

ecom[®]



Operating Instructions

ecom[®] EN2-F

Version 1.9.1

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i. Important Tips



The ecom-EN2-F meets the requirements for CTM 030, CTM 034, and ASTM D6522.



To control for thermal drift, start the analyzer and let it acclimate to ambient temperature for 15-30 minutes, then restart the analyzer before testing.



In order to get correct measurement values:

- allow 1 min. for auto-zero in fresh air
- allow at least 2 min. for stable readings before taking measurement



The following substances impair the instrument's operation:

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



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



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

i. Important Tips (continued)

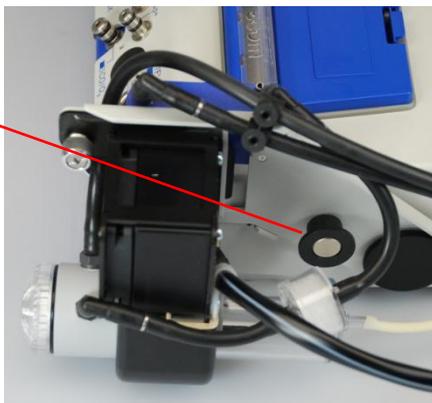




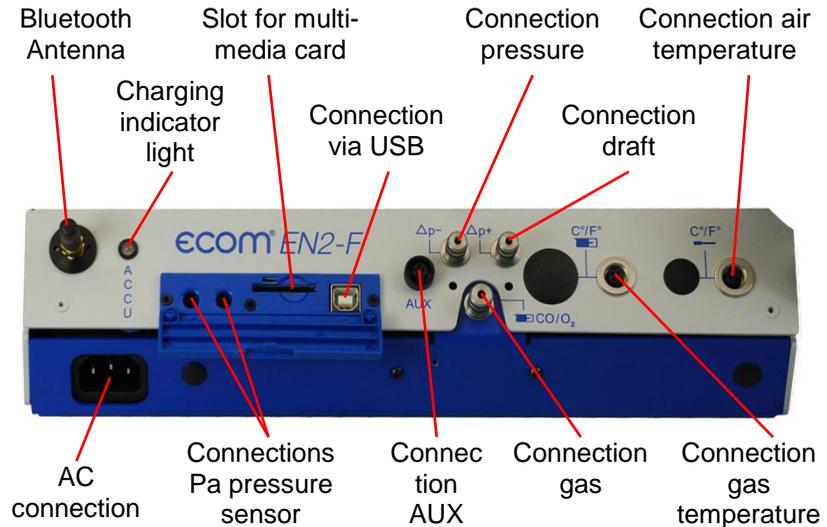
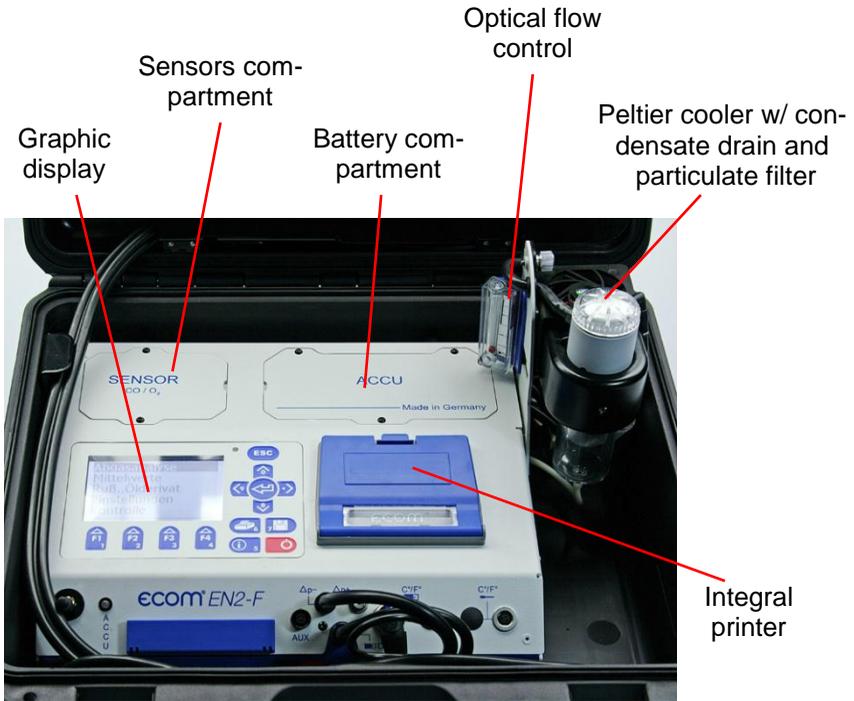
**Do not block fresh air opening
for fresh air pump!**

Before beginning with measurements, please set up condensation trap as follows:

- pull knob out to unlock
- swing the condensation trap a full 90deg up until it locks into place
- Unlocking pin must be engaged before pump will start

