

Portable Coulometric Analyser for Ascorbic Acid

C-Vit

Users Manual

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Notes on operation

Dropping the device or subjecting it to strong impacts may result in faulty performance. Handle the analyser with care.

The analytical instrument is not designed to be waterproof. The use of the analyser where water splashes may result in faulty operation and/or in short-circuit.

Never remodel the analyser. Istran will not be responsible for any damage of any kind which is caused by the user remodelling the instrument.

Injecting samples containing solid particles without proper filtering may clog irreversibly the electrode.

Application

The PCA **C-Vit** is used for the determination of ascorbic acid in beverages, foods, food additives, fruits, vegetables.

Concentration range in the measured solution: 0.1 to 500 mg/L.

The concentration range in the analysed sample depends on its dilution degree.

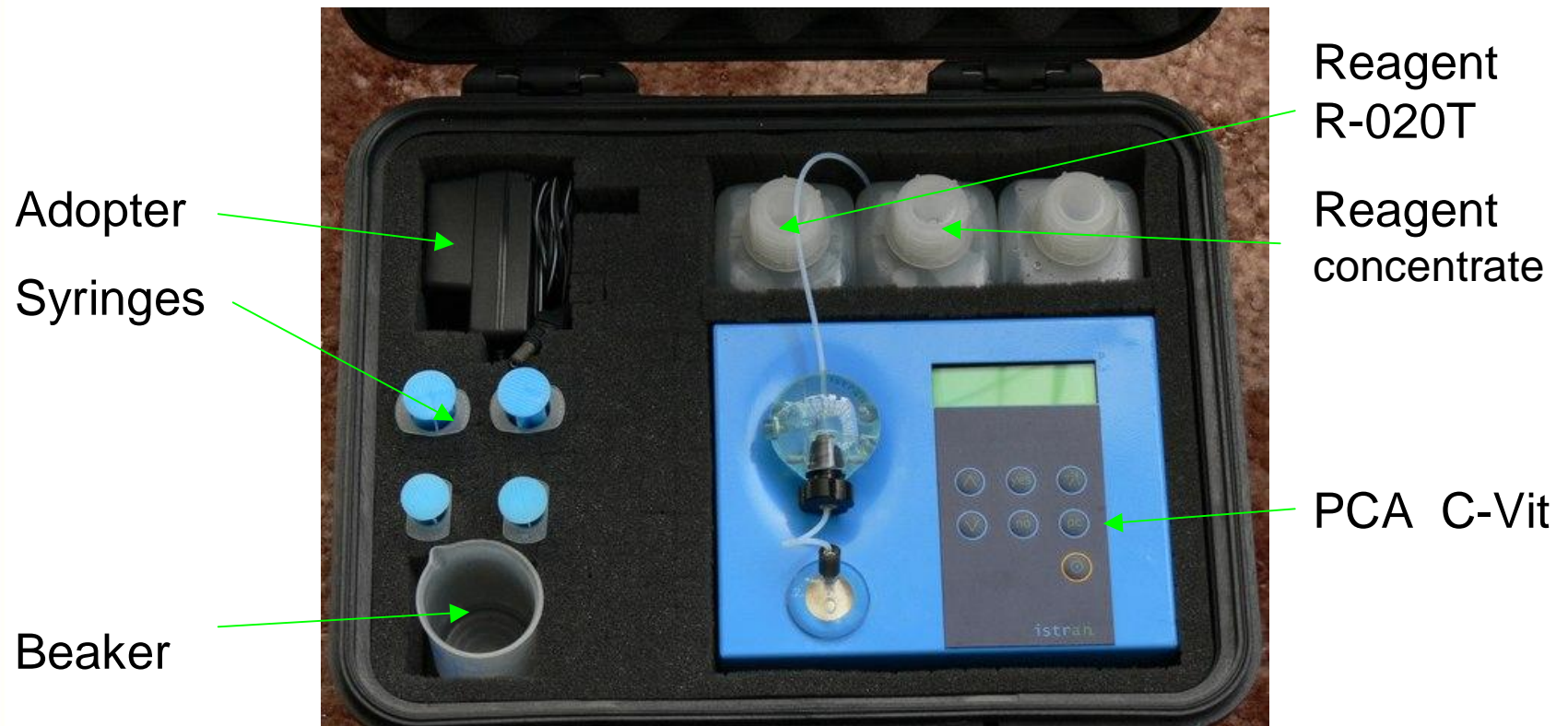
Operation Principle

Ascorbic acid is measured by its direct electrochemical oxidation to dehydroascorbic acid in the pores of the electrode. The duration of oxidation is measured and evaluated. This time is proportional to the ascorbic acid concentration in the sample and is used for the evaluation of the result by making use of a built-in calibration curve.

The slope of the calibration curve can be checked by recalibration with a standard solution containing 50 mg/l ascorbic acid.

