

# **Eickemeyer ERG**

A Description of the Appliance and Instructions to record an Electroretinogram

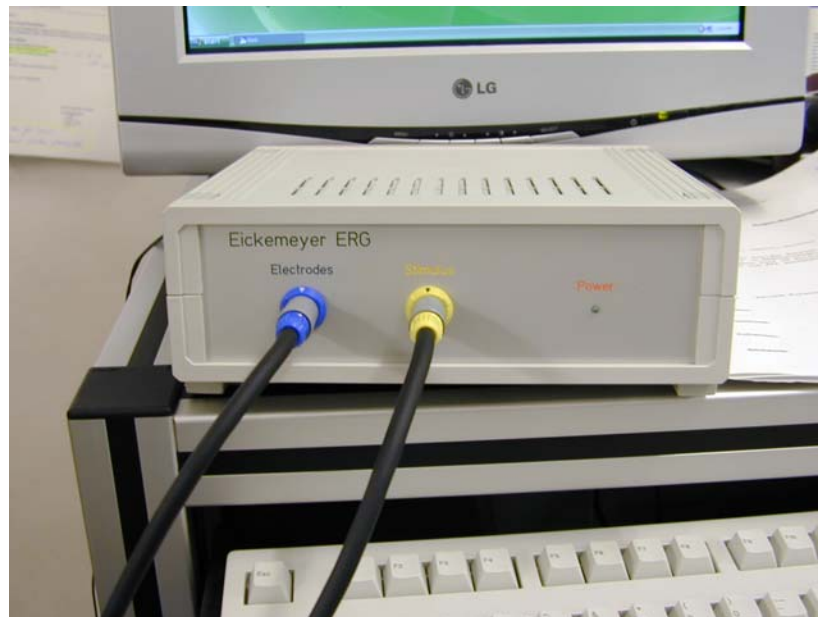
Dr. Corinna Eule, Resident ACVO/ECVO  
Prof. Dr. Bernhard M. Spiess, Dipl. ACVO/ECVO  
Vetsuisse-Fakultät der Universität Zürich

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## 1. The combined stimulation- and signal receiving-system

The compact appliance has an integrated LED-stimulator, signal-recording and – amplified (differential-amplified). The system does not include a desktop/Laptop computer (Windows 2000 oder XP).



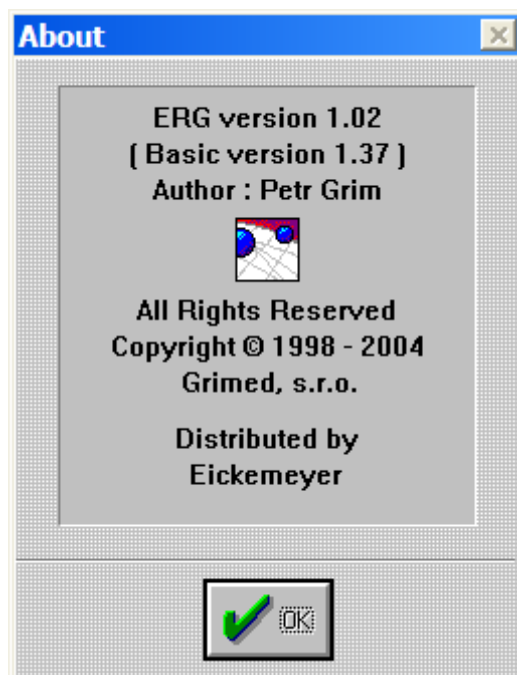
Picture Eickemeyer ERG front side with the socket for the electrodes (blue) and for the LED light source (yellow). All parameters are guided by the user's software.



Eickemeyer ERG rear side with the switch -Power On, electric cable (12 V), earth socket, serial and parallel connection (to the computer and printer)

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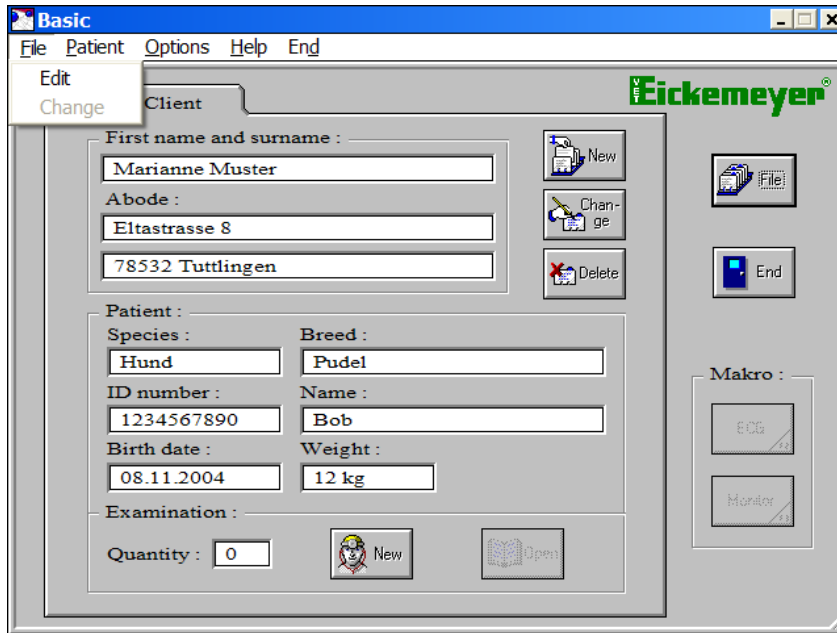
## 2. The Software



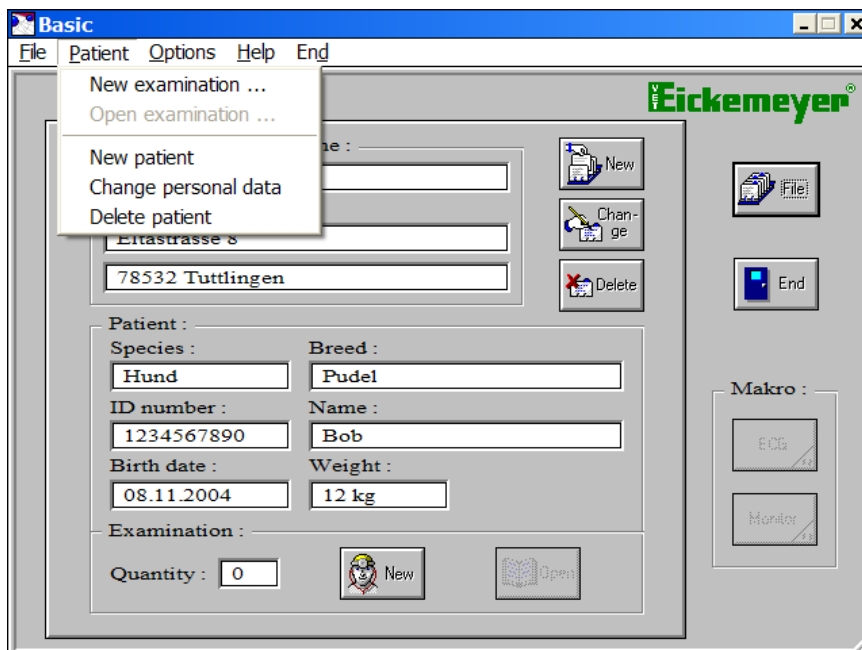
Mostly self explaining user's software in English



Eltastraße 8 • Tel.: 07461/96 580 54  
D78532 Tuttlingen • Fax.: 07461/96 580 90



Under File/Edit you can change owner's and patient details.

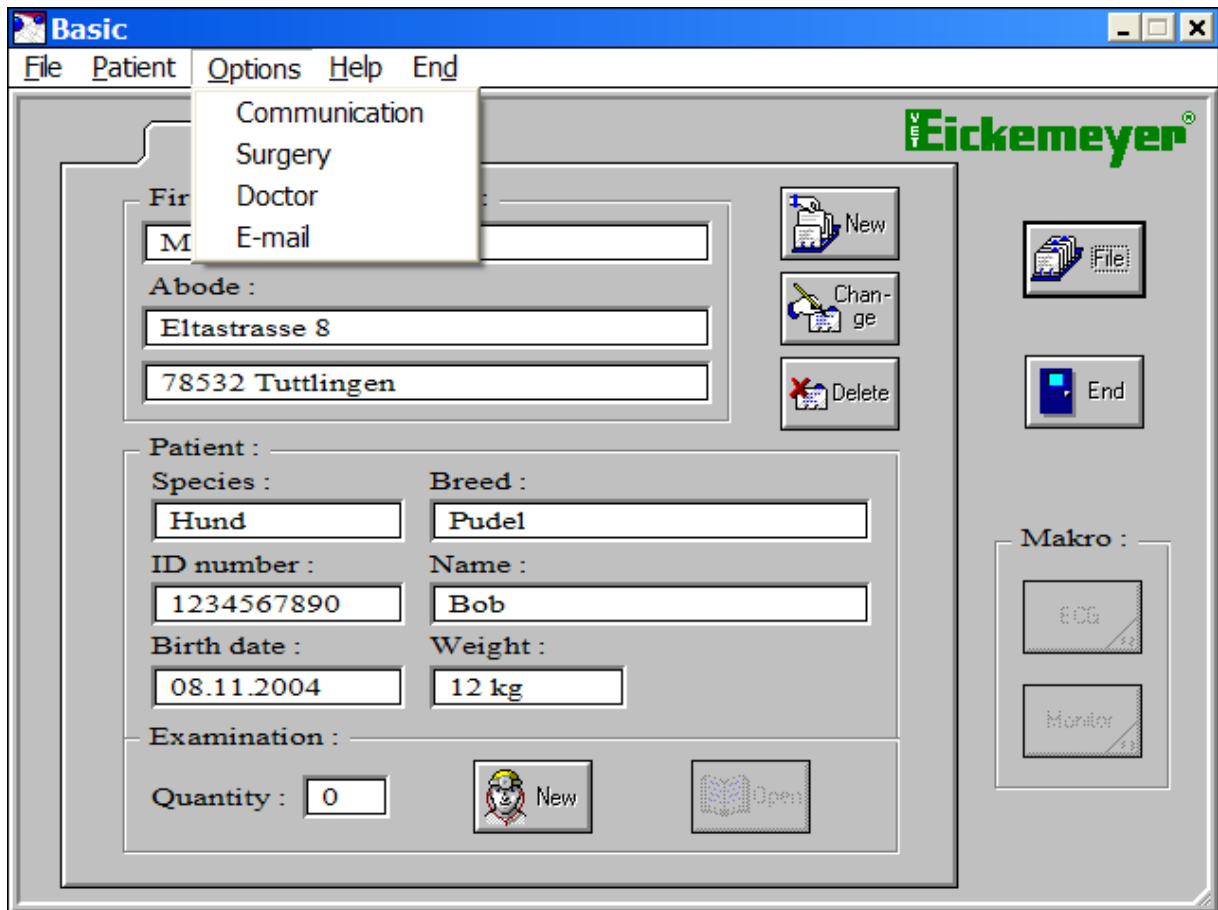


Under Patient/New examination you switch immediately to examination.