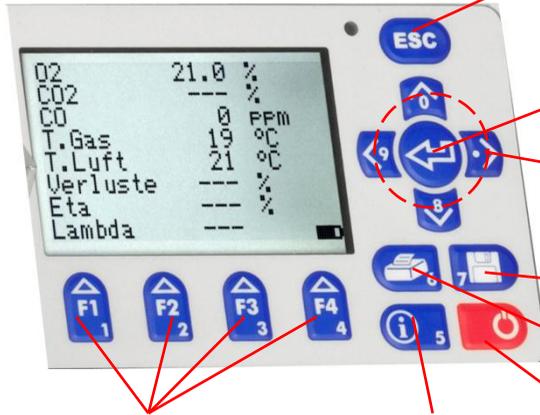


1. Instrument Design



Keyboard

In the input mode, the keys are used for numerical inputs



ESC key
(quit/
escape menu)

Enter key
(confirm
selection)

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

Save snapshot to
internal memory

Access printing
menus (press F2
to quick print)

F1: Standby – pump shuts off
F2: Quick print
F3: CO purge pump on/off
F4: Edit line items on screen

Info key
(access to
control menu)

ON / OFF
key

2. Accessories

	PART	PART NUMBER	DESCRIPTION
	Water Trap Filter (10/PK)	3015840G	10/PK - Particulate filter located on top of water trap assembly
	In-line Smoke Filter Standard(1 EACH)	7118501H	1 EACH - Standard 3/4" in-line filter in clear plastic casing.
	Thermal On-board Printer Paper (5/PK)	7927401H	5/PK - Printer paper for on-board thermal printer
	Li-Ion Battery	6983205H	Li-Ion Battery

3. Remote display (ECOM-R)



**Analyzer must have Bluetooth option!
(wireless range is approx. 10 m)**

Connection with ECOM analyzer

(the ecom-R connects with only 1 analyzer at a time)

Setup Bluetooth Connection

- Ensure there is only one instrument with Bluetooth near the ecom-R
- Turn on the analyzer
- Go to Adjustments → Internal → Bluetooth and select Protocol-Enhanced
- Turn on ecom-R & wait while the Bluetooth connection is made automatically

Unpair Bluetooth Connection

- Hold the red key (approx. 5 sec.) until **“Unpair:”** appears
- When **“Unpair: OK”** is shown, the connection is deleted



 Battery voltage

READY = Connection is active

CALIB = Analyzer in calibration phase

WAIT = Searching for connection

Page 8

 Change display* (see below)

 Start printout

 (4 displays)
Choose display screen

 Switch on/off ecom-R
(hold approx. 1 sec.)

*Change display:

 Choose line

 Adjust line

 Set adjustment

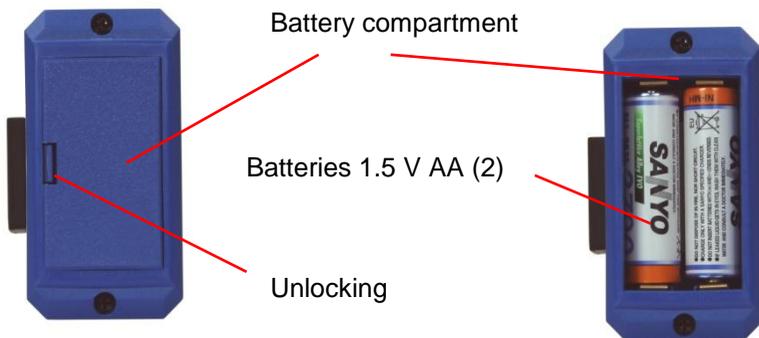
 Exit adjustment

3. Remote display (continued)

Changing out the batteries

- open battery compartment door
- take out used batteries
- put in new batteries (with correct polarity)
- close battery compartment door

Important: Always dispose of used batteries in official recycling containers only (e.g. in battery shops).

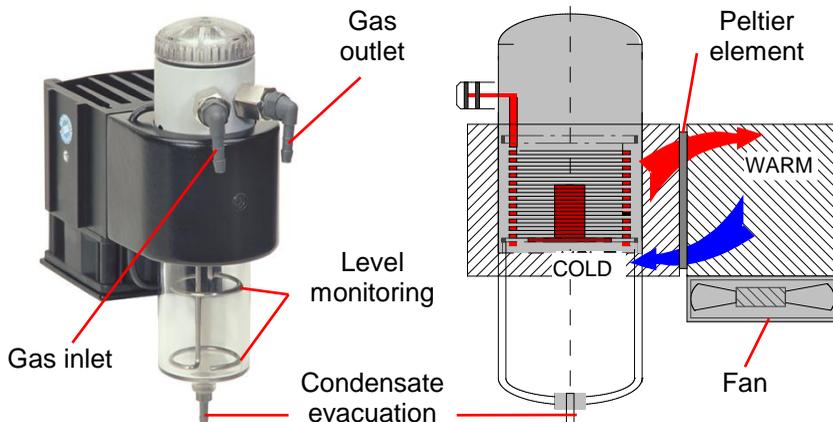


Model with integrated air temperature sensor



If there is no air temperature sensor connected at the ecom-EN2, then the air temperature sensor of the ecom-R supplies the measured values.

