

ecom<sup>®</sup>



## Operations Manual

ecom<sup>®</sup> B

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## Important Tips



The ECOM-B is not suitable for continuous emissions testing. Please allow at least 10 minutes of fresh air purge for each hour of testing.



In order to get correct measurement values:  
-allow 1 min. for auto-zero in fresh air  
-allow at least 2 mins. for stable readings before taking the measurement

The following substances will impair the instrument's operation:

- cleaning agents
- degreasers
- wax polishes
- adhesives
- anything containing formaldehyde




Adjustments on burners and boilers should be made only by specialists who are familiar with these installations.




1. Charge the internal battery regularly. (An unused analyzer should be charged at least once per month)
2. Never store the unit with a discharged battery!

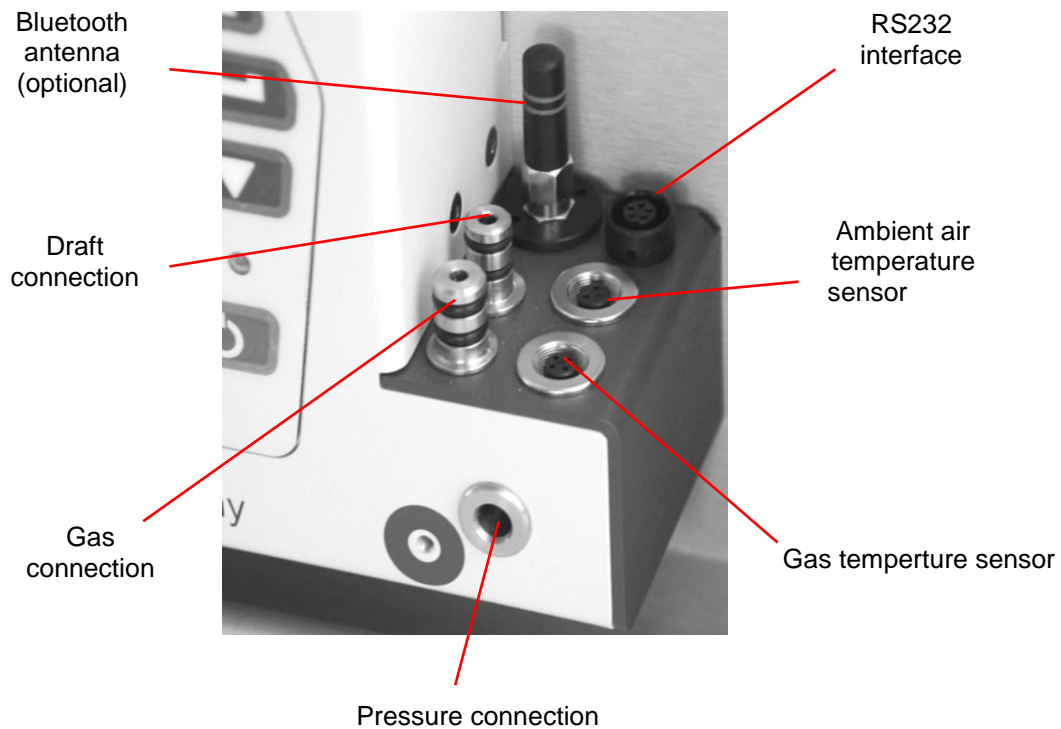
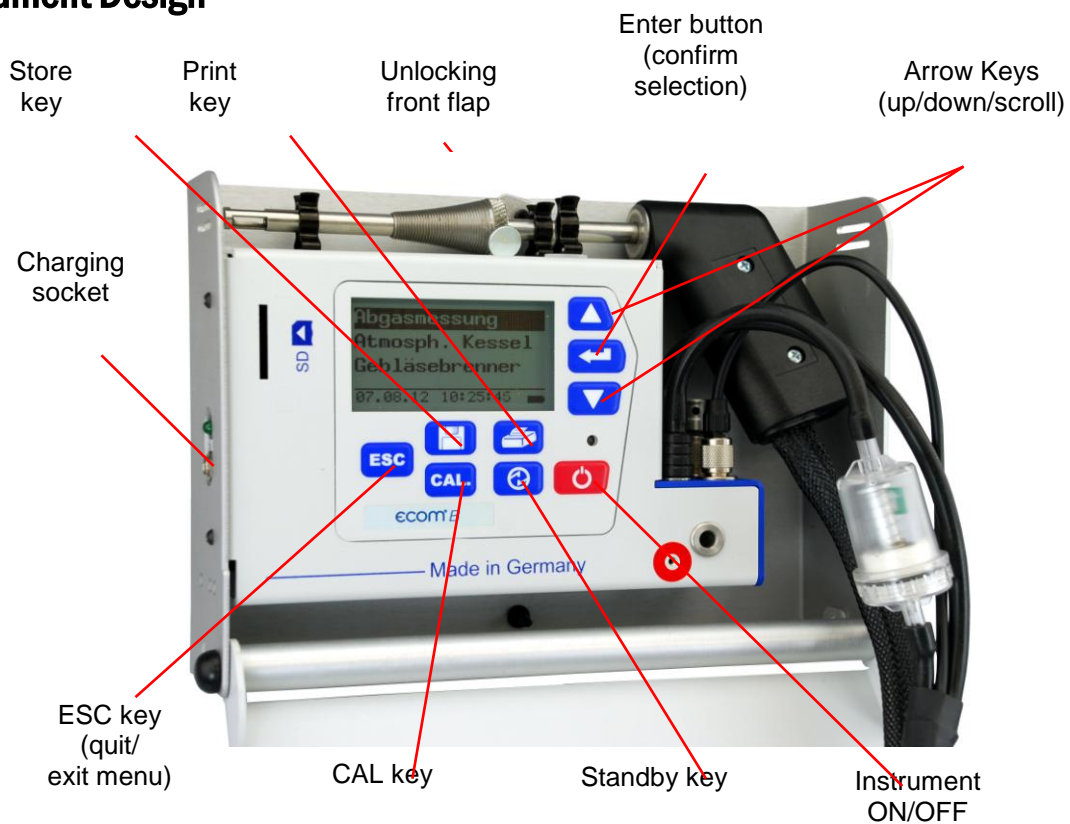