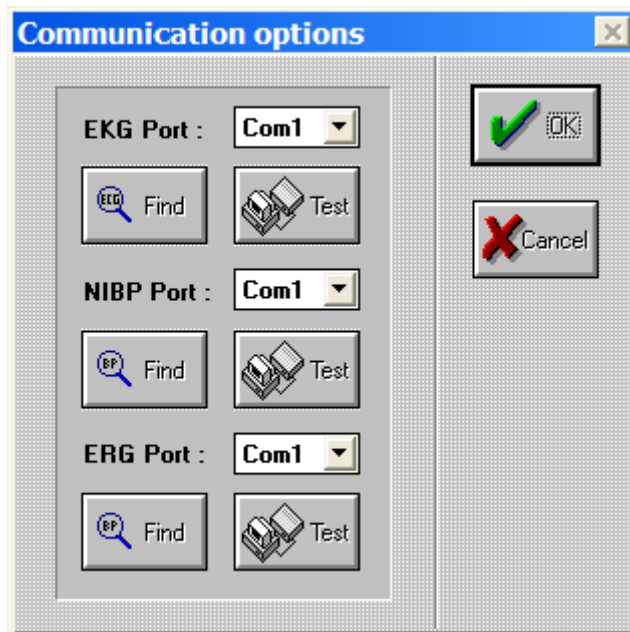
New patient: Insert new patient's details.

Change personal data: Change existing patient's details.

Delete patient: Deletes the entire data of the patient incl. All records!

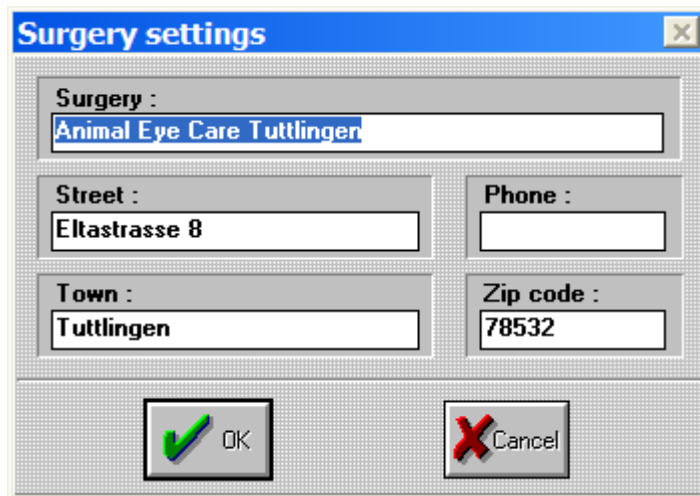


Options/Communication: Controls the connection between the computer and ERG-appliance



The ERG-Port should be on Com 1

Under Surgery inscribe the practice details.



**Surgery settings**

**Surgery :**  
Animal Eye Care Tuttlingen

**Street :**  
Eltastrasse 8

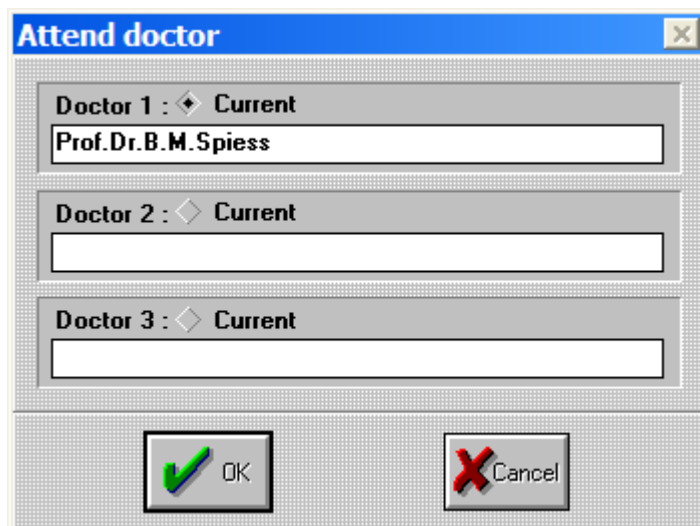
**Phone :**

**Town :**  
Tuttlingen


**Zip code :**  
78532


OK Cancel


Under Doctor inscribe the examiner.



**Attend doctor**

**Doctor 1 :**  Current  
Prof. Dr. B. M. Spiess

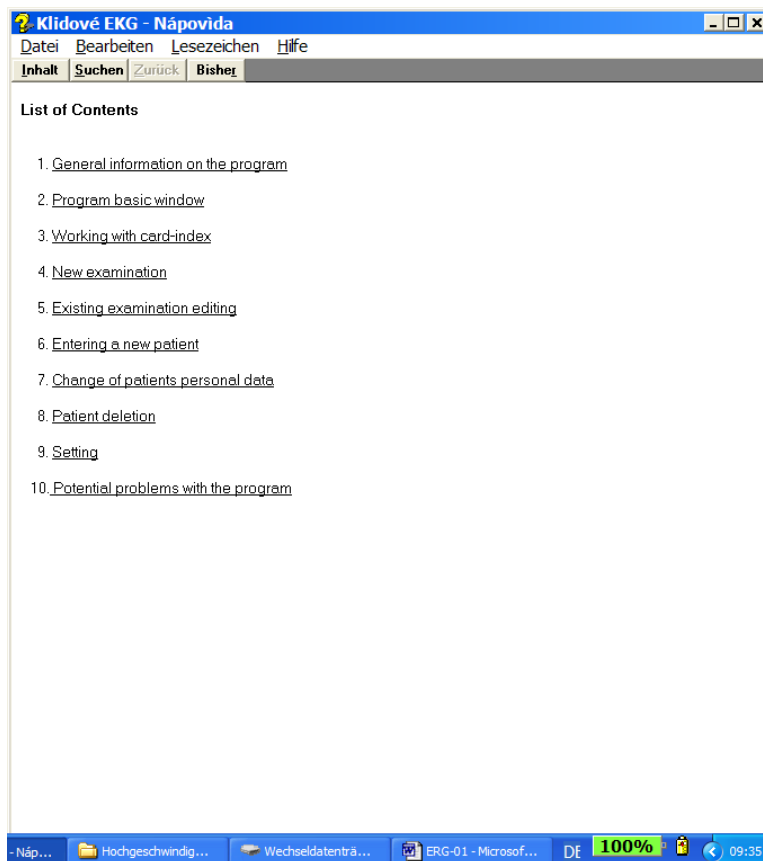
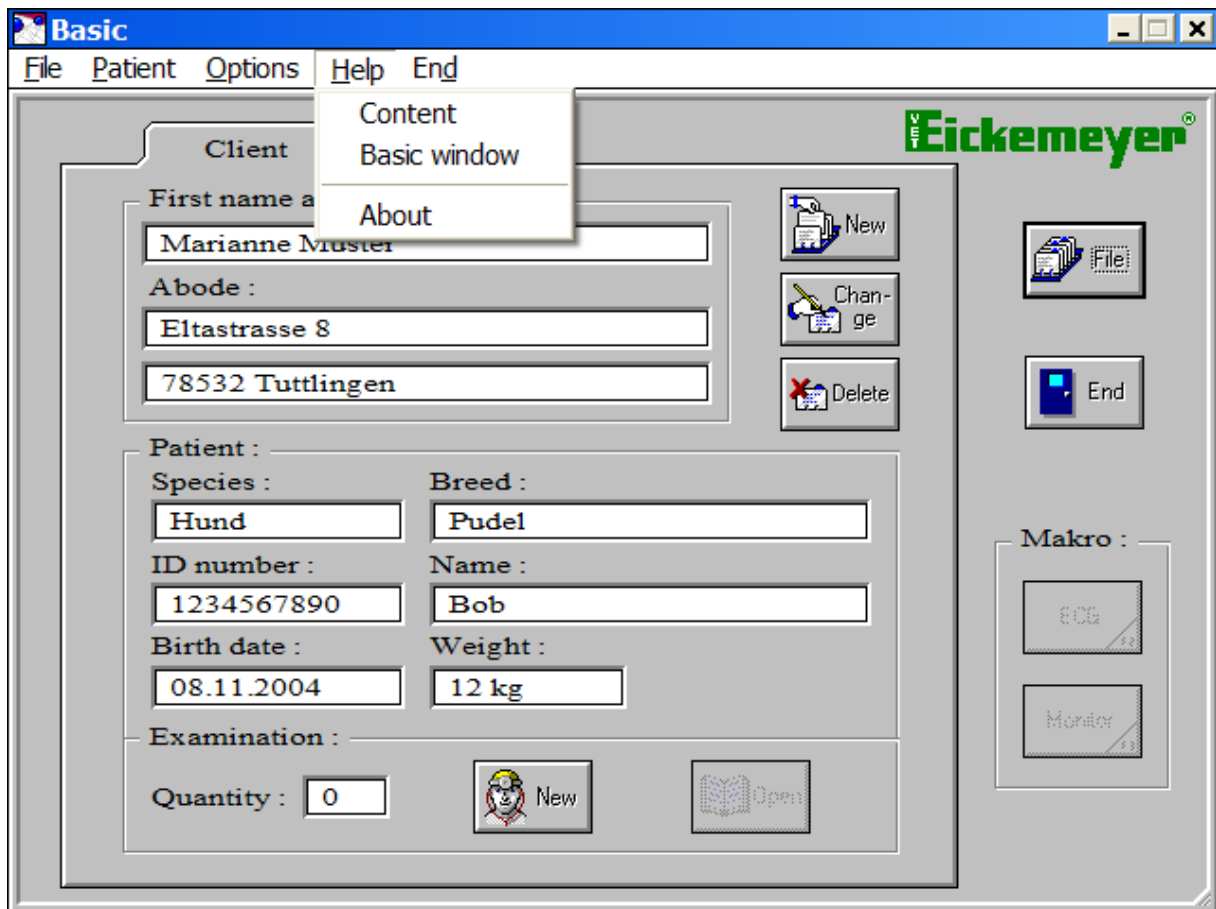
**Doctor 2 :**  Current

