rbr-ecom®

Operation Manual
Service Instrument

rbr-ecom FN

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1. Introduction

The service instrument **rbr-ecom FN** is a combination instrument for the analysis of exhaust components and the evaluation of further parameters bound to the combustion process.

Automatic condensate monitoring and of course the parameters necessitated by the correct monitoring of oil- and gas-fired combustion plants belong to the standard equipment of the unique service instrument **rbr-ecom FN**.

Thanks to the integral, large printer and the easy window selection programm, the user is able to issue valid and reliable service reports and herewith to fulfill the quality requirements of a clear and comprehensive documentation about the performed service job.

Besides service reports, invoices can also be printed out by the customer and hereby laid out with individual invoice texts.

Together with the PC software Voksy®, a maintenance management programm can be easily set up. The combined use of both service instrument and Voksy® software enables a complete and professional order processing in the field of maintenance and service of combustion plants.

The present manual describes the easy operation of the instrument. Please read it carefully in order to avoid error or problems by operating this high-tech instrument. Please also read the advices for service, maintenance and possible trouble.

We wish you an agreable work with the **rbr-ecom FN** and a lot of success in doing your service job.

Sincerely Yours,

rbr-Computertechnik GmbH

2.) Equipment of the rbr-ecom FN

Probes

Standard probe :

- Suitable for the combined gas, draught and losses measurement
- Insertion length probe pipe 290 mm
- External diameter probe pipe 10 mm
- Coaxial version with
  - . NiCr/Ni thermocouple (T-Gas$_{max.}$ = 500 °C)
  - . 3-chamber hose (length 3 m)
  - . Fixation cone

On request, we will enjoy to propose you different lengths (max. 1000 mm) respectively other temperature ranges (PtRh/Pt thermocouple).

Multi-hole probe (option):

- Probes set for CO measurement at gas-fired plants (safety check)
- 4 insertion lengths (142, 172, 182 und 205 mm)
- Hose length 3 m

Temperature sensors

T-Room sensor (standard):

- T-Room sensor with fixing magnet (T-Room$_{max.}$ = 99 °C)

T-Room probe (option):

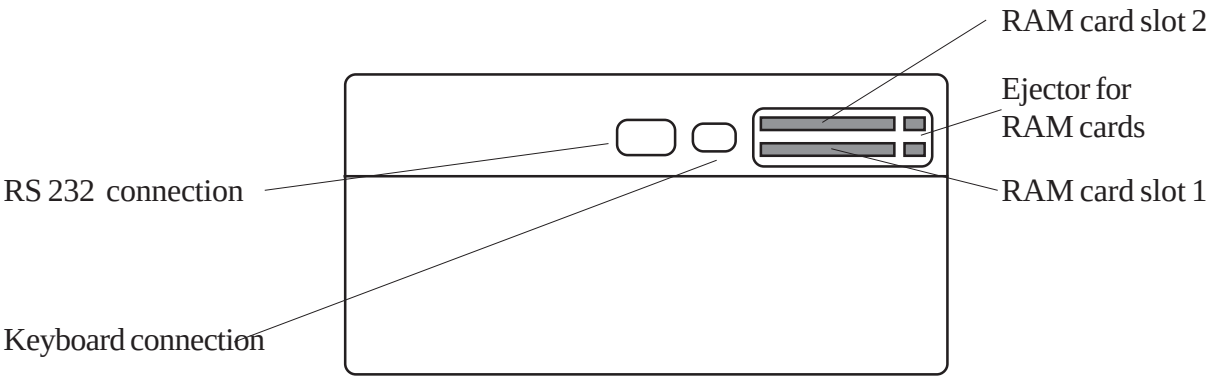
- T-Room sensor for T-Room independent gas burners (T-Room$_{max.}$ = 99 °C)

Standard delivery covering

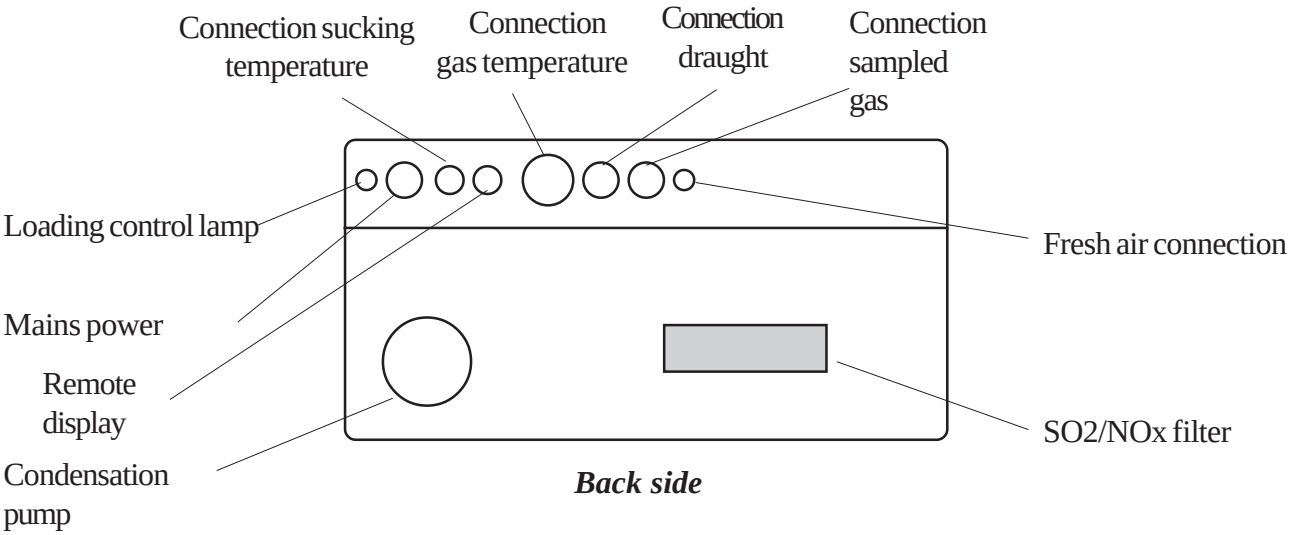
- Condensate hose
- Replacement filter
- Carrying strap for transport case
- Operation manual
- Final calibration data sheet

Optional accessories

- RAM cards (PCMCIA norm)
- Probe fixation (flexible)
- Undercase
- Voksy® software with initialisation programme

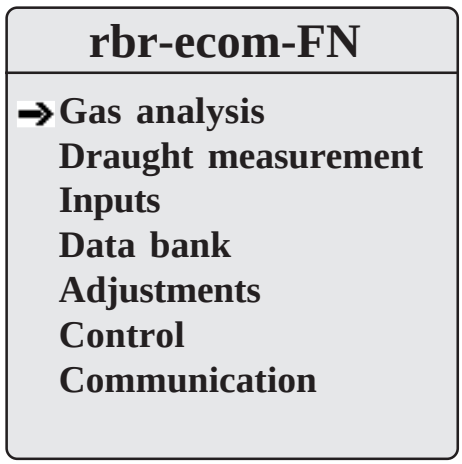


Front side



Back side

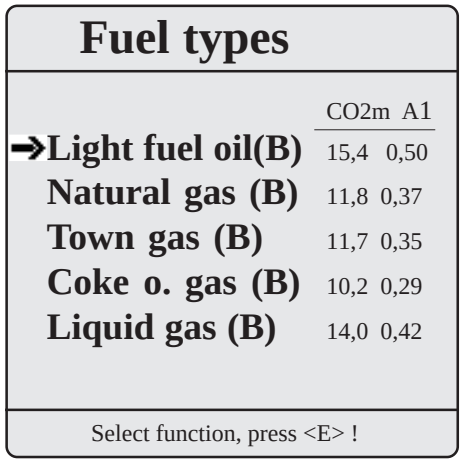
4. Operation of rbr-ecom FN



Press (Taste **<I/0>**) to switch on the instrument. The display shows the main menu from which 7 sub-menus can be accessed. These sub-menues have the following functions:

- Gas analysis : Perform gas analysis
- Draught measurement : Perform draught measurement
- Inputs : Make inputs
- Data bank : Record and process customers
- Adjustments : Modify instrument´s adjustements
- Control : Check operation state of instrument
- Communication : Data organisation/transfer

If you want to begin with the measurement mode, so select the sub-menu **"Gas analysis"** with the arrow keys and press **<E>**.



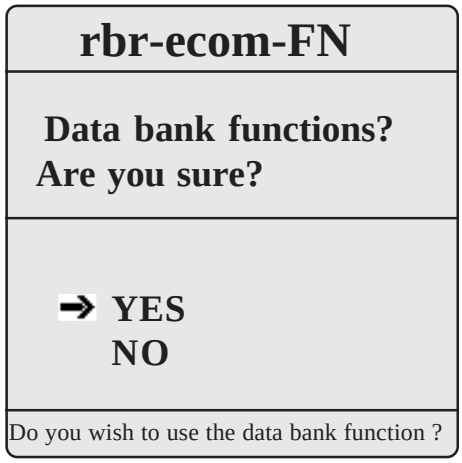
The instrument starts a 3-minute calibration phase after which the fuel types selection list will be displayed.

The following fuel types are available:

Fuel types acc. to 1.BImSchV (others on request)

Light fuel oil (B)
Natural gas (B)
Town gas (B)
Coke oven gas (B)
Liquid gas (B)

Make your selection with the arrow keys and press **<E>**.



Then the instrument needs to know if you want to use his data bank function. If you want to relate the upcoming measurement values to a particular combustion plant, select **"YES"** and confirm with **<E>**.

5. Select or record customers

You have the following possibilities to call up a customer data stored in the instrument or to record a new customer:

Search word (recommended method): If you know either the name, ZIP code/City or the customer number, you can find a recorded customer with help of **Text-in-Text-Search**.

