ecom® Creative technology made by rbr

Operating Instructions

ecom®-EN

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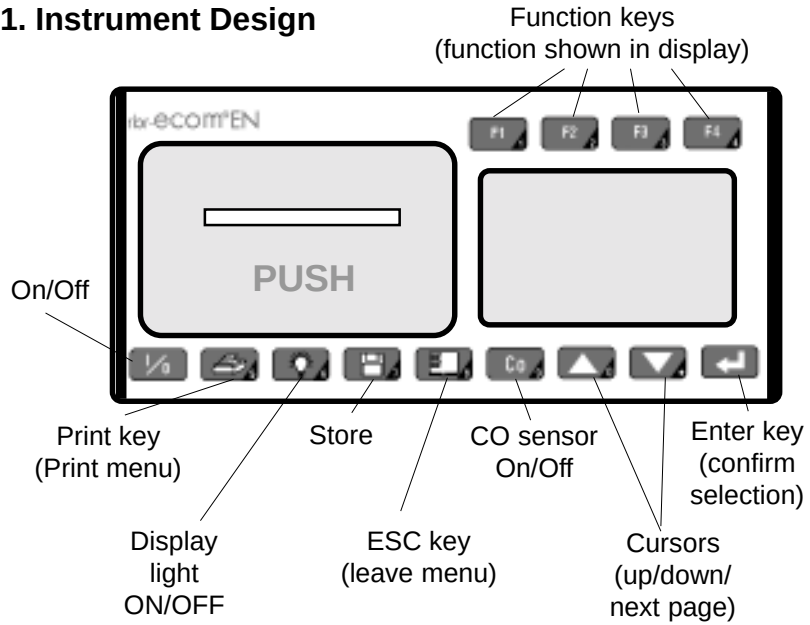
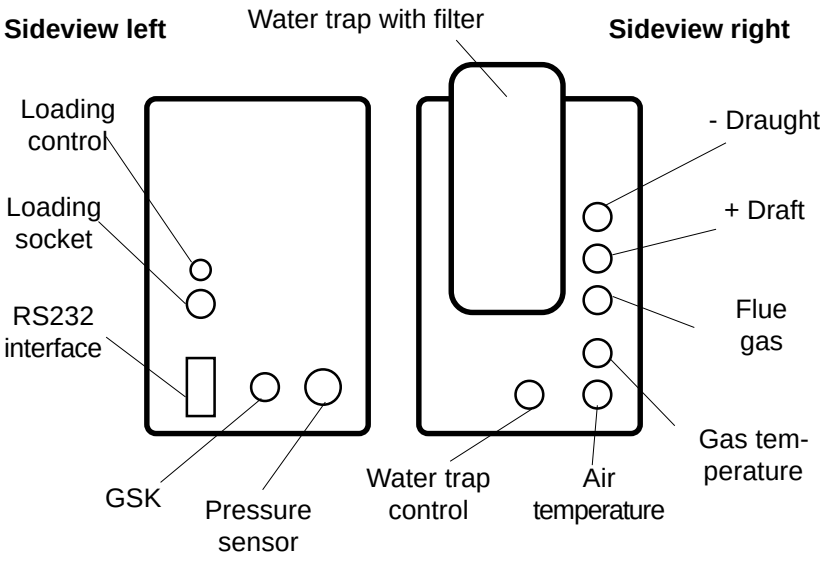
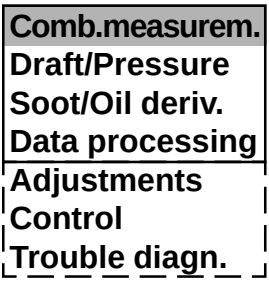
1. Instrument Design



Keys are also used to input the numbers



2. Operation



Turn on instrument (key **I/O**), the main menu will appear on the display and 7 choices will be displayed (scroll to access others not on screen).