**Doctor 3 :**  Current

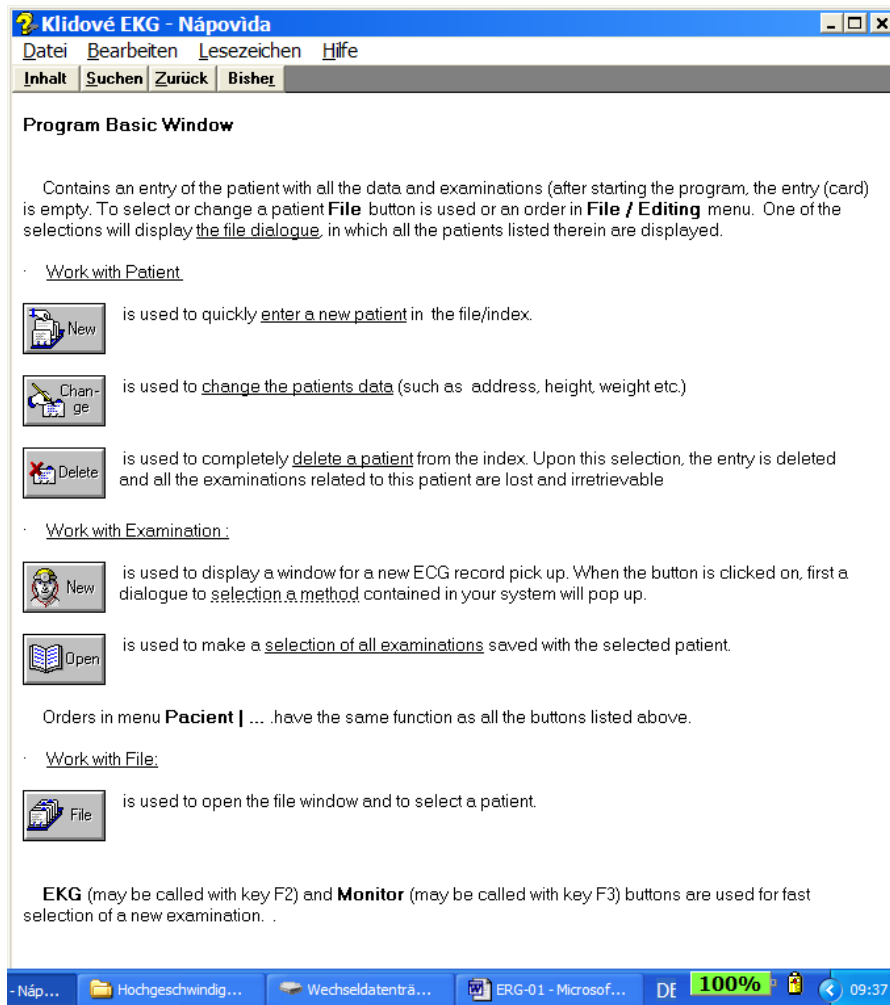
OK Cancel

Under Email send data (if the computer is configured).

Help/Content shows an interactive index of help pages.



Help/Basic Window explains the software.



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### **3. Preparation of the Patient**

- Dilate the pupils with a mydriatic (Tropicamide) at least 30 minutes before the ERG
- Sedation (e.g. Acepromazine, Domitor etc.)
- Catheterize a vein
- Short-acting GA (e.g. with Propofol i.v.)

A good sedation and GA is essential for an uninterrupted recording of the electroretinogram.

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### **4. Positioning of the Patient**

- in sternal position. The head can be elevated by a cushion
- small patients should be positioned on a heat pad



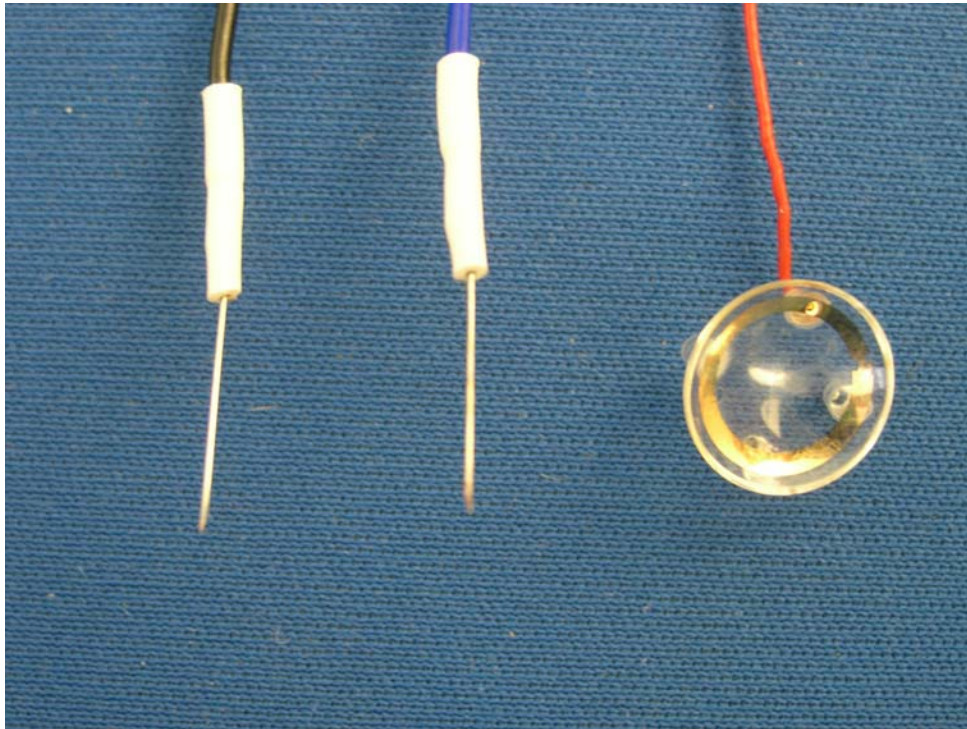
### **5. Applying of the Measure-Electrods**

The signal recording system contains generally two electrodes between which there is a potential difference. There is also an earth electrode.

For animals the recording electrode is usually a contact lens with an inlaid goldwire (e.g. ERG-Jet, Life-Tech inc., Houston Texas). The reference- and the earth electrodes are subcutaneous needle electrodes.

All electrodes are connected by an isolated and insulated cable with the amplifier.

Standard Electrodes :



Red ERG-Jet Electrode

Cornea

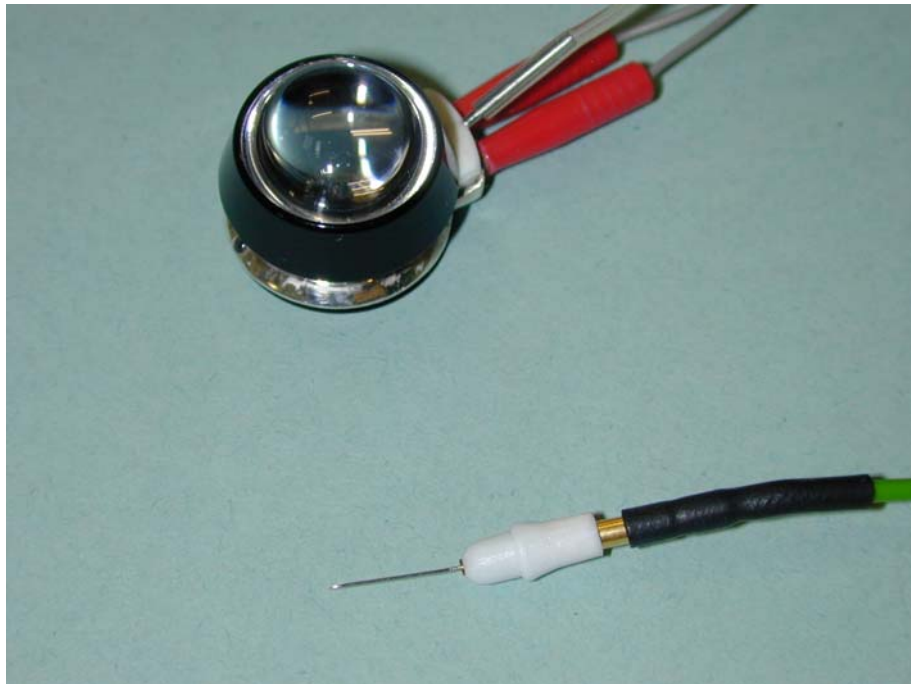
Black: Reference electrode

Lateral Canthus

Earth electrode

Occiput

Echte-Papst electrodes:



Re-usable Echte-Papst electrodes with conductor-electrode (inside) and reference electrode (outside). Green: the earth-electrode.