**Fresh air opening**

 **Do not block the fresh air opening for  
the fresh air pump!**

 **Make sure the probe is in fresh air upon  
starting the analyzer!**

# 1. Instrument Design



## 2. ECOM-B Accessories

	Part	Part Number	Description
	Thermal IR Portable Printer Paper (5/PK)	6951801H	5/PK - Thermal printer paper for portable IR printer
	IR Thermal Printer	7937501H	IR Thermal Printer
	Condensate Pad (5/pk)	6943611H	5/pk- Condensate Pads
	9vdc Power Pack	7940301H	9vdc Power Pack

### 3. Analyzer Start-Up

After turning on the instrument (press **<I/O>**), the main menu will appear on the display (see example on the right). The following sub-menu options will be displayed (additional sub-menus can be displayed by scrolling with the arrow keys):

<b>Comb.measure.</b>
<b>Mean value</b>
<b>Data processing</b>
<b>Adjustment</b>
<b>Control</b>

- Comb. measurement : Perform combustion measurement
- Mean value : Perform averaging over time
- Data processing : Save snapshots to internal memory or perform data logging (only if SD card is inserted)
- Adjustments : Modify instrument settings
- Control : Check operating status of instrument

To perform measurements, select "**Gas analysis**" using the arrow keys and confirm with **<Enter>**. The instrument starts then a 1-minute calibration phase and the fuel type selection list is displayed. The following fuel types are available:

- Natural Gas
- Propane
- Butane
- Number 2 Oil
- Number 4 Oil
- Number 6 Oil
- Coal
- Wood (0% H2O)
- Wood (17% H2O)
- Wood (50% H2O)
- North Sea Gas
- Diesel Oil

<b>Type of fuel</b>
<b>Fuel oil (B)</b>
CO2max : 15.4 A1-fact. : 0.50
Select with ↑↓ !

Use the arrow keys to select the desired fuel type and confirm with **<Enter>**. The instrument will then ask if you wish to use data processing. If you want to assign the sampled data to a specific machine, so choose **<YES>** with the arrow keys and confirm with **<Enter>**. If you choose **<NO>**, measurement will be performed without assignment.

Data processing
<b>NO</b> Are you sure?
Continue with : ↑↓↵

#### 4. Opening/Creating Data Records

The ECOM-B has 300 storage locations. In order to open a record with previously stored data or to create a new file, choose a data record with the arrow keys and confirm with **<Enter>**.