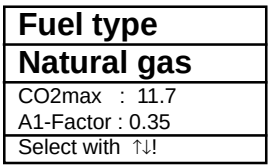
The functions are as follows:

- Comb.measurem.: Start gas analysis
- Draft/Pressure: Draft or pressure measurement performed
- Soot/Oil deriv: Input results of soot measurement
- Data processing: Assign measurement / Load or send data
- Adjustments: Change instrument´s settings
- Control: Check operation condition of instrument
- Trouble diagn.: Display of trouble protocols from control units.

When processing measurements, choose with cursor **"Comb.measurem."** and confirm with the **<Enter>** key. The instrument starts with a 3-minute calibration cycle and the fuel selection list is displayed. The following fuel types are available:

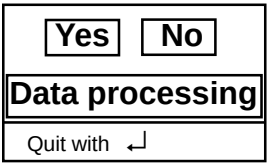
Fuel types acc. to BImSchV

Fuel oil
Natural gas
Town gas
Coke gas
Liquid gas



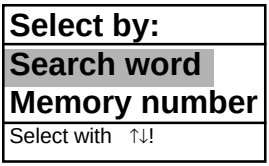
Select fuel type with arrow key and confirm with **<Enter>** key.

Select Yes or No for Data Processing. If you want the measured value in a certain order, then press the **<F1>** key for Yes, and **<F4>** for No.



3. Select / Input plant number

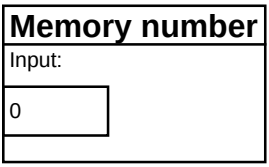
To call up a plant already stored in the instrument or to create a new file, you may select one of the available search modes.



Memory: For a new plant, a memory number can be allocated.

Choose **"Memory number"** and confirm with **<Enter>** key. Enter a memory number (0 - 4000).

For example, enter **"0"** for memory space 0.

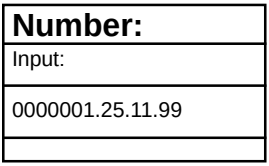


After entering number, press **<Enter>** to take up this memory space. Pressing the **<F3>** key will seek out the next free space (starting by 0). After pressing the **<F4>** key, an identification number can be inputted for the new plant.

Tip: Since only numbers can be inputted (max. 16 characters), we recommend inputting the date, so the subsequent search can be performed by date (search acc. to date).

For example: 0000001.25.11.99

Plant number or similar — **Date of measurement**



The memory space is activated by pressing **<Enter>** key when the input is finished. Then one can access the measurement mode. Press hereto twice on **<ESC>** to reach the main menu. Select **"Gas analysis"** and confirm with the **<Enter>** key.

Search word: If you know the identification number of the plant, the search mode will find the number if it is already in the memory.

Select **"Search word"** and confirm with **<Enter>**. Input 4 numbers to recognize the equipment.

Search word
Input:
25.11

For example: **"25.11"** for identification number **0000001.25.11.99**

After number input, press **<Enter>**. The programme will propose all stored numbers with this figures configuration. You can view each of them using the arrow key (use **<F1>** for the beginning and **<F2>** for selection end).

Once the correct data record is identified, it can be activated by pressing **<Enter>** and the stored measurement values can be viewed (choose **" Look at"** and confirm with **<Enter>**).

F1:Begin F3:Empty F2: End
0000001.25.11.99
Memory number 8 M

Measured values available

Using the cursor key, you can call up -one after the other- 4 display pages covering all measured and calculated values.

Date	Time
25.11.99	10:35:56
0000001.25.11.99	
Memory number	8

O2	3.2	%
CO2	13.1	%
CO	12	ppm
NO	52	ppm
T.Gas	184	°C
T.Air	20	°C
Losses	7.5	%
Eff.	92.5	%

Soot/Oil trace	
Draught	-0.08 hPa
T.Boiler	65 °C
1.Soot-meas.	0.5
2.Soot-meas.	0.3
3.Soot-meas.	0.7
Oil trace	No

CO-measure.		
O2		17.5 %
CO	0.0%	738 ppm
CO		123 ppm
Excess air		7.00
BImSchV : keys ↑↓!		

O2 multi-hole meas.	
O2	**19.5** %
BImSchV : keys ↑↓ !	