Description

Instrument Kit



Instrument

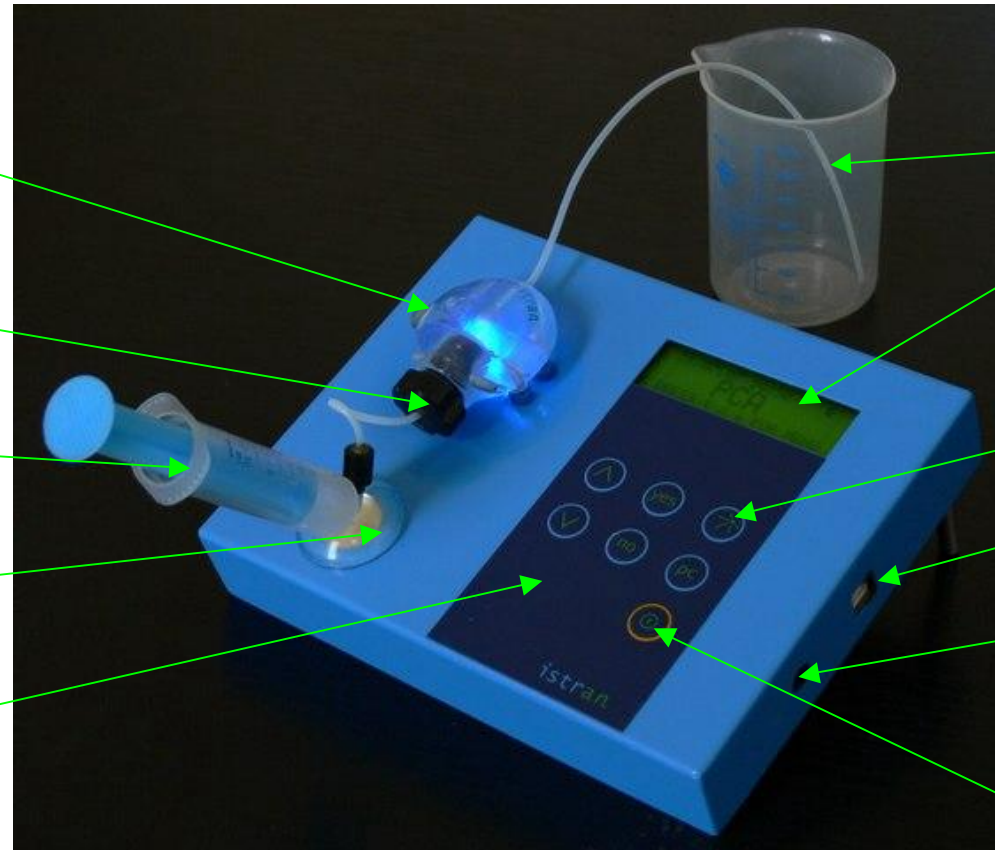
Cell with electrode

Electrode holder

Syringe

Injection port

Keyboard



Waste

Display

Backlight

USB port

Adopter

ON/OFF

Display

Date

Time

Battery status

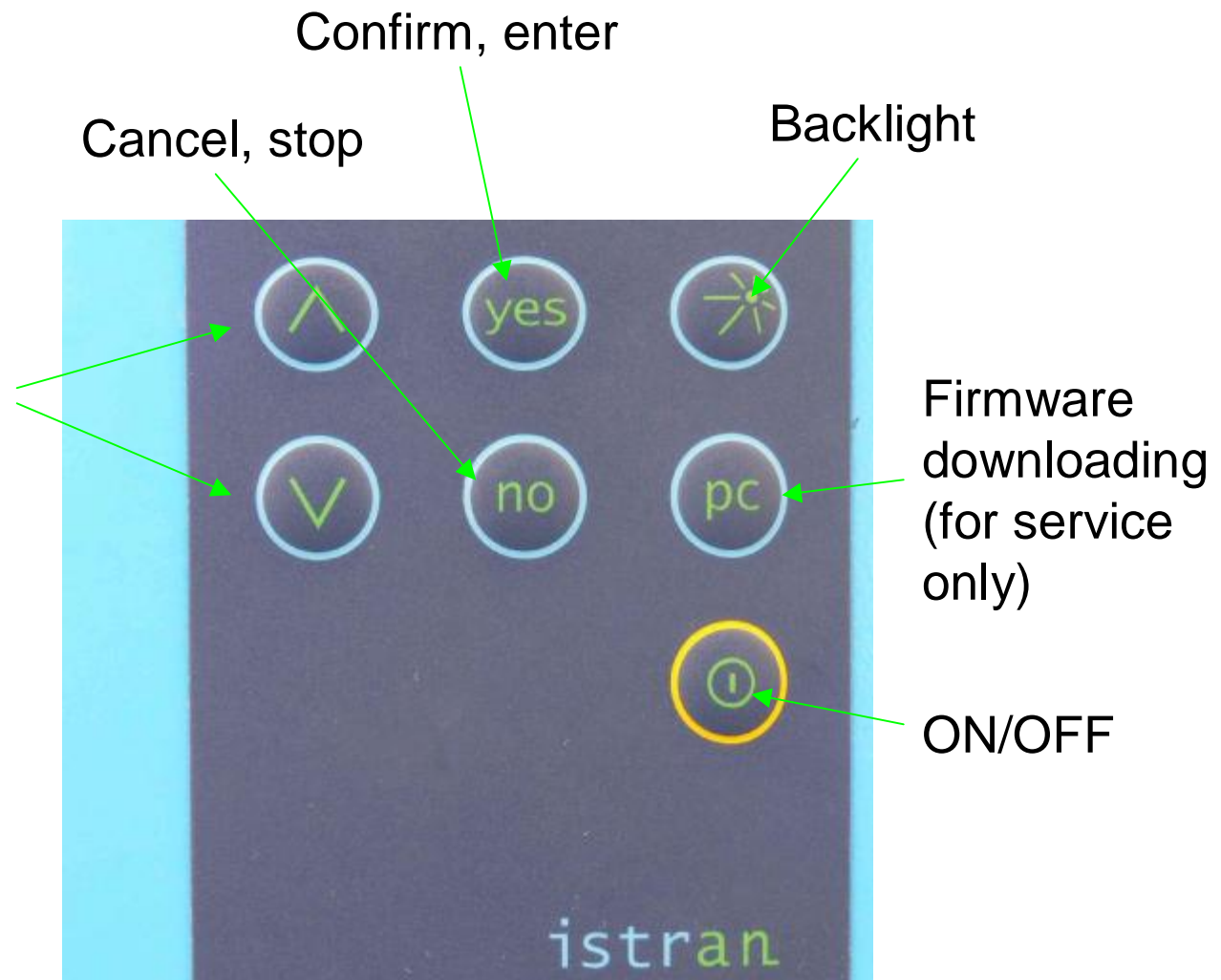


Main menu, results

Info line

Keyboard

Change menu item, listing the results



Cell

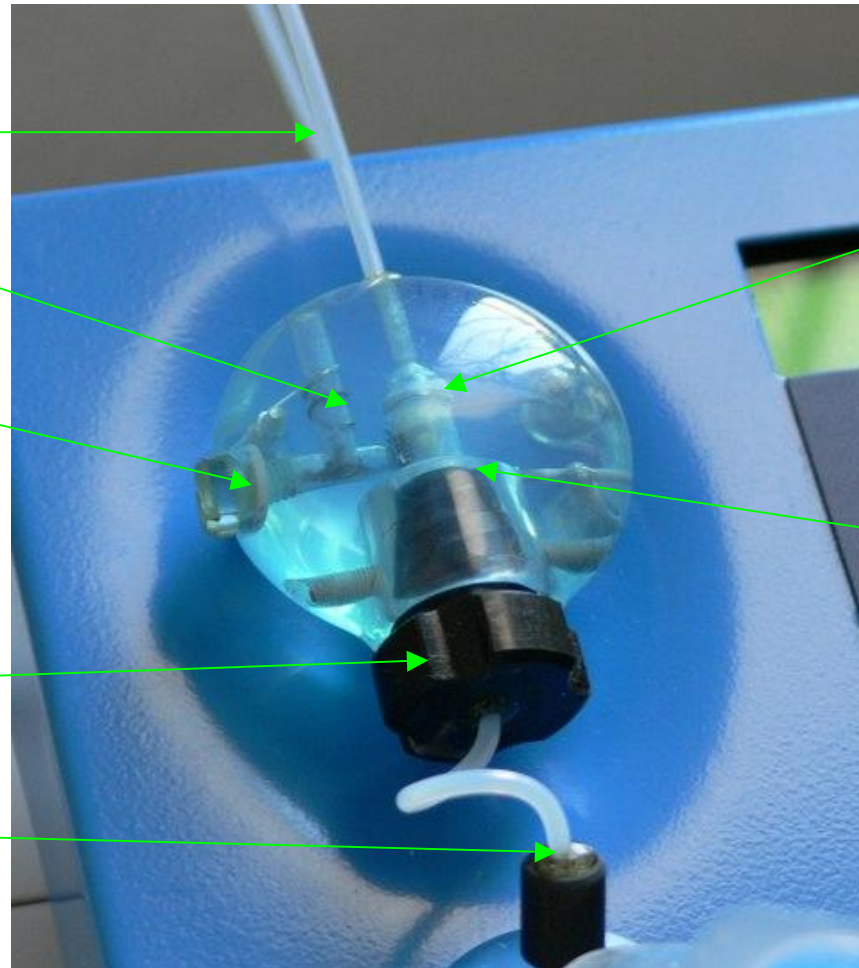
To the waste

Reference
electrode

Filling opening
with the screw

Holding screw
of the electrode

Inlet tube with
Luer fitting



Auxiliary
electrode

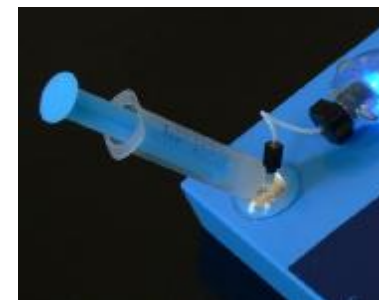
Contact to the
working
electrode

Sample Preparation

Sample Preparation: Liquids

- q Dilute **5 ml** of the sample to **50 ml** with the reagent R-020T.
- q If this solution contains solid particles, filter it through a filter paper. A slight turbidity does not influence the measurement.
- q This solution is used for the analysis.