### **The record-electrode (e.g. ERG-Jet) – red cable/red socket**

- local anaesthesia of the eye (proxymetacaine)
- one drop of Methylcellulose or artificial tears as a contact liquid (no bubbles between cornea and electrode!)
- central position on the cornea!
- the ERG-Jet electrode has on its outside four nipples which keeps the lids in small dogs and cats open. Use for bigger dogs use another electrode or a lid retractor.

### **The reference-electrode – black cable/grey socket**

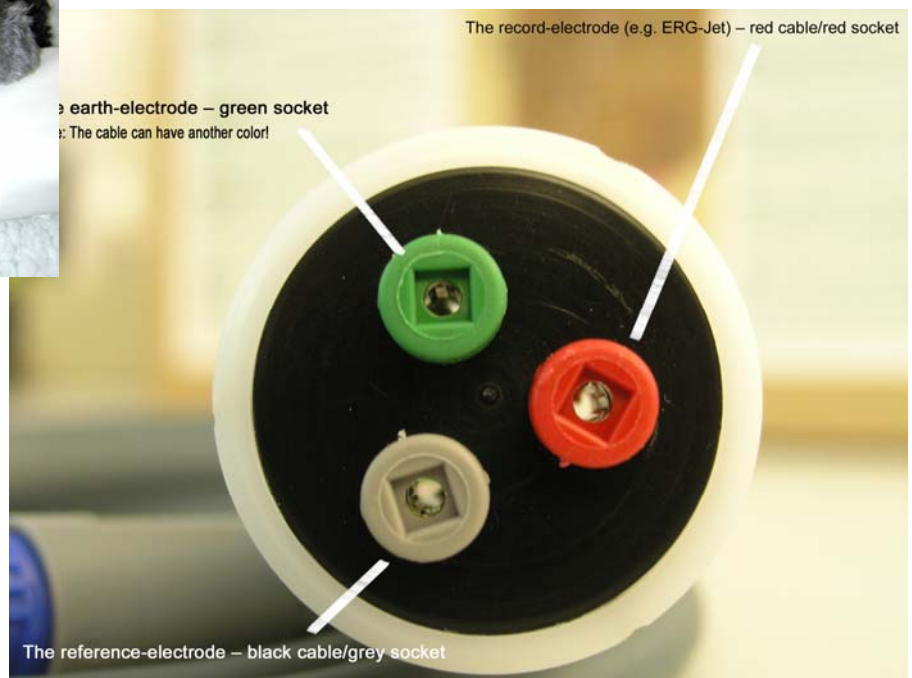
- apply subcutaneously at the lateral canthus of the examined eye
- swab with spirit
- NOTE: The greater the distance between the recording and the reference-electrode is the higher is the signal. But there may be more electrical disturbance .

## The earth-electrode – green socket

- Apply subcutaneously at the occiput and swab with spirit.

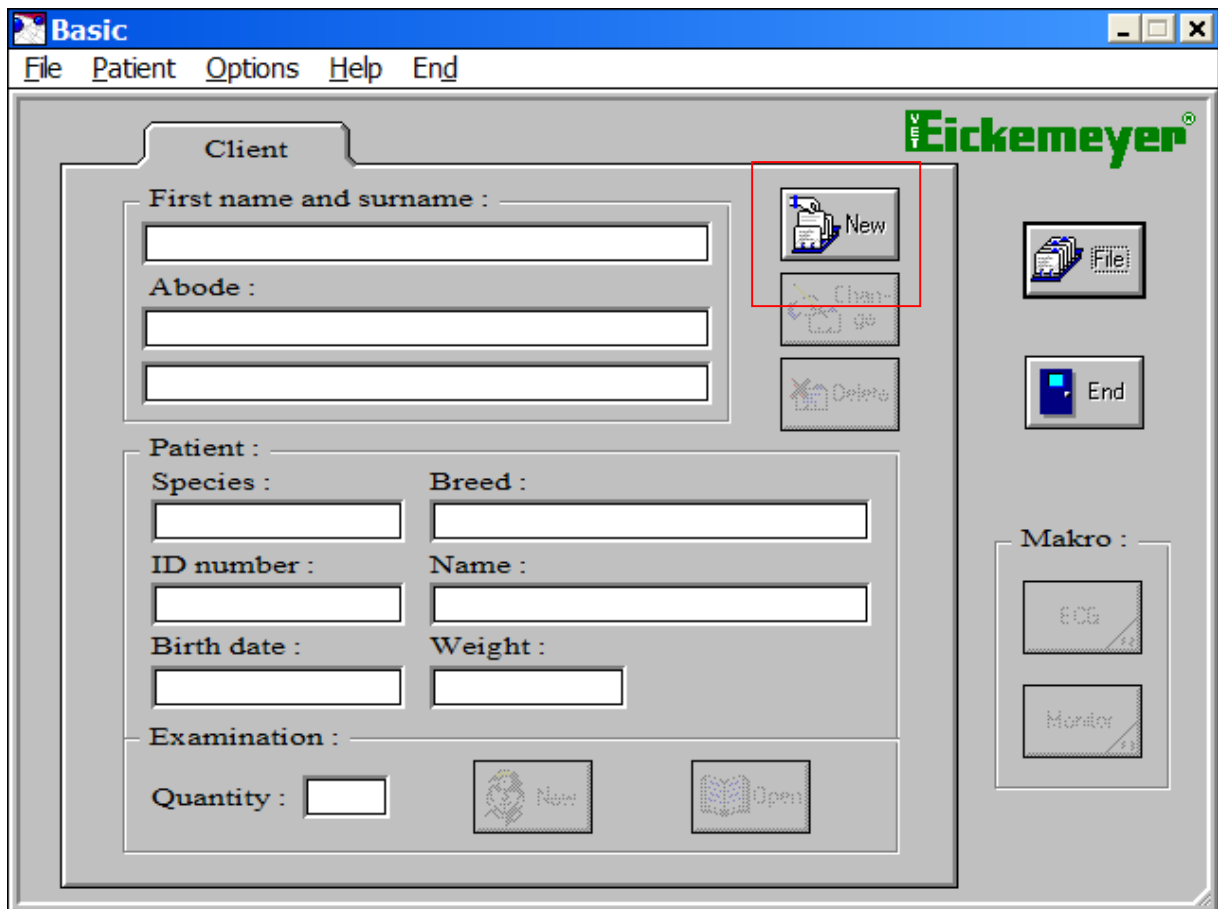


ERG-Jet electrode and reference-electrode in situ.

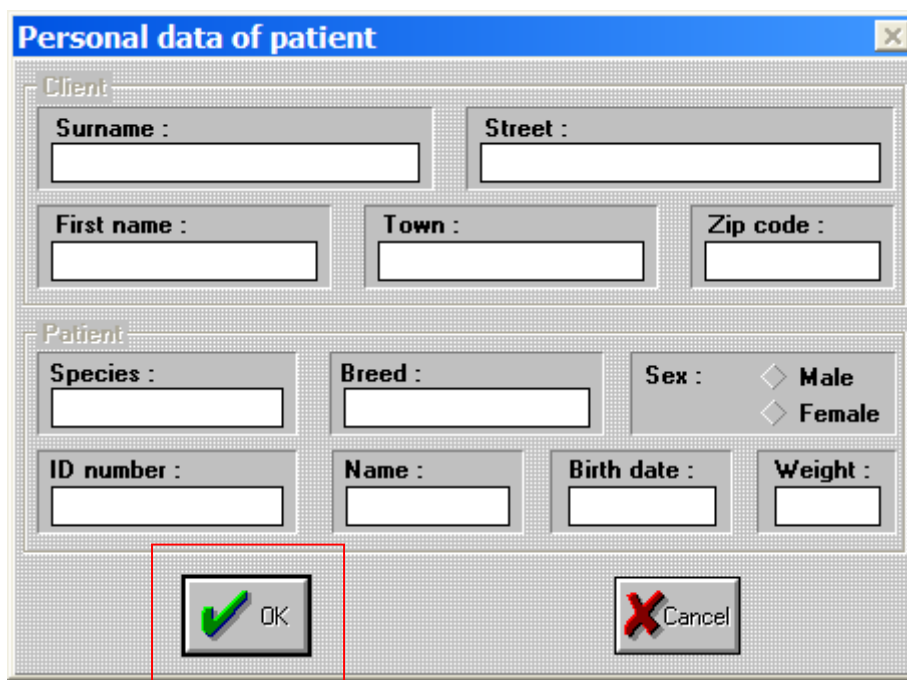


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## 6. Entering the Patient's details



On the basic window click „New“.



Input the patient's details; click „OK“.

**Personal data of patient**

**Client**

Surname :  Street :

First name :  Town :  Zip code :

**Patient**

Species :  Breed :  Sex :  Male  Female

ID number :  Name :  Birth date :  Weight :

**Basic**

File Patient Options Help End

**Client**

First name and surname :

Abo :

**Patient**

Species :  Breed :

ID number :  Name :

Birth date :  Weight :

**Examination**

Quantity :

**Eickemeyer®**

**Makro :**

The software is ready to take a record.

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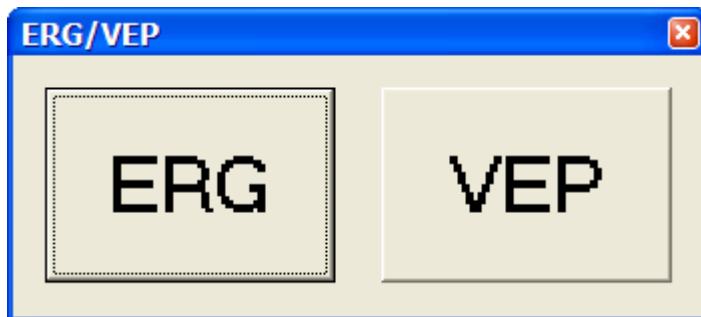
## 7. The Measurement

To compare the recorded data within the practice, you should prepare and examine each patient under the same examination protocol and circumstances. Several factors influence the ERG: the wideness of the pupils, the dark adaption, the choice of the sedation/GA, the depth of the GA and the animals body temperature.