4. Gas Cooler



Exhaust gas with a temperature above the steam dew point (35 - 65 °C) is introduced into a long spiralling gas path with a surface coated metal body with good thermal conductivity. The gas radiates its heat to this metal body. A Peltier element (semi-conductor cooling element) powered by a continuous current is thermally connected with this body and with a second metal body with cooling ribs and ventilation slots.

The flow thru the Peltier element creates a heat transfer from **WARM** to **COLD**, drains the heat of the metal body flown by gas and conveys it to the outer cooling body. This heat is conveyed to the surrounding air with the aid of a fan.

The condensation formed by the heat loss of the gas drops in a receptacle and is pumped out automatically via a peristaltic pump.



The Peltier cooler consumes a lot of power so the cooling efficiency may be reduced if the analyzer is running on battery power alone!

On battery operation alone, the Peltier cooler can be switched off to save battery power. In the Gas Analysis menu press **<Enter>**, select **Peltier I/O** and press **<Enter>**. To switch the Peltier cooler back on, repeat these steps.

5. Power Supply



Used batteries can be brought to recycling stations or public waste disposal companies!

The EN2-F is recommended to be powered by AC power when available. The analyzer can also be powered using the internal battery for a while (6 V; 3.8 Ah). The battery should be recharged when the analyzer starts beeping or an alert message appears. The battery life can be checked by looking at the voltage indication on the display in the **Control** menu. The low battery warning is activated when the value “Batt” falls below 5.7 V. When the analyser is connected to AC power, the voltage will read as dashes “—.—” Unplug the power cord to read the battery voltage.

When the battery voltage falls below 5.4 V, the instrument must be connected to AC power to retain power.

6. Data Logging onto Memory Card

The multi-media card enables the storage of data records on a removable SD card. The data fields on the csv file are listed at the end of this manual. The following conditions must be fulfilled for using a multi-media card:

- minimal card volume 32 MB - max. 2 GB
- card formatted on 16 bit FAT

Insert Memory Card

Insert the multi-media card as shown. Take care that the card inserts smoothly and that you do not jam it in.



Never pull out cards during data recording as this may cause a loss of data and/or damage to the memory card itself.

6. Data Logging onto Memory Card (continued)

Memory card must be 32MB to 2GB!

To log data using the memory card, follow these steps:

-insert the memory card – on the main menu a new option “Data processing” will appear

-go to Data Processing – press enter

-scroll down to Datalogger – press enter

-scroll to Save to MMC – press enter

-using the numerical buttons, enter the data logging interval in seconds (min 1 sec, max 255 sec) – press enter

(i.e. 15 sec will give you 4 data points per minute)

-scroll to Datalogger – press enter – press F1 to confirm

-a blinking disk will appear in the upper right corner indicating that the analyzer is currently logging data

-go back to Gas Analysis to start the pump (if not already running) and view the data

-when you are finished with your test, go back to the Datalogger screen (ESC - Data processing – Datalogger)

-go to Datalogger – press enter – press F1 to confirm to stop the test

The data file will be saved as a csv file (J2KDL-00.csv). Take out the memory card and insert into a computer to view in Excel. Edit the spreadsheet as necessary. The data fields on the csv file are listed at the end of this manual.

In addition to data logger recordings the data could be transferred online with 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 www.ecomusa.com.

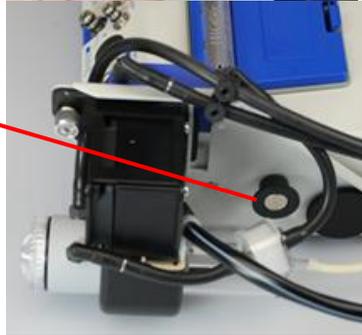
7. Analyzer startup

7.1 Carrying case & cooler

When opening the case, make sure to pull out on the bottom tab before you pull up.

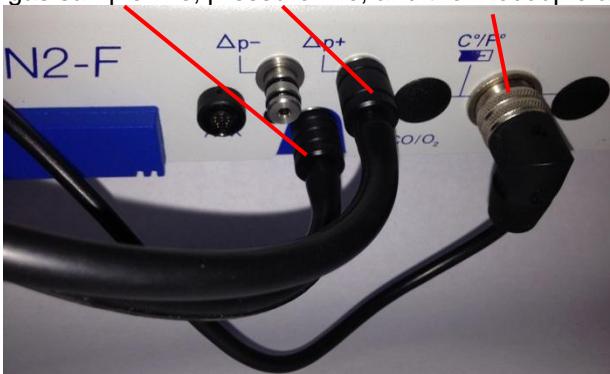


After the case is opened, unlock the cooler by pulling out on the knob and swinging the cooler 90deg upward. The cooler must be unlocked before the pump engages.



