

## ECG/EMG Box 1000579

### Instruction sheet

10/15 Hh



- 1 ECG/EMG box
- 2 miniDIN connecting cable
- 3 Limb attachment leads
- 4 ECG attachment electrodes

### 1. Safety instructions

The ECG/EMG box is only suitable for educational purposes. The measurement data and curves obtained with it must never be used for assessing the state of health of a person.

- Do not use the ECG/EMG box for diagnostic purposes.
- Do not use the ECG/EMG box for monitoring the effects of therapeutic treatments.
- The ECG/EMG box must not be opened or interfered with under any circumstances.
- Do not operate the ECG/EMG box near heart pacemakers or other electrical stimulation or therapeutic devices.
- Only connect the ECG/EMG box to one test person at any time.

The ECG/EMG box is constructed in accordance with the current safety requirements for "Protection Class II, Classification BF (body float)"!

- An instrument configuration consisting of the ECG/EMG box and the 3B NET/og™ unit may only be operated with a PC that conforms to the current CE regulations!

### 2. Description

Sensor box for the measurement of an electrocardiogram (ECG) on the skeletal musculature using the three standard Einthoven limb leads I, II and III:

- Lead I: from right arm to left arm;
- Lead II: from right arm to left leg;
- Lead III: from left arm to left leg.

The three leads can be selected by push-button and the choice is indicated by an LED.

The equipment works by measuring the changes in skin surface potential caused by contraction of the heart.

The action potentials of muscles in both relaxed and energised states can also be measured (electromyogram, EMG).

The sensor box is detected automatically by the 3B NET/og™ unit.

### 3. Equipment supplied

- 1 ECG/EMG box
- 1 Limb attachment leads, 4-position (right arm, left arm, left leg, right leg), with push-button contacts, length 1.50 m
- 2 Packs (60 in each) of ECG attachment electrodes F55, Ag/AgCl, with gel pre-applied
- 1 miniDIN connecting cable, 8-pin, 1 m long
- 1 Instruction sheet

### 4. Technical data

Input resistance:	> 10 M $\Omega$
Output voltage:	max. $\pm$ 1 V
Blocked frequency:	50 - 60 Hz

### 5. Operation

**Important:** When attaching the limb leads ("patient leads"), try to avoid crossing them over, and ensure that there are no current-carrying conductors nearby.

Vigorous movements by the person being tested can cause artefacts (disturbances) in the recorded curves. The person should remain lying back in a quiet and relaxed state.

- To prepare for recording the ECG, attach one electrode each (4 altogether) to the inner surfaces of both forearms and on the inner surfaces of both calves.
- Connect the limb leads to the ECG electrodes, with the correct colour identifications:  
**RED** for the right forearm (right arm), **YELLOW** for the left forearm (left arm), **GREEN** for the left calf (left leg), and **BLACK** for the right calf (see Fig. 1).
- Using the miniDIN connecting cable, connect the ECG/EMG box to one of the two analog inputs  $U_{in}^A$  or  $U_{in}^B$  of the 3B NET/og<sup>TM</sup> unit, whichever is preferred.
- Switch on the 3B NET/og<sup>TM</sup> unit and wait for the box to be detected automatically ("Probe Detect").
- Place the ECG/EMG box near the test person.
- By means of the push-button on the box, choose the required standard lead I, II or III.
- For recording the EMG (electromyogram), attach four electrodes to the arm of the test person as shown in Fig. 3:  
**RED** to the inner surface of the lower part of the left forearm, **YELLOW** to the inner surface of the upper part of the left forearm,

**GREEN** and **BLACK** to the outer surface of the left forearm.

- Select the EMG mode by pressing the button "I" for about 2 seconds.

### 6. Applications

Recording an ECG in a relaxed state with the three standard EINTHOVEN leads.

Studying the P, Q, R, S, T and U waveforms.

Recording an ECG after light physical activity.

Investigating the effects of different body postures on the ECG curves.

Investigating the effects of external influences (excitement, fright) on an ECG.

Determining pulse rate from the ECG curves.

Recording an EMG (electromyogram) produced by muscle contractions; measuring the electric potentials for involuntary movements of relaxed muscular regions.

### 7. Sample experiments

#### 1. Recording the ECG (electrocardiogram) of a person

Equipment required:

1 3B NET/og <sup>TM</sup>	1000539 / 40
1 3B NET/lab <sup>TM</sup>	1000544
1 ECG/EMG box	1000579

- Prepare the experiment as shown in Fig. 1.
- In 3B NET/lab<sup>TM</sup>, open the application program (template) for the ECG experiment using the ECG/EMG box.
- Start the template and record the curve for the chosen ECG variant (in this case, relaxed-state ECG with Einthoven standard lead I, see Fig. 2).
- Evaluate the ECG curve in accordance with the information about basic principles in the template.
- Determine the pulse rate of the person being tested.

**Important:** If the ECG just recorded does not completely resemble the example provided, this is not a cause for concern. Every person can show differences from the norm; even healthy hearts show such variations. The precise interpretation of an ECG requires much medical experience. This ECG/EMG box is not an instrument for diagnoses of that kind.

## 2. Recording the EMG (electromyogram) of a person

Equipment required:

1 3B NETlog™	1000539 / 40
1 3B NETlab™	1000544
1 ECG/EMG box	1000579

- Set up the experiment as shown in Fig. 3.
- In 3B NETlab™, open the application program (template) for the ECG experiment using the ECG/EMG box.
- Start the template and record the electromyogram curve (Fig. 4).