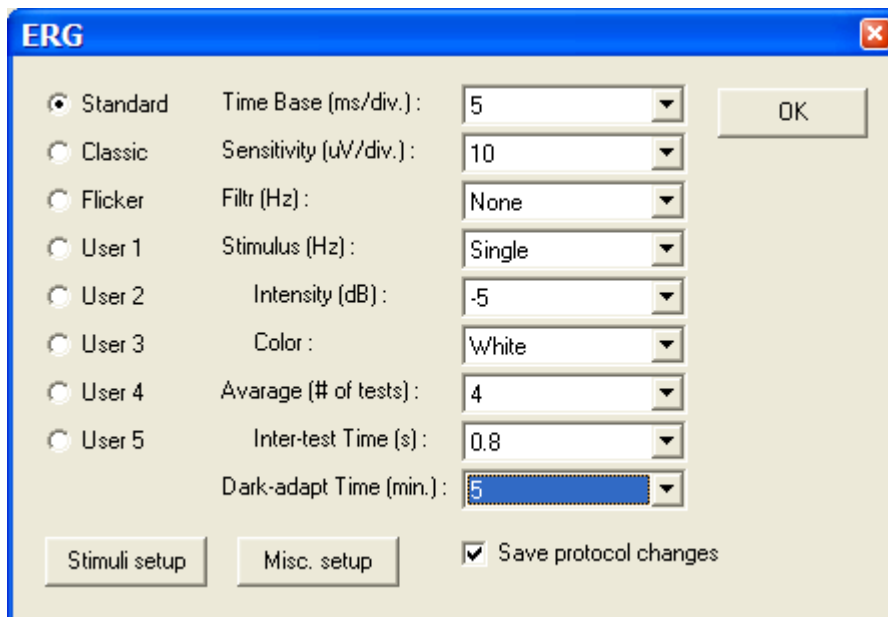
If you want to perform electroretinographic examination for scientific publishings, please, use the recommendation of the Comitee for the Harmonizing of ERG Protocols of the European College of Veterinary Ophthalmology 2002.

The following steps shows a recommended short-protocol for a pre-operative (cataract) electroretinography.

Press the „New“ key.



Press the „ERG“ key.



Choose „Standard“

Time Base (Ordinate): 5 ms/div

Sensitivity (Abszisse): 10  $\mu\text{V}/\text{div}$

Filter: Noisefilter 50/60 Hz necessary on „None“

Stimulus: „Single“ single flashes

Intensity (dB): -5 (this means around 2-3  $\text{cd}/\text{m}^2/\text{sec}$ )

Color: White, other colours are possible

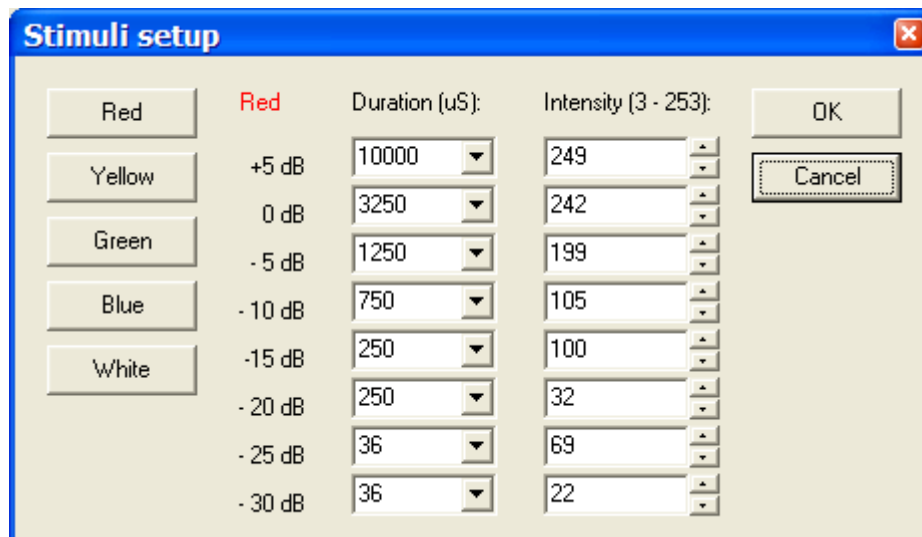
Average: Number of single flashes which shall be averaged (as small as possible)

Intertest Time: 0.8 sec. (quick flashing)

Dark-adapt Time: Time of the adaption of the dark 5 minutes for the standard protocol

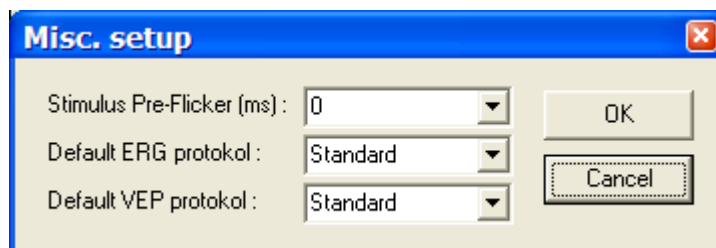
Save protocol changes (yes!)

Do not change anything at the Stimulus setup!



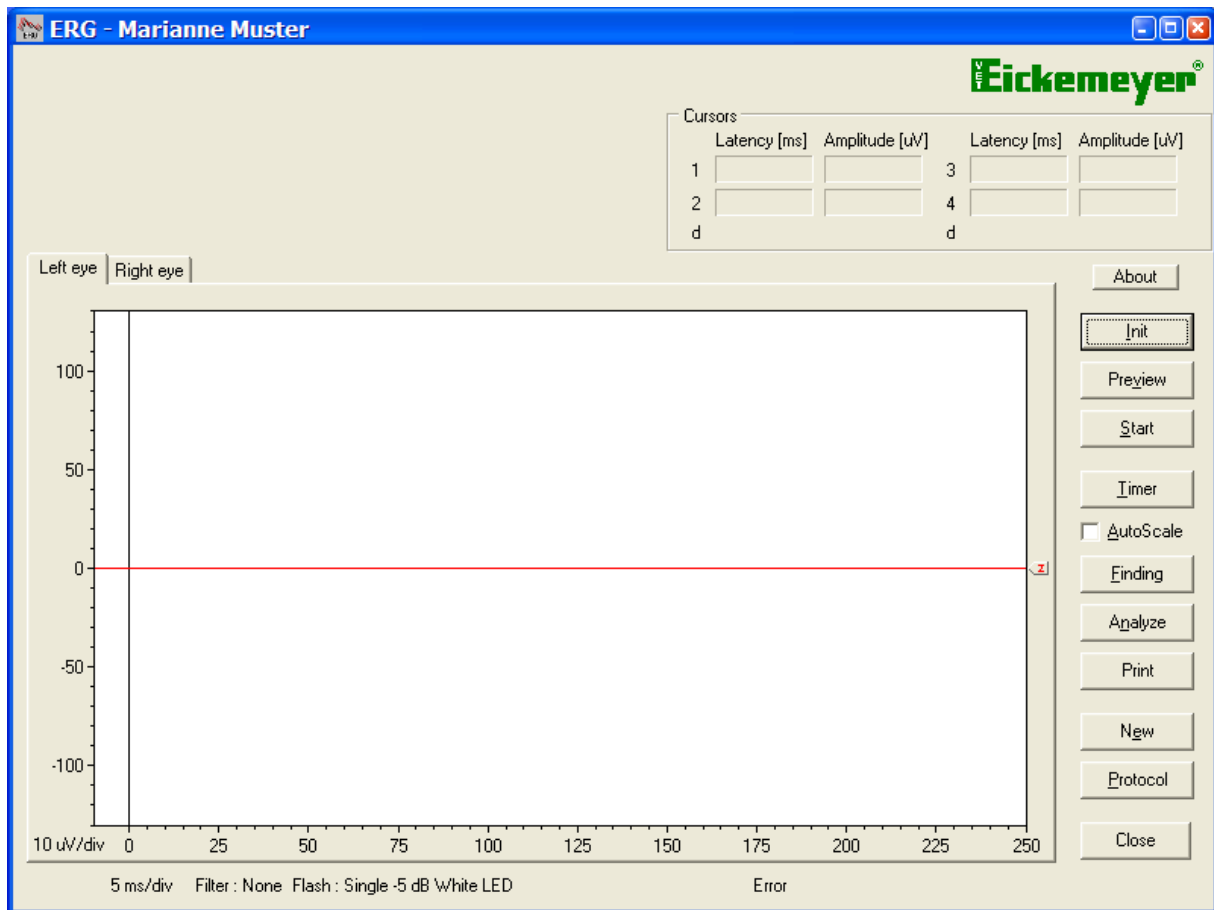
Leave the Misc. Setup unchanged!

Normally you are able to choose between special recording methods (e.g. Flicker, etc.), which you won't need during clinical ERG.



Press the „OK“ key.





The key „Init“ initialize the recording appliance and secure the connection: Usually unnecessary.

The key „Preview“ records the single signal and shows any unwanted noises or disturbances.

In case of many disturbances (e.g. 50/60 Hz cyclus) the surrounding needs to be optimized instead of switching on the filter (see above)!

Choose left or right eye.

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## **8. Measurement protocol**

In a light room:

As soon the patient is prepared and the electrodes are in place, press the „Start“ key. Hold the LED-stimulator 1 cm in front of the examined eye. The ERG will generate a

flash every 0.8 seconds (4 all together) and then average the signals and save the results. As soon you saved the results turn off the lights.

In a dark room:

Then press the „Timer“ key: The adaption of the dark of 5 minutes starts.

