ECOM®

Operating Instructions

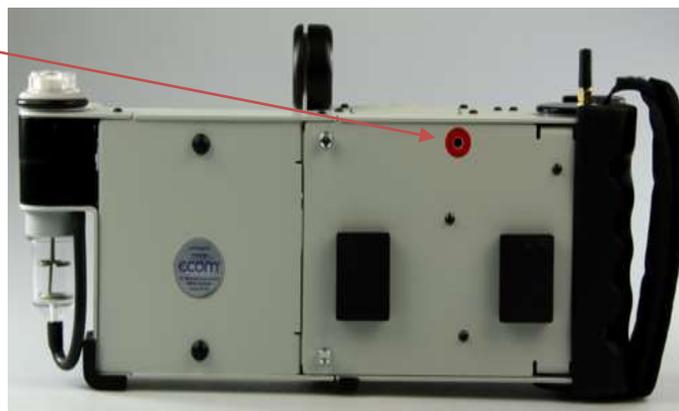# ECOM® D

Version 2.0.1
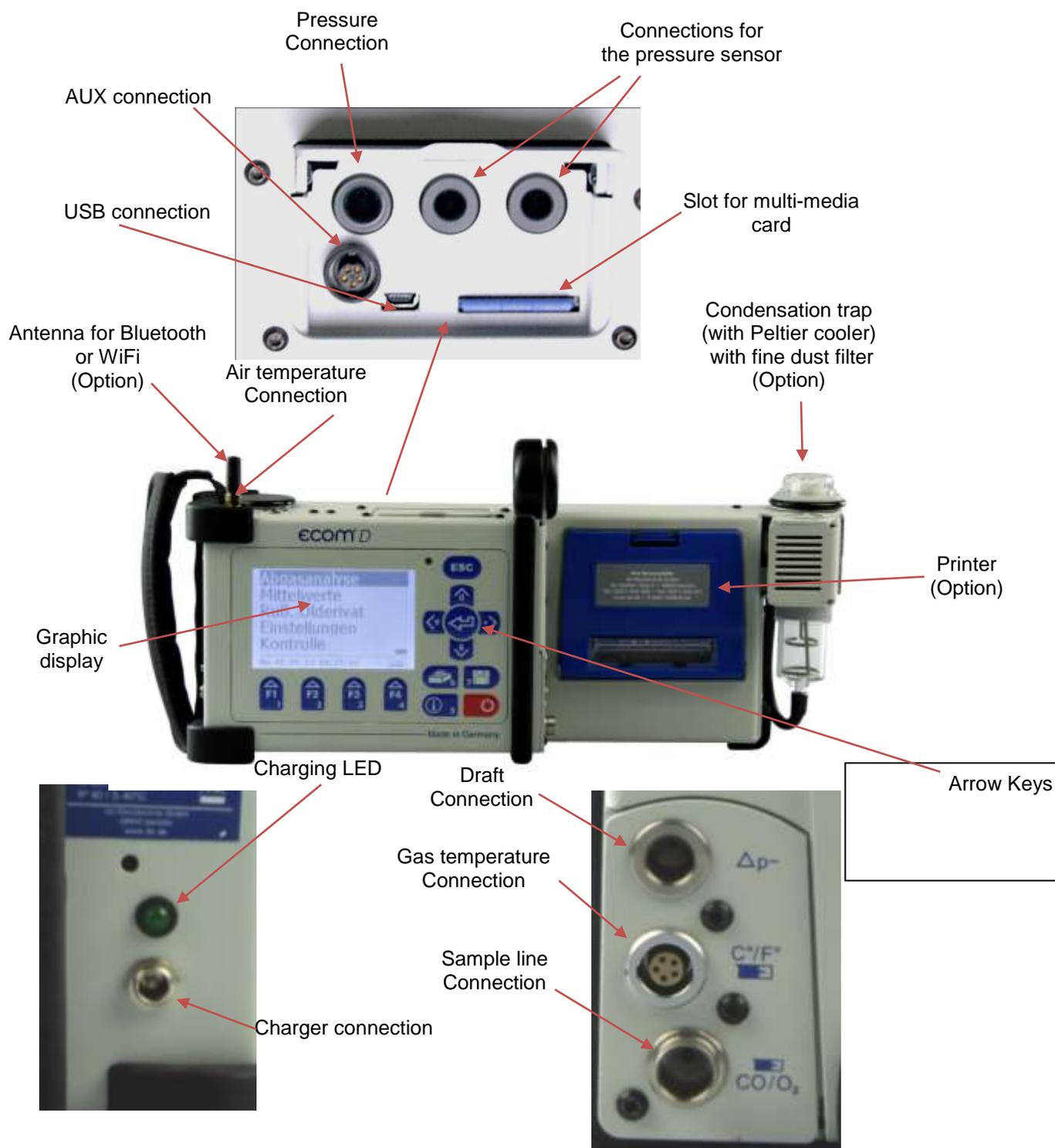
Index   Page

Important Tips

⚠️	**The Ecom-B is not suitable for continuous emissions testing. Please allow at least 10 minutes of fresh air purging 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 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!**

1. Instrument Design

Pressure Connection

Connections for the pressure sensor

AUX connection

USB connection

Slot for multi-media card

Antenna for Bluetooth or WiFi (Option)

Air temperature Connection

Condensation trap (with Peltier cooler) with fine dust filter (Option)

Printer (Option)

Graphic display

Arrow Keys

Charging LED

Draft Connection

Gas temperature Connection
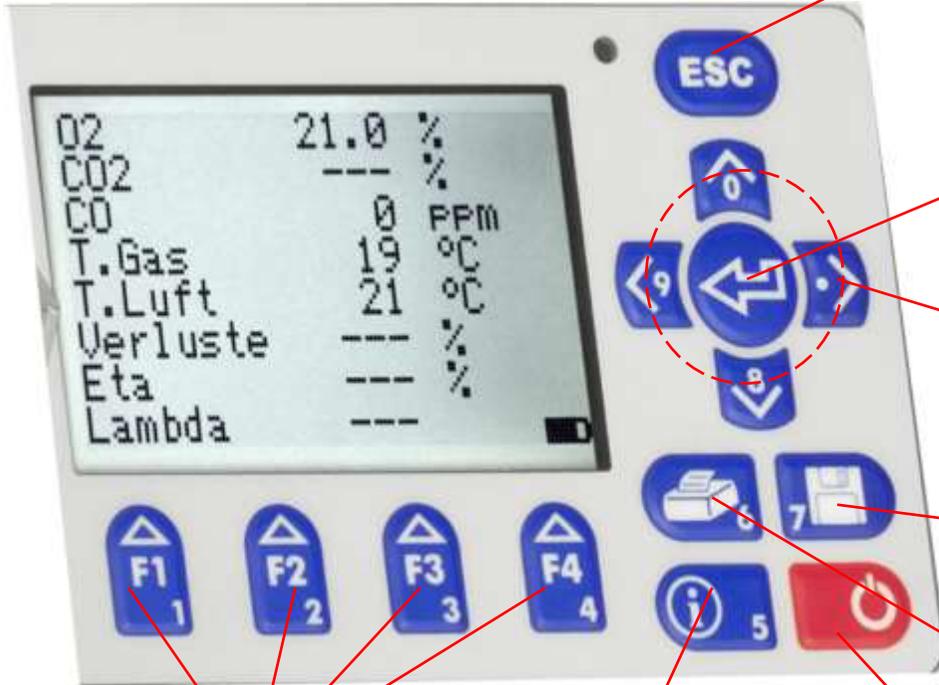
Sample line Connection