7.2 Sample line & probe

Connect gas sample line, pressure line, and thermocouple as pictured:



The fittings are sized so that you cannot switch the gas and pressure lines.

7.3 Analyzer startup



The probe must be in fresh air when you start the analyzer!

Press the red power button to turn on the analyzer. The main menu is displayed with 6 (or 7) menu options:

Gas analysis
Averaging
Soot Test
Data Processing
Adjustments
Control

- Gas analysis : Perform gas analysis (see **Chapter 8**)
- Averaging : Perform averaging test (see **Chapter 11**)
- Soot test : Perform soot test/smoke dot test (see **Chapter 10**)
- Data processing : Save snapshots to internal memory or perform data logging (only displays if MM card is inserted) (see **Chapters 6 & 14**)
- Adjustments : Modify instrument settings (see **Chapter 12**)
- Control : Check operation state of instrument (see **Chapter 13**)
- Diagnostics : Only used with ECOM AK tool

To perform measurements, select **Gas analysis** and confirm with **<Enter>**. The instrument starts a 1- minute auto-zero phase and the fuel types selection list is displayed. The following fuel types are available:

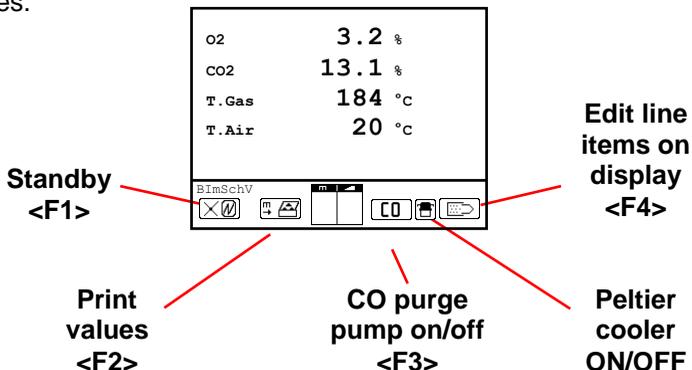
Natural gas	Propane
Butane	Number 2 oil
Number 4 oil	Number 6 oil
Coal	Wood
North sea gas	Diesel oil

Fuel type		
Natural gas		
CO2max	A1	B
11.7	0.37	0.009
Select: ↑↓		

8. Gas Analysis

8.1. Gas analysis display screen

After the 1-minute auto-zero phase, the instrument switches over to the measurement mode. The gas measurement values can be viewed on 4 display pages. Press up/down to scroll between the pages.



Note: To view readings with O2 correction, see **Chapter 8.6** for instructions on how to change the units to O2-corrected values.

Pressing <F1> goes to “Standby” mode which turns the pump off. If you want to change the F1 key, go to Adjustments->Internal->F1 Hotkey. You can set the F1 key to: Soot test, Data processing, View memory, Display values, Fuel type, Efficiency (K), Internal, Adjustments.

Press <F2> to print out the values simultaneously to their recording in the intermediate memory.

Press <F3> to start the CO purge pump. This dashes out the CO reading on the display and introduces fresh air to the CO sensor to protect it from over ranging **Note: The CO purge pump automatically activates when the CO ppm limit is exceeded – usually set at 4000ppm.**

8.1. Gas analysis display screen (continued)

Pressing <F4> goes to “Edit” mode which allows the user to change the line items on the display screen.

In “Edit” mode, the values on the screen can be changed to what the user wants to see. To change these values, press F4 and you should see the 1st line start blinking:

- select line you would like to change with Up/Down – it will blink
- select parameter you would like to see with Right/Left
- repeat until the display screen shows what you want it to
- press F4 to accept changes

8.2 Inserting the probe



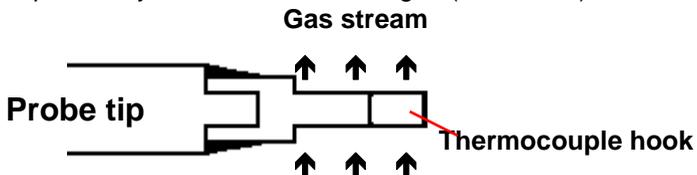
To control for thermal drift, start the analyzer and let it acclimate to ambient temperature for 15-30 minutes, then restart the analyzer before testing.

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

Core stream search

Connect the sampling tubing on the instrument to the sample gas inlet. Position the sampling probe in the exhaust channel, so that the thermocouple is fully surrounded with the gas (see below).