Press twice **<ESC>**, **"Comb.measurem."** and then **<Enter>** to enable the recording of the current measurement values.

4. Gas analysis

4.1. Gas analysis

Select a suitable probe for the type of measurement to be now performed and fix it at the measurement place. Also connect the temperature sensor for air suction to the instrument. Check the right fixation of all hoses and connections on probe and instrument. The instrument will switch to the measurement mode after the 3-minute calibration cycle.

The combustion values are shown on 4 display pages. (3 are BImSchV measurements, 1 CO mesurement. Scroll display pages with the arrow key).

O2	**4.0**	%
CO2	**12.5**	%
T.Air	**20**	°C
T.Gas	**212**	°C

O2	**4.0**	%
CO2	**12.5**	%
CO	**30**	ppm
NO	**45**	ppm

O2	4.0	%
CO2	12.5	%
CO	30	ppm
NO	45	ppm
T.Gas	166	°C
T.Air	20	°C
Losses	7.0	%
Eff	93.0	%

The position of the measured and calculated values (BImSchV measurement) is free selectable. To change the succession, process as follows:

-press **<F1>** to activate the first line on the display,
-select with arrow keys the measured or calculated value,
-press **<F1>** to activate the next line and so on and so on...

CO2, Efficiency, Losses, Excess air and dew point are calculated values. They are calculated only when realistic values for temperature and O2 are available. It means that:

O2 < 20.5%
T.Gas – T.Air > +5°C

The dew point can only be calculated correctly, if in the menu "**Adjustments**" the current barometric air pressure under adjustments has been entered. The analyser cannot determine the dew point.

Correct values are displayed after a short time, necessitated by the gas transport to the sensors and once a stable electrochemical reaction is given at the sensors. This time lies between 1 and 1 ½ minute. Wait for the values to get stable before storing, printing and evaluating them. If the gas values still fluctuate more than 2 ppm, there may unstable draught conditions in the gas channel.

Once the measured values are stable and the results can be printed, press **<Store>** to transfer the values in a temporary memory (note: store separately BImSchV and CO measurements). The data is stored in this temporary memory for a later printout or for a final data storage (you can view the values in the intermediate memory by pressing **<F4>**).

Measurement is stored in temporary memory

O2	4.0	%	**m**
CO2	12.5	%	
CO	30	ppm	
NO	45	ppm	
T.Gas	166	°C	
T.Air	20	°C	
Losses	7.0	%	
Eta	93.0	%	

4.2. CO measurement (Flue gas channel check)

The flue gas channel check, also called CO measurement, is the specific control of said channel by gas-fired plants, performed under safety aspects.
The CO content is measured in the flue gas channel after the gas has been enriched with surrounding air and is converted in an undiluted value (residual oxygen content in combustion gas = 0%). As the gas behaviour after air addition is no longer homogenous due to secondary air, and the main stream core determination can be erratic, this gas analysis is performed across the whole diameter of the exhaust pipe.
A multi-hole probe (optional accessory) is the ideal sampling tool hereto. The calculated CO value shown by "**CO 0.0%**" corresponds to the measured CO content, supposing that in the same gas volume the 02 content is 0%. This is consequently the undiluted CO content in the flue gas. Once the measured value is stable, press **<Store>** in order to transfer the value in temporary storage.

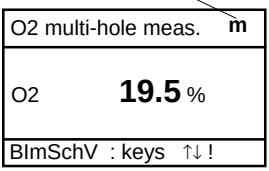
Measurement is stored in temporary storage

CO-measur.		**m**
O2		17.5 %
CO	0.0%	738 ppm
CO		123 ppm
Excess air		7.00
BImSchV: keys ↑↓ !		

4.3. O2 multi-hole measurement

This measurement is used at room-independant plant e.g. useful heat firing plants. It will be investigated if flue gas enter in the combustion air (O2 content is then reduced) and influence herewith on the combustion quality. For this measurement a multi-hole probe (optional accessory) is necessary. Once the value displayed is stable, press the key <Store> and the value is stored in the intermediate memory.