Charger connection

Δp-

C°/F°

CO/O₂

Keyboard

During input mode, the keys are used for numerical values

ESC key
(quit/
escape menu)

Enter key
(confirm
selection)

O2   21.0 %
CO2   --- %
CO   0 PPM
T.Gas   19 °C
T.Luft   21 °C
Verluste   --- %
Eta   --- %
Lambda   ---

Arrow keys
(Up/Down/Right/
Left/Scroll)

Store Key

Function keys
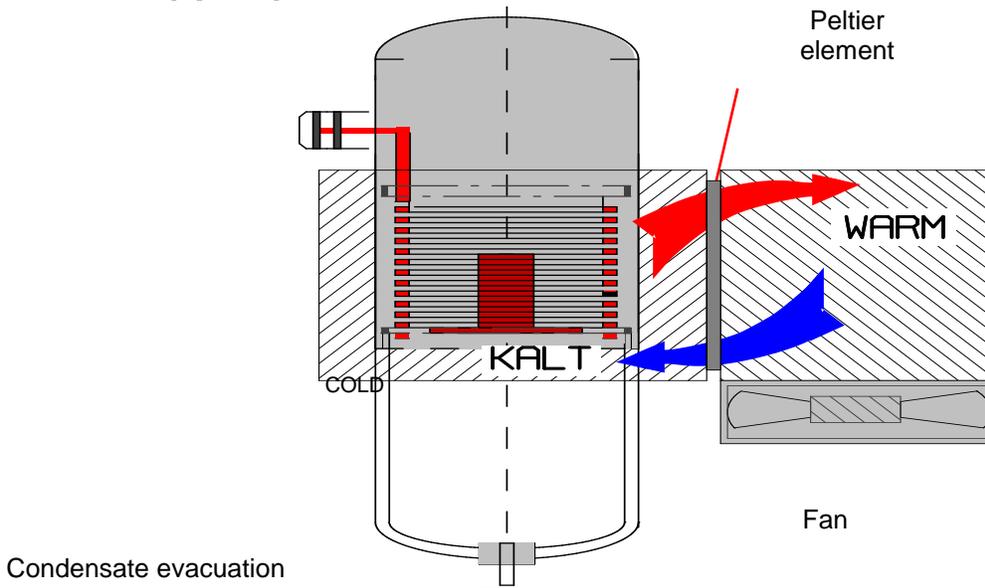(function shown on display)

Info key
(access control menu)

ON / OFF key

Print key
(access
printing menu)

2. Ecom-D Accessories

2 GB SD Card Part No:3014584G	**Thermal IR Portable Printer Paper (5/pk)** Part No: 6951801H
Water Trap Filter (10/pk)	

3. Gas Cooler (option)

Peltier element

WARM

KALT
COLD

Fan

Condensate evacuation

How it works:

Exhaust gas with a temperature over the steam dew point (35 - 65 °C) is drawn into a long gas path. Then, it is pushed through a metal coated surface with strong thermal conductivity. The gas radiates its heat to this metal surface. A Peltier element (semi-conductor cooling element) operated by a continuous current is connected with the metal surface and a second metal body with cooling ribs and ventilation slots.

The flow through the Peltier element creates a heat transfer from **WARM** to **COLD**. This drains the heat from the metal body and from the gas then transfers it to the outer cooling body. This heat is conveyed thru vertical forced ventilation to the surrounding air.

The condensation created by the heat loss of the gas drops in a receptacle and is pumped out when needed by a hose pump.

The Peltier cooler can be switched off in the following manner:

In the measurement menu, press **<Enter>**, select **<Peltier I/0>** and press **<Enter>** again (To turn the Peltier cooler switch on, just repeat this procedure).

4. Power Supply

	Used batteries can either be returned to Ecom or taken to local recycling centers!
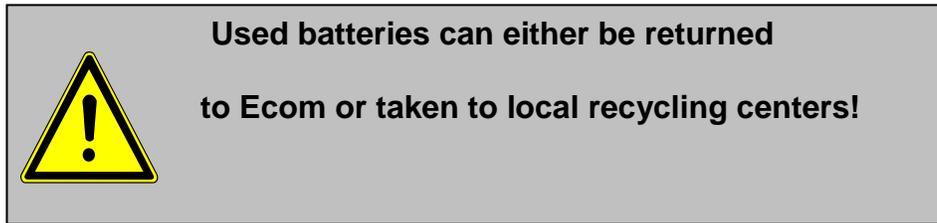
The Ecom-D comes with an external charger. The analyzer can also be powered via the internal battery (6 V; 3.8 Ah). The battery should be recharged as needed (Indicted by a warning sound and display light). The battery charging status can be by checked looking at the voltage indication on the display (menu "**Control**" - Info key). The battery warning is activated when <Accu> is lower than 5.9 V.
At 5.8 V, the battery does not have enough power to operate the analyzer. At this point, the instrument must be charged via the external charger.

5. Data Memory

The multi-media card enables the storage of measurements. The measurement results are written in a text file (J2KDV.txt). Data format information can be found in the appendix. The files can be transferred to a PC via the memory card.

In order to use the memory card function:

- The card must have at least 32 MB of memory, with a maximum of 2 GB
- The card must be formatted on 16 bit FAT
- It must be either an SD or MM card from rbr
- The PC must have a card reader from ECOM, Belkin, or SanDisk

Inserting the card

Insert the multi-media card as shown. Make sure that the card is inserted completely (so that none of the card is seen) and is secured in place.

⚠️ **Do not remove the card while opening/saving data.
This can cause damage to the card, card reader, or data loss.**

6. Analyzer Start-Up

⚠️ **Always position the probe in the exhaust pipe once the auto-zero phase is over!**

⚠️ **Always use a filtering system as per our recommendation for combustion plants firing solid combustibles!**

Once the instrument is switched on (key **<I/0>**), the main menu is displayed.