- Evaluate the EMG curve in accordance with the information about basic principles in the template.

Note: In the practice of medical “electrodiagnostics”, an EMG yields information about diseases of the nerve and muscle cells (neuropathy and myopathy). In “biomechanics” the relationships between the frequencies and amplitudes of the electrical signals and the performance of muscles are investigated, for example in order to optimise the movements of an athlete or sports person.

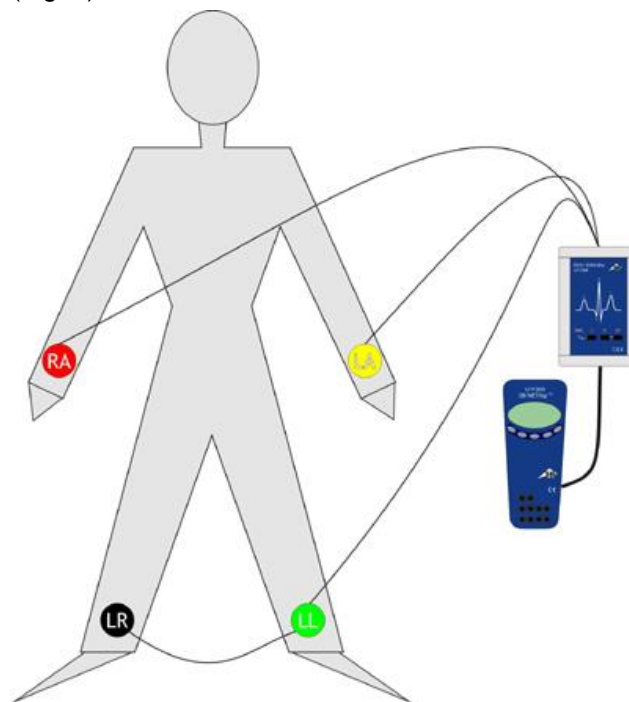


Fig. 1 Recording the ECG of a person

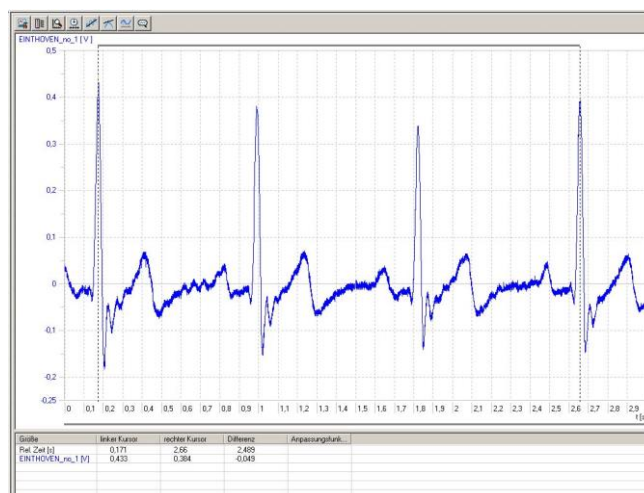


Fig. 2 A relaxed-state ECG recorded using Einthoven standard lead I and displayed on the screen in 3B NETlab™

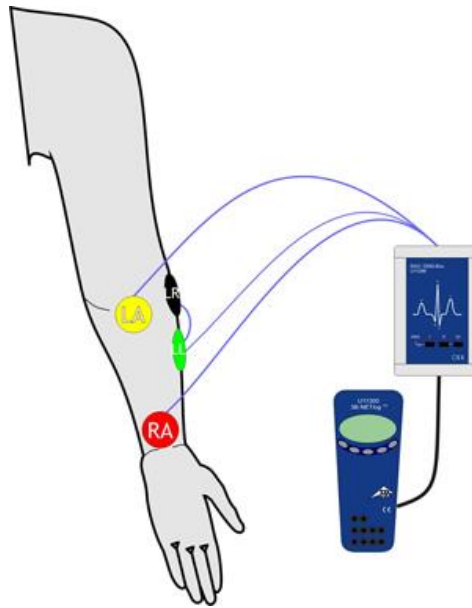


Fig. 3 Recording an electromyogram of the left forearm of a person

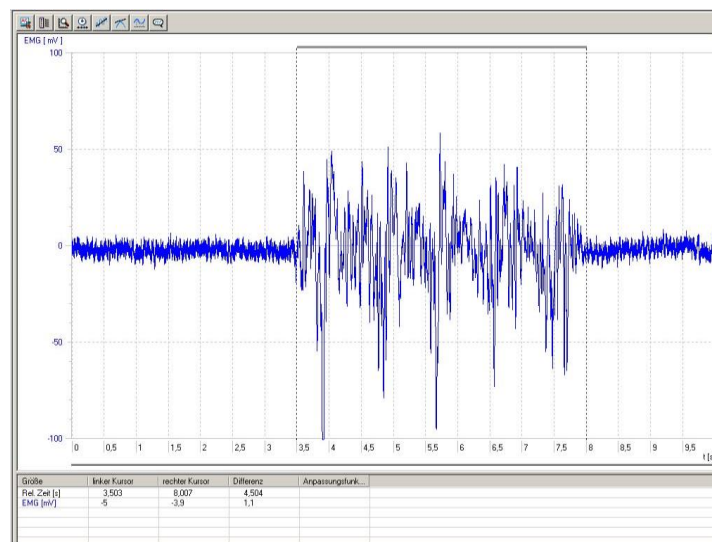


Fig. 4 EMG of muscular contractions of the left forearm; effect of switching between relaxed and active phases