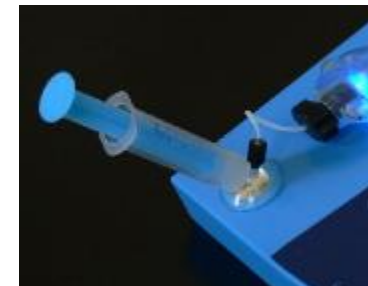
Note: The reagent solution R-020T can be prepared from the reagent concentrate R-020Tc, e.g.: Dilute 5 ml of the concentrate to 50 ml with pure water.



Sample Preparation: Solids

- q Add **100 ml** of the reagent solution R-020T to **10 g** of the sample in a beaker.
- q Homogenise the mixture with a blender.
- q Filter the mixture to get a clear solution. The best is to use a 0.45 um nylon syringe filter. However, a slight turbidity does not influence the measurement, so a filter paper can mostly be used.
- q This solution is used for the analysis.

Note: The reagent solution R-020T can be prepared from the reagent concentrate R-020Tc, e.g.: Dilute 10 ml of the concentrate to 100 ml with pure water.



Measurement

General Procedure

- q **Starting**
- q **Electrode activation:** If taking a new electrode activate it, the best with a fruit sample solution prepared as outlined in the Sample Preparation section.
- q **Calibration:** The calibration curve with an already used electrode is stable and the calibration should be carried out only rarely (once a day, once a week) just to confirm the proper operation of the system. The best is to take a fresh standard solution (50 mg/l ascorbic acid in the R-020T reagent) and measure it 2-3 times in the ANALYSIS-CHECK mode. Results of (50 ± 5) mg/l should be obtained. If not, make a calibration.
- q **Analysis** of sample solutions
- q **Finishing: Important:** Rinse the cell with pure water and turn off the instrument.

Starting

q Turn ON the instrument:



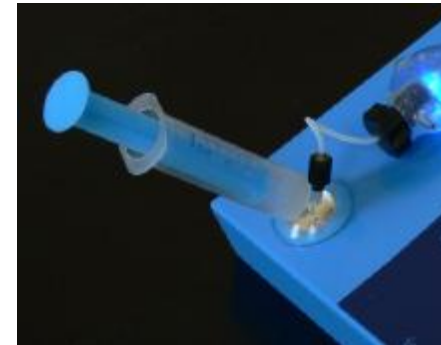
q The following message appears on the display:



Electrode Activation

Electrode activation should only be done if taking a new electrode !

- q Insert the syringe with a sample solution
- q In the ANALYSIS menu choose the ACTIVATE mode
- q Start the procedure
- q Let complete the procedure



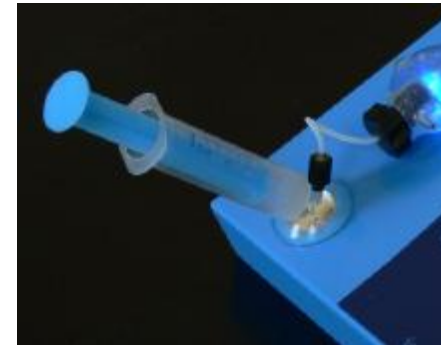
19.09.07 15:43
ANALYSIS
PRESS ↑ / ↓ FOR MENU

19.09.07 15:44
ACTIVATE
PRESS ↑ / ↓ FOR MENU

NO. 00143 19.09.07
0.00 ACT.
REPEAT: YES CANCEL: NO

Calibration

- q Insert the syringe with standard (freshly prepared solution of 50 mg/l ascorbic acid in the R-020T reagent solution)
- q Choose the CALIB. mode
- q Confirm the concentration of the standard (50 mg/l ascorbic acid in R-020T reagent)
- q Inject 2-3 ml of the standard
- q Confirm the injection. The measurement will proceed for about 1-2 min.
- q On completing the calibration coefficient will be displayed. Its value is usually $k=10-20$. The new value will be accepted only if pressing the YES button.



19.09.07 15:43
CALIB.
PRESS ↑ / ↓ FOR MENU

PREPARE STANDARD:
100 µg/l
READY: YES CANCEL: NO

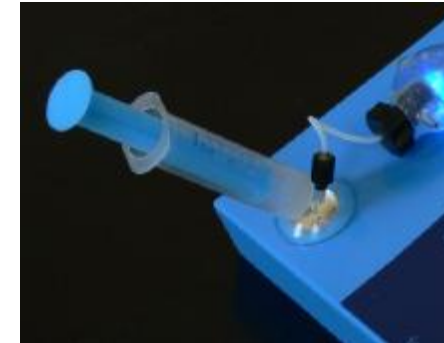
INJECT
READY: YES CANCEL: NO

MEASURING
STOP: PRESS "NO"

TAU:001.36 19.09.07
 $k=1.357E-2$
SAVE: YES, CANCEL: NO

Analysis

- ❑ Insert the syringe with the sample prepared according to the **Sample Preparation** section
- ❑ Choose the ANALYSIS mode
- ❑ Chose the sample type, e.g. JUICE
- ❑ Confirm the sample dilution ratio (cannot be changed, but the ratio is relevant only, the sample can also be diluted otherwise, e.g. 4.5 ml to 45 ml)
- ❑ Inject 1-2 ml of the sample. For repeated measurements 0.5-1 ml is sufficient, especially if the sample solution is turbid.
- ❑ Confirm the injection. The measurement will proceed for about 1-2 min.
- ❑ The measured result will be displayed together with the serial number of the measurement. The measurement can be repeated any times by pressing YES.