6 sub-menus with the following functions (non-visible sub-menus can be viewed with the arrow keys) are displayed:

Gas analysis
Soot..Oil trace
Data processing
Adjustments
Control

- Gas analysis : Perform gas analysis
- Soot...Oil trace   : Input of soot measurement results
- Data processing : Save measurements / Data transfer
                (Multi-media card required)
- Adjustments   : Modify instrument settings
- Control   : Check operation state of instrument

To perform measurements, select **"Gas analysis"** with the arrow keys and confirm with **<Enter>**. The instrument starts then a 1- minute auto-zero 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% H20)
Wood (17% H20)
Wood (50% H20)
North Sea Gas
Diesel Oil

Use the arrow keys to select the desired fuel type and confirm with **<Enter>**. The instrument will then ask if you wish to use the data bank. If you want to assign the sampled data to a specific file, so press **<F1>.** Press **<F4>** to perform the measurment without selecting a save file.

```
Do you wish to
use the data
processing?



Auswählen: <↵> !

      JA        NEIN
```
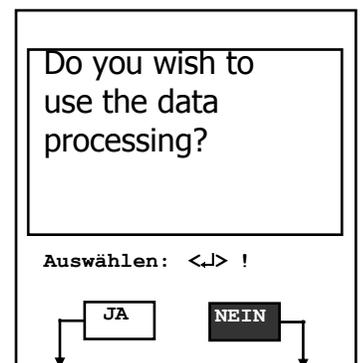
7. Input/ Selection of measurement data

To view data already recorded or to create a new file, the following options are available:

Create new (is automatically selected the first time an MM card is used): When creating a new file, a number should be assigned to it.
Select **<Create new>** and confirm with **<Enter>**. Input a number designation for this file (max. 16 figures) using the keyboard:

Selection upon:
Search word
Memory number
Create new
`Quit with: ESC`

- Use the arrow keys **<Up/Down/Right/Left>** to select
  the character (selected character is outlined by a black background)
- Press **<Enter>** to confirm the character selection (press **<F2>** to delete the last character if needed)
- Repeat this procedure until the desired number is complete.

Example: "25.09.2009"

Tip: We suggest a date-related file number to easily find the data file later on via the search function.

After confirming with **<F1>,** it is possible to enter a text via the keyboard (max. 6 lines with 20 characters each) which is printed out and can be used for data processing purposes. Proceed as follows:
- Select text line 1 using the arrow keys **<Up/Down>** and
  confirm with **<Enter>**
- Select the keyboard mode with **<F3>** (4 keyboard modes
  are available)
- Select with the desired character with **<Up/Down/Right/Left>** (selected character is outlined by a black background)
- Press **<Enter>** to confirm the character (press **<F2>** to delete the
  last character)
- Repeat this procedure until the desired text is complete.

Proceed as follows to change a character:
- Press **<F4>** to stop the character selection
- Use the arrow keys **<Right/Left>** to select the character that needs to be changed
- Confirm the character selection and correct character with **<F4>**
- Return to character selection and open the next line in the process with **<F1>**

Close the input menu with **<ESC>,** and the next available data record is activated. Press **<ESC>** to return to the gas analysis menu.

Selection upon:
Search word
Memory number
Create new
`Quit with: ESC`

Memory number: Selection by file number is the easiest way to view data already stored in the analyzer.

Select **<Memory number>** and confirm with **<Enter>**. Input the desired data file number:

Example: "3" for data file number 3

Input number
3
Please use the numerical keys!

- Put in the desired file number and confirm with **<Enter>**. You can use the arrow keys **<Up/Down>** to view a record of all saved files.
- Press **<F1>** to select the first file number and **<F2>** for the last.
- Press **<F4>** to delete the content of the selected file number.
- Press **<Enter>** to open the selected file number.
- Finally, press **<ESC>** to start the gas analysis.

Search word: It is also possible to search for a specific saved record, if you know the file number.

Select **"Search word"** and confirm with **<Enter>**. Using the software keyboard, type in at least 3 characters of the file number.

Example: "25.09" for file number 25.09.2009

Next, press **<F1>** to start the search. All files matching this number will be shown. The results can be scrolled using the arrow keys (F1 for the first file, F2 for the last). Once found, you can view the desired data file with **<Enter>**. The last measurement on this in this file can be viewed pressing **<Enter>** / **<View memory>** / **<Enter>**. All measured and calculated values can are viewed on 5 display pages, using the arrow keys to scroll between pages.

Memory number 1		
25.09.2009		💾
⏮	⏭	🗑

Memory number 1		
25.09.2009		
	12:15 25.09.09	

```
O2           3.2 %
CO2         13.1 %
CO             0 ppm
Eff.        92.5 %
Losses       7.5 %
Exc. air     1.18
T.Gas        184 °C
T.Air         20 °C



Gas analysis      12:15 25.09.09
Memory number 1
```

```
O2          17.5 %
CO 0%      738 ppm
CO         123 ppm
Exc. air   7.00



CO measurement    12:15 25.09.09
Memory number 1
```

O2 value in air

```
O2         19.5 %
CO            3 ppm
Draught    0.01 hPa



O2 value in air   12:15 25.09.09
Memory number 1
```

Soot..Oil trace

```
Boiler temp. :  65°C
1.Soot meas. :  0.5
2.Soot meas. :  0.3
3.Soot meas. :  0.7
Oil trace    :  NEIN



Soot..Oil trace   12:15 25.09.09
Memory number 1
```

dT-measurement

```
T1    70.4 °C
T2    56.3 °C
dT    14.1 °C



dT-measurement    12:15 25.09.09
Memory number 1
```

Press **<ESC>** to leave measurement data and the recording of the current data can begin.
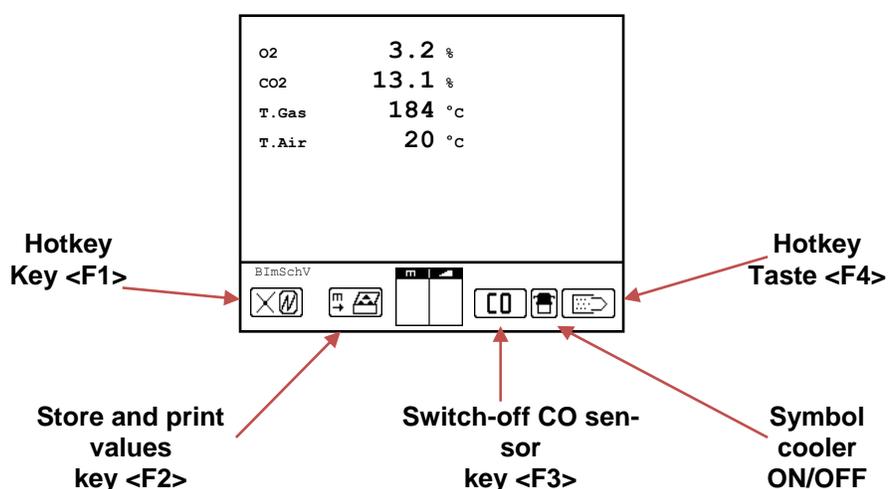
8. Flue Gas Analysis

8.1. Gas analysis

**Re-zero the instrument after each measurement (at least once per hour of measurement)
for the most accurate results!**

After the 1-minute auto-zero phase, the instrument switches over to measurement mode. The gas measurement values are seen on 4 display pages. Use the arrow keys to scroll the pages.

O2	3.2 %
CO2	13.1 %
T.Gas	184 °C
T.Air	20 °C

BImSchV

Hotkey Key <F1>

Hotkey Taste <F4>

Store and print values key <F2>

Switch-off CO sensor key <F3>

Symbol cooler ON/OFF

Pressing **<F1>** allows you to switch from the values display to a previous sub-menu (see chapter Adjustments). Possible sub-menus are: Soot...Oil trace, Data processing, View memory, Display values, Fuel type, Efficiency (K), Internal, Adjustments. You can also switch back from any menu to the values display with **<F1>**.