Storage number (only if storage number is known):
Access to all storage numbers of the data bank

Select **"Search word"** and confirm with **<E>**.
Select your input criterion:

Recorded customer:
- the first 4 letters of the name
- 4 digits (ZIP code) or 4 letters of the city
- 4 digits of the customer number

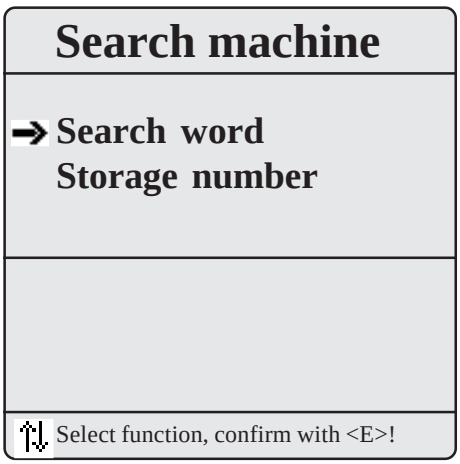
New customer:
- 4 ignore characters (search field name)

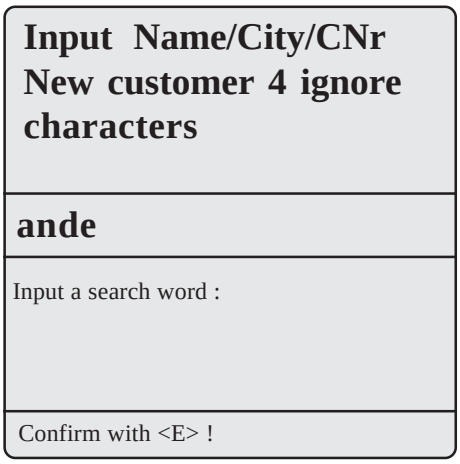
Example: "ande" for Anderson

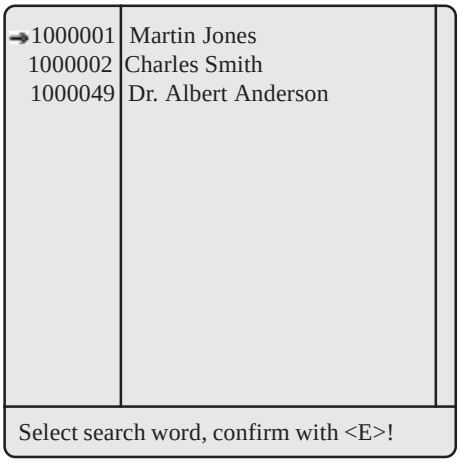
After input, press **<E>** and starts the search in the concerned field (cursor keys / key **<E>**).

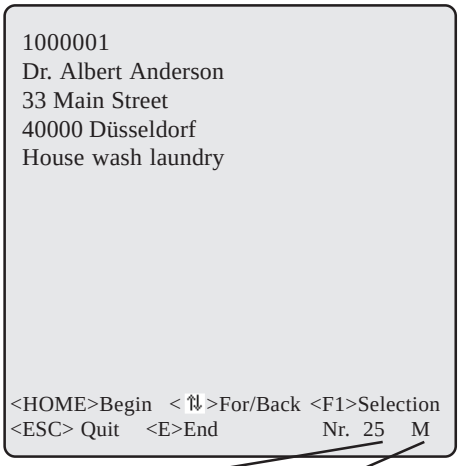
A list of customers whose data correspond to the search criterion is displayed.

Is the customer you´re looking for in the list, select with the arrow keys and press **<E>.** The complete customer number and address will be displayed.
New customers will be allocated the next possible storage number (indication: "**Storage is empty!**").







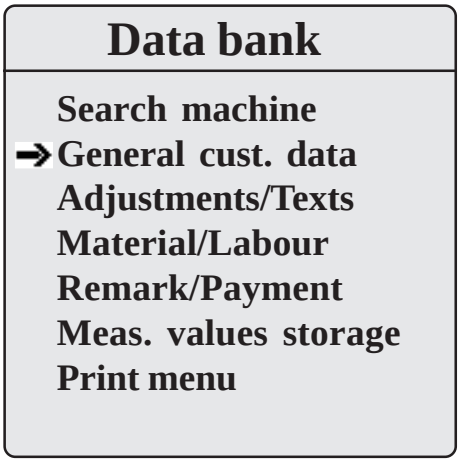


Storage number — **Measurement recorded**

All data belonging to the service report is stored in the display masks under 4 main sections:

- General customer data
- Adjustments/Texts
- Material/Workmanship
- Remark/Payment

Here data can be viewed, modified or recorded.



6. Service report issue

6.1. General customer data

Select the sub-menu **"General customer data"** with the arrow keys and confirm with **<E>**. The cursor stands in the field Help and blinks. Press **<F2>** to open an help file which covers the most important information for the issue of a service report . Press **<ESC>** to quit the help file.

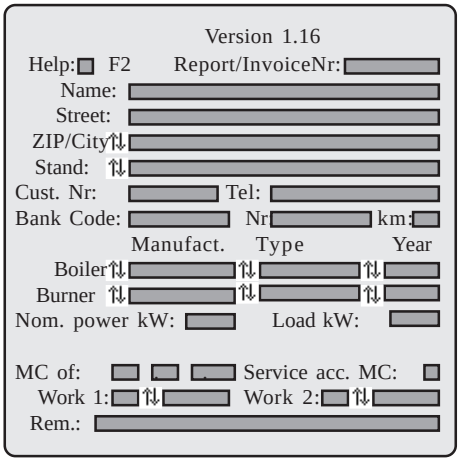
Principally the report fields can be filled up as follows:
- move cursor from field to field (key **<F1>**)
- fill in one field after the other:

  - fields **without** ⇅ are input fields
    (input only with keyboard possible)

  - fields **with** ⇅ are selection fields
    (input via keyboard and take-over from recorded selection tables possible)

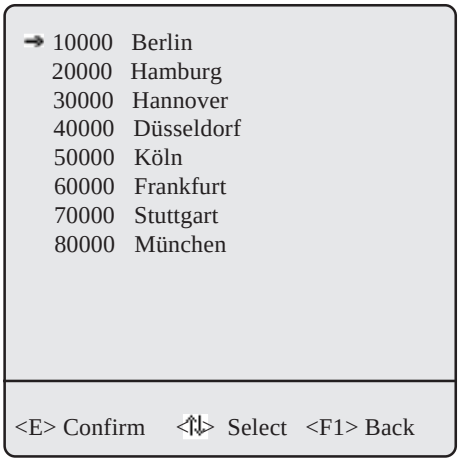
Please find the following explanation regarding the take-over from elements of selection tables.
Move the cursor with **<F1>** on the selection field **"ZIP/CITY"**. Press **<F2>** to open the attached selection table.

The available selection of cities will be displayed. Move the arrow key on the correct city and call up with **<E>**.

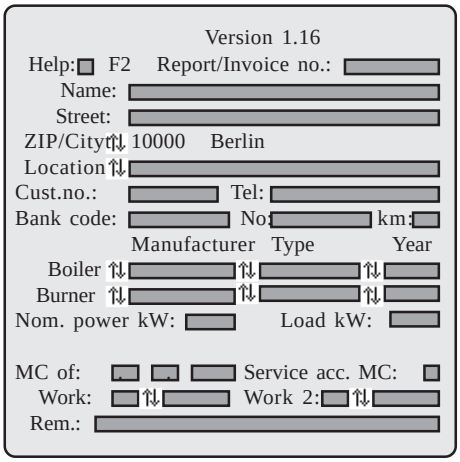


The last 3 figures relate to a maintenance contract (given by use of the Voksy® software). Abbreviations for inputs under Work 1 and Work 2 are e.g.:

01-12	= Month the job was made
BH	= Burner main revision
BI	= Burner inspection
BC	= Burner control revision
BC	= Boiler cleaning
T	= Tank check



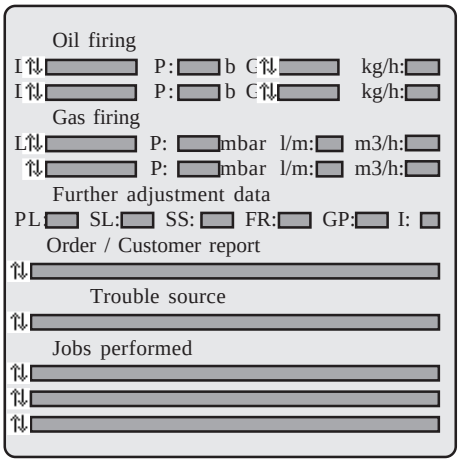
Check twice and press **<E>** to take over the city in the report field. If needed, the input can be modified or completed.
All necessary inputs can be made as described earlier.
Press **<ESC>** to return to the upper menu level.



6.2. Adjustment / Texts

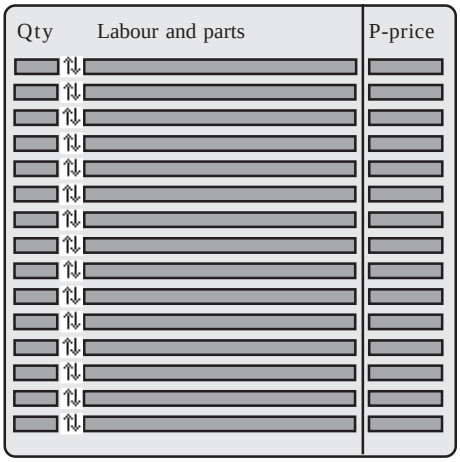
In the upper window part, load adjustment data -divided in oil and gas combustion- can be inputed or selected. In the lower part, trouble causes and performed jobs can be inputed.
The abbreviations have the following meaning.