Memory number 0
Data record is empty !
Confirm with : ↑↓↵

If you are choosing an empty data record, a record name (max. 16 characters) can be assigned. To assign a data record with a specific name, proceed as follows:

- Choose a keyboard with the **<CAL.>** key (5 keyboards are available)
- Select a character with the keys **<Store>** (left), **<Print>** (right) and the **<up/down>** arrow keys.
- Confirm the character with **<Enter>**.
- Repeat until you have the desired name.
- If you want to change a character, proceed as follows:
  - Press **<Standby>**.
  - Select the character with the keys **<Store>** (left), **<Print>** (right), and the **<up/down>** arrow keys.
  - Confirm the character to be changed with **<Standby>** and select the correct character.
- To return to the Combustion Measurement Screen, press **<ESC>** twice, then select **<Comb. Measurem>**, then press **<Enter>**

If you are choosing a record with previously recorded data, you can open the record with **<Enter>** / **<Store>** / **<Enter>**. Now you can view the data with the **<up/down>** arrow keys.



## 5. Testing Procedures

### 5.1 Preparation for Measuring



Condensate pad

Prepare the instrument for measurement by making all connections (T-Gas, Gas and Draft of the 3-chamber hose). Make sure that:

- the condensate pad has not expanded all the way
- the condensate pad is not darker than a no. 3 on the soot scale

### 5.2. Gas Analysis



**To being testing, simply position the probe in the exhaust pipe once the auto-zero phase is over!**



**To obtain accurate measurements, it's important to re-zero the instrument after each measurement (at least once per hour)!**

Once the auto-zero phase is over, the instrument enters measurement mode. The measurement values are displayed on 4 different screens: 3 x gas analysis; 1 x draft measurement. You can change between these screens using the arrow keys.

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

O2	4.0 %
CO2	12.5 %
CO	30 ppm
Lambda	1.23

O2	4.0 %
CO2	12.5 %
CO	30 ppm
Lambda	1.23
T.Gas	166 °C
T.Air	20 °C
Losses	7.0 %
Eta	93.0 %

The position of each measured value can be changed freely. To do so, please proceed as follows:

- Select the first line on the display by pressing **<Enter>**, then **<Display values>**, then **<Enter>** again.
- Using the arrow keys, choose the new position of the first value.
- Press **<Enter>** to select the next line on the display and so on.
- Once finished, press **<ESC>** or **<Enter>** to leave this process.

The values for CO<sub>2</sub>, Efficiency, Losses, Lambda and the Dew Point are calculated values. They are calculated by using readings for the basic values, such as O<sub>2</sub> and the temperature.

Make sure that:

$$\text{O}_2 < 20.5 \% \text{ and } \text{T.Gas} - \text{T.Air} > + 5^\circ\text{C}$$

The dew point can be calculated correctly if the current barometric air pressure has been entered in the menu “Adjustments / Air pressure”. If the combustion gas temperature falls below the dew point (between 25 and 65°C), the efficiency will be calculated with condensation gain. In this case, a (C) is displayed behind the efficiency. Correct measurement values are displayed after a delay of 1 to 1.5 minutes. This is needed so that the gas has time to reach the sensors and can establish a stable electrochemical reaction. Wait for the values to become stable before storing or printing. If the gas value still fluctuates for more than 2 ppm, there could be unstable draft conditions in the gas channel.

Once the measurement values are stable and the results can be printed, press **<store>** (Disc symbol) to transfer the values to the temporary memory. Data will be stored here for later printout (the values of the temporary memory can be checked by pressing **<Enter>** / **<store>** / **<Enter>**). While checking the values, the gas pump will be switched off in order to spare the sensors. (back with **<ESC>**).

O2	4.0	%
CO2	12.5	%
CO	30	ppm
Lambda	1.23	
T.Gas	166	°C
T.Air	20	°C
Losses	7.0	%
Eta	93.0	%

Measurement  
stored in tempo-  
rary memory

The analyzer has an automatic system that protects the CO-sensor from overload. If the CO measurement exceeds 4000 ppm, a secondary pump will be activated, flushing the sensor with fresh air. Once enough time has passed with the sensor exposed to fresh air, the sensor can be returned to measurement mode by pressing **<ENTER>**, then **<CO MV ON/OFF>**, then **<ENTER>** again. The sensor can be switched off manually the same way.

### 5.3. Draft Measurement

Gas measurement mode provides indications of the draft conditions in the gas channel. As the pressure sensor is very sensitive and tends to drift, the value will not be recorded by pressing **<Store>**. Therefore, it is recommended to recalibrate this sensor prior to the actual measurement and before printing the results.

