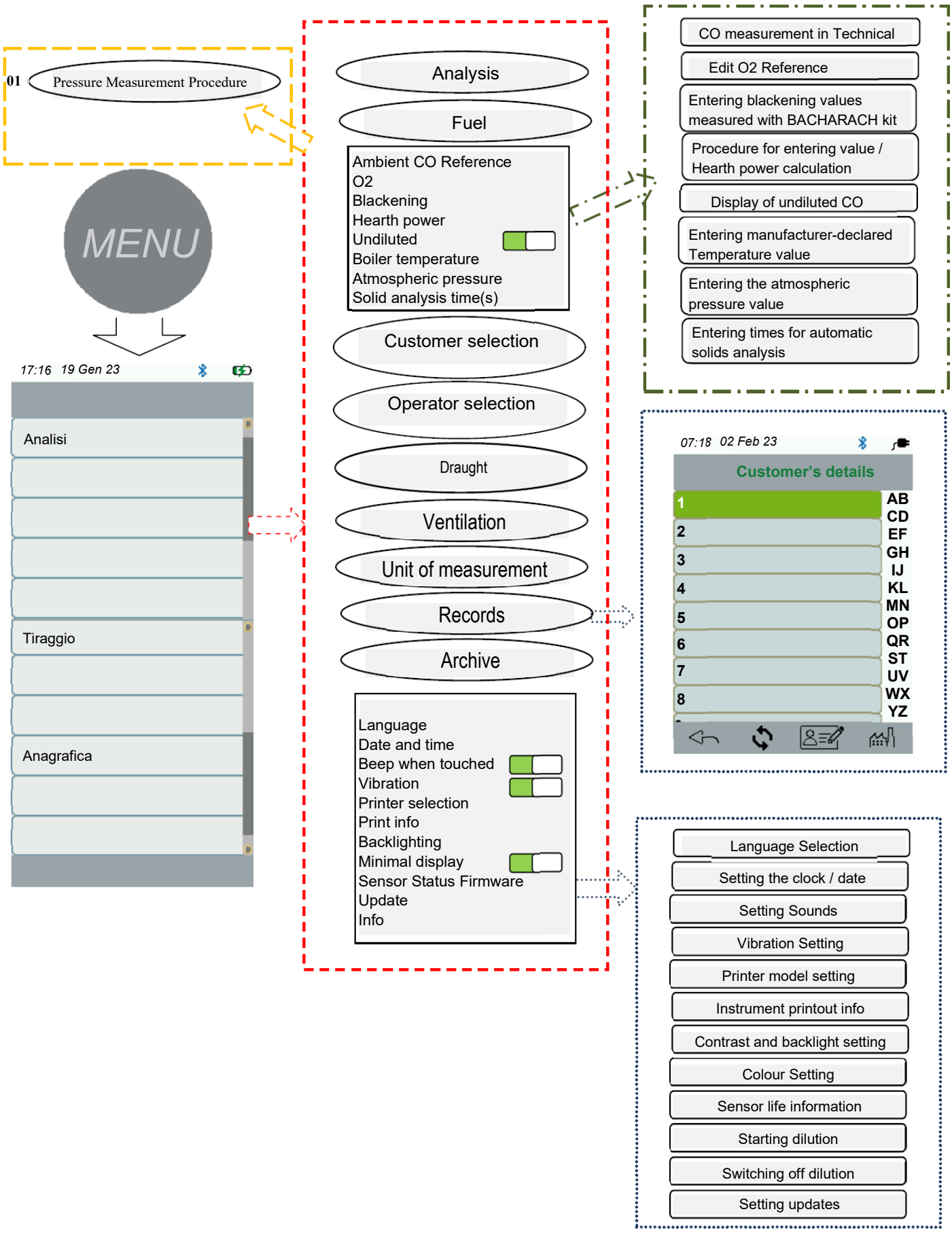
4.2.2 "Print or save analysis"



At the end of the automatic/manual Gas/liquid, Solid analysis, the following screen appears that can be used to proceed in the various ways indicated:
Print analysis, average or save average.
<u>N.B.</u> to print on an infrared printer, align it with the IR sensor.

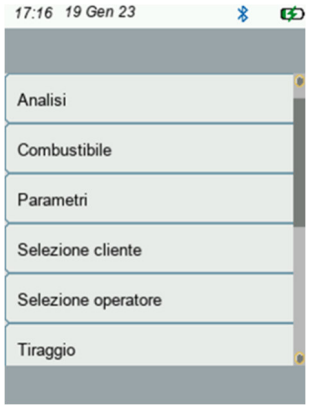
To print via there is no need for alignment, but pay attention to the (printer) icon, which appears when the connection is made.
The adjacent image indicates when the printer is connected in red.