8.2 Inserting the probe (continued)

Perform the measurement in the core stream of the exhaust gas channel (probe placed in the hottest gas temperature area). A trend indication for T.Gas lets you know whether the temperature is increasing or decreasing so that you can find the core stream. As long as the display shows an up arrow, it means the probe tip is moving towards the core stream center. If a down arrow is shown, it means you have moved the probe away from the core stream and the temperature is decreasing. If no temperature change is shown for at least 3 seconds, the trend indication will disappear.

8.3 Calculations:

CO₂, Efficiency, Losses, Excess air, & Dew point

CO₂, efficiency, losses, excess air and dew point are calculated values. They can only be calculated if realistic values for the basic parameters like O₂ and the temperatures are available. In order for the calculations to appear, the O₂ must be below 20.5% and the difference in gas temp and ambient temp must be at least 5°:

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

The dew point can only be calculated accurately if, in the menu "**Adjustments**", the current barometric air pressure value has been inputted. If the gas temperature falls below the dew point (between 25 and 65 °C), the efficiency will be calculated with condensation. In this case a (K) is displayed after „Efficiency“.

8.4 Taking a measurement:

Ramp up, measure, & purge

The analyzer takes a little time to ramp up, which allows for gas transport time and the build-up of a stable electrochemical reaction on the sensors. This time period lasts approx. 1 to 1.5 minute. Be sure to wait until the values are stable. If deviations higher than 2 ppm still occur by the gas values, they can be due to unstable pressure conditions in the exhaust channel.

If the measurement values are stable, press the **Save Button** (number 6) to transfer the values in the internal memory or **F2** to print.

8.5. Printing

Press **F2** to print the values on the screen.

To use the **Printer button** (number 6 on the keypad), you have to press the **Save button** (number 7 on the keypad) *before* pressing the **Printer button**.

Inserting Text onto the Printout

If you want to insert text onto the printout, press **Enter** while in Gas Analysis, select **Insert Text**, press up/down to select the line, and press **Enter** again to start entering text.

When done, press **F1** to accept the text, then press **ESC** until you are back in Gas Analysis.

Each time you print from now on, the text will appear on the printout. To delete the text, press **Enter** while in Gas Analysis, select **Insert Text**, press up/down to select the line, and press **Enter** again to start editing the text. Press **F4** to get the cursor up to the text line, scroll right until the blinking cursor is beyond the last character, then press **F2** until all characters are cleared.

When done, press **F1** to accept the text, then press **ESC** until you are back in Gas Analysis. No text will print out until the next time you insert text.

8.6 O2 Correction/Reference O2

O2 correction is commonly used by regulatory agencies to normalize CO and NOx values to a specific O2 percent (usually 3% or 15%). This allows for an “apples to apples” comparison when looking at emissions data from many different pieces of equipment with many different excess air values.

Go to **Adjustments** -> **Ref. O2** and enter the desired O2 correction value using the numbered buttons.

Now go to **Adjustments** -> **Units** and press up/down or right/left to change the unit to **%O2 undiluted**. Your units have been changed and you can return to Gas Analysis to view the corrected readings.

9. Draft/Pressure

A trend indication for the draft/pressure conditions in the exhaust channel can be viewed during the gas analysis. However, the draft/pressure value will not be on the printout until you zero the sensor. To record a pressure measurement, follow these steps:

While in Gas Analysis, scroll through the pages until you get to this one shown below. The pump will turn off.

Disconnect the draft hose from the instrument and press **F4** to zero the pressure sensor. The sensor is now calibrated. Reattach the draft hose, wait for the reading to appear, and press the **Save button** (number 6) to record the measurement. Now when you press **F2** (whether in this menu or within other Gas Analysis pages), you will see the draft print out along with the gas readings.

Pressure	
Draught	-0.12 hPa
Recorded value:	---.--- hPa
 	

10. Soot test

The **Soot test** allows you to enter up to 3 soot test measurements.

Soot test	
Boiler temp. :	66°C
1.Soot meas. :	-.-
2.Soot meas. :	-.-
3.Soot meas. :	-.-
Oil trace :	----
Select :	↑↓↵

You must first turn on the probe heater so that the sample is maintained above dew point, preventing any condensation in the probe which can affect the filter paper. The filter paper slot is heated up to approx. 70 °C. Go to **Adjustments / Internal / Probe heating / F1**.

- Return to **Soot test**.
- Insert a filter paper in the paper slot.
- Select the line „**1st. Soot meas.**“.
- Press **<Enter>** to start the measurement. The analyzer will pull 1.63 liters of sample gas.
- Release the filter paper from the probe slot.

10. Soot test (continued)

- Compare the greyness to your soot test chart (0-9).
- Input the result using the numerical keys and press **<Enter>**.
- Repeat this procedure until all 3 soot tests are completed. The average value will be calculated and automatically stored.
- Go back to **Gas Analysis** and press **F2** to print off soot test results.
- Go to **Adjustments / Internal / Probe heating / F4** to turn off the probe heater.

