ASTAR.

Etius – User Manual

CE
0197

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1. Introduction

Read this Guide carefully before starting the unit operation!
Follow the recommendations presented in this Guide!

Electrotherapy therapy unit Etius should be installed by the seller.
The recipient has the right to insist on the product operation training.
The unit may only be operated by qualified personnel or under supervision of such personnel!
WARNING: The device is intended for adult patients only. It is not intended for use in a home healthcare environment.

Description of symbols used in this manual:

Read appropriate passage of this user guide, warnings or important information. Failure to observe warnings can lead to injuries.

Important notices and information.

Following texts marked with this symbol facilitates device operation.

NOTE:
The outlook of screens shown in this manual may slightly differ from their actual outlook during device operation. These differences may concern size and type of fonts and size of symbols. There are no differences in the content of shown information.

Warning: No modification of this equipment is allowed!

1.1 Manufacturer

ASTAR Sp. z o.o.
ul. Świt 33
43-382 Bielsko-Biała, Poland
www.astar.eu

1.2 Risk management process

The manufacturer conducts continuous risk management process referring to the device construction, its intended use, method of operation and maintenance. Residual risks are presented in this User Manual in form of information about precautions, contraindications and warnings.

2. Intended use

Electrotherapy unit Etius is intended for carrying out treatments procedures using:
- bipolar (bidirectional) and unipolar (unidirectional) low frequency currents,
- bipolar (bidirectional) medium frequency currents and unipolar (unidirectional) medium frequency currents modulated by low frequency waveforms.

Etius unit is equipped with two fully independent electrotherapy treatment channels with the possibility of operation on 4 electrodes treatment procedures.

Detailed information about the available configuration is presented in chapter 7.

The unit possesses the base of preset treatment procedures, there is also a possibility to create own user-defined programs.

The unit may perform treatments by:
- interferential currents – dynamic and isoplanar,
- one-channel sine wave current (AMF),
- Kotz' – Russian stimulation,
- TENS, BURST and formed in packages to spastic paralysis SP-TENS currents,
- tonolysis – to spastic paralysis,
- ionophoresis and galvanization of constant current (in the continuous and interrupted mode),
- triangular or rectangular pulses (in continuous and interrupted mode),
- Träbert (Ultra Reiz), Leduc' and neofaradic (in continuous and interrupted mode),
- diadynamic according to Bernard – MF, DF, CP, CP-ISO, LP currents (in continuous and interrupted mode),
- USS – Unipolar Sine Surge current,
- microcurrents,
- qualitative and quantitative electrodiagnostics of the nervous-muscle system.

2.1 Intended users

The patient should not be the operator.

Users (operators) of Etius device can be:
- specialists in the field of the electrotherapy,
- physiotherapists specializing in the therapy of the musculoskeletal system,
- sports medicine specialists,
- aesthetic medicine specialists,
- trained personnel performing treatments under the supervision of the above-mentioned specialists.

The user should have:
- knowledge about the indications and contraindications for the use of electrotherapy,
- knowledge of the terminology and technical terms used in the manual (e.g. knowledge of units of physical quantities),
- practical skills in performing therapeutic treatments using multifunctional devices for therapy, resulting from education, experience and training.

Physical and cognitive requirements of the operator:
- eyesight enabling to recognize elements of LCD and keyboard,
- hearing enabling to hear the patient's voice,
- reading comprehension that allows to read the instructions of use and information on the LCD of the device,
- two functional upper limbs that allow to perform treatments and other activities related to the operation of the device (e.g. cleaning, disinfection),
- age in the range of admissible value of professional activity (depending on the regulations of the country where the device is used).

2.2 User training

The Etius user has to be properly trained in the device safe and effective use, before starting the operation. Training in the rules of operation can be carried out by representatives of the manufacturer or seller, based on this user manual. Recommended training positions:

- information about the intended use of the device,
- occupational safety information,
- information on the construction and method of the output signals generation,
- information on available settings and operation modes,
- instructions for use,
- indications and contraindications for the therapy,
- information on recommended maintenance, cleaning and disinfection,
- handling in the event of a technical malfunction.

Due to requirements of local law and regulations in different countries, additional training activities may be required. The user should inform the seller about such requirements in order to receive complete information.

3. Warranty and manufacturer's responsibility

The manufacturer warrants the controller to be free of faults for the period of time and conditions stated in Warranty Certificate. The manufacturer also provides post-warranty service for a period of 10 years from launching the unit onto the market. The warranty includes all material and workmanship faults.

The manufacturer undertakes to observe the warranty agreement, if the following conditions are met:

- all repairs, changes, extensions and calibrations of equipment are performed by manufacturer or authorized service personnel
- the mains supply system in the treatment room meets requirements of standards in force,
- the unit is operated by qualified personnel, in compliance with instructions presented in this manual,
- the unit is operated in compliance with its intended use.

The warranty does not include consumables, such as connection cables, mains cables and fuses, as well as faults or damage caused by:

- improper placement, installation, or configuration of the device,
- misuse or failure to observe the instructions presented in this user manual,
- inaccurate or inadequate maintenance carried out by the operator,
- improper environmental conditions specified for the product,
- unauthorized opening of the outer casing,
- adjustment and/or unauthorized tuning,
- use of non-original accessories.

The warranty does not cover any damage due to a failure to adhere to the recommendations stated in chapters 4.3 and 10 hereof.

The manufacturer is not liable in case of transmission of infection by equipment components.

The expected "life time" of the device is 10 years.

After elapse of 10 years from date of introduction of device and accessories in the market the manufacturer is not liable for device and accessories' faults or its consequences. After elapse of the expected life time of the device the user bears the complete responsibility for the occurrence of medical incidents.

The manufacturer bears no responsibility for results of faulty installation, wrong diagnosis, wrong use of the device and equipment, failure to observe user's manual and performance of repairs by unauthorized persons.

Inside the device there are no user serviceable components, except for fuses.
No parts can be serviced or maintained when the device is in use with a patient.

On demand, the producer makes available technical diagrams, parts lists, descriptions, instructions for calibration or other helpful information to appropriately qualified user's technical staff to repair these parts of unit, which are described by the producer as a reparable.

4. Operational safety

4.1 Mains supply and operation mode

The Etius unit is designed for supply from AC mains with rating 230 V ± 10%, 50/60Hz. It is a medical device under safety class I, type BF. The unit may be used only in rooms, where the electric system is executed in compliance with standards in force. The unit is intended for continuous operation. It is not necessary to switch it off from the mains between particular treatment procedures.

The unit is connected to the mains using the detachable power cord. The power supply cord is equipped with a mains plug that isolates the device from the supply mains on all poles simultaneously.

Recommendations related to isolation the device from the supply mains:

- **Do not position the device so that it is difficult to operate the disconnection of the device from the supply mains.**
- **To isolate the device from the supply mains, hold the mains socket-outlet with one hand, grasp the mains plug with second hand and disconnect it from the mains socket-outlet.**

Disconnection from the mains takes place after:

- **removing the mains cable plug from the mains power socket,**
- **removing the mains cable plug from the socket on the unit,**
- **switching the mains switch to the "0" position.**

4.2 Storage, operation and transport conditions

The Etius unit must be stored in closed rooms, where the atmosphere is free from vapors and caustic substances and:

- the temperature is maintained between + 5°C and +45°C,
- relative humidity does not exceed 75%,
- atmospheric pressure value is between 700 and 1060 hPa (70-106 kPa).

The unit is intended for operation under the following conditions:

- ambient temperature between +15°C and +30°C,
- relative humidity between 30% to 75%,
- atmospheric pressure between 700 to 1060 hPa (70-106 kPa).

If further transport of the device is required, use the delivery packaging. Transport shall be performed with covered transport means.
Recommended transport conditions:

- ambient temperature between -10°C to +45°C,
- humidity between 20 and 95%,
- atmospheric pressure between 700 and 1060 hPa (70-106 kPa).

4.3 WARNINGS and safety notes

The Etius unit has been designed and manufactured in such a way that its use does not jeopardize the health and safety of patients, users and third parties, as well as the unit should provide therapeutic benefits to patients if it is operated in appropriate conditions and in accordance with its intended purpose.

General:

- **The unit may be operated by qualified personnel in compliance with instructions presented in this manual.**
- **To avoid the risk of electric shock, the equipment must only be connected to mains supply with protective earth pin.**

- **No modification of this equipment is allowed!**
- **The treatment station (bed, couch, chair) shall be located away from other electric devices and water supply / sewerage installation / central heating system, so that it is impossible for the patient to touch any of them during treatment procedure.**
- **Do not position Etius so that it is difficult to operate the disconnection of the device from the supply mains.**
- **Do not remove warning signs and labels put by the manufacturer on the unit casing and casings of accessories.**
- **The unit shall be protected against high temperatures and atmospheric conditions.**
- **Damaged cables shall be replaced immediately. Pay special attention to the casing cracks, threadbare isolation and partially torn interconnecting cables.**
- **Prevent any fluid from penetrating inside the unit. In case of any fluid getting inside the unit, switch the unit immediately off, isolate from the mains and contact service to inspect the unit.**
- **By any means do not cover the vents. Do not insert any objects into the ventilation gaps.**
- **The unit may be only used with accessories, spare parts, disposable items which have been determined to be safe and appropriate inspection bodies have not issued contraindications against their use.**
- **It is recommended to use original accessories, spare parts and equipment of Astar. Use of accessories other than recommended by the manufacturer may result in decreased immunity and increase emissions of the unit in the electromagnetic compatibility.**
- **After switching the unit off, wait for 10 seconds before you switch it on again.**
- **Each serious incident concerned with the device should be reported to the manufacturer and competent authority of the country, where the user or patient resides. Serious incident means any incident that directly or indirectly led, might have led or might lead to any of the following:**
  - **the death of a patient, user or other person,**
  - **the temporary or permanent serious deterioration of a patient's, user's or other person's state of health,**
  - **a serious public health threat.**

Electromagnetic compatibility:

- **It is recommended to use original accessories, spare parts and equipment of Astar. Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.**
- **Use of the Etius adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, the Etius and the other equipment should be observed to verify that they are operating normally.**
- **Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Etius, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.**

Therapeutic:

- **The device is intended for adult patients (patient has to be conscious). Minor patients – only on the doctor's explicit recommendation, after considering contraindications.**
- **It is impermissible for the patient to carry out the treatment on their own.**
- **Patients with implanted electronic devices (e.g. cardiac pacemakers) or other metal implants should consult a physician prior to treatment.**
- **Before treatment it is necessary to interview the patient, including the occurrence of relative and absolute contraindications to conduct therapy.**
- **Do not perform treatments on patients under the influence of alcohol.**
- **Do not perform treatments on patients under the influence of intoxicants.**
- **It is necessary to ensure the adequate interval between treatments for the patient, in order to avoid an increase of the risk of complications.**
- **It is necessary to continuously update knowledge and follow literary activities in the scope of therapy.**
- **Treatment parameters should be consistent with the medical indications.**
- **Connect the cables to the patient at a time when the device does not generate the electricity to avoid the risk of electric shock.**

- **Electrodes should not be placed alongside the carotid artery (carotid sinus).**
- **It is prohibited to leave the patients unattended during treatments of electrotherapy.**
- **It is necessary to take precautions in case of the occurrence of surface metal implants in the spot of application.**
- **If it is possible, the treatment polarity should be adjusted so that the negative pole ought to be "further" from the heart than the positive one.**
- **It is not recommended to place electrodes in chest area, as it may increase the risk of ventricular fibrillation.**
- **Take special care with patients with disturbed surface sensation.**
- **In case of treatment performed near the head, the patient should be in lying position.**
- **Sitting or reclining position should be applied to the patients with respiratory disorders or breathing difficulties.**
- **Simultaneous performance of electrotherapy treatments and therapies with the use of high frequency equipment (diathermy and electro surgery) may result in burns where electrodes are applied.**
- **It is necessary to use operational and sanitized electrodes. Inadequate choice of electrodes may cause skin irritations or burns.**
- **It is recommended to differentiate the electrodes size according to performed treatment in order to do not exceed the current density:**
  - **0,2mA/cm^2 for currents with constant component (unipolar) - galvanic, diadynamic, pulse currents, unipolar sine surge, tonolysis,**
  - **2mA/cm^2 for bipolar currents – TENS, Kotz', interferential.**