4.3 Flow chart



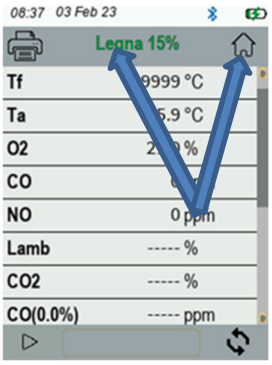
4.4 Menu

Push the ( ) button in the main screen, to access the instrument's main menu, from which the following procedures can be started:
'Analysis', "Fuel"., "Parameters"., "Customer Selection"., "Operator selection"., "Draught" , "Ventilation", "Units of Measurement", "Records", "Archive", "Miscellaneous".
From the main menu, you also have access to the following menus:
***"Parameters** for configuring analysis parameters,*
"Miscellaneous"

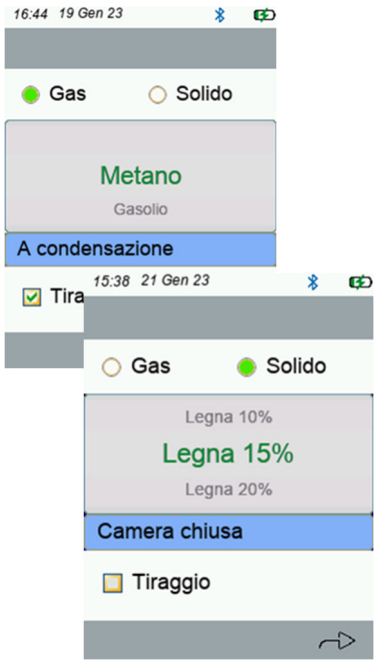


4.4.1.1 'Fuel'

Configuration of fuel and boiler type to be analysed

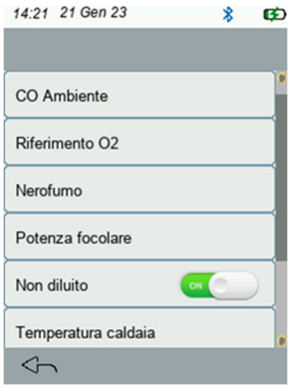


Access the main screen or push the wording at the top, to select the GAS fuels (methane, diesel, LPG), ("Solid Wood"),



<u>Gas/Liquid:</u>
Select 'Others' to go to the fuel selection menu (e.g. Methane, LPG, etc.)
<u>Boiler type</u>
Finally, select the type of boiler to be checked Open chamber, Closed chamber, Condensation
Use ( ) to go back to the Analysis menu
Solid:
Select 'Solid' to go to the fuel selection menu. Solid fuels are identified according to two types: Wood biomass (e.g. pellets, wood chips, etc.) and coal.
Humidity (only for solid fuels)
Finally, for solid fuels, the moisture level of the sample used for analysis must be indicated (on pellet sacks for example this is indicated, for other fuels it must be measured)

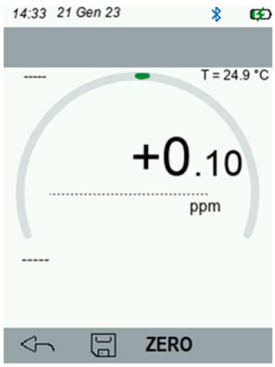
4.4.2 [Parameters]



Analysis parameter configuration sub-menu
This menu can be used to measure CO Amb. select the fuel type and boiler type, set the O2 reference, enter the data for the Blackening test and calculate the average, enter the hearth power or calculate it, enter the atmospheric pressure, enable display and printing of "undiluted" values, enter the boiler temperature data plate value, and configure the units of measurement used.

Use () to return to the main menu

4.4.2.1 'Ambient CO'



Procedure for measuring the ambient CO level.
*Push the **(Ambient CO)** line to view the highest COamb value detected during the test.*

The () button is used to store the current measured CO amb value.
*Use the **(ZERO)** button to cancel saving of the value just saved. Use () to return to the main menu*

4.4.2.2 'Ref. O_2"

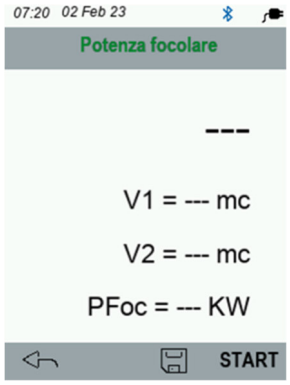
Configuration of the reference oxygen percentage level used to calculate undiluted values for CO, NO, etc.
The value to be entered varies according to regional regulations.