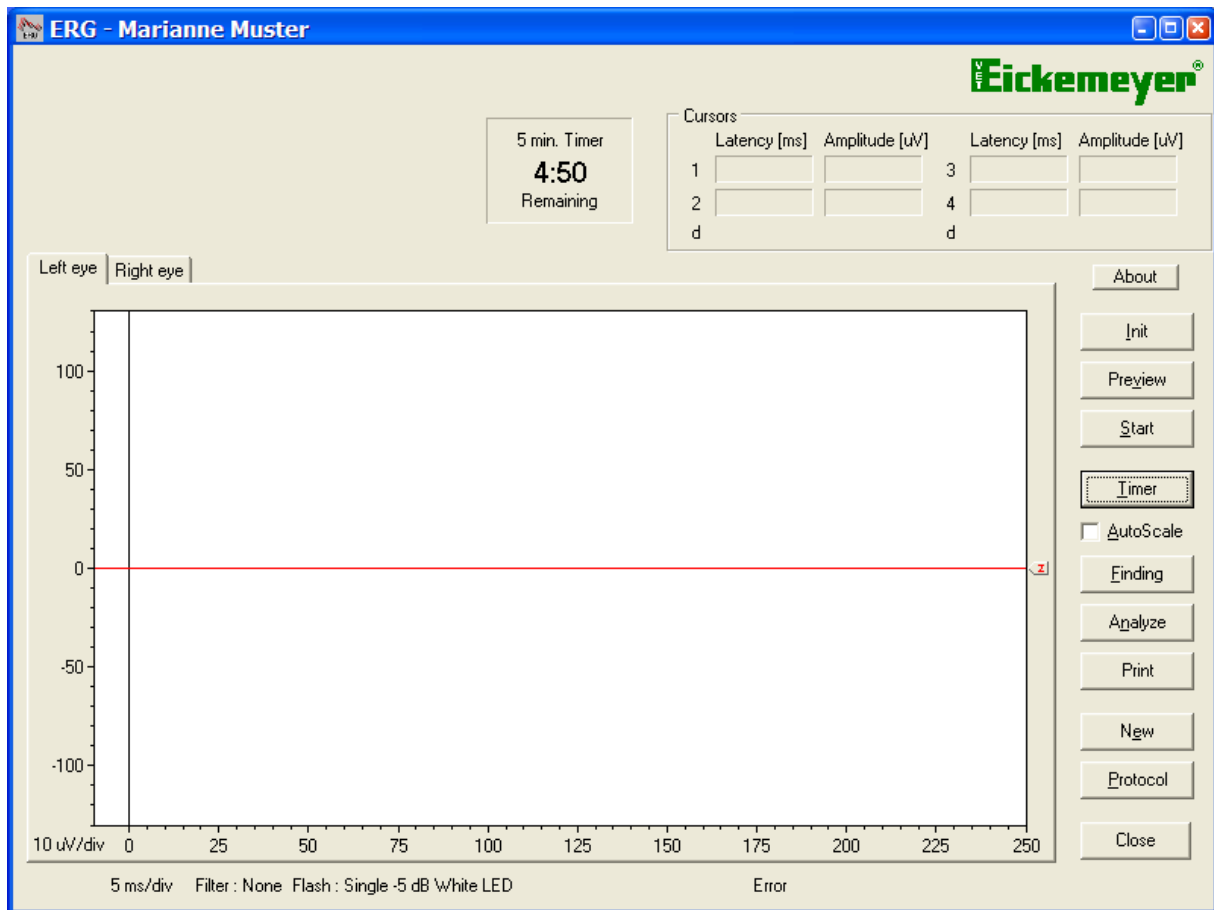
Immediately press the „Start“ key again so that the 4 signals can be averaged again.

Repeat the same procedure at the end of the dark adaption again.

Turn the lights on again.

Repeat the procedure for the second eye.

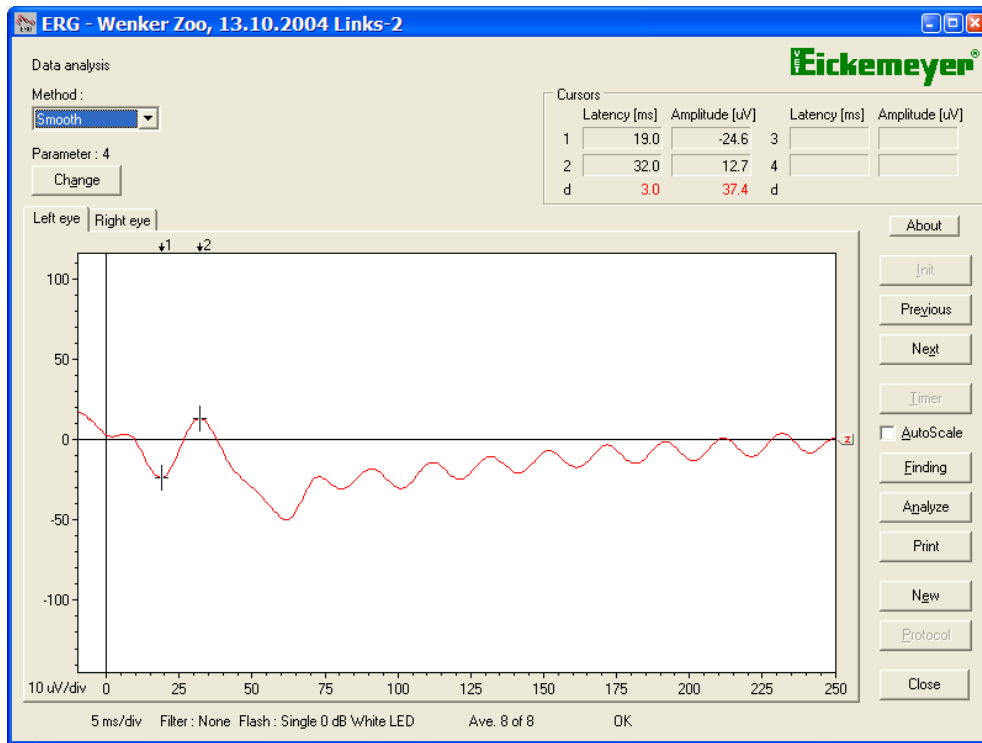
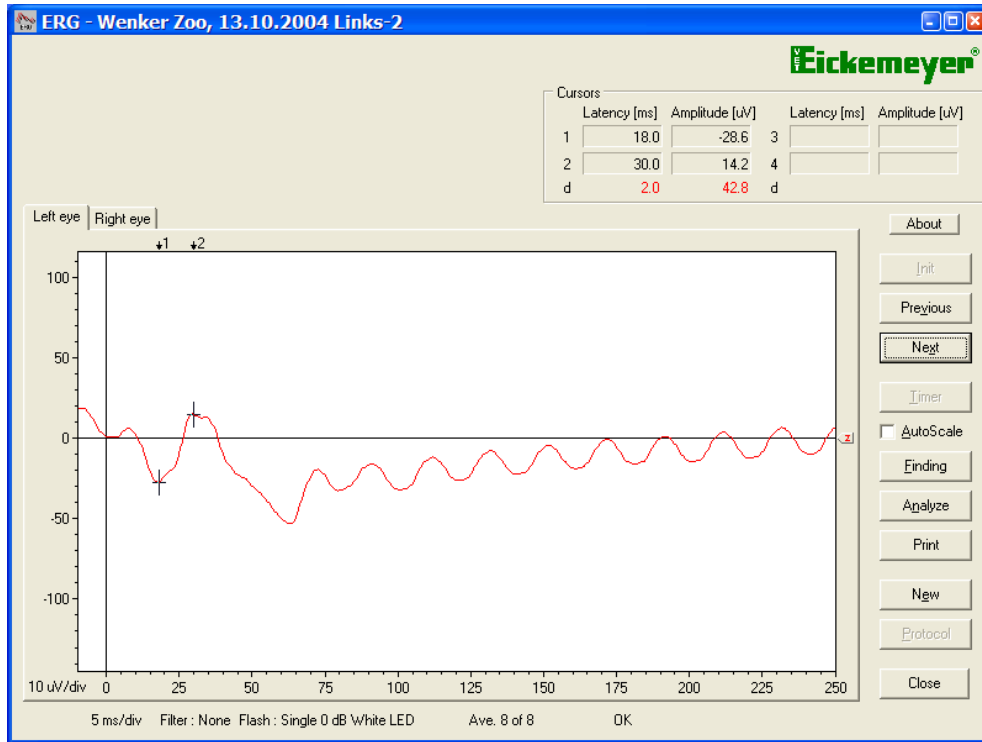




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## 9. The Results and Interpretation

Press the „Analyze“ key



Autoscale: If „Autoscale“ is activated it modifies the signal so that shows up at around 2/3 of the window (the scale on the x-axis or ordinate is changed). The absolute amplitude remains unchanged. The y-axis (axis) stays unchanged.

#### Choose „Method“: Smooth

Press the „Change“ key (smoothing the curve and eliminate disturbances within 9 steps)

NOTE: If you had already very good record conditions, don't use this button! It reduces the amplitudes.

#### Choose „Method“: Extract

This method cuts out the part of the signal with a low frequency. It shows only this parts of the signal which frequencies are above 150 MHz: Oscillation potentials.

Move the cursor onto „z“ to mark the zero line (the start of the signal on the x-axis or ordinate).

Place the cursor on the signal and shift until the a-wave is marked. Then left mouse-click or „Enter“.

Place cursor on the signal and shift until the b-wave is marked. Then left mouse-click or „Enter“.

The display top right shows the latency time (or better: peak time) of the a- and b-wave and its amplitudes. Amplitude of the a-wave in the example: -24.6.

Amplitude of the b-wave (from the bottom of the a-wave up to the peak of the b-wave) in the example: 37.4 (in red).

You can set more markers.

Set markers can be deleted with „Esc“ on the keyboard.

The keys „Previous“ and „Next“ switch between different records.

The „Print“ key prints the signal.

The „New“ key opens a session.

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## **10. Sorts of Errors and Correction of Errors**

### 5-20 Hz-Disturbance

These short steep potentials with repetition rates of 1 until 20 Hz and great amplitudes (10-100  $\mu$ V) are normally muscle potentials (EMG) of the extraocular muscles of the eye. Both – the cornea electrode and the reference electrode – can conduct these signals. To avoid this choose a deep GA and position the reference electrode far away from the eye muscles.