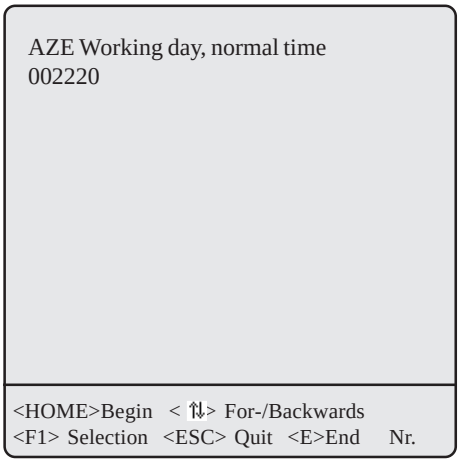
- -L = Load adjustment (**Caution:** Load ajustment 1 will be later on correlated to mesurement 1!)
- -P = Oil or gas pressure (in bar resp. mbar)
- -G = Nozzle description oil
- -PL = Adjustment primary air
- -SL = Adjustment secondary air
- -SS = Adjustment disk retarding
- -FR = Adjustment flame tube
- -GP = Blower pressing
- -I = Adjustment IRD



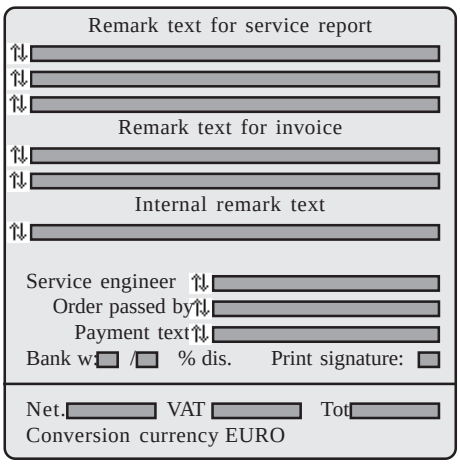
6.3. Material / Workmanship

The menu **"Material / Workmanship"** enables the documentation of spares replaced during the service job as well as the works done and theit implementation in the service report or on the invoice.
After input of the amount (material or working time) in column 1, press **<F1>** to access the selection field for parts and workmanship. Press **<F2>** to call up the catalogs stored in the rbr-ecom FN.
These catalogs cover current spares and labour works. Once you have selected one catalog with the arrow keys and <**E**> (e.g. working and driving times), all items respectively workmanships of this catalog will be displayed.
Choose e.g. **"AZE Working-day Normal time"** and press **<E>**, so this item will be displayed with the corresponding price (first 4 figures = amount DM net / last 2 figures = amount Pf net).
Press again **<E>** to store this choice.





6.4. Remark / Payment



In the last menu point **"Remark / Payment"** you can input remark texts (prepared forms via **<F2>** or input via keyboard) for service report and invoice.

Furthermore, selection fields enable the input of organisation data. At the page end, the amounts for spares and labour works are dsiplayed (net amount; VAT amount; Total amount, Conversion rate).

Once all data for service report and invoice has been inputed, you can switch over to gas analysis (key **<Menü>/"Gas analysis"/<E>**).
Advice 1: A switch to gas analysis is possible any time.

Advice 2: The VAT rate is stored under **"Adjustments / Menu Internal"**. The rate can be modified as follows:

- Select **"VAT"** with the arrow keys, confirm with **<E>**,
- Input correct rate and confirm with **<E>**,
- Return to main menu with **<Menü>**.

6.5. Report issue for Voksy® software

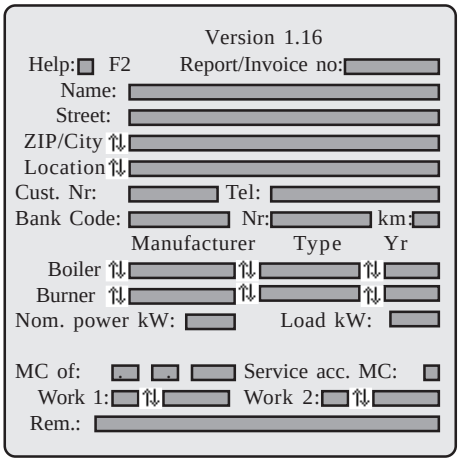
If the rbr-ecom FN is operated together with the Voksy® Maintenance Management Programme, the following points have to be observed absolutely:

- a regular data exchange between FN and Voksy® software must be secured,

- if a report or an invoice is to be issued for a customer, so a report/invoice number **must absolutely** be designated by the FN. Otherwise Voksy® will not process the data record.

Proceed principally as follows:

- Call up customer upon search machine,
- If need be, consult the data of the last report (general customer data, Adjustments/Texts, Material/Labour; Remark/Payment),
- Select **"General customer data"** and press **<E>**.



- Press simultaneously **<Shift>** + **<F2>,**
- Select **"New report / Invoice number"** and confirm with **<E>,**
- Answer question with **"YES":**
  - new report/invoice number will automatically be allocated (in the succession)
  - all data of the last report (excepted "General customer data" and "Adjustment") will be erased
- Press **<ESC>** to turn back to **"General customer data"**
- Issue new report.

Advice:
All other functions, excepted **"New report / Invoice number"** are special cases and are normally not needed:

- Cancel report / invoice number:
  - Report / Invoice number will be cancelled
  - Measurement values and inputs made under **"General customer data"** and **"Adjustments"** remain.

- Cancel measurement:
  - the measurement values only will be deleted.

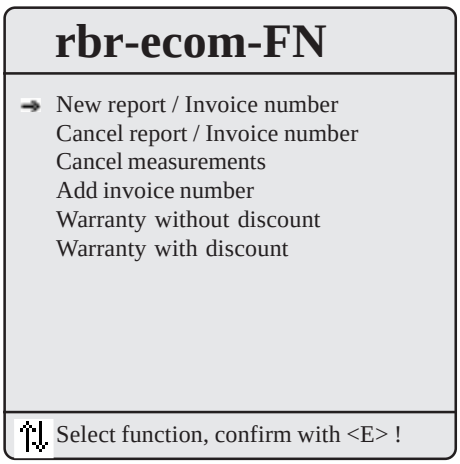
- Add invoice number:
  - a report/invoice number will be added to the data record (input possible afterwards if not processed before process of the report)

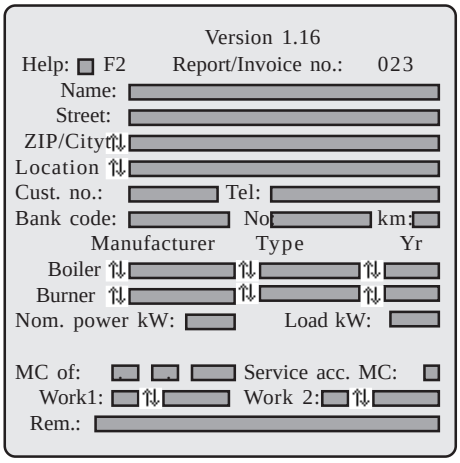
- Warranty with discount:
  - prepared for software working with discount (not relevant for Voksy®)

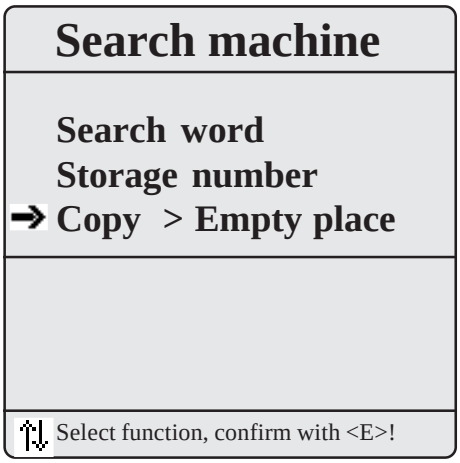
- Warranty with discount (as warranty w/o. discount).

6.6. Copy function

If you need to have the called-up customer stored more than one time in the FN (several reports), so the copy function can be activated. Select **"Data bank"/"Search machine",** then the function copy **"Copy > Empty place"**.
Press **<E>** to call up the function and answer the safety question with **"YES"**. The customer data record will be copied on the next vacant storage place (inputs under **"General customer data"** and **"Adjustment"**).
All other data including the mesurement data will not be copied.



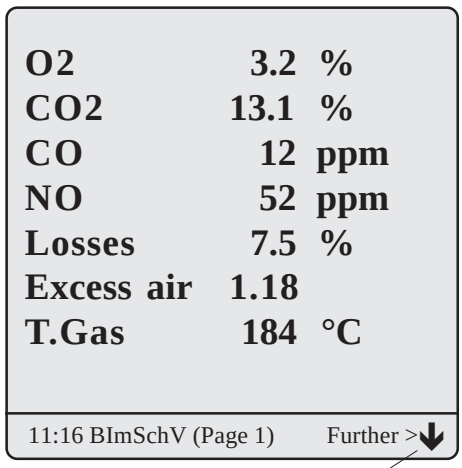




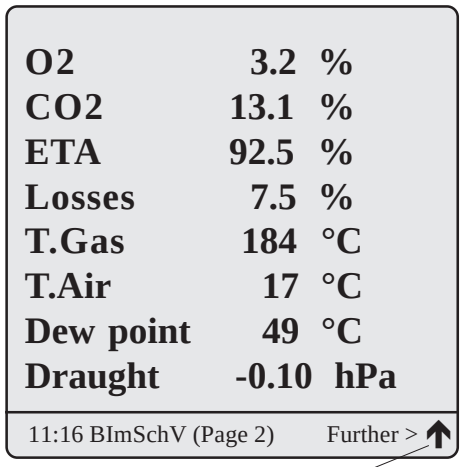
7. Flue gas measurement

7.1 Gas analysis

. Choose a probe suitable for the measurement application and measurement point and fix it at the measurement point and position the temperature sensor for sucking air.
. Check the proper fixation of all hose and connectors at the instrument and at the probe.
. If need be, connect a hose for the external air supply (if surrounding air is polluted and would cause erratic calibration values).
. Care for a collation of the condensation evacuated on the lower right side of the instrument.
. After 3 minutes calibration, the instrument will switch over to the measurement mode. The gas flow is switched in the instrument from "Fresh air" to "GAS" and after a short time delay of approx 20 seconds (time needed for gas transport to the sensors) the display shows the measurement values.
All measured and calculated values are displayed on 3 display windows (scroll using the arrow keys).