4.4.2.3 'Blackening'

Screen for entering BLACKENING values from an external 'BACHARACH' type test (manual pump or other). having taken 3 measurements and entered 3 values, the instrument will determine the average of the three measurements.
This average value will be included in the analysis printout.

4.4.2.4 'Hearth Power'

Procedure for manual entering or calculating Firebox Power.



*In **"V1"** enter the m^3 indicated by the system's volumetric meter, and start the procedure by pressing **(START)**.*
*When the 2-minute countdown has finished, in **'V2'** enter the m^3 indicated by the volumetric meter.*
The BostonX calculates the hearth power in kW/h and saves the value. Push (💾) to add it to the analysis printout.
*If your system is not equipped with a volumetric meter or if you already know the Hearth Power value, you can enter it manually by pushing **(PFoc=---kW)**.*

4.4.2.5 'Undiluted'

Enabling the display (and subsequent printing) of undiluted gas values.

[Menu]-[Parameters]-

4.4.2.6 "Boiler temp."

Enter the boiler temperature specified by the manufacturer.

4.4.2.7 "Atm pressure"

Enter the barometric pressure for the dew point calculation.

4.4.2.8 'Units of measurement'

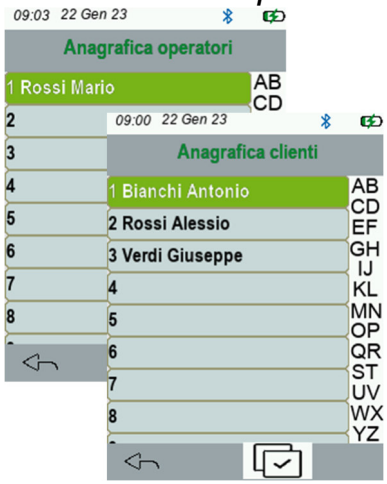
Units of measurement configuration. When the instrument is next switched on again, it retains the user-configured engineering units

4.4.2.9 'Solid analysis time (s)'

Entering the sampling interval in seconds for solids analysis

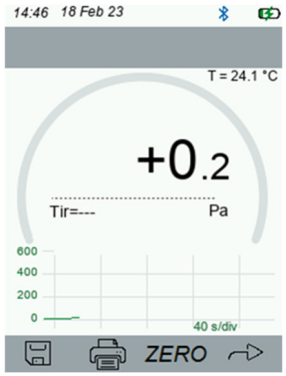
4.4.3 'Customer - Operator'

Customer and operator selection procedure.



In the 'customer' field the name saved for the customer for whom the analysis is done can be added to the print out and analysis, as well as the Operator doing the analysis.
Data entered previously and saved in 'Records'.
Use (↩) to return to the main menu

4.4.4 " Draught"



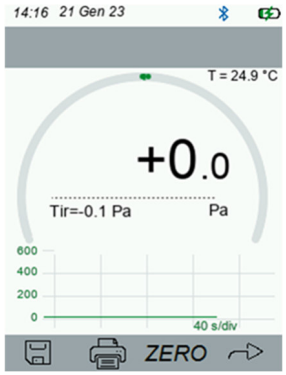
Draught measuring procedure.
Go to the Draught menu with the probe not inserted in the stack, and the instrument in a stable position. Carry out "ZEROING"

When a value is displayed, push the ( *) button to save the measured pressure value, which will be printed in the analysis printout.*

Push the ( *) button to print the current measured value. Use* ***(ESC)*** *to go back to the menu*

4.4.4.1 "Gas pressure"

Pressure measuring procedure
*Start the procedure with the probe not inserted in the stack, and the instrument in a stable position. Carry out "****ZEROING****"*

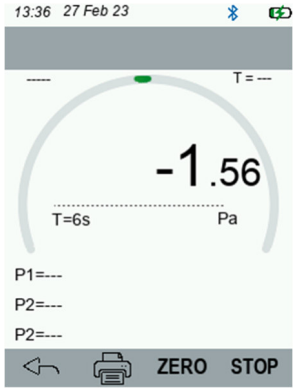


Use the ( *) button to save the pressure value measured. Two pressure values can be saved and the difference is calculated automatically.*