19.09.07 15:43
ANALYSIS
PRESS ↑ / ↓ FOR MENU

29.09.07 17:20
JUICE
PRESS ↑ / ↓ FOR MENU

PREPARE SAMPLE:
5 ml/50ml
READY: YES CANCEL: NO

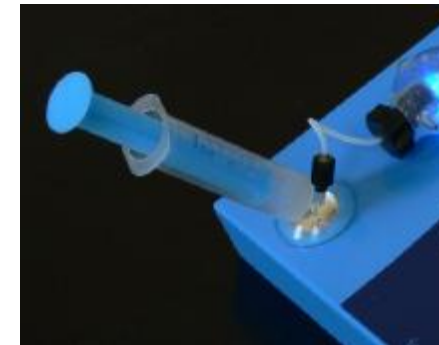
INJECT
READY: YES CANCEL: NO

MEASURING
STOP: PRESS "NO"

NO. 00707 19.09.07
88.9 $\mu\text{g/l}$
REPEAT: YES CANCEL: NO

Analysis: Check

- ❑ Insert the syringe with the sample solution or calibration solution (for checking the system)
- ❑ Choose the ANALYSIS mode
- ❑ Chose the CHECK measurement
- ❑ Confirm the sample dilution ratio (no dilution is assumed here)
- ❑ Inject 1-2 ml of the sample. For repeated measurements 0.5-1 ml is sufficient.
- ❑ Confirm the injection. The measurement will proceed for about 1-2 min.
- ❑ The measured result will be displayed together with the serial number of the measurement. The result corresponds to the concentration in the injected solution, no correction on dilution will be made. The measurement can be repeated any times by pressing YES.



19.09.07 15:43
ANALYSIS
PRESS ↑ / ↓ FOR MENU

29.09.07 17:24
CHECK
PRESS ↑ / ↓ FOR MENU

PREPARE SAMPLE:
1/1
READY: YES CANCEL: NO

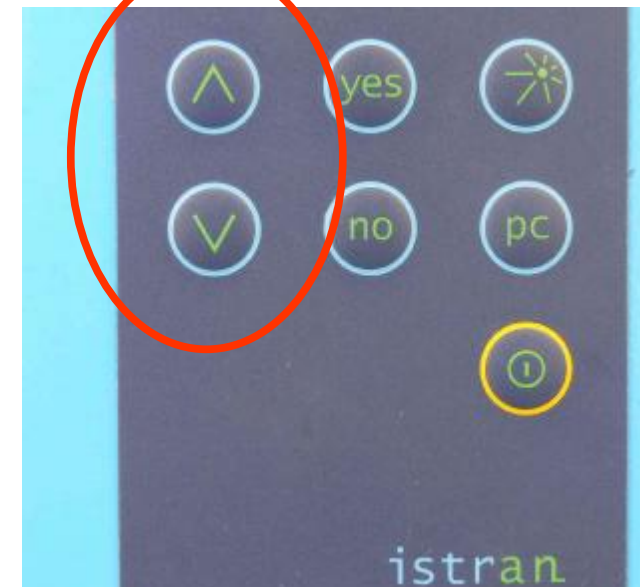
INJECT
READY: YES CANCEL: NO

MEASURING
STOP: PRESS "NO"

NO. 00707 19.09.07
88.9 $\mu\text{g/l}$
REPEAT: YES CANCEL: NO

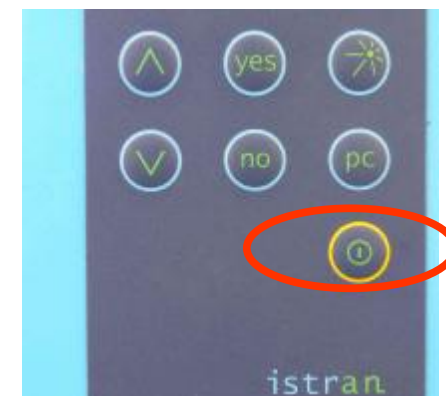
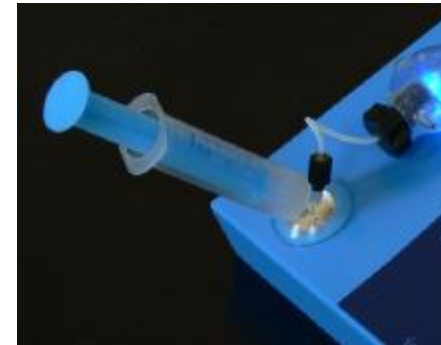
Listing the Results

- q Choose the RESULT mode
- q The last data will be displayed, with the serial number and date of the measurement
- q The earlier results can successsively be displayed by pressing the \hat{U} (down) or \hat{U} (up) arrows



Finishing

- q Insert a syringe with pure water
- q Rinse the cell with 2-5 ml of water
- q Turn OFF the instrument