The current value will be displayed as well as the remark to reset the zero point of the sensor. Simply disconnect the sample line from the instrument and press the **<CAL>** key. The sensor will then be calibrated.

Draught	
Draft	
Val.:	<b>-0.12</b> hPa - . - - hPa
Set zero point <b>CAL.</b>	

Reconnect the sample line to the analyzer. The exact measurement value is now displayed and can be stored by pressing **<Store>** and added to the other values already in the temporary memory. The stored value will then appear on the display.

Draught	
Draft	
Val.:	<b>-0.12</b> hPa <b>-0.12</b> hPa
Set zero point <b>CAL.</b>	

## 5.4. Soot Test

Under **<Soot...Oil trace>**, the measurement results for boiler temperature, soot number and oil derivative can be entered. Select the corresponding line in the display and confirm the selection by pressing **<Enter>**. The input for boiler temperature and soot number (3 measurements) can be done as follows:

- Select with the position that should be changed by using the keys **<store>** (left) and **<Print>** (right) (corresponding field will blink)
- Enter the designated number using the arrow keys **<up/down>**


By pressing **<Enter>**, the entry will be transferred to the data record of the measurement. The result of the oil derivative checking will be documented as follows:

- Set cursor to line **“Ölderivat”**
- Select the result with **<Enter>** (**“No”**, **“Yes”** or **“- - - “**)

Soot...Oil trace	
T.Boiler	--- °C
1.Soot meas.	---
2.Soot meas.	---
3.Soot meas.	---
Oil trace	---
Input: ↓	

When all necessary entries have been made, the entry can be closed by pressing **<ESC>**. The measurement is now completed.

## 5.5. Recording/Printing Measurement Results

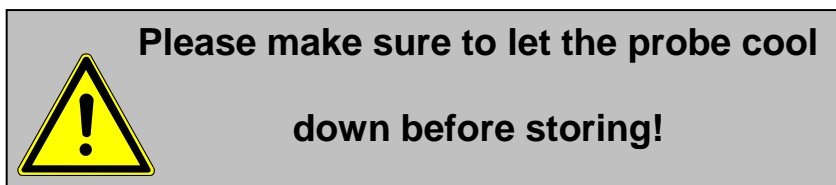


After gas analysis, please transfer the recorded data (intermediate memory) into the internal instrument memory. Otherwise the values will be lost when the analyzer is turned off!

After scrolling back to the gas measurement with the arrow keys **<up/down>**, the measurement can be transferred to the internal memory by pressing **<Enter>**, then **<Store to memory>**, then **<Enter>** again. After successful storage an **“M”** will appear on the display. The results can now be printed (IR Printer required) by pressing **<Print>**.