Use the ( *) button to cancel saving of the value just saved. Push the (*  *) button to print the current measured value. Use (*  *) to return to the main menu. When using the kit consisting of two tubes (standard supply), the instrument functions as a differential pressure gauge.*

4.4.4.2 "Ventilation "Test 4 Pa

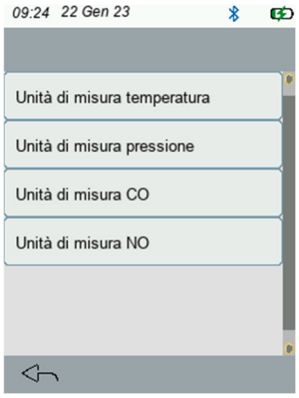
Ventilation measuring procedure according to UNI10683:2012.
Start the procedure with the instrument in a stable position.



Connect the tube (standard supply) to the pressure socket and position the opposite end of it to measure the external pressure.
Open the room door, wait for the measurement to stabilise and press ***(ZERO)*** *to zero.*
Close the room door. Push the ***(START)*** *button to start the 30-second countdown. At the end of the count, the measured value will be saved.*
Repeat the procedure for a total of 3 tests.
Use the ***(START)*** *button to cancel saving of the value just saved.*

Push the ( *) button to print the test values. Use (*  *) to return to the main menu*

4.4.5 'Units of measurement'



Changing units of measurement:
Go to the unit of measurement and, depending on the magnitude you select, the instrument offers a drop-down menu to select the chosen unit.

Use ( *) to return to the main menu*

4.4.6 "Records"

Record entries
various records can be entered using the T9 type keyboard:

 *The Industry icon is used to enter the details of the company that owns the instrument.*

 *The I.C. type icon is used to enter the data of the customer that can be or will be able to be selected in the field, see point 4.4.3 'Customer - Operator'.*

 *The double arrow icon is used to switch to entering the operator.*

Use ( *) to return to the main menu*

4.4.7 " Archive"

View Archive
Saved average analyses can be viewed and printed:

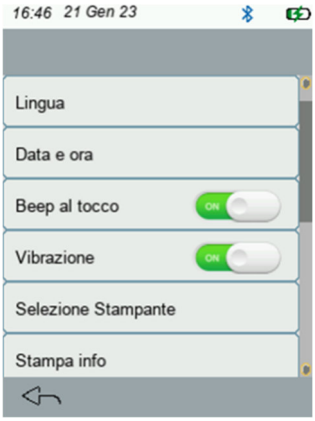
 *This is the icon used to view the analysis*

 *This is the Bin icon used to delete the selected analysis*

 *This is the printer icon for printing printouts*

Use ( *) to return to the main menu*

4.4.8 [Miscellaneous]



Instrument configuration sub-menu

4.4.8.1 'Language'

Configuration of the instrument language (user interface language and print language)

4.4.8.2 'Clock'

Clock configuration (time and date setting),

save ( ) on disc at the end of the operation

Use ( ) to return to the main menu

4.4.8.3 'Beep when touched'

Activates / deactivates the Beep sound

4.4.8.4 'Vibration'

Activates / activates the Vibration sound

4.4.8.5 "Select printer"

A drop-down list opens from which the printer you have can be selected.

4.4.8.6 "Backlighting"

Drop-down menu for improved display visibility

4.4.8.7 Vis. Minimal

Activates / deactivates the Colour

4.4.8.8 "Sensor status"

Important information on installed sensors.
The following are indicated:

- *Sensor type.,*
- *Cartridge software version*
- *Calibration expiry date*
- *Probable end of sensor life*
- *Sensor serial number*
- *Calibration scales*
- *Reading value*
- *Measurement magnitude*
- *Spare code for new order*

Use () to return to the main menu

4.4.8.9 "CO level for starting Dilution"
"CO level for stopping Dilution"

Automatic setting of start and stop levels for the dilution pump.
This allows high CO levels to be read, and safeguards the sensor from sudden gas fluctuations.

Use () to return to the main menu

4.4.8.10 Firmware update

Download the firmware from our website:
1. *Connect the USB cable to the instrument*
2. *Push the (Si) button and a black SP200AN BootLoader 1.1 page appears.*

Continue from point 7

4.4.8.11 Info

Display of instrument data, manufacturer

5 Printers

5.1 Bluetooth printer

The instrument is supplied with a Bluetooth thermal printer

A: Power. On button
B: Status LED
C: Battery charger connection socket (the battery charger supplied with the instrument)
Ambient operating conditions:
Temperature 0 – 50°C
Humidity 10% - 85% Rh

To replace the printer paper, proceed as follows:

1. *Open the flap.*
2. *Pull out the finished roll*
3. *Insert the new paper roll, positioning the flap on the outlet, and close the flap.*

5.2 Infrared printer

Optional infrared thermal printer included.