You do not need to input Boiler temp. or oil trace if not needed.



Let the probe cool down before putting back into the carrying case.

11. Averaging

The averaging feature allows you to collect snapshots in a timed interval and calculates the average over a set time period. For instance, if you want to take 1 measurement per minute over a 5 minute period, you can set up the Averaging test to automate this.

1. Select **Averaging** within the main menu
2. Select **Meas. Time**
Input total measuring time in minutes or seconds (for seconds, press decimal 1st)
3. Select **Scanning**
Input interval time (for seconds, press decimal 1st)

Mean values	
Start measurement	
Measurement time	
Scanning	
Printer	
Store	
Select	: ↑↓↵

For example: If the **Meas. Time** is 5 minutes and the **Scanning** time is 60 seconds or 1 minute, the mean value will take into account 5 scans and find the average.

11. Averaging (continued)

4. Select **Printer**

Select **No Value** to print only the final average values

Select **Each value** to print all recorded snapshots along with the final average

Select **Each value of 2** to print every other recorded snapshot, etc.

5. Do not select **Store**. Please leave to default setting.

6. Select **Start Measurement**

Mean value measurement has initiated

Press up/down to toggle between mean value and real-time results

7. After the **Meas. Time** has elapsed, press 6/Printer key to print results

8. Press ESC, select **Mean Value**, and press F1 to quit mean value calculation

12. Adjustments

Additionally to those **ecom-EN2-F** functions described previously, various adjustments can be made in the instrument.

From the main menu, select the sub-menu "**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 call up or modify the adjustment. The modifiable parameters are:

Unit (adjustment with **cursor keys**):

- Calculation of gas concentrations in:

- ppm = volume concentration (parts per million)
- mg/m³ = mass concentration per volume unit
- mg/kWh (undiluted) = mass concentration per power unit w/ O₂ correction
- mg/MJ (undiluted) = mass concentration per power unit w/ O₂ correction

Adjustments	
Units	
Ref. O ₂	
Fuel type	
Air pressu	
Select	: ↑ ↓ ↵
Set clock	
Paper feed	
Internal	

12. Adjustments (continued)

- ppm (undiluted) = volume concentration (parts per million) w/ O₂ correction
- mg/m³ (undiluted) = mass concentration per volume unit w/ O₂ correction

Undiluted:

Conversion of the gas concentration on selected reference oxygen:

- mg/kWh and mg/MJ are always calculated on 0% O₂ basis

- Conversion formula

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

O₂ reference

(for ppm und mg/m³ - Input after pressing <Enter>):

- Input of O₂ reference value O_{2ref}

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 cursor keys

Paper feed (press <Enter> to activate paper feed)

Internal (press <Enter> to open menu):

- Further instrument settings:
- See next page

12. Adjustments (continued)

Printout contrast (0..9)

(press <Enter> to access input menu):

- Printer contraste adjustment

Display contrast

(press <Enter> to access input menu):

- Display contraste adjustment with cursor keys

Key beep

(<F1> for YES / <F4> for NO):

- The analyzer beeps each time a button is pressed

Probe heating

(<F1> for YES / <F4> for NO):

- Turn on probe heating for the soot test
- Turn on probe heating if a large portion of the probe is outside of the exhaust channel to prevent condensation in the probe pipe

Language: English (change with <Enter>):

- Info about selected language (3 languages selectable)

F1 Hotkey (selection after pressing <Enter>):

- Modification of adjusted menu the programme will open after pressing <F1>

F4 Hotkey (selection after pressing <Enter>):

- Modification of adjusted menu the programme will open after pressing <F4>

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 automaticaly
 - NO (default) = CO sensor has to be switched on with <F3> after purging

Internal
Print contrast
Displ. contrast
Key beep
Language: English
Select: ↑↓
F1 Hotkey
F4 Hotkey
Eff. (C)
CO-Automatic
USB
Bluetooth
Pitot-factor
Printout

12. Adjustments (continued)

USB (selection after pressing **<Enter>**):

- Press up/down to change baud rate
- Press right/left to change protocol

Bluetooth (selection after pressing **<Enter>**):

- Press up/down to change baud rate
- Press right/left to change protocol



With first use of the Bluetooth connection to PC type in password „0000“ or „1234 “!

Pitot factor (selection after pressing **<Enter>**):

- Input of Pitot factor for flow rate calculation (standard = 0.93)

Printout (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 cursor keys to select the desired character (selected character is outlined by black background).
 4. Confirm selection while pressing **<Enter>**.
 5. Repeat procedure until desired text is complete.
 6. Once input for line 1 is completed, deactivate the characters selection mode with **<F4>** and move to the second line with the cursor key **<Down>**.
 7. Once all lines have been processed as desired, exit the menu with **<ESC>**.