Press **<F2>** to print out the values as they are recording in the intermediate memory.

Press **<F3>** to initiate the CO bypass, so that the CO sensor is protected against gas concentrations that are too high.

The position of the measured and calculated values (gas analysis sub-menu) on the display pages may be changed at any time. To change these positions:

- Press **<Enter> / <Display values> / <Enter>** to begin
  - Select the line with the arrow keys (Up/Down)
  - Select desired parameter with the arrow keys (Right/Left)
  - Repeat procedure until desired layout is completed
- Press **<Enter>** when finished

```
O2              3.2 %
CO2            13.1 %
CO                0 ppm
Eff.           92.5 %
Losses          7.5 %
Exc. air        1.18
T.Gas           184 °C
T.Air            20 °C


BImSchV          m
 X Ø        ⁿ        ▲    CO           ⇨
```
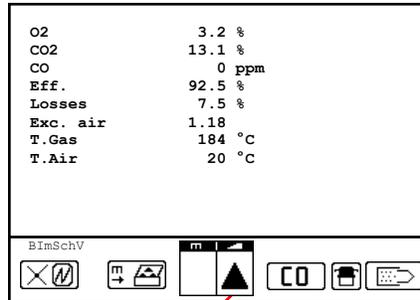
Core stream search

Connect the sample line to the <Gas Connection> plug, and position the sampling probe in the exhaust channel, so that the thermocouple is fully surrounded with the gas (see drawing).

Gas stream

Probe tip

Protection bow
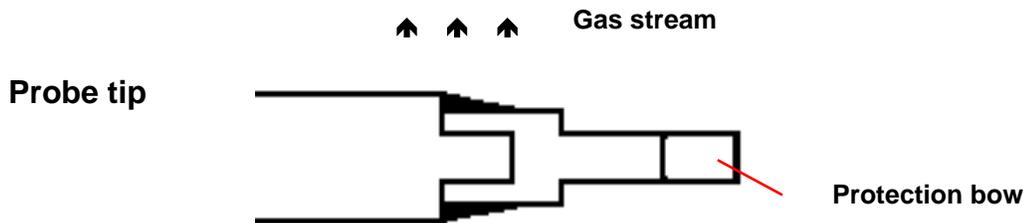
Perform the measurement in the core stream of the exhaust gas channel with the probe placed in the hottest gas temperature area. As you move the probe toward the center of the exhaust, the display will show an up arrow, indicating an increase in the measured temperature. If the probe is pulled away from the exhaust, an arrow pointing down is displayed, indicating a decrease in temperature. If no temperature change is shown for at least 3 seconds, the arrow display will disappear, indicating the lack of change.

CO$_2$, efficiency, losses, excess air and dew point are calculated values. They can only be calculated if values for the basic parameters like O$_2$ and the temperatures are available. Make sure that:

O$_2$ < 20.5 % and **T.Gas - T.Air > + 5 °C**

The current barometric pressure must be typed in (in the **<Adjustments>** menu) for the dew point to be calculated accurately. If the gas temperature falls below the dew point (between 25 and 65 °C), then efficiency will be calculated with condensation gain. In this case, a (K) is displayed after <Efficiency>.

Correct measurement values are displayed after a short delay. This is necessary so the gas has time to reach the sensors and to build-up a stable electrochemical reaction for the sensors. This time period lasts approx. 1 to 1.5 minute. For recording, printout and evaluation wait until the values do not change anymore. If deviations higher than 2 ppm still occur with the gas values, it may be due to unstable pressure conditions in the exhaust channel.

```
O2              3.2 %
CO2            13.1 %
CO                0 ppm
Eff.           92.5 %
Losses          7.5 %
Exc. air       1.18
T.Gas           184 °C
T.Air            20 °C

BImSchV         m
X⊘    m→▣   💾      CO 🔋 ▭▷
```

**Measurement stored in
intermediate memory**

If the measurement values are stable, press the key **<Record>** (disk symbol) to transfer the values in the intermediate memory (caution: store gas analysis, CO, O$_2$ check and draft measurements separately).

They will be kept there for a later printout and, if need be, for a final data record storage.

If a printout of the values needs to be made as the measurement is taking place, simply press **<F2>** (the complete content of the intermediate memory will be printed).

The CO sensor is protected against over-saturation thanks to an internal program. If the 4000 ppm limit is exceeded, a purging pump is activated which provides the sensor with fresh air. After sufficient purging time (X behinds CO disappears), the sensor can be reintegrated into the measurement system with **<F3>.** You can do this automatically by selecting **<Yes>** in **<Adjustments> / <Internal> / <CO-Automatic>.** The sensor can also be manually excluded from the measurement system by pressing **<F3>**.

8.2. Draft Measurement

A trend indication for the draft conditions in the exhaust channel can be viewed during the gas analysis. However, the draft will not be stored together with the gas values when pressing **<Record>** because the differential pressure sensor tends to drift.
For an exact measurement, auto-zero this sensor just before sampling and document the value.

The display shows the current value as well as the recommendation to reset the zero point of the sensor. Disconnect the draft hose from the instrument for a short period and press **<F4>**. The analyzer will then reset the sensor's zero point.

```
        Pressure


 Draught   -0.12 hPa


 Recorded value:
           --.-- hPa

 ☒Ⓝ   ⬆🖼           △P→0
```

Re-connect the draft tubing. The display shows the exact measurement value which can be stored by pressing **<Record>** and added to those results previous stored in the intermediate memory. The stored value is shown on the display. Press **<ESC>** to exit the draft measurement menu.

Pressure
Draught -0.12 hPa
Recorded value: -0.12 hPa
XØ ⊞▨   △P→Ø

Measurement stored in intermediate memory

8.3. Flow measurement (option)

This measurement can be done with a pitot tube. First, the pitot factor of the pitot tube must be entered by going to **<Adjustments>** / **<Internal>** / **<Pitot factor>**). After connecting the pitot tube to the analyzer, the zero point of the sensor can be set with **<F4>**. Enter the cross section of the flow channel with **<F1>.** This is needed for the calculation of the flow rate. After the pitot tube is positioned in the flow channel, the display shows the speed (m/s) and the flow rate (Nm3/h). If the value is stable, press **<Record>** to store the value in the intermediate memory. If a printout of the values is needed during the recording to the intermediate memory, press **<F2>.** The complete content of the intermediate memory will be printed out.

Connections for pitot tube

Flow measurement
Gas speed   0.3 m/sek M.Flow   44 Nm3/h
⟨◇⟩ ⊞▨ 💾   CO ⊟ᵐ/ₛ→Ø

Measurement stored in intermediate memory

8.4. Soot...Oil trace

```
          Soot..Oil trace

 Boiler temp. :   66°C
 1.Soot meas. :   -.-
 2.Soot meas. :   -.-
 3.Soot meas. :   -.-
 Oil trace    :   ----


 Select  : ↑↓↵
```

The **"Soot...Oil trace"** menu enables the input of measured results for boiler temperature, soot dots and oil trace. Select the desired line on the display and confirm the input with **<Enter>**. The input for boiler temperature and soot measurements 1-3 can be made one after the other using the instrument keyboard. Press **<Enter>** to store the value in the data record of the measurement.