PC Control

PC Control

- q The delivered software enables the parameter setting, data transfer and time setting on *PCA* by means of the serial port of the PC.
- q Link *PCA* to the PC by the delivered serial cable.
- q Switch *PCA* to PC mode.
- q On starting the PCA program, the following window opens:

Application name

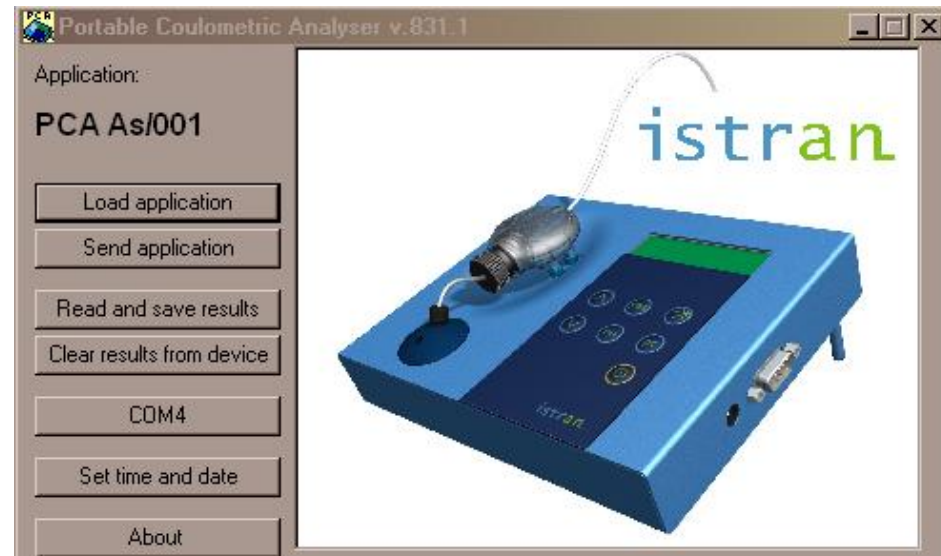
Loading application from PC

Sending application to PCA

Reading results from PCA

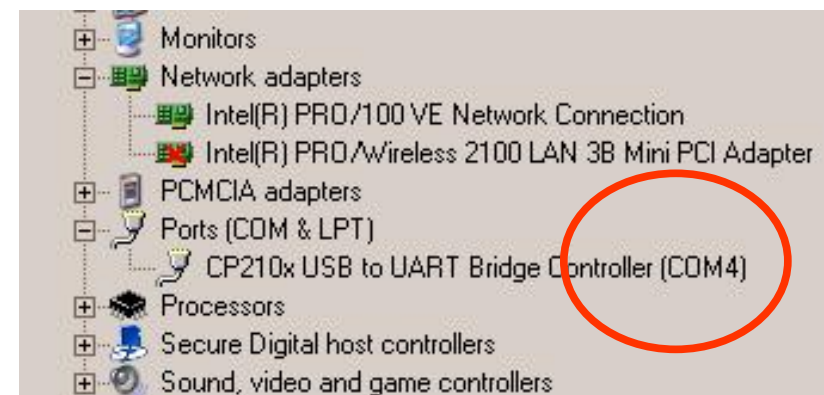
Communication port of PC

Time setting/changing on PCA



Communication Port

- ❑ Connect the PCA with a USB port of the PC by the USB serial cable.
- ❑ Turn ON the PCA and set it to PC MODE – PC CONTROL mode
- ❑ Start the Device Manager of the Windows system and check the COM number of the serial port PCA is connected to. It must be in the range of COM1 to COM7. If not, use another USB port.
- ❑ Use this COM number when starting the PCA program for communication between PCA and PC



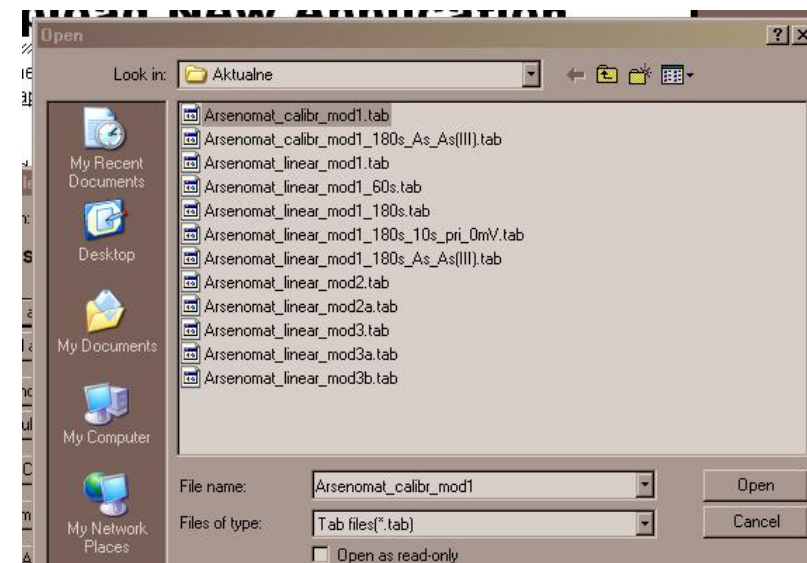
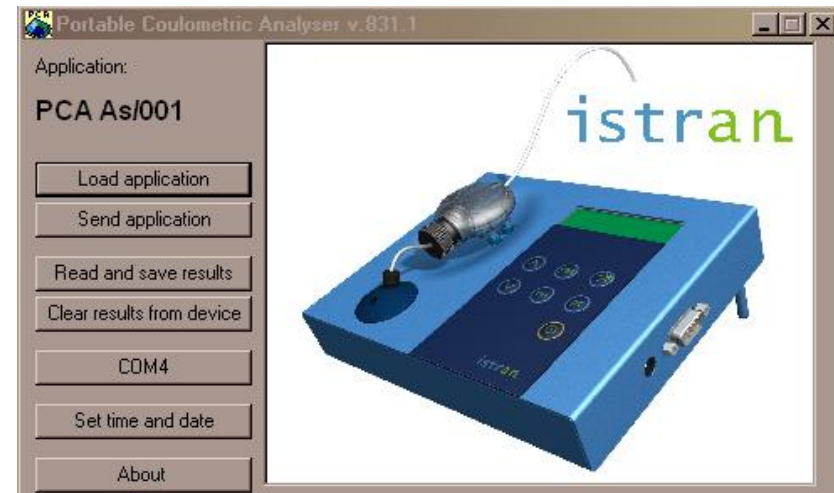
Time/Date Setting