  Improper selection of electrodes can cause skin irritation and burns.
- **Take special care if the treatment procedure is performed when the values of output signals amplitudes cause exceeding of the value of current density of 2 mA (rms value) per 1 cm^2 of the surface.**
- **Irritation and skin burns may occur during performing electrical stimulation. If such syndromes occur operator is obliged to interrupt the treatment and immediately consults with a doctor.**
- **It is not recommended to apply unidirectional currents in CV mode due to the possibility of skin burns. It is necessary to apply CC mode.**
- **It is necessary to avoid carrying out electrotherapy treatments in pregnant women or women with the likelihood of pregnancy.**
- **Special caution must be kept during electrotherapy treatments in children and older people.**

- **Immediately disconnect the patient in the case of appearing special messages on the display – see Table 4-1.**

Table 4-1. Special messages

Message	Explanation	Recommended action
Open circuit: A	Open circuit detected. Current flow in the patient circuit is not possible.	• Check the patient's cables condition • Check the electrodes condition • Check the quality of the patient's electrodes attachment • Moisten the electrode covers properly
Open circuit: B		
Open circuit: AB		
Current limit exceeded: A	Unacceptable deviation of the amplitude in patient circuit detected.	• Check the electrodes condition • Check the quality of the patient's electrodes attachment • Moisten the electrode covers properly • If the above mentioned actions are ineffective turn the unit off and on to verify the correctness of the performed self test • If the problem occurs frequently, contact your service
Current limit exceeded: B		
Current limit exceeded: AB		

Message	Explanation	Recommended action
Overcurrent: A	Limitation of the maximum current in patient circuit in CV mode.	• Check the electrodes condition • Check the quality of the patient's electrodes attachment • Moisten the electrode covers properly
Overcurrent: B		
Overcurrent: AB		
Overheating. Wait for cooling	Too high temperature inside the unit.	• Check whether the fan is working • Uncover the vents
Temperature too low. Wait for warming.	Too low room temperature.	• Wait until the room temperature rises above 15°C
Overload Hardware error	Possible unit damage.	• Disconnect the patient • Turn the unit on again to verify the correctness of the performed self test • If the problem occurs frequently, contact your service
Error (Error characteristics, e.g. power error +28 V)	• Possible unit damage. • External cause, e.g. power interruptions or/and dips.	• Disconnect the patient • Turn the unit on again to verify the correctness of the performed self test • If the problem occurs frequently, contact your service

4.4 Explosion proof environment

Device is not adapted to operation in rooms, where combustible gases or their vapors occur. It is recommended to avoid anesthetic or oxygen derivate gases, such as nitrous oxide (N_2O) and oxygen. Some materials (e.g. cotton wool) may after saturation with oxygen become combustible at high temperatures generated with normal operation of equipment. It is recommended that solutions of adhesive and combustible solvents be vaporized before equipment is operated. It is also recommended to pay attention to the danger of ignition of endogenous gases. The unit must be separated from the mains before approaching the disinfection room, where it is installed.

4.5 Electromagnetic environment

Warnings concerning about electromagnetic environment are given in chapter 4.3.

Due to the intended use, the device can be used in hospitals, clinics, outpatient clinics, medical and rehabilitation clinics and other health care facilities, under the supervision of qualified personnel.

Simultaneous operation of the unit with devices generating strong electromagnetic field, such as short wave and microwave diathermies, high frequency electrosurgical equipment, MRI systems, may disturb its operation. For this reason, it is recommended to maintain appropriate distance between these devices or to switch off the generator of strong fields during therapy with the Etius unit.

The unit meets requirements of electromagnetic interference emission and immunity standards and shall not pose a threat to correct operation of the other devices. Levels of the compatibility in terms of emission and resistance are given in chapter 11.2.

4.6 Technical supervision

The User of Etius unit should perform technical inspection of the unit at year's intervals. The inspection should be performed by a unit authorized by the manufacturer. The inspection is performed at the user's expense.
The inspection should include:

- evaluation of keyboard function and operation,
- control of correctness of the performed self test,
- safety test,
- electrotherapy cables and electrodes test,
- verification of accuracy of current and voltage amplitude.

The inspection should also include checking the quality of applied accessories and treatment materials.

Positive result of the technical inspection confirms that basic safety and essential performance is maintained.

4.7 Applied parts

The Etius device has one applied part type BF. It includes electrotherapy sockets with plugs and patient cables. The elements of the applied part are connected together. Physical contact of the electrodes with the patient's body during normal use is necessary for the device to perform its function.

The specification of the outputs, together with the location of the output sockets and the characteristics of the applicators, is described in detail in chapter 5.3. The symbol of the applied part type BF is placed on the sockets label.

4.8 Disposal

In case, when the disposal of the unit will become necessary (e.g. after elapse of its service life), please contact the manufacturer or manufacturer representative, which must react in an appropriate way i.e. collecting the unit from the user. The user may also contact companies specialized in removal and/or disposal of electrical devices or computer equipment.

The unit is marked with an appropriate symbol complying with the directive on waste electrical and electronic equipment (WEEE) – see table with description of the symbols used to label the product presented in **Appendix A**.

5. Unit description

5.1 General characteristics

Etius unit is a two-channel electrostimulator. Circuit configuration possibilities of two-channel operation are described in chapter 7.2.

Etius features console casing with top made of light-grey plastic. All indicators are located on the upper surface. The mains switch, fuse socket are mains socket are located on the left side of casing. Output sockets for connecting patient's cables and patient's stop switch are located on the right side of casing. General view of the unit is presented in Figure 5.1, view of the left and right panel in Figure 5.2.

Figure 5.1. General view

Figure 5.2. View of the left and right panel of the unit

5.2 Keyboard

Arrangement of keyboard components is shown in figure 5.3.

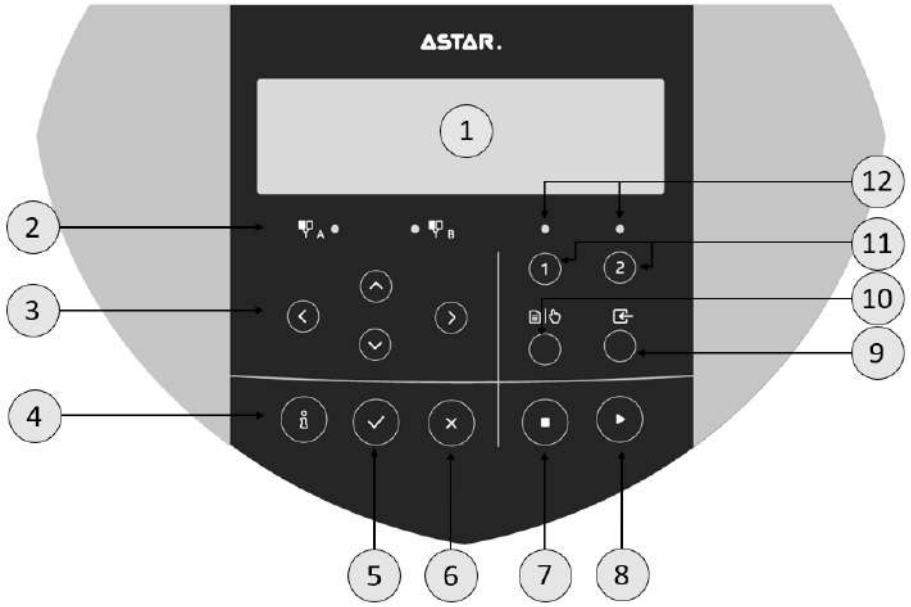


Figure 5.3. Arrangement of keyboard components

No.	Description	Functionality
1.	Liquid crystal display	The unit is equipped with a LCD with backlight and a resolution of 240x64 lines. The screen clearly displays all information related to the device operation.
2.	Current flow indicators	Spotlight indicators inform about current flow in a given channel. The indicator turns on when the current starts to flow in the output circuit.
3.	Edit keys	**Parameter change keys:** These keys are marked with symbols ^ v Pressing any of them results in: • change of value of edited parameter or setting in setup mode, • sign selection with introduction of name during edition of user-defined programs, • change of signal amplitude during treatment procedure. Keep holding the key down to change a parameter quicker. **Menu item change keys:** These keys are marked with symbols < > . Pressing any of them results in: • change of menu item, • change of cursor position when introducing names while editing user-defined programs, • addition or removal of preset program from favorites list. Keep holding the key down to change a cursor position or sign quicker.
4.	Information key	This key is marked with the symbol ⓘ. Pressing of this key causes displaying of more information with full name and parameters of: • treatment program, • treatment sequence, • user-defined program. Escape from information menu follows after pressing of the ⓘ or ✕.

No.	Description	Functionality
5.	Confirmation key	This key is marked with the symbol ✓ It is used to confirm: • selection of therapy in a particular treatment channel, • function in program mode, • current type in electrotherapy and combined therapy, • saving of user-defined program, • functions in setup mode, • changes in the unit settings.
6.	Escape key	This key is marked with the symbol ✕ Its pressing causes abolition of action and going over on an early menu level. Pressing of this key during treatment procedure results in immediate interruption of the procedure.
7.	STOP key	This key is marked with the symbol ■ Pressing STOP key while performing treatment procedure causes that the unit stops and enters the standby mode (pause). The treatment timer will stop.
8.	START key	This key is marked with the symbol ▶ Pressing START key results in current generation after: • selection of a treatment program or sequence, favorite program or user-defined program in program mode, • ending of parameters edition in manual mode. Pressing START key after interruption of a treatment procedure using STOP key (pause) makes it possible to continue the procedure.
9.	Save key	This key is marked with the symbol . Pressing of this key enables saving parameters of treatment procedure edited in manual mode as a user-defined program.
10.	Operation mode change key	This key is marked with the symbol . Pressing of this key results in change from program operation mode to manual mode (and vice versa).
11.	Therapeutic selection channel keys 1 and 2	Pressing selection channel keys 1 or 2 results in going over to particular treatment channel if second channel is currently selected.
12.	Treatment channels indicators	See chapter 5.6

5.3 Rear and side panels

On the unit's rear panel are located:
- name plate,
- service socket available only to authorized service center for diagnostic purposes.

On the left side panel are located:
- unit mains switch,
- fuse socket,
- mains socket.

On the right side panel are located:
- socket for connecting patient's cable,
- patient's stop switch socket.

5.4 Name plate

The name plate is located on the rear panel of unit casing. Among others there are following data on the name plate (see **Appendix A**):

- device version,
- serial number,
- nominal voltage and operation frequency,
- maximum power consumption
- type of applied fuses,
- manufacturer's data.

5.5 Current and voltage stabilization - CC and CV mode

In the range of electrotherapy, the Etius unit may operate in one of two modes:

- CC mode (constant current) – when output current is stabilized,
- CV mode (constant voltage) – when output voltage is stabilized.

In CC mode the current in patient's circuit is independent (within certain limits) from the resultant of resistance of skin, tissues, electrodes (with moist pads) and cables. Effective operation of the unit for very high resistance is possible due to its structure. At the maximum current value of 140 mA, stabilization within a full range of current intensity regulation is provided for resistance values from 30 to 500 Ω. For higher values of resistance, the maximum current intensity is lower. It means that increasing on the keyboard current intensity over the limiting value does not result in further increase of current in the output circuit. In the case, when resistance is too high (e.g. used electrodes, moist pads are not moistened enough), the information about open circuit will be shown on the display.
In CV mode, the voltage generated by the unit, which value is set up on the keyboard, is spread out (according to Kirchhoff voltage law) between the unit's output resistance and resistance of a load. Rough diagram of operation system in CV mode for one channel is presented in figure 5.4.

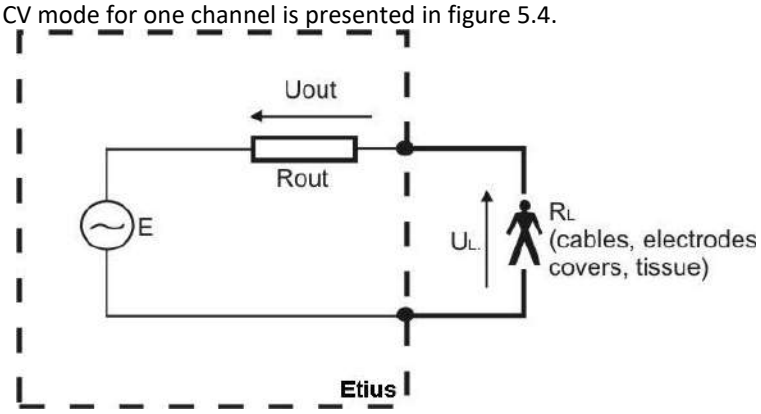


Figure 5.4. Rough diagram of the output circuit of the Etius unit working in CV mode (one channel).