Measurement is stored in temporary storage

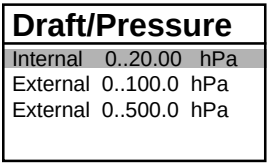


4.4. Draft / Pressure measurement

Besides the draught respectively differential pressure measurement performed by the internal draught sensor, the **ecom-EN** offers a connection possibility for an external pressure sensor (0 - 100 mbar or 0 -500 mbar) for the determination of pressure conditions in the surrounding field of combustion places (e.g. gas nozzle pressure).

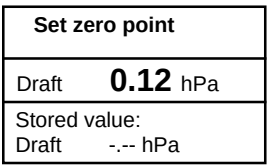
4.4.1. Draft measurement

The gas measurement mode already provide with a trend indication of the draught value. As the differential pressure sensor is very sensitive and tends to drift, the value will not be recorded by pressing **<Store>**. It is consequently advisable to recalibrate this sensor prior to the practical measurement and results printing. Enter the measurement mode by selecting **„Draft/Pressure“**.

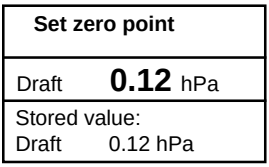


Select the internal pressure sensor (use arrow keys and then **<Enter>**).

The current value is displayed as well as the advice to zero the sensor. Remove the draft hose from the instrument and press **<Enter>**. The sensor is then reset to zero.



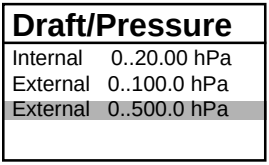
Reconnect the draught hose. The exact value is then displayed. Press **<Store>** to store it together with the gas mesurement results in the temporary memory.



Press **<ESC>** to escape pressure measurement.

4.4.2. Pressure measurement with external sensor

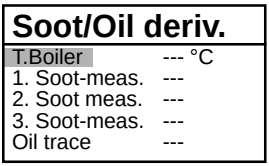
Connect the external pressure sensor to the instrument where labeled (Aux). Initialise the pressure measurement by selecting **„Draft/ Pressure“**. Select external sensor (Cursor to; **<Enter>**) and re-zero (**<F1>**). Place the sensor at the measurement point. Once the mesurement value is stable, it can be stored in the temporary memory for later printout.



4.5. Soot / Oil derivative

The measured values for boiler temperature, soot number and oil trace can be entered in the sub-menu **„Soot/Oil deriv.“**. Select the appropriate line on the display and press **<Enter>**. The input for boiler temperature, soot number 1 - 3 can be keyed in respectively. After pressing **<Enter>** the data is recorded. The result of the oil trace check is to be documented as follows:

- place cursor on line **„Oil deriv.“**
- press **<Enter>** to register (**„No“; „Yes“** or **„---“**)

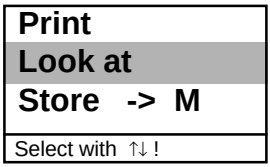


Press **<ESC>** to quit this menu when all required inputs have been made. The measurement is now complete.

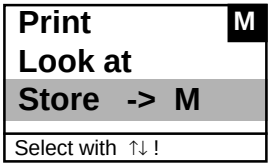
4.6. Store/Print measurements

Important: The values stored in the temporary memory must be transferred in the internal memory of the instrument, otherwise they will be lost when the instrument turns off !

Press key **<Print>** (printer symbol) to access the print menu. The values can be checked one more time (**„Look at“**; **<Enter>** and scroll with cursor).

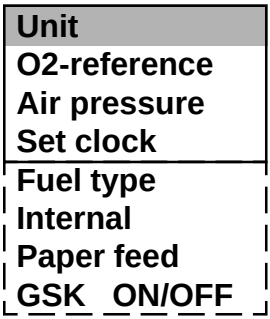


Select **„Store -> M“** and press **<Enter>** to store into the internal memory. Once the data is successfully stored, then a **„M“** appears in the right hand corner of the display and the data can now be printed (**„Print“** and **<Enter>**).