The result of the oil trace check will be documented as follows:

```
          Soot..Oil trace

 Boiler temp. :   66°C
 1.Soot meas. :   1.0
 2.Soot meas. :   0.5
 3.Soot meas. :   1.5
 Oil trace    :   NO


 Select  : ↑↓↵
```

- Move cursor to **"Oil trace"**
- Confirm the result with **<Enter>**
 (**"No"**, **"Yes"** or **"- - - "**)

Once all inputs have been entered, press **<ESC>** to exit the menu. The measurement is now complete.

⚠ **Make sure to let the probe cool down before securing it for transport!**
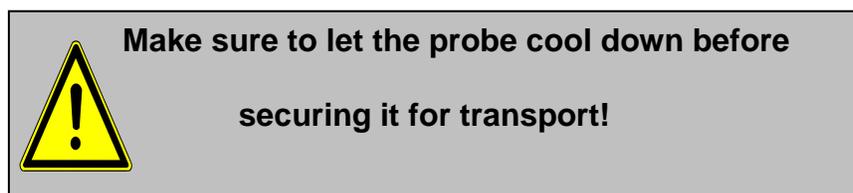
8.5. Measurement record and printout

Important: Once the gas analysis is completed, transfer the values recorded in the intermediate memory on the MM card, otherwise they will be deleted when the analyzer is turned off!

Press **<Print>** (printer symbol) to enter the printing menu. The sampled data can be checked again (**<View memory>**, **<Enter>** and scroll with the arrow keys).

--ECOM-D--
Start printout
View memory
Memory -> M
Input text
Select : ↑↓↵

The software keyboard enables input or correction of the 6 lines of text in the file identification. (**<Input text>**, **<Enter>**, to write text, see chapter 7).

If all the data is correct, press **<Memory> -> <M>** and **<Enter>** to save it in the internal memory or on the MM card (**"Disk symbol"** is shown in black in measurement mode). The text is saved into the data record only by saving on an MM card.

--ECOM-D--
Start printout
View memory
Memory -> M
Input text
Select : ↑↓↵

Select **<Start printout>** and **<Enter>** to print out the data (only instruments with printer).
Press **<ESC>** to return to gas analysis mode.

<View memory>, **<Memory -> M>** and **<Input text>** can also be selected outside of measurement mode with **<Enter>**.

--ECOM-D--
Start printout
View memory
Memory -> M
Input text
Select : ↑↓↵

--ECOM-D--
Start printout
View memory
Memory -> M
Input text
Select : ↑↓↵

9. Mean Value Measurement (option)

The mean value measurement function allows you to sample measurements in an adjustable time frame, and to calculate the average of those results. Should the several measurement values or the average calculation need to be saved, a save file has to be selected as described in chapter 7. If the **"Store"** function is used, all measurements will be placed in numeric order starting with the number of the first saved file. If the **"Store"** function is not used, the results can be stored on MMC with **<Print> / <Memory -> M>**.

Once the fresh air calibration is completed, select **<Mean values>**. Before starting, **<Measurement time>**, **<Scanning>**, **<Printer>** and **<Record>** should be modified as needed. See their use below:

Gas analysis
Mean value
Soot..Oil trace
Data processing
Adjustments
Control
Diagnostics

- **Measurement time** = the length of time the measurements will occur
- **Scanning** = Time interval between the measurements considered in the average value calculation
- **Printer** = Documentation of measurements of the average value calculation
- **Store** = All measurements for average value calculation will be stored

<Measurement time> and **<Scanning>** can be adjusted as follows:
- Select value you want to change and confirm with **<Enter>**
- Set the desired time using the numerical keys:
   0.01 = 1 sec = minimal value
   59.59 = 59 min: 59 sec = maximum value
- Confirm with **<Enter>**

The settings for **\<Printer\>** can be changed as follows:
- Select value you want to change and confirm with **\<Enter\>**
- Make the desired adjustment with the arrow keys
- Confirm with **\<Enter\>**

```
O2            3.2 %
CO2          13.1 %
CO              0 ppm
Eff.         92.5 %
Losses        7.5 %
Exc. air      1.18
T.Gas         184 °C
T.Air          20 °C

Mean value
15:35min
    ⌀       ▯▮     CO ▯ X
```

The setting for **\<Store\>** can be changed as follows:
- Select value you want to change and confirm with **\<Enter\>**
- Activate the memory function with **\<F1\>** or deactivate it with **\<F4\>**

 Press **\<Start measurement\>** / **\<Enter\>** to start the evaluation of the measurement values. On the display, the actual average values will be shown and will be updated as new measurements come in. You can switch to the actual values with the arrow keys **\<up/down\>**. You can also scroll through the values with the arrow keys **\<right/left\>**. You can interrupt the measurement with **\<F2\>** or stop it completely with **\<F4\>**.

After the measurement time has elapsed, you can print the results containing all average values (only instruments with printer - key **\<Print\>**).

10. Adjustments

In addition to the ECOM-D functions described previously, various adjustments can be made to the instrument.

From the main menu, select **"Adjustments"** and confirm with **<Enter>**.

A selection of modifiable parameters, adjustable according to the application, is displayed.

Place the cursor on the desired line and press **<Enter>** to view or modify the adjustment. The modifiable parameters are:

```
        Adjustments
Einheit

Ref. O2
Fuel type
Air pressure
Select    : ↑↓↵
Set clock
Paper feed
Internal
```

Unit (adjustment with **arrow keys**):
- Calculation of gas concentrations in:

- ppm   = volume concentration (parts per million)
- mg/m^3 = mass concentration per volume unit
- mg/kWh (undiluted) = mass concentration per power unit
- mg/MJ (undiluted) = mass concentration per power unit
- ppm (undiluted) = volume concentration (parts per million)
- mg/m^3 (undiluted) = mass concentration per volume unit

Undiluted:
Conversion of the gas concentration on selected reference oxygen:

- mg/kWh and mg/MJ are always calculated on 0% O_2 basis

- Conversion formula

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

O_2 reference

(for ppm and mg/m^3 - Input after pressing **<Enter>**):
- Input of O_2 reference value $O_{2\,ref}$

Fuel type (press **<Enter>** to access selection list):
- Modification of adjusted fuel type
  (e.g. by measurements at combi-plants)

Air pressure (press **<Enter>** to access menu):
- Input of barometric air pressure for dew point calculation

Clock set (press **<Enter>** to access setting menu):
- Correction of internal clock with the arrow keys

Paper feed (only instruments with printer)
(press **<Enter>** to activate paper feeding):
- Paper feed line by line

Internal
Print contrast
Displ. contrast
Key beep
Language: English

Internal (press **<Enter>** to open menu):
- Further instrument settings:

Select: ↑↓↵

F1 Hotkey
F4 Hotkey
Eff. (C)
CO-Automatic
USB
Bluetooth
WLAN
Pitot-factor
Printout

**Print contrast
(only instruments with printer)**
(press **<Enter>** to access setting menu):
- Print contrast adjustment with
  the arrow keys

Display contrast
(press **<Enter>** to access setting menu):
- Display contrast adjustment with the
  arrow keys

Key beep
(**<F1>** for YES / **<F4>** for NO):
- Keys beep when pressed

Language: English (change with **<Enter>**):
- Info about selected language (3 languages selectable)

F1 Hotkey (selection after pressing **<Enter>**):
- Change the menu that pressing **<F1>** will open

F4 Hotkey (selection after pressing **<Enter>**):
- Change the menu that pressing **<F4>** will open

Efficiency (C) (**<F1>** for YES / **<F4>** for NO):
- Efficiency calculation with or without condensation gain

CO-Automatic (**<F1>** for YES / **<F4>** for NO):
- Adjustment for CO purging
   - YES = CO sensor switches on after purging automatically
   - NO (default) = CO sensor has to be switched on manually with **<F3>** after purging.