Symbols used in figure:

- E – the value of output voltage – set on the keyboard
- Uout – drop of the voltage on unit's output resistance
- Rout – unit's output resistance
- U_L – load voltage
- R_L – load resistance

The value of voltage in the patient's circuit depends on the quotient of unit's output resistance by the resultant of resistance of skin, tissues, electrodes (with moist pads) and cables. During the unit operation, on the display there are shown the internal setting and voltage value in patient's circuit.

It is recommended to use CV mode while performing non-stationary treatment procedures, e.g. combination therapy of current and ultrasounds or using the point electrodes. A momentary loss of contact between the electrode and patient's body does not result in treatment procedure being stopped, contrary to CC mode.
The calibration settings for CC mode are being entered with the load which has a resistance of 500 Ω. The calibration settings for CV mode are being entered in the idle operation mode of the unit.

5.6 Selection and operation status indicators

Light indicators located under the therapeutic channels symbols 1 and 2.

Channel	Indicator color and lighting mode	Explanation
1	**Green, continuous**	Parameters edition mode.
	Orange, continuous	Treatment is performed.
	Orange, pulse	Special operation status: • the end of a treatment, • open patient circuit detection, • current limit exceeded in CV mode, • detection of the exceeded output amplitude tolerance in CC mode.
2	**Green, continuous**	Parameters edition mode.
	Orange, continuous	Treatment is performed.
	Orange, pulse	Special operation status: • the end of a treatment, • open patient circuit detection, • current limit exceeded in CV mode, • detection of the exceeded output amplitude tolerance in CC mode.

5.7 Protection

5.7.1 Patient's stop switch

Patient's stop switch is an optional accessory. Its pressing automatically interrupts the treatment and the unit is in pause mode. The switch is intended for the patient in the case of feeling unwell during the treatment, especially electrotherapy treatments, when the patient is not under the supervision of a therapist. Restoring current generation is possible by pressing ▶ key on the front panel.

5.7.2 Open circuit detection

In the case, when starting or performing a treatment procedure, the state of high resistance on the output will be detected, which may be caused by:

- incorrect connection of electrodes,
- a poor contact between electrodes and tissue (e.g. covers are not moistened enough),
- used electrodes,
- damaged patient's cables,

the information about open circuit will be shown on the display.

The open circuit detection system is active during the unit's operation. The open circuit detection system works when current value is more than 2,5 mA or voltage is set above 15 V.
Detailed description of checking cables and electrodes condition is given in chapter 10.4.

5.7.3 Current accuracy control in CC mode

While performing the electrotherapy treatment in stabilized output current mode (CC), the unit controls the accuracy of current intensity. In the case when the difference between the setting and output value is higher than 20%, the treatment will be interrupted and the message **"Current limit exceeded"** will appear on the display.

5.7.4 Overcurrent in CV mode

While performing the electrotherapy treatment in stabilized output voltage mode (CV), the unit controls whether the maximum current value is not beyond the limits. If the voltage setting for current value is higher than the allowed limit (specified for the stabilized output current in CC mode), the treatment will be interrupted and the message **"Overcurrent"** will appear on the display.

6. Device installation and start-up

6.1 Unit installation

The first installation should be performed by a qualified manufacturer's or distributor's representative!

After removing the unit from the carton, check if the complete unit has been delivered. In case of any inconsistencies contact the distributor or manufacturer.

After removing the unit from transportation packaging wait approximately two hours before proceeding to next installation steps. This is aimed at adaptation of the unit to conditions in operation room.

The unit shall be placed on a table, trolley or in a cabinet near mains socket with power input 230V and 50/60Hz. Due to manufacturing under safety class I the unit can be connected only to a socket with protective earth pin. It is recommended to place the unit at such a height that it would enable convenient operation from the front panel. The light shall enable easy readout of display indicators, however the unit shall not be exposed to direct sunlight.

All connectors of patient's cables are protected against pulling out. When plugging a connector in, twist the thread to secure it.

6.1.1 Connection of patient's cables and application of electrodes

Electrotherapy leads should be connected to electrotherapy socket according to Figure 6.1.

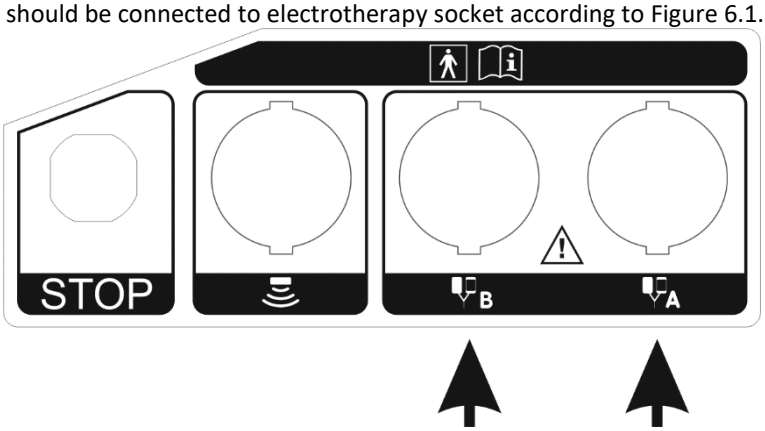


Figure 6.1. Electrotherapy sockets

Cables are terminated with banana type 4 mm or 2 mm plugs – two are red and the other two are black. Channels are marketed with appropriate symbols. Electrodes should be connected to those plugs.

Figure 6.2. Connection of electrodes

After switching the unit on, red plugs are connected to positive pole, and black plugs are connected to negative pole. Electrode connection polarity matters in case of treatments with galvanic currents as well as unipolar currents of low and medium frequency.
As a standard accessory, the unit is equipped with elastomer-carbon electrodes. Parameters of such electrodes facilitate performing treatment procedures within a full range of available values of output signals amplitudes. It is recommended to operate with the unipolar currents using metal – tin or aluminum electrodes, as they wear out much slower than the electrodes made from other materials.
As optional accessories you can purchase self-adhesive electrodes in different dimensions. This type of electrodes is suitable for use with bipolar currents, especially TENS currents. **They shall not be used for therapy with unipolar currents!** Selection of the electrodes type to a particular treatment should be based on doctor's or physiotherapist's knowledge and experience.

6.1.2 Connection in combined therapy

It is possible to apply Etius to combined therapy in connection with ultrasound device, for example Sonaris.

To perform a combined therapy treatment session connect red plug to the ultrasound unit and black plug to the electrode. Set the electrotherapy parameters on the Etius according to this manual. Set the parameters of the ultrasound device according to its user manual.

6.1.3 Patient's stop switch connection

Patient's switch should be connected into the socked marked STOP.

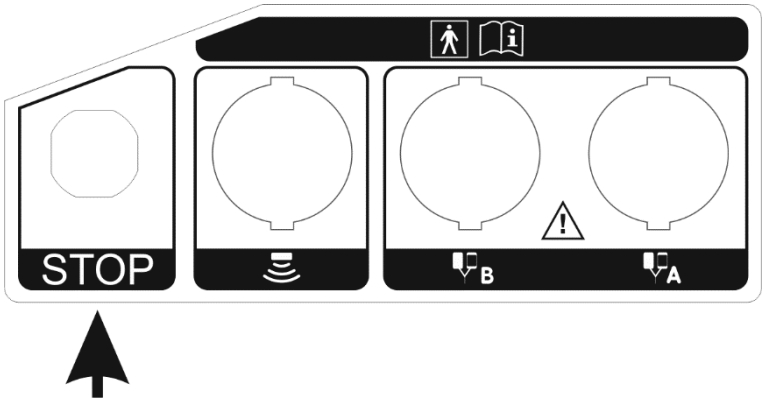


Figure 6.3. Patient's stop switch socket

6.1.4 First operation

Connect the unit to mains supply with delivered detachable mains cable. Turn the unit on. After switching the mains supply on proper work of all blocks are tested.

If after switching on mains supply the display is illegible and no light indicator is illuminated, check whether mains fuse or mains cable operate correctly. Care shall be given to apply fuses with rating given on the name plate. If fuse and cables are working properly, contact the authorized service.
If the self-test results in appearing on the display the information about unit or connected applicator defect along with the error code, turn the unit off and contact with an authorized service representative.

6.2 Setup mode

To enter setup mode, during self test procedure press ✓. After completed self-test, on the display following options will appear:

- Language
- Sounds

- Buzzer volume
- Contrast
- Removal of user-defined programs
- Start-up menu
- Electrodes test
- Statistics
- US Dose units
- Head sensitivity

The option is available when the appropriate accessory is connected. The function is selected with the ^ v keys, to enter the selected option press the ✓ key. To exit the setup mode, switch off the mains supply or in setup mode press the ✕ key (then the unit restarts, and the suitable information is shown on the display).

6.2.1 Language

Information on the display may be presented in different language versions. The user is free to select language options.
To change of language version use the ^ v keys, switching on particular option take place with the < or > keys. That a particular option is on, is confirmed by the "tick" symbol visible in the field just opposite the option name. Approval of selection is performed by pressing the ✓ key. Escape without approval ✕ (settings from before modification remain) is performed by pressing the key.

6.2.2 Sounds

The user may configure settings of acoustic signals, which occur during unit operation. Description of available configuration options:

- key sounds – sound signal is generated whenever a key is pressed,
- sounds during treatment – while performing treatment procedure sound signals are generated at one-second intervals,
- end of treatment sound – the end of a treatment procedure is signaled by sequence of short sound signals.

To select arrow position use the ^ v keys, switching on and off particular option takes place with the < > keys. That a particular option is on, is confirmed by the "tick" symbol visible in the field just opposite the option name. If the field is empty, this particular option has not been selected.
Approval of selection is performed by pressing the ✓ key. Escape without approval (settings from before modification remain) is performed by pressing the ✕ key.
Signals connected with emergency cases cannot be switched off.

6.2.3 Buzzer volume

The unit has got the possibility of setting buzzer volume. Pressing the > key, the level of signal is increased and with the < key, decreased. Approval of selection is performed by pressing the ✓ key. Escape without approval (settings from before modification remain) is performed by pressing the ✕ key.

6.2.4 Contrast

In the unit it is possible to adjust display contrast. Using the > key, the level of contrast is increased and with the < key, decreased. Approval of selection is performed by pressing the ✓ key. Escape without approval (settings from before modification remain) is performed by pressing the ✕ key.

6.2.5 Removal of user-defined programs

Selection of this option enables overall deletion of programs saved by the user. In order to delete all user-defined programs, follow the instructions shown on the display. While editing settings, it is unnecessary to repeat deletion of user-defined programs several times.

6.2.6 Start-up menu

This option enables selection of mode, in which after switching on the mains supply the unit will be started. Two options are available for each channel:

- Channel mode selection
- Recently selected program

In the first case, after switching on mains supply, therapy selection menu will appear. In the second case, after switching on mains supply the list of preset programs will be displayed at the program which was recently selected in the last treatment cycle or manual mode in particular channel. That a particular option is on, is confirmed by the "tick" symbol visible in the field just opposite the option name.

6.2.7 Electrodes test

Function is intended to check the usage status of electrodes. Details are described in chapter **10.4.**

6.2.8 Statistics

The unit has the possibility of checking the number of performed treatments. Additionally for the electrotherapy treatments there is a possibility of checking the number of performed treatments with particular currents. Navigation should be done by using the ^ v keys. To escape from statistics section press the ✕ key. Statistics may be deleted. To delete them, by using the ^ v keys you need to select the **„Reset (!)”** and press the key ✓. During this procedure it is recommended to follow the instructions shown on the display.

7. Unit operation

The unit may operate in one of two modes:
- program mode,
- manual mode.

In the program mode you can use preset procedures of treatment programs, treatment sequences, acupuncture programs and user-defined programs.
In the program mode you cannot edit the introduced parameters. Such an option is available in the manual operation mode Transition between program operation mode and manual mode (and vice versa) follows after pressing the key.

7.1 Patient preparation and treatment performance

7.1.1 General information

To perform safe and effective treatment procedure you are obliged to:
- make sure if there are no contraindications to perform the treatment,
- the patient should be placed in a comfortable position while providing relaxation of tissues in the treatment area, the patient should be in lying position in case of treatment performed near the head,
- sitting or reclining position should be applied to patients with respiratory disorders or breathing difficulties,
- inform the patient about the possible feelings occurring during treatment procedure.

The treatment effectiveness depends on the choice of parameters to the current patient's condition. The patient's condition changes over time. Its observation and assessment should take place before, during and after therapy. Such an action is necessary for changing the parameters in order to adapt them to the actual condition of the patient.
It is recommended to keep records of treatments including the parameters of therapy, the area of treatment, treatment technique, dose and symptoms after therapy. If the treatment does not generate the intended effects, change of treatment parameters should be taken into consideration. It is necessary to continuously update knowledge and follow literary activities in the scope of therapy.