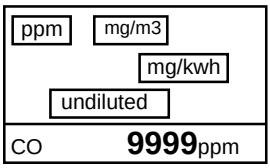


Press **<ESC>** to escape to main menu.

5. Adjustments



In addition to the functions already described, various adjustments can be performed in this instrument. From the main menu, select **„Adjustments“** and confirm by pressing **<Enter>**. You will find a selection of other parameters, which can be adjusted for each application. Place the cursor on the requested line and press **<Enter>** to call up or change the adjustment.



Explanations:

Unit (change with **<F1>** - **<F3>**):
-Calculation of gas concentration in:

-ppm = volume concentration (parts per million)
-mg/m^3 = mass concentration by volume
-mg/kWh = mass concentration by unit of productivity

Undiluted (change with **<F4>**):
-Conversion of gas concentration for a given content of reference O2
-Formula for conversion:

$$E_{ref} = E_{meas} * \frac{21 - O_{2ref}}{21 - O_{2meas}}$$

Reference-O2 (press **<Enter>** then input):
-Input reference-O2 (O_{2ref})

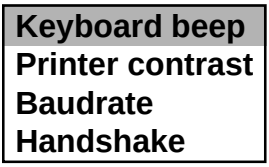
Air pressure (press **<Enter>** then input):
-Input barometric pressure for calculation of dew point

Set clock (press **<Enter>** then input):
-Correct inner clock by overwritting new numbers

Fuel type (press **<Enter>** and then select):
-Change the type of fuel (e.g. by measurements at combi plants)

Paper feed (press **<Enter>**):
-paper feed line by line

Internal (access menu with **<Enter>**):
-further instrument´s adjustments



Keyboard beep (press **<F1>** for Yes / **<F4>** for No):
-Acoustic signal when keyboard is pressed

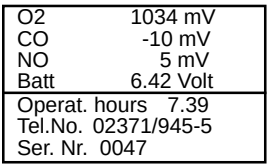
Printer contrast (0..9) (press **<Enter>** then select):
-Set contrast of printer

Baudrate (adjustment with **Cursor keys**):
-Data transfer speed via RS 232 (1200 -19200 Baud)

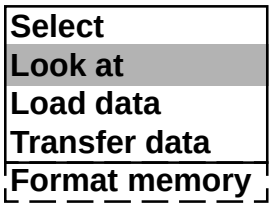
Handshake (key **<F1>** for Yes / **<F4>** for No):
-Adjustment of data transfer option

6. Control

The electrochemical sensors used for gas analysis underlie a wearing process along the time. They alter their output values along their operation time, this depending on the gas concentration, the time they are submitted to gas and on the purity of the gas. The program (software) monitors the sensors and corrects drifts. If the drift is too important and could lead to an incorrect measurement, then an error message will be displayed.
In this case, the corresponding sensor must be changed. The sensors´ status is indicated in the control menu with, in addition, the following values:



-battery voltage (loading condition)
-operation time
-telephone number of nearest service center
-serial number



7. Data processing

The menu **„Data processing“** offers the following functions:

Select:
To identify or create a combustion plant´s data file for allocation of measurement data (see § 3).

Look at:
To look at recorded values of the selected combustion plant (see § 3).

Load data:
To import data from PC programmes (pay attention to the transfer options of your software and adjust them, if need be, on the instrument, see § 5). Proceed as follows:

1. Connect **rbr-ecom EN** and PC via a current RS 232 cable.
2. Select „**Load data**“ and confirm with <**Enter**>.
3. Answer safety question with Yes.
4. Decide whether stored values should be erased
   (<**F1**> for Yes, <**F4**> for No).
5. Start data transfer at your PC.

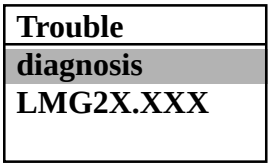
Send data:
To transfer data records containing measurement values to the PC programme (proceed like described under „**Load data**“).

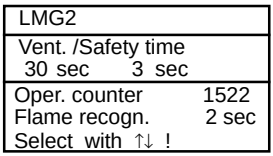
Format memory:
This function is usually needed only at our factory to initialise the instrument (preparing the internal memory for data receipt).
Caution: all stored data are erased !