USB (selection after pressing **<Enter>**):
-Adjustment of transfer speed (arrow keys **<Up/Down>**) and protocol (arrow keys **<Right/Left>**) for the USB interface (connection USB):
   -Protocol DAS = Protocol for the program DASNT
   -Protocol Enhanced = Protocol for the program DAS5

Bluetooth (selection after pressing **<Enter>**):
- Adjust the protocol for the Bluetooth interface with the arrow keys **<Right/Left>**:
   -Protocol DAS = Protocol for the program DASNT
   -Protocol Enhanced = Protocol for the program DAS5

> ⚠️ **With first using the Bluetooth connection to your PC, type in the password shown!**

WLAN (selection after pressing **<Enter>**)
Instrument as Access Point (for connection with mobile terminals):
-(Start/Stop WLAN: manual switching of WLAN connection
   – available only with if Auto Connect is inactive**)**
-Access Point: (**<F1>** for YES / **<F4>** for NO)

-(W.O.) Auto Connect: Automatic connection
 (**<F1>** for YES / **<F4>** for NO)
-Channel: Input channel (1 – 13)
 (selection after pressing **<Enter>**)
Connection with existing network:
-(Start/Stop WLAN: manual switching of WLAN connection
  – available only with deactivated Auto Connect**)**
-Existing Network: available only with deactivated Access Point
-(W.O.) Auto Connect: Automatic connection
 (**<F1>** for YES / **<F4>** for NO)

-Network scan: Search for available networks
 (selection with **<Enter>**)

-WPA password: Input of password for the selected network

Pitot factor (selection after pressing **<Enter>**):
- Input of Pitot factor for flow rate calculation (standard = 0.93)

Printout (only instruments with printer)
 (selection after pressing **<Enter>**):
- Text input for printout on measurement protocol (8 x 24 characters)
- Input the text of line 1 as follows:
1. Activate character selection list with **<F4>**.
2. Select keyboard type with **<F3>** (4 different keyboards available).
3. Use the arrow keys to select the desired character
   (selected character is outlined by black background).
4. Confirm the selection by pressing **<Enter>**.
5. Repeat procedure until desired text is complete.
6. Once input for line 1 is completed, deactivate the character
   selection mode with **<F4>** and move to the second line with the
   arrow key **<Down>**.
7. Once all lines are complete, exit the menu
   with **<ESC>**.

11. Control

The electrochemical sensors for gas analysis are subject to normal wear and tear as they age. Their accuracy may decrease as time goes on, depending on the gas concentration, the exposure time and the soiling grade of the sampled gas. The analyzer monitors the sensors and corrects drift.

If the drift and the correlated measurement errors increase, an error message is displayed. In this case, the corresponding sensor must be changed by an authorized service center. The control menu has information about the current status of the sensors.

Further information is can be seen on 3 display pages (use the arrow keys to scroll):

- Battery voltage (charging status);
  is displayed as a symbol in all menus:
Full charge   Half charge   Empty

```
O2   10744 mV
CO       7 mV
Accu   6.09 V

Operation hours :    8.45
hrs
Total        :   18.75 hrs
Next unit check :
01.07.10
Further pages: ↑↓
```

- Operation hours since last service
- Total operation hours
- Date of the next recommended service
- Phone number of the nearest service center
- Software version
- Serial number
- Total number of CO switch-offs
- Total error count

```
Program version  :V1.2
19.11.09
Serial no.     :D-0001
CO purges      : 15
Error counter     : 21

Operation hours :
8.45 hrs
Total        :   18.75
hrs
Next unit check :
Further pages: ↑↓
```

- Information from the last maintenance

```
Last service (history)

25.08.09     88 hrs
14.08.10    145 hrs
23.08.11    205 hrs
19.08.12    322 hrs
--.--.--
--.--.--

Further pages: ↑↓
```

12. Data Processing

If a MM card is inserted in the slot, it will be used to save measurement records. The menu **<Data processing>** offers the following functions:

Select:
For searching or creating of record files (see chapter 7.).

View:
Recorded values of the file can be viewed
(see chapter 7.).

Data processing
Select
View
Memory (M)
Format
DRT <-> PC !
Datalogger

Memory (M):
Here all stored measurements (sorted by record number) can be viewed. Single measurement results can be viewed as follows:

- Select desired record number with the arrow keys and confirm with **<Enter>**
- Scroll with the arrow keys
- Press **<ESC>** to exit

```
 Date            Fuel type

1 01.09.09  11:01   Fuel oil
 2 01.09.09  11:02   Fuel oil
 3 01.09.09  11:04   Fuel oil
 4 01.09.09  11:07   Fuel oil
 5 01.09.09  11:11   Fuel oil
 6 01.09.09  11:23   Fuel oil
 7 01.09.09  11:44   Fuel oil
 8 01.09.09  11:53   Fuel oil


 Select  : ↑↓↵
```

Format:
This function is usually needed by initial adjustment of the instrument at our factory.
Caution: All stored values will be cancelled!

DRT <-> PC!:

Load data:
Enables data importation from the rbr software (available on our website <www.rbr.de>). See the chapter on <Technical Data> for data format information (please observe the transfer options of your software!).

Proceed as follows:
-Connect ECOM-D to your PC via USB cable.
-Select **<Load data>** and confirm with **<Enter>**.
-Answer the displayed question with **YES** (**<F1>**).
-Decide if the data recorded can be cancelled
  (**<F1>** for **YES** / **<F4>** for **NO**).
-Start the data transfer to your PC.

Send data:
With this function, the data records completed with measurement values can be transferred to the PC.
(the procedure is similar to **<Load data>**).

Data logger (Option):
Here a Data logger record (Select **<Data logger>** and press **<OK>** / On the top right of the display, the disk symbol appears.) can be started or finished (only available when using the multi-media card). With **<Record>,** you can interrupt or continue the record (only in gas analysis). For each recording, one file will be written on the card. The files will be numbered consecutively (J2KDL-00.csv, J2KDL-01.csv and so on) and can be transferred to your PC with a card reader. The maximum size of a dataset is 500 bytes which means that on a 32 MB card 64000 measurements can be recorded.