A: Infrared port: align with the instrument's infrared LED
B: Mode button. On button
C: Status LED
D: Battery charger connection socket (the battery charger supplied with the instrument)
Ambient operating conditions:
Temperature 0 – 50°C
Humidity 10% - 85% Rh

To replace the printer paper, proceed as follows:

4. *Open the flap by lifting the transparent window.*
5. *Pull out the finished paper roll*
6. *Insert the new paper roll, inserting the flap into the slot.*

To replace the printer's batteries, proceed as follows:

1. *Remove the battery compartment cover at the back of the printer*
2. *Remove the 4 batteries and insert the new ones according to the polarity indicated*

For further information on the printer, please refer to the printer manual enclosed with the product.

6 Maintenance

In order to keep the instrument in good working order and to guarantee correct measurements in accordance with current regulations, routine maintenance must be carried out
The instrument must be serviced at an authorised service centre, at least once a year (by law).
Normal operations include checking calibration of the equipment (issuing a Calibration Report) and cleaning the flue gas extraction ducts and pneumatic circuit.
It is always advisable to clean the instrument, filter and flue gas probe at the end of the day.
Always use original sensors and spare parts for proper maintenance and avoid servicing at unauthorised service centres, as this will invalidate the warranty.

6.1 Cleaning the instrument

Use a cloth moistened with hot water to clean the instrument.
Be sure to avoid aggressive products such as thinners, alcohol, etc., which could damage or remove the rubbering treatment of the shell itself or ruin the protective glass over the display

6.2 Flue gas sampling probe

The probe and suction tube must be cleaned regularly, in proportion to the use of the instrument in order to avoid particle build-up inside and prevent corrosion.
The tube must be disconnected from the instrument, washed with plain hot water and dried before use.
Residues inside the probe can also be removed using a compressor (always with the probe disconnected from the instrument)

6.3 Condensation trap

Unscrew the transparent bayonet cover on the condensate trap and check the condition of the dust filter at the bottom. When the filter turns grey (soot number of about 2-3 on the Bacharach scale), it must be replaced.

6.4 *Flue gas extraction pump*

Check the pump's draught as indicated below.
Extract the 'flue gas extraction' tube (larger diameter tube) on the probe from the instrument and close the hole in the instrument with your finger, checking that there is a vacuum.

6.5 Replacing sensor cartridges

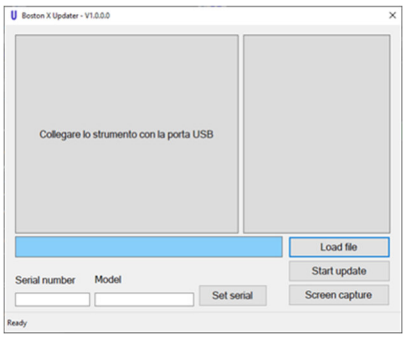
With the new sensor models used by Tecnocontrol S.r.l it is possible, in the event of an emergency, to replace the individual sensor or all sensors.
It is also possible to replace the pump, thus avoiding shipment to the manufacturer or retailer if necessary.
To replace the sensor, simply remove the top cover of the instrument (by unscrewing the 2 fastening screws), disconnect the sensor, and remove it from the motherboard to which it is connected. Connect the new sensor by inserting it into the connection, close the instrument and have it calibrated.

POSITION	***Sensor TYPE***
1	O_2 / O_2 long-life
2	CO (with various ranges)/ NO if present
3	CO

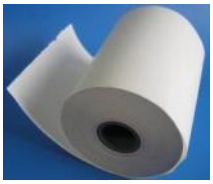
TYPE	CARTRIDGE CODE	NOTES
O_2 - 7 years	ZB200/O2	Replaceable by the customer for all groups
CO - 4000/10000ppm	ZB200/CO	Replaceable by the customer for all groups
NO - 1000ppm	ZB200/NO	Replaceable by the customer for all groups

7 Firmware Update

1. *Connect the USB cable to the instrument*
2. *At the end of calibration, go to Menu, Miscellaneous, Update Firmware, which starts in BootLoader mode.*
3. *See point 4.4.8.10*
4. *Run the "Boston Updater" program, click the "Load File" button and select the file that contains the FW (e.g. boston_v1.010.hex). Select the communication port assigned to the instrument, and finally push the "Start update" button*
5. *Wait for end of programming confirmation, the instrument restarts in normal operating mode*