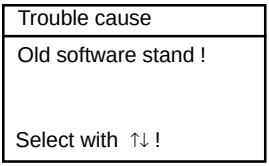
8. Trouble diagnosis

The **ecom-EN** is able to readout and print troubleshooting diagnostics from monitoring instruments of type LMG 2.

A special reading adapter is necessary for this function. Consult your sales agent for price & availability.







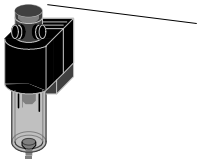
9. Maintenance tips

Your instrument should be serviced by an authorised service center once a year, respectively after 500 operating hours at a maximum, in order to check the sensors and clean the internal tubing.
Do not use sensors/parts which are not provided by our factory, and be aware that service done by unauthorised service centers, will cancel any warranty.

The following tips for the daily care of accessible parts and components should be helpful:

Dust filter on top of the water trap

Unscrew the top cap of the water trap and check the condition of the particle filter. When the filter becomes grey, it should be changed (soot number approx. 2-3).



Sensors

Each time the instrument is turned on, the sensors are calibrated with fresh air. The instrument permanently monitors the condition of the sensors. New sensors wear out from use in time due to reagent (O2 sensor) and due to soiled gases respectively gases in concentrations beyond the nominal range (toxic sensors). The output values of the sensor are (menu „**Control**“) :

O2	approx. 1000 mV
CO	0 mV (+/- 70)
NO	0 mV (+/- 30)

If an error message is displayed during calibration and does not disappear after repeated calibrations, then the instrument should be sent to a service center. The O2 sensor should show > 200 mV, otherwise it should be changed.

The internal program applies an upper limit value for each sensor. By exceeding, a magnetic switch flows fresh air to the sensor (respectively to all sensors).
The CO sensor limit is set at 4.000 ppm and corresponds for other toxic sensors (if available in the instrument) to their respective measurement range end value.

Mains Power

The battery makes mains power independent operation possible. The battery is automatically loaded when the instrument is plugged in. It should be expressly re-loaded when the voltage displayed (menu „**Control**“) is lower than 5.8 V. The instrument will indeed stop working by 5.5 V.

Sampling probe and hose

Probe and hose must be cleaned regularly, correspondingly to the frequency of use, thus in order to prevent particles from lodging and early ware due to corrosion.
The hose can be released from the probe and instrument and cleaned (use warm water and then blow out to dry).

Replace paper roll

Press slightly on the paper roll drawer to release the lock. Pull out the paper drawer and eject -if need be- residual paper from the printer („**Adjustments**“, „**Paper feed**“ and then **<Enter>**).
Extract the paper shaft and put a new printer roll on the shaft. Re-position the printer shaft in the fixation. Insert the paper roll end through the slot. Press „**Adjustments**“, „**Paper feed**“ and then **<Enter>** to pull out approx. 10 cm paper. Push the drawer back in the compartment. Push carefully the paper drawer until it locks.

10. Technical data

Parameter	Range	Measurement principle
O2	0 ... 21 % vol	electrochemical
CO	0 ... 4.000 ppm	electrochemical
NO (option)	0 ... 2.000 ppm	electrochemical
CO_2	0 ... CO_{2max}	calculated
T-G	0 ... 500 °C	NiCr/Ni
T-A	0 ... 99 °C	semiconductor
Pressure	0 ... +/- 20 hPa	DMS-bridge
Efficiency	0 ... 99,9 %	calculated
Losses	0 ... 99,9 %	calculated
Lambda	1 ... ∞	calculated
CO-undiluted	(ref. 02 adjustable)	calculated
Dew point of combustion gas		calculated

Power supply	230 V / 50~; battery 6 V / 1,2 Ah
Printer	Integrated; 58mm paper width
Display	Graphic display; backlight
Size	190 mm x 160 mm x 75 mm
Weight	approx. 3500g complete with sampling system

Subject to technical changes
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