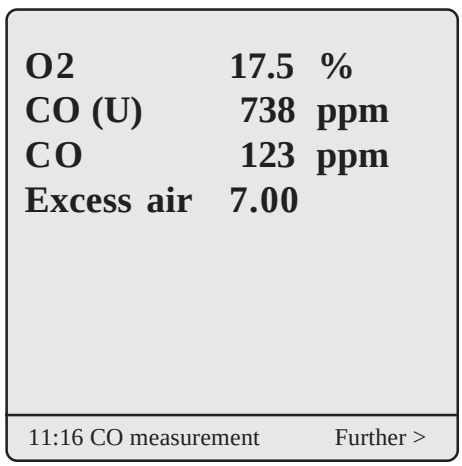
T-Gas dropping



T-Gas increasing

Please care for:
1.) Effectuate the measurement in the main stream core of the exhaust channel. The main stream core is the area where the highest gas temperature is found. A trend indication for T-Gas easies this determination.
As long as the arrow in the lower display part shows up, the temperature increases. It means the probe tip moves towards the main stream core.
If the arrow shows down, it means the probe is moved out of the main stream core and temperature sinks.
If no temperature alteration occurs during 3 seconds at a minimum, so the trend indication will disappear.

2.) Correct measurement values will be display after a short delay, necessary for gas transport to the sensor and the building-up of a stable electrochemical reaction at the sensors.
This time is between 1 and 1,5 minute. Wait for records, protocols and evaluation, until values do not change anymore.
If fluctuations higher than 2 ppm are still occurring, the reason could be unstable draught conditions within the exhaust channel, which issues a non-constant main stream core.
Check the draught indication. If this value fluctuates respectively is higher than - 0,20 hPa, so the correct mesurement is no more ascertained.



3.) CO_2, efficiency, losses, excess air and dew point are calculated values. They can only be calculated if realistic values are given for the basic parameters O_2 and the temperatures.
It must be ascertained that:

O_2 < 20,5 % and
T-Gas - T.Air > + 5 °C.

The dew point can be calculated with exactitude if in the menu **"Adjustments"** the current barometric air pressure value in inputed. This value cannot be determined by the FN.

The **rbr-ecom FN** enables the recording of 2 measurement per customer data record, whereby measurement 1 can be completed with information (draught, soot and boiler temperature).
If the measurement values are stable and the results can be documented, so press **<m>** to record them in the temporary memory (please pay attention to store separately BImSchV and CO safety check results). The data can be called up later on for a printout and if need be for a definitive data record storage.

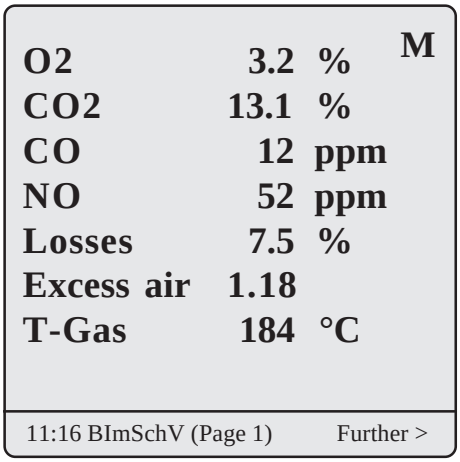
7.2 Difference pressure measurement

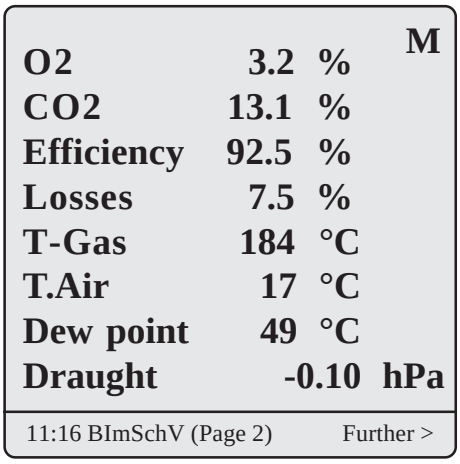
Already in the measurement values indication (BImSchV page 2) you got a trend indication of the draught conditions in the exhaust channels.
The value for the draught hasn´t been memorised with **<m>** as the pressure sensor, due to its sensitivity, tends to drift. Consequently it is advised for an accurate measurement to re-calibrate the sensor immediately before the measurement.

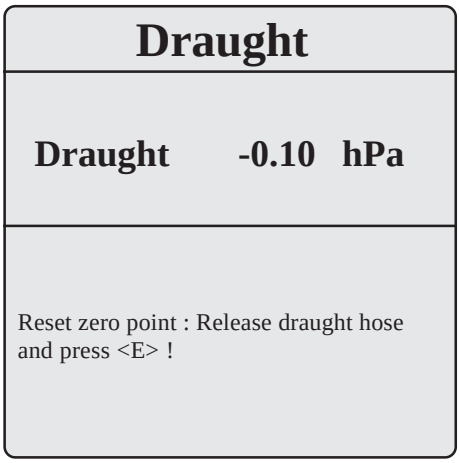
Start the measurement while selecting the menu **"Draught measurement"**. The display shows the current value as well as the calibration information. Hereto, separate the draught hose from the instrument (connector with 3 ringa) and press **<E>**. The sensor is re-calibrated.

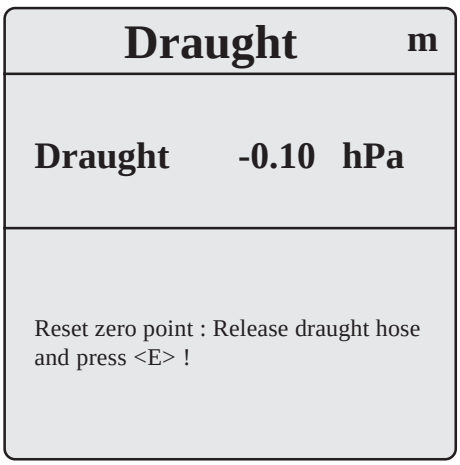
Re-connect the draught hose. The display shows the exact value which you can store while pressing **<m>** and add to those results already stored in the temporary memory.
The recorded value is displayed.

Press **<ESC>** to quit the draught measurement mode.







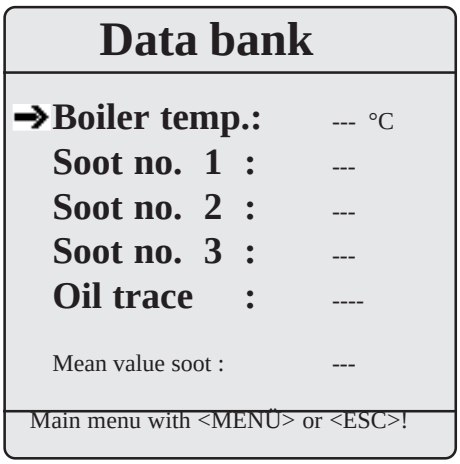


7.3. Inputs

The sub-menu **"Inputs"** enable the registration of measurement results like boiler temperature, soot number and oil trace.
Select the corresponding line and press **<E>**. The input for boiler temperature and soot number 1-3 can be made via the instrument´s keyboard (numerical function of single keys) or external keyboard one after the other. Press **<E>** again to store the value in data record 1.
An oil trace found on the filter paper (sign of incomplete combustion) can be documented as follows:

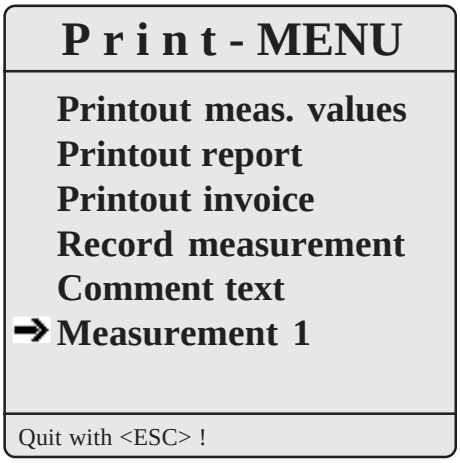
- move cursor on **"Oil trace",**
- press **<E>** to adjust result
  (**"No", "Yes" or "- - - -"**)

Press **<ESC>** once all inputs are made to quit this submenu. Measurement is now complete.



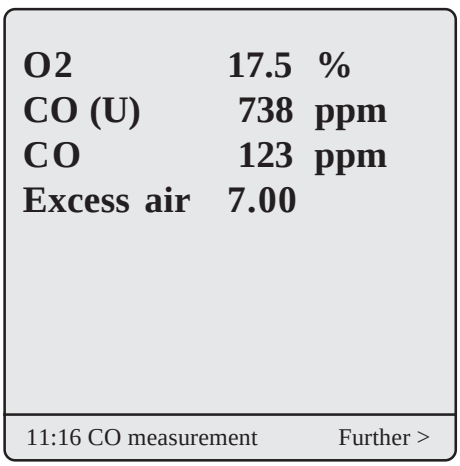
7.4. Measurement 2

In case of need (multistage plant) a 2nd mesurement can be performed. Press **<Print>** (or via **"Data bank"/"Print menu"**) to access the print menu. The lower line shows the adjusted measurement. Once measurement 2 has been activated (move cursor on lowest line and press **<E>** to switch on measurement 2), the measurement values vcan be determined and temporary stored as by measurement 1 (**Caution:** draught, soot and boiler temperature are **not** recordable for measurement 2).

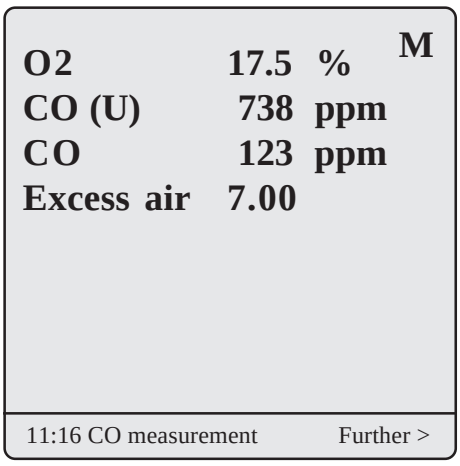


7.5. CO measurement (safety check)

The flue gas channel check, also called CO measurement, is the specific control of said channel by gas-fired plants, performed under safety aspects.
The CO content is measured in the flue gas channel after the gas has been enriched with surrounding air and is converted in an undiluted value (residual oxygen content in combustion gas = 0%). As the gas behaviour after air addition is no longer homogenous due to secondary air, and the main stream core determination can be erratic, this gas analysis is performed accross the whole diameter of the exhaust pipe.