In addition to data logger recordings, the data can also be transferred with a USB cable (**USB Driver** / **1200 Baud** / Protocol **DAS**) to the software **"DASNT"**. The software **"DASNT"** and the **USB Driver** are available free of charge from the rbr website.

Save to MMC (min. 1 second / max. 255 seconds):
Adjustment of the interval time for data logger recordings.

13. Maintenance Tips

To secure the accuracy of your analyzer, we recommend an annual check by an authorized ECOM service center. In the case of heavy usage (e.g. several hours of measurement per day, rough conditions etc.) service should be done more frequently. All ECOM service centers can be found at www.rbr.de.

> ⚠️ **Service by unauthorized service centers will result in a complete and immediate loss of any warranty!**

The following advice will be of help with maintenance of your ECOM-D:

Change Fine dust filter (Instruments with gas cooler)
Screw off the cover of the condensate trap/gas cooler and check the particle filter. Change it once the filter has a grey color (= number 2 - 3 of the soot comparison scale).


Fine dust filter

Condensate pad (Instruments without gas cooler)

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 to the "MAX" mark

To replace the condensate pad:
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 retain bolt with spring again
5. Screw on cap and replace the hose to the cap
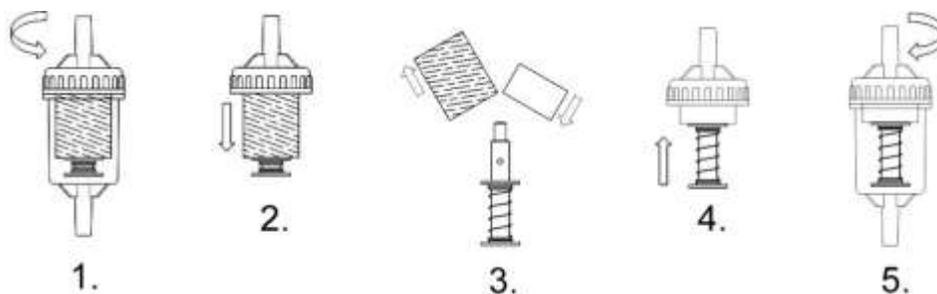
Sensors

The sensors are auto-zeroed in fresh air each time the analyzer is turned on. Their state is constantly monitored by the instrument. New sensors age as you use the analyzer due to normal wear and tear (oxygen sensor) and due to measurements exceeding concentrations beyond the nominal measurement range (toxic sensors). The output values of the sensors are (menu **"Control"**):

O_2 approx. 20000 mV

Others 0 mV (+/- 150)

If an error message is displayed during the auto-zero phase and does not disappear after several retries, the instrument must be checked by an authorized service center. The oxygen sensor must show a value of >7000 mV, otherwise it must be changed by an authorized service center.

The CO sensor is protected against over-saturation by an internal program. If the limit value of 4000 ppm is exceeded, a second pump switches on and floods the sensor with fresh air.

After sufficient purging time (X behinds CO disappears), the sensor can be reintegrated into the measurement system with **<F3>** (if you choose **<Yes>** in **<Adjustments> / <Internal> / <CO-Automatic>,** the CO sensor will begin measuring again automatically). The sensor can also be manually excluded from the measurement system with **<F3>**.

Probe and tubing

Depending on the frequency of use, the probe and sample line should be regularly cleaned in order to prevent particle deposit build-up and to prevent early wearing due to corrosion.
-Release the connections at the instrument and at the probe grip
 to disconnect the tubing.
-Clean it with warm water in then blow dry the water out
-Slightly grease the O-rings of the tubing connections from time to
 time with acid-free grease.

Change printer paper roll

-Release the printer cover (press lock downwards).
-If necessary, extract the remaining paper from the printer. To do this, select
  <Adjustments>/<Paper feed>/<Enter>).
-Remove the plastic tube of the previous roll.
-Insert the paper end in the slot under the transport roll (paper
 roll on the inner side facing you when inserting the paper).
-Feed approx. 3 cm paper through the printer (**<Adjust-ments>/<PaperFeed>/<Enter>**).
-Lay the paper roll in the corresponding space.
-Insert the paper through the slot of the printer compartment then cover and close the lid.

Unlocking printer cover

14. Technical Data

Parameter	Range	Principle
O_2	0 ... 21 vol-%	Electrochemical
CO	0 ... 4000 ppm	Electrochemical
NO (option)	0 ... 5000 ppm	Electrochemical
NO_2 (option)	0 ... 500 ppm	Electrochemical
SO_2 (option)	0 ... 5000 ppm	Electrochemical
CO% (option)	4000 ... 63000 ppm	Electrochemical
CO_2	0 ... CO_{2max}	Calculation
T-Gas	0 ... 500 °C	NiCr/Ni
T-Air	0 ... 99 °C	Semi-conductor
Differential pressure	0 ... +/- 100 hPa	DMS bridge
Efficiency	0 ... 120 %	Calculation
Losses	0 ... 99,9 %	Calculation
Excess air	1 ... ∞	Calculation
CO undiluted (adjustable ref. O_2)		Calculated
Flue gas dew point		Calculated
Op. Temp: 20-122°F		

Power supply	Charger 230 V / 50 Hz~; Accu 6 V / 3,8 Ah
Protocol printer	integral; 58 mm paper width
	Printout individually programmable
Indication	graphic display; backlit
Dim. (W x H x D)	400 mm x 260 mm x 175 mm
Weight	approx. 6 kg complete with sampling system

Subject to technical changes

15. Calibration Procedure

For best results, the calibration gas concentration should be as close to the expected levels of emissions as possible. Because each sensor is linear through a nominal range, one calibration gas concentration can be used for a reasonably wide range of emission levels.

Fully charge analyzer:
Place unit on charge the night before you plan to use analyzer to ensure full charge of battery.

Turn on analyzer and let warm up:
Switch on analyzer. Select **Gas Analysis** on main menu. Select Fuel Type and press **OK**. Select **No** for Data Processing (if prompted). Instrument will complete auto-zero sequence. Let the analyzer run for 15 minutes to acclimate to ambient temperature. This is very important, as the accuracy of electrochemical sensors is dependent on a proper temperature setting. Switch off the analyzer and switch back on. Go to **Gas Analysis** mode. The instrument will complete auto-zero based on the proper temperature.

Calibrate your analyzer:

1. Select **Control** on the main menu. Swipe calibration magnet over the Cal Magnet sticker, located above the **ESC** button. The analyzer is now in calibration mode. You will see real-time readings on the screen.

2. Connect calibration hose from the regulator to the gas inlet (O2/CO) on the analyzer.

   a. If you are using an on demand regulator, connect it to the gas bottle and open gas bottle valve completely. The regulator will hold back the flow of gas until connected to the analyzer.

   b. If you are NOT using an on demand regulator, adjust the flow to match the analyzer pump draw.

3. You must check for air leaks before calibrating. Apply a gas with 0% O2 to check for air leaks (ECOM service dept. uses NO gas balanced in N2). Flow calibration gas for 3 minutes. Check that O2 reading is 0.0%. If it is reading other than 0.0 %, turn off gas and troubleshoot the source of air leak. Do not proceed to calibrate analyzer until air leak is corrected.