### 50/60 Hz-Disturbance

This disturbance results from a bad earthing of the appliance or the patient and of bad contact between the electrodes (e.g. air between contact lense and cornea; needle electrodes hasn't been swabed with spirit).

### High Frequency-Disturbance (> 100 Hz)

This disturbance results normally from electronic enviroment signales like radios, TV, computer or similar machines. A clean kink-free connection of the appliance and protected electrodes/cables are essential. Switch off unused machines in the examination room. Sometimes it might necessary to change the examination room or protect the room by some kind of Faraday-cage.

### ECG-Influences

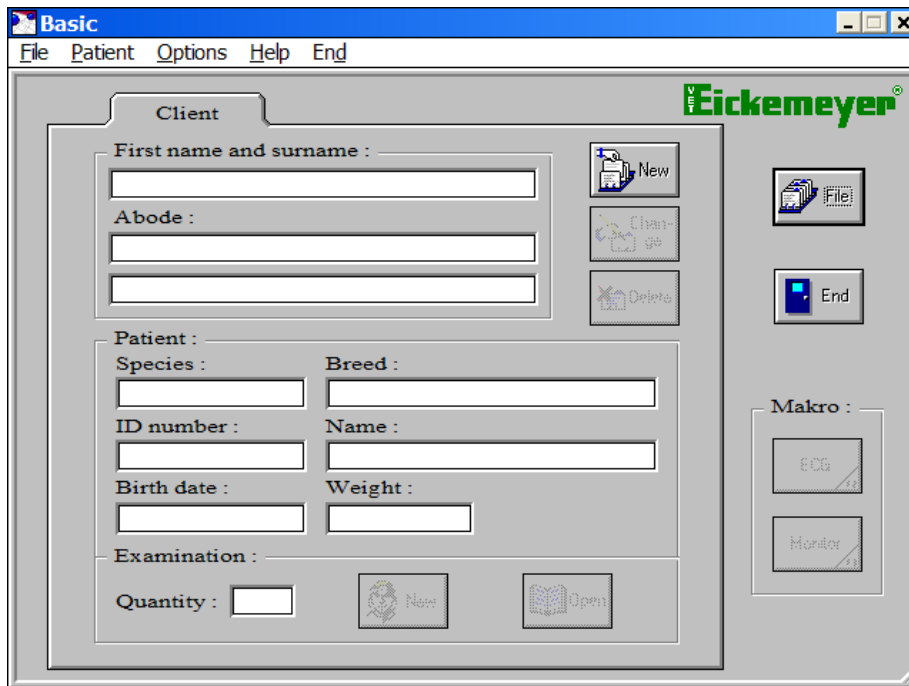
Is the reference-electrode to close to a large vessel or too far away of the active cornea-electrode some kind of a ECG can be conducted and interfere with the ERG. The reference-electrode should be re-positioned to avoid similar disturbance.

### EEG-Influences

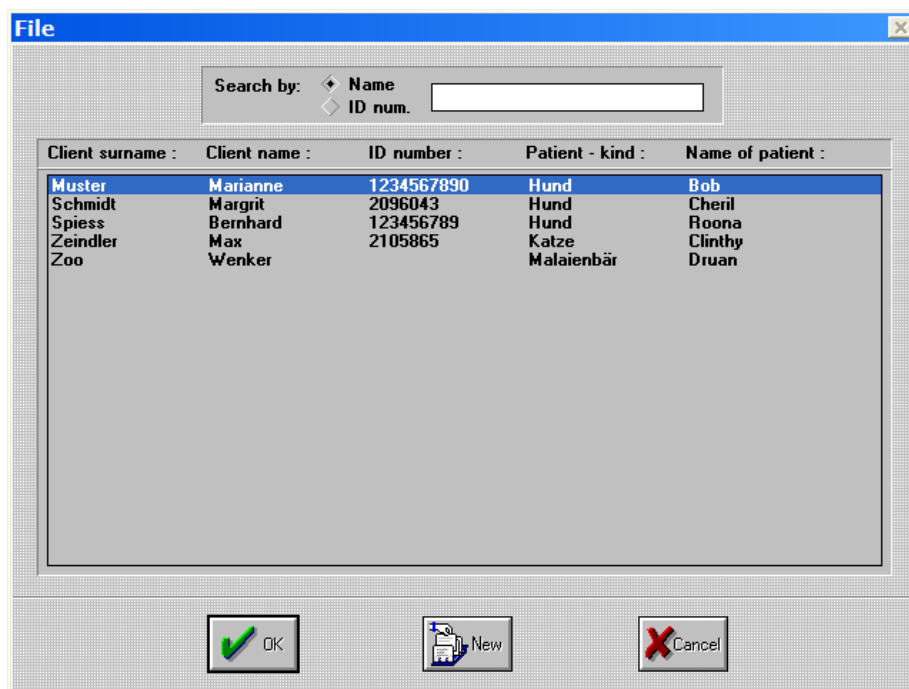
Is the reference-electrode place too far occipital an EEG can be conducted and recorded. In this case the electrode should be placed nearer to the eye.

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## 11. Filing of Datas

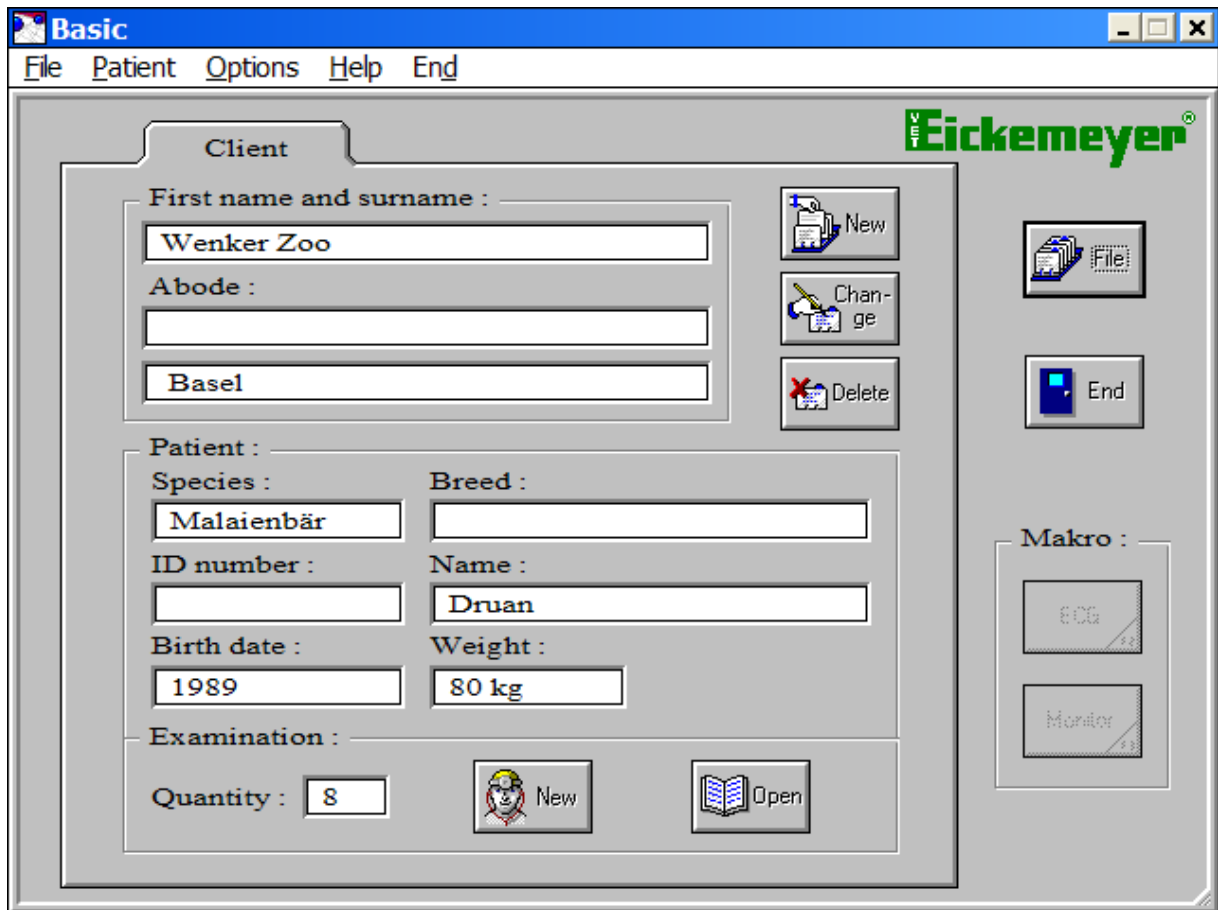


Press the „File“ key on the right hand side of the basic window.



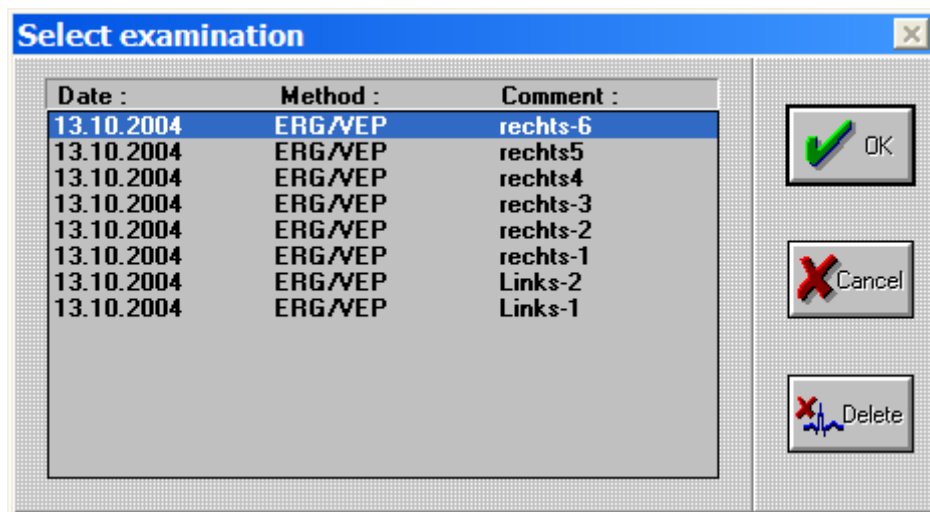
A new windows opens where all former exams are listed.

click at the record you want and press the „OK“ key.