13. Control

The electrochemical sensors for gas analysis are submitted to a wearing process and do age. They alter their output values along the time depending on the gas concentration, the exposure time and the soiling grade of the sampled gas. The programme monitors the sensors and corrects drifts.

But if the drifts and the correlated measurement errors increase, an error message is displayed. In this case the corresponding sensor must be changed by an authorised service centre. The control menu informs about the current status values for the sensors.

Further information is also consigned on 2 display pages (use cursor keys to scroll):

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



- operation hours since last service
- total operation hours
- date of the next recommended service
- phone number of the next service center
- software version
- serial number
- amount of CO switch-offs
- error amount

O2	19744 mV
CO	7 mV
Accu	6.09 V
Operation hours	: 8.45 hrs
Total	: 18.75 hrs
Next unit check	: 01.07.10
Service tel.	: 02371-945-303
Further pages: ↑↓	

Program version	:V1.2 19.11.09
Serial no.	:EN2-0001
CO purges	: 15
Error counter	: 21
Operation hours	: 8.45 hrs
Total	: 18.75 hrs
Next unit check	: 01.07.10
Service tel.	: 02371-945-303
Further pages: ↑↓	

14. Data Processing

In order for this menu to appear, a memory card (32MB to 2GB) must be inserted into the analyzer.

Note: This section explains how to save data snapshots to internal memory. For data logging onto a memory card, see “6. Data Logging onto Memory Card”

Select:

Search or create files to save the data snapshot

View:

View data files that have been saved

Memory (M):

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

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

Format:

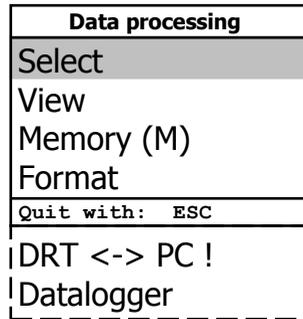
If your memory card is not working properly, you may have to reformat.

Caution: If you reformat, all files on the memory card will be lost!

DRT <-> PC!:

Load data:

Enables the data import from e.g. rbr software (available on our website www.rbr.de). See **Technical Data** at the end of this manual for data format information (please observe the transfer options of your software!).



	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 : ↑↓↵

14. Data Processing (continued)

Proceed as follows:

- Connect ecom-EN2-F and 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 on your PC.

Send data:

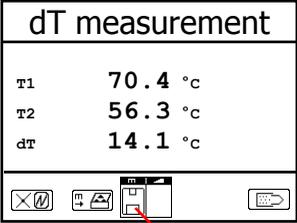
With this function the data records completed with measurement values can be transferred to the PC programme (procedure similar to chapter „**Load data**“).

15. Delta-T Measurement (Option)

With the ecom-EN2-F a difference temperature measurement is possible. For measurements at pipings (e.g water-in and water-out of heating systems), special temperature sensors are needed, available from your authorised rbr agency. Out of the main menu point "**Diagnositics**" select the sub-menu "**dT measurement**" and confirm with **<Enter>**.

The instrument indicates the temperature T1 (sensor at connection „Gas temperature“), the temperature T2 (sensor at connection „Air temperature“) and the difference between both temperatures (T1 - T2). Press **<Memory>** to store the result in the intermediate memory. A printout can be started with **<Print>**.

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



Measurement stored in intermediate memory

14. Maintenance Tips



Do not use other sensors or feelers from other manufacturers otherwise the TÜV / DIN EN approval will not be valid anymore!

To secure the accuracy of your measuring instrument we recommend the annual check by an authorized ecom partner. In the case of strong demand (e.g. permanent several hours of measurement per day, rough conditions etc.) shorter intervals between checks should be selected - please contact your ecom partner. All ecom partners are listed under www.rbr.de.



Service made by service centres non-authorized by rbr Messtechnik GmbH will result in a complete and immediate lost of any warranty!

The following advices will be of help for the daily check and maintenance of single parts or assemblies:

Fine dust filter

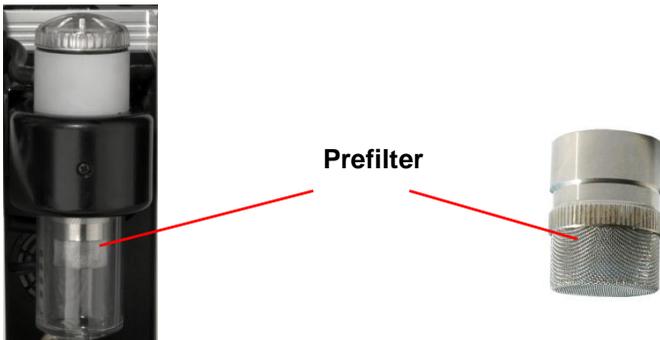
Screw off the cover of the condensate trap/gas cooler and check the state of the particle filter. Change it once the filter has a grey colour (= number 2 - 3 of the soot comparison scale).