Spare parts and accessories

 ***ZZ-SO201*** *Complete flue gas probe 220mm / tube 3m*	 ***ZZ-SO202*** *Complete hose probe 200mm / tube 3m*	 ***ZZ-SO20x*** *Complete flue gas probe 220mm / tube 1,5 m*	 ***ZZ-SO205*** *Complete flue gas probe 300mm / tube 3m*
 ***ZZ-SO111*** *Combustion air temperature probe l:13cm + 85cm cable*	 ***BST337*** *Infrared thermal printer*	 ***BST339*** *Bluetooth thermal printer*	 ***ZR102*** *Thermal paper roll for printer*
 ***ZZ-RC100*** *Complete condensate collector*	 ***AL003*** *Power supply unit / battery charger*	 ***CA026*** *CABLE USB-C*	 ***BA046*** *Lithium battery*
 ***FI092 + GU152*** *Additional filter kit*	 ***SP100*** *Brush for cleaning heat exchangers/radiators*	 ***PO206*** *Internal suction pump dilution*	 ***PO207*** *Internal suction pump*
 *PO144 Kit “BACHARACH” carbon black”*	 ***ZB101*** *‘BACHARACH' test cards*	 ***ZB102*** *‘BACHARACH" index comparison scale*	 ***FI090*** *Pack of 10 replacement filters (for the flue gas filter)*

8 Further details

8.1 FAQ (frequently asked questions)

Below we provide some thermal-hydraulic notions for those who are new to using the product.

COMBUSTION FAQ		
What % of O2 is found during an analysis?	***During analysis:*** *2÷5% (watertight boilers)* *up to 14% (atmospheric boilers)*	***In the air:*** *Oxygen in the atmosphere is about 20.9%.*
What % of CO is found during an analysis?	***During analysis:*** *As low as possible no more than 1000 ppm*	***In the air:*** *0 ppm*
What % of CO2 is found during an analysis?	***During analysis:*** *10-11% (Depends on O2 and fuel)*	***In the air:*** *Close to 0%*
How is the 'ambient temperature' probe used?	*With atmospheric boilers, the ambient temperature of the room in which the boiler is installed (combustion air) applies.*	
	Whereas for sealed-chamber boilers, the temperature probe is placed in the suction flue through the threaded cone	
How is the 'flue gas temperature' probe used?	*It is inserted into the hole in all flue gas stacks at an ideal distance for reading the highest temperature (in the centre). Normally the flue gas temperature during analysis is 120-300°C*	
What does 'draught' mean?	*This indicates the stack suction value*	
What is the ideal performance?	*Law 10 (standard UNI 10389-1) expresses the formula to calculate this.* *Example:* *Boiler of 30,000 kCal installed after 1993 the performance will be:* *at 70°C $\geq$ 89%* *at 50 °C $\geq$ 87%*	
What is Blackening?	*This is the smoke opacity measurement carried out using a Bacharach pump*	
What is Lambda?	*This is the excess air in the flue gases. Ratio, expressed in %, of the difference between the quantity of air used for combustion and the stoichiometric quantity of air and the stoichiometric quantity itself.*	
What are Losses?	*This is the difference between the ideal performance (100%) and actual performance: i.e. if the performance is 86%, the loss is 14%.*	
What is NO?	*It is one of the toxic gases found in combustion fumes:* *"Nitrous Oxide".*	
What is NO2?	*It is one of the toxic gases found in combustion fumes:* *"Nitrogen dioxide".*	
What are NOX?	*These are the total nitrogen oxides, i.e. the sum of NO and NO2*	
What is SO2?	*It is one of the toxic gases found in combustion fumes:* *"Sulphur dioxide".* *It represents the sulphur content of the fuel*	
What is the dew point?	*This is the temperature at which the moisture content of the flue gas condenses.*	
What is O2 (Oxygen) reference?	*This is the figure according to regional regulations for calculating dry CO (without water vapour).*	

8.2 Parameter calculation formulas (flue gas analysis)

Calculation of carbon dioxide CO_2:

$$CO_2 = CO_{2\max} * (1 - \frac{O_{2mis}}{21})$$

O_{2mis} is the measured oxygen concentration. CO_{2max} is the maximum possible carbon dioxide concentration that can be produced with the fuel being used.