4. If there is no air leak, allow gas to flow for another 2 minutes (total of 5 minutes). After the reading has stabilized, press up/down to place the arrow beside the target sensor and press **OK** to go to input mode. Input concentration of calibration gas using numbers on keypad. Press **OK**. The sensor has now been calibrated.

5. Allow the gas to flow for another 45-60 seconds. If it does not drift more than 2% of the span gas, the calibration is steady and you may disconnect the gas. (If it does drift more than 2%, allow the reading to stabilize and reset calibration. If this still doesn't work, call ECOM.)

6. If calibrating more than one sensor, disconnect the regulator and reconnect to the next gas cylinder. Then flow calibration gas for 5 minutes, input calibration setting, & repeat step 5.

7. After all sensors have been calibrated, disconnect gas and allow the analyzer to flush with fresh air for 10 minutes or until readings are below 10 ppm.

Questions? Call ECOM at 1-877-326-6411

16. Memory Card Data

Description of data record ecom-D with Multi Media Card

Format data logger records: J2KDL-xx.csv (separation mark between values = comma)

Format punctual measurements: J2KDV.txt (separation mark between values = comma)

Column	Description	Remark / Example
A	Date	DD.MM.YYYY (also US-Version)
B	Time	HH:MM:SS (also US-Version)
C	O2 in vol.%	0,0 - 21,0
D	CO in ppm	0 - 4000
E	NO in ppm	0 - 5000
F	NO2 in ppm	0 - 1000
G	SO2 in ppm	0 - 5000
H	CO converted*	
I	NO converted*	
J	NO2 converted*	
K	NOX converted*	
L	SO2 converted*	
M	T.Gas in °C or °F	0 - 500 (US-Version with other range in °F)
N	T.Air in °C or °F	0 - 99 (US-Version with other range in °F)
O	Draught in hPa	0,00 - 20,00
P	CO2 in vol.%	0,0 - 25,0
Q	Efficiency in %	0,0 - 120,0
R	Losses in %	0,0 - 100,0
S	Excess air	> 1,00
T	Dew point in °C oder °F	0 - 500 (US-Version with other range in °F)
U	Poisoning index	> 0,0
V	O2 (gas channel check) in vol.%	0,0 - 21,0
W	CO (gas channel check) in ppm	Related to 0,0 vol.% O2
X	CO (gas channel check) in ppm	Measured value
Y	O2 (O2 check) in vol.%	0,0 - 21,0
Z	T.Boiler	0 - 999
AA	T.Sensor	0 - 99
AB	O2 reference	0,0 - 21,0
AC	Unit	0=ppm; 1=mg/m3; 2=mg/kWh; 3=mg/MJ
AD	Norm	N = converted to O2 ref.
AE	Fuel type number	Index acc. to instrument table
AF	Fuel type text	Text acc. to instrument table
AG	Soot 1	0,0 - 9,9
AH	Soot 1	0,0 - 9,9
AI	Soot 1	0,0 - 9,9
AJ	Oil trace	0=no; 1=yes;
AK	20 characters text	
AL	20 characters text	
AM	16 characters text	
AN	Serial number	
AO	CO (O2 check) in ppm	
AP	Zug (O2 check) in hPa	
AQ	CxHy	
AR	Number copy data	
AS	T1 (deltaT-measurement)	
AT	T2 (deltaT-measurement)	
AU	Velocity	m/s
AV	CO Environment	CH-version = Kind of control
AW	free	CH-version = Load range

AX	Comment text	
AY	Comment text	
AZ	Comment text	
BA	Comment text	
BB	H2 in ppm	CH version = Oil consumption
BC	H2 converted*	CH version = Thermal output
BD	Sensor 6 in ppm	CH version = Operation hours counter
BE	Sensor 6 converted *	CH version = Code
BF	dP (velocity) in Pa	0 – 1000,00
BG	Air pressure in hPa	300 – 1100
BH	Unit 2	0=ppm; 1=mg/m3; 2=mg/kWh; 3=mg/MJ; 4=ppmN; 5=mg/m3; 6=---
BI	CO (Unit 2)	
BJ	NO (Unit 2)	
BK	NO2 (Unit 2)	
BL	NOx (Unit 2)	
BM	SO2 (Unit 2)	
BN	Analogue input 1	
BO	Analogue input 2	
BP	Sensor 7 in ppm	
BQ	Meas. gas volume in l/min	
BR	last column	0

* converted to unit (column AC) and converted on O2 ref. (Column AB) when column AD = N

17. Calibration log

Date:	Cal gas concentration	Sensor response after 5 min
CO		
NO		
NO2		
Date:	Cal gas concentration	Sensor response after 5 min
CO		
NO		
NO2		
Date:	Cal gas concentration	Sensor response after 5 min
CO		
NO		
NO2		
Date:	Cal gas concentration	Sensor response after 5 min
CO		
NO		
NO2		
Date:	Cal gas concentration	Sensor response after 5 min
CO		
NO		
NO2		
Date:	Cal gas concentration	Sensor response after 5 min

Date:	Cal gas concentration	Sensor response after 5 min
CO		
NO		
NO2		
Date:	**Cal gas concentration**	**Sensor response after 5 min**
CO		
NO		
NO2		
Date:	**Cal gas concentration**	**Sensor response after 5 min**
CO		
NO		
NO2		
Date:	**Cal gas concentration**	**Sensor response after 5 min**
CO		
NO		
NO2		
Date:	**Cal gas concentration**	**Sensor response after 5 min**
CO		
NO		
NO2		

18. FAQ

Where do I find important instrument information?

In the menu "Control", all important instrument information is shown (e.g. accu voltage, sensor values, unit number, next service date, operation hours etc.). With the arrow keys stands you can switch to the second page.

How long is the life span of the sensors?

The life span depends on the operating hours and the instrument equipment. The life span of the toxic sensors (CO, NO, SO_2, NO_2) is affected by high gas concentrations and a not sufficient purging. The life span for these sensors amounts to on the average between 4 and 6 years. The life span of the O_2 sensor is independent of the operating hours and amounts to approx. 2 years.

Which sensors can I exchange?

The following sensors are exchangeable:
- O_2 sensor
- CO sensor (pre-calibrated)
- NO sensor (pre-calibrated)
- SO_2 sensor (pre-calibrated / only together with
  CO sensor

The instrument shows the error message "O_2 sensor 0 mV"!

The sensor must be renewed.

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 check the instrument. The instrument is however still ready for use.

The instrument shows the error message "T-Gas" or "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 implemented.

Possible reasons could be:
- O_2 is defective (CO_2 values are calculated from
  the O_2 values)
- Pump is not working correctly
- Leakage in the gas way
- condensate trap / gas cooler is clogged

My instrument cannot be switched on!	- Please check the mains cable - Please check the fuse - Please check mains connection (Plug socket switched on?) - Please load the accumulator min. 8 hours (Accumulator could be over-discharged)
My instrument does not print!	Please check whether the printer paper is correctly inserted. The thermal printer writes only on the thermally sensitive side. Please always use the correct paper for the printer to prevent defects with the printer. Please make sure that the printer is clean (no chads in the drive).
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 next authorized service center.

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