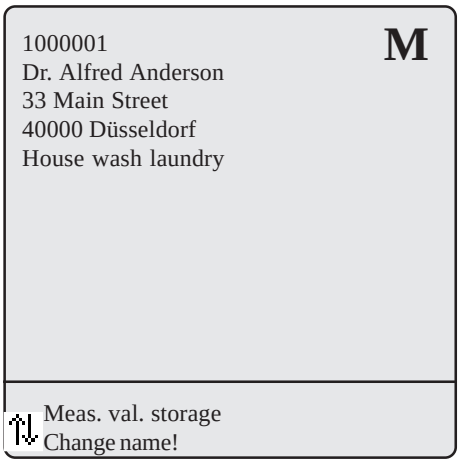


A multi-hole probe (optional accessory) is the ideal sampling tool hereto. The calculated CO value shown by "**CO 0.0%**" corresponds to the measured CO content, supposing that in the same gas volume the 02 content is 0%. This is consequently the undiluted CO content in the flue gas. Once the measured value is stable, press < **m** > in order to transfer the value in temporary storage.



7.6. Store measurement on RAM card

Once the gas analysis is completed, the determined values stored in the temporary memory can be correlated to the customer (storage on RAM card).
Press **<Print>** (or via **"Data bank"/"Print menu"**) to access the print menu.
Select **"Record measurement"** and press **<E>**. The stored values are displayed.
If you need to check customer address, measurement 1 and measurement 2, call these data up with the arrow keys. Press **<m>** (instrument´s keyboard) to correlate the results to the customer (storage on RAM card). By successful storage **"M"** is displayed on the upper right corner of the display.
Press **<ESC>** to turn back to **"Print menu"**.
Important: Only data stored on a RAM card can be transferred to the Voksy® programme!



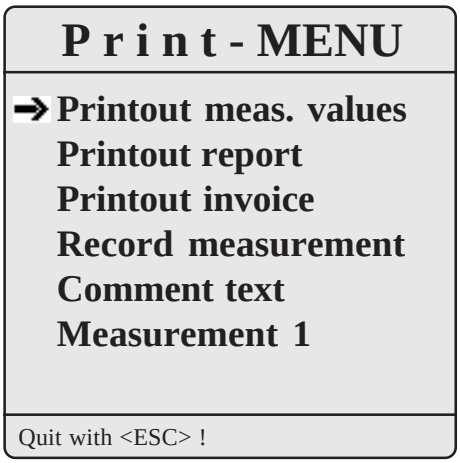
8. Printout

The **"Print menu"** enables the following printouts (select line and press **<E>**):

- Measurement values (see page 16):
  only the measurement values of the measurement selected in the print menu (with comment text 2 x 20 characters, if stored under **"Comment text"**) will be printed

- Report (see page 17):
  complete service report with measurement 1 + 2 (if stored) will be printed

- Invoice (see page 18):
  complete invoice with all inputed positions will be printed



William Benson
Heating and Plumbing

Company logo

Comment text
2 x 20 characters

Date: 08.12.99 Time: 14:37:29

Fuel type Fuel oil

EMISSION MEAS. (1) acc. 1. BImSchV

T. Air	17	°C
T. Gas	184	°C
T. Heat transfer medium	73	°C
Rest oxygen O2	3.2	%
Carbon monoxide CO	12	ppm
Carbon dioxide CO2	13.1	%
Efficiency	92.5	%
Losses acc. 1. BImSchV	7.5	%
Excess air Lambda	1.18	
Diff. pressure (DRAUGHT)	-0.10	hPa
Mean value soot	0.5	
Oil trace Oil trace Y/N	NO	

William Benson Heating and Plumbing
Bank name : EURO BANK Berlin
Bank code: 100 200 100 Account no.: 123 123
58640 Iserlohn-Sümmern Tel.: 02371-9455

Measurement full load

(Measurement 1 = load 1)

William Benson

Heating and Plumbing

Company logo

Report no. 1234567 of 08.12.99

Document issued at 14:33 with flue gas analyser rbr-ecom FN Nr. 47/349

Bank data : EURO BANK Berlin
Bank code 100 300 100 Account no.: 123 123
58640 Iserlohn-Sümmern Tel.: 02371-9455

Company address

Customer no.: 1000001
Dr. Alfred Anderson
33 Main Street
40000 Düsseldorf
Stand: House wash laundry

Customer address

SERVICEREPORT

Order/Customer report: Check plant on trouble
Trouble constated....: Nozzle and filter soiled
Job made.....: Nozzle and filter changed
Service engineer.....: Frank Jones

Boiler.....: Buderus G 215 1998
Burner.....: Weishaupt WL 20 Z 1998
kW boiler....: 44 kW load: 40
Oper. stand: Full load Oil pres.: 20.0 bar Nozzle: 1,00/60H Perfor.: 3,6 kg/h
Oper. stand: Partial load Oil pres.:12.0 bar Nozzle: 1,00/60H Perfor.: 2,8 kg/h

Plant description with adjustment data

08.03.00 FLUE GAS ANALYSIS 14:37 Full load Fuel type: Fuel oil

Combustion air temp. in sucking area	17°C
Heat trasnfer medium temp. during analysis	73°C
Flue gas temp. meas. in stream core	184°C
Oxygen content (O2) in stream core	3.2% Vol.
Carbone dioxide content (CO2) calculated out of O2 & CO2max	13.1 %Vol.
Carbone monoxide (CO) parts per million	12 ppm
Excess air calculated out of O2 & CO2max	1.18 Lambda
Pressure diff. (Location -> Exhaust system)	-0.10 hPa
Average soot dot out of 3 meas.	0.5 scale
Oil trace test Oil trace Yes/No	No
Efficiency calculated (ETA)	92.5 %
Flue gas losses acc. to 1. BImSchV	7.5 %

Measurement full load
(Measurement 1 = load 1)

08.03.00 FLUE GAS ANALYSIS 14:38 Partial load Fuel type: Fuel oil

Combustion air temp. measured in sucking area	18 °C
Flue gas temp. in stream core	166°C
Oxygen content (O2)in stream core	4.0 % Vol.
Carbone dioxide (CO2) out of O2/CO2max	12.5% Vol.
Carbone monoxide (CO) parts per million	30 ppm
Excess air calc. of O2 & CO2max	1.23 Lambda
Press. diff.(Location -> Exhaust system)	-0.10 hPa
Efficiency calculated (ETA)	93.0 %
Flue gas losses acc. to 1. BImSchV	7.0 %

Measurement partial load
(Measurement 2 = load 2)

Qty	SERVICE JOB	Qty	SERVICE JOB
1	Nozzle 0.5-30 Gal/h	1	OV Siku filter element
1	Sealing ring oil filter OV	60	Min. service engineer
10	Kilometre service car		

Service job

Burner exchange recommended

William Benson

Heating and Plumbing

Company logo

Report nr. 1234567 of 08.03.00
Document issue 14:33 with flue gas analyser rbr-ecom FN Nr. 47/349

Bank name: EUROPA BANK Berlin
Bank code: 100 200 100 Account no.: 123 123

58640 Iserlohn-Sümmern Tel.: 02371-9455

Company address

Customer number: 1000001
Dr. Albert Anderson
33 Main Street
40000 Düsseldorf
Stand: House wash laundry

Invoice address

INVOICE

Order/Customer report:	Check plant on trouble
Trouble constated.....:	Nozzle and filter soiled
Job made.....:	Nozzle and filter changed
Service engineer.....:	Frank Jones

Job report

Boiler.....:	Buderus	G 215	1998
Burner.....:	Weishaupt	WL 20 Z	1998

Qty	Material and labour	Price/pce	Total price
1	Nozzle 0.5-30 Gal/h	23.00 DM	23.00 DM
1	OV Siku filter element	10.70 DM	10.70 DM
1	Sealing ring oil filter OV	2.14 DM	2.14 DM
60	Min. service engineer	1.50 DM	90.50 DM
10	Kilometre service car	0.89 DM	8.90 DM
		net:	134.74 DM
		+ 16% VAT.:	21.56 DM
		Total invoice amount:	156.30 DM

Invoice

Payment: Bank charging
Bank charging accepted for invoice amount.
Your account: 123 456 7890 BLZ: 200 100 00
Bank charging will be processed with a 2% discount.

Payment mode

Come and visit our sanitary show with the last novelties!

Customer signature: _____

9. Adjustments

Adjustments	
➔ Unit	**ppm**
Undiluted	**NO**
Ref. O2	**0.0 %**
Air pressure	**1013 mbar**
Fuel type	
Set clock	
Paper clock	
Menu INTERNAL	
Main menu with <Menü> or <ESC>	

Additionally to the described functions of the **rbr-ecom FN**, several adjustments can be made in the instrument. Select the sub-menu **"Adjustments"** and confirm with **<E>**. You will get a selection list of alterable parameters, which are to be adjusted according to the application. Move the cursor on the desired line and call up or modify the adjustment with <**E**>.
Selection list:

Unit (adjustment upon **<E>**):
- Calculation of gas concentration in:
  - -ppm = volume concentration (parts per million)
  - -mg/m^3= mass concentration per volume unit
  - -mg/kWh= mass concentration per performance unit

Undiluted (adjustment upon **<E>**):
- Convertion of gas concentration into inputed rest oxygen
  (adjustment upon **"YES"**):
  - -Formula for convertion:

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

Reference O2 (input after pressing **<E>**):
- Input of residual oxygen content O_{2rel}

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

Fuel type (press **<E>** then select):
- Modification of adjusted fuel type
  (e.g. by mesurements at combi-plants)

Set clock (press **<E>** then input):
- Correction of internal clock

Paper feed (press **<E>**):
- Paper feed, one line

Menu INTERNAL (open menu with **<E>**):
- Further instrument´s adjustments (see next chapter)

10. Menu INTERNAL

Printout contraste (0..9) (press **<E> then input):**
- Contraste adjustment of printer

Key beep (adjust with **<E>**):
- Acoustical signal by key pressing

VAT (press **<E>** then input):
- Modification of VAT rate for calculation of total amount

Invoice number (press **<E> then input):**
- Adjustment of start invoice number
- Using the Voksy® Maintenance Management
  Programme the start of invoice number of the software and of the FN in order not to overlap.
  Example: In Voksy® the start invoice number is 10000, in the FN the start invoice number is 1. The FN can consequently print out 9999 invoices and transfer to Voksy®, before invoice number overlap.

Baud rate (adjustment upon **<E>**):
- Adjustment of transfer rate by data transfer via RS 232:

  - Use of lite Voksy® software:
    9600 Baud, RTS/CTS activated
  - Use of full Voksy® software:
    115200 Baud, RTS/CTS activated

RAM card 1 (adjustment upon **<E>**):
- Adjustment of total capacity RAM card 1 (slot 1)
- By using a RAM card, the latest must be divided in 2 fields:

  - Customer data (press **<E>** and then input):
    Example adjustment 448 kB (512 kB RAM card)
    1 customer ~ 1,5 kB; 448 kB ~ 300 customers
  - Item data (automatic):
    Adjustment depending on the number of customers
    Example adjustment 64 kB (512 kB RAM card)
    1 item ~ 0,05 kB; 64 kB ~ 1280 items

Menu INTERNAL

➔ Print contraste (0..9)	**5**
Key beep	**NO**
VAT :	**16.0 %**
Invoice no.	**001**
Baud rate	**9600 Baud**
RAM card 1	**4096 kB**
Customer data	**4032 kB**
Item data	**64 kB**
RAM card 2	**4096 kB**
Type	**SRAM card**

Main menu with <Menü> or <ESC>

Customer data

The maximal volume amounts 16384 kByte by a 16 MB RAM card. The rbr- ecom-FN fits the volume consequently!

Input :

448 **KByte**

Quit with <ESC> !

Special case 2nd RAM card
(Use only after consultation with you rbr-ecom dealer/ subsidiary!)

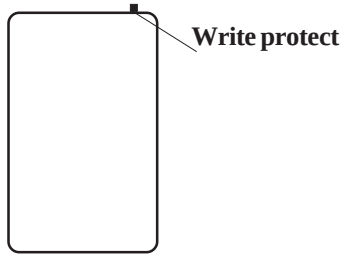
Using 2 RAM cards select the adjustment customers data = total capacity RAM card 1!

RAM card 2 (adjustment upon **<E>**):
- Adjustment of total capacity RAM card 2 (slot 2)
- Using 2 RAM cards, RAM card 1 will be used for customers data recording only.
The item data bank (selection tables and catalogues) will be recorded on RAM card 2.

Type (adjustment upon **<E>**):
- Selection of RAM card type for RAM card 2:
  - -SRAM card
  - -Flash card
  - -not used (**always adjust**, if no 2nd RAM card is used).

Important:
Using SRAM cards, the write protection should **not stand** on "Write Protect", otherwise no data record is possible on the RAM card!

SRAM card



View back side of RAM card

11. Menu Control

The electrochemical sensors for gas analysis wear out along the time and age. They modify their output values during the course of their use, depending on the gas concentration, the flow duration with sampled gas and the gas purity.
The programme controls the sensors and corrects drifts. If these drifts and the correlated measurement error is too high, so an error message is then displayed. In this case, the corresponding sensor must be exchanged by an authorised service center.
The control menu displays the current state values of the sensors and additionally:

- the battery voltage (loading state),
- the operation hours since the initial operation,
- the serial number,
- the telephone number of the next service center,
- the day of initial use.

CONTROL

O2	1005	mVolt
CO	2	mVolt
NO	-1	mVolt
Zug	-34	mVolt
Batt	12.34	Volt

Operation hours	:	25.11 hrs
Serial number	:	FN 1
Service tel. no.	:	02371/945-5
Initialisation	:	13.12.99

12. Data transfer

Only use an RS 232 connection cable provided by **rbr-Compurtertechnik GmbH for data transfer** (9-pin; 1 to 1 occupied).

12.1. Initialisation for Voksy® software

Prior to data transfer start Voksy® software/rbr-ecom FN, initialise the FN for this application.
Proceeed as follows:
- store the item catalogues to be transmitted first in the Voksy® software (see Voksy® software manual),
- copy the directory "FNKATALG" from the diskette (Laufwerk A:\FNKATALG) on your fixed-disk (C:\FNKATALG)
- switch into "DOS mode" (MS-DOS input)
- call up the directorty C:\FNKATALG on (cd FNKATALG ; Return)
- call up the programme thru input of "Start" and pressing "Return",
- select the first menu point "Edit spares catalogues" and confirm with "Return"
- assign the catalogue description you inputed in the Voksy® software the corresponding catalogue (activate the line "Catalogue description" with "Return"; make input; quit input with "Return"; answer question with "Y")
- quit the editing mode with "F10" after all inputs have been made,
- create a new transfer file (select menu point "Create new transfer file for rbr-ecom FN" and activate with "Return"),
- check the inputs made (select menu point "View transfer file for rbr-ecom FN" and activate with "Return"),
- transfer the file via COM1 or COM2 (select corresponding menu point and activate with "Return"; follow display instructions),
- quit the programme after completed transfer (select menu point "Quit programme" and activate with "Return")

12.2. Conditions for data transfer

The following points must be observed to guarantee a frictionless data transfer between the rbr-ecom FN and the Voksy® software:

- the FN must be initialised for the Voksy® software,
- date and date must be correctly adjusted on both PC and FN,
- the RAM cards adjustments must be made correctly (see § **"Menu INTERNAL"**),
- the interface adjustment in Voksy® and FN must match:

    - use of Voksy® software: 115200 Baud, RTS/CTS activated.

13. Menu Communication

This menu covers functions for data transfer and data care. According to the application, only some functions will be usable or worth to be used:

No use of Voksy® software
Please use only the function **"Modify item data bank"**.

Use of Voksy® software
Please use only the functions **"Load customers data"**, **"Send customers data"** and **"Load item data bank"** for data transfer.
Please pay attention to delete all customers data or item data stored in the rbr-ecom FN before loading customers/items data from the Voksy® software (answer question with **"YES"**).

Use of Voksy® software with RAM card reader module
Please use only the function **"Simulation RAM card reader"** for data transfer.

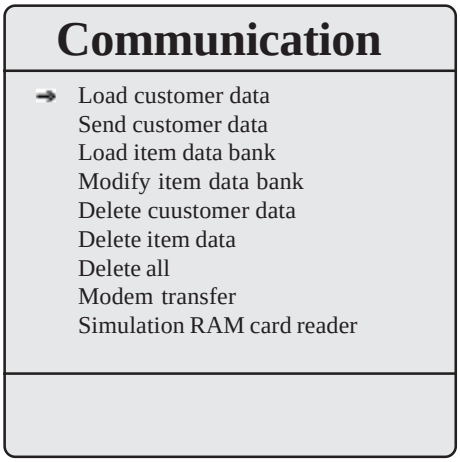
13.1. Deleting functions

- Delete customers data
All stored customers and corresponding measurement results (service reports) will be deleted.
- Delete item data
All selection tables and catalogues will be deleted.
- Delete all
All data will be deleted on the RAM card.

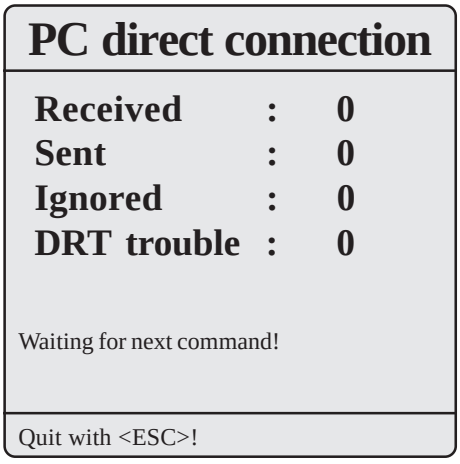
Caution!
Press these functions only if you´re sure that the corresponding data should be deleted from the RAM card!

13.2. Modem transfer

An analogue Modem can be monitored by the **rbr-ecom FN** in order to realise a data remote transfer (DRT).
After initialisation of the Modem (follow manufacturer instructions) and input of selection command (depending on telephone system), the transfer can take place via the menu point **"Start"**. As an especially tailored receiving programme is required for use, please consult in case of interest your **rbr-ecom** dealer/subsidiary.



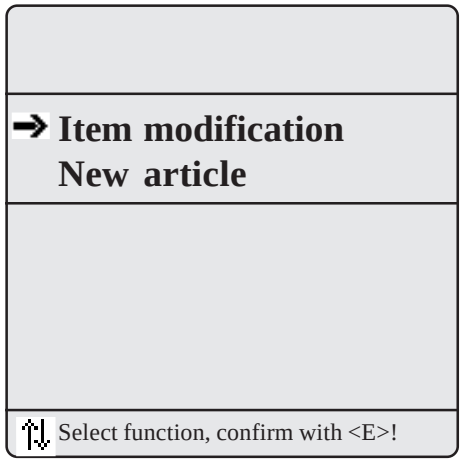
Function **"Simulation RAM card reader"**



13.3. Modify item data bank

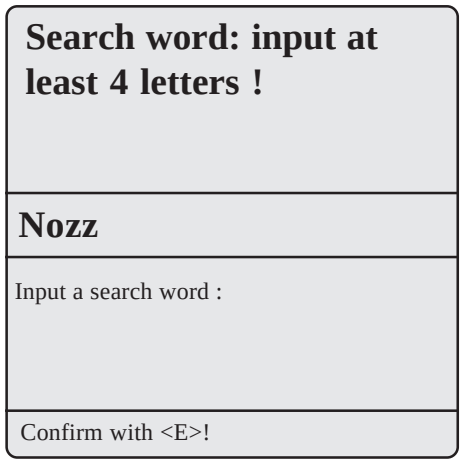
Select "**Modify items data bank**" and press **<E>**.

If you want to modify one item only, so confirm "**Item modification**".