Performance / Loss calculation for NON condensing boilers:

$$\mathrm{Re}nd = 100 - q_s$$
$$q_s = (\frac{A}{21 - O_2} + B) * (T_f - T_a)$$

q_s represents the power lost in the stack (losses)
T_f and T_a are the temperature of the flue gas and combustion air respectively
A and B are coefficients that depend on the fuel used.

Performance / Loss calculation for condensing boilers:

$$\mathrm{Re}nd = 100 - q_s + ET$$

q_s represents the power lost in the stack (losses)
ET is the increase in performance due to condensation

Excess Air Calculation

$$\lambda = 1 + \frac{O_2}{(21 - O_2)}$$

Lambda (λ) is the excess air

Calculation of air index n

$$n = \frac{21}{21 - O_{2\_mis}}$$

n is the air index

$$CO_{(0)} = CO_{mis} * n$$

Multiplying the air index by the measured CO value yields the undiluted CO value, which is indicated at O_2=0%

Calculation of undiluted CO

$$CO_{(rifO_2\%)} = CO_{mis} * \left(\frac{21 - O_{2rif}}{21 - O_{2mis}} \right)$$

Considering that the Oxygen reference value on which to base the calculation of undiluted CO is not always zero, but may vary according to regional standards, the calculation is carried out here.

8.3 Characteristics

Parameter	***Sensor Type***	***Measuring range***	***Resolution***	***Precision***	***NOTES***
O_2	Electrochemical	0 - 21% vol	0,1% vol.	±0.3 % vol	4 years
CO – 4000 Up to 10,000	Electrochemical	0 - 4000 ppm	1 ppm	±20ppm ±5%	
NO	Electrochemical	0 - 1000 ppm	1 ppm	(0-100) ±5ppm (100-1000) ±5%rdg	Mod: ST200OCN
COamb	Electrochemical	0 - 500 ppm	1 ppm	(0-100) ±5ppm (100-500) ±5%rdg	
CO_2	calculated	0 - 100% vol	0,1% vol.	±0.1 % vol	
NO_X	calculated	0 - 1500 ppm	1 ppm	-	(No+5%)
Flue gas temperature	Tc K	0 - 1000°C	1°C	±2°C	
Combustion air temperature	Tc K	-20 - 150°C	0,1°C	±1°C	
Draught	Semi-conductor	-500 - 500 Pa	0,1 Pa	±0.5Pa	
Pressure	Semi-conductor	-50 - 500 Pa	1 Pa	1 Pa	

Power supply:	*External 230Vac power supply for charging or direct power supply (also for printer). 5vdc USB-C output voltage*
Battery	*Li-ion 3.6 Vdc 6.3 Ah*
Display	*TFT graphic LCD*
Average autonomy	*8 / 10h*
Battery charging time	*4 hours*
Printer	*External Bluetooth or infrared; paper width 58mm*
Operating temperature	*-10 +50°C*
Storage temperature	*-20 +55°C*
Protection Index	*IP40*
Dimensions	*200mm x 80mm x 60mm*
Weight	*Approx. 1,0 kg*
Weight (with suitcase)	*Approx. 2.5 kg (with suitcase)*

9 Warranty

WARRANTY RULES

DURATION

In the case of faults or defects for which the manufacturer is found to be responsible, Tecnocontrol S.r.l. guarantees the product for a period of **24 months** from the date of purchase by the end Customer (hereinafter referred to as the Customer), which is proven by a document valid for fiscal purposes issued by the authorised retailer.

Note: Sensors (e.g. measuring cells), pump and batteries are covered by warranty for a period of **12 months**.

VALIDITY

Warranty means the free repair or replacement of component parts of the equipment that are found to be defective due to manufacturing defects, with the exclusion of the cases listed under "Limitations of Liability".

Warranty entitlement must be proven by the original certificate and a document valid for tax purposes, issued by the dealer at the time of purchase, from which the model, serial number of the product, date of purchase and company name of the dealer can be deduced.

This warranty is void if the type or serial number of the product is changed, deleted, removed or made illegible and if repairs or modifications are carried out by unauthorised personnel or using non-original spare parts.

Note: This warranty does not cover regular maintenance or replacement of parts due to normal wear and tear.

This commercial warranty offered by Tecnocontrol S.r.l does not affect the consumer's rights under Legislative Decree N° 24 of 2 February 2002, issued in implementation of the European Directive 99/44/EC, as well as Legislative Decree N° 206 of 6 September 2005.