When performing therapy, it is recommended to follow the guidelines given in the following sections.

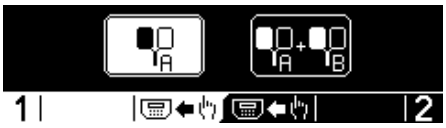
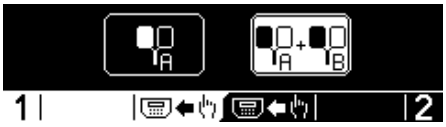
7.1.2 Electrotherapy

- **Before electrotherapy it is necessary to check the correct operation of the device and check the technical condition of cables and electrodes using a tester or the built-in device function - see chapter 10.4.**
- **Use only disinfected and in good condition electrodes.**
- **Improper selection of electrodes can cause skin irritation and burns.**
- **In case of direct current and unidirectional pulse currents of long pulse duration it is necessary to use tin electrodes.**
- **It is necessary to use properly moistened pads for electrodes, they may be made of viscose or fine mesh gauze to "keep" water properly. For unidirectional currents it is necessary to use properly moistened pads and of adequate thickness, however water should not drip from them.**
- **The water should be warm so as not to cause vasoconstriction in the area of performed treatment, you should use casual tap water.**
- **Apply the gel (e.g. aloe vera) coupling the electrodes with the patient's body if there are no viscose or gauze pads.**
- **Properly attach the electrodes with viscose pads to the patient's body, e.g. by velcro belts, elastic bandage or sand bags.**

- **In the place of the arrangement of the electrodes it is necessary to estimate the continuity of the skin and exteroceptive sensation.**
- **In order to decrease the resistance of skin you can clean it with alcohol or water with soap, after wiping leave the skin moist. Small skin damages should be secured with medical or cosmetic petroleum jelly.**
- **During the first therapy it is necessary to use rather lower doses of current than the recommended ones. Intensity (sensory threshold level or motor threshold) depending on the goal of therapy, it is necessary to increase in accordance with the patient's sensations and maintaining comfort during treatment.**
- **In case of reporting burning it is necessary to stop the treatment and examine the skin.**
- **The electrodes should be used in accordance with the indications of the manufacturer and should be replaced periodically, depending on the degree of wear. Loss of electrical properties by the electrodes causes the risk of burning the patient.**

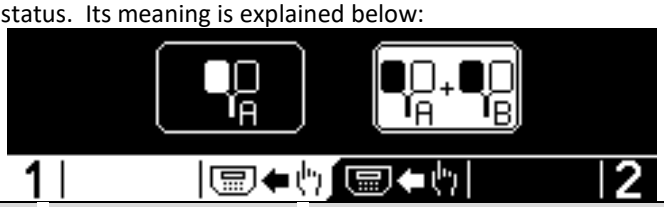
7.2 General configuration

7.2.1 Treatment channel configuration

Treatment channel 1 Available treatments	Treatment channel 2 Available treatments	Connected accessories
Treatment: 1- channel electrotherapy 	Treatment: 1- channel electrotherapy 	• Patient's cable
Treatment: 2- channel electrotherapy 	Treatment: unavailable therapies 	• Patient's cable

7.2.2 Status tabs

On the display there are shown two status tabs, each for one treatment channel. There is presented information about the unit operation status. Its meaning is explained below:



Symbol	Treatment channel	Description
	1	Selected 1-channel electrotherapy - socket A
	1	Selected 2-channel electrotherapy - socket A and B
	2	Selected 1-channel electrotherapy - socket B
	1 and 2	Treatment selection and parameters edition mode
	1 and 2	Treatment channel in generation mode
	1 and 2	The end of a treatment in one treatment channel
	1 and 2	Open circuit for electrotherapy or lack of head contact

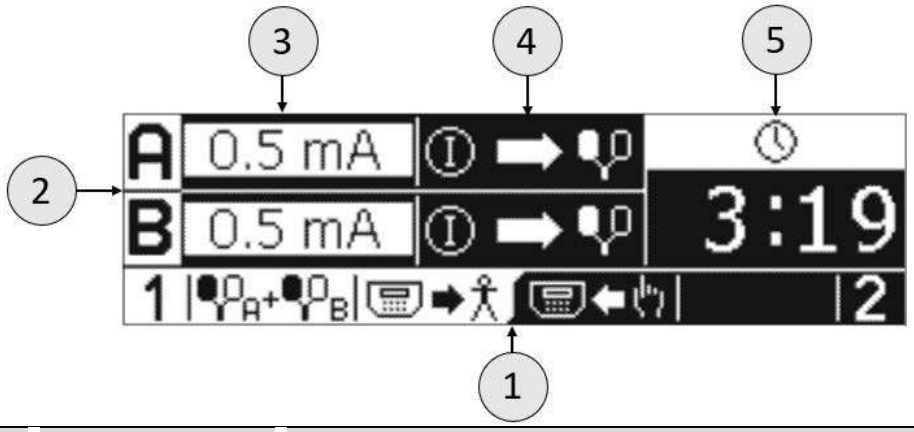
Symbol	Treatment channel	Description
ⓘ	1 and 2	Preset treatment programs and sequences parameters view mode
ⓘ 1/3 ⓘ 2/3 ⓘ 3/3 ⓘ 1/2 ⓘ 2/2	1 and 2	Preset treatment sequences parameters view mode – position number

7.2.3 Limitations

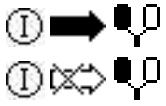
The list of limitations in the unit operation:

Condition	Limitations
Treatment channel 1 Set electrotherapy mode A+B	It is impossible to set electrotherapy B in channel 2 until the treatment session in channel 1 is finished.
Treatment channel 2, selected electrotherapy B	In channel 1 there is a possibility of setting only electrotherapy A
Performing of I/t curve	I/t curve is available only for channel 1, electrotherapy A

7.3 Display description



Symbol	Display	Description	
1	Status tab	Information about the unit operation status and treatment type. The tab of currently selected treatment channel is highlighted in white.	
2	Circuit field	A	Electrotherapy circuit – socket A
		B	Electrotherapy circuit – socket B
3	Amplitude field	Amplitude settings: • current and voltage for electrotherapy circuits	

Symbol	Display	Description
4	Information field	 CV mode – the voltage value and the estimated intensity of current flow, where: • one column – current < 10 mA • two columns – current in the range of 10 – 20 mA • three columns – current in the range of 20 – 30 mA • four columns – current in the range of 30 – 40 mA • five columns – current > 40 mA
		 CC mode, stabilized output current in patient circuit
5	Treatment timer field	Presentation of the treatment elapsed time

7.4 Operation with preset treatment programs and sequences

The simplest method of unit's operation is to use its preset programs or treatment sequences. The unit includes a database containing several dozens of most frequently met disorders together with suggested treatment types and parameters. In this mode, the operation is reduced to selection of disease entity from the list. The list of all disease entities with parameters is included in the guide **"Preset Treatment Programs and Sequences - Etius Family and Polaris 2"** which is attached to the unit's accessories.

The values of the preset treatment programs parameters are based on the available literature data and they are determined as average values. Parameters should be treated exclusively as indications. Sole responsibility for application of preset treatment programs rests with the user.

Symbol definition and parameters range are given in chapter 8.

Schematic procedures for different therapies are presented below. In continuous operation, it is recommended to start the treatment procedure from step 3 of each of the schemes.

Schematic procedure for treatments:

Step	Description
1.	Connect the patient's cable.
2.	Switch on the unit.
3.	Choose the treatment channel 1 or 2. Select the therapy 
4.	If the unit is in manual mode, press the key  . From the function list in program mode select the option: • **Favorites** • **Preset treatment programs** • **Preset treatment sequences** • **User programs** and press the key ✓.
5.	Using the ^ v keys, choose the position from the list.

Step	Description
6.	Prepare the patient for the treatment according to indications in point 7.1
7.	Press the ▶.
8.	Using the < > keys choose the circuit, using the ^ v keys set the current or voltage amplitude.

To check the parameters of preset programs or sequences you should:

Action	Effect	
	Program	**Sequence**
1. Press ⓘ	Displaying of current type	Displaying of current type
2. Press ⓘ	Displaying of treatment parameters	Displaying of parameters of the first current
a. Press ^ v	---	Viewing of subsequent currents in the sequence
b. Press < >	Viewing of user-defined programs with more parameters	---
3. Press ⓘ	Return to the list of programs	Return to the list of programs

Exit from information display mode (including name and parameters) follows after pressing the key ✕.
The fact that the screen with parameters consists of two parts is indicated by icons ⋯→ and ←⋯.
If it is necessary to interrupt the treatment procedure (pause), press ■ key. To resume the treatment procedure it is recommended to follow the instructions shown on the display.

7.5 Favorites

The function offers quick access to frequently used programs from the preset treatment programs without browsing the entire list. For each of the available therapies, user can save up to twenty favorite programs. To mark the program as a favorite treatment you should:

Step	Description
1.	Switch on the unit.
2.	Choose the treatment channel 1 or 2.
3.	Select the therapy according to the point 7.2.1
4.	If the unit is in manual mode, press the ▤|☜ key. From the function list in program mode select the option **Preset treatment programs** and press the ✓ key. For scanning and cluster applicator choose **Preset treatment sequences**.
5.	Using the ^ v keys, choose the position from the list.
6.	Press the key >. Next to the program name appears an icon ☺ or ✳ that confirms adding the program to the list.

If there is a need to remove the program from the list of favorites, you must select the program and press the < key. Exclusion is possible only from the favorites list or a list of preset treatment programs level.
If for a given therapy no program has been selected as a “favorite”, after going over the favorites, the message **"Favorites list is empty"** will be shown.

7.6 Manual mode operation

Symbol definition and parameters range are given in chapter 8.

Step	Description
1.	Switch on the unit.
2.	Choose the treatment channel 1 or 2.
3.	Select the therapy according to the point 7.2.1
4.	If the unit is in program mode, press the key.
5.	Select the current type and press the key.
6.	Using the keys, select the parameter to be edited, using the keys, select its value.
7.	Prepare the patient for the treatment according to indications in point 7.1.
8.	Press the .
9.	Using the keys choose the circuit, using the keys set the current or voltage amplitude.
10.	If it is necessary, during treatment procedure, using the keys set the amplitude.

If it is necessary to interrupt the treatment procedure (pause), press key. To resume the treatment procedure it is recommended to follow the instructions shown on the display.

7.7 User programs

The user has the possibility of saving own treatment programs for each available therapy. Each program may be given a name consisting of letters (up to 15 signs).

Saving of user-defined programs is possible only when the unit does not perform the treatment!

Step	Description
1.	Switch on the unit.
2.	Choose the treatment channel 1 or 2.
3.	Select the therapy according to the point 7.2.1
4.	If the unit is in program mode, press the key.
5.	Select the current type and press the key.
6.	Using the keys, select the parameter to be edited, using the keys, select its value.
7.	After edition of parameters press the key key.
8.	Using the keys, select the number that will be assigned to the program. Confirm your choice with the key.
9.	Enter program name - use the keys to choose the letter and the keys to change cursor position.
10.	Press the key to confirm the program name, press the key again to save the program.

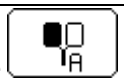
At any stage of defining a program, it is possible to return to the previous level by pressing the key.
The user-defined programs are selected in the same way as preset treatment programs. In program mode menu select the option **User Programs.**

If you try to select a dedicated program for A+B mode in the channel A or B (e.g. interferential current, diadynamic current, tonolysis) on the display will appear the message that the treatment is unavailable, because it requires two-channel electrotherapy.

At the first attempt to save user-defined program all memory locations are free. Saving of consecutive user-defined programs may follow to free locations or already saved by their overwriting.

7.8 I/t curve

It is recommended to use the results obtained by determining I/t curve to create treatment programs that will be executed exclusively with the Etius, Etius U, Etius LM and Etius ULM units.

Step	Description
1.	Switch on the unit.
2.	Choose the treatment channel 1, mode 
3.	If the unit is in manual mode, press the key. From the function list in program mode select the option **"I/t curve"** and press the ✓ key.
4.	Prepare the patient for the treatment according to indications in point **7.1.** It is recommended to use the point electrode (cathode, black plug) as an active electrode.
5.	Press the ▶. The unit is in stimulation mode.
6.	Using the ∧ ∨ keys start increasing the output current for the pulse duration of 1000 ms until reaching value, at which minimum muscle contraction is observed. The output current value can be read from the display and noted down on a form compiled for that purpose (see **Appendix A** placed at the end of the User Guide). The pulses appear at 2 seconds intervals.
7.	Using the ✓ key or the > key advance by one position to the right to the value under the 700 ms pulse duration. Again set the current at such a value at which minimum contraction occurs, then mark it on the diagram (setting starts with value measured for the previous pulse sweep time, you can reduce the current and start your observation from zero value of the output current). Repeat the procedure for all rectangular and triangular pulse time values.
8.	Using the ✓ key or the > key, after completed procedure, calculated values will be shown on the display: • I/t curve diagram, • rheobase, chronaxie, accommodation threshold value, • accommodation factor with a comment, • accommodation quotient with a comment,
9.	Press the ✕ key to escape from the I/t curve mode.