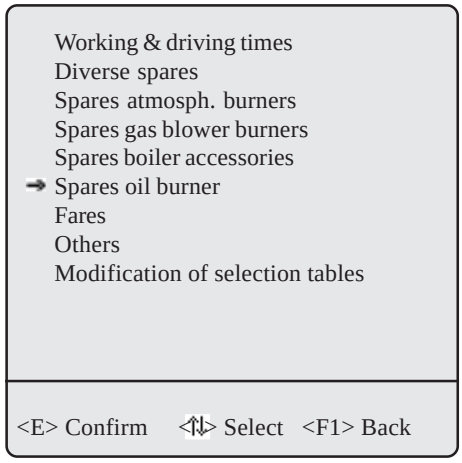


On the subsequent display window you will be required to input at least 4 characters.
This search machine is a so-called **Text-in-Text-Search**. It means that you can input the first 4 letters, the last 4 letters or 4 coherent letters of a search word.

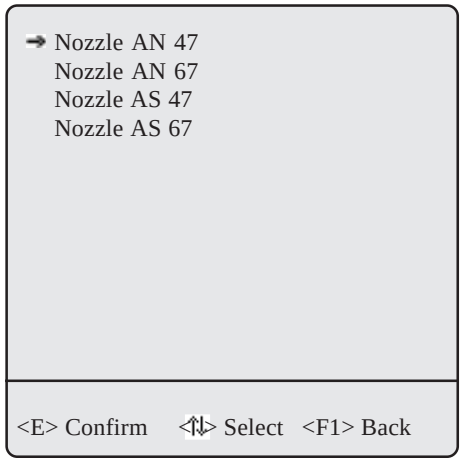
Input 4 letters of the search word you´re looking for (e.g. "Nozz" for nozzle) and press **<E>**.



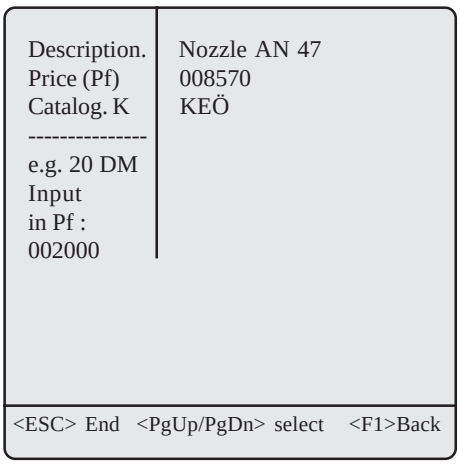
Decide if this item is belonging to the 8 catalogues or to a text of the selection tables (as in example: spare for oil burner).
You will find an overview of the selection tables and catalogues on the next page.
Once your selection is made (**arrow keys** + **<E>**) all words matching with the search input will be displayed.



Search the item to be modified and press twice **<E>**.



The following window is displayed.



You can now modify the item text or the price.

To store a new item, move the cursor in the menu point **"Modify item data bank"** on **"New item"**.
Press **<E>** to access the input mask. Input the desired text, the price and the catalogue group respectively selection table.
Press 3 times **<ESC>** to turn back to the main menu.

Please observe!
By new record or modification of an item, it is most important to input respectively to keep the correct description of the catalogue or the selection table.
Only if the correct description is made for the item to modify or to store as new, it is ascertained, that the required input is made in the corresponding selection table.
By searching for the catalogue, please care for capital or small letters.

Selection tables

Group	Description
001	ZIP code/City
002	Location
003	Boiler manufacturer
004	Manufacturing year
005	Burner manufacturer
006	Boiler type
007	Burner type
008	CDP works
009	Measurement on load
010	Oil burner nozzle
050	Trouble message
051	Trouble identification
052	Troubleshooting
053	Remark text for service report
054	Remark text for invoice
055	Service engineer
056	Orderer
057	Payment

Catalogues

Group	Description
KAR	Working & driving times
KED	Diverse spares
KEK	Spare boiler accessories
KEA	Spares atmosph. burner
KEG	Spare gas blower burner
KEÖ	Spare oil burner
KPA	Fares
KSO	Others

14. Selection tables

Selection	Catalogue
21220 Amelinghausen	001
21250 Dohren	001
21320 Eckel	001
21334 Hausbruch	001
21350 Nenndorf	001
21440 Reindorf	001
21650 Seevetal	001
21770 Wulfsen	001
acc. to invoice address	002
Cellar	002
House wash laundry	002
Ground floor	002
Brötje	003
Buderus	003
Dietrich	003
Domotherm	003
Ferroli	003
Fröling	003
Hoval	003
PaKü	003
Schäfer	003
Strebel	003
Vaillant	003
Viessmann	003
Weishaupt	003
Wolf	003
1984	004
1985	004
1986	004
1987	004
1988	004
1989	004
1990	004
1991	004
1992	004
1993	004
1994	004
1995	004
1996	004
1997	004
1998	004
Brötje	005
Buderus	005
E-Klöckner	005
Elect.-Oil	005
Giersch	005
Hansa	005
Hofamat	005
Hoval	005
Körting	005
MAN	005
OERTLI-Ro.	005
Olymp	005
Riello	005
Thyssen	005
Weishaupt	005
G105	006
G115	006
G205	006
Typ Hoval	006
KL 20	007
RE 1.0	007
RE 1.0 LN	007
Typ Hoval	007
WL 10	007
WL 20	007
BH+KR	008
BH+KR+T	008
Bl	008
Bl+KR	008
Bl+KR+T	008
BK	008
BK+T	008
1st. step	009

Selection	Catalogue
2nd. step	009
Partial load	009
Full lioad	009
0,40/45S	010
0,40/60E	010
0,40/60H	010
0,40/60S	010
0,40/80H	010
0,50/45S	010
0,50/60E	010
0,50/60H	010
0,50/60S	010
0,50/80H	010
0,50-45	010
0,60/45S	010
0,60/60E	010
0,60/60H	010
0,60/60S	010
0,60/80H	010
0,65/60E	010
0,65/60H	010
0,65/80H	010
0,75/45S	010
0,75/60H	010
0,75/60S	010
0,75/80H	010
0,85/45S	010
0,85/60H	010
0,85/60S	010
0,85/80H	010
1,00/45S	010
1,00/60H	010
1,00/60S	010
1,00/80H	010
1,10/60H	010
1,10/80H	010
1,25/45S	010
1,25/60H	010
1,25/60S	010
1,25/80H	010
1,50/45S	010
1,50/60S	010
Plant disturbed	050
Plant off (no further info)	050
Automatic is out of order	050
Burner disturbed	050
Burner buffers	050
Noise coming up	050
Heating and water don´t warm up	050
Heating doesn´t warm up	050
Initiation	050
Heating fuse fails down	050
Tank emptied	050
Circulation pump defect	050
Maintenance	050
Water doesn´t warm up	050
Automatic defect	051
Automatic misadjusted	051
Burner defect	051
Burner doesn´t ignate	051
Nozzle and filter soiled	051
Nozzle soiled	051
Filter soiled	051
Main switch off	051
Air in the plant	051
Not enough fuel oil	051
Circulation pump defect	051
Burner main revision	052
Burner control check	052
Boiler cleaning	052
Boiler cleaning (chemical)	052
Boiler / exhaust pipe tightened	052
Burner checked, defect parts exchanged	052
Burner verified	052

Selection	Catalogue
New oil burner installed and adjusted	052
Draught regulator installed	052
Circulation pump exchanged	052
Quick exhauster exchanged	052
Extension container exchanged	052
KFE cock exchanged	052
Automatic adjusted	052
Automatic repaired	052
Burner inspection	052
Burner retrofitted on lower performance	052
Boiler sucks secondary air	053
Burners has (further) defects	053
Burner exchange recommended	053
Automatic is defect	053
Exhaust pipe defect, exchange necessary	053
Chimney draught too high	053
Installation of draught regulator recommended	053
Warranty period is over	053
Oil supply is not OK	053
Installation of one -line system recommended	053
Tank cleaning recommended	053
Please call regarding order submission	053
Plant switched off because of danger	053
Boiler cleaning necessary	053
Labour and driving acc. to maintenance contract	054
Works under warranty	054
No charging due to good will	054
Warranty period is over	054
Trouble source due to handling	054
Plant has (further) defects	054
By question reg. the invoice please call	054
Plant switched off because of danger	054
Service contract recommended	054
Payment with cheque no.	054
Frank Allison	055
Jim Smith	055
Harry Windslow	055
William Sotheby	056
Miss	056
Mister	056
Tenant	056
see receiver	056
Until:	057
In 2 rates	057
Received in cash!	057
Within 14 days!	057
Cheque payment	057
AZE Working-day normal time	002220KAR
AZE Overtime before 8.00 pm	002400KAR
AZE Overtime after 8.00 pm	002600KAR
AZE Overtime Sunday	002800KAR
AZE Overtime public holiday	003050KAR
FZE Working-day normal time	001820KAR
FZE Overtime before 8.00 pm	002000KAR
FZE Overtime after 8.00 pm	002200KAR
FZE Overtime Sunday	002400KAR
FZE Overtime public holiday	002650KAR
Oil-level gauge	001850KED
One-line system oil filter	004100KED
Two-line system oil filter	003030KED
Filter element Siku	000195KED
Filter element Niro	000425KED
Filter element Filz	000190KED
Quick-acting gate valve 8mm	002210KED
Quick-acting gate valve 10mm	002440KED
Quick-acting gate valve 12mm	002870KED
Foot valve 3/8"	000880KED
Foot valve 1/2"	000990KED
Gland screw 1"x8/10	001040KED
Ventilation cap 1 1/2"	001220KED
Filling tube cap 2"	001620KED
Limit transmitter	003225KED
Flexo block 1 1/2"	009720KED
Lift protection valve	009850KED
Leak detector spray	001060KED
Burner cleaner	000790KED
Chimney draught controller	003675KED

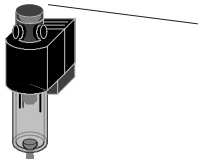
Selection	Catalogue
Manometer 0-4 bar	001185KEK
Manometer shut-off valve	000270KEK
Safety valve 2,5 bar	001340KEK
Safety valve 10 bar	001340KEK
Thermometer 63 mm	001530KEK
Quick-exhauster	000870KEK
Stop valve	000140KEK
Control thermostat	009000KEK
Safety temp. limiter	008500KEK
Thermoelement TE-600	000715KEA
Thermoelement	001950KEA
Combi-valve V 4600	016720KEA
Combi-valve V 4400	022800KEA
Combi-valve V 4610	017630KEA
Combi-valve V 4635	028240KEA
Piezo ignitor	003610KEA
Gas filter 1/2 „	007000KEA
Gas filter 3/4 „	007100KEA
Gas filter 1 „	011000KEA
Gas pressure controller 1/2 „	009600KEA
Gas pressure controller 3/4 „	009600KEA
Gas pressure controller 1 „	011700KEA
Gas pressure watcher	008730KEA
Gas switch valve 1/2 „	000740KEA
Gas switch valve 3/4 „	001070KEA
Gas switch valve 1 „	001530KEA
Gas counter conn. plate 1"	003660KEA
Surface burner	KEA
Gas meter 1 „	045700KEA
Gas pressure controller 1 „	025000KEA
Manometer 1/2"	010800KEA
Push-button gauge-cock 1/2"	003400KEA
Flue gas temperature sensor	KEA
SAT. firing automaton MMI	020930KEG
SAT. firing automaton MMG	025970KEG
Light sensor UVZ 780	013830KEG
Ionisation electrode	001130KEG
L & G automation LFM	032200KEG
Light sensor UV RAZ	015200KEG
Univers. ignition trafo	008260KEG
Ignition electrodes	000450KEG
Air pressure controller	KEG
Gas pressure controller	KEG
Gas electrovalve 1/2 „	KEG
Gas electrovalve 3/4 „	KEG
Oil nozzle exchanged	001800KEÖ
flex. oil hose 1000 mm	001200KEÖ
Oil preheater	010300KEÖ
Oil pump AN 47	008570KEÖ
Oil pump AN 67	009830KEÖ
Oil pump AS 47	010250KEÖ
Oil pump AS 67	012650KEÖ
Eckerle pump	013500KEÖ
Cover seal	000140KEÖ
Pump sifter	000410KEÖ
L & G automaton LOA 21	006150KEÖ
L & G automaton LOA 25	011100KEÖ
Light sensor QRB	001600KEÖ
DANFOSS automaton BHO 62	006900KEÖ
DANFOSS automaton BHO 64	013100KEÖ
SATRONIK automaton TF 801	005450KEÖ
SATRONIK automaton TF 804	006010KEÖ
Univers. ignition trafo	008260KEÖ
Ignition electrodes	000450KEÖ
Double electrode	000650KEÖ
Electrovalve 1/4 „	003430KEÖ
Journey rate	001000KPA
Emission measurement	002500KPA
Initiation oil burner	020000KPA
Initiation gas burner	018000KPA
Initiation gas boiler	016000KPA
Small material	000500KPA
Maintenance oil burner	022000KPA
Maintenance gas burner	020000KPA
Maintenance gas boiler	018000KPA
Cash payment discount	- 500KSO
Cash payment discount	- 1000KSO

15. Maintenance advices

We recommend to have your instrument serviced by an authorised and qualified service center one time a year respectively after 500 operation hours at a maximum in order to check and clean sensors and inner hoses.
Do not use any part not provided by us and consider that service works done by other service centers than those appointed by us cancel any warranty.
The following advices for the daily maintenance of single parts and sub-assemblies may be of help:

The instrument is fitted with filters for the protection of the sensors and gas-leadings parts which need a regular check. These are:

Fine dust filter on the gas cooler
Unscrew the lid of the gas cooler and check the particle filter. It should be changed when the filter is dark grey/black where the gas comes in (soot number approx. 2-3).



C) SO2/NOx filter
In the tubing leading to the CO sensor on the rear of the instrument, there is a chemical filter for filtering SO2 and NOx out of the flue gas. The filter material is manganese VII oxide granules and should be changed once it has turned grey (colour change : pink > brown > black > grey > white).

Sensors
After switching on the instrument, the sensors are calibrated with fresh air. The instrument constantly checks the sensor status. New sensors age due to the reagents being used up (oxygen sensor) or due to dirt or being exposed to concentrations above their standard range (toxic gas sensors). The initial values for sensors in check mode are :

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

These values are relative values created by the instrument´s programme. The check mode <CTRL> for the toxic gas sensors should show a value < +/- 150 mV. If not, the calibration should be repeated. If an error occurs during calibration and does not disappear after repeating the calibration several times, the instrument should be sent in for servicing.

The oxygen sensor should show a value > 200 mV. If this is not the case, it should be exchanged.

The sensors have a programmed limit value which exceeding releases a magnet valve leading fresh air to the sensor(s). This value is 4000 ppm for the CO sensor, for other toxic cells (so far fitted) it corresponds to the measurement range end value.

Mains supply

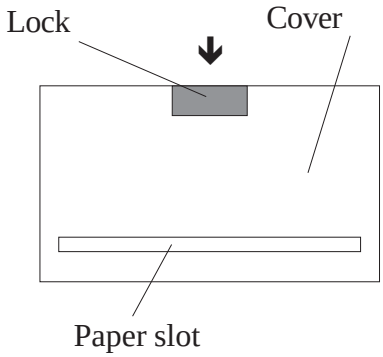
Rechargeable batteries are used for mains free operation. The batteries have a capacity of 1.2 Ah and the length of use depends on the operating mode. The batteries are recharged by plugging the instrument into the mains (charge time approx. 10 hours). Switching on is not necessary. The batteries should be recharged once the voltage display reads less than 11 V (the critical point is 10.5 V after this the instrument will not function).

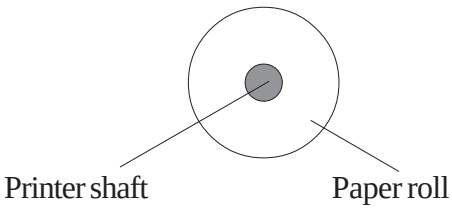
Probe and sampling hose

The tubing and the probe should be cleaned regularly, depending on use, thus in order to remove dirt and to avoid wear due to corrosion taking place. The coaxial probe can be dismantled by unscrewing the outer tube. The inner tube is connected to the grip. The thermocouple is permanently attached to the grip. The tubing can be cleaned after removing it from the connections on the instrument and probe (use warm water and then dry or blow dry).

Change paper roll

Release the box cover (press lock forwards) and pull out residual paper from the printer (**"Adjustements"/"Paper feed"/<E>**). Extract the printer shaft and put the new roll on the shaft. Insert the paper roll end through the slot. Forward the paper (approx. 10 cm) through the printer (**"Adjustments"/"Paper feed"/<E>**). Place the paper roll in the box (printer shaft in the designed guidance mechanism) and re-position the cover (lead paper through the slot).





16. Technical data

General data

Power supply:	Power pack primary: 230 V~ / 50 Hz secundary: 18 V - / 1A Batteries 2 x 6 V / 1,2 Ah (lead).
Display:	17-line backlit LCD display.
Admissible surrounding temperature:	+ 5 bis + 40 °C
Admissible storage temperature:	-20 to +50°C

Accessories and options

RAM card (PCMCIA norm)

RAM card reader **rbr-ecom M+**

Undercase for additional storage

Multi-hole probes set (142, 172, 182, 205 mm, d = 6 mm)

T-Room probe

Remote control devices **rbr-ecom Z** or **rbr-ecom Z^{mini}**

Dimensions and weight

Standard transport case (W x L x H): 530 x 260 x 300 mm approx. 11 kg

with undercase 530 x 260 x 505 mm ca. 12,5 kg

Measured values

Parameter	Range	Principle	Sensor	
O2	0 ... 21 Vol.-%	electrochemical	C/N	
CO	0 ... 4.000 ppm	electrochemical	A3E/F(G)	
NO	0 ... 2.000 ppm	electrochemical	3NF/Fs	(Option)
Draught	0 +/- 20 hPa	DMS bridge	SCX01DNC	
T-Gas*)	0 ... 500 °C		Thermocouple NiCr/Ni comp. with TSF102GF2	
T-Room	0 ... 99 °C		Semi-conductor TSF102GF2	

Calculated values

Parameter	*Calculation*	*Resolution*	*Formula*
CO_2	0 - CO_{2max}	0,1 %	$CO_2 = CO_{2max} * \left(1 - \frac{O_{2measured}}{21}\right)$
Losses	0 - 99,9 %	0,1 %	$q_A = \left(\frac{A2}{21 - O_2} + B\right) * (T_{Gas} - T_{Air})$
Efficiency	0 - 99,9 %	0,1 %	$ETA = 100 - q_A$
Excess air	1 - *l*	0,01	$\lambda = 1 + \frac{O_2}{21 - O_2}$

Fuel types acc. to 1. BImSchV
CO2max. values and factors

Fuel type	**A1**	**A2**	**B**	**CO2max**
Fuel oil (B)	0,50	0,68	0,007	15,4
Natural gas (B)	0,37	0,66	0,009	11,8
Town gas (B)	0,35	0,63	0,011	11,7
Coke oven gas (B)	0,29	0,60	0,011	10,2
Liquid gas (B)	0,42	0,63	0,008	14,0

Conversions and factors (ppm - mg/m3)

Gas	ppm in mg/m3	mg/m3 in ppm
O2	1,429	0,699
CO	1,25	0,8
NO	1,34	0,75
NOx	2,05	0,49

Dew point calculation

The dew point calculation uses the calculation method with approximate formula acc. to DIN 4705 part 1.

Humidity content of combustion gases in %

$$\chi_{H_2O} = \frac{100}{1 + \frac{f_W}{CO_2}} + 1{,}1$$

f_W is a fuel type specific factor

Natural gas = 57
Town gas = 53
Liquid gas = 77
Fuel oil = 111

Calculation steam partial pressure in Pa

$$P_D = \frac{\chi_{H_2O}}{100} * P_{Luft}$$

P_{Air} = atmospheric air pressure (900...1100 mbar)

Dew point calculation in °C

$$TP = \frac{4077{,}9}{23{,}6448 - \ln P_D} - 236{,}67$$

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