- On starting the PCA program click on the Set time and date button:
- Type manually the time and/or date or read the PC time
- Send these values to PCA (click on the Set Date/Time button)
- Close this window
- The set values should be displayed on PCA



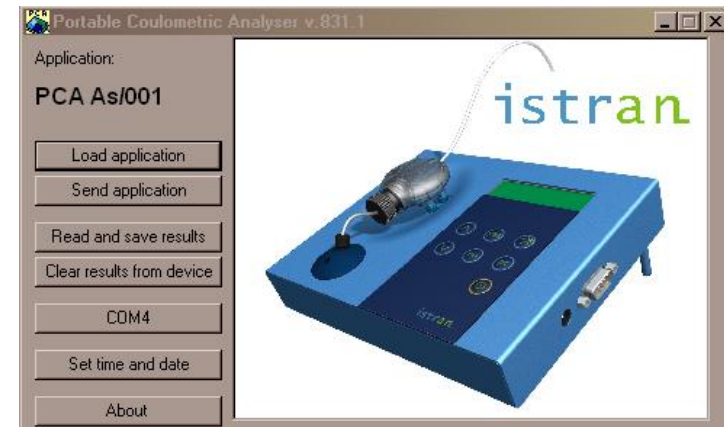
Upload New Application

- ❏ On starting the PCA program click on the Load application button:
- ❏ Find the application in the directory of PC (files of type *.tab)
- ❏ Open the application
- ❏ Set the valid communication port of the PC (COM1 to COM7, check it in the Device Manager)
- ❏ Send the application to PCA (a cracking noise accompanies the data transfer)



Read and Save Results to PC

- On starting the PCA program click on the Read and save results button:
- Find a subdirectory in the PC and save the data (a cracking noise accompanies the data transfer, for a large data file the transfer may take some minutes)

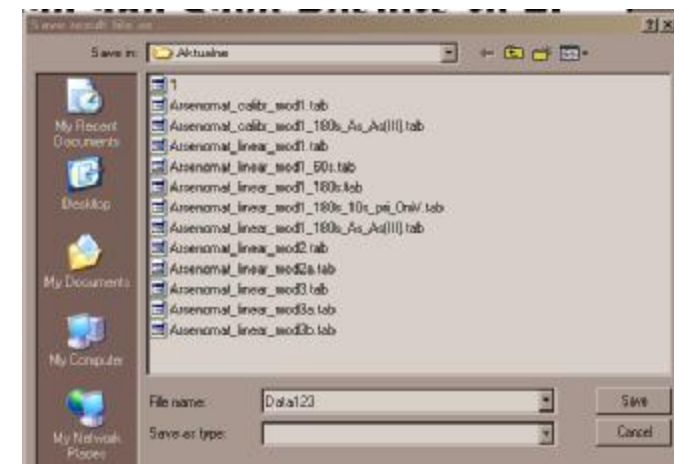


The saved file is of ASCII type and has the structure below:

No.; Measured; Value; Dimension; Time; Date;