In the new window are all details of the patient shown. The box „Quantity“ bottom left shows the number of former records.

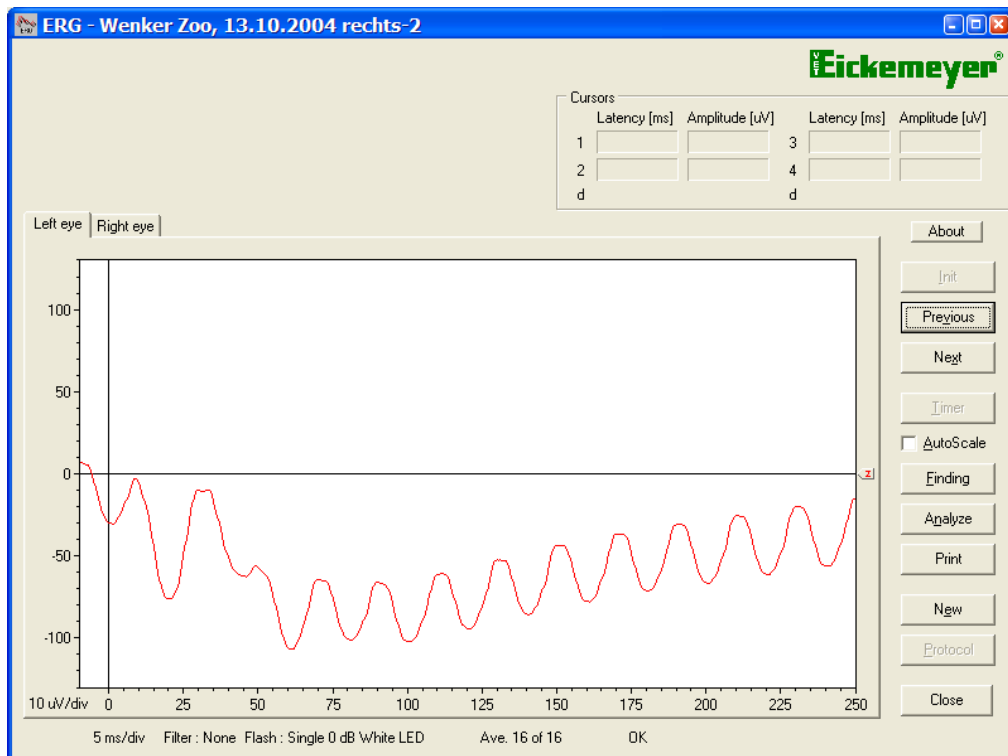
If you want to record a new session press the „New“ key.  
To analyse filed signals press the „Open“ key.





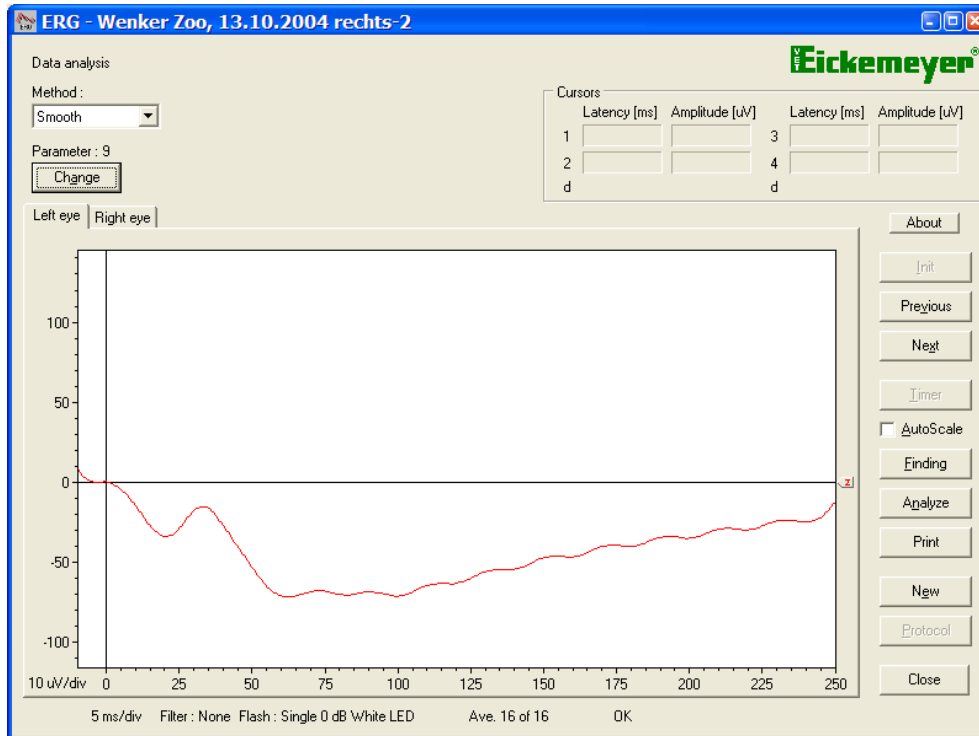
In the new window all previous records include date, method and examiners comment .

After choosing a record press the „OK“ key, the chosen ERG-curve is shown in a new window.

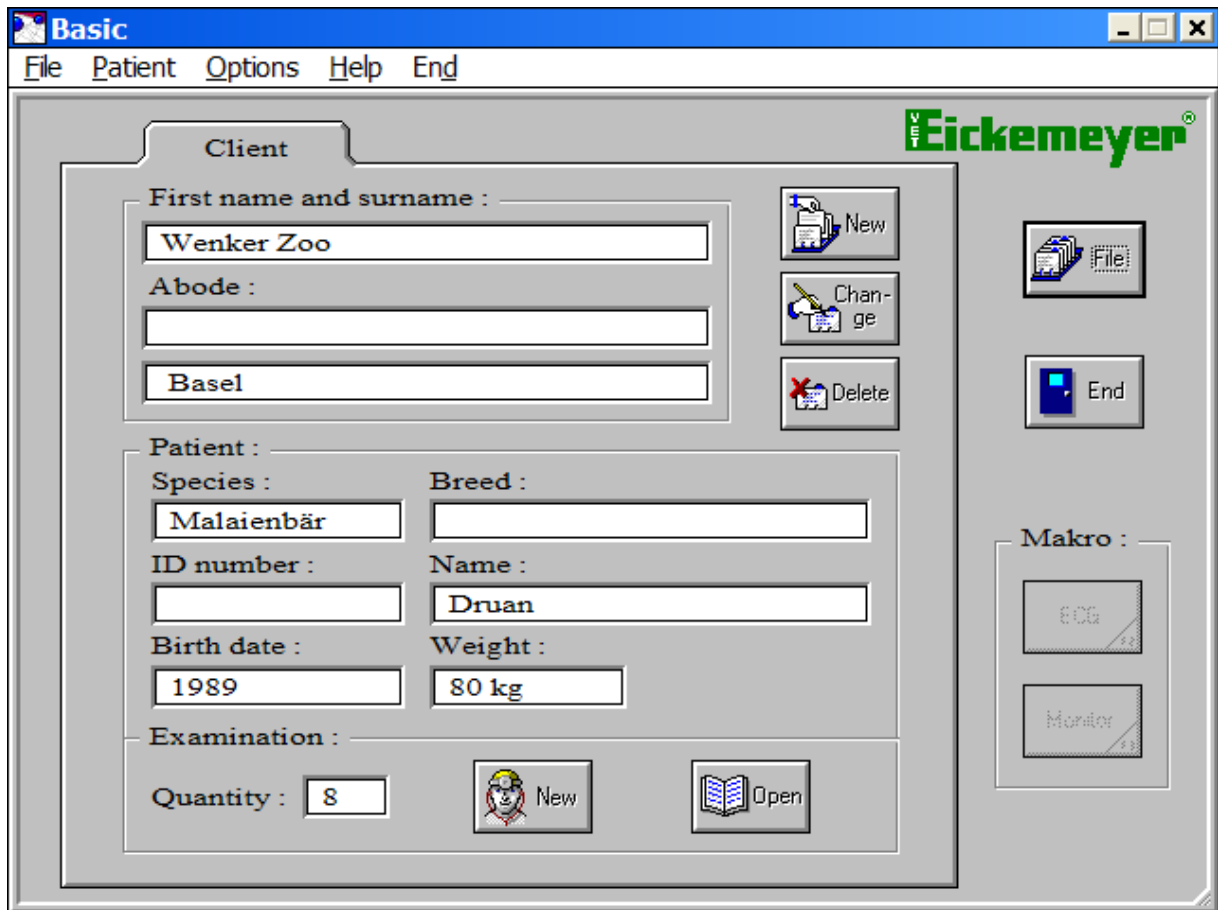


In this particular case the signal was contaminated with 50 Hz „noises“ contamination and could hardly be analysed.

although there is the possibility of reducing the noise with „Analyze“ and „Smooth 9“ , the amplitudes produced by this are reduced to unrecognisable levels.



With the „Delete“ key you can delete useless signals.



The „End“ key finishes the program.

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## 12. Further Literature

B.M. Spiess u. A. Leber-Zürcher (1991)  
Klinische Elektroretinographie beim Hund. 1. Teil  
Schweiz. Arch. Tierheilk. 133, 217 - 223

A. Leber-Zürcher et al. (1991)  
Klinische Elektroretinographie beim Hund. 2. Teil  
Schweiz. Arch. Tierheilk. 133, 301 - 309

B.M. Spiess u. A. Leber-Zürcher (1992)  
Klinische Elektroretinographie beim Hund. 3. Teil  
Schweiz. Arch. Tierheilk. 134, 61 - 74

K. Narfstrom et al. (2002)  
Guidelines for clinical electroretinography in the dog.  
Doc Ophthalmol. 105(2), 83 - 92

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