It may happen that the muscle reaction is not observed for triangular pulses of 1000 ms and 700 ms pulse duration. Then you should interrupt the procedure and start it again from 500 ms pulse duration. In this case, parameters are determined on the base of signal amplitude for 400 ms and 200 ms pulse duration.

The unit stores the parameters and results until:

- the next treatment procedure starts (after pressing ▶ button, the previous measurements are deleted),
- it is unplugged.

The unit is protected from accidentally moving on to the subsequent pulse duration while omitting the preceding pulses – the ✓ and > keys repetition is blocked Thus, after setting the amplitude please wait half a second before the next pulse duration.

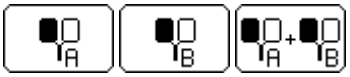
7.9 Safe shutdown procedure

The work flow for the safe termination of the operation:

Step	Description
1.	Proceed with the treatment to the end or stop it by pressing the ✕ key.
2.	Put the equipment back.
3.	Turn the device off using the mains switch located on the left side of the device.
4.	If you do not use the device for a long time, remove the mains cable plug from the mains socket.

8. Definitions and parameters

8.1 Electrotherapy



8.1.1 Terminology

The carrier frequency is a parameter of medium frequency alternative current, the so called carrier wave of interferential currents (4000 Hz), Kotz' current (2500 Hz) and medium frequency unipolar currents modulated by low frequency current. The medium frequency alternative current features good penetrability within the medium, which the human body is, and its properties are used to "transport" the base frequency, which is the proper therapeutic instrument.

Base frequency is a parameter of low frequency alternative current, which is produced in course of amplitude modulation of carrier wave creating a low frequency sine curve (5÷100Hz). The sine wave of base frequency constitutes an envelope circumscribed on the carrier wave, which enables its deep penetration into human body tissues.

Basic frequency **spectrum** determines scope of modulation of this parameter as function of time. This parameter determines the frequency added to basic frequency, and the sum of them is the highest BASE frequency value that occurs during modulation.

Example:
Base frequency is at 60 Hz, spectrum 40 Hz. That means that the base frequency will vary within the limits 60 to 100 Hz (60+40=100) in timely dependence determined by the FM program.

The base frequency of Kotz' current determines the frequency of occurring rectangular, bipolar "bursts" (filled with carrier wave 4000 or 2500 Hz), the duration of which equals the pause time.

TENS pulse frequency determines frequency of occurring pulses, where the pulse duration time is a value set separately between 50 and 300μs.

8.1.2 Galvanic current

Galvanic current is a medium frequency unipolar current, not modulated. There are no significant therapeutic differences between this type of current and traditional direct current. However, because of applying medium frequency current, patient's sensation during treatment procedure improves. **It should be taken into consideration that set up amplitude, which determines certain degree of sensation, will be higher than amplitude of traditional direct current, which causes the same degree of sensation.**

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Continuous or interrupted shape of the current		continuous
			pulse frequency is 4kHz duty factor 80%

Symbol	Description	Available parameters	
	Polarization		For such polarization setting red plug is a positive electrode, and black plug is a negative electrode.
			For such polarization setting red plug is a negative electrode and black plug is a positive electrode. Warning means that such a setting is the reverse of commonly accepted way of marking polarity.
			Automatic polarization switch in the half performed treatment.
	Maximum amplitude	**0 – 40 mA in CC mode** Regulation: • 0,1 mA in the range of 0-10 mA, • 0,5 mA in the range of 10-20 mA, • 1 mA in the range of 20-40 mA.	

8.1.3 Diadynamic currents

Diadynamic currents generated by the Etius unit are medium frequency currents (carrier wave is 40 kHz) modulated by low frequency current, which comply with traditional diadynamic currents described by Bernard. There are no significant therapeutic differences between such an approach to diadynamic currents generation and traditional method. However, because of applying medium frequency current, patient's feeling during treatment improves.

Parameters description:

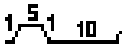
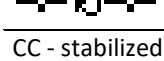
Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Shape of the current	• MF • DF • CP • CP-ISO (modification of MF phase, reduction with 12%) • LP	
	Continuous or interrupted shape of the current		continuous
			pulse frequency is 4kHz duty factor 80%
	Polarization		For such polarization setting red plug is a positive electrode, and black plug is a negative electrode.
			For such polarization setting red plug is a negative electrode and black plug is a positive electrode. Warning means that such a setting is the reverse of commonly accepted way of marking polarity.
			Automatic polarization switch in the half performed treatment.
	Maximum amplitude	**0 – 60 mA in CC mode** Regulation: • 0,1 mA in the range of 0-10 mA, • 0,5 mA in the range of 10-20 mA, • 1 mA in the range of 20-60 mA.	

8.1.4 Rectangular and triangular pulse currents

Pulse currents generated in the Etius unit are medium frequency unipolar currents modulated by low frequency rectangular or triangular current.
Rectangular pulse current consists of pulse sequence of rectangular shape and independently adjusted times of pulse and pause. This current is used for the stimulation of healthy or slightly denervated muscles. It is also applied in electrodiagnostics to determine the I/t curve.
Triangular pulse current consists of a sequence of saw-shaped pulses and independently adjusted times of pulse and pause. It is used to stimulate denervated muscles (struck by flaccid paralysis) and smooth muscles. It is also applied in electrodiagnostics to determine the I/t curve.
The Ultra Reiz current (Träbert's current) is a special case of rectangular pulse current. This is a current with rectangular shape, pulse duration 2 ms and pause duration 5 ms. These settings are not adjustable. Because it is also pain relieving, it is applied in pain syndrome treatment, muscle pain and degenerative joint disease.
Another special case of rectangular pulse currents are Leduc's currents with pulse duration 1ms and pause duration 9 ms and neofaradic current with pulse duration 1 ms and pause duration 19 ms available also for triangular currents.

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Shape of the current		Rectangular pulse current
			Rectangular pulse current according to Träbert (Ultra Reiz)
			Rectangular pulse current according to Leduc
			Neofaradic rectangular pulse current
			Triangular pulse current
			Neofaradic triangular pulse current
	Continuous or interrupted shape of the current		continuous
			pulse frequency is 4kHz duty factor 80% Pulse time values of 100 us and 200 us do not have pause.
	Pulse duration	Regulation range 100 us – 1 s for rectangular and triangular pulse currents. Regulation range 100us - 200ms for rectangular and triangular pulse current with the operation of training program PT Constant 2 ms for Ultra Reiz Constant 1 ms for Leduc's and neofaradic currents	
	Pause duration	Regulation range 1 ms – 10 s for rectangular and triangular pulse current Regulation range 1 ms – 200 ms for rectangular and triangular pulse current with the operation of training program PT Constant 5 ms for Ultra Reiz Constant 9 ms for Leduc's currents Constant 19 ms for neofaradic currents	
f	Basic pulse frequency	Non editable parameter, displayed for information purposes calculated from the formula F=1/(Pulse duration + Pause duration)	
PT	Training program	——	No training program
			Rise time 1 s Contraction phase 3 s Fall time 1 s Rest phase 8 s

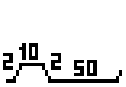
Symbol	Description	Available parameters	
			Rise time 1 s Contraction phase 5 s Fall time 1 s Rest phase 10 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 50 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 40 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 30 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 20 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 10 s
			Rise time 3 s Contraction phase 15 s Fall time 3 s Rest phase 50 s
			Rise time 3 s Contraction phase 15 s Fall time 3 s Rest phase 30 s
	Polarization		For such polarization setting red plug is a positive electrode, and black plug is a negative electrode.
			For such polarization setting red plug is a negative electrode and black plug is a positive electrode. Warning means that such a setting is the reverse of commonly accepted way of marking polarity.
			Automatic polarization switch in the half performed treatment.
	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage	
	Maximum amplitude	**0 – 60 mA in CC mode** Regulation: • 0,1 mA in the range of 0-10 mA, • 0,5 mA in the range of 10-20 mA, • 1 mA in the range of 20-60 mA. **0 – 100 V in CC mode, max. 60 mA** Regulation: • 0.5 V in the range of 0-100 V.	

Training program controls occurrence of muscle contraction and rest stages. Voltage and amperage, which will be applied during electrostimulation, should be determined when no training program is set. This program includes an active phase only, enabling comfortable setup of appropriate value of output signal. Set value of output signal shall be remembered and set up during session of the selected treatment program.

8.1.5 Kotz' current (Russian stimulation)

The Kotz` stimulation influences correctly innervated skeletal muscles. The method is useful for stimulation of hypotrophic muscles disappearing due to immobilization and for exercise of healthy muscles. This method does not enable stimulation of partially and totally denervated muscles. It is worth remarking here that the method is practically painless. For the stimulation a relatively complicated current train is here applied. Current of 2500 Hz frequency is joined to form rectangular trains or “bursts” with length equal to the pause time (e.g. pulse current with 20 Hz frequency consists of bursts lasting 25 ms and pauses of equal length). The bipolar pulse current of such duty cycle is subjected to amplitude modulation to obtain smooth increase and reduction of output current within patient circuit, which results in mild muscle contraction and relaxation effect with determined activity and rest stage. Kotz describes stimulations using frequency within the above range, suggesting that by using the 2500 Hz frequency the deeper located muscle layers are excited. The stimulation methodic is similar to the classic method utilizing unipolar rectangular or triangular impulses. Most frequently the bipolar method is used by applying small, flat electrodes above extreme segments of muscle belly. Stimulation involves the parts of muscle groups that perform the same movement.

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Carrier frequency	2500 Hz	
	Basic frequency	Regulation in the range of 5 Hz - 100 Hz	
PT	Training program	———	No training program
			Rise time 1 s Contraction phase 3 s Fall time 1 s Rest phase 8 s
			Rise time 1 s Contraction phase 5 s Fall time 1 s Rest phase 10 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 50 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 40 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 30 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 20 s
			Rise time 2 s Contraction phase 10 s Fall time 2 s Rest phase 10 s

Symbol	Description	Available parameters
		 Rise time 3 s Contraction phase 15 s Fall time 3 s Rest phase 50 s
		 Rise time 3 s Contraction phase 15 s Fall time 3 s Rest phase 30 s
	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage
	Maximum amplitude	**0 – 100 mA in CC mode** Regulation: • 0,5 mA in the range of 0-10 mA, • 1 mA in the range of 10-100 mA. **0 – 100 V in CV mode, max. 100 mA** Regulation: • 0.5 V in the range of 0-100 V.

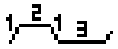
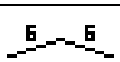
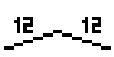
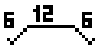
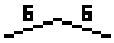
Training program controls occurrence of muscle contraction and rest stages. Voltage and amperage, which will be applied during electro stimulation, should be determined when no training program is set. This program includes an active phase only, enabling comfortable setup of appropriate value of output signal. This program shall not be applied in therapy. Set value of output signal shall be remembered and set up during session of the selected treatment program.
The programs which feature relatively long rest stage in relation to contraction stage give appropriate conditions for muscle fibre regeneration. The programs which have decisively shorter rest stage shall only be applied to electro-gymnastics with healthy persons or to cause tonolitic effect.

8.1.6 TENS pulse current

The TENS method (Transcutaneus Electrical Nerve Stimulation) was developed in the sixties as an alternative to the then modern analgesic stimulation with electrodes implanted adjacent to posterior horns of spinal cord. According to the check gate theory of Wall and Melzack, stimulation of fast-conducting nerve fibres of the A type inhibits the conductivity of slow-conducting fibres of the C type, responsible for connection of pain receptors with posterior horns of spinal cord. The check gate constitutes here the common synaptic system, loaded with the burden of A type fibre pulses, which inhibits pain transmission.
Additional phenomenon accompanying the TENS stimulation is increase in endorphin production in Central Nervous System centers.
TENS are used mainly for prolonged analgesic therapy and for stimulation of skeleton muscles.
The pulse current used with this method consists of rectangular bipolar pulses, symmetrical, asymmetrical or asymmetrical with alternately changing polarization. The choice of pulse shape is at the discretion of the patient's preferences. Symmetric and asymmetric pulses have similar biophysical properties. The pulse duration is short, whereas the amplitude is relatively high. The pulse frequency occurs within the range from several to more than one hundred Hertz. The TENS pulse current is frequency and amplitude modulated, which aims at delay in adaptation and creation of relax stages during session.