Fine dust filter

Prefilter

The prefilter made of high-grade steel is within the condensate container. It should be cleaned when contamination (with warm water and dry). Unscrew condensate container and prefilter. Assemble after cleaning again in reverse order.



Sensors

The sensors get calibrated with the reference gas fresh air by each switch-on. Their state is permanently checked by the instrument. New sensors age along the operation time because of the wearing of the reagents (oxygen sensor) and due to soiling respectively 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 calibration and cannot be eliminated despite several calibration phases, so the instrument must be checked by a qualified and authorised service centre. The oxygen sensor must show a value of >7000 mV, otherwise it must be changed by an authorised service centre.

The CO sensor is protected against exceedings by the internal programme. If the limit value of 4000 ppm is exceeded, a second pump switches on and flows the sensor with fresh air. After sufficient purging time (X behind CO disappears) the sensor can be reintegrated into the measurement system with <F3> (if you choose „**Yes**“ at „**Adjustments**“ / „**Internal**“ / „**CO-Automatic**“ the CO sensor switches to measurement automatically). The sensor can also be manually be excluded from the measurement system with <F3>.

Probe and tubing

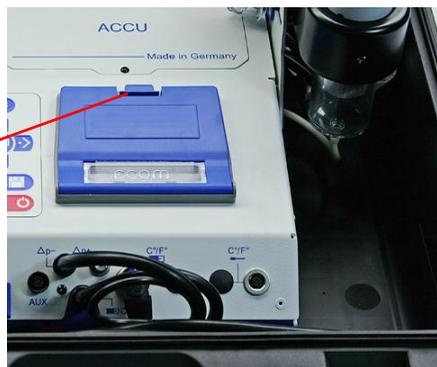
Depending on the frequency of use, probe and tubing should be regularly cleaned in order to release particle deposits and to prevent early wearing due to corrosion.

- Release the connections at the instrument and at the probe grip to free the tubing.
- Clean it (flow warm water in then dry respectively blow water drops 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 paper rest out of the printer. Hereto select "**Adjustments**"/"**Paper feed**"/<Enter>).
- Remove the plastics tube of the previous roll.
- Insert the paper end in the slot under the transport roll (paper roll inner side facing you while inserting the paper).
- Convey approx. 3 cm paper thru the printer ("**Adjustments**"/"**Paper feed**"/<Enter>).
- Lay the paper roll in the corresponding hollow.
- Insert the paper thru the slot of the printer compartment cover and close the latest.

Unlocking
printer cover



15. Technical Data

Parameter	Range	Principle
O ₂	0 ... 21 vol-%	Electrochemistry
CO	0 ... 4000 ppm	Electrochemistry
NO (option)	0 ... 5000 ppm	Electrochemistry
NO ₂ (option)	0 ... 1000 ppm	Electrochemistry
SO ₂ (option)	0 ... 5000 ppm	Electrochemistry
CO% (option)	4000 ... 63000 ppm	Electrochemistry
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
Power supply	Mains power 230 V / 50 Hz~; Accu 6 V / 4,6 Ah	
Protocole printer	integral; 58 mm paper width Printout individually programmable	
Indication	graphic display; backlit	
Dim. (W x H x D)	430 mm x 170 mm x 380 mm	
Weight	approx. 7 kg complete with sampling system	

Subject to technical changes
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rbr Messtechnik GmbH
Am Grossen Teich 2
D-58640 Iserlohn
Telefon: +49 (0) 2371 - 945-5
Telefax: +49 (0) 2371 - 40305
Internet: <http://www.rbr.de>
eMail: info@rbr.de

16. FAQ

Where do I find important instrument information?	In the menu „Control“ all important instrument informations are 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: <ul style="list-style-type: none">- O₂ sensor- CO sensor (pre-calibrated)- NO sensor (pre-calibrated)- SO₂ 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 let check the instrument. The instrument is however still ready for use.
The instrument shows the error message „T-Gas“ oder „T-Air“!	Possible reasons could be: <ul style="list-style-type: none">- Cable is broken (at the plug)- T-Air sensor is broken- Thermocouple is broken- Cable is defective Note: The error messages can be ignored at the EN2-F by pressing „Enter“. Calculations that depends on these temperatures are not implemented.
The instrument shows wrong or inaccurately CO ₂ values!	Possible reasons could be: <ul style="list-style-type: none">- O₂ is defective (CO₂ values are calculated from the O₂ 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 use always the correct paper for the printer, you will prevent defects at 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 authorised service centre.

19. 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.

19. Calibration Procedure (continued)

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

20. Memory Card Data

Description of data record ecom-EN2-F 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

Calibration log

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

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



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ecom.info@ecomusa.com**

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