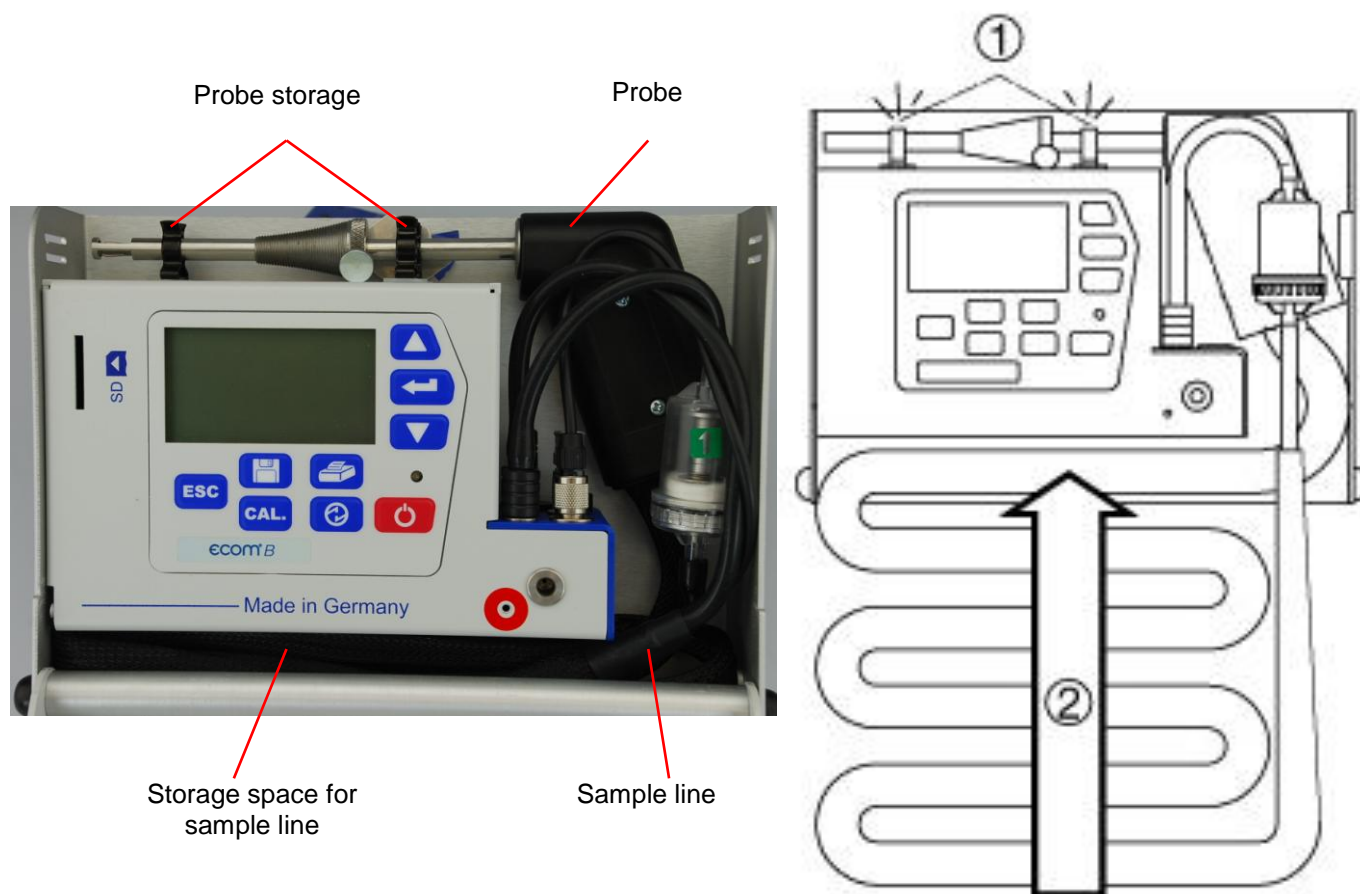
Display/Memory
Memory Store to memory Display values CO MV ON/OFF
Continue with: ↑↓↵

## 5.6. After Measuring



Stow probe and sample line in the device as follows:

1. Attach the probe to the designated fixation.
2. Slide the sample line, starting at the probe, into the space between the analyzer and the case. Coil the sample line here alternately from right to left and left to right.



## 6. Mean Value Function

The mean value measurement function allows sampling within an adjustable time frame, and averaging the results. If the results need to be saved, simply follow the directions in Chapter 4.

Once the fresh air calibration is completed, select **<Mean values>**. Before starting, make sure the **<Measurement time>** and **<Scanning>** are modified accordingly.

<b>Comb.measure.</b>
<b>Mean value</b>
<b>Data processing</b>
<b>Adjustment</b>
<b>Control</b>

- **Measurement time** = How long the mean values will be sampled

- **Scanning** = Time interval between the measurements for average value calculation

In order to adjust the **<Measurement Time>** and **<Scanning>** values:

- Select the value you wish to change using the arrow keys and press **<ENTER>**
- Set the desired time using the arrow keys

After adjustment, the measurement can be started by pressing **<Start>** / **<Enter>**. With the **<up/down>** arrow keys, you can switch between current and average readings. The measurement can be interrupted by pressing **<Standby>** (press **<Standby>** to resume the measurement).

<b>Mean value</b>
<b>Start</b>
<b>Meas. time</b>
<b>Scanning</b>
<b>Continue with : ↑↓↵</b>

## 7. Adjustment

In addition to the features previously mentioned, there are also other various settings that can be adjusted as needed. Select **<Adjustment>** from the main menu and confirm with **<Enter>**. A list of the possible settings is displayed and can be changed accordingly. Scroll the cursor to the corresponding line and press **<Enter>**:

Set clock
Display contrast
Type of fuel
Unit
O2 refer.
Air press.
Keyboard beep
AUX(COM)
Bluetooth
Eta(C)
Printout

### Set clock

- Press **<Enter>**
- Scroll to the value that needs to be changed with the **(up / down)** arrow keys
- Confirm by pressing **<Enter>**
- Set the time with the **<up / down>** arrow keys.
- Confirm the setting by pressing **<Enter>**
- After finishing, leave the menu with **<ESC>**

### Display contrast

- Confirm with **<Enter>**
- Set display contrast with the **(up / down)** arrow keys.
- Reset with **<CAL>**

### Type of fuel

- Select after pressing **<Enter>**
- Change the fuel type
- Unit** (change with the **(up / down)** arrow keys)
- Calculation of gas concentration in:
  - Ppm = Volume concentration (parts per million)
  - Mg/m<sup>3</sup> = Mass concentration unit
  - Mg/kWh 0.0 % = Mass concentration per capacity unit calculated with reference O<sub>2</sub>
  - Ppm 0.0 % = Volume concentration (parts per million) calculated with reference O<sub>2</sub>



-Mg/m<sup>3</sup> 0,0 % = Mass concentration per capacity unit calculated with reference O<sub>2</sub>

-Calculated with reference O<sub>2</sub> – formula for the calculation:

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

### **O<sub>2</sub> Reference**

- Confirm by pressing **<Enter>**
- Set reference oxygen value O<sub>2ref</sub>
- Reset by pressing **<CAL>**

### **Air pressure**

- Set by pressing **<Enter>**
- Input barometric pressure for calculation of the dew point
- Reset by pressing **<CAL>**

### **Keyboard beep**

- Set with **<up / down>** arrow keys.
- Select the sound when hitting the keys
- Reset by pressing **<CAL>**

### **Baud rate** (adjustment via **<CAL.>**):

- Adjustment of transfer speed by data transfer via RS 232 (1200 -38400 Baud)

### **Online data** (adjustment via **arrow keys**):

- Adjustment of what kind of data should be sent:
  - No protocol: Data for program **<MiniDV>**
  - Remote: Only for special applications
  - DAS (rbr): Data for program **<DASNT>** (1200 Baud)

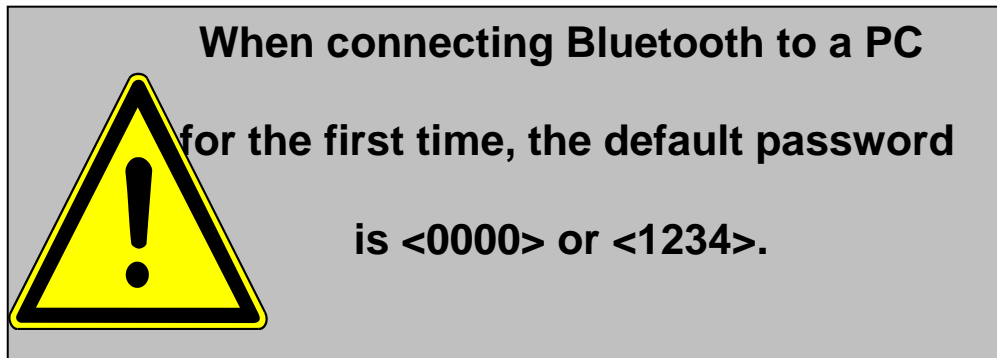
The programs **<MiniDV>** and **<DASNT>** are available free of charge from the rbr website.

## Bluetooth

-Adjustment of what kind of data should be sent:

- No protocol: Data for program **<MiniDV>**
- Remote: Only for special applications
- DAS (rbr): Data for program **<DASNT> (1200 Baud)**

The programs **<MiniDV>** and **<DASNT>** are available free of charge from the rbr website.



**Eta(C)** (adjustment via **arrow keys**):

- Efficiency calculation with or without condensation gain

**Printout** (set by pressing **<Enter>**)

-create a protocol feet (8 x 24 digits)

-Put in the text for line one as follows:

1. Confirm symbol selection with **<Standby>**
2. Select keyboard with **<CAL.>** (5 keyboards are available)
3. Choose a symbol with **<store>** (left), **<Print>** (right) and the **<up / down>** arrow keys.
4. Choose the symbol with **<Enter>**
5. Repeat steps 2-4 until line 1 is finished
6. Stop choosing symbols with **<Standby>** and change with the **<up>** arrow key to line 2.
7. After finishing the input for all lines, leave the menu with **<ESC>**

## 8. Control

The accuracy of the electrochemical sensors may decrease as they are subjected to normal wear and tear and aging. The analyzer automatically controls the sensors and corrects drifts in measurement. If drifts and errors with the correlated measurements increase, an error message is displayed. In this case, the corresponding sensors must be changed by one of our authorized service centers. The actual status of the sensors is displayed in the control menu. Additionally, the following information will be displayed as well, and can be viewed by using the arrow keys.