The BURST 7/2 program consist of 7 pulse sequences (timp = 100 µs) generated every 10 ms, occurring with 2 Hz frequency.
The BURST 7/4 program consist of 7 pulse sequences (timp = 100 µs) generated every 10 ms, occurring with 4 Hz frequency.
The BURST 9/2 program consist of 9 pulse sequences (timp = 100 µs) generated every 10 ms, occurring with 2 Hz frequency.
The BURST 9/4 program consist of 9 pulse sequences (timp = 100 µs) generated every 10 ms, occurring with 4 Hz frequency.

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Shape of the current		Symmetric
			Asymmetric
			Alternating asymmetric
	TENS pulse duration	Possible settings: 25 us, 50 us, 100 us, 150 us, 200 us, 250 us, 300 us	
	Basic frequency	Regulation in the range of 1 Hz - 100 Hz	
	Frequency spectrum	Regulation in the range of 0 Hz – 150 Hz and RANDOM	
FM	Frequency modulation program	——	Frequency modulation program is switched off
			Frequency rise time 3 s Frequency fall time 3 s
			Frequency rise time 1 s Hold time of maximum frequency 2 s Frequency fall time 1 s Hold time of basic frequency 3 s
			Frequency rise time 6 s Frequency fall time 6 s
			Frequency rise time 6 s Hold time of maximum frequency 6 s Frequency fall time 6 s Hold time of basic frequency 6 s
			Frequency rise time 12 s Frequency fall time 12 s
		RAND	Random pulse generation
AM	Amplitude modulation program	——	Amplitude modulation program is switched off
			Amplitude rise time 6 s Hold time of maximum amplitude 12 s Amplitude fall time
			Amplitude rise time 6 s Amplitude fall time
			Amplitude rise time 3 s Hold time of maximum amplitude 3 s Amplitude fall time 3 s
	BURST mode	7/2Hz	7 pulse sequences, 2 Hz
		7/4Hz	7 pulse sequences, 4 Hz
		9/2Hz	9 pulse sequences, 2 Hz
		9/4Hz	9 pulse sequences, 4 Hz
CC/CV	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage	
	Maximum amplitude	**0 – 140 mA in CC mode** Regulation: • 0,5 mA in the range of 0-10 mA, • 1 mA in the range of 10-140 mA. **0 – 140 V in CC mode, max. 140 mA** Regulation: • 0.5 V in the range of 0-140 V.	

Frequency modulation program FM determines in what time relations the base frequency modulation in the set up range occurs. The FM program describes the duration of lowest base frequency, time of increase to its highest value and time of falling to its lowest value.

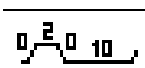
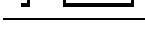
If SPECTRUM value is set up at 0 Hz, it is not possible to use frequency modulation program. And when nonzero SPECTRUM value is selected, default settings of frequency modulation program are 3 s rise time and 3 s fall time.

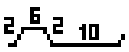
Amplitude modulation program AM determines in what time relations amplitude modulation, that is therapeutic output current, occurs and how deep that change goes. Such modulation aims at delaying process of adaptation to the set up output current and alleviation of adverse treatment results with patients badly tolerating electrotherapy. Amplitude is modulated within the range 70 % to 100 % of set up output signal.

8.1.7 SP-TENS pulse current

On the basis of classical TENS pulse currents, SP-TENS currents were created, intended for spastic paralysis treatments. Stimulation may be performed by using one- or two-channels simultaneously. While two-channel operation, during the stimulation phase in one channel, in the second channel the rest phase occurs, then there is a change.

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	SP-TENS current		one-channel
			Sequence, available only in 
	TENS current type		Symmetric
			Asymmetric
	TENS pulse duration	Possible settings: 25 us, 50 us, 100 us, 150 us, 200 us, 250 us, 300 us	
	Basic frequency	Regulation in the range of 30 Hz - 100 Hz	
PT	Amplitude modulation program		Stimulation phase 2 s Rest phase 2 s
			Stimulation phase 2 s Rest phase 4 s
			Stimulation phase 2 s Rest phase 6 s
			Stimulation phase 2 s Rest phase 10 s
			Rise time 0.5 s Stimulation phase 3 s Fall time 0.5 s Rest phase 4 s
			Rise time 0.5 s Stimulation phase 3 s Fall time 0.5 s Rest phase 8 s
			Rise time 1 s Stimulation phase 4 s Fall time 1 s Rest phase 6 s

Symbol	Description	Available parameters
		 Rise time 1 s Stimulation phase 4 s Fall time 1 s Rest phase 10 s
		 Rise time 2 s Stimulation phase 6 s Fall time 2 s Rest phase 10 s
	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage
	Maximum amplitude	**0 – 140 mA in CC mode** Regulation: • 0,5 mA in the range of 0-10 mA, • 1 mA in the range of 10-140 mA. **0 – 140 V in CC mode, max. 140 mA** Regulation: • 0.5 V in the range of 0-140 V.

8.1.8 Interferential currents

Interferential current is a two-channel sine wave current with carrier frequency with modulated amplitude. In this way effective therapeutic currents are obtained from sine wave and basic frequency of the order of approx. 10 – 100 Hz. Most frequently basic frequency is modulated, i.e. it changes with the time within the preset spectrum.
As opposed to the classic technique of generating interferential currents within patient's tissue (frequency interference), with the Etius unit the internal modulation process has been transferred to the inside of the unit. This technology causes generation of interference field occupying much space (the therapeutic current passes larger tissue space than with the classic method), interference occurs even in case of not very precise electrode application, which simplifies the treatment method.

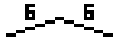
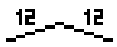
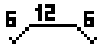
In case of **dynamic interferential current** additional amplitude and phase modulation of both channels was introduced, which causes the area of most effective therapeutic current operation to sweep in cycles the area between the electrodes (vector scanning). This effect increases additionally the volume capacity exposed to stimulation and continuous change of interference field location delays the adaptation process.

Isoplanar interferential current – its properties are similar to the current resulting from the classical interference, generated by the older unit versions. The Etius unit has the additional amplitude modulation causing that the treatment covers the entire area between the electrodes and not just a small part on bisector of angles formed by lines connecting the electrodes centers from both circuits. This simplifies the placement of electrodes and improves the spatiality of the current therapeutic effect.

Static interferential current – is not directly available. In order to apply this current you should choose **AMF** current working in **A+B mode** and use both channel while placing the electrodes.

AMF current – two-electrode technique is applied with two electrodes (one channel). Its biophysical properties are the same as in the case of standard interference, however, it features somewhat lesser penetration range. It is recommended for electrotherapy applied onto a small area or in places, which are not easily accessible. Because of the similarity to the interferential current it is determined as the IF-2P on the list of treatment programs.

Parameters description:

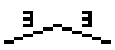
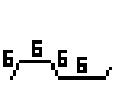
Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Shape of the current		Diadynamic interferential current
			Isoplanar interferential current
			One-channel AMF current
	Carrier frequency	Possible settings 2000 Hz, 4000 Hz, 6000 Hz, 8000 Hz, 10000 Hz	
	Basic frequency	Regulation in the range of 1 Hz - 100 Hz	
	Frequency spectrum	Regulation in the range of 5 Hz - 200 Hz	
	Pulse duration	Possible settings 4 s, 6 s, 8 s, 10 s	
FM	Frequency modulation program	—	Frequency modulation program is switched off
			Frequency rise time 3 s Frequency fall time 3 s
			Frequency rise time 1 s Hold time of maximum frequency 2 s Frequency fall time 1 s Hold time of basic frequency 3 s
			Frequency rise time 6 s Frequency fall time 6 s
			Frequency rise time 6 s Hold time of maximum frequency 6 s Frequency fall time 6 s Hold time of basic frequency 6 s
			Frequency rise time 12 s Frequency fall time 12 s
AM	Amplitude modulation program	—	Amplitude modulation program is switched off
			Amplitude rise time 6 s Hold time of maximum amplitude 12 s Amplitude fall time 6 s
			Amplitude rise time 6 s Amplitude fall time 6 s
			Amplitude rise time 3 s Hold time of maximum amplitude 3 s Amplitude fall time 3 s
	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage	
	Maximum amplitude	**0 – 100 mA in CC mode** Regulation: • 0,5 mA in the range of 0-10 mA, • 1 mA in the range of 10-100 mA. **0 – 100 V in CC mode, max. 100 mA** Regulation: • 0.5 V in the range of 0-100 V.	

If SPECTRUM value is set up at 0 Hz, it is not possible to use frequency modulation program. And when nonzero SPECTRUM value is selected, default settings of frequency modulation program are 3 s rise time and 3 s fall time. Amplitude is modulated within the range 70 % to 100 % of set up output signal.

8.1.9 USS - Unipolar Sine Surge

Unipolar (unidirectional) Sine Surge current is an average frequency current with modulated amplitude. The shape of the generated wave is very similar to the interferential current, the main difference relates to the polarization and generation of electrochemical changes under the electrodes, as in the constant current. Therefore, you must pay special attention to safety during treatment. It is recommended to use thick pads and it is possible to change the polarity while the treatment is performing.
The biggest advantage stems from the fact that this current is better tolerated by patients than the low frequency pulse current and direct current, it also creates proper conditions for affecting tissues located deeper. By modulating the low frequency amplitude, there are possibilities of using medium frequency unipolar current in order to relief acute and chronic pain disorders, improving peripheral circulation, acceleration of wound healing, strengthening muscles as well as to ionophoresis treatments.

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
---	Carrier frequency	40 kHz modulated by rectangular pulses with 4 kHz frequency and duty factor 50 %	
	Basic frequency	Regulation in the range of 1 Hz - 100 Hz	
	Frequency spectrum	Regulation in the range of 5 Hz - 200 Hz	
FM	Frequency modulation program		Frequency modulation program is switched off
			Frequency rise time 3 s Frequency fall time 3 s
			Frequency rise time 1 s Hold time of maximum frequency 2 s Frequency fall time 1 s Hold time of basic frequency 3 s
			Frequency rise time 6 s Frequency fall time 6 s
			Frequency rise time 6 s Hold time of maximum frequency 6 s Frequency fall time 6 s Hold time of basic frequency 6 s
			Frequency rise time 12 s Frequency fall time 12 s
AM	Amplitude modulation program		Amplitude modulation program is switched off
			Amplitude rise time 6 s Hold time of maximum amplitude 12 s Amplitude fall time 6 s
			Amplitude rise time 6 s Amplitude fall time 6 s
			Amplitude rise time 3 s Hold time of maximum amplitude 3 s Amplitude fall time 3 s
	Polarization		For such polarization setting red plug is a positive electrode, and black plug is a negative electrode.
			For such polarization setting red plug is a negative electrode and black plug is a positive electrode. Warning means that such a setting is the reverse of commonly accepted way of marking polarity.
			Automatic polarization switch in the half performed treatment.

Symbol	Description	Available parameters
CC/CV	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage
	Maximum amplitude	**0 – 100 mA in CC mode** Regulation: • 0,5 mA in the range of 0-20 mA, • 1 mA in the range of 20-100 mA, **0 – 100 V in CC mode, max. 100 mA** Regulation: • 0,5 V in the range of 0-100 V,

If SPECTRUM value is set up at 0 Hz, it is not possible to use frequency modulation program. And when nonzero SPECTRUM value is selected, default settings of frequency modulation program are 3 s rise time and 3 s fall time. Amplitude is modulated within the range 70 % to 100 % of set up output signal.