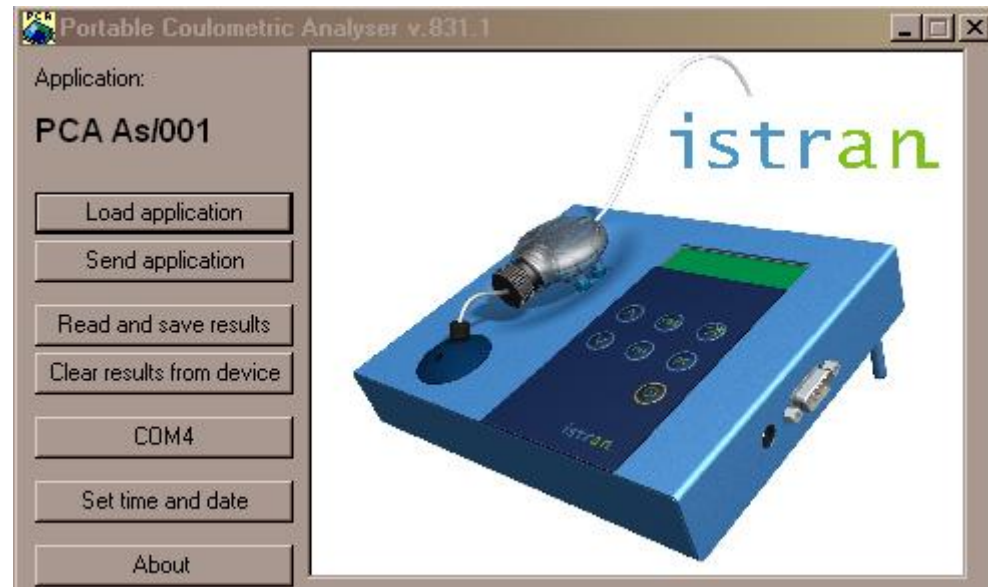
```

File Edit Options Help
629;TEST III 0,00; ug/l ;17:32;16.9.2007;
630;TEST III 0,00; ug/l ;17:36;16.9.2007;
631;TEST U 120,; ug/l ;17:47;16.9.2007;
632;TEST U 116,; ug/l ;17:51;16.9.2007;
633;TEST U 121,; ug/l ;17:55;16.9.2007;
634;STANDBY 0,00;STDB/END ;17:56;16.9.2007;
635;ACTIVATE 0,00;ACT./END ;12:45;17.9.2007;
636;ACTIVATE 0,00;ACT./END ;13:6;17.9.2007;
637;ACTIVATE 0,00;ACT./END ;13:12;17.9.2007;
638;TEST U 96,7; ug/l ;14:27;17.9.2007;
639;TEST U 106,; ug/l ;14:30;17.9.2007;
    
```



Delete Results

- ❑ On starting the PCA program click on the Clear results from device button
- ❑ All measured data and the calibration coefficient will be deleted



Error Messages

- If there is a invalid communication port number or PCA is disconnected, the following message will be displayed:



Maintenance

Maintenance

- ❑ *Electrode replacement* : The lifetime of the electrode is over 100 measurements, but improper use, especially if not filtering appropriately the sample solutions may deteriorate the performance of the electrode earlier. Electrode deterioration is mostly caused by clogging the the pores of the electrode by solids. Such an electrode cannot be regenerated and need to be replaced by a new one.
- ❑ *Refilling of the reference electrode*: Only if the level of the electrolyte in the reference electrode drops below the lower limit

Electrode Replacement

- ❑ Remove liquid from the cell
- ❑ Detach the cell from PCA
- ❑ Screw out the black electrode holder screw
- ❑ Take out the old electrode and replace it by a new one. **Important:** The flat part of the electrode cylinder must direct upwards !
- ❑ Hold the cell in vertical position and screw back carefully the electrode holder with the electrode. Screw it firmly into the cell body but do not use any tools for it !
- ❑ Put the cell back into PCA and connect the input tube to the injection port.

Note: *If during the ensuing operation some liquid escapes from the cell along the electrode holder screw, stop immediately, take out the electrode, dry the cell compartment with a cloth or filter paper and return the electrode back.*



Reference Electrode

The reference electrode (Ag/AgCl) is filled with saturated KCl containing some dark AgCl crystals. The compartment of the electrode must always contain electrolyte, its upper and lower levels should be in the range indicated by arrows:

The electrolyte should fill up completely the lower horizontal part of the reference electrode, without any air bubbles. If there are any, shake the cell to get air bubbles to the top.

If the electrode compartment becomes completely full with liquid, release the cap screw and remove some liquid by a piece of filter paper.



Filling the Reference Electrode

If the level of the reference electrolyte becomes low (see above), the reference electrolyte must be refilled:

- ❑ Remove liquid from the cell
- ❑ Detach the cell from PCA
- ❑ Loose and remove the screw of the filling opening
- ❑ By means of a micropipette inject the reference electrolyte (saturated KCl) into the reference electrode compartment: 50 – 100 μ l are sufficient. Do not remove the solid AgCl particles present in the reference electrode compartment !
- ❑ Turn the cell to its normal position and screw back the cap by hand
- ❑ Shake the cell until the electrolyte fills the lower part of the electrode compartment without any bubbles there.



Consumables

- | | |
|---|----------|
| q Working electrode E-56 CP | Cat. No. |
| q Reagent solution R-020T | Cat. No. |
| q Reagent solution R-020Tc, concentrate * | Cat. No. |
| q Electrolyte for reference electrode | Cat. No. |
| q Injection syringe 5ml | Cat. No. |
| q Injection syringe 10 ml | Cat. No. |
| q PE beaker 50 ml | Cat. No. |

* *Dilute this concentrate 10-times with pure water to obtain the reagent solution R-020T*

Spare parts

- | | |
|--------------------------------------|----------|
| q Measuring cell 353c | Cat. No. |
| q Adopter 230V/50 Hz, 1000 mA DC OUT | Cat. No. |
| q Serial cable USB | Cat. No. |
| q Instrument case | Cat. No. |

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