-The battery voltage (charging status)

Displayed in all menus as symbol:

Battery full    Battery ½ full    Battery empty



-The phone number of nearest service center

-The serial number

-The software version

-The operation hours

-The last date the unit was serviced

-The number of CO switch offs

-The number of errors that have occurred

O2	1034 mV
CO	-10 mV
Batt	6.42 Volt
Tel.No. 02371/945-5	
Ins.No. B-0009 V1.1	
Further info with ↑↓	

Oper. hours	7.39
Service date	23.06.04
CO-Überläufe	0
Error counter	00
Tel.No. 02371/945-5	
Ins.No. B-0009 V1.1	
Further info with ↑↓	

-Information about the last maintenance

Last service	
26.06.12	103 hrs
10.06.11	073 hrs
31.05.10	035 hrs
-- . . . --	
-- . . . --	
Further info with ↑↓	

## 9. Data processing

The **<Data processing>** function allows for the selection of the following options:

Data processing
Select
Look at
Load data
Send data
Format memory
Continue with : ↑↓↵

### Select:

This sub-menu allows you to search for or create a data record for the measurement results (see chapter 4.).

### Look at:

The recorded values of the selected data record can be viewed (see chapter 4.).

### Load data:

Allows data importation (from rbr software available at [www.rbr.de](http://www.rbr.de))  
To check the transfer options of your software:

1. Connect instrument and PC with a current RS232 cable.
2. Select **<Load data>** and confirm with **<OK>**.
3. Answer following question with **Yes** (select with the arrow keys).
4. Start the data transfer from the PC.

### Transmit data:

The date record and measurement results can be transferred to the PC program using this function (procedure identical to **<Load data>**).

### Format memory:

This function is normally only needed for the initial adjustment of the instrument by the manufacturer. **Caution: All recorded values will be deleted!**

## 10. Maintenance Tips

To ensure the accuracy of your analyzer, we recommend an annual check by an authorized ECOM service center. If your analyzer is used regularly, you may want to have it serviced on a more frequent basis. All ECOM service centers can be found at [www.rbr.de](http://www.rbr.de). Do not use any sensor other than the ones supplied by ECOM. Any service done by non-authorized parties will lead to expiration of any existing warranty.

Below are some regular maintenance tips to help keep your analyzer at its best:

### Condensate pad



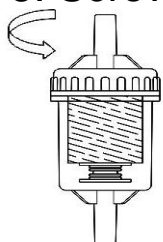
Condensate pad

Regularly check the condition of the condensate pad. It should be changed:

- If it is darker than no. 3 on the soot scale
- If it has expanded past the "MAX" marking

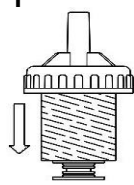
Replace the condensate pad as follows:

1. Remove hose from the cap and unscrew the cap
2. Unscrew the retaining bolt with spring
3. Replace old condensate pad with the new
4. Screw on the retaining bolt with spring again
5. Screw on cap and replace the hose to the cap

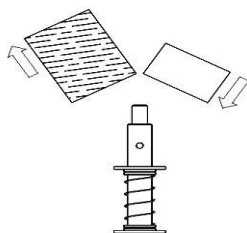


1.

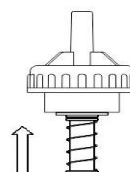
ecom-B



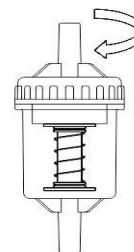
2.



3.



4.



5.

## Sensors

Each time the instrument is switched on, the sensors are calibrated with fresh air. The instrument constantly monitors the condition of the sensors. New sensors wear out from use over time due to reaction (O<sub>2</sub>-sensor) and due to soiled gases, especially gases in concentrations beyond the nominal range (toxic sensors). The output values of the sensors are (see menu "**Control**"):

O<sub>2</sub> approx. 1500 mV      NO +/- 100 mV

CO 0 mV (+/- 30)

If an error message is displayed during calibration cycle and does not disappear after repeated calibrations, the instrument needs to be sent to a service center. The O<sub>2</sub> sensor should show > 200 mV, otherwise it should be changed.