8.1.10 Tonolysis

Tonolysis is a method of two-channel electro stimulation, which through proprioreceptive facilitation of impulse transmission along nervous pathways aims at restoration of physiological balance of nerve fibre stimulation. It is applied in case of dysfunctions of central nervous system, when spastic muscle paralysis occurs. Due to lack of central regulation of muscle spindles domination of stimulation by flexor muscle tone occurs as well as weakness and stretching of extensor muscles acting on joints. With tonolysis spastically paralyzed muscles are stimulated with short triangular impulse of high output current. In this way their strong contraction is evoked, which is followed by their relaxation. In the phase of relaxation of flexor muscles, muscles operating antagonistically in relation to flexors, which are extensors, are stimulated with a sequence of amplitude modulated impulses. Alternative operation of flexor and extensor muscles, forced by the passage of the current, results in reproduction of the movement mechanism and restoration of physiological balance of paralyzed muscles.
The biological effect of tonolysis consists of:

- alternative facilitation of impulse transmission along nervous pathways of muscles flexing and extending joints
- activation of new multi-synaptic junctions

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Trigger pulse shape (channel A)		Rectangular pulse
			Triangular pulse
	Trigger pulse duration	Regulation in the range of 100 - 10 ms	
	Trigger pulse frequency	Regulation in the range of 0.2 Hz - 10 Hz	
	Stimulating pulse envelope shape (channel B)		Sinusoidal bipolar frequency and current shape - rectangular 4 kHz
			Sinusoidal unipolar frequency and current shape - rectangular 40kHz with modulation 4 kHz duty factor 50%
			Triangular bipolar frequency and current shape - rectangular 4 kHz

Symbol	Description	Available parameters	
			Triangular unipolar frequency and current shape - rectangular 40kHz with modulation 4 kHz duty factor 50%
	Time lag between channels	Regulation in the range of 5 - 300 ms	
	Stimulating pulse width (stimulation duration)	Regulation in the range of 5 - 1000 ms	
	Polarization		For such polarization setting red plug is a positive electrode, and black plug is a negative electrode.
			For such polarization setting red plug is a negative electrode and black plug is a positive electrode. Warning means that such a setting is the reverse of commonly accepted way of marking polarity.
	Amplifier operation mode	CC - stabilized output current CV - stabilized output voltage	
	Maximum amplitude	**CC mode:** **0 – 100 mA for trigger pulses – channel A** Regulation: • 0,5 mA in the range of 0-20 mA, • 1 mA in the range of 20-100 mA, **0 – 60 mA for unipolar stimulating pulses – channel B** Regulation: • 0,5 mA in the range of 0-20 mA, • 1 mA in the range of 20-60 mA, **0 – 100 mA for bipolar stimulating pulses – channel B** Regulation: • 0,5 mA in the range of 0-20 mA, • 1 mA in the range of 20-100 mA, **CV mode:** **0 – 100 V max. 60 mA for unipolar stimulating pulses – channel B** **0 – 100 V max. 100 mA for trigger pulses (channel A) and bipolar stimulating pulses (channel B)** Regulation: • 0,5 V in the range of 0-100 V,	

8.1.11 Microcurrents

Microcurrents characterize significantly lower values of amplitudes in comparison with traditional currents used in electrotherapy. Therefore, they are barely or not at all felt by the patient. Due to the very low amplitude of microcurrent there is significantly reduced risk of side effects like irritation, skin burns and damages as well as discomfort of current flow felt by some patients.

Parameters description:

Symbol	Description	Available parameters	
	Treatment time	1 - 60 minutes	
	Shape of the current		positive
			negative
			alternating
	Pulse duration	Regulation in the range of 1 - 500 ms	

Symbol	Description	Available parameters	
	Basic frequency	Regulation in the range of 0.3Hz - 500 Hz	
	Frequency spectrum	Regulation in the range of 5 Hz - 500 Hz	
FM	Frequency modulation program		Frequency modulation program is switched off
			Frequency rise time 3 s Frequency fall time 3 s
			Frequency rise time 1 s Hold time of maximum frequency 2 s Frequency fall time 1 s Hold time of basic frequency 3 s
			Frequency rise time 6 s Frequency fall time 6 s
			Frequency rise time 6 s Hold time of maximum frequency 6 s Frequency fall time 6 s Hold time of basic frequency 6 s
			Frequency rise time 12 s Frequency fall time 12 s
	Maximum amplitude	**0 – 1000µA in CC mode** Regulation: • 50 µA entire range	

If SPECTRUM value is set up at 0 Hz, it is not possible to use frequency modulation program. And when nonzero SPECTRUM value is selected, default settings of frequency modulation program are 3 s rise time and 3 s fall time. Amplitude is modulated within the range 70 % to 100 % of set up output signal.

9. Indications and contraindications

9.1 Indications

9.1.1 Interferential and AMF currents

biological impact: interferential and AMF currents affect mainly tissues located deeper inside human body showing different biological impact based on the range of basic frequency:

- f 5 – 50 Hz stimulation of muscles
- f 40 – 90 Hz improvement of local circulation, acceleration of resorption
- f 50 – 15 0Hz relief of pain and relaxation of muscles
- f 90 – 150 Hz relief of pain
- f 100 – 150 Hz normalization of vegetative system functions

therapeutic application:

- pains in ankylosing spondylitis
- discopathy
- degenerative joint diseases
- pains in rheumatoid arthritis and spondylitis
- neuralgias and compression syndromes
- periarthritic inflammation
- vascular syndromes
- post-traumatic conditions after leg injuries
- syndromes with increased muscular tone
- vegetative disorders
- oedemas, subcutaneous and intramuscular extravasations

9.1.2 Kotz' current- Russian stimulation

biological impact: contraction of skeleton muscles

therapeutic application:

- muscle atrophy of immobilization
- muscle re-education
- modeling of silhouette
- lipolysis
- cellulites

9.1.3 TENS and SP-TENS current

biological impact: pain relief, improvement of blood circulation, stimulation of muscles, stimulation of nerve fibres with varying effect depending on frequency range, pulse width and modulation type:

- timp 50÷100 μs, f 50÷150 Hz - 150 Hz - inhibition of pain conduction
- timp 100÷300 μs, f 1÷10 Hz - – 10 Hz – stimulation of endorphins synthesis, facilitation of pulse transmission along afferent fibres, stimulation in electro acupuncture
- timp 200÷300 μs, f 5÷50 Hz – stimulation of neuromotoric units
- BURST – strong analgesic effect
- SP-TENS – for spastic paralysis of the nervous muscle system

therapeutic application:

- discopathy
- degenerative joint diseases
- arthralgias and pain syndromes of rheumatoid arthritis and spondylitis
- neuralgias and compression syndromes
- periarthritic inflammation
- zoster
- post-surgical pain
- other pain syndromes except for tumor related pain
- partial damage of afferent nerve fibres (facilitation of impulse transmission)
- atrophy of immobilization or partial denervation
- acceleration of bone consolidation
- wound healing

9.1.4 Diadynamic currents

biological impact:

- pain relief
- improvement of peripheral circulation
- normalization of vegetative system functions
- muscle relaxation
- acceleration of resorption

therapeutic application:

- pains in ankylosing spondylitis
- discopathy
- degenerative joint diseases
- neuralgias and compression syndromes
- periarthritic inflammation
- vascular syndromes
- post-traumatic conditions after leg injuries
- syndromes with increased muscle tone
- vegetative disorders
- chilblains
- oedemas, subcutaneous and intramuscular extravasations
- emphysema, subcutaneous emphysema

9.1.5 Ultra Reiz current

biological impact:

- decrease in muscle tone
- pain relief
- improvement of peripheral circulation

therapeutic application:

- degenerative joint diseases
- neuralgias
- peripheral circulation disorders
- spinal cord pain syndromes
- radicular pains (sciatic neuralgia)
- post-traumatic states

9.1.6 Rectangular impulses

biological impact: muscle and nerve stimulation

therapeutic application:
- electrostimulation of nerves
- electrostimulation of healthy or slightly denervated skeleton muscles
- electro diagnostics, plotting the I/t curve

9.1.7 Triangular impulses

biological impact: muscle and nerve stimulation

therapeutic application:
- electrostimulation of smooth muscular coat, e.g. electro-stimulation in case of post-surgical atonia of bladder and intestines, treatment of spastic and atonic
- electrostimulation of denervated skeleton muscles
- electro diagnostics, plotting the I/t curve

9.1.8 Tonolysis

biological impact:
- restoration of physiologic equilibrium of muscles
- activation of the system of stretch reflex inhibiting organ by stimulating Golgi's organ
- activation of new synaptic junctions

therapeutic application:
- stimulation of spastically paralyzed muscles with damaged central nervous system

9.1.9 Microcurrents

biological impact:
- restoring the electric equilibrium of cells and tissues
- improving blood circulation in capillaries
- supporting cells and tissues recovery process
- acceleration of lactic acid and pain substances decomposition and elimination

therapeutic application:
- acute/chronic pain of known etiology
- extremities osteoarthritis/spine joint disease
- difficult bone consolidation
- wounds which are difficult to heal
- traumas of periarticular soft tissues
- decubitus ulcers
- ulceration
- face medical aesthetics

9.1.10 USS - Unipolar Sine Surge

biological impact:
- pain relief
- increasing muscle strength
- circulation improvement

therapeutic application:
- acute/chronic pain of known etiology
- drug administration (iontophoresis)

- circulation disorder
- oedemas
- hematomas
- muscle strength training

9.1.11 Galvanic current

biological impact:
- dilatation of peripheral vessels
- ion movement within tissues

therapeutic application:
- drug administration (iontophoresis)
- circulation disorder
- diagnostics of internal inflammatory focuses (galvano-palpation)

9.2 Contraindications for electrotherapy

- patients with implanted electronic devices (e.g. cardiac pacemakers) –procedures on torso and thorax, especially dangerous frequencies 10 – 60 Hz
- patients with implanted implants (e.g. internal prostheses, bone screws)should consult a physician prior to treatment
- acute infections and inflammatory processes
- thrombophlebitis
- risk of an embolism
- diseases with the possibility of hemorrhages
- pregnancy (abdomen and lower part of the spine area)
- sensory disturbances
- pain of unknown etiology
- active tumor in the treatment area
- active tuberculosis
- diseases with pyrexia
- superficial metal implants – special attention required
- peripheral artery occlusive disease, II b- IV (Fontaine)
- cutaneous changes at electrode application places
- cases, when the skin cannot be moisten

10. Maintenance, cleaning, disinfection

NOTE: The warranty does not cover any damage due to a failure to adhere to the recommendations stated in this chapter.

NOTE: Before attempting to perform following operations isolate the unit from the mains supply!

The activities of maintenance, cleaning and disinfection of device components should be realized at:

- ambient temperature between +15°C to +30°C,
- relative humidity between 30% to 75%,
- atmospheric pressure between 700 hPa and 1060 hPa (70 – 106 kPa).

These conditions are identical to those defined in chapter 4.2 as operation conditions.

There are no limitations for the number of cleaning and disinfection cycles, procedures should be carried out during the entire device "life time".

10.1 Cleaning of the unit

Cleaning of the unit shall be performed with lightly humid sponge or soft cloth with delicate soap solution or mild detergent. It is recommended to use a microfiber cloth, preferably designated for cleaning mirrors or electronic equipment.

Do not use solvents for paints and lacquers. Do not use excessively dampened sponges either, which can lead to water penetration inside the unit.

Then all cleaned cables shall be wiped with dry cloth and left for complete drying. Do not use wet or moist unit and leads!

Do not disinfect or sterilize unit and switch mode power supply casing. Disinfection of accessories, which are not intended for contact with patient's body (for example cables), shall be carried out at least once a week. It is recommended to use agent based on ethanol and/or isopropyl alcohol e.g. Alpro Minuten Spray or 70% solution of spirit.

It is not recommended to use sanitizers consisting of active oxygen, because it can lead to accessories damage.

10.2 Cleaning and disinfection of the electrotherapy accessories

Leads and electrodes shall be cleaned with water and gentle soap or mild detergent, and then wiped with dry cloth and left for complete drying. Electrodes shall be thoroughly cleaned after each treatment session.

Do not use wet or moist leads!

Electrodes shall be disinfected after each treatment session. To disinfect it is recommended to use 70 % alcohol solution. It is recommended to use agent based on ethanol and/or isopropyl alcohol e.g. Alpro Minuten Spray or 70% solution of spirit. After disinfection, accessories must be cleaned to avoid allergic reaction.

After each treatment session viscose electrode pads shall be accurately rinsed in clean water, if necessary it is recommended to add some vinegar to the water to remove calcareous deposit. In this case viscose pads shall be rinsed again in clean water. Viscose electrode covers and elastic belts may be disinfected with 70 % alcohol solution. It is also premised to use agent based on ethanol and/or isopropyl alcohol e.g. Alpro Minuten Spray or 70% solution of spirit.
Viscose electrode covers can be also washed in boiling water by the time of 1 minute, after that it is recommended to soak them in saline solution to improve conducting properties. Before immersion in the boiling water, it is recommended to soak viscose pads in the cool water.

If the viscose covers have a material tear or damage to the seams, replace them with new ones.

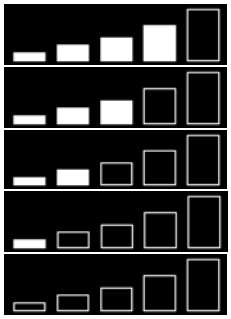
NOTE: Used electrodes and viscose pads should be disposed of with hospital waste.