LIABILITY

During the warranty period, Tecnocontrol S.r.l undertakes to correct the defect caused by a manufacturing fault, at no cost to the Customer. In the event that the defective equipment is missing one or more parts, it will be repaired and returned without adding them, unless explicitly requested to do so. Should repair not be possible and/or should the repair prove to be excessively onerous in relation to the value of the product, (assessed at the sole discretion of Tecnocontrol S.r.l.) the equipment shall be replaced for the end Customer subject to written notice, leaving the expiry date and terms of the warranty referred to in the original contract unchanged, as proven by the fiscal document issued by the dealer at the time of purchase. If the equipment is replaced, if the same model of the defective equipment is not available for any reason whatsoever, Tecnocontrol S.r.l. reserves the right to replace the device with another of a similar type, but of a different model and having the same functions and the same purpose.

LIMITATIONS OF LIABILITY

Defects are not attributable to Tecnocontrol S.r.l. if they are found to be caused by conditions extraneous to operation of the product. Also excluded from warranty cover are damages attributable to improper or incorrect installation/use, i.e. installation/use not in accordance with the relevant instructions or in the absence thereof not carried out in a workmanlike manner; for incorrect or deficient maintenance in accordance with the relevant instructions or in any case in accordance with the usual maintenance procedures; for improper or incorrect operation or use, for neglect or inability to use and in any case for causes of any kind not attributable to the manufacturer.

Consumables (printer paper, filters, etc.) are excluded from the warranty.

Tecnocontrol S.r.l. declines all responsibility for any damage that may directly or indirectly derive from its products to persons, things or animals as a consequence of the failure to observe all the instructions given in the instruction booklet, concerning the use, operation and maintenance of the equipment.

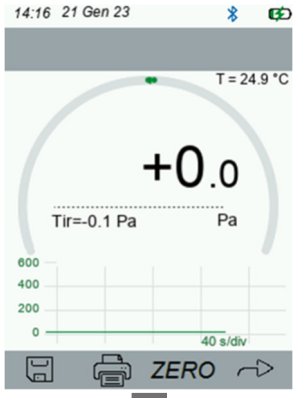
Model: _____

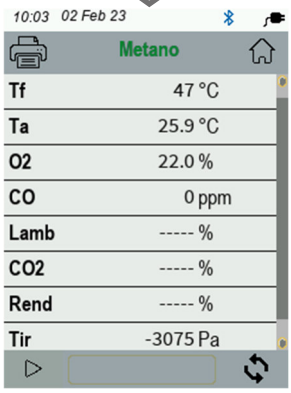
Serial number/series _____

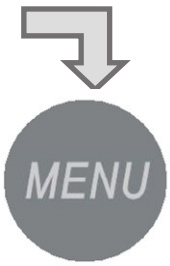
DEALER/INSTALLER STAMP AND SIGNATURE

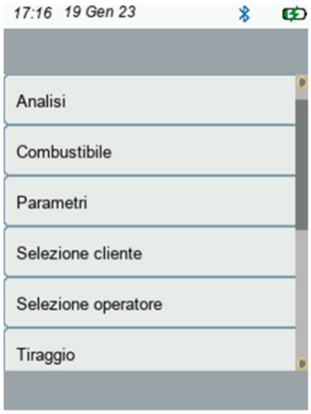
THIS WARRANTY CERTIFICATE DOES NOT HAVE TO BE SENT, BUT ATTACHED TO THE TAX RECEIPT
The warranty is only valid if accompanied by a Tax Receipt. We therefore advise you to staple the Tax Receipt that the dealer gave you and attach it to the warranty certificate.

10 BostonX in brief









11 Notes

INFORMATION TO USERS: Pursuant to Art. 13 of Legislative Decree of 25 July 2005, n°. 151 'Implementation of Directives 2002/95/EC, 2002/96/EC and 2003/108/EC on the reduction of the use of hazardous substances in electrical and electronic equipment and the disposal of waste'

The crossed-out bin symbol on the equipment or its packaging indicates that, at the end of its working life the product must be collected separately from other waste.

Separate collection of this end-of-life equipment is organised and managed by the manufacturer. Users who wish to discard this equipment should therefore contact the manufacturer and follow the system the manufacturer has adopted to enable separate collection of end-of-life equipment.

Appropriate separate collection for subsequent forwarding of discarded equipment for environmentally sound recycling, treatment and disposal helps to avoid possible negative effects on the environment and health, and promotes the reuse and/or recycling of the materials of which the equipment is made.

Unauthorised disposal of the product by the holder entails the application of the administrative sanctions provided for by the legislation in force