The CO-sensor is protected against overload by the internal program. If the limit of 4000 ppm is exceeded, the gas pump is switched off.

## Power supply

The battery ensures independent operation. The battery is automatically charged when the analyzer is connected to the main power supply. Please do not disrupt the charging process too soon, as this could cause faulty operation of the charging circuitry. The battery should also be recharged if the voltage display (menu "**Control**") is less than 5.8 V (Instrument will stop working at 5.5 V).

## Sampling probe and hose

Depending on the frequency of use, the probe and the hose must be cleaned regularly to prevent particles from lodging inside them and causing premature wear and tear due to corrosion. Before cleaning the hose and probe, turn off all connections to the analyzer. Then use warm water, and blow it out to dry.

## 11. Technical Data

<b>Parameter</b>	<b>Range</b>	<b>Measurement principles</b>
O <sub>2</sub>	0 ... 21 vol-%	electrochemical
CO	0 ... 4000 ppm	electrochemical
NO (Option)	0 ... 5000 ppm	electrochemical
CO <sub>2</sub>	0 ... CO <sub>2</sub> max.	calculated
T-G	0 ... 500 °C	NiCr/Ni
T-R	0 ... 100 °C	semiconductor
Pressure	0 ... +/- 100 hPa	DMS-bridge
Efficiency	0 ... 120 %	calculated
Losses	0 ... 99.9 %	calculated
Lambda	1 ... ∞	calculated
CO-undiluted (reference-O <sub>2</sub> ; adjustable)		calculated
Dew point of combustion gases		calculated
<b>Power Supply</b>	110 - 230 V~ / 50 - 60 Hz;	
<b>Battery</b>	6 V / 3,3 Ah	
<b>Display:</b>	graphic display, backlit	
<b>Size</b>	(W x H x D) 250 mm x 180 mm x 80 mm	
<b>Weight</b>	approx. 2,1 kg (complete with sampling system)	

Subject to technical changes  
V1.0/ 02.2014

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## 12. FAQ

Where do I find important instrument information?

In the menu <Control>, all important instrument information is shown (e.g. battery voltage, sensor values, unit number, next service date, operation hours etc.). You can switch to the second page with the arrow keys.

How long is the life span of the sensors?

The life span depends on the operating hours and the instrument. The life span of the toxic sensors (CO, NO, SO<sub>2</sub>, NO<sub>2</sub>) is affected by high gas concentrations and insufficient purging. The life span for these sensors is, on the average, between 4 and 6 years. The life span of the O<sub>2</sub> sensor is approx. 2 years, regardless of usage.

Which sensors can I exchange?

Please contact the nearest authorized service center for sensor information.

The instrument shows the error message <O<sub>2</sub> sensor 0 mV>!

The sensor must be replaced.

The instrument shows the message <Check required>!

This message appears automatically every 12 months or after 250 operating hours. Note: This is a recommendation to send in the analyzer for service. The analyzer will still function normally.

The instrument shows the error message <T-Gas>< oder >><T-Air>!

Possible reasons could be:  
- Cable is broken (at the plug)  
- T-Air sensor is broken  
- Thermocouple is broken  
- Cable is defective

Note: The error messages can be ignored by pressing <Enter>. Calculations that depend on these temperatures are not measured.

The instrument shows wrong or inaccurate CO<sub>2</sub> values!

Possible reasons could be:  
- O<sub>2</sub> is defective (CO<sub>2</sub> values are calculated from the O<sub>2</sub> values)  
- Pump is not working correctly  
- Leakage in the gas pathway  
- condensate trap / gas cooler is clogged



Why won't my analyzer turn on?

- Please check the main cable
- Please check the fuse
- Please check main connection (Plug socket switched on?)
- Please charge the battery min. 8 hours  
(The battery may not be charged which would prevent the unit from turning on)

Why won't my analyzer print? Please check whether the printer paper is correctly inserted. The thermal printer writes only on the thermally sensitive side. Please use the correct paper for the printer to prevent printer defects. Please make sure that the printer is clean (check for paper jams).

Can I change the printout? You can change the printout (Menu: "Adjustments").

Hint: If you have several instruments of the same type, you can locate an error by exchanging the accessories (probe, hose, temperature sensor etc.).

If further questions or problems should arise, please contact the nearest authorized service center.