10.3 Checking the condition of interconnecting cables and electrodes

10.3.1 Checking of cable condition

To check the electrode condition you may use the function available in setup mode as **"Electrodes test"**.

Special caution should be exercised due to the possibility of high current flow while testing leads. Performing the test, do not touch the cable plug that is examined!

Step	Description
1.	Switch on the unit.
2.	While performing the self-test, press the ✓ key to enter setup mode.
3.	Using the ^ v keys select the option **"Electrodes test"**. Confirm your choice with the ✓ key.
4.	Into socket A connect the patient's cable which is going to be tested. Holding for the plastic covers close to each other cable connectors. Additionally, you should move the cable near the plugs. Observe the indication of column varying in height.
5.	Evaluate the usage of electrodes according to instructions below:
	 Cable in good condition
	 Reducing the signal level indicates the cable damage
6.	To escape the test mode press the ✕ key.

Alternative method: cable plug should be inserted into the output socket, and plugs from the side of electrodes should be short-circuited. Then select one-channel interferential current and set maximum amplitude. Additionally, you can make movements with the cable, and particularly with the spiral cable glands.
If during current increase to maximum value the information about open circuit **is not displayed**, the cable shall be deemed in proper working condition.

10.3.2 Checking of electrode condition

The unit possesses the function of electrodes test, which allows checking the status of their usage. To check it, the current circuit A is used, where on its output voltage the signal is given. The unit while measuring the current flow in the circuit determines the level of electrode usage. When the electrode is more consumed, the less current flows in the circuit.

Special caution should be exercised due to the possibility of high current flow while testing leads. Performing the test, do not touch the cable plug that is examined!

Step	Description	
1.	Switch on the unit.	
2.	While performing the self-test, press the ✓ key to enter setup mode.	
3.	Using the ^ v keys select the option **"Electrodes test"**. Confirm your choice with the ✓ key.	
4.	To the patient lead red plug in circuit A connect the electrode that is going to be tested. Black plug should be attached at the locations shown on the LCD display. Observe the indication of column varying in height.	
5.	Evaluate the usage of electrodes according to instructions below:	
		New electrode, no signs of usage
		Small level of usage
		Medium level of usage
		Large level of usage, it is not recommended to perform the treatments with unipolar currents due to the possibility of open circuit frequent detection.
		Electrode completely consumed, recommended immediate replacement.
6.	To escape the test mode press the ✕ key.	

Alternative method: Rubber electrodes should be inspected using special "Electrode Tester" or resistance meter. In the case of using a resistance meter, electrodes should be considered to be used, when their resistance measured at the ends (diagonally for rectangular shapes, and diametrically for round shapes) is higher than 1000 Ω.
In the case of working with used electrodes, the information about open circuit detection will be shown on the display, while performing treatment procedure.

10.4 Troubleshooting

Problem	Undertaking action
The unit does not respond to mains supply.	Check spare fuses. If they are blown, replace them in accordance with indications in point 10.5. Try to connect different mains cable. If the problem persists, contact your service.
The unit does not respond when you press a key / keys.	Switch the unit off and on once again. if the problem persists or frequently occurs, contact your service.
Incomprehensible messages.	Switch on the unit. Enter the setup mode. Select an appropriate language version.
Unclear display.	Switch on the unit. Enter the setup mode. Adjust the contrast.
Lack of buzzer signals.	Switch on the unit. Enter the setup mode. Check the configuration of buzzer volume.
Too silent buzzer volume.	Switch on the unit. Enter the setup mode. Set an appropriate buzzer volume.
Message "Open circuit" frequently appears. Problems with interconnecting cables or/and electrodes.	Check it in accordance with point 10.3.1 or/and **10.3.2**. Follow the instructions described there.
Unit Error.	Switch the unit off and on once again. if the problem persists or frequently occurs, note down the error number and contact your service.

10.5 Fuse replacement

NOTE:
Before proceeding to the further described operations isolate the unit from the mains supply!

In case of burnt fuses, they must be replaced. Their parameters are given in chapter **„Specification and accessories”** and on the name plate.

To replace fuses:

Step	Description
1.	Disconnect the device from the mains.
2.	Disconnect the mains cable from the mains socket.
3.	With flat screwdriver lever the fuse socket until the moment of its slipping from the socket.
4.	Remove the socket with your fingers, replace the fuses, install them in the socket again and press firmly.
5.	Connect the mains cable - first to the socket placed in the rear panel of the controller and then to the mains.
6.	Check the device operation.

11. Specification and accessories

11.1 Specification

Classification:

medical device class:	IIa, rule 9
(in compliance with MDD 93/42 / EEC and Annex VIII of European Parliament and Council Regulation (EU) 2017/745 of 5 April 2017)	
electrical safety class:	I
applied part type:	BF

Operation mode:

The unit is intended for continuous operation.

Treatment parameters:

Given in chapter 8

carrier frequency for unipolar unidirectional currents:	40Hz

Accuracy of operation parameters:

Electrotherapy:

output current and voltage amplitude:	±20% for the range
load resistance:	30-500 Ω
microcurrents calibration:	for resistance 22 kΩ
pulse repetition frequency:	±20%
pulse duration:	±20%
accuracy of times of individual phases for AM and FM:	±20%

Treatment programs and sequences:

preset treatment programs for electrotherapy:	59
preset treatment sequences for electrotherapy:	30
Total:	89
User-defined programs for electrotherapy:	50

Treatment timer:

treatment time setting range for electrotherapy:	1÷60 minutes
step:	1 minute
time accuracy:	±10%

General:

mains supply:	230 V ±10%, 50/60 Hz
max. power consumption:	70 W, 100 VA
degree of protection provided by enclosures:	IP20
mains fuses:	2xT1L250V; 1 A, 250 V
unit weight:	max 6 kg
unit dimensions (WxDxH):	30x23x11 cm

Storage conditions:

temperature range:	+5÷+45°C
relative humidity:	30÷75%
pressure range:	700÷1060 hPa (70 – 106 kPa)

Operation conditions:

temperature range:	+15÷+30°C
relative humidity:	30÷75%
pressure range:	700÷1060 hPa (70 – 106 kPa)

Transport conditions:

temperature range:	-10÷+45°C
relative humidity:	20÷95%
pressure range:	700÷1060 hPa (70 – 106 kPa)

11.2 EMC parameters

In compliance with IEC 60601-1-2:2014

Guidance and manufacturer's declaration – electromagnetic emissions

Emission test	Compliance level
RF emissions CISPR 11	Group 1
RF emissions CISPR 11	Class B
Harmonic emissions IEC 61000-3-2	Class A
Voltage fluctuations / Flicker emissions IEC 61000-3-3	Complies

Guidance and manufacturer's declaration – electromagnetic immunity

Immunity test	IEC60601 test level	Compliance level
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2, ±4, ±8, ±15 kV air	±8 kV contact ±2, ±4, ±8, ±15 kV air
Recommendation: Floor should be made of wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.		

Immunity test	IEC60601 test level	Compliance level
Radiated RF IEC 61000-4-3	10 V/m 80MHz to 2,7 GHz	10 V/m
Field strengths from fixed transmitters, such base stations for radio (cellular / cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Etius unit is used exceeds the applicable RF compliance level above, the unit should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Etius unit. Applied compliance level is suitable for home healthcare environment. It means the device may be connected to the public low-voltage power supply network.		

Immunity test	IEC60601 test level	Compliance level
Electric fast transient / burst IEC 61000-4-4	±2 kV	±2 kV

Immunity test	IEC60601 test level	Compliance level
Surges IEC 61000-4-5	1 kV line-to-line 2 kV line-to-ground	1 kV line-to-line 2 kV line-to-ground

Immunity test	IEC60601 test level	Compliance level
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms 150 kHz to 80 MHz
	6 Vrms in ISM and amateur radio bands between 150 kHz – 80 MHz	6 Vrms in ISM and amateur radio bands between 150 kHz – 80 MHz

Field strengths from fixed transmitters, such base stations for radio (cellular / cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Etius unit is used exceeds the applicable RF compliance level above, the unit should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Etius unit.

Applied compliance level is suitable for home healthcare environment. It means the device may be connected to the public low-voltage power supply network.

Immunity test	IEC60601 test level	Compliance level
Magnetic field power frequency (50/60 Hz) IEC 61000-4-8	30 A/m	30 A/m

Immunity test	IEC60601 test level	Compliance level
Voltage dips IEC 61000-4-11	0% U_T 0,5 cycle, phase angles of synchronization with AC power supply voltage 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°	Complies
	0% U_T 1 cycle, phase angle of synchronization with AC power supply voltage 0°	Complies
	70% U_T 25 cycles for 50 Hz 30 cycles for 60 Hz phase angle of synchronization with AC power supply voltage 0°	Complies
Voltage interruptions IEC 61000-4-11	0% U_T 250 cycles for 50 Hz 300 cycles for 60 Hz	Complies

Immunity test	Compliance level
Proximity fields from RF wireless communications equipment according to 8.10 IEC 60601-1-2:2014	Complies

11.3 Standard accessories

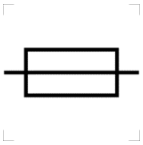
No.	Name	REF	Quantity
1.	Etius - the controller	A-UE-AST-EEWH	1
2.	Mains cable	-	1
3.	Patient's cable: a) Channel A b) Channel B	a) A-AE-AST-KPET2M_A or A-AE-AST-KPWPR2M_A b) A-AE-AST-KPET2M_B or A-AE-AST-KPWPR2M_B	2
4.	Electrodes 6x6 cm	A-AE-AST-EL6060R or A-AE-AST-EL6060RV2	4
5.	Electrodes 7,5x9 cm	A-AE-AST-EL7590R or A-AE-AST-EL7590RV2	2
6.	Viscose covers for 6x6 cm electrodes	A-AE-AST-PW8X8	8
7.	Viscose covers for 7,5x9 cm electrodes	A-AE-AST-PW10X10	4
8.	Elastic Velcro strap 100x10 cm or 100x9 cm	A-AE-SPM-PR100X10 or A-AE-AST-PR100X9CA	2
9.	Elastic Velcro strap 40x10 cm or 40x9 cm	A-AE-SPM-PR40X10 or A-AE-AST-PR40X9CA	2
10.	Spare fuses - time lag T1L250, 1A, 250V	-	2
11.	User manual	-	1
12.	List of preset treatment programs and sequences - Etius Family, Polaris 2	-	1
13.	Post inspection report	-	1
14.	Electrical safety test report	-	1

11.4 Optional accessories

Applicators and trolleys	
Name	**REF**
Trolley: a) Versa b) Versa X	 a) A-AM-AST-VSA b) A-AM-AST-VSX

Other	
Name	
Point electrodes 6, 10, 15, 20 mm	Sand bags 21x14 cm, 21 x 28 cm
Self-adhesive electrodes	Bag for the unit and accessories
Crocodile clips	Patient's stop switch
Phillips screwdriver	

12. Appendix A, Symbols description, I(t) curve card

Symbol	Explanation
	Caution, symbol ISO 7000-0434A
	Type BF applied part, symbol IEC 60417-5333
	Date of production: year, symbol ISO 7000-2497
	Manufacturer, symbol ISO 7000-3082
IP20	Degree of protection provided by enclosures, based on IEC 60529
	Fuse, symbol IEC 60417-5016
VER	Unit version
	Serial number, symbol ISO 7000-2498
	Batch code, symbol ISO 7000-2492
	Catalogue number, symbol ISO 7000-2493
	Operator's manual, symbol ISO7000-1641
	Disposal of used devices together with other waste is prohibited, complied with the requirements of WEEE
	Follow operating instructions, symbol ISO 7010-M002 Background color: blue

Symbol	Explanation
	No sitting, symbol ISO 7010-P018 Background color: white Circular band and slash: red Symbol or text: black
	No stepping on surface, symbol ISO 7010-P019 Background color: white Circular band and slash: red Symbol or text: black
	No pushing, symbol ISO 7010-P017 Background color: white Circular band and slash: red Symbol or text: black
	Weight
	Packaging size
	Temperature limit, symbol ISO 7000-0632
	Keep away from rain, symbol ISO 7000-0626
	Fragile; handle with care, symbol ISO 7000-0621
	This way up, symbol ISO 7000-0623
CE 0197	The marking of conformity with legal regulations for medical devices applicable in the European Union along with the number of the Notified Body taking part in the conformity assessment.

ASTAR.

I/t curve diagram

Patient:	Date of examination:
Age:	Therapist:
Description:	
Site: Rheobase: mA Chronaxie: ms Accomodation factor: